Linking large-scale movement strategies of arctic foxes and epidemiology of rabies: A spatially explicit individual-based approach Université m de Montréal Olivia Tardy ¹ (olivia.tardy@umontreal.ca), Agathe Allibert ¹, Audrey Simon ¹, Erin Rees ^{1,2}, Sandra Lai ³, Dominique Berteaux ³, and Patrick Leighton ¹

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Introduction and objective Figure 1: Rabies Large-scale responses to climate change (see review in Abundance an **Biomass and** enetic diversit **D**vnamics Physiology Phenology Morphology Population Community Organisms

- Arctic fox rabies is an ongoing threat to human populations and **domestic animals** in northern polar areas
- Arctic foxes (*Vulpes lagopus*) are the main reservoir hosts
- The objective is to assess the **interplay** between **large-scale movement strategies** of arctic foxes and **rabies epidemiology** under climate change

Method: A spatially explicit Arctic rabies model

The **individual-based model** is parameterized using **field data** and empirical studies



References:

[1] Scheffers et al. (2016). The broad footprint of climate change from genes to biomes to people. Science 354 [2] Lai et al. (2017). Movement tactics of a mobile predator in a meta-ecosystem with fluctuating resources: the arctic fox in the High Arctic. Oikos 126:937-947 [3] Bastille-Rousseau et al. (2016). Flexible characterization of animal movement pattern using net squared displacement and a latent state model. Movement Ecology 4:15

Characterizing large-scale host movement patterns

Materials: Study area and field data

- **Satellite-tracking data** were collected in the **Bylot** Island [2]
- **47 adults** (24F and 23M) were monitored with **Argos collars** from **2009** to **2015**
- **One location** was recorded **daily** during each year





Analytical method and Results

Using the Net Squared Displacement (NSD) approach to identify large-scale movement strategies [3]



Figure 3: Movement patterns of radio-collared arctic foxes. Examples of large-scale movement strategies are represented in color (see Table 1 below).

Movement strategies	Percentage of arctic foxes (N = 47)	
Sedentarism	70 %	Т
Nomadism	13 %	m
Dispersal	13 %	ar
Migration	4 %	

ble 1: Classification of large-scale ovement strategies for radio-collared ctic foxes using the NSD approach

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Bylot Island www.cen.ulaval.ca

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Next steps and Implications

Integrating large-scale host movement strategies in the Arctic rabies model

Figure 6: A flow-chart representation of the movement stochastic processes in the Artic rabies model





• This project will provide new insights into the mechanisms of rabies persistence in arctic foxes, and will help to develop more cost-effective prevention strategies for rabies in the Arctic