SORICIDEX DIMORPHUS G. N., SP. N. (ACARI: DEMODICIDAE) FROM THE COMMON SHREW, SOREX ARANEUS

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Abstract. A new genus, Soricides, is erected and its type species, S. dimorphus, described from the hair follicles of the common shrew, Sorex araneus. Supposed adaptive nature of podosomal lamellated structures in female and phylogenetic affinities of opisthosomal organ are discussed.

Three currently accepted species of the family Demodicidae have been described from insectivore hosts to date*: Demodex erinacei Hirst, 1917 from the hedgehog, Erinaceus europaeus, D. soricinus Hirst, 1918 from the common shrew, Sorex araneus castaneus, and D. talpae Hirst, 1921 from the common mole, Talpa europaea. A new genus, Soricides, is erected for unique demodicids from soricid insectivores discussed below, followed by a description of the type species, S. dimorphus, with some information on the incidence, sites and intensity of infestation, populations, and pathogenicity.

MATERIAL AND METHODS

One hundred and twenty (40 males, 80 females) common shrews captured in the field in May 1979 — February 1981 were examined for demodicids. Skin and muzzle of 88 animals were scraped and squeeze-plucked with watchmaker forceps in 11 body areas (nasal, vibrissae area, eyelids, mouth, ear, vertex, dorsum of trunk, venter of trunk, genitals, anus, tail); 22 animals were examined on vertex, dorsum and venter of trunk only. The material obtained was mounted in Hoyez’s medium. Skin sections 5 x 5 mm large from various body areas of 5 infested shrews were excised, digested in 10% KOH and examined to obtain population counts. Sectors of dorsal trunk skin from heavily infested animals were hair-cropped, fixed in formalin, paraffin-embedded, cut at 8–10 μm and stained with hematoxylin-eosin. Light- and phase contrast optics and oil immersion were used studying Hoyez’s mounts and skin sections. For the purpose of scanning electron microscopy the sectors of skin fixed in formalin were dehydrated in a graded series of ethanol, transferred to amyl acetate, critical point dried, coated with gold and examined with a Tesla BS—300 microscope.

RESULTS

Soricides g. n.

Diagnosis. With characters of the family Demodicidae Nicolet, 1855 as given by Baker and Wharton (1952) and in part, emended by Desch et al. (1972). Medium-sized elongate body with annulated opisthosoma comprising about one half or more of total body length. Legs prominent and strong, their free parts three-segmented, with two claws which are bifid distally and spurred on shaft. Gnathosoma narrow, bearing palps with two free segments, terminal group of strong spines and supraocular spines.

*) The author supports the doubts of validity of Epimyodes talpae Fain et Orte, 1969 within the family Demodicidae expressed by Lukoschus and Nutting (1979).
Soricidix g.n. is related to Domexus Owen, 1843 (for generic diagnosis see Desch et al. 1972, for detailed account of morphology see Desch and Nutting 1977) and Pterodexus Lukoshezus et al. 1980. Soricidix differs from these two genera in the following diagnostic characters: 1. striking sexual dimorphism in both body proportions and several special structures; 2. gnathosoma in males partly hidden under dorsal cover lamella (anterior part of podosomal "carapace") as in Ophiolabidexus Lukoshezus et Nutting, 1979, but incised anteriorly; 3. gnathosoma in female with conspicuous mushroom-shaped stylophore; 4. podosoma in female dorsally with shelf-like lamellae.

At present, the generic diagnosis of Soricidix is adequate for three hitherto undescribed demodicids found by the author in soricid insectivores; one of them has been collected in sufficient numbers for a full description given below.

**Type species:** *Soricidix dimorphus* sp. n.

**Male** (holotype) (Plate I, Fig. 1). Body length 297 μm with opisthosoma measuring two thirds of this value. Other measurements are given in Table I.

