LIGZDOJOŠO SIBĪRIJAS ZĪLĪŠU *PARUS CINCTUS* HEMATOLOĢISKIE PARAMETRI, ASINS PARAZĪTU PREVALENCE UN TO SAISTĪBA AR PARAZITĒMIJAS INTENSITĀTI
BLOOD PARASITES PREVALENCE AND HEMATOLOGICAL HEALTH INDICES OF BREEDING SIBERIAN TITS *PARUS CINCTUS*

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ABSTRACT

Haemosporidian blood parasites are intracellular protozoan using their host tissue and blood stream for asexual reproduction. Many species of birds can be exposed simultaneously to several species and lineages of haemosporidian parasites, and the fitness effects of these parasites range from negligible to severe. Parasite loads can affect reproduction in breeding birds, and parasites may play an important role in sexual selection by affecting the expression of male secondary sexual traits. This is the reason why avian blood parasites are often used as models for testing hypotheses relating to sexual selection and underlying mechanisms of reproductive costs which shows the necessity to estimate blood parasite diversity, the intensity of invasion and prevalence (proportion of infected individuals) of the individual birds being studied.

There are many reports of bird blood parasites all over the world revealing noticeable differences in blood parasite seasonal and geographical variations. High prevalence is dependent on parasite relapse from tissues into the blood, thus, enhancing the reproduction and distribution of the pathogens. While the diversity of blood parasite of birds is higher in tropical areas, the prevalence seems to be highest at higher latitudes. The higher proportion of infected individuals in northern animal populations supposedly are due to the high abundance of transmitting vectors as well as the high species diversity of vectors specialized for birds or mammals in the northern latitudes.

Blood parasites usually provoke chronic infections in the wild with relapses during stressful situations for the hosts (Atkinson and Van Riper 1991, Bennett et al. 1993) especially during breeding (Weatherhead and Bennett 1991, Merino et al. 2000) which is energy and time demanding season. Food is one of the most important factors influencing reproduction in birds (Lack 1947, 1968, Martin 1987). Northern birds experience food limitation especially during the nestling period due to the shorter summer season and more unpredictable weather conditions. Detrimental working hours while provisioning food for nestlings require greater investments in each breeding attempt. Therefore northern species could be more stressed during breeding having suppressed immune function because of prolonged corticosterone exposure which may lead to higher intensity of parasite infestation.

This is the first study dealing with blood parasites of the Siberian tit (*Parus cinctus*), a small insectivorous passerine. Its nearly circumpolar range comprises boreal forests in northern Eurasia, Alaska and northwest Canada. Siberian tit is among those taiga birds most likely to remain true to their hatching location year round which means that transmission of its blood parasites occurs in boreal taiga forests only. Our aim was to study blood parasite composition, prevalence and the intensity of infection of the Siberian tit during the nestling

period in order to test for a link between parasite infections, hematological parameters of individual birds and reproductive output of this species in northern Finland.

Breeding adult Siberian tits were captured within their nestboxes during nestling period from 17 June to 21 June 2007 near Kuusamo, northern Finland. The vegetation in the area was composed mainly by Scots pine *Pinus sylvestris,* where nestboxes were placed for a long-term study. All of the breeding individuals were ringed with metal and individual plastic rings. Sex and age of the birds were known from previous seasons. The blood samples were taken from 42 Siberian tits. For identification of blood parasites and leukocytes from each individual Siberian tit a drop of blood was obtained by puncturing the tarsal vein and then smeared on three individually marked microscope slides. Smears were air-dried in the field and immediately fixed with methanol and subsequently stained with Romanovska - Gimsa stain. Smears were screened with a light microscope under oil immersion at 1000x magnification for *Haemoproteus* and *Plasmodium* and at 500x magnification for *Leucocytozoon*, *Trypanosoma* and *Microfilaria*. Parasites were enumerated from 100 fields by moving the slide to areas where blood cells formed a monolayer for Leucocytozoon and from more than 200 fields for *Haemoproteus* and *Plasmodium*. Slides were screened twice and there was a good repeatability of blood parasite detection. Individuals were classified as infected when smears were positive for at least one hemoparasite taxon. In the hematological analyses, only data for lymphocytes and heterophiles, as the most numerous immune cells, were used. The proportion of heterophiles and lymphocytes was assessed under 1, 000 x magnification on the basis of an examination of a total 100 leukocytes in oil immersion.

We expected high parasite prevalence and parasitemia in breeding Siberian tits which breeding and wintering success are relatively poor because of adverse climate and habitat deterioration by extensive forestry. Finally we asked whether parasitemia levels correlate with leukocyte health state indices, predicting positive relationship with markers of inflammation and stress such as heterophile count and heterophile/lymphocyte (H/L) ratio.

KEY WORDS: bird blood parasites, hematological parameters