

PARASITE BIODIVERSITY, DEVELOPMENT, AND TRANSMISSION: AN INTEGRATIVE MODEL FOR MONITORING CLIMATE CHANGE AT NORTHERN LATITUDES

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Abstract: The survival, development, and transmission of helminth parasites is intimately linked to environmental conditions. It follows that a changing global climate, particularly global warming, will profoundly influence the abundance of parasitic organisms in wildlife, ultimately exerting an effect on the abundance and distribution of various host species. Such issues may be exacerbated in the Arctic where the biotic response to global warming is predicted to be profound. Despite the potential role that parasites play in host population dynamics, there is very limited published information on the parasite fauna of arctic mammals, particularly ruminants. Qualitative and quantitative baseline knowledge of the biodiversity, geographic distribution, and host associations for the parasite fauna characteristic in arctic mammals is important for predicting and monitoring the effect of climate change on the host-parasite systems in northern environments. Once understood, these systems, which can be indicators of the variation in abiotic processes that are determinants of biodiversity over prolonged periods, may be used in a more comprehensive model for monitoring the potential impact and response to climate change. Recent research on a remarkable lungworm (*Umingmakstrongylus pallikuukensis*) in muskoxen (*Ovibos moschatus*) has resulted in a model for assessing biotic response to warming. This multifaceted model is based on the concept that seasonal limits on transmission and the potential for amplification of parasite populations over time are intimately linked to temperature and development rates larval parasites. Parameters integrated in the model, in part validated by field studies, include threshold temperatures and degree-day requirements for parasite development in the external environment, the behaviour of the intermediate hosts, and soil surface temperatures. This model can be used both to monitor parasite development in the environment as well as to predict parasite development in other environments or geographic locations. In addition the model could be adapted and applied to other members of the Protostrongylidae in other hosts (e.g., Dall's sheep and mountain goats) in the Arctic and Subarctic to increase our knowledge of these host-parasite systems and the biotic and abiotic controls on their distribution.
