

First finding of *Tyzzeria parvula* (Kotlán, 1933) Klimeš , 1963 (Protozoa: Coccidiida) in Barnacle Geese (*Branta leucopsis* Bechstein, 1803) on Spitsbergen

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This is the first finding of *Tyzzeria* sp. in Barnacle Geese, as well as the first documentation of *Tyzzeria* parasites on Spitsbergen. Since goslings were highly infected, it can be concluded that transmission of *Tyzzeria* parasites takes place on the arctic breeding grounds.

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The Barnacle goose has gone through an exponential population increase, together with a range expansion from arctic breeding sites towards temperate breeding sites in the Baltic and the Netherlands (Black et al., 2007). Our study population is one out of five relatively distinct populations. It breeds exclusively in arctic Spitsbergen (76° to 81°N) and winters in SW Scotland (55°N). Coccidia of *Tyzzeria parvula* have been described from domestic geese and several species of wild geese (e.g. Hanson et al., 1957), but not from Barnacle Geese. Coccidia oocysts come out of the bird together with faeces and the new host becomes infected if swallowing the oocysts. To become infective the oocysts have to complete the sporulation, and during this time coccidia oocysts from birds are very susceptible to direct sunlight and desiccation (e.g. Marquardt et al., 1960). The time of sporulation depends very much on temperature (Long, 1982), and low temperature slows down the sporulation. This could make the Arctic into a coccidia-poor habitat (Piersma, 1997). The aim of our study was to find out if Barnacle Geese are infected with *Tyzzeria* parasites, and if the transmission of *Tyzzeria* spp. can take place on arctic breeding grounds, or if the young birds from arctic breeding populations have the advantage to be coccidia-free until reaching the wintering grounds at temperate latitudes.

During the 2006 breeding season, individual faeces samples were collected on Spitsbergen from 81 adult and 7 young (30-40 days old) Barnacle Geese. The samples were kept in 2.5% calium dichromate and investigated for the presence of coccidia parasites using flotation centrifuging (Dolnik, 2006).

Oocysts of *Tyzzeria parvula* were found in 41% of adults and 57% of young birds; infection intensity in goslings reached 3800 oocysts per defecation.

This is the first finding of *Tyzzeria* sp. in Barnacle Geese, and the first evidence of *Tyzzeria* transmission in the Arctic. Since not only adults, but also goslings were highly infected, we can conclude that transmission of *Tyzzeria* takes place on Spitsbergen. Compared to other coccidia species, tyzzerian oocysts are much more fragile and very sensitive to physical as well as chemical agents (Klimeš , 1963). It could be expected that survival

of *Tyzzeria* oocysts was reduced under cold, humid conditions with 24-hour daylight, and even that the transmission could not take place. Therefore it is an interesting fact that these parasites are able not only survive in the Arctic, but also succeed to sporulate and infect the new generation of the host. Since *Tyzzeria parvula* can be experimentally transmitted (Farr, 1952) from Domestic Goose *Anser anser* dom. to Canadian Goose *Branta canadensis*, we can suggest that migrating Barnacle Geese can become a source of infection for other birds sharing parts of their flyway. Breeding in the Arctic does not help avoiding coccidia parasite pressure.

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