

**DEMODEX KUTZERI SP. N. (ACARI: DEMODICIDAE),
AN IDENTICAL PARASITE OF TWO SPECIES OF DEER,
CERVUS ELAPHUS AND C. NIPPON PSEUDAXIS**

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Abstract. Reports on demodicid mites of the old world species of deer are reviewed and *Demodex kutzeri* sp. n. (= *D. cervi* sensu Kutzer and Grünberg 1972; part.) described in all stages of the life cycle. The occurrence of *D. kutzeri* on two host species, *Cervus elaphus* L., 1758 and *C. nippon pseudaxis* Eydoux et Souleyet, 1841 is reported and discussed as a rare phenomenon in the genus *Demodex*.

The information on the occurrence of demodicid mites on deer (Cervidae) from the Old World is comparatively extensive, involving at least four host species. Most of the reports, however, are too brief with incomplete data on hosts and/or mites (Table 1). Consequently, demodicid mites from the old world deer, while long known to produce pronounced pathological conditions, range among the taxonomically least known forms. If a degree of analogy with demodicids parasitizing the related family Bovidae is assumed, the taxonomy of demodicids parasitizing the Cervidae may be complicated (cf. presence of up to three *Demodex* spp. on a bovid host — Bukva 1986, and morphological similarity of discrete *Demodex* spp. on bovid hosts — Nutting and Guilfooy 1979).

Demodicid mites on a cervid host were first reported as *Demodex folliculorum* from a captive sambar, *Rusa unicolor* Kerr, 1792 (syn. *Cervus aristotelis*) in Germany by Prietsch (1886). They were characterized very unsatisfactorily as being smaller than demodicids from the dog. Later they were named "*Demodex cervi* Prietsch, 1886" by Hirst (1919) without having been examined by him. No demodicid mites have been recorded on the sambar since then, and demodicids from this host need a redescription.

The first detailed description of *Demodex* from a cervid host was published by Vanselow (1910), who studied the causative agent of cutaneous nodular demodicosis of deer in Germany. Unfortunately, host species of his *Demodex folliculorum* var. *cervi* (also mentioned as *D. cervi* in Vanselow 1910) is not positively known, as it was referred to as a deer ("ein Hirsch") by both Vanselow and Bugge (1909), who gave Vanselow the material. The red deer, *Cervus elaphus* L., 1758 was suggested as the probable host of this form by Kutzer and Grünberg (1972). Apparently no specimens of Vanselow's *D. folliculorum* var. *cervi* are extant in collections (Hoffmann, pers. comm.; Moritz, pers. comm.; Zahner, pers. comm.).

Another form, *Demodex pseudaxisi* from the lesions on the sika deer, *Cervus nippon hortulorum* Swinhoe, 1864 (syn. *Cervus (Pseudaxis) hortulorum*) was reported as a new species by Shpringol'ts—Shmidt (1937). He did not know the papers by Prietsch (1886), Bugge (1909), Vanselow (1910), and Hirst (1919). To characterize the mites only their total length was given. No specimens of *D. pseudaxisi* are extant in collections (Dubinina, pers. comm.; Lebedev, pers. comm.).

Kutzer and Grünberg (1972) reported demodicids from the red deer in Austria.

Table 1. Review of the published reports on demodicid mites from the old world deer

Authority	Host*	Name** of parasite	Information on parasite's morphology	Specimens of parasite in collections
Prietsch 1886	<i>Rusa unicolor</i>	<i>Demodex folliculorum</i>	unsatisfactory	none
Prietsch 1909	<i>Capreolus capreolus</i>	none ("Akarusräude")	none	none
Bugge 1909	deer ("ein Hirsch")	none ("Acarusmilben")	none	none
Vanselow 1910	deer ("ein Hirsch")	<i>Demodex folliculorum</i> var. <i>cervi</i> (<i>Demodex cervi</i>)	description but no figure	none
Hirst 1919	<i>Rusa unicolor</i>	<i>Demodex cervi</i> Prietsch	none	none
Hirst 1921	"deer (species?)"	<i>Demodex bovis</i> Stiles	short description but no figure	British Museum (Nat. History), London
Shpringol'ts-Schmidt 1937	<i>Cervus nippon hortulorum</i>	<i>Demodex pseudaxisi</i>	unsatisfactory	none
Kutzer and Grünberg 1972	<i>Cervus elaphus</i>	<i>Demodex cervi</i> Prietsch 1886	short description with figures	College of Veterinary Medicine, Vienna
Seidel and Tscherner 1985	<i>Cervus nippon pseudaxisi</i>	none ("Hearbalgmilben")	limited	Zoological Garden, Berlin

* current names, ** as in the original report

They identified their form with "*Demodex cervi* Prietsch, 1886" from the sambar, gave a short description of it, and synonymized Vanselow's (1910) and Shpringol'ts—Schmidt's (1937) forms with it.

