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DESCRIPTION OF A NEW SPECIES  
IN THE GENUS *CRIOKERON* VOLGIN, 1966  
AND OF THE MALE  
OF *CRIOQUERON QUINTUS*  
(DOMROW & BAKER, 1963)  
(ACARI, CHEYLETIDAE)

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BY A. FAIN<sup>1</sup> and F. S. LUKOSCHUS<sup>2</sup>

TAXONOMY  
ORIENTAL  
FAUNA  
DISCOVERY  
OF  
ALLOTYPUS  
AND  
IMMATURES  
HOMEOMORPHIC  
HETEROMORPHIC  
MALES  
ONTOGENIES

ABSTRACT : A new species, *Criokeron thailandicus*, is described from *Tupaia glis* from Thailand. The male and the immatures of *Criokeron quintus* (Domrow & Baker, 1963) (Acari, Cheyletidae) are described for the first time. The males are either homeomorphic or heteromorphic ; they develop within protonymphs whilst the females develop within tritonymphs.

TAXONOMIE  
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RÉSUMÉ : *Criokeron thailandicus* sp. n. est décrit de *Tupaia glis* de la Thaïlande. Le mâle et les immatures sont décrits pour la première fois chez *Criokeron quintus* (Domrow & Baker, 1963) (Acari, Cheyletidae). Les deux types de mâles, homéomorphique et hétéromorphique ont été rencontrés. Le mâle se développe dans une protonymphe alors que la femelle prend naissance dans une tritonymphe.

INTRODUCTION

*Criokeron quintus* (Domrow & Baker, 1963) has been described from a female specimen collected from *Tupaia glis* in Malaysia. We describe herein for the first time the male and the immatures of

this species. They were collected, mixed with females, from the nest box of a *Tupaia glis* originating from Thailand and reared in the laboratory of a German Primate Center. In addition we describe here a new species of *Criokeron*, *C. thailandicus*, collected from *Tupaia glis* in Thailand.

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REMARKS ON THE SUBFAMILIES CRIOKERONTINAE  
AND NIHELIINAE

LAWRENCE (1954) created the genus *Hemicheyletus* for two species, *Cheletiella lemuricola* (from a Primate) and *Ch. curvidens* (from a Mongoose), that he had described in 1948. This genus was not valid because the author omitted to designate a type species.

In 1960, DOMROW and BAKER created the genus *Nihelia* for *Nihelia calcarata* sp. n. from a Carnivore. As this species appeared to be congeneric with *H. curvidens*, this new genus replaced the genus of LAWRENCE for this group of species. In 1963, DOMROW and BAKER described two new species in this genus : *N. squamosa* from a squirrel and *N. quinta* from *Tupaia glis*.

VOLGIN (1966) rejected the name *Nihelia* and erected for *N. quinta* a new genus *Criokeron*. In 1969, he created for *N. squamosa* a new subgenus *Sciurocheyla* in the genus *Hemicheyletus*, the latter being revalidated by this author. Both genera were included in the subfamily Cheyletiellinae Volgin, 1961.

SMILEY (1970) elevated the Cheyletiellinae to the family rank. In 1977 he created several new subfamilies in this new taxon including the Criokerontinae (type genus *Criokeron*) and the Niheliinae (type genus *Nihelia*).

FAIN (1979 a) proposed to restrict the family Cheyletiellidae to the two most evolved genera of the group (*Cheletiella* and *Eucheyletiella*) and to maintain the other genera in the Cheyletidae. He created two new genera : *galagocheles* (type species *Hemicheyletus lemuricola*) and *Smileycheles* (type species *Smileycheles camerounensis* sp. n.) and described a new species *Nihelia cynictis* from a Carnivore.

In the present paper we follow SMILEY (1977) who includes the genus *Criokeron* into the subfamily Criokerontinae and the other genera in the Niheliinae. These two subfamilies present clear affinities with the subfamily Chelonotinae which contains several genera specialized for primitive rodents (see FAIN, 1979 b).

DIVISION OF THE CRIOKERONTINAE  
AND THE NIHELIINAE

The subfamily Criokerontinae contains only the type genus *Criokeron*. The female in this genus is clearly characterized by the shape of the gnathosoma which is strongly modified. Its base is prolonged laterally by a pair of enormous hooks, the palps are reduced, straight, situated not far from the midline and with most of the segments (tarsus, tibia genu and femur) fused and ending apically by a comb. The palptibial spine is absent. The coxa I bears a large flat attaching organ. There are no hooks or spurs on palps, legs, and on dorsal and ventral surfaces of the gnathosoma. In the male that we describe below the palps are strongly developed, all the segments are free and normal in shape and the palptarsus bears a large comb, two sickle-setae, a barbed seta and a solenidion. There are no spurs or hooks on the palp (except for two strongly pedunculate setae on the palpfemora, on the legs and on the gnathosoma. The copulatory orifice is terminal.

The subfamily Niheliinae contains four genera characterized as follows : In the female the palps have at least the tibia and the genu fused and these two segments, including the apical spine of tibia, are strongly recurved ventrally acting as a hook. Palptarsus always reduced and lacking a comb, or completely absent. Spurs or hooks always present on the palps, inconstant on legs and on base of gnathosoma. The idiosoma bears variable retrorse or spurlike processes. The males are known in the genera *Galagocheles* and *Nihelia*. In *Galagocheles* the palps resemble those of genus *Criokeron* except for the following characters : palptarsus smaller and without comb, palpfemur with a strong retrorse ventral hook, coxa I with a strong ventral hook, genua I and II with small ventral spurs, gnathosomal base with one pair of ventral hooks and one pair of transverse crests, the copulatory orifice is dorsal. In *Nihelia* the palp resembles that of *Galagocheles* but the palptarsus is fused with the tibia and vestigial, the

palpfemur bears more hooks or spurs, the gnathosomal base bears hooks dorsally, the peritremes are more posterior, the genera I and II are devoid of spurs and the setae *ve* are situated on prominent sclerotized processes. The genital aperture is dorsal as in *Galagocheles*.

The Niheliinae contain four genera forming two distinct groups : In the group *Galagocheles-Nihelia* the peritremes are strongly developed and have large cells and the gnathosomal base bears ventral or dorsal spurs or hooks. In the group *Sciurocheyla-Smileycheles* the peritreme are less developed and narrow with small regular cells and the gnathosomal base is devoid of sclerotized processes.

KEY TO THE GENERA OF THE CRIOKERONTINAE AND NIHELIINAE

(FEMALES)

- 1. Base of gnathosoma prolonged laterally by a pair of enormous hooks directed postero-ventrally. Palps relatively very small, straight, close to the midline, with tarsus, tibia, genu and femur fused and bearing an apical comb ; apical tibial spine absent. Absence of spurs or hooks on the palps, the dorsal and ventral surface of gnathosoma, and the legs, except the coxae I which bear a flat hooklike process..... Criokerontinae. One genus : *Criokeron*, Volgin, 1966  
Base of gnathosoma without strong lateral hooks. Palps well developed, more lateral, with their apical part strongly curved in ventral direction (hook-like) and with at least the tibia and the genu fused. Palptarsus either small and devoid of a comb or absent. Palps, specially the palpfemur, with hooks ; ventral or dorsal surface of gnathosoma, or both, with spurs or hooks..... Niheliinae (2)
- 2. Peritremes strongly developed with large cells. Gnathosomal base with spurs or hooks ventrally or dorsally ..... 3  
Peritremes narrow, linear with small subequal cells. Absence of spurs or hooks on the dorsal or ventral surface of gnathosoma ..... 4
- 3. Hooks or spurs present on legs I and II (ventral surface of tarsus, genu and femur and laterally on coxae I and II) ; a pair of rounded retrorse processes on ventral surface of gnathosoma ; dorsal surface of gnathosoma without retrorse processes ; absence of

processes on dorsal surface of idiosoma. Palptarsus relatively large. Peritreme situated in the anterior half of the gnathosomal base. Palpfemur, legfemora and legtrochanters with setae either bare or with a very few barbs.....

genus *Galagocheles*, Fain, 1979

Legs I and II without hooks or spurs. Ventral surface of gnathosoma with a pair of rounded processes along its posterior margin ; dorsal surface with a pair of large hooks and one or two pairs of lateral spurs. Dorsal surface of idiosoma with a pair of triangular processes bearing setae *ve* and a pair of rounded and flat processes behind setae *h*. Palptarsus very small. Peritreme situated in the posterior half of the gnathosoma. Palpfemur legfemora and legtrochanters with densely barbed setae.....

genus *Nihelia* (Domrow & Baker, 1960)

- 4. All dorsal setae piliform. Palptarsus completely lacking..... genus *Smileycheles*, Fain, 1979  
Some dorsal setae are squamose. Palptarsus completely lacking ..... genus *Smileycheles*, Fain, 1979  
Some dorsal setae are squamose. Palptarsus present... genus *Sciurocheyla*, Volgin, 1969, stat. nov.

(MALES)

(N. B. The males of *Sciurocheyla* and *Smileycheles* are unknown)

- 1. Palptarsus with a comb, genital opening terminal, absence of retrorse spur on palpfemur..... Criokerontinae  
Palptarsus without a comb, genital opening dorsal, presence of a retrorse spur on palpfemur..... Niheliinae (2)
- 2. Setae *ve* and dorsal setae of palpfemur and genu setiform ..... *Galagocheles*, Fain, 1979  
Setae *ve* and palpal setae barbed..... *Nihelia* (Domrow & Baker, 1960)

LIST OF THE SPECIES IN THE CRIOKERONTINAE AND THE NIHELIINAE

These interesting mites live on Afrotropical and Oriental mammals. They have been found so far on African Lorisidae (Primates), on Oriental Tupaiidae (Scandentia), on Oriental Sciuridae and African Anomaluridae (Rodentia) and on Mongooses (Viverridae, Carnivora) from both regions.

Here is a list of the known species :

Genus *Criokeron* Volgin, 1966

1. *C. quintus* (Domrow & Baker, 1963) (type species) : from *Tupaia glis* in Malaysia and Thailand.
2. *C. thailandicus* spec. nov. : from *Tupaia glis*, in Thailand.

Genus *Nihelia* Domrow and Baker, 1960

1. *N. calcarata* Domrow & Baker, 1960 (type species) : from *Herpestes* sp., Thailand.
2. *N. curvidens* (Lawrence, 1948) : from *Herpestes sanguineus punctulatus* in South Africa and *H. sanguineus bocagei* in Angola.
3. *N. cynictis* Fain, 1979 : from *Cynictis penicillata* in South Africa.

Genus *Galagocheles* Fain, 1979

1. *G. lemuricola* (Lawrence, 1948) (type species) : from *Galago crassicaudata garnetti* in South Africa, *G. crassicaudata monteri* in Southern Zaire and *G. senegalensis moholi* in Zaire and in Rwanda.

Genus *Sciurocheyla* Volgin, 1969 stat. nov.

1. *S. squamosus* (Domrow & Baker, 1963) stat. nov. (type species) : from *Menetes* sp. (Sciuridae) in Thailand.

Genus *Smileycheles* Fain, 1979

1. *S. camerounensis* Fain, 1979 (type species) : from *Zenkerella insignis* (Anomaluridae) in Cameroun.

Genus *Criokeron* Volgin, 1966

1. *Criokeron quintus* (Domrow & Baker, 1963)

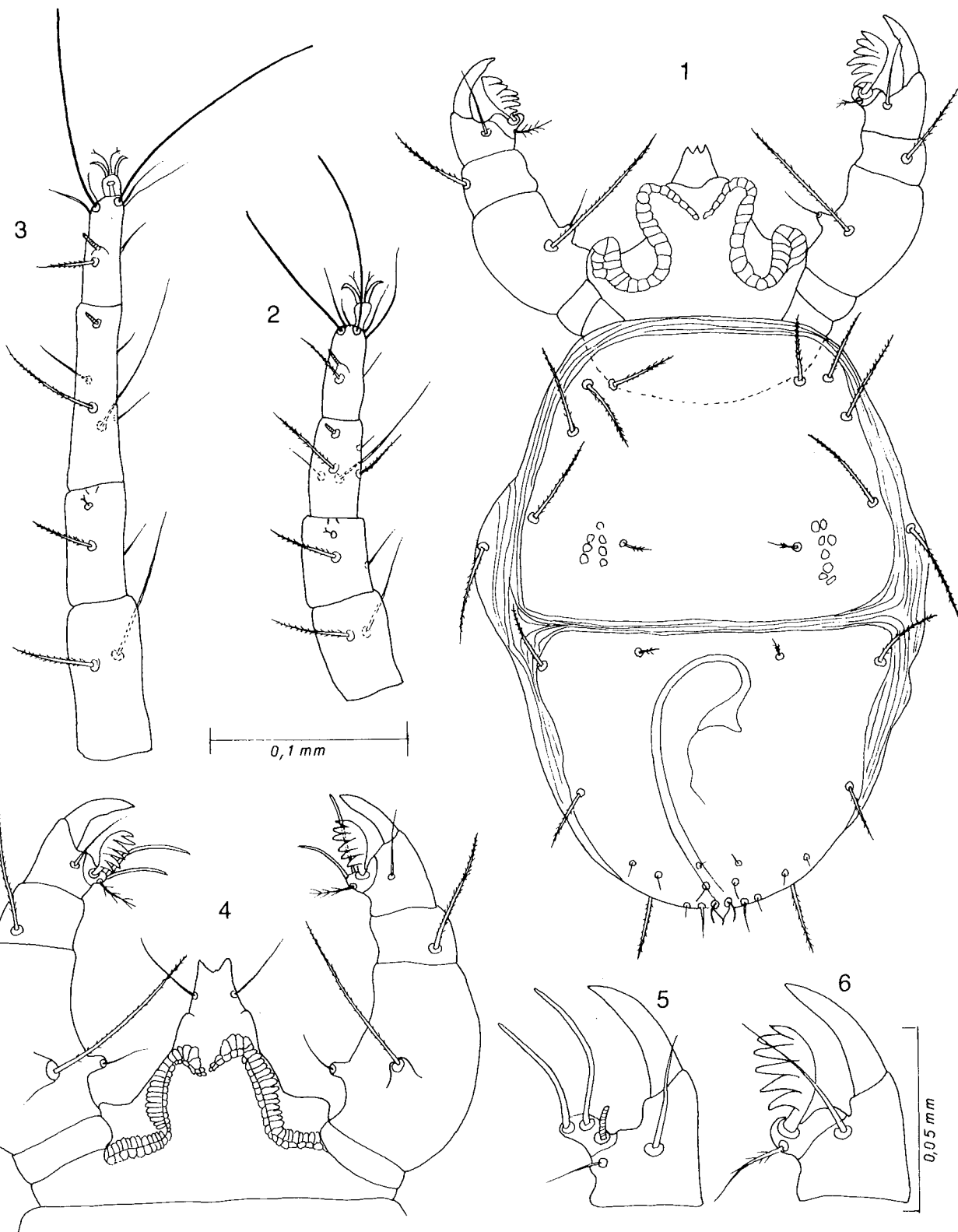
*Nihelia quinta* DOMROW & BAKER, 1963 : 230  
*Criokeron quintus*, VOLGIN, 1966 : 219 ; 1969 : 386

We describe herein the male and the immatures, so far unknown. The males are either homeomorphic or heteromorphic. The degree of heteromorphism varies according to the specimens. The organs that are the most involved by heteromorphism are the gnathosoma, the palps and the legs, especially the legs I.

*Homeomorphic male* (figs 1-2) : Idiosoma devoid of spurs or hooks. Idiosoma 300  $\mu\text{m}$  long and 240  $\mu\text{m}$  wide. Total length including gnathosoma 380  $\mu\text{m}$  (in midline). Propodonotal shield bearing 5 pairs of barbed setae of which one pair (*d l*) very short. Hysteronotal shield with 4 pairs of barbed setae (30-50  $\mu\text{m}$ ) and 7 pairs of very small setae. Penis very long, curved. Gnathosoma : base partly covered by the idiosoma, its total length in midline is 120  $\mu\text{m}$  (ventrally). The part visible dorsally is 80  $\mu\text{m}$  long. The base is devoid of spurs or hooks. Peritreme strongly developed, D-shaped. Palpfemur 60  $\mu\text{m}$  long with an internal rounded process bearing a thin seta, but without hooks ; it bears in addition a ventral bare seta and a dorsal barbed seta. Palp-genu with 2 setae. Palptibia with an apical slightly curved spine and 3 setae. Palptarsus normally shaped bearing a comb with 6 thick teeth, 2 sickle-setae, 1 barbed seta and a solenidion. Leg I 190  $\mu\text{m}$  long (the 4 apical segments), the tibia alone is 50  $\mu\text{m}$ , the femur 60  $\mu\text{m}$  long. Legs II-IV much shorter (135-120-125  $\mu\text{m}$  respectively). Chaetotaxy (number of setae) as in the female : Tarsi 9-7-7-7. Tibiae 5-4-4-4. Genua 2-2-2-2. Femora 2-2-2-1. Trochanters 1-1-2-1. Coxae 2-1-2-2. All tarsi with 2 claws and an empodium with 3 pairs of tenents hairs.

*Heteromorphic male* (figs. 3-6) : In a strongly heteromorphic specimen the total length of the body is 460  $\mu\text{m}$ . The gnathosoma is 155  $\mu\text{m}$  long in the midline, the palpfemur 93  $\mu\text{m}$ , the leg I 270  $\mu\text{m}$  (the four apical segments), leg II 150  $\mu\text{m}$ , leg III 148  $\mu\text{m}$  and leg IV 160  $\mu\text{m}$ . The peritreme is much less sinuous. In other less heteromorphic specimens these measurements are intermediate between this strongly heteromorphic and the homeomorphic males.

*Tritonymph* : Total length 350  $\mu\text{m}$ , width 210  $\mu\text{m}$ . It resembles the female except for the following characters : absence of lateral hooks on the gnathosoma, palps as in female but relatively larger and with a comb bearing 12-13 thinner teeth ; the peritreme is narrower and very sinuous ; hysteronotum with two small parame-



FIGS. 1-6 : *Criokeron quintus* (Domrow & Baker).

1-2. — Homeomorphic male ; dorsum (1) ; leg I in dorsal view (2).

3-6. — Heteromorphic male ; leg I in dorsal view (3) ; gnathosoma in dorsal view (4) ; tibia and tarsus of palp in ventral view (5) ; the same in dorsal view (6).

dian shields ; propodonotal shield smaller bearing only 4 pairs of setae, the fifth pair being on the soft cuticle ; genitoanal area with 7 pairs of simple setae.

*Protonymph* : Total length 400  $\mu\text{m}$ , width 240  $\mu\text{m}$ . Another contracted specimen is only 250  $\mu\text{m}$  long and 140  $\mu\text{m}$  wide. It differs from the tritonymph by the shape of the palps whose segments are rather well separated, the smaller size of the propodonotal and of the two hysteronotal shields and the less developed chaetotaxy. Coxae with 2-1-2-0 setae, the trochanteral I, II and IV and genital setae are lacking ; trochanter III with 1 seta. Genito-anal area with 4 pairs of setae.

*Larva* : Total length 210  $\mu\text{m}$ , width 135  $\mu\text{m}$ . Palps very short without apical comb ; peritreme shorter than in protonymph ; propodonotal shield smaller than in protonymph bearing only the *vi* and *ve* setae, the three other pairs being on the soft cuticle ; hysteronotum without shield ; coxae I-III with 1-0-0 setae ; there are only two pairs of *ic* setae (*ic 1* and *ic 3*). Other setae present : *d 1*, *d 2*, *l 1* to *l 5*. The anus is surrounded by 3 pairs of anal setae.

*Development* : Seven protonymphs in the molting stage contained a male. Five females were developing within a tritonymph. This type of development has already been observed in the genus *Ornithocheyletia* Volgin, 1964 (see FAIN, 1981).

*Origin of our specimen* : All these specimens were collected in a nest box of a *Tupaia glis* originating from Thailand and reared in the laboratory of a German Primate Center (Justus-Liebig University at Giessen).

## 2. *Criokeron thailandicus* spec. nov.

This species is represented only by the female.

*Female* (figs 7-11) : Idiosoma in holotype 480  $\mu\text{m}$  long and 380  $\mu\text{m}$  wide. Length including the gnathosoma 630  $\mu\text{m}$  (in midline). Total

length and width in 3 paratypes : 650  $\times$  360  $\mu\text{m}$  ; 665  $\times$  300  $\mu\text{m}$  and 678  $\mu\text{m}$   $\times$  400  $\mu\text{m}$ . Average lengths of 10 specimens : idiosoma 524  $\mu\text{m}$ , total length 710  $\mu\text{m}$  (in *C. quintus* these measurements are, in 10 females : 444  $\mu\text{m}$  and 609  $\mu\text{m}$  respectively.) Dorsum bearing two large shields. Anterior shield with 6 pairs of thick barbed setae. Posterior shield with 5 pairs of barbed more unequal setae. *Venter* : Coxae with 2-1-2-2 thin and not barbed setae. Setae *ic 1*, *ic 3*, *ic 4*, the 5 pairs of genitals and the 3 pairs of anals are bare. Gnathosoma very large with a pair of very strong lateral hooks directed ventrally and posteriorly. Palps close to the midline, they are small and straight and their 4 apical segments are fused. Peritreme with many elongate cells. Chaetotaxy : The *vi*, *ve*, and *sc i* are 65-75  $\mu\text{m}$  long ; *sc e* 100  $\mu\text{m}$  ; *d 1* and *d 2* 70  $\mu\text{m}$  ; *D 3* 90  $\mu\text{m}$  ; *d 4* 50  $\mu\text{m}$  ; *d 5* 105  $\mu\text{m}$  ; *l 1* and *l 2* 100  $\mu\text{m}$  ; *l 3* 120  $\mu\text{m}$  ; *h* 105  $\mu\text{m}$ . All these setae are dorsal, they are thick and shortly barbed. The *l 4* and *l 5* are ventral and 80 and 60  $\mu\text{m}$  long respectively. Legs I-IV (number of setae) : Tarsi 9-7-7-7. Tibiae 5-4-4-4. Genua 2-2-2-2. Femora 2-2-2-1. Trochanters 1-1-2-1. Solenidiotaxy : Tarsi 1-1-0-0. Tibiae 1-0-0-0. The genu I bears a very short specialized seta. Palps : The fused segments bear 8 setae (5 thick and 1 small, all barbed, 1 thin not barbed and 1 short and thick not barbed). 1 solenidion and 1 comb bearing 7-8 teeth. Empodium as in *C. quintus*.

*Host and Locality* : Holotype and 29 paratypes female from *Tupaia glis* KT 1728, from Nakhon Rachisima, Pak Thong Chai, Ban Sakaerat, Thailand (approximately 14°36' N, 102°02' E). This animal is conserved in the U.S. National Museum Washington D.C. (N° USNM 399408). Holotype in US National Museum.

*Remarks* : This species differs from *C. quintus* by the following characters : peritremes much smaller, far apart in the midline and differently shaped, absence of a large spoonlike seta on the ventral surface of tibia I, propodonotal shield with 6 pairs of setae (5 pairs in *C. quintus*).

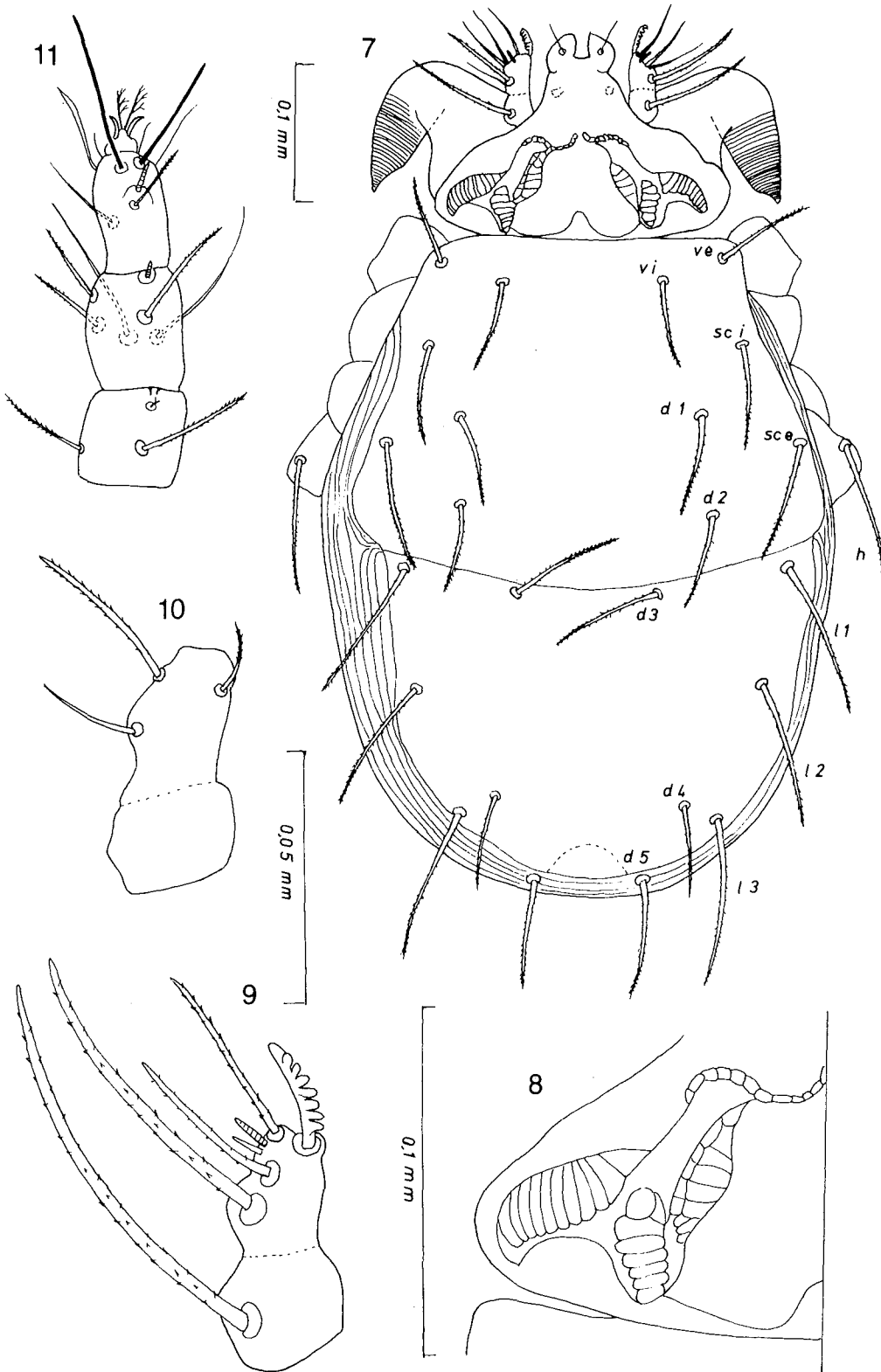


FIG. 7-11 : *Criokeron thailandicus* sp. n. Female.

Dorsum (7) ; peritreme (8) ; palp in dorsal view (9) ; palp in ventral view (10) ; leg I in dorsal view (three apical segments) (11).



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