



# Long-term change in upland grasslands: Slow Plants & Fast Birds

Robin Pakeman & Debbie Fielding



The James  
**Hutton**  
Institute

# A little bit of history

- Early 2000's concern about impact of CAP reform
- 2003 saw the decoupling of payments from animal numbers; payments focused on area
- Scottish Executive (now Government) wanted to know what impact that might have on the uplands



# Glen Finglas

- Woodland Trust
- Historic royal hunting ground
- Later used for grazing, leaving parkland with ancient trees
- Woodland Trust planting and fencing to allow natural regeneration
- Rich in wildlife, including black grouse
- <https://www.woodlandtrust.org.uk/visiting-woods/wood-information/glen-finglas/>







# Glen Finglas

- Original aim - to understand how changes in upland grazing would cascade through from vegetation to birds



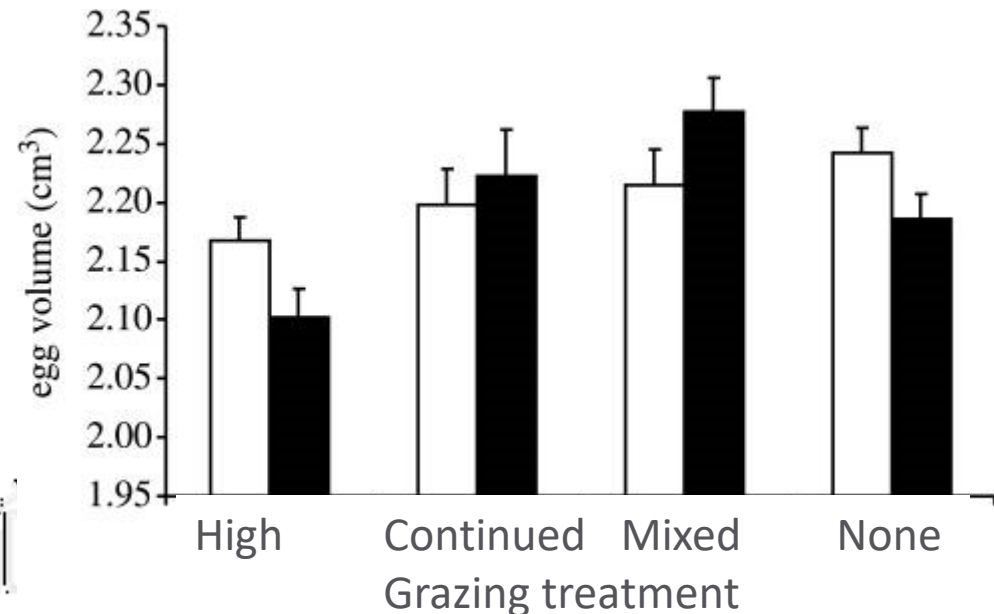
# The design

- 24 plots, 3.3 ha each (c. 180 m x 180 m)
- Six replicates
- Four treatments
  - Continued - three ewes per plot ( $0.9 \text{ ewe ha}^{-1}$ ) —◆—, the control treatment as this was the grazing level pre-experiment
  - High - a tripling of sheep numbers to  $2.7 \text{ ewe ha}^{-1}$  —■—
  - Mixed - a partial substitution of sheep by cattle, overall offtake = Continued --▲--
  - None ...○...



# Fast birds (1)

- Experiment designed to be big enough for multiple meadow pipit nests per plot
- Within one year of grazing there were effects on egg volume



# Fast birds (2)

Slide removed as part of  
unpublished PhD work





# Explanation

- Not food abundance
  - Highest abundance in the ungrazed treatment
- Must be food availability
  - Pipits forage preferentially in areas of short vegetation created by high grazing pressure or by cattle, i.e. in plots with highest variability in height.



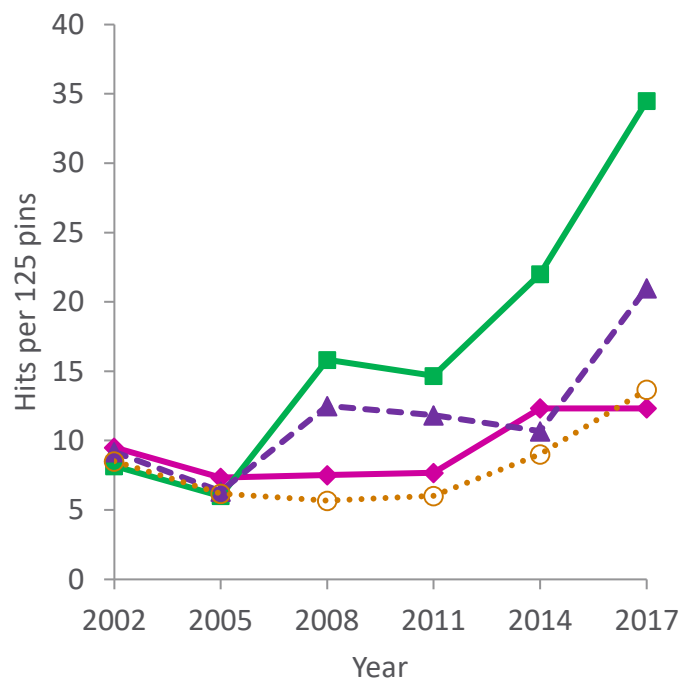
# Slow plants

- Full analysis in 2011 (nine years of treatments). Nothing newsworthy!
- Analysis in 2017, somewhat newsworthy. Anyway, enough to write a paper about.



## Some species do well under more grazing

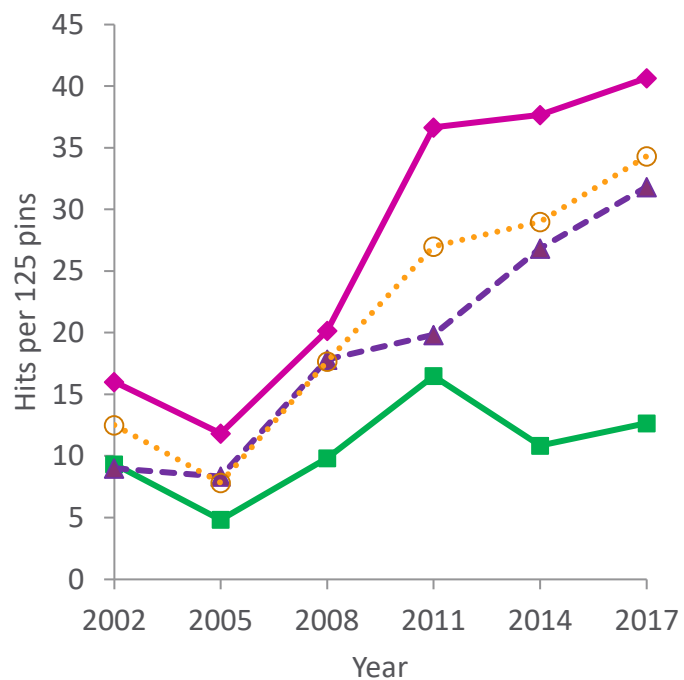
- *Anthoxanthum odoratum* (sweet vernal grass)



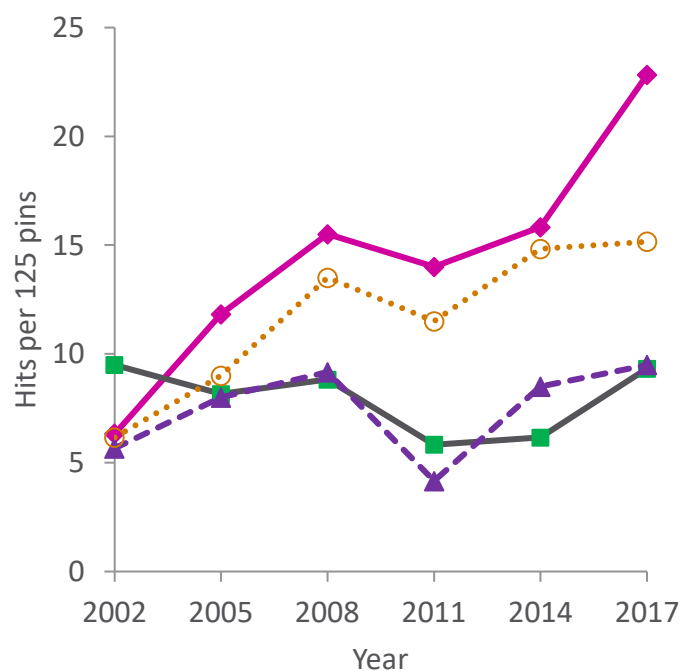
- *Nardus stricta* (mat grass)



## Some species do well under less/no grazing



- *Narthecium ossifragum* (bog asphodel)



- *Vaccinium myrtillus* (blaeberry, whimberry, bilberry, whortleberry)

# Heterogenous vegetation

Mainly

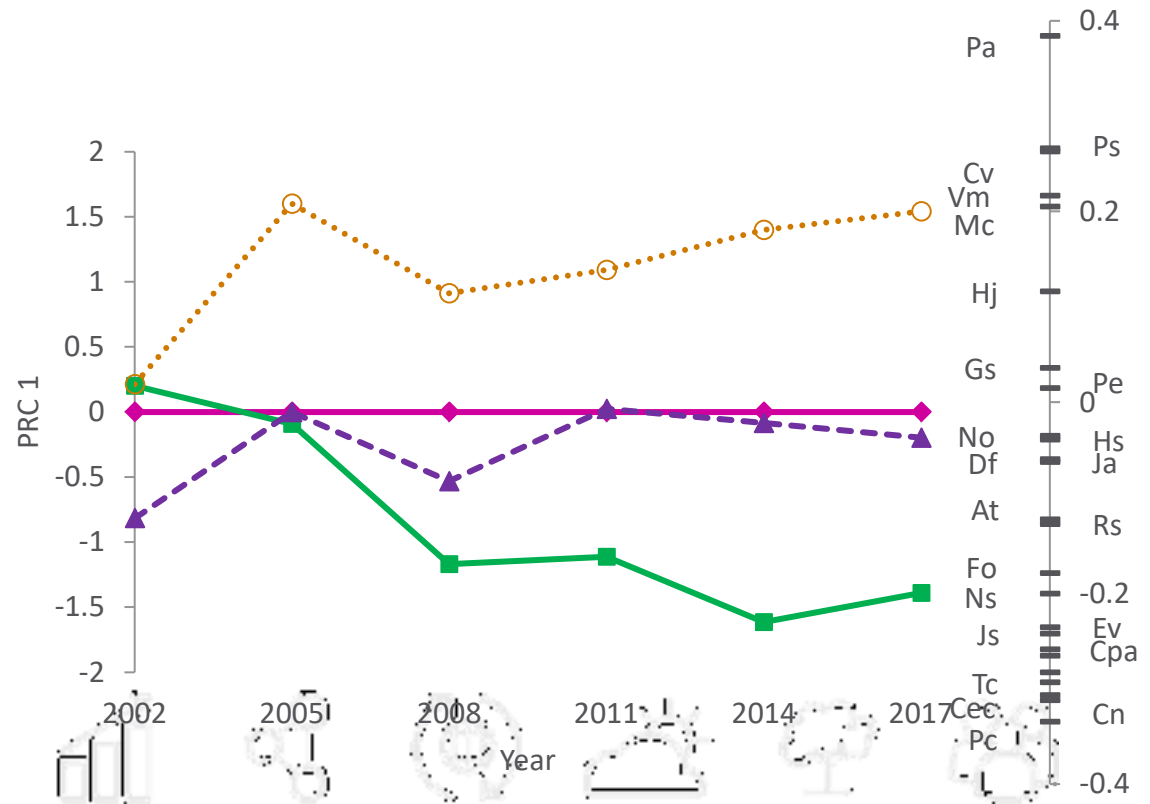
- M15 *Scirpus (Trichophorum) cespitosus* – *Erica tetralix* **WET HEATH**
- M6 *Carex echinata* – *Sphagnum recurvum/auriculatum* **SEDGE MIRE**
- M25 *Molinia caerulea* – *Potentilla erecta* **RUSH PASTURE**
- U4 *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile* **BENT-FESCUE GRASSLAND**
- U5 *Nardus stricta* – *G. saxatile* **WHITE MOOR**
- U20 *Pteridium aquilinum* – *G. saxatile* **BRACKEN**



# Vegetation change M15 Wet Heath



- Principal Response Curves
- Form of Redundancy Analysis
- Allows temporal trends in control treatment to be corrected for



# Vegetation change M15 Wet Heath



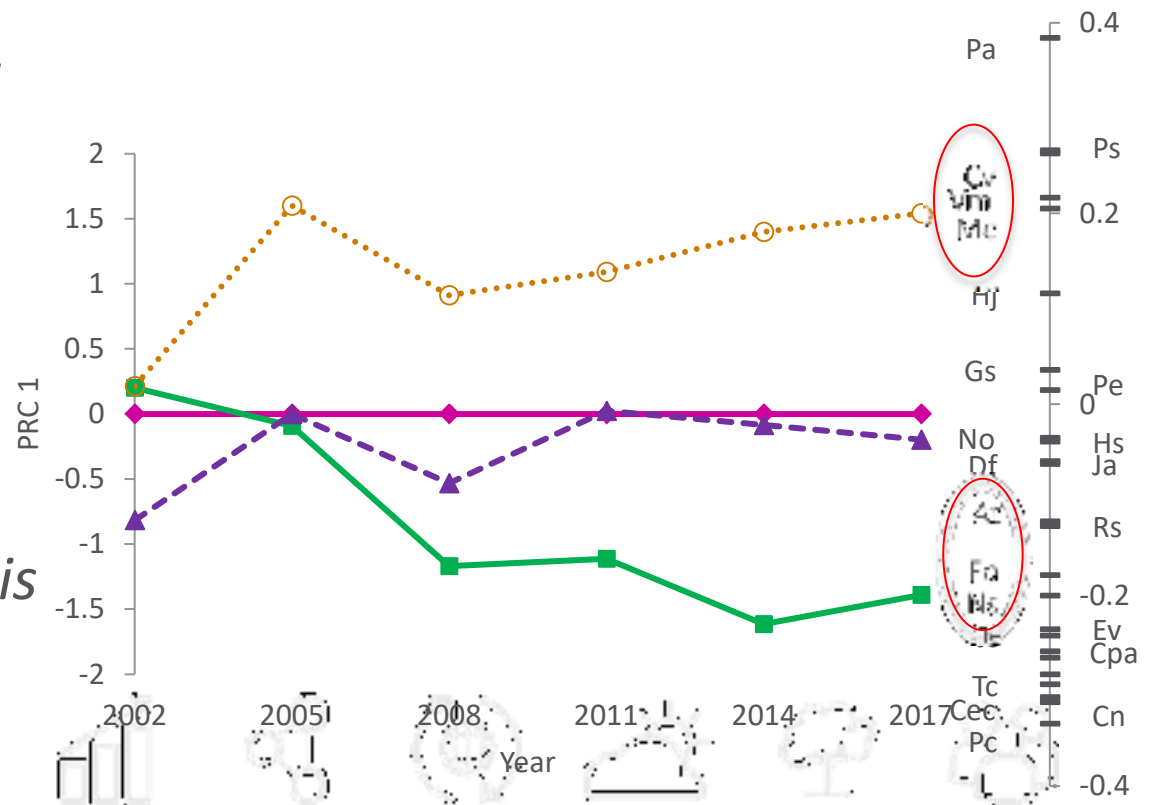
- Expected pattern

- +ve no grazing

- Calluna vulgaris*
- Molina caerulea*
- Vaccinium myrtillus*

- +ve grazing

- Nardus stricta*
- Festuca ovina*
- Agrostis capillaris*



# Vegetation change U4 Bent-Fescue

- No response to grazing removal

- -ve grazing

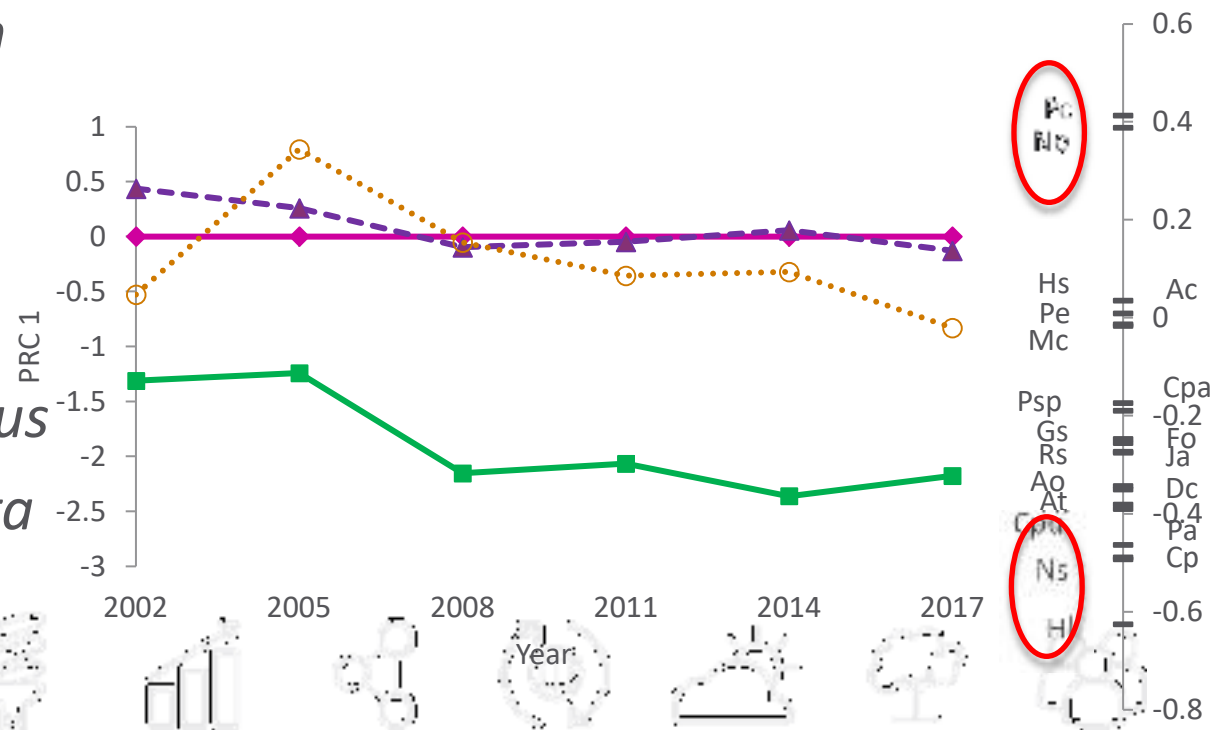
- *Narthecium ossifragum*

- *Polytrichum commune*

- +ve grazing

- *Holcus lanatus*

- *Nardus stricta*



# Response across communities

- M15 *Scirpus (Trichophorum) cespitosus* – *Erica tetralix*
  - Responds to grazing increase or removal
- U4 *Festuca ovina* – *Agrostis capillaris* – *Galium saxatile*
  - Responds only to grazing increase
- Less preferred vegetation still contains species that can respond to grazing removal. Preferred vegetation these have been eliminated.



# Other groups

- Voles
  - Higher densities on ungrazed
  - Grazing reduces the cyclicity of vole populations
- Foxes
  - More activity in ungrazed plots
- Moths
  - More diversity and abundance on ungrazed plots
- