

## Original papers

## New data on distribution of *Demodex huttereri* Mertens, Lukoschus et Nutting, 1983 and topical specificity and topography of demodectic mites in striped field mouse *Apodemus agrarius*

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**ABSTRACT.** Localization of three species of mites belonging to Demodecidae family (Acari, Prostigmata) in striped field mouse *Apodemus agrarius* (Pallas, 1771) was analyzed. Occurrence of *Demodex agrarii* Bukva, 1994, *D. arvicolae apodemi* Hirst, 1918 and *D. huttereri* Mertens, Lukoschus et Nutting, 1983 was established. This is the first time when *D. huttereri* was found in Poland. Earlier cases of occurrence of that particular species were only recorded for striped field mice in Germany. Out of these three species, the predominant one was *D.a. apodemi* found in 78% of studied mice. This species inhabited hair follicles of common hairs; however, *D.a. apodemi* significantly demonstrated topographical preferences, and its occurrence was mostly limited to the head (74%) and genital-anal region (18%). In the remaining hairy body parts, only individual specimens were observed. *D. agrarii*, which has been associated solely with external auditory meatus, was observed in the ear region in 8% of the hosts. *D. huttereri*, which inhabits Meibomian glands, was observed in the region of eyelids in 6% hosts. In striped field mouse, demodectic mites demonstrate significant topographical preferences that are conditioned not only by tissue/topical specificity, but also by transmission ways between hosts.

**Key words:** *Demodex agrarii*, *D. arvicolae apodemi*, *D. huttereri*, demodectic mites, *Apodemus agrarius*, localization

### Introduction

Mites of Demodecidae (Acari, Prostigmata) family usually reveal topical specificity while inhabiting strictly defined microhabitats of the skin and body cavities of mammals. For example, species from follicles of common and sensory hair, sebaceous glands, Meibomian glands or epidermis are known. At the same time, preferences in demodecid topography in host have been observed – some species were found mainly or exclusively in the skin of the head or genital-anal area [1,2]. Reasons for such preferences are not always intelligible. It seems obvious in case of the species with narrow specialization, adapted to living in strictly defined tissue type or organ, that the topography of mites depends on the localization of

a typical microhabitat. For instance, *Demodex flagellurus* Bukva, 1985 shows adaptations towards existence in the glands of genital area of house mice (*Mus musculus* Linnaeus, 1758), thus it is found only in this part of the host skin [3,4]. However, topographical preferences were also observed in species localized in non-specialized sebaceous glands or hair follicles, which are spaced quite regularly in the host skin [4,5]. Therefore, the reasons for the selection of the localization can be more complex and may be connected with mite transmission between hosts or mechanical transfer within the host during grooming [6].

The problem was analyzed for three species of *Demodex* in striped field mouse *Apodemus agrarius* (Pallas, 1771).

## Material and methods

Fifty striped field mice, acquired in 2008–2010, were used in the study. The mice originated from several sites in northern Poland (53°59'N/18°05'E, 54°15'N/18°14'E). Demodectic mites were detected using the method of digesting skin fragments [7] from skin slices from the area of eyelids, ears, vibrissae, lips, cheeks, chin, abdomen, back, limbs and genital-anal part.

For determination of the hosts' infection level, basic parasitological parameters, such as prevalence (number of individuals of a host species infested with a particular parasite species to number of hosts examined, expressed as the percentage) and mean intensity (mean number of individuals of a particular parasite species per infested host in a sample) were calculated [8].

## Results and discussion

Three species of demodectic mites, *Demodex agrarii* Bukva, 1994, *D. arvicolae apodemi* Hirst, 1918 and *D. huttereri* Mertens, Lukoschus et Nutting, 1983 were found in striped field mice.

*Demodex agrarii* was described in the Slovak Republic [9], but it was also found in Poland [5]. *D.a. apodemi* (= *D. apodemi*) was described as a

subspecies from two hosts, *Apodemus sylvaticus* (Linnaeus, 1758) and *A. agrarius*, in England [10], but it was also found in Russia [11] and Poland [5]; however, individual species as well as forms originating from various hosts but considered as the same subspecies demonstrate significant differences in their structure, size and body proportions, which call for their further verification [4]. *D. huttereri* was previously found only in Germany [12], though it has also been found in Poland recently (Fig. 1, Table 1). Therefore, it constitutes a new species for Polish fauna.

