

Skin mites (Acari: Demodecidae, Psoroptidae, and Sarcoptidae) of the European bison, *Bison bonasus*

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Abstract: Skin mites of the European bison from Poland were studied. They belonged to 6 species of 3 families: Demodecidae (*Demodex bisonianus*, *D. bovis*, and *Demodex* sp.), Psoroptidae (*Psoroptes equi* and *Chorioptes bovis*), and Sarcoptidae (*Sarcoptes scabiei*). Among them, *D. bisonianus* and *Ch. bovis* were the most frequent and abundant, as they were collected from almost half of the bison examined (total: about 250 individuals). The remaining species were much rarer. All studied parasites were strongly specific with respect to their location on/in the host skin.

Key words: European bison, *Bison bonasus*, skin parasites, *Demodex*, *Chorioptes*, *Psoroptes*, *Sarcoptes*

INTRODUCTION

The European bison *Bison bonasus* (Linnaeus, 1758) (Artiodactyla: Bovidae) is the largest wild European ungulate. This species is very rare and strongly protected and, therefore, difficultly accessible for scientific research, including parasitological investigations. The extant natural populations of *B. bonasus* are products of restitution procedures, which were based on a limited number of individuals that had survived in various zoos. The natural parasitic fauna of the European bison probably almost perished along with the demise of the natural host populations. The European bison perhaps lost most of its natural parasites during the period of breeding in captivity. On the other hand, it had many opportunities there to be infested by some parasites from other mammals. Therefore, the present composition of parasites inhabiting this host has a complicated origin because of some bison's parasites switched on this host presumably during the period of breeding in captivity. Only 3 species parasitizing *B. bonasus* are monoxenous parasites of this host: *Trypanosoma wrublewskii* Wladimiroff et Yakimoff, 1909 (Kinetoplastida, Trypanosomatidae), *Bisonicola sedecimdecembrii* Eichler, 1946 (Phthiraptera, Trichodectidae), and *Demodex bisonianus* Kadulski et Izdebska, 1996 (Acari, Demodecidae). In contrast, most of the other ungulates have richer specific parasitofaunas, even with respect to para-

sitic arthropods. For example, domestic cattle *Bos taurus* Linnaeus, 1758 has a species-specific louse *Haematopinus eurysternus* (Nitzsch, 1818), biting louse *Bovicola bovis* Linnaeus, 1758, and 3 species of demodecids (*Demodex bovis* Stiles, 1892, *D. tauri* Bukva, 1986, *D. ghanensis* Oppong, Lee et Yasin, 1975).

Among parasitic arthropods in the European bison (IZDEBSKA 2000), those capable of a high prevalence and, at the same time, hardly affected by factors of the external environment should be most successful in their persistence to date. It is contended that such parasites should be sought among skin mites, an ecological group whose representatives in mammals belong to the families Demodecidae, Psoroptidae, and Sarcoptidae. They are represented by species differing in their host preferences and the degree of specificity. In typical hosts, the mites are frequent due to the transmission manner (they are transmitted within a host population during inter-individual encounters) and dwell in skin tissues. Psoroptids inhabit the surface layers of the host skin, sarcoptids produce channels in the epidermis, while demodecids, the most advanced skin parasites, are associated with glands and hair follicles.

MATERIALS AND METHODS

The material for this study is based on collections of parasitic arthropods from the European bison in Poland, made during the past 14 years (1992–2005). The research involved almost 1/3 of the Polish population of the European bison (about 250 individuals). The hosts examined were selected from free-ranging stocks (in the Białowieża Primeval Forest and in the Bieszczady Mountains) and breeding stocks kept in bison reserves (Niepołomice, Smardzewice, the European bison reserve in the Białowieża Primeval Forest), or specimens from zoos.

To detect the presence of skin mites and to isolate them, usually skin samples were digested. Only occasionally the mites were also “scared away” from skin tissues by use of an original method (IZDEBSKA in preparation), or material was scraped off from pathologically changed skin fragments. Most of the samples were collected in November–March, due to the timing of European bison culling operations (ordered by the Polish Ministry of Environment). Skin samples included material collected from the head (ear, nose, eyelids), armpits of the fore and hind legs, abdomen, and the genital and anal areas. The samples were digested in aqueous solutions of potassium hydroxide (concentration 6–10%, depending on skin thickness). The isolated mites were mounted for identification (e.g., embedded in Faure’s liquid).

The level of infestation was determined on the basis of prevalence (percentage of infested hosts in the studied group of bison), mean intensity (mean number of parasites in sample material from 1 infested host), and range of intensity (the lowest and the highest number of parasites in sample material from 1 infested host) (ZŁOTORZYCKA et al. 1998).

RESULTS AND DISCUSSION

The oldest data on parasitic arthropods of the European bison fur and skin surface date back to the early 20th century (WRÓBLEWSKI 1927, EICHLER 1946). More comprehensive studies were carried out in the second half of that century on the free-ranging bison in the Białowieża Primeval Forest (KADULSKI 1977, 1989). However,

the first reports on skin mites appeared during the last 15 years, when the bison-specific skin mite, *Demodex bisonianus*, was discovered (KADULSKI & IZDEBSKA 1996) and 3 scabies mite species were reported from the European bison (DEMIASZ-KIEWICZ 1991, KADULSKI et al. 1996, IZDEBSKA 1998, 2000, 2001a).

