Influence of GPS schedules on wolf feeding site’s detection

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Introduction

Livestock predation is one of the main factors triggering conflicts between large carnivores and humans worldwide (1,2). In order to frame every conflict scenario properly and act accordingly, researchers and managers use GPS collars to estimate the predation rates of large carnivores on prey species, including livestock (5,6). However, little information is available of optimum sampling frequency to detect the feeding sites to obtain reliable quantitative estimates of the impact of large carnivores on livestock. Moreover, the influence of livestock species (size and age) and different carnivore behaviors (predation and scavenging) have on the detection of kills/scavenging sites remains poorly understood.

Objectives

1. To evaluate how different GPS schedules affect the detection rate of wolves (Canis lupus signatus) feeding sites.
2. To evaluate the influence of prey type (species and age) and wolf behavior (predation and scavenging) on feeding sites detection.

Hypothesis

1. The detection rate of feeding events and clusters decreases when the GPS sampling interval increases.
2. There is an overestimation of the importance of large prey and predation events for wolves over small prey and scavenging events.

Methods

Study area

Western Galicia (NW Spain), a human-dominated landscape transformed by agricultural and livestock activities, where wolves feed mainly on horses (60%) and cattle (27%).

Data collection

Five wolves were live-trapped and fitted with GPS-GSM collars. Collars were programmed with three different schedules:

- From 12th to 26th: every 20 minutes
- On 27th: scheduled to obtain positions every 10 minutes
- From 28th to 1st: every 20 from 20:00 to 06:00 GMT and one location at 12:00 GMT.

Data analysis

1. We generated multiple subsets with different time intervals between positions: 40, 60, 80, 100, 120, 180 and 240 minutes. Clusters were identified and aggregated into events. Considering that 100% of clusters and events are detected with 20 minutes schedule, we calculated the proportion of clusters and events lost for every higher time interval.
2. Using the full dataset of wolf positions every 10 minutes, we generated a subset with 20 minutes intervals between positions, and calculated the proportion of clusters and events lost for 20 minutes in relation to the 10 minute time interval.
3. We used Chi-squared test to assess the effects of different factors on the proportion of events and clusters lost: type (horses or cattle, the main prey in this area) and age (adult or juvenile) of prey and wolf behavior (predation or scavenging).

Results

Feeding sites detection

When GPS sampling interval increased, events and clusters detection decreased, this decrease was more pronounced from 200 to 60 min (Figure 1).

- From 20 to 40 min we would have lost 22% of events and 16% of clusters.
- From 20 to 60 min we would have lost 38% of events and 51% of clusters.
- From 20 to 20 min we would have lost 6% of events and 15% of clusters.

Influence of prey type and wolf behavior

- Type of prey: The proportion of clusters and events lost was similar, proportions were higher for adult horses than cows, but differences were not significant. The proportion of events lost was higher when the prey was a cow than a calf, with significant differences at 240 min (Table 1).
- Age of prey: The proportion of events and clusters lost was similar, from 40 to 240 min proportions were higher for adult cows than calves but differences were not significant (Table 1).
- Wolf behavior: Scavenging events last was always higher than predation. Significant differences at 40 min interval (Table 1).

Discussion and conclusions

Feeding sites detection

1. Use small time intervals between fixes is important to obtain reliable quantitative estimates of the impact of wolves on livestock (Fig. 1).
2. Clusters were more sensitive to the time interval between fixes (Fig. 1, Table 1): the wolves handling time is variable.
3. Using GPS schedules considering 20 minutes between fixes we would avoid short traces for GPS collars (an expensive technique) (Fig. 3), whereas providing good estimates of kill and scavenging rates.

The remarkable loss when increasing time intervals between fixes and the apparent lack of influence of type of prey in the detection, could be associated by:

- Short handling periods of prey by wolves because of the humanized context: wolves would minimize encounters with humans (4,5,7).
- Short handling times associated with scavenging sites.

Influence of prey type and wolf behavior

1. Few differences were observed on detection rates according to type and age of prey, these were only in 240 minutes sampling interval (Table 2).
2. Half of scavenging events detected using a 20 minutes time interval would have been lost using a 60 minutes time interval (Table 1): scavenging handling time is presumably short (6).
3. Using 60 min interval we would underestimate the importance of scavenging for wolves in our study area.

Discussion

The main findings of this study are:

- The detection rate of feeding events and clusters decreases when the GPS sampling interval increases.
- There is an overestimation of the importance of large prey and predation events for wolves over small prey and scavenging events.

Bibliography