



Risky business: red foxes killed when scavenging from snow leopard kills

Gustaf Samelius^{1,2,*} Lingyun Xiao^{3,4} Juan Li⁴ Purevjav Lkhagvajav⁵
Örjan Johansson^{1,6}

1 Snow Leopard Trust, 4649 Sunnyside Avenue North, Seattle, Washington 98103, USA

2 Nordens Ark, Åby Säteri, 456 93, Hunnebostrand, Sweden

3 Department of Health and Environmental Sciences, Xi'an Jiaotong-Liverpool University; Suzhou, China 215123

4 School of Life Sciences, Peking University, Beijing, China 100871.

5 Snow Leopard Conservation Foundation,

6 Swedish University of Agricultural Sciences, 730 91, Riddarhyttan, Sweden

* Corresponding author: Gustaf Samelius, e-mail:gustaf@snowleopard.org

Key words

Interspecific killing,
intraguild predation,
Panthera uncia,
Vulpes vulpes

Abstract

Scavenging of foods is a common but potentially dangerous behavior that exposes animals to risk of injury and even death from other animals. Here we report on two observations of red foxes that were killed when scavenging from snow leopard kills that illustrates the risks associated with scavenging for red foxes and other small and medium-sized predators.

Article History: Corresponding editor: Sandro Lovari
Submitted 17 Aug 2021, Revised 1 Nov 2021, Accepted 2 Nov 2021

Copyright: © 2022 Gustaf Samelius et al. 2022.

This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material for any purpose, even commercially, provided the original work is properly cited and states its license.

Main text

Scavenging is a common behavior among many mammals and birds (De Vault et al. 2003, Iyengar 2008). While the behavior provides easy access to foods, sometimes in large amounts, it is also a dangerous behavior as animals may get injured or even killed by other animals when scavenging (Iyengar 2008, Prugh and Sivy 2020). Red foxes (*Vulpes vulpes*) are opportunistic predators and scavengers that occur throughout a large portion of the northern hemisphere (Larivière and Pasitschniak-Arts 1996). Red foxes have diverse diets with scavenging often being an important source of foods (Larivière and Pasitschniak-Arts 1996). Here we report on two observations of red foxes that were killed when scavenging from snow leopard (*Panthera uncia*) kills in two different parts of the snow leopard range.

The first observation of a red fox killed when scavenging from a snow leopard kill was made in the Sanjiangyuan Region on the Eastern Tibetan Plateau in China (34° N, 94° E) on 24 April 2011. The observation was made when setting up a camera trap at a snow leopard kill inside a narrow valley (see Li et al. 2013 for detail). We spotted a snow leopard climbing a slope as we entered the valley. We judged the snow leopard to be the same female that visited the kill with two cubs the following night based on photos from the camera trap that we set up at the site. We found a bharal (*Pseudois nayaur*) carcass at the bottom of the small valley and a dead red fox lying 5 meters away from the carcass. The fox had a bit of blood dripping from the mouth but no other clear wounds (Fig. 1). We suspect that the blood in the mouth might have been caused by a nape bite or suffocation associated with a throat bite by the snow leopard. We put an infrared camera beside the kill and recorded the snow leopard returning



Fig. 1. Red fox found dead at the kill site of a snow leopard in Sanjiangyuan Region on the Eastern Tibetan Plateau in April 2011. The fox had a bit of blood dripping out of the mouth but no other clear wounds.

to the carcass at 16:24 which was approximately one hour after we left the site. The snow leopard fed on the carcass for 15 minutes during which it called occasionally. It left the carcass at 16:38 and returned to the carcass with two cubs at 18:58. The cubs stayed at the kill until 19:40 and fed on the carcass during most of the time. The female snow leopard stayed at the kill until 20:18 and then returned again from 20:47 to 21:47. A Tibetan brown bear (*Ursus arctos pruinosus*) replaced the snow leopards at the kill and was at the carcass from 21:50 to 00:15 and then returned for a short visit at 06:52. Neither the snow leopards or the brown bear touched or showed any interest in the dead fox. We saw snow leopard and fox tracks at the kill site on the first visit to the kill site but no signs from any other carnivores.

