

Original papers

New data on occurrence of *Demodex flagellurus* (Acari, Demodecidae) – rarely recorded parasite from the house mouse *Mus musculus* (Rodentia, Muridae)

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ABSTRACT. *Demodex flagellurus* Bukva, 1985 is one of two known demodecid mites of the house mouse *Mus musculus* Linnaeus, 1758, in which it is observed in genital area. Skin fragments of 30 house mice from various regions of Poland (residential buildings in Gdynia and Gdańsk, rural region in Wielkopolska-Kujawska Lowland) were examined. The mites were noted in 25.0% of the mice, with mean intensity of 48.0 and intensity range of 2–103. *D. flagellurus* demonstrated the differentiated occurrence in host populations.

Key words: *Demodex flagellurus*, Demodecidae, demodecid mites, house mouse, *Mus musculus*, Rodentia

Introduction

Skin mites of mammals, including Demodecidae, are relatively poorly recognized. The highest number of data concern demodecid mites parasitizing in human, house and farm animals, while most species related to wild mammals are only known from single observations. However, 19 species of this family of mites have been demonstrated in rodents from Muridae family, most of them are demodecid mites observed synhospitally in common, cosmopolitan or palearctic mice and rats [1–3]. Thus, five Demodecidae species were described both in brown rat *Rattus norvegicus* Berkenhout, 1769 [3–6] and wood mouse *Apodemus sylvaticus* Linnaeus, 1758 [4,7,8], and four in striped field mouse *Apodemus agrarius* Pallas, 1771 [2,9].

It seems in that context, that skin acarofauna of the house mouse *Mus musculus* Linnaeus, 1758, as cosmopolitan, synanthropic animal, moreover used as laboratory, bred for pets and pet food, should be recognized to the best degree. In fact, only two demodecid mite species in house mouse are known, and there is a relatively low amount of data concerning them. The first one, *Demodex musculi* (Oudemans, 1897), is related to haired areas of the whole body skin and is noted both in mice from wild populations and from laboratory breeding. Information concerning that species are usually found in correlation of skin lesions occurrence [e.g. 10–12], and considerably lower amount of data concerns biology of various aspects of parasitism [13–15]. The second one in turn, *D. flagellurus* Bukva, 1985, is only known from Czech Republic (South Bohemia region), from where it also was described [16,17] and from Poland [13–15]. Thus, little is known about its occurrence in host populations, parasitism, biology or the range of morphological diversity. These demodecid mites were very abundant in infected mice from Czech Republic, while in case of the mice examined in Poland originating mainly from northern as well as central part of the country, they were noted sporadically and only sparse individuals were found [13–15]. It seemed that this parasite may be rare in mice in these regions, and it demonstrates low level of prevalence. Current data points that infestation level may demonstrate differentiated occurrence in host populations.

Materials and Methods

The research material consisted of 30 house mice, including 20 specimens from northern Poland (residential buildings, Gdynia 54°31′N/18°29′E and Gdańsk 54°22′N/18°36′E) collected in 2012, and 10 from Wielkopolska-Kujawska Lowland (rural region – farmland, Słomowo 52°21′N/17°32′E) were collected in 2009. This demodecid mites are characterized by strict topical specificity, thus skin fragments from genital region of mice were taken into account in the study; tissue samples were examined using the method of digesting and decantation [18]. Obtained mite specimens were mounted in polyvinyl-lactophenol solution and analyzed using phase contrast microscope. Measurements were taken as follows: gnathosomal width = width at base; podosomal and opisthosomal width = maximum width.

Results

Demodex flagellurus (Figs. 1,2) was observed in 4 out of 30 examined mice. The prevalence of

