Does livestock grazing influence the foraging behaviour of an upland passerine?

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INTRODUCTION

- Grazing herbivores are implicated in the declines of bird populations across upland Britain
- Livestock influence habitat structure, invertebrate abundance and therefore the foraging conditions for birds

Species: Meadow pipit (*Anthus pratensis*) (Fig.1)

- Upland ground-breeding passerine, generalist insectivore
- Associated with habitat mosaics
- Amber conservation status

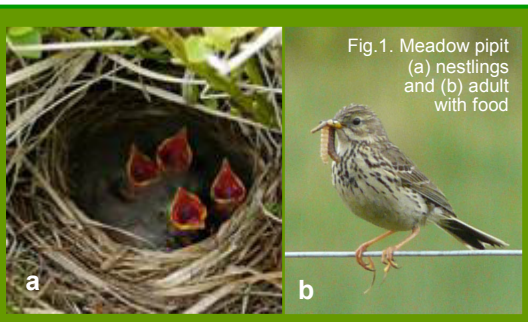


Fig.1. Meadow pipit (a) nestlings and (b) adult with food

Research questions

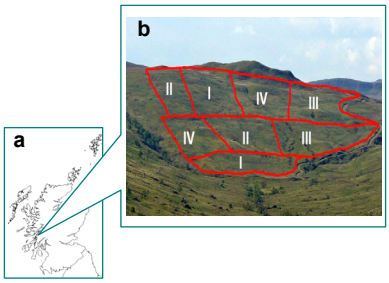
- Do meadow pipits select foraging patches according to vegetation and invertebrate characteristics?
- Do meadow pipits travel increased distances to forage in more intensively grazed plots?

METHODS

Meadow pipit foraging behaviour was observed at nests in high (n=5) and low intensity (n=6) grazing treatments (Fig. 2). At each nest:

- four foraging points were paired with random points (Fig.3).
- vegetation & invertebrate characteristics were measured in a 2x2m square placed at each point (Fig.3).

Fig. 2. (**a**) Location of the study site at Glen Finglas, Scotland (UK). There are three paired replicate blocks with (**b**) four grazing treatments randomly assigned in each block: **I = high intensity grazing (High-S, 9 sheep ha^{-1})**, II = low grazing (Low-S, 3 sheep ha^{-1}), **III = low intensity, mixed grazing (Low-SC, sheep & cattle)** and IV = no grazing.



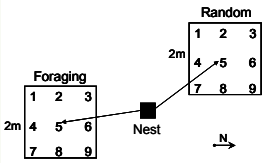


Fig. 3. Random points were positioned at a random angle of orientation but at the same distance from the nest as its paired foraging point. A grid standardised the locations for vegetation and invertebrate sampling.

Analysis: REML, with nested design structure specified as a random effect.

RESULTS

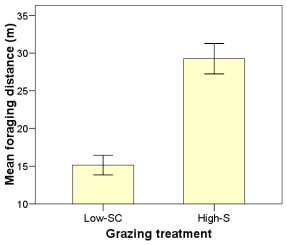


Fig.4. Comparison of mean foraging distance between grazing treatments

- Birds forage further from the nest in the high intensity grazing treatment ($F_{1,35}$: 12.0, p<0.01) (Fig.4).

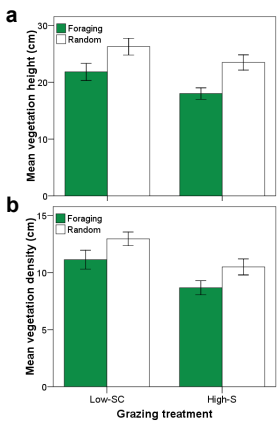


Fig.5. Vegetation (a) height and (b) density between grazing treatments and foraging / random squares

- Differences in vegetation height and density are similar between grazing treatments.

however

- Vegetation height ($F_{1,53}$: 20.6, p<0.001) and density ($F_{1,53}$: 8.7, p<0.01) (Fig. 5b) are significantly lower in foraging squares.

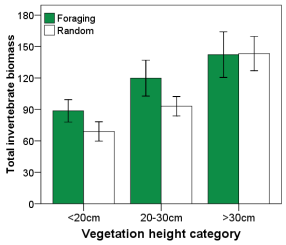


Fig.6. Effect of square type and vegetation height class on invertebrate biomass

- Foraging squares, with an average vegetation height of <30cm, tend to contain a higher biomass of invertebrates (Fig.6).

CONCLUSIONS

- Birds travel further to forage in the high intensity grazing treatments.
- Birds select foraging patches with shorter, less dense vegetation and with a higher biomass of invertebrates in both grazing treatments.

FUTURE RESEARCH

- Measure adult condition to assess if birds absorb the costs of foraging further from the nest in the high intensity grazing treatments.
- Determine if grazing treatment and/or female condition is linked to variation in egg colour and brood sex ratio.

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