The second observation of a red fox killed when scavenging from a snow leopard kill was made in the Tost Mountains in Southern Mongolia (43° N, 100° E) on 7 April 2018. The observation was made at a cluster (an aggregation of positions) from a GPS-collared snow leopard as part of our work on snow leopard predation patterns

(see Johansson et al. 2015 for details). Clusters are visited after the snow leopards have left the kills to avoid disturbing the animals. The cluster where we found the dead fox was from an adult male snow leopard that had killed a domestic goat (*Capra aegagrus*). The snow leopard was at the cluster from 15:00 on 27 March to 19:00 on 28 March and then returned to the kill from 04:00 to 19:00 on 31 March and, again, from 00:00 to 01:00 on 1 April. When we visited the cluster on 7 April, we found a dead red fox ca 30 meters from the goat carcass. The fox had a small drop of blood on the right flank but did not show any other signs of outside trauma (Fig. 2). The backbone of the fox was crushed (soft) whereas the skull was hard and did not



Fig. 2. Red fox found dead at the kill site of a male snow leopard in the Tost Mountains in southern Mongolia in April 2018. The fox had a small drop of blood on the right flank and the backbone was crushed but did not show any other signs of outside trauma.

show any evidence of biting. We saw snow leopard and fox tracks and what we judged to be snow leopard and fox scats at the kill site but no signs of any other carnivores.

The observations reported here are, to our knowledge, the first reports of red foxes killed

when scavenging from snow leopard kills and they illustrate the risks associated with scavenging for red foxes and other small and medium-sized predators (De Vault et al. 2003, Iyengar 2008). We could not determine that these foxes were killed by snow leopards as it is possible that they were killed by other large carnivores. However, the only other large carnivores present in these areas were brown bears, wolves (*Canis lupus*), and dogs (*Canis familiaris*) that generally kill by slashing bites or bites and shakes that results in large wounds (Ewer 1973). Felids, on the other hand, generally kill by a strong bite to the throat or back of the prey (Ewer 1973, Leyhausen 1979). The evidence therefore strongly suggest that the foxes were killed by snow leopards because there were no signs of outer trauma on the foxes and we did not see signs of any other large carnivores when finding the dead foxes (the bear that visited the carcass on the Tibetan Plateau visited the site after we found the fox). Red foxes often scavenge foods and we commonly see them and other scavengers and their signs at the snow leopard kills in the studies on the Tibetan Plateau and in southern Mongolia (Li et al. 2013, Johansson et al. 2015). Scavenging animals are often very cautious and vigilant when scavenging (Wikenros et al. 2014) and we sometimes see red foxes leaving the snow leopard kills when visiting them after the snow leopards have left the kills (Snow Leopard Trust, Unpublished data). We therefore suggest that red foxes are generally very cautious when at the kill sites and that the majority of these visits occur when the foxes perceive that the snow leopards have left the kills given the potential risks associated with this behavior.

Interspecific killing among carnivores is relatively common (Palomares and Caro 1999, Donadio and Buskirk 2006) and red foxes have

been reported to be killed by wolves and lynx (*Lynx spp.*) (Stephenson et al. 1991, Peterson 1995, Jobin et al. 2000, Helldin et al. 2006). Carnivores may kill other carnivore species to reduce competition, avoid losing foods to scavengers, reduce the risk of infant mortality, for consumption, or a combination thereof where prey availability may affect whether or not the dead animal is consumed (Palomares and Caro 1999). The two foxes reported here were untouched which suggest that they were killed to avoid losing foods to scavengers rather than killed for consumption. Snow leopards have been reported to feed on red foxes occasionally although it was unknown if the foxes in these studies were killed by the snow leopards or scavenged (Lovari et al. 2013, Lyngdoh et al. 2014).

Acknowledgements

We thank Byron Weckworth and an anonymous reviewer for valuable comments that helped improve this manuscript.