An unnamed demodicid species on the sika deer, *Cervus nippon pseudaxisi* Eydoux et Souleyet, 1841 was reported from captive animals in Berlin by Seidel and Tscherner (1985).

As can be seen from the above brief review (summarized and expanded in Table 1), Kutzer and Grünberg's form (1972) is currently the only one *Demodex* satisfactorily described from a known host species and thus positively identifiable among the demodicids reported from the old world deer to date. A full redescription of this form in all stages of the life cycle and data on its host range are given below. For the reasons discussed below, the status of a new species and a new name in honour of one of the original discoverers are introduced.

MATERIALS AND METHODS

Mites were retrieved from preserved samples of the skin from a red deer fawn from Wattens/Tirol, Austria (preservative 75 % alcohol), a captive sika deer in the Zoological Garden, Berlin (preservative 75 % alcohol), and six head of red deer from various localities in Czechoslovakia (preservative 10 % formol). Mass numbers of the mites obtained were mounted into Hoyer's medium and representative specimens studied with phase-contrast immersion optics several months to two years subsequent to mounting. A slide labelled "*Demodex* of Deer" from Hirst's collection, British Museum (Natural History), London containing numerous mites was also studied. For comparison, specimens of *Demodex bovis* retrieved from cases of nodular demodicosis of cattle in Czechoslovakia were processed and studied in a similar way. Except for the cases in deer in Czechoslovakia, additional data on the above cases of demodicosis may be found in Kutzer and Grünberg (1972), Seidel and Tscherner (1985), Hirst (1921), and Bukva et al. (1985), respectively.

Scanning electron micrographs were taken of preserved mite specimens from the red deer (Wattens/Tirol) which were transferred through graded concentrations to 100 % ethanol and subsequently to 100 % acetone, dried up by the method of critical point of CO₂, coated with gold, and examined with a Tesla BS-300 microscope.

RESULTS

Demodex kutzeri sp. n.*

= *Demodex cervi* sensu Kutzer and Grünberg 1972; part.; nec *Demodex cervi* Vanselow, 1910.

Female (holotype) (Pl. III A—C; Pl. I, Fig. 1). Average total body length 242.5 μm; the average ratio total body length : podosoma width = 3.5 : 1. Measurements of 20 random specimens are given in Table 2.

Gnathosoma wider than long; its outlines trapezoidal. Palps with two free segments; proximal segment slightly salient, distal segment with three hyaline denticles antero-ventrally and two 2-tined and one simple spines ventrally. Supracoxal spines straight, directed dorsomedially, with spatulate, in some specimens nearly bifurcate apices (Pl. III B; cf. Pl. II, Fig. 4). Pharyngeal bulb rounded, open posteriorly; subgnathosomal setae inserted in light, circular areolae approximately three-quarters the length of pharyngeal bulb anteriorly to it.

Podosoma with four pairs of evenly spaced legs; legs I in V-shaped position. Three-segmented free parts of legs inconspicuous from dorsal aspect. Space separating inner margins of epimeral plates narrowes posteriorly; epimeral plates IV fused,

* Unless stated otherwise this is a description of characters as may be seen in the optical microscope.

without demarcation posteriorly. Movable leg segments 2 each with a blunt spur ventro-posteriorly. Each leg with two equal claws; each claw bifid distally and with a spur projecting from the shaft. Solenidia not seen. Dorsum of podosoma over legs I—III with an indistinct shield bearing faint, dense, generally longitudinal, fingerprint-like striation laterally and several transverse striae medially; dorsum over legs IV with transverse striation as on opisthosoma.

Opisthosoma conical, tapering to a blunt point. Striation faint, moderately dense, regular. Opisthosomal organ saclike.

Vulva a longitudinal slit opening posteriorly to legs IV.

Male (allotype) (Pl. III D; Pl. I, Fig. 1; Pl. II, Figs. 1—4). Average total body length 216.1 μm ; the ratio total body length: podosoma width = 3.2: 1. Measurements of 20 random specimens are given in Table 2.

Gnathosoma shorter than in female. Shape of gnathosomal structures as in female.

Dimensions and structures of podosoma similar to female. Dorsum of podosoma over legs I—III smooth except for several striae near the genital orifice; dorsum over legs IV with faint, transverse striation as on opisthosoma.

Opisthosoma of a somewhat sack-like appearance, the anterior one-half being of approximately the same width as podosoma. Opisthosomal organ absent.