During this study, 6 skin mite species were found on the European bison *Bison bonasus* (Linnaeus, 1758), namely: *Demodex bisonianus* Kadulski et Izdebska, 1996, *Demodex bovis* Stiles, 1892, *Demodex* sp. Owen, 1843 (Prostigmata, Demodicidae), *Psoroptes equi* (Hering, 1838), *Chorioptes bovis* (Hering, 1838) (Astigmata, Psoroptidae), and *Sarcoptes scabiei* De Geer, 1778 (Astigmata, Sarcoptidae) (Table 1). Two of those species are especially common in the bison populations: they were present in skin samples from about half of the European bison examined (Table 2). The first is the European-bison-specific skin mite *D. bisonianus*; its prevalence reached 46%, and the infested skin samples examined contained on average 19 individuals. The other species, *Ch. bovis* had a prevalence of 54%; skin samples from infested hosts contained on average 12 specimens, although some samples revealed as many as several hundreds of them. These 2 species were recorded in the free-ranging and contained stocks and at all the Polish centres of European bison visited (IZDEBSKA 2005). The remaining skin mites proved rare and were only locally recorded. *P. equi* (prevalence 2%; mean intensity 25 individuals per infested sample) was found in the bison in the Białowieża Primeval Forest (both free-ranging and those dwelling in the reserve) (IZDEBSKA 2001b, IZDEBSKA & CYDZIK 2005). *S. scabiei* occurred only in the free-ranging stock in the Białowieża Primeval Forest (prevalence 2%, mean intensity 3 individuals per infested sample). *D. bovis*, the cattle-

Table 1. Infestation of the European bison by skin mites in Poland

Species	Prevalence [%]	Total number of parasites	Mean intensity [individual]	Range of intensity [individual]	Polish centres of European bison occurrence visited
<i>Demodex bisonianus</i>	46	2185	19	1-166	everywhere
<i>Demodex bovis</i>	1	5	2	2-3	in Białowieża Primeval Forest reserve
<i>Demodex</i> sp.	1	9	3.5	2-4	in free-ranging European bison in Białowieża Primeval Forest
<i>Chorioptes bovis</i>	54	1620	12	1-256	everywhere
<i>Psoroptes equi</i>	2	125	25	3-9	in Białowieża Primeval Forest (both free-ranging and those dwelling in the reserve)
<i>Sarcoptes scabiei</i>	2	15	3	2-4	in free-ranging European bison in Białowieża Primeval Forest

Table 2. Infestation of sex/age groups of the European bison in Poland by 2 dominant species of skin mites: *Demodex bisonianus* and *Chorioptes bovis*

Sex/age of the bison	Prevalence [%]	Total number of parasites [individual]	Mean intensity [individual]
<i>Demodex bisonianus</i>			
Bulls (61)	56	594	17
Cows (83)	48	879	22
Calves (106)	32	712	21
Total (250)	46	2185	19
<i>Chorioptes bovis</i>			
Bulls (61)	57	153	4
Cows (83)	47	289	7
Calves (106)	56	1178	19
Total (250)	54	1620	12

specific skin mite, seems to be an accidental parasite of the bison; it was found only on hosts from the bison reserve in the Białowieża Primeval Forest (7 specimens collected from 3 individuals), where the bison are in contact with, e.g., the bison-cattle hybrids. The actual host ranges of *Demodex* sp. (prevalence 1%, mean intensity 3.5 individuals per infested sample), found only in the free-ranging European bison in the Białowieża Primeval Forest, is unknown. The poor condition of the small number of obtained individuals made precise taxonomic identification impossible. It is not clear whether these mites were contaminated from other mammals or they are native parasites of the bison. Various mammalian species are parasitized by synhospital demodecids with varied locations on the host body. It is quite possible that this parasite is another European bison-specific demodecid (i.a. IZDEBSKA 2002), particularly if that species is rarer than *D. bisonianus* due to a different location in tissues or different transmission pathways.

Skin mites in the European bison showed distinct topographic preferences: *D. bisonianus* was most often present in the eyelid skin, while *Ch. bovis* was usually isolated from material collected from legs, armpits, abdomen, and neck. The skin mite infestations were usually symptomless. Skin lesions were observed only when *Ch. bovis* was present and were usually limited to the area of pasterns or entire legs and armpits; other parts of the body were seldom affected (IZDEBSKA 2004, IZDEBSKA & ROLBIECKI 2004).

To sum up, skin mites are frequent in the European bison: most bison are infested, although individual mite species differ in intensity and prevalence. Infestations may be symptomless; whenever symptoms are observed, they differ from those reported from other ungulates, e.g., chorioptosis. Two species, *D. bisonianus* (species-specific for the European bison) and *Ch. bovis*, can be regarded as typical of

the European bison. *D. bisonianus* certainly and *Ch. bovis* probably occurred in former European bison populations. Infestation by those species was highly prevalent and usually symptomless, evidencing a good adaptation of both components of the parasite-host system. The remaining skin mite species are rare, occasionally accidental, perhaps acquired from other mammals under conditions of a confined breeding centre. However, even when not abundant, parasitic arthropods, including skin mites, are a reservoir of parasites, which under favourable conditions may develop parasitoses with distinct pathological symptoms. They may also be important as pathogen vectors, a particularly pertinent consideration in view of the expansion of diseases of unknown aetiology (e.g. necrotic balanoposthitis) among the European bison.

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