*D. huttereri* occurred sparsely (prevalence: 6.0%, mean intensity: 4.7) and only in the area of eyelids (Table 2). According to Mertens et al. [12] it is related to the Meibomian glands, therefore its range is limited to the eyelids. This restricts the occurrence of this species in the host population, as it probably transmits in a way similar to other demodectids, that is, through direct contact. The reasons for relatively low level of infection with *D. agrarii* (8.0%, 4.3) topographically limited to the area of ears (Table 2) seem to be similar, because they populate the glands in the external auditory meatus. Also in previous studies conducted within other stands in northern Poland, the species showed similar infection parameters [5].

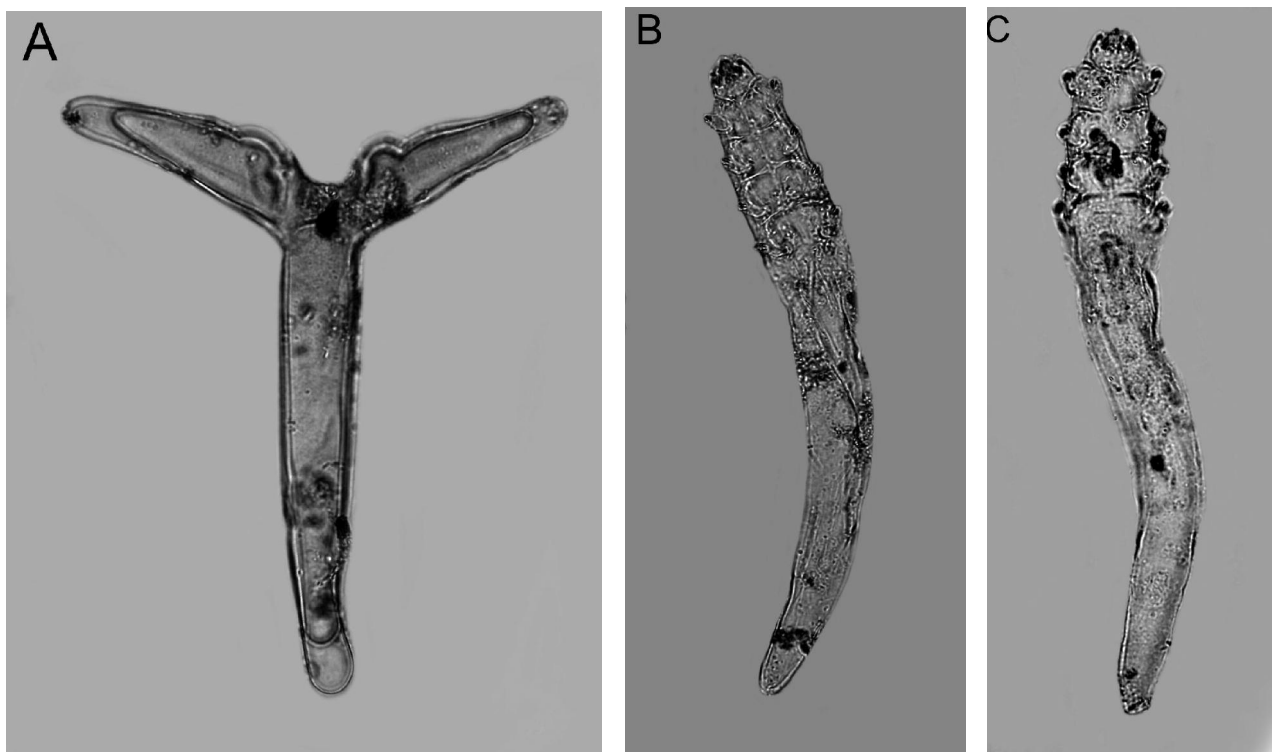


Fig. 1. *Demodex huttereri*. A: egg, B, C: females.