Aedeagus sheathed, with bulbous base. Genital orifice a longitudinal slit between

Table 2. Body dimensions of 20 random specimens of each stage and sex of *Demodex kutzeri* sp. n. from *Cervus elaphus* (measurements of 20 random specimens from *Cervus nippon pseudaxis* in parentheses); means and standard deviations; all measurements in μm

		Male		Female	
Gnathosoma	Length	25.5 \pm 1.0	(25.9 \pm 1.1)	31.5 \pm 1.3	(31.0 \pm 1.1)
	Width	30.0 \pm 1.6	(29.4 \pm 1.0)	32.5 \pm 2.1	(32.5 \pm 1.7)
Podosoma	Length	64.7 \pm 5.1	(73.3 \pm 2.4)*	66.8 \pm 3.0	(83.2 \pm 2.5)*
	Width	68.3 \pm 6.9	(65.9 \pm 3.2)	69.4 \pm 4.2	(67.2 \pm 2.7)
Opisthosoma	Length	126.0 \pm 12.0	(141.5 \pm 7.5)*	144.2 \pm 14.1	(121.3 \pm 14.0)*
	Width	66.9 \pm 4.3	(65.2 \pm 7.0)	63.0 \pm 6.5	(56.6 \pm 3.2)*
Total length		216.1 \pm 13.9	(230.4 \pm 7.9)*	242.5 \pm 15.2	(220.4 \pm 13.5)*
Aedeagus		32.6 \pm 2.7	(30.6 \pm 1.0)*	—	—
Vulva		—	—	10.7 \pm 0.6	(14.9 \pm 0.8)*

	Ovum	Larva	Protonymph	Nymph
Length	74.0 \pm 6.2 (78.0 \pm 6.3)**	121.4 \pm 11.1 (119.2 \pm 19.4)	198.6 \pm 22.8 (188.5 \pm 25.9)	253.7 \pm 38.8 (264.0 \pm 20.3)
Width	50.0 \pm 5.5 (52.2 \pm 6.5)	51.1 \pm 6.5 (52.5 \pm 4.5)	58.5 \pm 6.0 (69.3 \pm 4.5)*	73.7 \pm 8.3 (77.9 \pm 8.6)

* the difference between the values is statistically significant (t-test; $p = 0.01$)

** the difference between the values is statistically significant (t-test; $p = 0.05$)

two prominent protuberances at level of posterior margins of legs I. Dorsal podosomal tubercles not seen in the optical microscope. In the scanning electron microscope they were seen as indistinct elevations bearing minute, peglike structures of apparently setaceous origin (Pl. II, Figs. 1, 3).

Ovum (Pl. I, Fig. 2). Oval-shaped, on the average 74.0 μm long and 50.0 μm wide, non-operculate.

Larva (Pl. I, Fig. 3). Fusiform, on the average 121.4 μm long. Legs absent; three pairs of single leg claws grown on the general body wall. Terminal segment of palps with a group of large spines (3 + 1 points seen). Supracoxal spines peglike. Pharyngeal bulb rounded, open posteriorly. Subgnathosomal setae absent. Leg claws 4-pointed. Epimeral scutes not seen.

Protonymph (Pl. I, Fig. 4). General shape and other structures similar to larva; on the average 198.6 μm long. Three pairs of 4-pointed leg claws. A vestigial short, peglike claw dorsad to each 4-pointed claw. Two pairs of indistinct, shelf-like epimeral scutes between leg claws II and III.

Nymph (Pl. I, Fig. 5). Similar to larva and protonymph; on the average 253.7 μm long. Four pairs of coupled leg claws; each of the eight claws 4-pointed. Four pairs of shelf-like epimeral scutes between leg claws I—IV.

Differential diagnosis. *Demodex kutzeri* is most similar to *D. bovis* Stiles, 1892 as redescribed by Desch and Nutting (1973) and reexamined by Bukva (1986). Differences in non-meristic characters: (1) Prominent, irregular, roughly transverse striae which are situated approximately one-length of genital protuberances anteriorly to the latter may be present in males of *D. kutzeri* but no prominent, regular fold situated approximately half the distance anteriorly to genital protuberances as in males of *D. bovis*. (2) Aedeagal sheath of moderate dimensions, spindle-shaped with the widest point near the middle in *D. kutzeri* vs. sheath large, bell-shaped with the widest point near the anterior pole in *D. bovis*. (3) Vulva posterior to epimeral region of legs IV in *D. kutzeri* vs. vulva between epimeral plates IV, anteriorly embraced by furcate coxal sutures in *D. bovis*. Meristic characters are nearly identical except for males: opisthosoma approximately twice as long (126.0 μm) as podosoma, anterior one-half of opisthosoma of approximately the same width as podosoma, giving the body a somewhat sack-like appearance in males of *D. kutzeri* vs. opisthosoma absolutely and relatively longer (opisthosoma 170.9 μm ; podosoma 63.2 μm long), tapering gradually and thus of a more slender appearance in males of *D. bovis*.

For comparison of *D. kutzeri* with *Demodex* species from deer see below in Discussion.

Host and locality (the material described): *Cervus elaphus* L., 1758, the red deer; Wattens/Tirol, Austria, February 1970; the case of demodicosis reported by Kutzer and Grünberg 1972.

Holotype, allotype and numerous paratypes deposited in the collections at the Institute of Parasitology, Czechoslovak Academy of Sciences, České Budějovice (slide No PaÚ ČSAV 1934). Representative specimens are deposited also at the College of Veterinary Medicine, Vienna and the British Museum (Natural History), London (BMNH accession Nos 1986. 8. 7. 1&2).

Additional records: *Cervus elaphus*; Czechoslovakia; six head out of 21 examined: Rakovník, 3. 3. 1983; Liberec 6. 4. 1983; Liberec, 6. 8. 1984; Česká Kamenice, 22. 3. 1984; Rychnov n. Kněžnou, 30. 12. 1983; Most, 22. 3. 1985. *Cervus nippon pseudaxis* Eyndoux et Souleyet, 1841, the sika deer; two captive animals in the Zoological Garden, Berlin, 14. 5. 1984; the cases of demodicosis reported by Seidel and Tscherner 1985 (Plate I, Figures 6, 7).

Host range. To check on the unexpected occurrence of identical mites on two host species, all stages of the mites on the red deer were compared to those on the sika deer. No difference whatever was revealed in non-meristic characters. Differences in

measurements of some standard meristic characters were established (Table 2). They, however, are of no diagnostic value, which may also be demonstrated through comparison of the mite set from the red deer presently studied (Table 2) with another set from the same host individual (as measured by Kutzer and Grünberg 1972: male gnathosoma length 24.5–28 μm , male total length 195–210 μm , male maximum width 49–53 μm ; female gnathosoma length 26–33 μm , female total length 200 to 230 μm , female maximum width 49–57 μm , nymph total length 190–262 μm , nymph maximum width 48–59 μm). Accordingly, it is inferred that the mites on both the red deer and sika deer are *D. kutzeri*.

Apparently the same species from a deer host is contained in Hirst's slide labelled "Demodex of Deer". Important morphological characters of this material, which was not very well preserved in Hirst's time, are extremely difficult to observe at present. No characters proving that the mites are *D. bovis* — as they were determined in Hirst 1921 — were revealed by the present author.

Pathogenicity. According to the data published elsewhere, *D. kutzeri* inhabits the hair follicles and is the causative agent of a severe disease. The reported, generalized cases in the red deer and sika deer manifested as chronic, pachydermatous, partly nodulous, partly pustulous, alopecic dermatitis (Kutzer and Grünberg 1972; Seidel and Tscherner 1985). Also the demodicids from a deer reported by Hirst (1921) were retrieved from pustules.

DISCUSSION

In chronological sequence, the name *cervi* has been applied to the following *Demodex* forms:

(1) *Demodex folliculorum* var. *cervi* Vanselow, 1910; host dubious, probably *Cervus elaphus*. (Also mentioned as *Demodex cervi* by Vanselow 1910).

(2) "*Demodex cervi* Prietsch, 1886" sensu Hirst 1919; host *Rusa unicolor*. (This combination of the binomen *D. cervi*, its author, and date was introduced by Hirst (1919) for the form originally reported as *D. folliculorum* by Prietsch (1886). Thus Prietsch did not introduce the binomen *D. cervi* and should never be mentioned as its author, Hirst being responsible for applying the name *cervi* to this form.)

(3) "*Demodex cervi* Prietsch, 1886" sensu Kutzer et Grünberg 1972 (part.); host *Cervus elaphus*. This is the form redescribed as *D. kutzeri* above.

The valid name *Demodex cervi* Vanselow, 1910 should only be applied to the (first so named) form 1 unless the forms 2 and/or 3 are conspecific with it. At present little is known of mutual taxonomic relationships of these three forms since the information on taxonomic characters of the form 1 is limited and of the form 2 virtually none. Consequently, conspecificity of any two of the forms 1, 2, 3 (and *D. pseudaxisi* Shpringol'ts—Shmidt, 1937) as suggested by Kutzer and Grünberg (1972) is presently doubtful, the more so that host species specificity is the prevailing type of *Demodex* spp. distribution (Nutting 1985) and an ungulate host may be parasitized by up to three *Demodex* species (Bukva 1986). For these reasons, the status of a separate species and a new name *Demodex kutzeri* are introduced for the chronologically last form 3.

Demodex kutzeri and *D. cervi* Vanselow, 1910 certainly are two separate species. Vanselow (1910), knowing both *D. cervi* and *D. bovis*, stated that *D. cervi* is very slender, more slender than *D. bovis*, and that it resembles *D. canis*. In contrast, *D. kutzeri* is very similar to *D. bovis*. Especially its width dimensions markedly differ from those of *D. cervi* given by Vanselow: *D. kutzeri* male (female) vs. *D. cervi*

male (female) (in μm): total length 216.1 (242.5) vs. 165 (180); gnathosoma length 25.5 (31.5) vs. 20 (25); gnathosoma width 30.0 (32.5) vs. 20 (24); podosoma length 64.7 (66.8) vs. 42 (50); podosoma width 68.3 (69.4) vs. 40 (48); opisthosoma length 126.0 (144.2) vs. 103 (105). Besides *D. kutzeri*, specimens of (an)other (?) species which correspond(s) better to the description of *D. cervi* were retrieved from *Cervus elaphus* and *C. nippon pseudaxis* during the present study. Until there is an adequate number of specimens available for examination it is refrained from further conclusions.