A large portion of gnathosomal structures is hidden in dorsal and lateral views under cover lamella, which originates on dorsal and lateral sides of idiosoma and extends anteriorly. The following structures are freely visible from dorsal aspect, frontally to anterior V-shaped incision of the lamella: stylophore, diverging spines of large coxal endites and terminal parts of supracoxal spines (Figs. 1 A, D). In comparison to cover lamella, the gnathosoma proper is narrow, at apices of palps 19 μm wide, longer than wide, with V-shaped capsule. Palpal tarsus with 3 spines, two of which are strong, claw-like and 2-tined; one spine is slender and setiform (unornamented). Supracoxal spines long, approximately 4 μm long, edged dorsally, directed towards midline. Pharyngeal bulb elongate, open posteriorly. Subgnathosomal setae absent.

Podosoma comprises approximately one fourth of total body length. Four pairs of strong legs arranged radially, approximately two thirds of body width from dorsal aspect. Indistinct epimeral plates do not meet at midline. Teardrop-shaped segments of legs I—IV with two spurs, a larger ventroposterior one (on leg I 7 μm long) and a smaller dorsoposterior one (on leg I 3 μm long), which differ little in size on legs I—IV. Claws bifid distally and with a large curved spur projecting from shaft. Legs I and II with a slightly curved solenidion on terminal segment near the dorsal-most claw.

Opisthosoma attached to podosoma without postpedal constriction, more or less tubular, terminating in blunt point. Opisthosomal annuli distinct and wide (at mid-opisthosoma 3—4 μm). Opisthosomal organ mid-ventrally posterior to onehalf of opisthosoma (56 μm from the terminus), multiple, originating on body wall as a circular group (9 μm in diameter) of approximately 30 pores, each of which is extended to thin invagination 10 μm long. The invaginations are upright, on periphery of the group diverging slightly from dorsoventral axis (Fig. 1 E).

Genital orifice mid-dorsally over epimera I, a narrow slit in a small oval protuberance (Fig. 1 I). Penis sheathed, 18 μm long, with bulbous base. Dorsal podosomal tubercles oval-shaped, arranged to form subrectangular field 16 μm long and 14 μm wide.

**Female** (allotype) (Plate I, Fig. 2). Body length 210 μm with opisthosoma measuring one half of this value.

Gnathosoma not covered by unusually shaped cover structures: the compressed cylindrical sheath of loose creased material allows distal half of gnathosoma to be freely visible (Fig. 1 E). Gnathosoma with a mushroom-shaped stylophore conspicuous from dorsal aspect, its "cap" being 5 μm long and 13 μm wide, with protruding coxal

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**Fig. 1. Soricidix dimorphus** sp. n. A—lateral view of anterior part of male; B—left supracoxal spine; C—pharyngeal bulb; D—dorsal view of male gnathosoma; E—dorsolateral view of anterior part of female, dorsal sclerotized structures (arrows); F—dorsal view of female gnathosoma; G—female external genitalia (arrow), epimera extensions III, epimera plate IV; H—lateral view of male opisthosomal organ (approx. one third of total number of invaginations drawn); I—male genitalia and dorsal tubercles; J—lateral view of female opisthosomal organ.

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endites. Palps with stronger spines than in male. Other gnathosomal structures identical with male.

Dorsal plates measure slightly over one third of total body length. Four pairs of strong legs evenly spaced along podosoma, approximately four fifths of each visible from dorsal aspect. Distinct epimeral plates I–III meet at midline. Epimeral plates IV confluent, lacking posterior and anterior surfaces and extended posteriorly to form a free lamella covering base of opisthosoma. Similar smaller extensions present over posterior epimeral surfaces I–III (Figs. 1, 2, 3, 4, 5), protruding also laterally beyond outline of podosoma (mean maximum width of podosoma measured in 20 specimens at epimeral extensions is by 13.7 µm greater than that measured at lateral border wall). Segments 2 of legs I–IV with two spurs, which are shorter than in male (ventral-posterodorsal and dorso-posterodorsal spurs on leg I are 5 µm and 2–3 µm long respectively) and decrease in length from legs I to IV. Claws stronger than in male. Legs II–IV near to claws with biconcave-shaped projection 0.5 µm long and 2.5 µm wide. Solenidia as in male.

Dorsum of podosoma laterally over gaps between leg pairs I–IV with three pairs of conspicuous sclerotized structures the first largest pair of which are triangular to oval lamellae 16 µm long and 9 µm wide, attached in anterior part and slabs-like extended from body in dorso-latero-posterior directions. The second smaller pair of lamellae has a similar appearance: the third pair are small selerites embedded in integument (Fig. 1, Plate I, Fig. 8). Dorsal podosomal tubercles absent.

Distinct postepical constriction between podosoma and opisthosoma; maximum width of opisthosoma at the middle; terminus blunt. Annuli faint and narrow (at mid-opisthosoma 1–2 µm wide). Gnathosomal organ of the same relative position as in male (52 µm from the terminus), a single pore with a short tubular inflation, from the apex of which several very indistinct filamentous branches run anteriorly and posteriorly (Fig. 1 D).

Vulva 11 µm long, irregular longitudinal slit opening behind anterior surface of fused epipleral plates IV (Fig. 1 G). Ovum (Plate I, Fig. 3). Oval-shaped to slightly reniform, on the average 37.6 µm long and 18.5 µm wide, non-operculate, usually with a filiform appendix on each end. Larva (Plate I, Fig. 4). Body oval-shaped, with rounded posterior part and prominent gnathosoma; on the average 45.9 µm long and 19.3 µm wide. Gnathosoma simple, without unusual cover structures. Palps with a marginal group of spines (one 2-tined spine – one simple spine), dorsal sclerotized exocarne of obliquely transverse orientation, and small suprascoanal spines. Horseshoe-shaped pharyngeal bulb open posteriorly. Subgnathosomal setae absent. Three pairs of short stubby legs, each ending with a single three-pointed claw. Solenidia and epimeral setae absent.

Pronymph (Plate I, Fig. 5). In general body outline similar to larva, except for posterior part of body elongated to a blunt terminus; on the average 74.8 µm long and 34.6 µm wide. Gnathosoma and related structures similar to larva; palps with two 2-tined spines and one simple spine. Legs as in larva, except for each with two four-pointed claws. Solenidia and epimeral setae absent.

Nymph (Plate I, Fig. 6). The dorsally high arched body has inflated appearance; attenuated posterior part terminates in acute point; on the average 160.0 µm long and 67.9 µm wide. Body with faint transverse striation. Gnathosoma and related structures similar to pronymph; palps with two 2-tined spines and one simple spine. Four pairs of legs, each with two four-pointed claws. Solenidia and epimeral setae absent.

Host and locality: Strix araneus araneus Linnaeus, 1766, the common shrew. Type material is from host specimens collected in Botkyřina, Czechoslovakia, 15. 4. 1972 (holotype No. PaO CSAY 1256, allotype, typical series – part), 10. 10. 1979 and 19. 9. 1980 (typical series – part).

Type material is deposited in the collection of the Institute of Parasitology, Czechoslovak Academy of Sciences, Prague; several specimens are deposited in the collection at the University of Massachusetts, Amherst, USA.

Incidence, sites and intensity of infestation. Using routine scrape-squeeze-peek techniques 14 animals (11.7 %) of the total 120 examined were found infested with Soroicidus dimorphus. Of these 7 were males and 7 females, indicating a significant higher incidence of mites (p = 0.05) in males (17.5 %) than in females (8.8 %).

The mites were recovered from vibrissae area, vertex, dorso of trunk, venter of trunk; 13–7–3 animals were found infested on head (vibrissae area and/or vertex) – dorsum of trunk – venter of trunk, respectively.

Counts in 5 × 5 mm skin sectors from vertex – dorsum of trunk – venter of trunk of two heavily infested animals (male and female) revealed the following number of mites (all stages): 392–649–345 and 230–364–288, respectively. Total S. dimorphus load on a heavily infested host animal can be estimated from these data: if on the average 300 mites per 25 mm² (chosen arbitrarily) infest whole head-and-trunk area estimated to be over 4,500 mm², the total parasite load on a host animal amounts to over 5 × 10⁴ mites.

