



Snow leopards and water: high waterhole visitation rate by a breeding female in summer

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Abstract

Water is a limiting resource in arid environments where space use of animals is often driven by access to water during the dry times of the year. Here we report on a breeding female snow leopard visiting a waterhole 37 times in June and July in 2015. These observations show that space use of snow leopards can be driven strongly by access to water during certain times of the year such as when lactating and the need for water is increased. Strong dependence on water during certain times of the year suggest that climate change and high human pressure on limited water sources may have negative impact on snow leopards and other wildlife in the mountains of High Asia.

Introduction

Water is essential for all life and is a limiting resource in arid environments where space use of animals is often driven by access to water during the dry times of the year (Valeix et al. 2010, Davidson et al. 2013, Davies et al. 2017). For example, lions often congregate around waterholes during the dry period which appears to be related both to the congregation of their prey at these waterholes but also by the increased need for water by the lions themselves (Valeix et al. 2010, Davidson et al. 2013). The need for water may also be greater during certain life stages such as when mammals are lactating (Oswald et al. 1996, Adams and Hayes 2008). Here we report of a breeding female snow leopard (*Panthera uncia*) that visited a waterhole in Sevrei Mountains in southern Mongolia 37 times in June and July in 2015.

Methods

The observations reported here were made as part of camera-monitoring of snow leopards in southern Mongolia following Sharma et al. (2014). Specifically, the observations reported here were made at a waterhole in Sevrei Mountains (43.6° N, 102.0° E) in June and July 2015. The Sevrei Mountains are part of the Gobi Desert with annual precipitation less than 130 mm and the temperature ranging between -35 in winter and 40° C in summer. The vegetation is sparse and consists mainly of short grasses, dwarf shrubs, and patches of shrubs. We deployed the camera at the waterhole on 2 June and collected it on 1 August 2015. The size of the waterhole varied between about 30 by 30 cm and 50 by 50 cm and did not appear to contain more than a

few liters during this study. The cat reported here often turned around when at the waterhole which allowed us to identify both sides of the body. We considered visits to the waterhole that were less than 1 hour apart as the same visit. We also had a camera deployed at the waterhole in the summer of 2016 when the cat reported here was followed by a one-year old cub. This allowed us to confirm that it was a female and that she gave birth in 2015 given that snow leopards are seasonal breeders that give birth in May and June (Johansson et al. 2020).

Results

The female snow leopard visited the waterhole 37 times in June and July in 2015 which corresponds to one visit every 1.6 days on average (range between visits = 1 hour and 32 minutes to 144 hours and 19 minutes, Figure 1). On nine days she visited the waterhole twice and one day she visited the waterhole three times (Figure 2). The longest time between visits was six days (13-19 June and 19-25 June) and second longest time between visit was five days (14-19 July). The average length of the visits to the waterhole was 11 minutes and 11 seconds (range = 5 seconds to 32 minutes and 41 seconds). Twenty of the visits were during the night, two during dusk, and fifteen during the day (Figure 2). We saw her drink at the waterhole on 27 of the 37 visits. The female visited the waterhole with a one-year old cub on 31 May in 2016 (Figure 3). Other visitors to the waterhole in June and July 2015 were one male snow leopard visiting the waterhole six times, one visit by a herd of goats (*Capra hircus*) and sheep (*Ovis aries*), eight visits by ibex (*Capra sibirica*) where all



Figure 1. The female drinking at the waterhole on 8 July in 2015. The red arrows are highlighting three distinct rosettes with two small dots below them that are highlighted also in Figure 3.

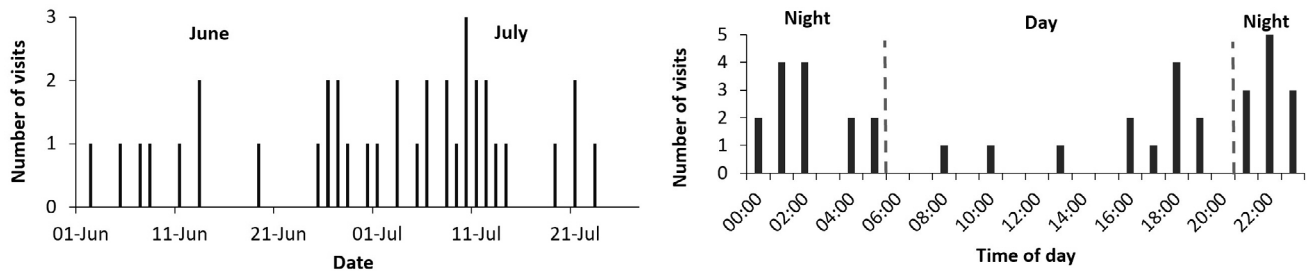


Figure 2. Time of day (right) and dates (left) when the female snow leopard visited the waterhole in the Sevrei Mountains in June and July 2015. The sun raises at 05:40 and sets at 21:00 on 1 July in the Sevrei Mountains.