References

- DeVault T.L., Rhodes Jr O.R. and Shivik J.A. 2003. Scavenging by vertebrates: behavioural, ecological, and evolutionary perspectives on an important energy transfer pathway in terrestrial ecosystems. *Oikos* 102: 225–234. <https://doi.org/10.1034/j.1600-0706.2003.12378.x>
- Donadio E. and Buskirk S. W. 2006. Diet, morphology, and interspecific killing in Carnivora. *The American Naturalist* 167: 524-536. <https://doi.org/10.1086/501033>
- Ewer R. F. 1973. *The carnivores*. Ithaca: Cornell University Press.
- Helldin J.O., Liberg O. and Glöersen G. 2006. Lynx (*Lynx lynx*) killing red foxes (*Vulpes vulpes*) in boreal Sweden - frequency and population effects. *Journal of Zoology* 270: 657-663. <https://doi.org/10.1111/j.1469-7998.2006.00172.x>
- Iyengar E.V. 2008. Kleptoparasitic interactions throughout the animal kingdom and a re-evaluation, based on participant mobility, of the conditions promoting the evolution of kleptoparasitism. *Biological Journal of the Linnean Society* 93: 745-762. <https://doi.org/10.1111/j.1095-8312.2008.00954.x>
- Jobin A., Molinari P. and Breitenmoser, U. 2000. Prey spectrum, prey preference and consumption rates of Eurasian lynx in the Swiss Jura Mountains. *Acta Theriologica* 45: 243-252.
- Johansson Ö., McCarthy T., Samelius G., Andrén H., Tumursukh L. and Mishra C. 2015. Snow leopard predation in a livestock dominated landscape in Mongolia. *Biological Conservation* 184: 251-258. <https://doi.org/10.1016/j.biocon.2015.02.003>
- Larivière S. and Pasitschniak-Arts M. 1996. *Vulpes vulpes*. *Mammalian Species* 537: 1-11. <https://doi.org/10.2307/3504236>
- Leyhausen P. 1979. *Cat behavior*. New York: Garland STPM press.
- Li J., Schaller G.B., McCarthy T.M., Wang D., Jiagong Z., Cai P., Basang L. and Lu Z. 2013. A communal sign post of snow leopards (*Panthera uncia*) and other species on the Tibetan Plateau, China. *International Journal of Biodiversity*: 370905 <https://doi.org/10.1155/2013/370905>.
- Lovari S., Ventimiglia M. and Minder I. 2013. Food habits of two leopard species, competition, climate change and upper treeline: a way to the decrease of an endangered species? *Ethology Ecology & Evolution* 25: 305-318. <https://doi.org/10.1080/03949370.2013.806362>
- Lyngdoh S., Shrotriya S., Goyal S. P., Clements H., Hayward M. W. and Habib B. 2014. Prey preferences of the snow leopard (*Panthera uncia*): regional diet specificity holds global significance for conservation. *Plos One* 9: e88349. <https://doi.org/10.1371/journal.pone.0088349>
- Palomares F. and Caro T.M. 1999. Interspecific killing among mammalian carnivores. *American Naturalist* 153: 492-508 <https://doi.org/10.1086/303189>
- Peterson, R.O. 1995. Wolves as interspecific competitors in canid ecology. In *Ecology and conservation of wolves in a changing world*: 315-323. Carbyn L.N., Fritts S.H. and Seip D.R. (Eds). Edmonton: Canadian Circumpolar Institute Press.
- Prugh L. R. and Sivy K. J. 2020. Enemies with benefits: integrating positive and negative interactions among terrestrial carnivores. *Ecology Letters* 23: 902-918. <https://publons.com/publon/10.1111/ele.13489>
- Stephenson, R.O., Grangaard, D.V. & Burch, J. 1991. Lynx *Felix* lynx predation on red foxes *Vulpes vulpes*, caribou *Rangifer tarandus*, and dall sheep *Ovis dalli* in Alaska. *Canadian Field Naturalist* 105: 255-262.
- Wikenros C., Ståhlberg S. and Sand H. 2014. Feeding under high risk of intraguild predation: vigilance patterns of two medium-sized generalist predators. *Journal of Mammalogy* 95: 862-870. <https://doi.org/10.1644/13-MAMM-A-125>