

“Skin and tissue mites (Acariformes: Demodecidae, Psorergatidae) of small mammals (Mammalia: Chiroptera, Rodentia, Soricomorpha) from Poland – occurrence and analysis of the topical and topographical preferences of synhospitolic species”

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Skin and tissue mites (Acariformes: Demodecidae, Psorergatidae) are stationary parasites commonly found in mammalian populations. They can cause various clinical symptoms, including skin lesions of varying severity; however, infestations are generally asymptomatic, which contributes to their infrequent detection during parasitological or veterinary examinations. To date, the highest number of species has been described in the so-called "small mammals" (Chiroptera, Rodentia, Soricomorpha), with 77 species of Demodecidae and 65 species of Psorergatidae identified in these groups. Therefore, one might expect that the state of knowledge regarding both families in this group of mammals would be the most comprehensive; however, information about them is usually fragmented and based on single publications, often describing species new to science. This is particularly true for Psorergatidae, a group of mites poorly studied both biologically and taxonomically, and which has not been subjected to comprehensive analyses for over 30 years. As a result, there has been a lack of data on their biodiversity, complete host range, and specificity in terms of host, topic (habitat preference), topographical distribution, geographical ranges, biology, life cycles, and other aspects of the parasite-host relationship.

Demodecidae and Psorergatidae, as ecologically and systematically related groups (so-called sister groups) with high host specificity, utilise a shared host range. Nevertheless, there is still a lack of data on their co-occurrence, both at the species and individual levels. Considering that skin and tissue mites from these families are evolutionarily associated with mammals, studying their host, topographical, and topic specificity could reveal the mechanisms behind the formation and functioning of synhospitolic species within the host.

The study involved mammals from among bats, rodents, and shrews collected from Poland. Based on monitoring studies and analysis of literature data, species were selected that serve as suitable research models for analysing the occurrence of Demodecidae and Psorergatidae in these groups. These were common mammals with a wide geographical distribution (Chiroptera – *Plecotus auritus*, *Nyctalus noctula*; Rodentia – *Apodemus flavicollis*, *Rattus norvegicus*; Soricomorpha – *Crocidura suaveolens*, *Talpa europaea*), in which these mite groups had already been recorded previously. Skin samples from various body regions were collected from 69 animals and examined for the presence of skin parasites using the digestion

and decantation method. This method is very laborious (analysing 1 cm² of skin requires examining about 100 wet preparations), but it allows for the detection of even single specimens of mites in the skin that shows no symptoms of disease. Subsequently, microscopic preparations for taxonomic analysis were made using phase-contrast and immersion techniques. To determine the level of mite infestation for each host species, standard parasitological parameters were applied (prevalence, mean intensity, range of intensity, density in the skin).

The study provided new data on the biodiversity of skin mites – four species new to science were discovered and described: *Demodex crocidurae* in the lesser white-toothed shrew (*C. suaveolens*), *D. pusillus* in the noctule bat (*N. noctula*), and *D. mediocris* and *D. tenuis* in the yellow-necked mouse (*A. flavicollis*). For the second time worldwide, and the first time in Poland, *D. foveolator* was recorded in *C. suaveolens* and *Psorergates rattus* in the brown rat (*R. norvegicus*). Additionally, a rarely noted species, *D. talpae*, was recorded in the European mole (*T. europaea*), for which a redescriptive analysis was conducted. The study also recorded *Psorergatoides kerivoluae* in the brown long-eared bat (*P. auritus*) and *Psorergates muricola* in *A. flavicollis*, constituting a new host record for this parasite species. Importantly, all detected parasites were asymptomatic. In total, 11 mite species were found in six host species studied, confirming the possibility of the occurrence of several synhospital species occupying different microhabitats within the host. The analysis of location confirmed the hypothesis of high topographical specificity (preferences in choosing body regions) for mites from both groups and topic specificity (inhabiting different microhabitats, e.g., different skin structures) for Demodecidae. This was best illustrated by the parasitism model observed in the rodent, the yellow-necked mouse, where five synhospital species (four Demodecidae and one Psorergatidae) were found occupying different regions of the host's body. In both Chiroptera and Rodentia, the hypothesis of the co-occurrence of Demodecidae and Psorergatidae in the same hosts was confirmed not only at the species level but also at the individual level. It was found that skin mites are common among hosts – at least one species was recorded in most of the studied mammals, and in some cases (e.g., *A. flavicollis*), the prevalence of infestation reached 100%. However, mites generally exhibit low levels of intensity (usually the smaller the region of inhabited skin, the lower the intensity), resulting in asymptomatic infestations.

Additionally, lists of Demodecidae and Psorergatidae species occurring in small mammals (Chiroptera, Rodentia, Soricomorpha) worldwide were compiled, including all previous records, illustrating the possibility of the co-occurrence of these mites in different hosts.

In conclusion, the study results confirmed that the skin mite fauna of small mammals is much more diverse and richer than previously known. The host range of Demodecidae and Psorergatidae is broader, and both families exhibit topographical specificity. On the other hand, only Demodecidae are characterised by topic specificity. Monoxeny was confirmed for Demodecidae, while this aspect requires further research in the case of Psorergatidae.