

Original papers

Sarcoptic mites (Acari, Sarcoptidae) parasitizing the brown rat *Rattus norvegicus* (Berkenhout, 1769) (Rodentia, Muridae), with a new data for the fauna of Poland

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ABSTRACT. One of the least researched groups of parasitic arthropods in the brown rat *Rattus norvegicus* (Berkenhout, 1769) are skin mites from the family of Sarcoptidae. Specimens representing two species of sarcoptic mites were found in 30 examined rats from northern Poland: *Notoedres muris* Megnin, 1877 and *Trixacarus diversus* Sellnick, 1944. The total prevalence and mean intensity of infestation were 13.3% and 3.3, respectively. At the same time, the list of sarcoptic mites occurring in Poland was completed with a new genus and new species – *T. diversus*.

Key words: *Notoedres muris*, *Trixacarus diversus*, Sarcoptidae, sarcoptic mites, *Rattus norvegicus*

Introduction

Parasitic arthropods of the brown rat *Rattus norvegicus* (Berkenhout, 1769) are not well investigated [1,2]. Although a number of species with a varying range of specificity are listed among parasites of this host – both species-specific as well as oligo- and polyxenic ones, the knowledge about their occurrence – parameters, the course and effects of infestation – is fragmentary. At the same time, most of the worldwide and Polish data relate to parasitic insects of Anoplura and Siphonaptera, and mites associated with the hair and the skin surface [i.a. 1,3–11].

There is much less information about the occurrence of skin mites in rats. So far, four Demodecidae species were described in the brown rat [12–14]; they were reported also from Poland [2,15–17]. Furthermore, a representative of Psorergatidae – *Psorergates rattus* Fain et Goff 1986 [18] was found, as well as two species from Sarcoptidae – *Notoedres muris* Megnin, 1877 and *Trixacarus diversus* Sellnick, 1944 [19]; so far, only *N. muris* was found in Poland [5,10,20].

While demodecid mites are common in the populations of rats, and they often occur with high

infestation parameters – up to 100% prevalence [17], sarcoptic mites are seldom found. Although there are some data on notoedric mange in rodents, including the brown rat [21–25], these observations are usually related to breeding animals – laboratory ones or pets. There is little information on the occurrence of sarcoptic mites in rats from wild populations. According to Haitlinger and Jankowska [1], they are rare parasites in this host – classified as subprecedents in the dominance structure, i.e. species with the abundance below 1%.

Materials and Methods

The material for the study consisted of 30 brown rats *R. norvegicus* from northern Poland (54°30'N/18°32'E, 54°22'N/18°36'E, 54°37'N/17°22'E) collected in 2010 and 2011. Skin samples were collected from head regions (eyes, pinnae, cheeks, chin, lips, nose, vibrissae), from the back and abdomen, limbs, as well as from the genital and anal regions. Tissue samples were examined by applying the method of digestion and decantation [15], and specimens of mites were immersed in Faure's solution.

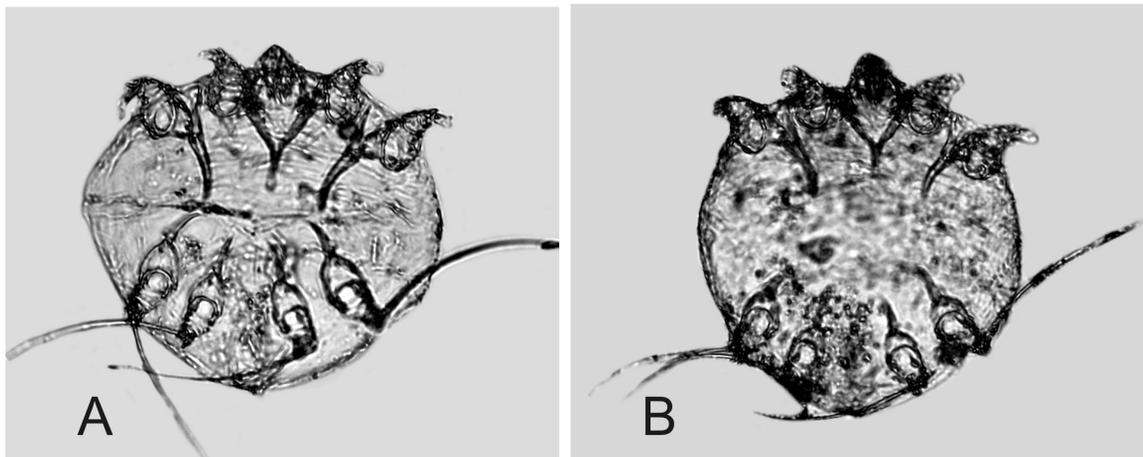


Fig. 1. *Notoedres muris*, various specimens

Results

Two species of sarcoptic mites: *N. muris* (Fig. 1) and *T. diversus* (Fig. 2) were found in the examined rats. The total prevalence of infestation with sarcoptic mites was 13.3%, with mean intensity (calculated for the examined skin samples) of 3.3. *N. muris* was found in three rats (prevalence 10%), a total of 11 specimens (6 females, 2 male, 1 nymph, 2 larvae), and 6 eggs. Whereas *T. diversus* was found in one rat (prevalence 3.3%): 2 females and one egg. All specimens of *N. muris* were found in the skin of the head (nose, pinnae), while specimens of *T. diversus* came from the skin of the hind limb (thigh).

