Microsatellite loci among Alaskan rabies hosts: Arctic and red fox

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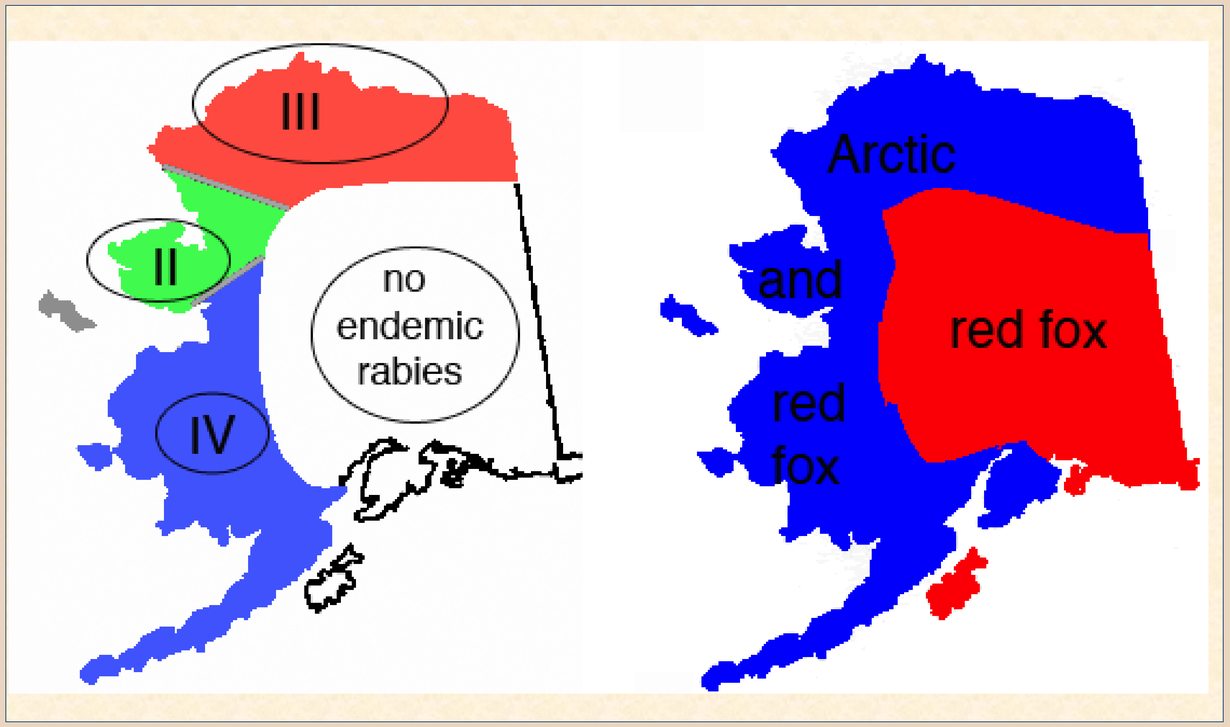
Abstract

Little is known about the population dynamics between Arctic and red foxes in Alaska and consequences for rabies ecology. Both species carry different variants of rabies and inhabit different environments. As the global warming trends progress, the Arctic and red fox will have increased habitat overlap due to northward range expansion of the red fox into the historic habitat of the Arctic fox.

Hypothesis: global warming trends will significantly influence the disease dynamics between red and Arctic foxes as well as their roles in disease dynamics in the far North. In order to better survey the movement of the variants of rabies among Arctic and red fox, microsatellites will be used to assess population structure of these host species.

Research Design and Methods

- **Rationale:** By using microsatellite loci that amplify in both Arctic and red foxes, we will be able to set up a workflow that can efficiently analyze molecular genetic markers in these important host species for studies on population structure, integrating them with information on both climate and disease.
- There have been twenty microsatellite loci described for red foxes (Wandeler and Funk 2006) and 10 for Arctic foxes (Dalen 2006).
- Many microsatellite loci were amplified in red and Arctic fox in hopes of obtaining 12-15 loci that will amplify in both species.
- Initially, conventional PCR was carried out to identify microsatellites that amplify in both fox species.
- Multiple primer pairs will be grouped for multiplexing.



Distribution of rabies (left) Distribution of red and Arctic fox (right)

Preliminary Data

Fox Microsatellites	50ºC	52.5ºC	55ºC	57.5ºC
CPH3		X	X	X
CPH9		X	X	X
CPH15			X	
CO1.424		X		
CO4.140	X			
FH2004			X	
CPH2			X	
FH2328			X	X
AHTh171	X			
Sex	X			
ATH121		X	X	
Ren 105		X	X	
Ren 247		X		X

PCR Gradients showing optimal temperatures in both Arctic and red fox.

Primer Groups	1	2	3
Group 1	Sex		
Group 2	AHTh171	CO4.140	REN105L03
Group 3	CPH2	FH2328	FH2004
Group 4	AHT121	CHP3	REN247M23
Group 5	CPH15	CO1.424	CPH9

Multiplex Design (**MultiPLX 2.1**) of 13 primers

Results & Discussion

Each of the 13 microsatellites amplified in both the arctic and Red fox. Many of the microsatellites showed narrow ranges of optimal temperature amplification. However, some showed a wide range of temperatures; both CPH3 and CPH9 were able to amplify at temperatures ranging from 52.5ºC to 57.5ºC. A wider range of temperatures allows for more flexibility when grouping the microsatellites for multiplexing

Next Step: This project will be moving towards marking these microsatellites with fluorescent tags and grouping them in a PCR reaction (Multiplexing). Once these markers have been established, multiple tissue samples from both arctic and Red fox can be analyzed. The results can then be used to assess population structure as well as be compared to the previously proposed population structure of foxes with the described distribution of rabies in Alaska (Kuzmin, Hughes et al. 2008).

References

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