Table 1. Body size ( $\mu\text{m}$ ) of *Demodex huttereri*, new record from Poland

	Male N=2	Female N=9
Length of gnathosoma	26.2 (24.8–27.5) SD 1.9	25.4 (23.5–27.3) SD 1.2
Width of gnathosoma (at base)	31.3 (30.1–32.5) SD 1.7	31.2 (29.0–33.4) SD 1.7
Length of podosoma	81.9 (81.4–82.3) SD 0.6	90.4 (85.0–93.1) SD 3.1
Width of podosoma	55.9 (53.0–58.8) SD 4.1	48.2 (43.5–54.6) SD 3.4
Length of opisthosoma	132.7 (129.8–135.5) SD 4.0	248.5 (240.0–256.5) SD 6.8
Width of opisthosoma	48.1 (48.1–48.0) SD 0.1	43.9 (39.0–47.3) SD 2.9
Total length of body	240.7 (236.0–245.3) SD 6.6	364.3 (355.8–375.9) SD 8.6

The most frequent among all the studied species was *D.a. apodemi* (78.0%, 6.4), which is convergent with earlier studies [5]. According to Hirst [10], its microhabitat are follicles of common hair, thus it should occur in the completely haired skin with similar density. In the meanwhile, the majority of individuals were found in the skin of the head (area of eyelids, cheeks, ears, also vibrissae, lips and chin) and in the skin of genital-anal area (Table 2, Fig. 2). Presumably, such topography depends on the mechanism of transfer related to host behavior. The mites can be transferred during the „greeting ritual”

or sexual contacts. Uneven distribution in the skin of the head is related to the density and type of hair – there are less demodecids in the area of vibrissae where, apart from common hair, larger sensory hairs also occur. In this area, in different mouse species (*A. sylvaticus*) another species related to sensory hair, *D. longior* Hirst, 1918, almost twice as long as *A.a. apodemi* was described [10].

To conclude, demodecids show clear topographical preferences conditioned not only by topical/tissue specificity, but also by the method of transmission between hosts.

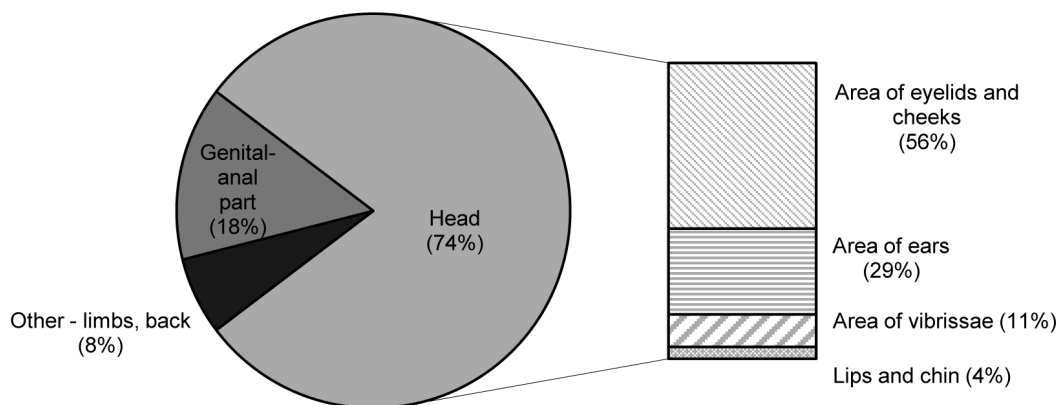
Fig. 2. Topographic preferences of *Demodex arvicolae apodemi* in the striped field mice

Table 2. Localization and number (eggs not counted) of Demodecidae individuals found in striped field mice

Species	Localization	Number of demodecids
<i>Demodex agrarii</i>	only area of ears	17 and eggs
<i>Demodex huttereri</i>	only area of eyelids	14 and eggs
<i>Demodex arvicolae apodemi</i>	head	184 and eggs
	genital-anal part	45 and eggs
	other – limbs, back	19 and eggs

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