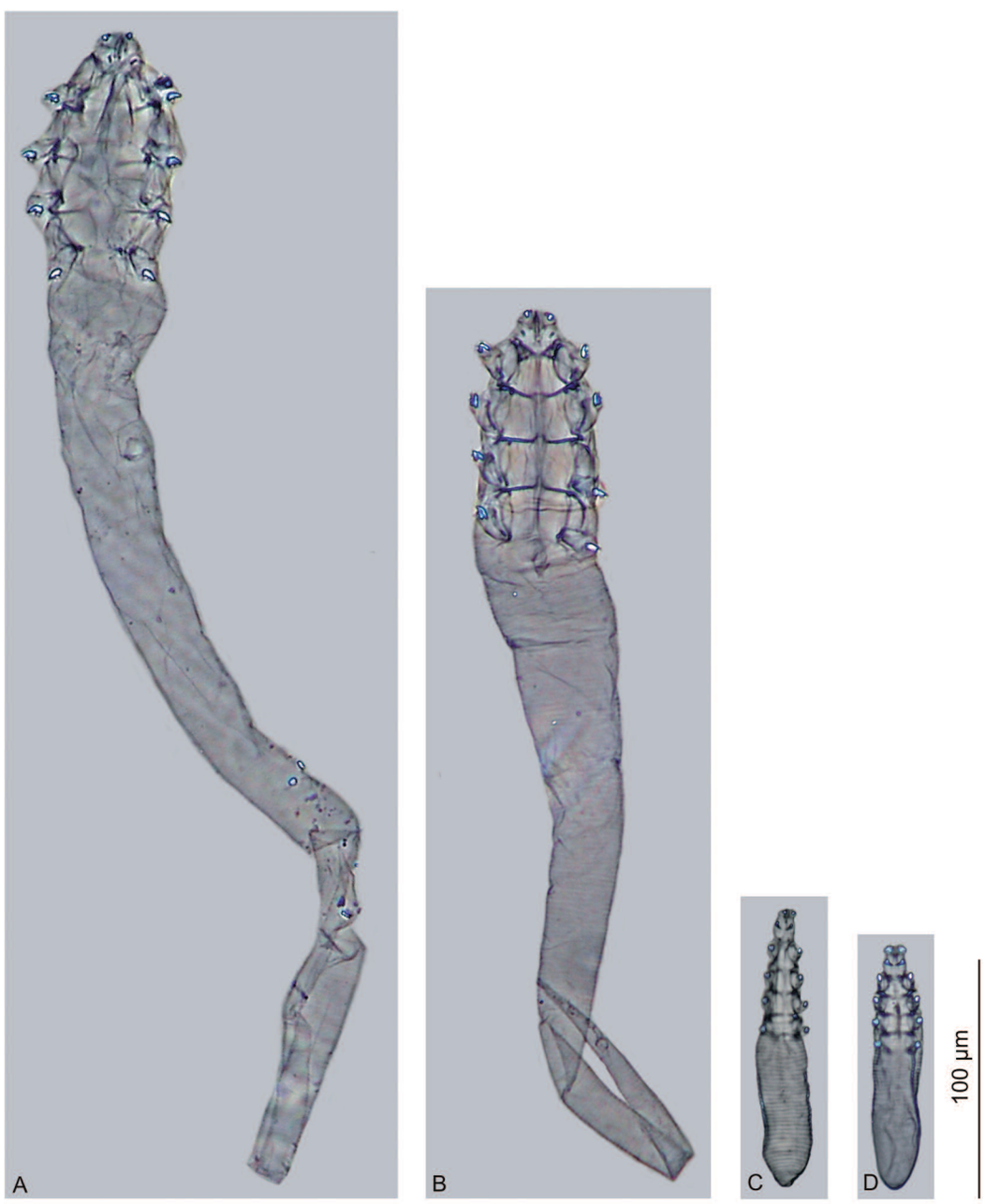

Fig. 1. *Demodex flagellurus* (A: male, B: female) compared to *Demodex musculi* (C: female, D: male)

infestation was thus 25.0%, with mean intensity of 48.0, and intensity range of 2–103. All development stages were noted – 97 females, 25 males, 5 larvae, 9 protonymphs and 56 nymphs. The level of infestation in mouse from residential buildings (Gdynia and Gdańsk) was: 5.0% and 5.0, while in rural region (Wielkopolska-Kujawska Lowland, Słomowo): 30.0%, 62.3 and 2–103.

An analysis of the metric features demonstrated a high degree of characteristics variability compared to data given by Bukva [16] (Table 1).

Discussion

Demodex flagellurus, except *D. agrarii* from striped field mouse *A. agrarius*, is one of the biggest known demodecid mites (Table 1). It was noted in mice from wild populations [13–17], however Bukva [17] reports that he also noted it in the laboratory mice. This mite is characterized by strict topographic specificity [2,3], i.e. it is only observed in genital region of host skin. Location limited to genital area allowed to investigate the mechanism of these mites transfer [17], it moves between the individuals in host populations both during adult individuals sexual intercourses, and in vertical transfer from mother to offspring. House mouse reaches maturity at the age of about 2–3 months, and pregnancy lasts 20–21 days. In favoring conditions it reproduces for the whole year, giving 5–8 litters per year [19]. Thus, taking into account mouse biology, such mechanism of demodecid mites transfer should favor these mites spreading between the hosts. However Bukva [16], who examined 434 hosts, noted these mites only in 5.5% of mice. In previous study conducted in Poland, *D. flagellurus* was noted in 6.6–10.0% mice from Tricity (Gdańsk and Gdynia) region [13–15], and in about 6.0% from Wielkopolska-Kujawska Lowland [15]. Currently, analogical level of infestation prevalence was observed in mice originating from various residential buildings in Gdynia and Gdańsk. In turn, the prevalence was high in mice obtained from spatially limited site (farmland) in central Poland. These demodecid mites presumably occur in some local populations of mice and exhibit high infestation level, since they easily transfer between the hosts. Thus, infestation level observed in the study may depend on the number and kind of local populations the examined mice originated from. Additionally, the mice derived from various buildings in Gdynia and Gdańsk would have belonged to different local populations.

