Topic Summary

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Red and arctic foxes are territorial species with similar food preferences, namely small prey mammals (Elmhagen, Tannerfeldt, & Angerbjörn 2002). The red fox is larger in weight and dimension than the arctic fox, with higher metabolic demands (Hersteinsson & MacDonald 1992). In the past, lack of prey availability in a colder climate has been a constraining factor for northward range expansion of the red fox into arctic fox territory (Hersteinsson & MacDonald 1992). Global warming has increased average temperature, causing an increase in productivity and food availability, therefore red foxes can survive at higher latitudes (Hersteinsson & MacDonald 1992). New aggressive interactions are being observed between red and arctic foxes as recent range overlap has led to competition for resources between these previously separate species (Frafjord, Becker, & Angerbjörn, 1989). Direct competition for dens is causing range retraction of the arctic fox as they abandon their traditional denning sites to the dominating red fox (Rodnikova, et al. 2011). Aggressive interactions show that arctic foxes will flee from red foxes, abandon dens, and can even be killed by red foxes (Frafjord, Becker, & Angerbjörn 1989; Pamperin, Follmann, & Petersen 2006).

While it may be tempting to view arctic foxes as smaller red foxes with a different coat colour, they are different in physiology and behavior. Arctic foxes are adapted to extreme cold, having coats that are 50% more insulating than a red fox coat (Hersteinsson & MacDonald 1992). As well, arctic foxes do not need to produce metabolic heat until -40 to -50 Celsius, compared to an Alaskan red fox at -13 Celsius (Hersteinsson & MacDonald 1992). Both species are territorial however, arctic foxes will use the same dens for generations, while red foxes have less established sites (Frafjord, 2003).

Recent climate change, and the resulting increase in food availability, has caused an increasing overlap to occur between the northern distribution of the red fox and the southern distribution of the arctic fox (Hersteinsson & MacDonald 1992). Interactions are increasing in occurrence between these species as they now compete in resource limited circumstances (Pamperin, Follmann, & Petersen 2006).

Researchers have been interested in the interactions occurring between red and arctic foxes as new range overlap may have long-term consequences for arctic fox populations (Rudzinski, et al. 1982). Many hours of observation have been spent in order to view direct interactions occurring between red and arctic foxes (Frafjord, Becker, & Angerbjörn1989). Multiple instances of red fox aggression, predation, and arctic foxes fleeing and abandoning dens upon red fox approach have been noted in the wild (Frafjord, Becker, & Angerbjörn1989). Penned behaviour between red and arctic foxes also demonstrates that red foxes dominate arctic foxes when competing for resources like dens and resting areas (Rudzinski, et al. 1982).

Researchers wanted to understand the shift in arctic fox range and non-recovery of population numbers in certain areas (Frajford 2003). Analysis of den use and molecular species identification by faeces are ways to identify the constraining factors of size and location of arctic fox populations (Frafjord 2003; Dalén, Elmhagen, & Angerbjörn 2004). Arctic foxes avoid red foxes by moving further northward during summer months, however this forces them to spend their breeding season in areas with less prey (Tannerfeldt, Elmhagen, & Angerbjörn 2002). The consequence of arctic foxes not removing far enough from red fox dens during breeding season is drastic, as arctic fox juveniles have been killed by red foxes when their dens are situated too closely (Tannerfeldt, Elmhagen, & Angerbjörn 2002). When penned together red foxes breedings and whelpings succeed better than arctic foxes breedings and whelpings, demonstrating the dominance of the red fox species when in a constrained region (Korhonen, et al. 1997). These are thought to be factors contributing to lower arctic fox population numbers.

Further research should be done about the type of interactions occurring between the red and arctic fox during resource limited times (Pamperin, Follmann, & Petersen 2006). Aggressive behavior, such as an Alaskan winter when a red fox was documented killing an arctic fox, may have severe long-term consequences for the arctic fox (Pamperin, Follmann, & Petersen 2006).

**References:**

Dalén, L., Elmhagen, B., & Angerbjörn, A. (2004). DNA analysis on fox faeces and competition induced niche shifts: Competition and niche shifts in the arctic fox. *Molecular Ecology*, *13*(8), 2389–2392. <https://doi.org/10.1111/j.1365-294X.2004.02249.x>

Elmhagen, B., Tannerfeldt, M., & Angerbjörn, A. (2002). Food-niche overlap between arctic and red foxes. *Canadian Journal of Zoology*, *80*(7), 1274–1285. <https://doi.org/10.1139/z02-108>

Frafjord, K. (2003). Ecology and use of arctic fox *Alopex lagopus* dens in Norway: Tradition overtaken by interspecific competition? *Biological Conservation*, *111*(3), 445–453. <https://doi.org/1.1016/S0006-3207(02)00314-2>

Frafjord, K., Becker, D., & Angerbjörn, A. (1989). Interactions between arctic and red foxes in Scandinavia — predation and aggression. *Arctic*, *42*(4), 354–356. <http://www.jstor.org/stable/40510856>

Hersteinsson, P., & MacDonald, D. W. (1992). Interspecific competition and the geographical distribution of red and arctic foxes *Vulpes vulpes* and *Alopex lagopus*. *Oikos*, *64*(3), 505. <https://doi.org/10.2307/3545168>

Korhonen, H., Alasuutari, S., Mäkinen, A. [Niemelä](https://link.springer.com/article/10.1007/PL00013374#auth-Paavo-Niemel_), P. ( 1997) Inter- and intraspecific competition between the fox species *Alopex lagopus* and *Vulpes vulpes*: An evaluation trial under penned conditions. *Polar Biol* 17, 330–336 https://doi.org/10.1007/PL00013374

Pamperin, N. J., Follmann, E. H., & Petersen, B. (2006). Interspecific killing of an arctic fox by a red fox at Prudhoe Bay, Alaska. *Arctic*, *59*(4), 361–364.

Rodnikova, A., Ims, R. A., Sokolov, A., Skogstad, G., Sokolov, V., Shtro, V., & Fuglei, E. (2011). Red fox takeover of arctic fox breeding den: An observation from Yamal Peninsula, Russia. *Polar Biology*, *34*(10), 1609–1614. <https://doi.org/10.1007/s00300-011-0987-0>

Rudzinski, D. R., Graves, H. B., Sargeant, A. B., & Storm, G. L. (1982). Behavioral interactions of penned red and arctic foxes. *The Journal of Wildlife Management*, *46*(4), 877. <https://doi.org/10.2307/3808220>

Tannerfeldt, M., Elmhagen, B., & Angerbjörn, A. (2002). Exclusion by interference competition? The relationship between red and arctic foxes. *Oecologia*, *132*(2), 213–220. <https://doi.org/10.1007/s00442-002-0967-8>