

Deer Vigilance Behaviors by Species

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Introduction

Purpose:

To investigate whether herds of deer exhibit coordinated vigilance, as exhibiting such anti-predatory behavior could indicate an advanced form of communication that could be attributed to inherited instincts.

Research Questions:

- RQ1: Do deer display coordinated vigilance behavior?
- RQ2: Do vigilance behaviors differ between Père David's deer (*Elaphurus davidianus*), Fallow deer (*Dama dama*), and Red deer (*Cervus elaphus*)?

Methodology:

Operationalization

Vigilance = Standing with a raised head (head turned away from herd, if walking).

Non-Vigilance = Standing with a lowered head (likely grazing) or sitting.

Consensus Vigilance = The majority of the deer within the herd are either vigilant or non-vigilant, with fewer acting independently.

Random Vigilance = Deer within the herd are randomly vigilant, independent of actions of other deer in the herd.

Coordinated Vigilance = A set number of deer within the herd are consistently vigilant at any given time and there is an overall low-level of vigilance within the herd.

Data Collection

Over two days of observation at Margam Country Park in Wales, we gathered 90 minutes of video footage in 10-minute intervals, 30 minutes per species.

For each 10-minute video, we used scan sampling and counted the total number of deer in frame. We noted the location of each observed deer within the herd, and recorded whether each observed standing deer had its head up, employing time sampling in 30 second intervals.

Statistical Analysis

Test performed:

- We conducted a **Monte Carlo Simulation (MCS)**.

Data Simulation:

- 40,000 virtual deer were simulated in Microsoft Excel.
 - 10,000 per species
 - 10,000 for the overall deer population of Margam Country Park.
- Average vigilance was permuted to mass generate random virtual deer data. The permuted data were used to determine differences in vigilance behavior between species.

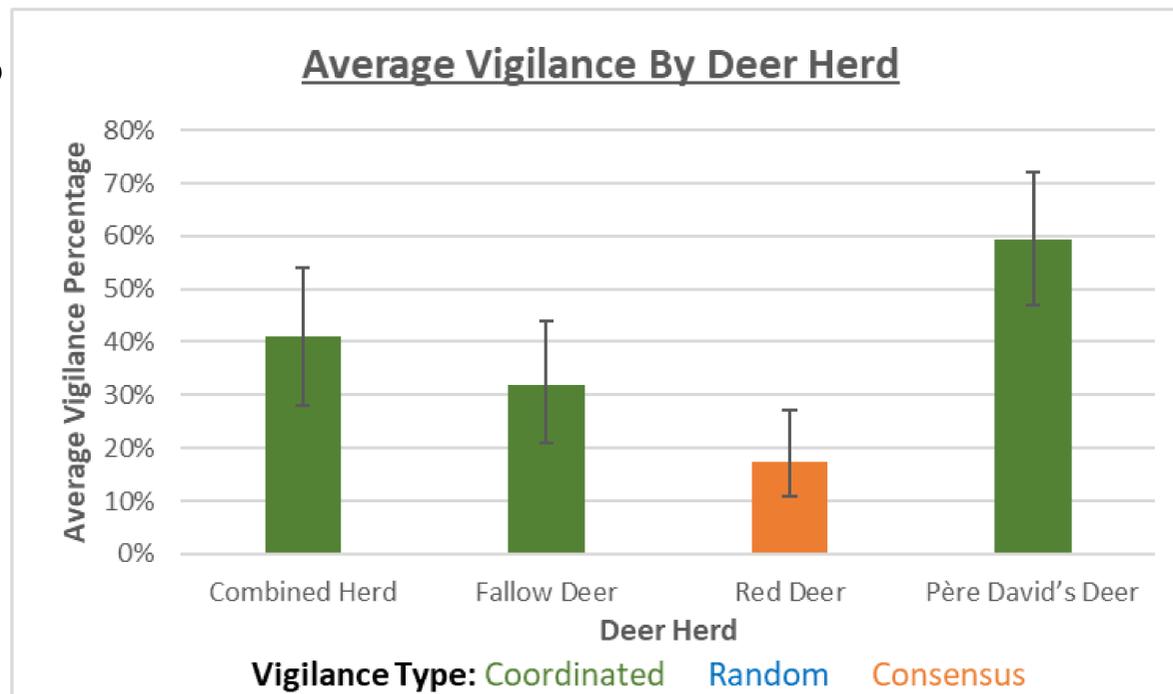
Results and Figure

RQ1: Supported by Results

Vigilance is coordinated in deer herds (MCS, $p = 0.002$)

RQ2: Supported by Results

Coordinated vigilance behavior was exhibited by Père David (MCS, $p < 0.001$) and Fallow (MCS, $p = 0.0033$), while Red deer displayed consensus vigilance (MCS, $p < 0.001$).



Discussion:

It appears that the responsibility of vigilance is a shared behavior, suggesting that the deer have some form of communication to indicate when individuals will take shifts and go from non-vigilance to vigilance and vice versa.

Our findings suggest that vigilance is an instinctual and intentional behavior which may be impacted by the presence of predators, genetic diversity, and environmental factors:

- Both Fallow and Père David's deer are non-native to the United Kingdom. Both species may not be far enough removed from their ancestors to exhibit different vigilance behaviors that reflect the lack of predators in the in the UK.
 - Fallow were reintroduced to England in the 11th Century, constituting a naturalized species.
 - All Père David's in England today come from one 18-deer herd introduced from China in 1900.
- Red deer are a native species in the UK, as they have occupied the country for 11,000 years and evolved with minimal predator threats, thus not requiring vigilance coordination and displaying allelomimetic (copying) behavior.

Limitations

- Data was gathered in the span of 2 days.
- Better camouflage could have prevented any confounding as the deer could have reacted to observers despite our efforts to remain hidden.
- The resolution of the video gathered was not very high.
- Without proper equipment our camera was not stabilized, potentially impacting vigilance coding.

Future Research

Differences in vigilance amongst the species could have been due to a multitude of factors that could be investigated in future research, including:

- Environment • Genetic Diversity • Grazing Location
- Herd Size • Weather Conditions
- Presence of Predators • Presence of Stags • Presence of Young
- Time of Year/Awareness of Culling Season



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