

Original papers

Demodectic mites of the brown rat *Rattus norvegicus* (Berkenhout, 1769) (Rodentia, Muridae) with a new finding of *Demodex raticola* Bukva, 1995 (Acari, Demodecidae)

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ABSTRACT. *Demodex raticola* was recorded in the brown rat *Rattus norvegicus* from northern Poland. It is a skin mite specific to this host, previously recorded only in the Czech Republic. *D. raticola* was found at a prevalence 65.0% and mean intensity 12.7 in skin samples taken from the regions of lips, nose and chin. Furthermore, three other species from the family of Demodecidae were recorded, including *Demodex nanus* found in skin samples from different parts of the body and characterised by the highest parameters of infestation (100.0%, 25.2), *D. ratti* (50.0%, 3.3) found in the head skin and *D. norvegicus* (30.0%, 3.5) found in the genital and anal regions. The identified demodectic mites did not cause any pathological symptoms in rats.

Key words: *Demodex nanus*, *D. norvegicus*, *D. ratti*, *D. raticola*, demodectic mites, *Rattus norvegicus*

Introduction

Different synhospital species from Demodecidae (Acari, Prostigmata) often occur in individual species of mammals, adapting to particular microhabitats of a host [1,2]. So far four species of specific skin mites from this family were described in the brown rat *Rattus norvegicus* (Berkenhout, 1769) (Rodentia, Muridae). *Demodex ratti* Hirst, 1917 was discovered as the first one; then it was redescribed by Bukva [3] based on the materials coming from the brown rat from the Czech Republic [3–5]. Furthermore, this species was recorded in Russia and in Poland [6–9], whereas *Demodex nanus* Hirst, 1918 was recorded in *R. norvegicus* and *Rattus rattus* (Linnaeus, 1758) from Great Britain [5,10]. Subsequently, a redescription of the species was done by Desch [11] based on the material acquired from the brown rat coming from the USA and from the black rat from New Zealand. Additionally, *D. nanus* was also recorded in Russia, Germany, North America and Poland [6–9,11]. Much later, yet another two species – *Demodex norvegicus* Bukva, 1995 and *Demodex raticola*

Bukva, 1995 – were identified and described based on the specimens coming from the brown rat from the Czech Republic [3]. However, *D. norvegicus* was also recorded in Poland [7–9], with *D. raticola* recorded only once [3].

Materials and Methods

The material for the studies consisted of 20 brown rats *Rattus norvegicus* from northern Poland (Gdańsk 54°22'N/18°36'E, Rzuszcze 54°37'N/17°27'E, Tczew 54°06'N/18°47'E) collected in 2009. Skin samples were collected from the head regions (eyelids, the region of eyes, cheeks, pinnae, chin, lips, nose), from the back and abdomen, as well as from the genital and anal regions; also external auditory meatus, tongue and stoma tissue samples were examined. Tissue samples were examined by applying the method of digestion and decantation [7], and specimens of mites were immersed in Faure's solution. Specimens of demodectic mites were analysed under a phase-contrast microscope.

Results and Discussion

The study showed total 100.0% of the brown rats have been infested at a mean intensity 36.2 (values do not include eggs). Altogether, 4 demodectic mites were found (*Demodex ratticola*, *D. nanus*, *D. ratti*, *D. norvegicus*). Earlier studies on the brown rat from Poland revealed the presence of three demodectic mites (*D. nanus*, *D. ratti*, *D. norvegicus*) at a overall infection 69.7%, 5.8 [9].

The presence of *Demodex ratticola* (Figs. 1–3) was ascertained in thirteen brown rats (prevalence: 65.0%, mean intensity: 12.7). This is the first discovery of this species in Poland. So far it has been recorded only from the Czech Republic [3]. Adult stages dominated over the immatures (Fig. 4). The adult specimens of the detected *D. ratticola* were also on average slightly smaller than those described in the previous studies. However, at present and previously, only a small number of

specimens has been available for measurements (Tables 1,2). The majority of specimens came from sample sections from the region of lips and nose, which is consistent with the location indicated by Bukva [3]; single specimens were found in the chin.

In addition, representatives of three other species of demodectic mites, typical of *Rattus norvegicus*, were found in the studied rats. *D. nanus* occurred in the largest numbers (prevalence: 100.0%, mean intensity: 25.2) and was found in skin samples from different regions of the body, but mostly in genital-anal region, whereas *D. ratti* (50.0%, 3.3) was detected in the head skin, and *D. norvegicus* (30.0%, 3.5) within the genital and anal regions.

