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Natural History

Is There A Mechanism That Causes Wolves from Same Area to Disperse Long-distances in Same Direction?

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Abstract

In 2018, we documented 2 grey wolves (*Canis lupus*) from the Greater Voyageurs Ecosystem, Minnesota that dispersed >300 km north individually but exhibited strikingly similar dispersal patterns. These individuals eventually interacted with one another several months after dispersing. Though the probability of this occurring randomly appears incredibly low, we do not know whether the observed dispersal movements were the result of chance encounter or of an undescribed biological phenomenon that causes wolves from the same area to disperse long distances in the same direction. Interestingly, there are multiple observations of wolves from the same area dispersing long-distances in the same direction suggesting that there could be a biological explanation for the observed dispersal behaviour.

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INTRODUCTION

Dispersal is a fundamental component of the ecology of most animal populations. Dispersing individuals typically leave their natal habitat in search of a mate or available resources such as food and space (Gotelli 2008). Grey wolves (*Canis lupus*) typically disperse as juveniles (<3 yrs old) and can travel long distances (>1000 km; Wabakken *et al.* 2007) in search of vacant territory and a mate (Fuller *et al.* 2003). Prior work, based predominantly on radio-telemetry studies, has demonstrated that wolf dispersal strategies and behaviour are complex (Mech, submitted). In particular, there are a few extraordinary accounts where dispersing individuals from the same natal pack or population disperse >100-300 km and settle in the same pack or in close proximity to one another (Mech 1987; Boyd and Pletscher 1999; Kojola *et al.* 2006). Such observations suggest that there could be an underlying biological pattern (e.g., inherited or learned habitat preferences or movement decisions; Sanz-Pérez *et al.* 2018) that causes individuals from the same area to disperse similar directions and distances. Recent advances in GPS-tracking technology provide an unprecedented ability to study and understand long-distance wolf dispersal patterns and strategies (Wabakken *et al.* 2007). In 2018, we documented 2 GPS-collared wolves that were caught in the Greater Voyageurs Ecosystem (GVE) that dispersed individually but eventually interacted with one another several months after dispersing >250 km north of the GVE. We question and discuss whether this observation and examples from prior research are the result of chance encounters or a biological pattern.

OBSERVATIONS & DISCUSSION

We captured wolves V057 and V059 on 17 February 2018 and 22 April 2018, respectively, and fit both with Lotek IridiumTrack1D GPS-collars (Lotek Wireless Inc, Newmarket, Ontario, Canada) that recorded location fixes every 20 min (72 locations/d). Both wolves were collared as part of a larger wolf ecology study in the GVE, Minnesota (see Gable *et al.* 2018 for more details on study area; capture and handling of wolves was approved by the National Park Service's Institutional Animal Care and Use Committee protocol no.: MWR_VOYA_WINDELS_WOLF). Wolf V057 was a yearling (born in Spring 2017) female wolf that remained with her natal pack (the Moose River Pack) until April 10, 2018 when she dispersed. V059 was a ~2-3-year-old lone male wolf that was captured near the center of the Lightfoot Pack territory, which is the pack that is westerly adjacent to the Moose River Pack. V059 immediately started traveling long distances and crossing through multiple pack territories after being collared. Though V057 and V059 were captured 9.8 km apart, we do not know whether both wolves were from the same natal pack because V059's history prior to capture is unknown. Wolf V059 initially traveled 60 km south before heading north on 27 April.

Wolves V057 and V059 dispersed north into Ontario, Canada on 24 April and 22 May 2018, respectively, but they never traveled together and were never closer than 50 km to one another when traveling northward (Figures 1 and 2). By the end of June, both wolves had reached Trout Lake Provincial Park, Ontario, which was the farthest north we documented either wolf. In total, V057 and V059 traveled a straight-line distance of 330 km and 387 km, respectively, from their southernmost location in Minnesota to their northernmost location in Ontario. By late July, both wolves started localizing around a landfill ~50 km southwest of Trout Lake Provincial Park, and both wolves generally remained within a 10-km radius of the landfill through mid-September. During this time, both wolves spent considerable time in close proximity to one another (Figure 2) based on GPS-collar locations. We identified 58 locations where both wolves were <200 m apart, 27 locations where both wolves were <100 m apart, and 4 locations where both wolves were <50 m apart. On 7 September 2018, at 13:40, the wolves came within 5 m of one another, which was the closest the wolves were documented together. Interestingly, this interaction occurred 2 km from the landfill. In late September, V059's collar failed and we lost contact with him until January 7th, 2019 when V059 was legally harvested near Red Lake, Ontario roughly 50 km NW of the landfill. V057's collar had a programmable drop-off that released the collar 1 km from the landfill on 31 October 2018. Although the probability that 2 wolves, captured 9 km apart, dispersed >300 km and interacted with one another months later is likely quite low, we still question whether this is evidence of a biological pattern. Observations of similar dispersal behaviour appear to be relatively rare as we are only aware of a few similar accounts. In 2 instances, 2 individuals from the same pack in Montana dispersed at different times but ended up in the same pack 150 km away from the natal territory (Boyd and Pletscher 1999). In another instance, 3 pack members in Minnesota dispersed and ended up in the same general area ~180 km away (Mech 1987). Multiple wolves from east-central Finland dispersed >100-300 km and settled in close proximity to other wolves that dispersed from the same natal area (see Figure 4 in Kojola *et al.* 2006). Similarly, wolves on the Scandinavian Peninsula from the same area dispersed >170-200 km and eventually settled in the same territory or in bordering territories (see Figure 2 in Milleret *et al.* 2019). Undoubtedly, the presence of the landfill impacted the movements, behaviour, and eventual interaction between V057 and V059, as both wolves appeared to be subsisting on garbage for several months. Yet,

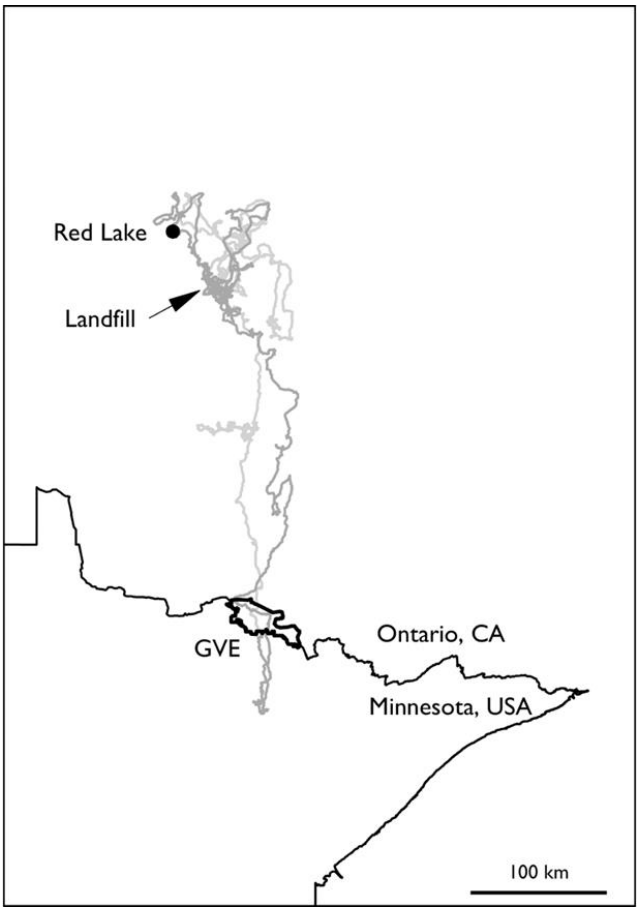

Figure. 1. The dispersal movements of 2 dispersing wolves, V057 (light gray line) and V059 (dark gray line), from the Greater Voyageurs Ecosystem (bold black polygon), Minnesota, USA. Both wolves were fitted with GPS-collars that recorded locations every 20 min. Both wolves dispersed north into Ontario, Canada in April-May 2018, within 29 d of each other, and eventually localized around a landfill southeast of Red Lake, Ontario.

before either wolf discovered the landfill, both exhibited—ostensibly independent of one another—strikingly similar dispersal patterns (Figure 2). Each wolf made a long-distance northward movement in the spring followed by a period of time in and around Trout Lake Provincial Park before localizing around the landfill (Figure 1).

Ultimately, we do not know whether the dispersal patterns of V057 and V059 were the result of chance or of an undescribed biological pattern that leads wolves from the same areas to disperse long distances in the same direction. Long-distance dispersal strategies in mammals generally evolved in part to minimize inbreeding with closely-related individuals so it would be surprising if closely-related individuals had a natural disposition to exhibit similar long-distance dispersal strategies (Van Vuren 1998). Though, observations of wolves in multiple systems dispersing together suggest there might be benefits to doing so (Mech and Boitani 2003). We speculate that the dispersal behaviour we observed, should it be indicative of a biological pattern, could be the result of a genetic predisposition to disperse in certain directions and distances (Pasinelli *et al.* 2004), or that there could be habitat corridors that facilitate similar long-distance dispersal patterns. Recent evidence suggests there might also be a link between natal habitat, wolf dispersal strategies, and where dispersing wolves ultimately settle, though more research is needed to understand these relationships (Sanz-Pérez *et al.* 2018; Milleret *et al.* 2019).

We think it is only by documenting these accounts that larger patterns of wolf dispersal might be identified and that subsequent studies can be developed to detect such patterns.

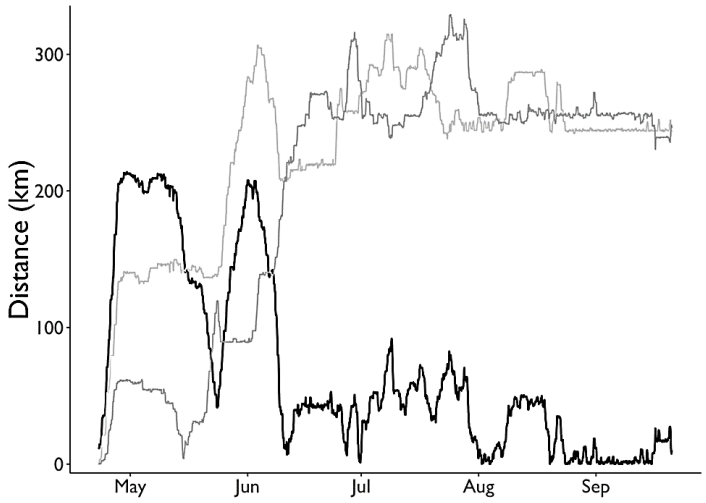

Figure. 2. The straight-line distance of 2 GPS-collared dispersing wolves (V057=light gray, V059=dark gray) from their capture locations in the Greater Voyageurs Ecosystem, Minnesota, USA from 22 April to 21 September 2018. The black line represents the straight-line distance between the 2 wolves as they dispersed north into Ontario, Canada. On 7 September 2018, the 2 wolves were 5 m apart.

If future research using GPS-collars does not reveal dispersal behaviours similar to ours, then our observation is likely the result of a chance encounter. But if similar behaviour is documented repeatedly in the future, then there will exist a fascinating opportunity to explore and identify the mechanism(s) behind this phenomenon.

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