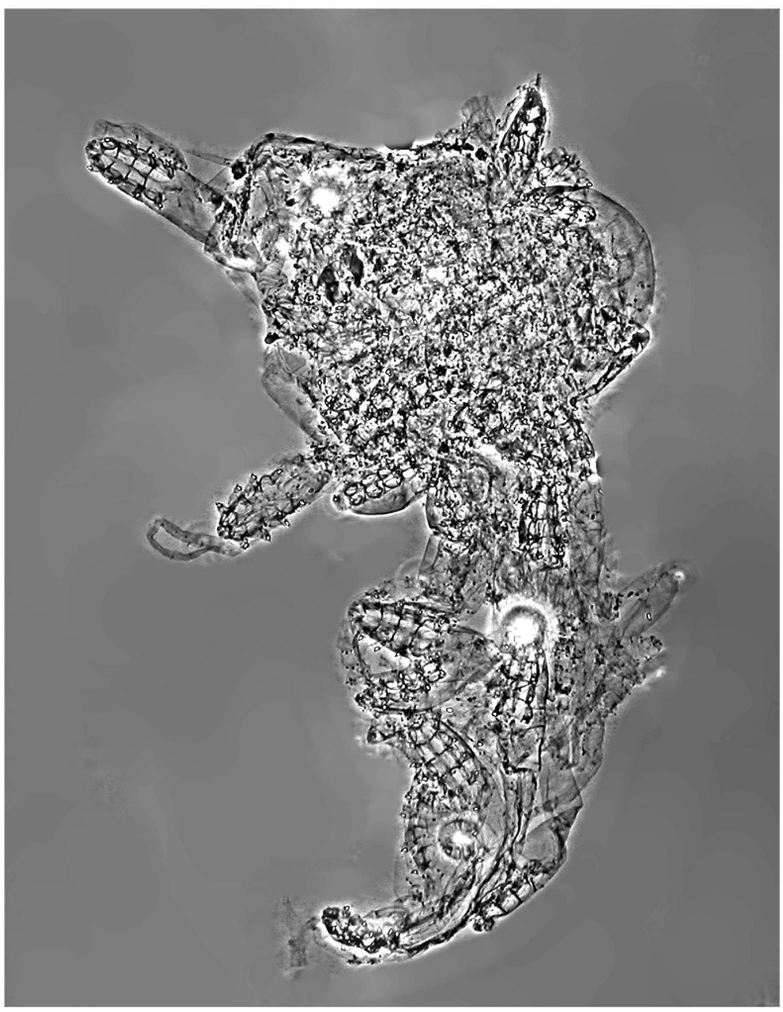

Fig. 2. Group of specimens of *Demodex flagellurus* prepared from host tissues

High intensity infestation was noted in mice investigated in Czech Republic [16] – over 1000 *D. flagellurus* individuals were found in 24 mice. However, the number of these mites in particular hosts was differentiated, since half of noted individuals originated from four mice, but generally infestation level was distinctly higher compared to the mice examined so far in Poland, especially that these demodecid mites are relatively big, and concurrently they inhabit very limited area. According to previous data derived from examination of mice from a few sites in northern and central Poland, the infestation level was low, and mean intensity was 6.5–7.7 individuals, with intensity range of 4–11 [13–15]. Analogical infestation intensity level was noted in currently investigated mice originating from Gdynia and Gdańsk, while the mice from the site in

Table 1. Body size (micrometers) for adults of *Demodex flagellurus*

Morphologic features	♂ (n = 20)	♀ (n = 40)	♂ (n = 20) Bukva [16]*	♀ (n = 20) Bukva [16]*
Length of gnathosoma	21 (18–24), SD 2	20 (16–24), SD 2	24, SD 2	23, SD 2
Width of gnathosoma	22 (20–25), SD 2	24 (20–27), SD 2	25, SD 1	30, SD 3
Length of podosoma	89 (75–94), SD 4	87 (80–95), SD 3	94, SD 4	90, SD 2
Width of podosoma	56 (45–63), SD 5	52 (48–60), SD 3	62, SD 5	56, SD 6
Length of opisthosoma	509 (420–576), SD 53	363 (300–425), SD 25	571, SD 76	363, SD 41
Width of opisthosoma	48 (40–55), SD 4	50 (40–58), SD 4	50, SD 12	50, SD 7
Aedeagus	45 (40–50), SD 3	50 (40–58), SD 4	46, SD 11	–
Vulva	–	–	–	11, SD 1
Total length of body	618 (518–693), SD 57	469 (404–533), SD 26	89, SD 76	476, SD 41

*Author give only means and SD. Measurements were rounded to the nearest micrometer with respect to the original results.

Wielkopolska-Kujawska Lowland demonstrated very high intensity of infestation. Probably, the reasons of parasites abundance differentiation in particular hosts are the complex issue, conditioned by physiological state of the host itself (maybe by the stage of life cycle and reproduction organs functioning), as well as by external environment factors. Explanation of that problem requires however an examination of *D. flagellurus* seasonal dynamics in mice from various populations.

It is interesting, that no disease symptoms related to parasites presence were noted even in mice with high infestation intensity. Similar, asymptomatic infestation course was observed in the case of mass occurrence of two demodecid mite species, *D. norvegicus* Bukva 1995 and *D. nanus* (Desch, 1987), in genital area of common rats, which in fact is a rule in infestation with this group demodecid mites.

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Received 27 October 2014
Accepted 10 December 2014