Although, individual species of demodectic mites are listed in different textbooks on diseases and parasites of rats, actual and documented records are missing in the related literature. Nevertheless, despite the lack of available data on the occurrence of synhospital *Demodex* spp. in brown rats from



Fig. 1. *Demodex ratticola*, egg



Fig. 2. *Demodex ratticola*, male



Fig. 3. *Demodex ratticola*, female

Table 1. Body size (means, ranges, standard deviations, in μm) of adult stages of *Demodex ratticola*

	Present		Bukva [3]	
	Male N=24	Female N=20	Male N=20	Female N=20
Length of gnathosoma	18.7 [15.5-20.5] SD 1.4	20.3 [17.2-22.6] SD 1.6	17.9 [17-20] SD 0.9	18.9 [17-21] SD 0.9
Width of gnathosoma (at base)	21.1 [18.0-23.9] SD 1.8	23.3 [20.5-29.1] SD 2.1	22.6 [21-24] SD 1.0	24.8 [21-30] SD 1.6
Length of podosoma	58.1 [51.0-67.5] SD 4.7	61.3 [53.4-71.2] SD 4.5	60.7 [56-66] SD 2.4	64.0 [58-71] SD 3.6
Width of podosoma	32.1 [28.0-39.0] SD 2.5	34.2 [28.9-42.0] SD 3.9	34.9 [30-40] SD 2.8	36.0 [30-43] SD 3.6
Length of opisthosoma	114.3 [93.0-135.1] SD 11.5	99.5 [92.5-123.5] SD 6.7	116.2 [94-130] SD 10.1	102.8 [93-125] SD 9.2
Width of opisthosoma	26.2 [24.2-33.6] SD 2.4	29.5 [24.8-35.8] SD 3.3	27.4 [24-34] SD 2.7	30.6 [25-37] SD 3.4
Length of aedeagus	29.3 [25.5-32.5] SD 2.3	–	29.9 [27-32] SD 1.2	–
Length of vulva	–	9.0 [8.0-10.8] SD 1.0	–	9.3 [7-12] SD 1.0
Total length of body	191.4 [159.5-218.3] SD 15.0	181.1 [164.7-215.6] SD 11.2	194.8 [172-209] SD 10.3	185.8 [174-212] SD 11.4

Table 2. Body size (means, ranges, standard deviations, in μm) of immature stages of *Demodex ratticola*

	Present				Bukva [3]			
	Egg N=6	Larva N=2	Protonymph N=0	Nymph N=6	Egg N=20	Nymph N=6	Protonymph N=6	Nymph N=12
Length	84.2 SD 6.5 [75.0-90.0]	112.0 SD 4.2 [109-115]	–	199.8 SD 33.8 [167.5-250.0]	82.9 SD 5.7 [71-93]	107.9 SD 12.3 [85-117]	151.3 SD 20.4 [122-173]	192.2 SD 38.7 [121-246]
Width	16.3 SD 1.3 [15.0-18.00]	26.0 SD 7.1 [21-31]	–	33.8 SD 4.8 [29.5-43.0]	17.2 SD 0.7 [16-19]	21.8 SD 0.9 [20-22]	26.1 SD 3.4 [22-31]	29.7 SD 4.2 [24-39]

other parts of the world, one can assume that the four species of demodectic mites parasitizing rats identified so far constitute a constant, characteristic and probably common element of its parasitofauna. The lack of information on their occurrence probably results from the fact that these mites usually do not induce any pathological changes in their hosts. And most of the data on *Demodex* is related to observations of dermal symptoms.

References

- [1] Izdebska J.N. 2010. *Demodex* spp. (Acari, Demodecidae) and demodecosis in dogs: characteristics, symptoms, occurrence. *Bulletin of the Veterinary Institute in Pulawy* 54: 335-338.
- [2] Izdebska J.N., Rolbiecki L., Fryderyk S. 2011. 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*. *Wiadomości Parazytolo-*

