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OBSERVATIONS ON THE GENUS *EPIMYODEX* FAIN & ORTS, 1969,  
WITH DESCRIPTION OF TWO NEW SPECIES.  
TRANSFER OF THIS GENUS TO THE CLOACARIDAE  
(ACARI, PROSTIGMATA)

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A. FAIN, F. S. LUKOSCHUS and P. G. ROSMALEN

(With 12 textfigures)

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ABSTRACT

Two new species of genus *Epimyodex* FAIN & ORTS, 1969 (Acari, Prostigmata) are described from the loose deep connective subcutaneous tissues of mammals in Nederland: *E. crociduræ* sp. n. from *Crocidura russula* and *E. microti* sp. n. from *Microtus arvalis*. The genus is transferred from the Demodicidae into the Cloacaridae. A key is given to the three known species of the genus *Epimyodex*.

The genus *Epimyodex* FAIN & ORTS, 1969 was so far represented only by the type species, *E. talpæ*, described from *Talpa europæa* in Belgium.

F. S. L. found in Nederland new specimens of *E. talpæ* from the typical host and two new species, one from murids, the other from an insectivore. Larva and nymphs were also discovered, allowing for the first time to observe the life-cycle of these very unusual mites. *E. talpæ* was also found in 1972 by F. S. L. from *Talpa romana* in Pescasseroli, Italy.

*Epimyodex* has been placed in the family Demodicidae, owing to the general shape and the poor sclerotization of body and legs. The study of this new material leads us now to revise our first opinion and to remove this genus from the Demodicidae. As a matter of fact the genus *Epimyodex* presents some resemblance with the Cloacaridae CAMIN et al., 1968,

a family of mites formed of 4 genera and 11 species, all endoparasitic in turtles.

In table I we summarize the main characters of *Epimyodex* compared with those of *Demodex* and the Cloacaridae.

TABLE 1

<i>Females</i>	<i>Demodicidae</i> ( <i>Demodex</i> and 4 other genera)	<i>Cloacaridae</i> (4 genera, 11 species)	<i>Epimyodex</i> (3 species)
<b>IDIOSOMA:</b>			
<i>Shape</i> ... ..	Narrow and subcylindrical in <i>Demodex</i> . Variable in other genera	Flattened dorso-ventrally	Slightly flattened dorso-ventrally
Opisthosoma ... ..	Long in <i>Demodex</i> .	Very short	About 50 % of body length
<i>Epimeres</i> ... ..	Forming coxae	Long, directed postero-internally	Long, directed postero-internally, not forming coxae
<i>Shape</i> ... ..			
Sclerotization ... ..	Poor	Strong	Poor
Epimeres I ... ..	Separate	Y-shaped	Y-shaped
Podonotal shield ...	Poorly sclerotized	Well sclerotized	Very poorly sclerotized
Cuticular striations	Well developed	Absent	Poorly developed, inconstant
<i>Vulva</i> ... ..	Between coxae IV or slightly behind	Either dorsal, postero-ventral or terminal	Terminal
Posterior papillae ...	Absent	Present	Present
<i>Chaetotaxy</i> ... ..			
Setae on dorsal shield ... ..	Vestigial	Vestigial and inconstant	Vestigial
<b>GNATHOSOMA:</b>			
Size ... ..	Normally developed	Vestigial	Very poorly developed
Situation ... ..	Terminal	Ventral	Ventral
<i>Palps</i> ... ..			
Number of segments	2 free and 1 fixed (coxa)	Only the coxa	(?) One free segment
Setae on apical segment ... ..	3 to 5 small curved retrorse spinelets and several other more apical spinelets	Coxa with a single « pedipalp » (long moveable retrorse hook)	With a short bifid or trifid curved retrorse pedipalp
<i>Chelicerae</i> ... ..	Stylerlike	Absent	Very small with base bulbous
<i>Pharyngeal bulb</i> ...	Present (in <i>Rhinodex</i> ?)	Absent	Very small with base bulbous. Absent

TABLE I (*suite et fin*)

<i>Females</i>	<i>Demodicidae</i> ( <i>Demodex</i> and 4 other genera)	<i>Cloacaridae</i> (4 genera, 11 species)	<i>Epimyodex</i> (3 species)
<i>Chaetotaxy</i> on gnathosoma ... ..	Present	Absent	Absent
<b>LEGS :</b>			
<i>Shape, size</i> ... ..	Very short	Short and thick	Slender, relatively long
<i>Number of free segments</i> ... ..	3 in <i>Demodex</i> ; 2 in <i>Pterodex</i> ; 5 in <i>Rhinodex</i> and <i>Stomatodex</i>	4	5
<i>Tarsal claws</i> ... ..	A pair of modified claws	Absent	A pair of normal, curved claws
<b>CHAETOTAXY :</b> (legs I-IV)			
On tarsus ... ..	Absent	4 to 6 setae	3 short conical dorsal spines
On tibia ... ..	Absent	1 or 2 spinelets	2 conical lateral spines (an anterior and a posterior)
<i>Solenidia</i> on tarsi I-II ... ..	Present	Absent	Absent
<b>NYMPHS AND LARVAE :</b>			
<i>Number of leg segments</i> ... ..	Unsegmented to 2 segments (Unknown in <i>Rhinodex</i> )	4	3
<i>Coxae</i> ... ..	Not sclerotized	Epimeres as in adults	Epimeres as in adults but epimeres I free
<i>Tarsal claws</i> ... ..	Present	Absent	Absent
<i>Solenidia</i> on legs I-II ... ..	Present	Absent	Absent
<b>BIOTOPE</b> ... ..	Pilous follicle and sebaceous glands (mammals)	Cloaca or muscles (turtles)	Deep loose connective subcutaneous or perimyscular tissues (mammals)

## SYSTEMATIC POSITION OF GENUS EPIMYODEX

Considering the characters of the three groups of mites (*Epimyodex*, *Demodicidae* and *Cloacaridae*) it appears clearly that *Epimyodex* is closer to the *Cloacaridae* than to *Demodex*. The most important characters that are shared by the first two groups are : the absence or the vestigial aspect of the gnathosoma and of the chelicerae, the presence of a palpal spine

(pedipalp) (either simple, bifid, or trifid), the shape of the epimeres, not forming true coxae, the posterior situation of vulva (either postero-ventral, terminal or dorsal), the flattened shape of the body, the shape and the chaetotaxy of the legs, the aspect of the nymphs and the larva.

We think therefore that *Epimyodex* should be removed from the Demodicidae and transferred in the Cloacaridae. However, owing to certain important differences existing between *Epimyodex* and the *Cloacaridae* we erect a new subfamily, Epimyodicinae for this genus.

#### EPIMYODICINAE subf. nov.

**Definition.** — With the characters of the Cloacaridae except for the following differences: Dorsal plates, ventral cuticle and legs very poorly sclerotized, palpal spine (« pedipalp ») much shorter, curved and bifid or trifid, presence of vestigial chelicerae, opisthosoma relatively much longer, legs longer and narrower with a pair of tarsal claws and with setae on tarsi and tibiae disposed differently.

**Type genus.** — *Epimyodex talpae* FAIN and ORTS, 1969.

#### Life-cycle of *Epimyodex*

We have observed nymphs and larvae. The nymph resembles closely the female except for the absence of the vulva, the shape of epimeres I remaining free and the absence of claws on leg tarsi. The larva is similar to the nymph but leg IV are lacking.

The transmission of the mite from host to host is still unknown. The two most likely ways of penetration of the mite into a new host seem to be the transplacental infection during the pregnancy of the host or the transmission by contaminated sperm during the copulation of the hosts, as it has been suggested for *Cloacarus* spp.

In order to check the exact situation of the mites in the hosts we have carefully examined 48 moles. Among those 21 were found infested. No mites were found in 12 subadult moles examined. In 5 gravid moles mites were not found in the uterus, in the connective tissues around the foetus nor in the skin of the foetus. The normal habitat of *E. talpae* is the loose deep connective tissues situated under the skin, on dorsal side of lumbal region. In three gravid moles and in one *Peromyscus leucopus* some specimens were found on venter near vulva and on inner side of femur of hind legs. In one male mole two mites were found in the preputial gland. No lesions were found in tissues invaded by the mites.

#### Key to the genus *Epimyodex*

##### Females

1. With a pair of well-developed terminal papillae. Pedipalp with 3 distinct prongs. Podonotal plate with 4-5 pairs of small paramedian ringlets. From *Talpa europaea* . . . . . *E. talpae* FAIN & ORTS, 1969.

- Posterior papillae very small. Pedipalps with 2 distinct prongs. Podonotal plate with either 10-17 pairs of very small paramedian ringlets or with only one pair of ringlets . . . . . 2.
2. Podonotal plate with 10-17 pairs of paramedian well-distinct ringlets. From *Microtus arvalis* and *Apodemus sylvaticus* . . . *E. microti* sp. n.  
Podonotal plate with only one pair of small rings. From *Crocidura russula* . . . . . *E. crocidurae* sp. n.

#### Males

1. Genital aperture in the anterior part of podonotal plate. Pedipalps with 3 prongs . . . . . *E. talpae* FAIN & ORTS, 1969.  
Genital aperture situated on posterior margin of podonotal plate . . . 2.
2. Tarsi with a pair of well-developed claws. Pedipalps well developed. Podonotal plate not striated and with 11-18 pairs of ringlets . . . . . *E. microti* sp. n.  
Tarsi with very small, almost vestigial claws. Pedipalps very small. Podonotal plate striated in its posterior half and bearing only one pair of ringlets . . . . . *E. crocidurae* sp. n.

### 1. *Epimyodex crocidurae* spec. nov.

**Female** (figs. 1, 2, 9, 10). — Holotype 194  $\mu$  long and 96  $\mu$  wide. In one paratype 186  $\times$  92  $\mu$ . Cuticle very poorly sclerotized. **Dorsum** : Anterior part with a very poorly distinct shield 85  $\mu$  long and 60  $\mu$  wide. This shield bears one pair of small anterior and paramedian ringlets and an indistinct antero-median pattern. Opisthonotum with indistinct striations. **Venter** : Epimeres I fused in Y, other epimeres free, directed postero-internally. Epimeres with a clear spot in their basal half. Vulva terminal, flanked by a pair of small terminal papillae. **Legs** : with 5 free segments inserted turtle-like. Tarsi I-IV with 2 small curved normally-formed claws and 3 dorsal spines; tibiae I-IV with 2 spines, an anterior and a posterior. **Gnathosoma** a ventral, very poorly developed. Chelicerae ovoid ending in a narrow digit bearing indistinct teeth. Pedipalps small, formed of short bifid and recurved sclerites inserted on a short palpal segment. Pharyngeal bulb and gnathosomal setae absent.

**Male** (fig. 3). — Allotype 165  $\mu$  long, 90  $\mu$  wide. In 2 paratypes 160  $\times$  80  $\mu$  and 170  $\times$  90  $\mu$ . **Dorsum** : Podonotal shield 70  $\mu$  long and 54  $\mu$  wide, poorly sclerotized in its anterior half and finely striated in its posterior half. This striation is also present on soft cuticle along posterior margins of the shield. A pair of ringlets is visible in the anterior half of the shield which also bears a median poorly defined structure. A transverse furrow is present in the middle of the shield. Male orifice situated immediately behind posterior margin of the shield; sclerotized

penis  $12\ \mu$  long, total length including soft sheath  $50\ \mu$ . Anus and terminal papillae absent. Venter as in female. Legs as in female but the tarsal claws are very small, almost vestigial. Pedipalps very small, almost vestigial. Chelicerae as in female.

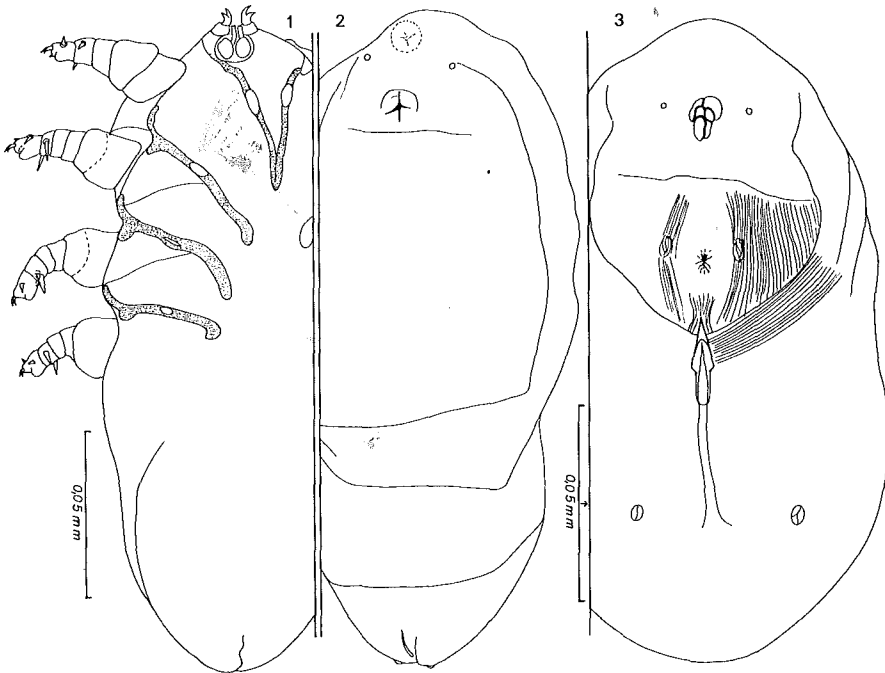


Fig. 1-3. — *Epimyodex crociduræ* sp. n.  
Fig. 1-2 : Female; 1, ventral view; 2, dorsal view. Fig. 3 : Male, dorsal view.

**Nymph.** — Length  $187\ \mu$ , width  $95\ \mu$ . General aspect as in female but the epimeres I are free, the shield is not distinct, the legs are reduced and do not bear claws. The tibio-tarsi bear 8 spines (legs I-II) or 7 spines (legs III-IV). Gnathosoma similar as in adults but less sclerotized and with vestigial pedipalps.

**Larva** (fig. 7). — Length  $135\ \mu$  long,  $78\ \mu$  wide. Posterior extremity truncate. Cuticle without striations but bearing minute surelevations in the region of opisthosoma. Structure of epimeres and legs as in the nymph. Anterior part of body with a rounded orifice resembling a sucker. Gnathosoma not observed.

#### Host and locality :

Holotype from *Crocidura russula*, Nijmegen, Nederland, 21 February, 1971; 1 female paratype, allotype and 3 male paratypes from the same host and locality, 20-21 February 1971; 1 larva and 1 nymph, same host

and locality, 23 October 1973; 5 females from same host in Schayk, Nederland, October and December 1974. Types in Rijksmuseum van Natuurlijke Historie, Leiden. Paratype male in the Institut royal des Sciences naturelles de Belgique, Bruxelles, Belgium.

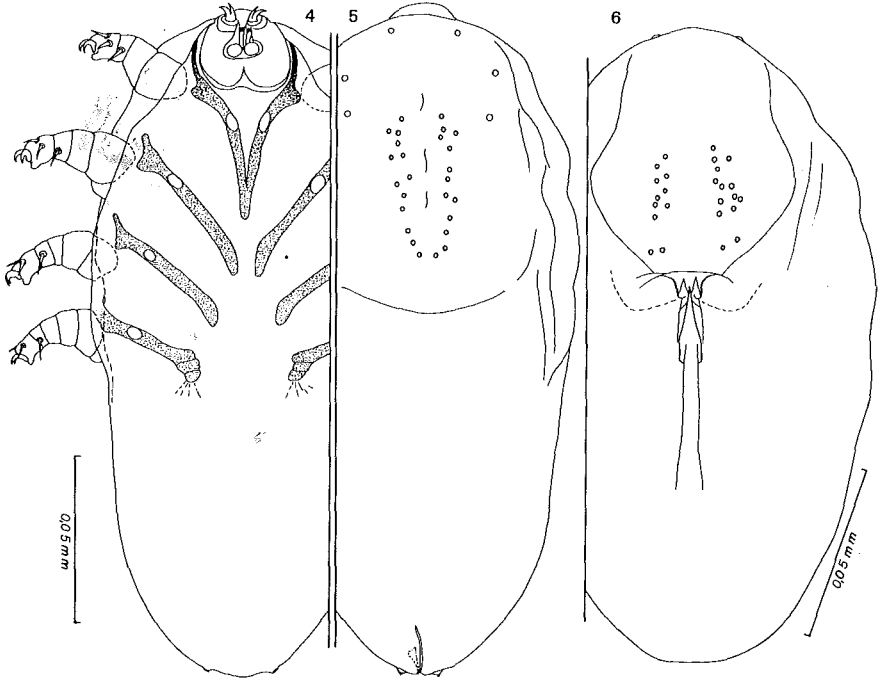


Fig. 4-6. — *Epimyodex microti* sp. n.  
Fig. 4-5 : Female; 4, ventral view; 5, dorsal view. Fig. 6 : Male, dorsal view.

## 2. *Epimyodex microti* spec. nov.

**F e m a l e** (figs. 4, 5, 11, 12). — Holotype 200  $\mu$  long and 92  $\mu$  wide. Measurements in 20 paratypes : 196-213  $\mu$  and 83-101  $\mu$ . Cuticle very weak. **D o r s u m** : Prodonotal plate very poorly sclerotized, 90  $\mu$  long, 61  $\mu$  wide (in the paratypes : 87-94  $\mu$  long and 59-62  $\mu$  wide) bearing an indistinct median pattern, 13 pairs of paramedian very small darkened ringlets (10 to 17 in paratypes) and 3 pairs of more anterior larger ringlets. There are indistinct striations on soft parts of dorsum. **V e n t e r** : Epimeres I fused in Y, other epimeres free and directed obliquely backwards. All these epimeres have a clear spot near their bases. Vulva terminal flanked by 2 small papillae. Anus absent. **L e g s** : with 5 free segments, inserted turtle-like. Tarsi I-IV with 2 equal and normal apical claws and 3 dorsal spines; tibiae I-IV with an anterior and a posterior spine. **G n a t h o s o m a** ventral, very poorly developed; its posterior border



more or less W-shaped. Chelicerae ovoid short, attenuated apically where they end into several very small hardly visible teeth. Pedipalp consisting in a bifid recurved sclerotized process situated on a very short palpal segment. Pharyngeal bulb, gnathosoma setae and supracoxal spines absent.

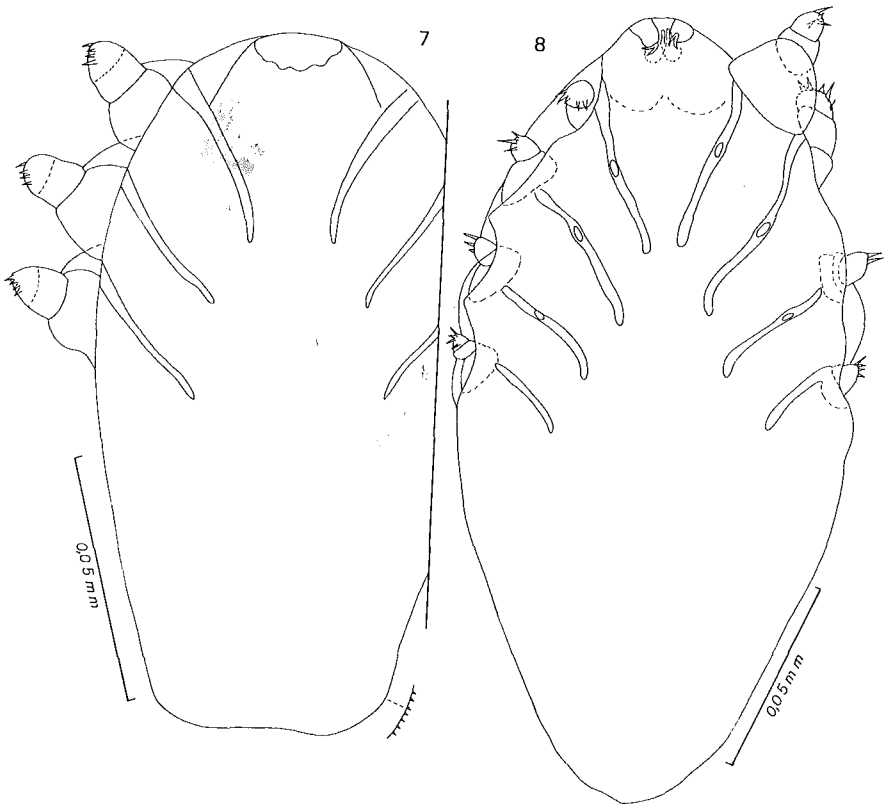


Fig. 7-8. — Fig. 7: *Epimyodex crocidurae* sp. n., Larva, ventral view.  
Fig. 8: *Epimyodex microti*, sp. n., Nymph, ventral view.

**Male** (figs. 6). — Allotype  $180\ \mu$  long,  $105\ \mu$  wide. In 4 paratypes  $177-182\ \mu \times 102-115\ \mu$ . Shape as in female. **Dorsum**: Shield  $65\ \mu$  long,  $59\ \mu$  wide with an indistinct median pattern and 10-14 pairs of paramedian ringlets or dark spots disposed in two irregular files (in paratypes 12 to 17 pairs). In some specimens there is a transverse furrow at level of trochanters IV. Genital opening immediately behind dorsal shield. Sclerotized penis slightly curved,  $18-20\ \mu$  long, prolonged by a soft sheat,  $25-30\ \mu$  long. Anus and terminal papillae absent. An irregular striation, never annular, is visible in some specimens. **Venter**: As in female but tibial spines larger and tarsal claws smaller. Pedipalps smaller than in female with 2 unequal prongs.

Nymphs (fig. 8). — Length 198  $\mu$ , width 106  $\mu$ . Shape as in female. Dorsum without shield, spots and striations. All epimeres free, less sclerotized than in female. Epimeres IV without white spots. Legs with three free segments, oriented as in adults; apical segments with 4 spines (leg III-IV) or 5 spines (legs I-II). Gnathosoma as in adults but with the posterior border not sclerotized. Anus, genital opening and papillae lacking.

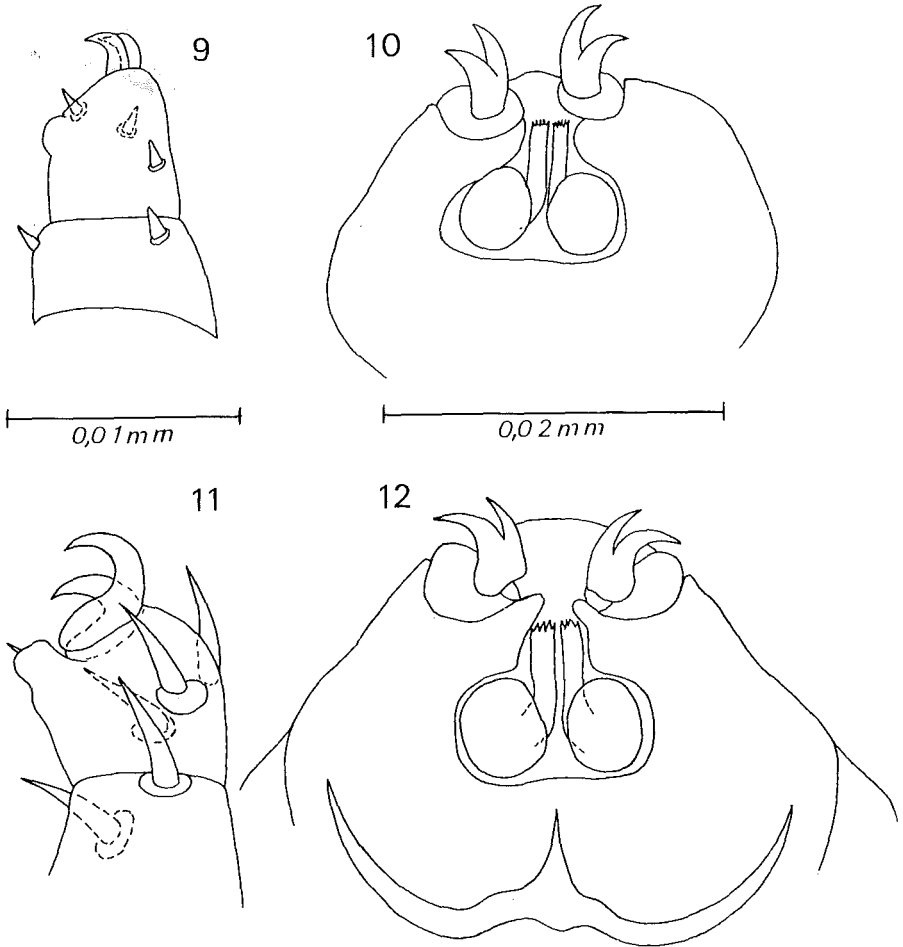


Fig. 9-12. — Fig. 9-10 : *Epimyodex crociduræ* sp. n., Female;  
9, tibia and tarsus I, in lateral view; 10, gnathosoma, ventral view.  
Fig. 11-12 : *Epimyodex microti* sp. n., Female;  
11, tibia and tarsus I, in lateral view; 12, gnathosoma, ventral view.

#### Host and locality :

- 1) Holotype from *Microtus arvalis*, Nijmegen, Nederland, January, 1971, 36 paratypes female, allotype and 5 paratypes male from the same host

(6 animals) and locality, on 15, 21, 25 January and 1, 6 and 23 February 1971. Paratypes female and male in Institut royal des Sciences naturelles de Belgique, Bruxelles.

The mites were found in the loose connective tissues under the skin or around the dorsal muscles in the lumbal regions. No lesions were observed.

- 2) *Apodemus sylvaticus*, Nijmegen, Nederland, 21-24 February 1971, 4 females and 3 males paratypes; February 1974, March 1974 and October 1974 : 8 females and 2 larvae. These specimens are not separable from those from *Microtus arvalis*. Deposition of types as for *E. crocidurae*.
- 3) *Pitymys savii*, Pescasseroli, Italy, 16 October 1974, 3 females.

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