Whether *D. kutzeri* is identical with *D. pseudaxisi* Shpringol'ts—Shmidt, 1937 of which only total length is known (male 0.16–0.18 mm; female 0.18–0.21 mm) cannot be decided at present.

Presence of a *Demodex* species on more than one host species is currently considered a rare situation. Similar host range was reported for *D. soricinus* Hirst, 1918 alleged to parasitize insectivoran, rodent, and chiropteran hosts, *Sorex araneus castaneus*, *Rattus rattus*, *R. norvegicus* (Hirst 1919), and *Plecotus auritus* (Hirst 1921). Another instance in which a competent acarologist compared the morphology of *Demodex* specimens on two host species and found the mites conspecific was the alleged occurrence of *Demodex bovis* Stiles, 1892, parasite of cattle, on a deer species (Hirst 1921). This, however, is considered erroneous by the present author since the mites collected on deer apparently are *D. kutzeri* (see above). Speculation that two or more host species share an identical *Demodex* species permanently and/or may acquire mites from one another through mutual contacts may often be found in medical and veterinary literature. For example, the roe deer and dog were suspected to be such demodicids' multiple hosts (Prietsch 1909), as well as man and dog (e.g., Bisseru 1967, Pashkin 1978, Morgan 1984), dog and hare, squirell and fox (Pashkin 1978), cattle and other animals (Pashkin 1978). No taxonomic confirmation of conspecificity of demodicid mites on these hosts is available. Quite on the contrary, modern specialists recently reviewing the problem of host specificity concluded that there had been no documented instance of multiple-species host range and interspecific transfer for any *Demodex* species (Nutting and Desch 1978; Nutting 1985). The likelihood of transfer of demodicids between mammalian species was considered to be little since (in 1983) all information available on *Demodex* species indicated their host-species specificity (Nutting 1985). However, the possibility of existence of identical demodicids on well-isolated mammalian demes, sibling species, species recently sympatric, or even hybrids was anticipated (Nutting 1985).

The first instance in which *Demodex* mites from a number of host species could not be distinguished on a basis of adequate taxonomic criteria by contemporary authors was *D. sabani*, a species from the Meibomian glands of seven species of related, sympatric murids (Desch et al. 1984). Two congeneric host species have recently been confirmed for *D. nanus* Hirst, 1918 parasitizing *Rattus rattus* and *R. norvegicus* (Desch; pers. comm.; paper in press). The present record of *D. kutzeri* on *Cervus elaphus* and *C. nippon* is the third adequately documented instance of the multiple-species host range of a *Demodex* species. Credibility of the present finding is supported by the close phylogenetic proximity of the two deer species involved (Geptner et al. 1961), which produce fertile hybrids in captivity (Geptner et al. 1961), in the wild in some areas into which *C. nippon* has been introduced (Lowe and Gardiner 1975; Bartoš et al. 1981), and even in the overlap of the original ranges of *C. elaphus* and *C. nippon* in the Ussuri district of the U.S.S.R. and north-eastern China (Flerov 1952; Geptner et al. 1961).

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DEMODEX KUTZERI SP. N. (ACARI: DEMODICIDAE), ИДЕНТИЧНЫЙ ПАРАЗИТ ДВУХ ВИДОВ ОЛЕНЕЙ *CERVUS ELAPHUS* И *C. NIPPON PSEUDAXIS*

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Резюме. Дан обзор литературных данных по железницам из оленей Евразии и описан новый вид железницы *Demodex kutzeri* sp. n. (*D. cervi* sensu Kutzer et Grünberg 1972; part.) во всех стадиях жизненного цикла. Наличие этой железницы у двух видов оленей *Cervus elaphus* L., 1758 и *C. nippon pseudaxis* Eydoux et Souleyet, 1841 обсуждается как редкий случай в роде *Demodex*, виды которого обыкновенно являются паразитами видово специфичными.

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MYXIDIUM RHODEI LÉGER, 1905 (PROTOZOA: MYXOSPOREA) IN THE MUSCLE AND LIVER TISSUE OF THE ROACH, RUTILUS RUTILUS (LINNÉ)

The protozoan infection caused by the myxosporean *Myxidium rhodei* is often diagnosed in some fish species of the family Cyprinidae, primarily in the roach (*Rutilus rutilus*). As

suggested by the findings in Czechoslovakia, mainly in the region of South Bohemia, primarily kidneys are the host tissue.

While regularly catching samples of fishes

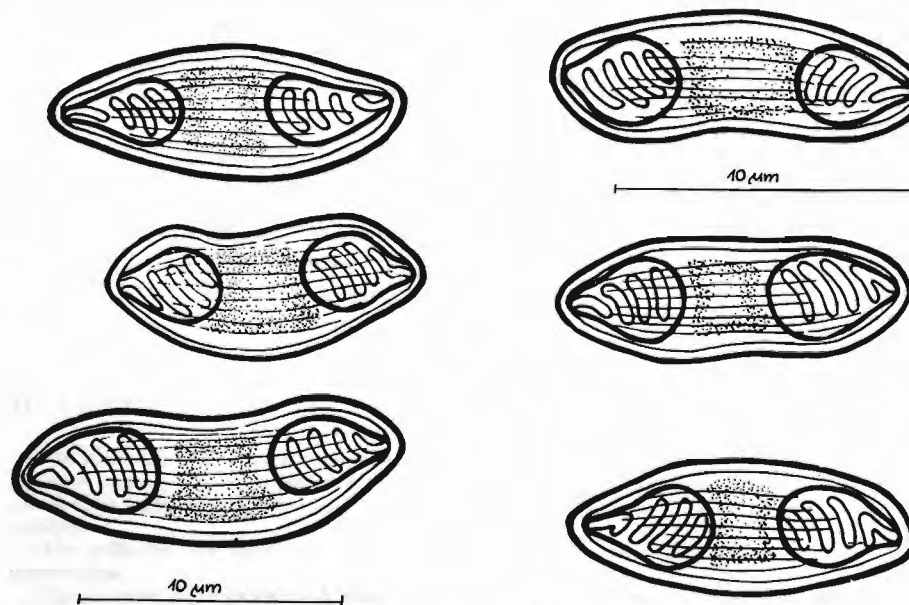
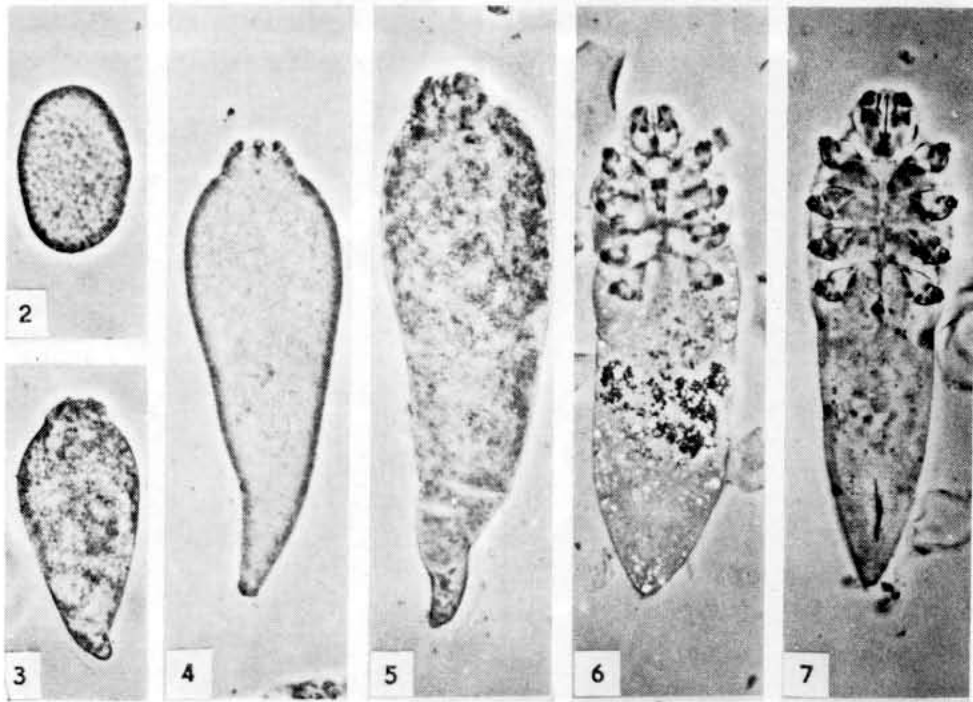
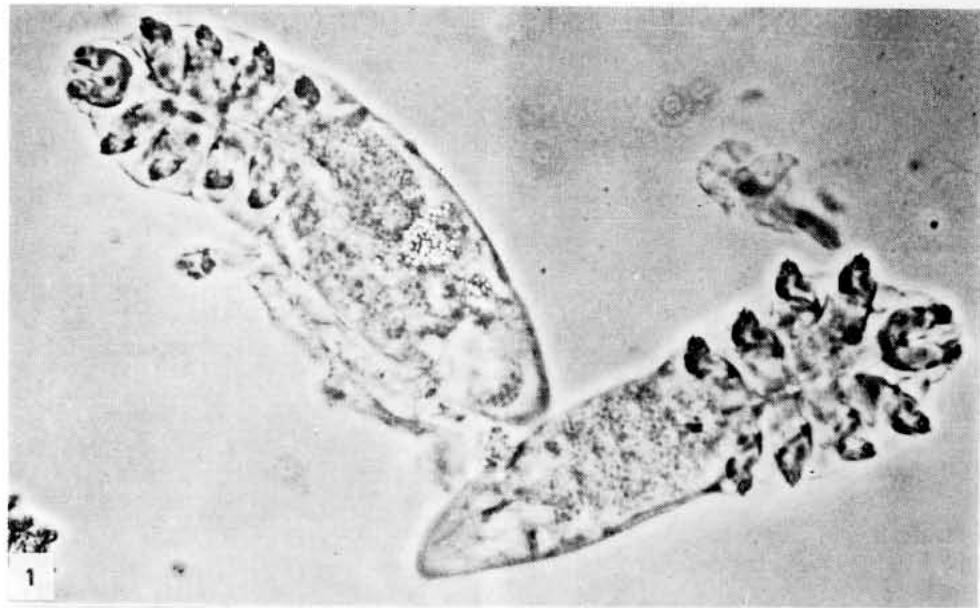
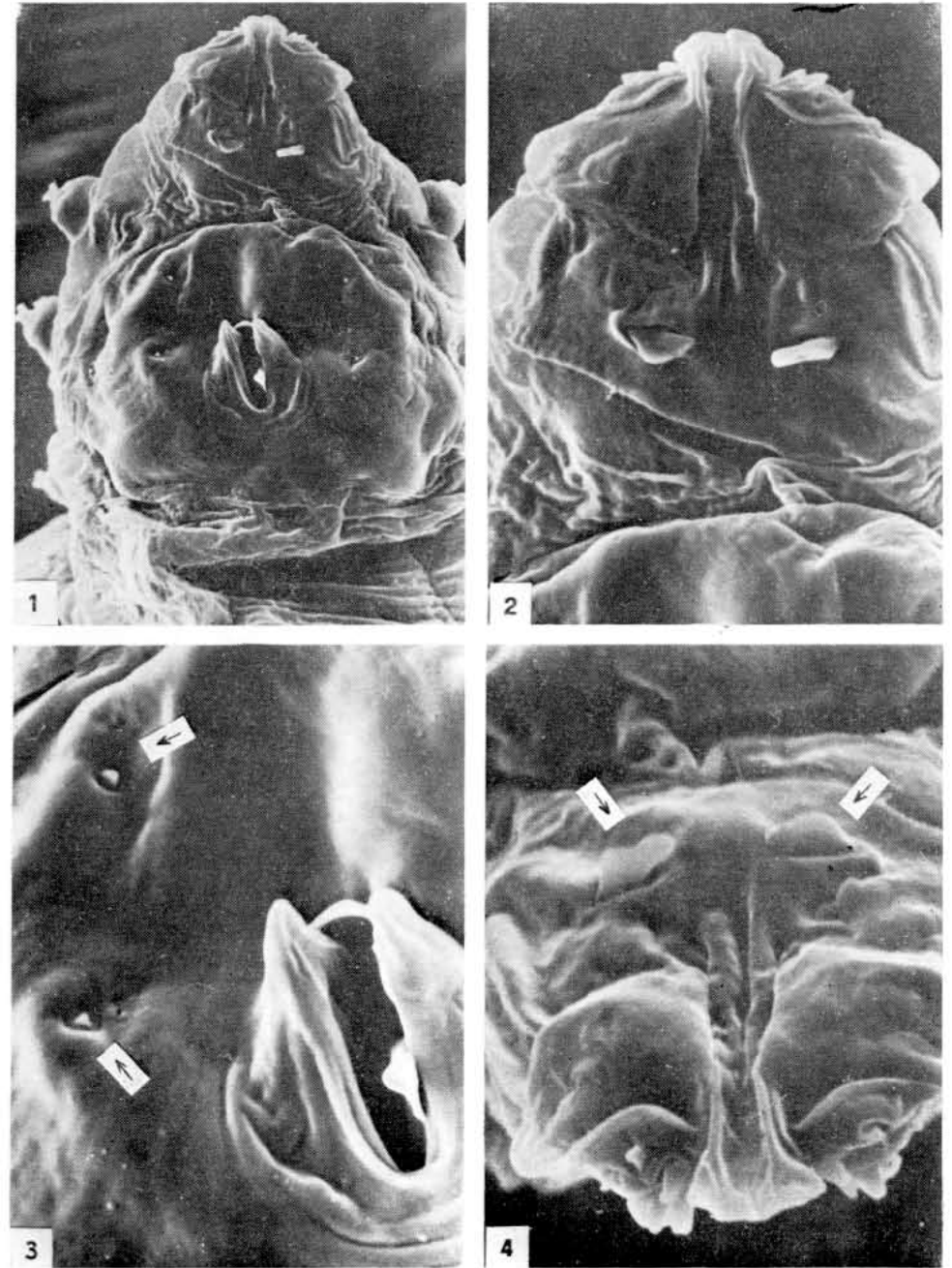