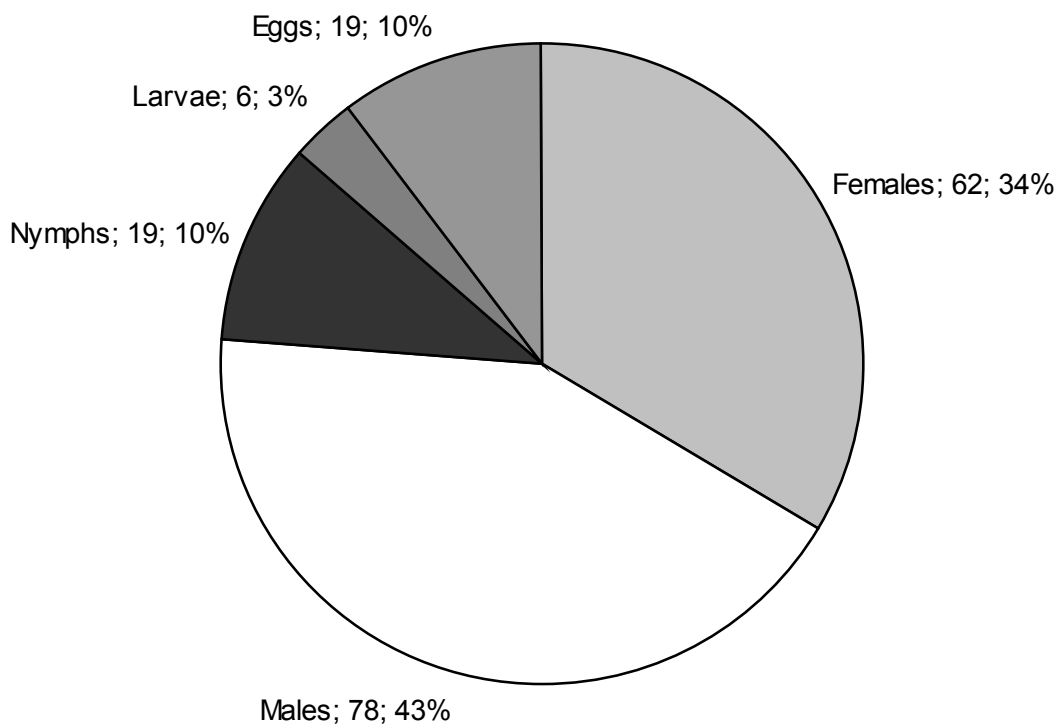


Fig. 4. The population structure (number and percentage) of *Demodex ratticola*

giczne 57: 261-264.

- [3] Bukva V. 1995. *Demodex* species (Acari: Demodecidae) parasitizing the brown rat, *Rattus norvegicus* (Rodentia): redescription of *Demodex ratti* and description of *D. norvegicus* sp. n. and *D. ratticola* sp. n. *Folia Parasitologica* 42: 149-160.
- [4] Hirst S. 1917. Remarks on certain species of the genus *Demodex*, Owen (the *Demodex* of man, the horse, dog, rat, and mouse). *The Annals and Magazine of Natural History* 20: 232-235.
- [5] Hirst S. 1919. Studies on Acari. No. 1. The Genus *Demodex*, Owen. British Museum (Natural History), London.
- [6] Bregetova N.G., Bulanova-Zahvatkina E.M., Volgin V.I., Dubinin V.B., Zahvatkin A.A., Zemskaja A.A., Lange A., Pavlovskij E.N., Serdúkova G.V., Šluger E.G. 1955. [Kleši gryzunov fauny SSSR]. Izdatel'stvo Akademii Nauk SSSR, Moskva, Leningrad (In Russian).
- [7] Izdebska J.N. 2004. *Demodex* spp. (Acari: Demodecidae) in brown rat (Rodentia: Muridae) in Poland. *Wiadomości Parazytologiczne* 50: 333-335.
- [8] Izdebska J.N. 2008. Nużeńcowate (Demodecidae). In: *Fauna Polski - charakterystyka i wykaz gatunków*. vol. II. (Eds. W. Bogdanowicz, E. Chudzicka, I. Piliński, E. Skibińska). Museum and Zoology Institute of PAS, Warsaw: 128-130, 200-201.
- [9] Izdebska J.N., Rolbiecki L. 2004. Występowanie *Demodex* spp. w korelacji z poziomem zarażenia helmintami szczura wędrownego *Rattus norvegicus* (Berk.) z aglomeracji miejskiej Trójmiasta. In: *Fauna miast Europy Środkowej 21. wieku*. (Eds. P. Indykiewicz, T. Barczak). Wydawnictwo LOGO, Bydgoszcz: 581-584.
- [10] Hirst S. 1918. On four new species of the genus *Demodex*, Owen. *The Annals and Magazine of Natural History* 2: 145-146.
- [11] Desch C.E. 1987. Redescription of *Demodex nanus* (Acari: Demodecidae) from *Rattus norvegicus* and *R. rattus* (Rodentia). *Journal of Medical Entomology* 24: 19-23.

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