Discussion

Sarcoptic mites (Sarcoptidae) are parasites that burrow into the skin of mammals and are characterized by a diverse range of host specificity. They are mostly recorded in marsupials, primates, bats, rodents and insectivores, but a few species were also found in hosts from other orders of mammals [19]. A total of ca. 120 species have been described so far [26], including only 5 species from Poland (the genera: *Sarcoptes*, *Notoedres* and *Nycteridocoptes*) [20,26]. At present, a new genus and a new species – *T. diversus* were added to the list. This is also a new parasite for the brown rat in Poland.

Sarcoptic mites are recognizable by their oval or round, dorsally convex bodies, transversely striated

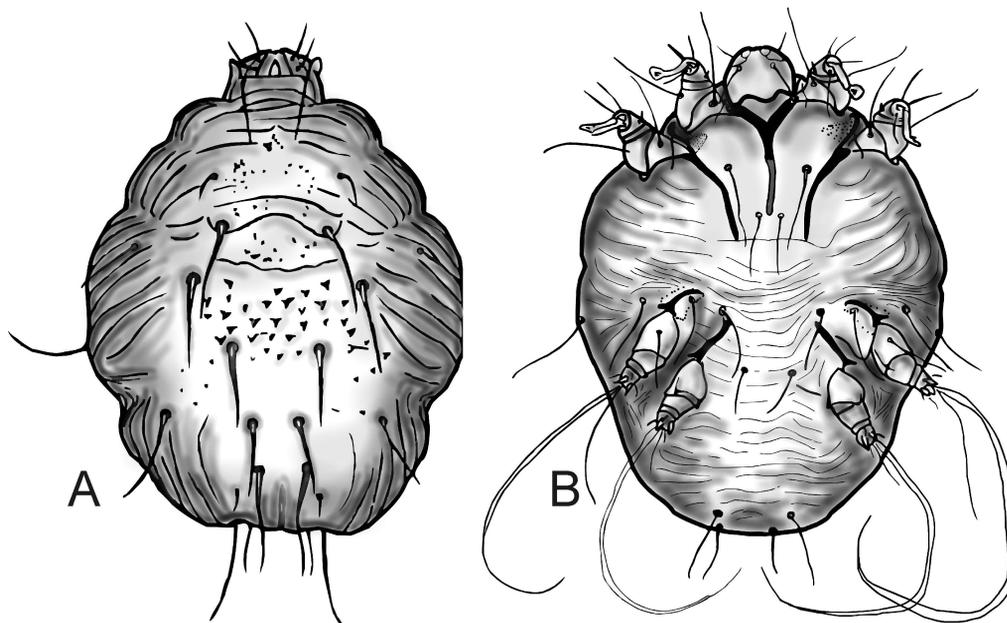


Fig. 2. *Trixacarus diversus*, female: A. dorsal view, B. ventral view

on the integument; scales or spines occur locally. Gnathosoma is short and wide, wrapped in a transparent membrane, and sometimes completely covered by epistome. Legs are short and reduced, arranged in two groups with conspicuous epimers, where epimers of pair I are merged into sternum. Furthermore, legs are equipped with small suckers on a very long, unsegmented stalk. *Trixacarus* mites are diagnosed in the adults by long and filiform dorsal setae (Fig. 2A), while in *Notoadres* the dorsal setae are short [26–27].

These mites may cause parasitosis (i.e. mange – sarcoptosis, notoedrosis) or allergic reaction, nevertheless, they often occur with no disease symptoms in hosts [27]. *N. muris* is listed as a parasite of rats and other murids, cricetids [19,28–29], but also insectivores, e.g. hedgehogs [21] or marsupials [19]. Acariasis symptoms in hosts occur most frequently in the skin of the ears and other regions of the head, but also in the genital areas and the tail [22]. Apart from pathological changes in the skin of the above-mentioned regions, rats affected by notoedric mange develop sometimes pathological changes around the nasal area in the shape of „horns” [30]. This parasite has probably a high infestation rate in breeding animals, e.g. 70% of 80 laboratory rats examined by Mircean et. al. [31] were infested with *N. muris*. However, this parasite appears to be much less common in wild populations of rats or locally shows higher infestation parameters. And thus, *N. muris* was found in 2.1% of 725 rats examined from the region of Vancouver (Canada). However, most of the infected rats came from the international shipping port, where the infestation rate was 46.9% [25].

Whereas *T. diversus* was originally known from European *R. norvegicus* and *R. rattus* (Linnaeus, 1758) only, but morphologically identical specimens were found in the endemic rodent from South America – *Calomys musculus* (Thomas, 1913) [19]. These mites may cause hair loss in hosts, skin lesions in the form of scabs all over the body, especially on the head and the tail, and the symptoms may occur even with a relatively low infestation rate [19,32].

To sum up, it appears that sarcoptic mites are characterized by low infestation parameters in the populations of brown rats. The research on parasitofauna in rats performed in Poland report only single cases of infestation [5,10], and research conducted in the context of skin mites in rats provided data on demodecid mites and no data on

sarcoptic mites [2,15–17]. These parasites are transmitted during intraspecific contacts between hosts, hence higher density of rats is conducive to a higher infestation rate. Nevertheless, the development of parasitosis is connected not only with high parameters of infestation, but also with favorable conditions provided by a host organism – weakness, reduced immunity, poor diet [27]. Therefore, symptoms were often observed in laboratory animals, which as a result of different breeding and experimental treatments tend to be more susceptible to diseases. Similar data are provided by observations of skin parasitosis in other groups of rodents, e.g. demodecosis in hamsters [33–35].

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