Populations. Three population counts in skin sectors from head, dorso of trunk, and venter of trunk of a single male shrew (KOH digestion) yielded a total of 1916 mites in the following proportions: males 348 (18.2 %); females 452 (23.6 %); ova 146 (7.6 %), larvae and protonymphs 345 (17.5 %), nymphs 628 (32.8 %). Thus the following ratios from this total count were obtained: male to female, 1 : 1.5; immature to mature, 1 : 2 : 1; female to ova, 3 : 1 : 1.

Habitat and histopathology. In a heavily infested host numerous adult mites were disconed in skin from outside, with their anterior parts embedded in skin and posterior ends extending from skin (Plate II, Figs. 1, 2). No gross signs of infestation were noted on skin from outside.

In histological sections adult mites were found in follicles of general body hairs

Table 1. Means and standard deviations of 20 specimens of each stage and sex of Soroicidus dimorphus (All measurements in µm)

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<thead>
<tr>
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<th>Male</th>
<th>Female</th>
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<tr>
<td>Gnathosoma</td>
<td>length</td>
<td>25.8 ± 2.5</td>
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<tr>
<td></td>
<td>to apex of cover lamella</td>
<td>20.9 ± 1.9</td>
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<tr>
<td></td>
<td>width</td>
<td>19.0 ± 0.8</td>
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<tr>
<td>Podosoma</td>
<td>length</td>
<td>43.1 ± 3.0</td>
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<tr>
<td></td>
<td>width</td>
<td>39.8 ± 2.6</td>
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<tr>
<td>Opisthosoma</td>
<td>length</td>
<td>132.1 ± 11.3</td>
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<tr>
<td></td>
<td>width</td>
<td>50.2 ± 4.0</td>
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<tr>
<td>Total length</td>
<td></td>
<td>204.8 ± 13.2</td>
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<tr>
<td>Penis</td>
<td>length</td>
<td>16.3 ± 2.9</td>
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<tr>
<td>Vulva</td>
<td></td>
<td>43.9 ± 4.4</td>
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<tr>
<td>Ovum</td>
<td>length</td>
<td>37.6 ± 9.1</td>
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<tr>
<td></td>
<td>Width</td>
<td>16.3 ± 2.9</td>
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<tr>
<td>Larva</td>
<td>length</td>
<td>74.8 ± 7.4</td>
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<tr>
<td></td>
<td>Width</td>
<td>34.6 ± 4.1</td>
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<tr>
<td>Protonymph</td>
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<td>49.0 ± 5.3</td>
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<td>Nymph</td>
<td></td>
<td>68.0 ± 6.3</td>
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Soricidex dimorphus G. N., Sp. N. (Acari: Demodicidae) Of Zemljеврхн ареныус

В. Буняк

Резюме. Создан новый род Soricidex и описан его типовой вид S. dimorphus с волосковой фолликулами дермы Sorex araneus. В работе обсуждается приспособленность известных патологических структур у сны филогенетическое сходство организмы задней части тела.

REFERENCES


—, —, SWEETMAN G. K., Demodex antechinis sp. nov. (Acati, Demodicidae) parasites on Antechinis sturtii (Murpilus). Parasitology 60: 425-429, 1970.

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Soricidex dimorphus n. sp. n. Figs. 1-6. Developmental stages (× 150). Fig. 1. Male. Fig. 2. Female. Fig. 3. Ovum. Fig. 4. Larva. Fig. 5. Protonymph. Fig. 6. Nymph. Figs. 7-8. Female, anterior part of body (× 2 600). Fig. 7. Ventral view, note V-shaped capsule of gnathosoma and terminal projections on legs II-IV. Fig. 8. Dorsal view, note podosomal sclerotized structures.

Figs. 1-4. Habitat of Soricidex dimorphus in skin of Sorex araneus. Fig. 1. Posterior of half-extending adult mite (× 90). Fig. 2. An adult mite penetrating into a hair follicle with a hair (× 220). Fig. 3. Section through a hair follicle with a male in entrance (× 115). Fig. 4. Section through a hair follicle with a male (left) and a female (right). Note evidence of undercutting of follicular epithelium by the male (× 115).