Fig. 1. The most frequently occurring forms of *M. rhodei* in muscle tissue.

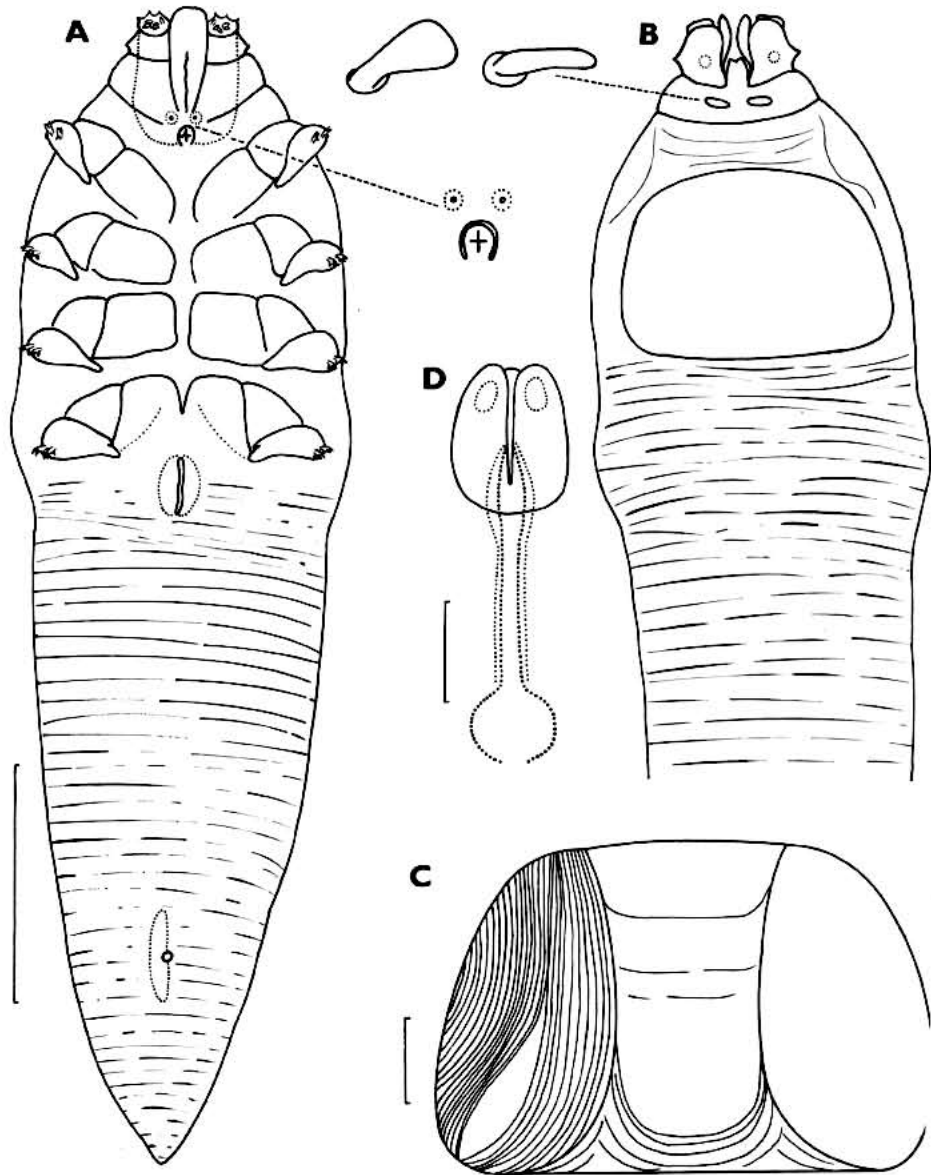
Fig. 2. The most frequently occurring forms of *M. rhodei* in renal tissue.



Figs. 1—5. *Demodex kutzeri* from *Cervus elaphus*. Fig. 1. Male (left) and female (right); Fig. 2. Ovum; Fig. 3. Larva; Fig. 4. Protonymph; Fig. 5. Nymph. Figs. 6—7. *Demodex kutzeri* from *Cervus nippon pseudaxis*. Fig. 6. Male; Fig. 7. Female. (Fig. 1×360, Figs. 2—7×300.)



Figs. 1—4. Scanning electron micrographs of male *Demodex kutzeri* from *Cervus elaphus*. Fig. 1. Gnathosoma and podosoma; Fig. 2. Gnathosoma; Fig. 3. Genital orifice with genital protuberances (lower right corner) and dorsal podosomal tubercles (arrows); Fig. 4. Gnathosoma (dorsofrontal view). Note the different shape of supracoxal spines (arrows). (Fig. 1×1 250, Fig. 2×3 000, Fig. 3×3 900, Fig. 4×3 900.)



Demodex kutzeri sp. n. A — female, ventral view; B — female, dorsal view (striation on dorsal podosomal shield not drawn); C — female, dorsal podosomal shield; D — male, aedeagus and genital orifice (scale bars: A, B = 50 μ m; C = 10 μ m; D = 10 μ m).