The Canadian Field-Naturalist

Note

Red Fox (*Vulpes vulpes*) scavenging on the spring sea ice: potential implications for Arctic food webs

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Jung, T.S., M.J. Suitor, S. Baryluk, J. Nuyaviak, D.C. Gordon, D. Gordon, Jr., and E. Pokiak. 2020. Red Fox (*Vulpes vulpes*) scavenging on the spring sea ice: potential implications for Arctic food webs. Canadian Field-Naturalist 134(2): 144–146. https://doi.org/10.22621/cfn.v134i2.2375

Abstract

Red Fox (*Vulpes vulpes*) has been increasingly observed in the Arctic. However, few observations of Red Foxes occupying and using resources on the sea ice have been reported. We observed a Red Fox scavenging on a Polar Bear (*Ursus maritimus*) carcass on the Beaufort Sea, Northwest Territories, Canada. The fox was in a jumble of ice (i.e., rubble ice) approximately 4.5 km from shore. Local Inuvialuit hunters had also previously observed Red Foxes on the sea ice. Our observation, coupled with those of Inuvialuit hunters, is of interest because it provides additional information on the adaptability of Red Foxes to local environments and their ability to use a wide range of habitats and food sources. Moreover, it points to encroachment by Red Foxes into the offshore habitat of Arctic Foxes (*Vulpes lagopus*) and potential competition with them for scarce resources, which may impact trophic food webs.

Key words: Beaufort Sea; Red Fox; range expansion; scavenging; sea ice; *Vulpes vulpes*

Red Fox (*Vulpes vulpes*) is among the most cosmopolitan terrestrial mammals, occupying a wide variety of biomes and habitats globally (Larivière and Pasitschniak-Arts 1996). In the past half century, Red Foxes have expanded their range onto Arctic tundra (Smits *et al*. 1989; Killengreen *et al*. 2011), including several islands in the Arctic Ocean (Gallant *et al*. 2012). As a generalist that can use a wide variety of items as food, such as eggs, small mammals, and carrion (Larivière and Pasitschniak-Arts 1996; Dalén *et al*. 2004), the occurrence of Red Foxes in the Arctic may have consequences for trophic food webs and faunal community dynamics. Concern regarding range expansion of Red Fox into the Arctic has largely focussed on potential interference or exploitative competition with resident Arctic Fox (*Vulpes lagopus*; e.g., Frafjord *et al*. 1989; Hersteinsson and MacDonald 1992; Dalén *et al*. 2004; Pamperin *et al*. 2006; Killengreen *et al*. 2007; Henden *et al*. 2010; Gallant *et al*. 2012).

Almost all observations of Red Foxes in the Arctic have been in terrestrial (tundra) habitats; few have reported Red Foxes occupying and using resources on the sea ice. Sea ice is the domain of the congeneric Arctic Fox (Smith 1976; Pamperin *et al*. 2008), although Inuvialuit hunters (as reported to the coauthors) and others (e.g., Richardson and Andriashek 2006; Watts *et al*. 2010) have also occasionally observed Gray Wolves (*Canis lupus*) hunting on the frozen Arctic Ocean. On the Labrador Sea, Red Foxes have been reported as somewhat common on the sea ice, along with Arctic Foxes and Gray Wolves (Andriashek *et al*. 1985). However, in the Beaufort Sea, only a single Red Fox was observed offshore during

>10 000 km of survey effort (Andriashek and Spencer 1989). We are not aware of any other published reports of Red Foxes on sea ice. Here, we report an observation of a Red Fox scavenging offshore on the frozen Beaufort Sea, and we place it in the context of local and Traditional Ecological Knowledge in the vicinity of Tuktoyaktuk and Aklavik, Northwest Territories (NT).

On 30 March 2019, while searching for Polar Bear (*Ursus maritimus*) from a helicopter as part of a mark–recapture population census, we observed the carcass of a hunter-killed Polar Bear on the spring sea ice ~70 km northeast of Tuktoyaktuk, NT. The carcass was skinned but otherwise intact. Fox tracks surrounded it, and we observed a Red Fox running from the carcass while we circled at low elevation (~30 m above ground level). We have ample experience observing both Arctic Foxes and Red Foxes, and identified the individual as the latter based on pelage colour (cross fox colour morph), comparatively large body size, long legs, ears, and muzzle. Regrettably, we took no photographs. The Red Fox was observed 4.5 km from land, in an area of landfast jumbled ice.

