PROPOSED REVISIONS TO GPS COLLAR PERMIT

A temporary collar attachment would be fitted to 20 new GPS collars deployed on individuals from the Bathurst, Bluenose East and/or Beverly Caribou herds in the years 2024, 2025 and 2026. The number of individuals from each herd with these attachments will vary, as these herds mix heavily in the winter, when collaring occurs. These attachments, known as 'audiologgers', would contain a miniature audio recorder and an activity sensor (i.e. accelerometer) that tracks fine scale animal movements, such as head shaking, resting or grazing. These audiologgers were developed by behavioral ecologists in France (Latorre et al. 2021) and have been deployed on a variety of wildlife in France, southern Africa and Greenland. The audiologgers would be on the collars when deployed in March and scheduled to drop off the collars in September that year. The weight of the collar would be temporarily increased from about 600 grams to about 750 g. Funding for this project comes from the CIMP-Polar program, the World Wildlife Foundation, National Science Foundation, and the Natural Sciences and Engineering Research Council of Canada.

RESEARCH IMPORTANCE

Audiologgers can record a host of behaviors (digestion, sociality, foraging) (Lynch et al. 2015, Yan et al. 2019) that influence nutrition and body condition. For our purposes, the audio recorder within these loggers should be able to detect a variety of sounds relevant to caribou behavior, including: the sounds of biting insects, nearby industrial noise, rumination behaviors (burping, chewing), and the vocalizations of other caribou, such as calves. With this information, we intend to build an activity budget, i.e. a description of how a caribou spends their time exhibiting different behaviors. It would be the first activity budget recorded for caribou that also measures rumination, a vital digestive process that requires periods of rest as a caribou feeds—regurgitating and rechewing their food in a 4-stage process. We can monitor rumination through audible burps, chewing and swallowing; this may allow us to identify under what conditions they are unable to rest or digest their food properly. Certain disturbances, such as insect harassment or the sounds of human activity, could disrupt their ability to ruminate, with significant impacts on health and reproduction.

With the activity sensor, we will be able to detect general behaviors, such as running, resting, or foraging. With this combined information, we intend to build a detailed activity budget, i.e. a description of how a caribou spends their time exhibiting different behaviors. This will allow us to determine their specific response when exposed to specific sounds. E.g., do they stop foraging and start running? Or exhibit other startled behaviors? The activity sensors will also allow us to observe how caribou move and interact with obstructions near roads or other infrastructure. Combined with GPS locations, we will learn how caribou are responding to human disturbance and insect harassment, while identifying areas where they get the most relief from these two potential disturbances. This will provide important baseline information on how caribou are using undeveloped regions which are currently being assessed for new infrastructure projects, such as the Slave Geological Province Road Corridor (SGPRC).

The route of the SGPRC depends upon the availability of raw materials, which will be largely

derived from eskers. Eskers are a post-glacial, elevated rock formation. For caribou, eskers are an important habitat in both the winter and summer. In winter, windblown eskers may provide areas that are easy for caribou to navigate during migration (Traynor 2001), and in summer, they may use the windy ridges for insect relief (Witter et al. 2012). Identifying the importance of these landscape features is a vital part of evaluating the impact of the road itself, which is being preferentially routed near eskers that can be mined for road material (Aurora Geosciences 2020). While proposed road corridors take into account core caribou habitat, these core habitats may not account for the importance of these landscape features during migration, or during the short—but incredibly stressful—period of insect harassment, when caribou mortality may be highest (Joly et al. 2020). Insect harassment is only expected to increase with climate change in the north (Culler et al. 2015). Actions that may reduce caribou's access to eskers may have a disproportionately large impact on them.

AUDIOLOGGER DETAILS

20 audiologgers will be deployed each season, with 60 being deployed in total over the period of 3 years. These audiologgers will remain on the collars for six months, March until September, at which time they are scheduled to fall off. A drop off device developed by Rafiq et al. (2019) will attach the audiologgers via a sturdy nylon fishing line in contact with a nichrome resistance wire. At the specified drop off time, this wire heats to high temperatures of 150-220°C, severing the line that attaches the audiologger to the collar and causing it to fall off. This device can be deployed for up to 875 days, depending on the battery, and drop off timing is accurate to the second. A VHF beacon will be attached to the audiologgers so that they can be found and retrieved once they fall off (see figure 1 for full design details).