Figure 3. The female (walking to the left) with a one-year old cub (laying down) at the waterhole on 31 May in 2016. The red arrows are highlighting three distinct rosettes with two small dots below them that are highlighted also in Figure 1.

visits were by one individual per visit, and several visits by red foxes (*Vulpes vulpes*), stone martens (*Martes foina*), and chukar partridges (*Alectoris chukar*).

Discussion

The breeding female visiting the waterhole 37 times in June and July shows that space use of snow leopards can be driven strongly by access to water during certain times of the year. The female giving birth in 2015 also suggests that the high visitation rate to the waterhole was related to increased need for water when producing milk and lactating the young and that her den was located near the waterhole (Oswald et al. 1996, Adams and Hayes 2008). We commonly see snow leopards visiting waterholes also at other locations but have not seen the same individual visiting a waterhole more than 10 times during two to three months of camera-trapping in the neighboring Tost Mountains in 2009 to 2023 (Snow Leopard Trust and Snow Leopard Conservation Foundation, unpublished material). We suggest that the den of the female reported here was likely located close to the waterhole and that visiting the waterhole as frequently as reported here therefore had limited impact on the time available for hunting and other behaviors.

Central Asia is warming at more than twice the average rate than the rest of the northern hemisphere and climate induced changes in the water dynamics may have negative effects on the ecology of snow leopards and other wildlife in High Asia (Liu and Chen 2000, Chen et al. 2009). For example, climate warming and changes in the water dynamics can have negative impact on the number of lactating bats and our results suggest that the impact of

climate change and reduction in access to water could have similar effects on reproductive output of snow leopards and other animals in the mountains of Central Asia (Adams and Hayes 2008). Growing human pressures on limited water sources may also affect access to water for snow leopards and other wildlife in that large-scale mining activities and increasing livestock numbers may affect the water sources negatively (Andrew et al. 1997, Kaczensky et al. 2010, Boldy et al. 2021). A better understanding of the importance of water for the ecology of snow leopards and other wildlife is therefore important for wildlife conservation in High Asia.

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References

- Adams R.A. and Hayes M.A. 2008. Water availability and successful lactation by bats as related to climate change in arid regions of western North America. *Journal of Animal Ecology* 77: 1115-1121.
- Andrew N.G., Lesicka L.M. and Bleich V.C. 1997. An improved fence design to protect water sources for native ungulates. *Wildlife Society Bulletin* 25: 823-825.
- Boldy R., Santini T., Annandale M., Erskine P.D. and Sonter L.J. 2021: Understanding the impacts of mining on ecosystem services through a systematic review. *The Extractive Industries and Society* 8: 457-466.

- Chen F., Wang J., Jin L., Zhang Q., Li J. and Chen J. 2009. Rapid warming in mid-latitude central Asia for the past 100 years. *Frontiers of Earth Science* 3: 42-50.
- Davidson Z., Valeix M., Van Kesteren F., Loveridge A.J., Hunt J.E., Murindagomo F. and Macdonald D.W. 2013. Seasonal diet and prey preference of the African lion in a waterhole-driven semi-arid savanna. *PLoS ONE* 8: e55182.
- Davies J.A., Kerecsy A. and Nicol S. 2017. Springs: conserving perennial water is critical in arid landscapes. *Biological Conservation* 211: 30-35.
- Johansson Ö., Ausilio G., Low M., Lkhagvajav P. Weckworth B. and Sharma K. 2020. The timing of breeding and independence for snow leopard females and their cubs. *Mammalian Biology* 101: 173-180.
- Kaczensky P., Dresley V., Vetter D., Otgonbayar H. and Walzer C. 2010. Water use of Asiatic wild asses in the Mongolian Gobi. *Erforschung Biologischer Ressourcen der Mongolei* 11: 291-298.
- Liu X. and Chen B. 2000. Climatic warming in the Tibetan Plateau during recent decades. *International Journal of Climatology* 20: 1729-1742.
- Oswald C., Fonken P., Atkinson D. and Palladino M. 1996. Lactational water balance and recycling in white-footed mice, red-backed voles, and gerbils. *Journal of Mammalogy* 74: 963-970.
- Sharma K., Bayraksiz R., Tumursukh L., Johansson O., Sevger P., McCarthy T., and Mishra C. 2014. Vigorous dynamics underlie a stable population of the endangered snow leopard *Panthera uncia* in Tost Mountains, South Gobi, Mongolia. *PLoS ONE* 9: e101319.
- Valeix M., Loveridge A.J., Davidson Z., Madzikanda H., Fritz H. and Macdonald D.W. 2010. How key habitat features influence large terrestrial carnivore movements: waterholes and African lions in a semi-arid savanna of north-western Zimbabwe. *Landscape Ecology* 25:337-351