During >6600 km of aerial surveys in the Canadian portion of the Beaufort Sea in spring 2019, from the Alaska–Yukon border to Cape Bathurst, NT, we did not observe any additional Red Foxes on the sea ice. However, fox tracks and Arctic Foxes were commonly seen offshore, and Red Foxes were commonly observed on islands and the coastal mainland during our aerial survey.

Some Inuvialuit hunters have regularly observed Red Foxes on the spring sea ice in the southern Beaufort Sea (D.C.G. and Lennie Emaghok unpubl. data). As such, it is important to note that our observation of Red Foxes on the sea ice is not unique, but well known among local Inuvialuit hunters, as told by the four Inuvialuit coauthors. However, the occurrence of Red Foxes on the frozen ocean—and their foraging there—has not been commonly reported in the scientific literature.

Although Red Foxes have previously been observed on the sea ice during similar aerial surveys, there is only a single published observation outside of the Labrador Sea (Andriashek and Spencer 1989). Red Foxes likely disperse across relatively short stretches of sea ice to colonize offshore islands (Andriashek *et al*. 1985), and many such instances likely occur but are unreported. On the Labrador Sea, for example, the numerous small offshore islands are important areas for nesting birds, which may represent a seasonal food source for Red Foxes. Similar habitats and resources are present across Arctic North America, including within our study area. However, only one published observation is of a Red Fox foraging on the sea ice: in the Beaufort Sea, a Red Fox was observed apparently killing and feeding on a Ringed Seal (*Phoca hispidus*) pup (Andriashek and Spencer 1989), a main prey item of Arctic Foxes in spring (Smith 1976). Curiously, this observation was made close to our observation site (near Tuktoyaktuk), albeit 32 years earlier. This is consistent with local Inuvialuit knowledge that Red Foxes are occasionally seen on the sea ice near the coast. Taken together, this information suggests that Red Foxes may have learned to hunt on the spring sea ice in this region. This relationship may be more common, but unreported, across the Arctic.

Our observation is of interest because it points to the adaptability of Red Foxes to use an increasingly wide range of novel habitats and food sources. More important, it points to encroachment by Red Foxes on the habitat of Arctic Foxes with the potential for aggressively displacing or killing them (Frafjord *et al*. 1989; Bailey 1992; Pamperin *et al*. 2006) or competing for scarce resources (Hersteinsson and MacDonald 1992; Dalén *et al*. 2004; Henden *et al*. 2010; Killengreen *et al*. 2011; Gallant *et al*. 2012), not only on land but also on the spring sea ice. In nearby Alaska, Pamperin *et al.* (2006) reported a Red Fox killing an Arctic Fox on land, where they are sympatric. Moreover, Red Foxes have been used by wildlife managers to control Arctic Fox abundance in Alaska's Aleutian Islands (Bailey 1992), attesting to their ability to potentially displace Arctic Foxes. We suggest further investigation of the extent of Red Fox occurrence and foraging on the sea ice, through scientific surveys and reference to the local knowledge of Inuvialuit, Inupiat, Inuit, and Cree hunters.

Acknowledgements

We thank the Inupiat-Inuvialuit Polar Bear Joint Commission for encouraging the surveys that led to this observation. We thank Chris Lennie (Canadian Helicopters, Inuvik, Northwest Territories, Canada) for safe piloting and effectively participating in data collection. We thank the various Inuvialuit hunters who kindly talked to us about their personal observations of wildlife on the spring sea ice, particularly Lennie Emaghok (Tuktoyaktuk Hunters and Trappers Committee, Tuktoyaktuk, Northwest Territories, Canada). Funding was provided by the Government of Northwest Territories and the Government of Yukon. Marsha Branigan, Ryan Brook, Graham Forbes, Dwayne Lepitzki, and two anonymous reviewers kindly provided comments that greatly improved this note.

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Received 11 October 2019
Accepted 28 May 2020
Associate Editor: G.J. Forbes