The audiologgers weigh approximately 80g with a battery and housing. Including the drop off device and VHF beacon, the total weight is approximately 150g. Collars currently in use with these caribou herds weigh about 600g. The added weight from these audiologgers would bring the total collar weight up to 750g for 6 months. As a general rule, collars should always weigh less than 3% of an animal's overall body weight (Kenward 2001). These audiologgers would cause the collars to weigh ~0.6% of an animal's body weight, safely below this threshold.

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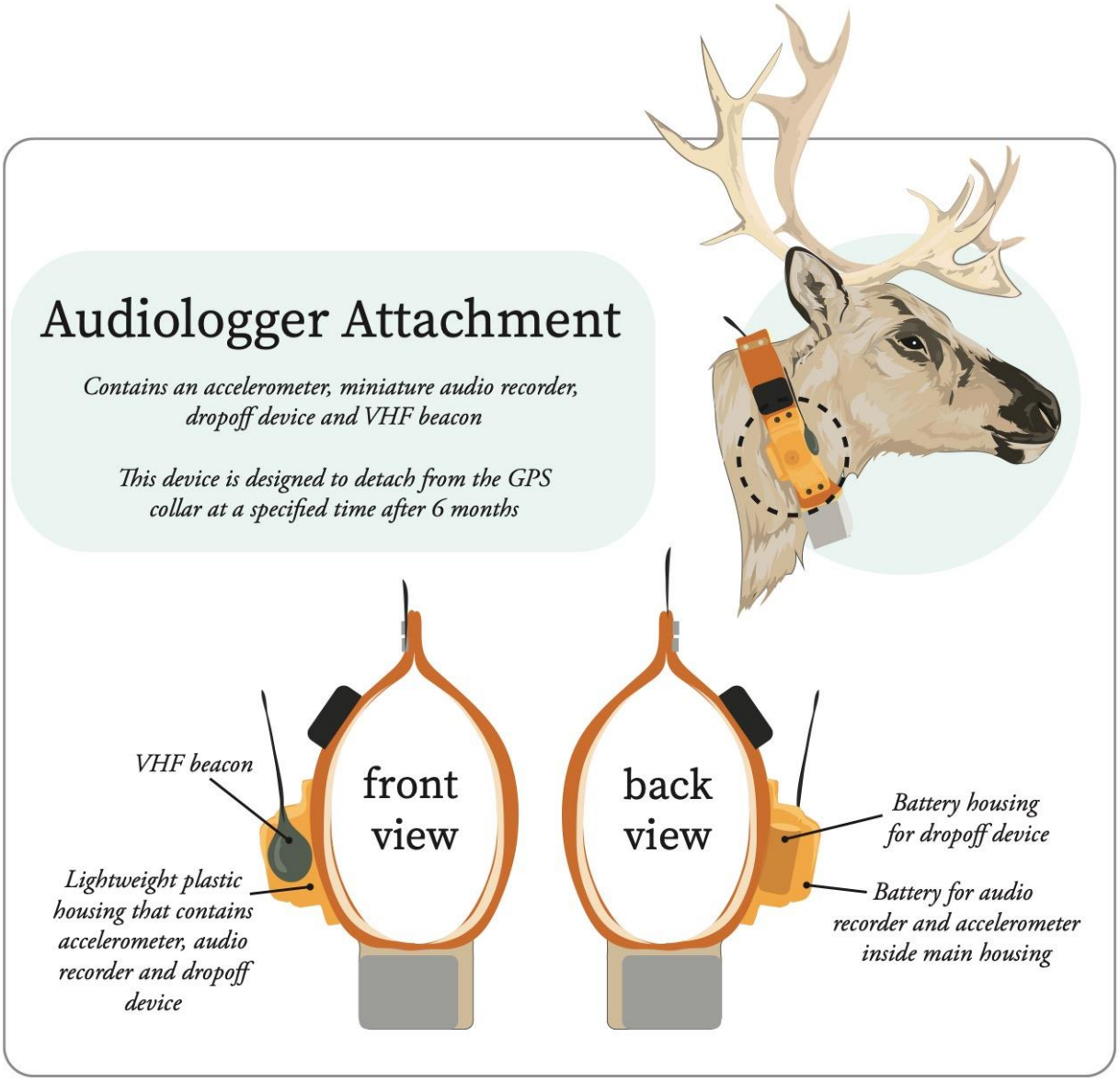

Figure 1. A diagram of the placement and size of the audiologger when installed on the GPS collar belt.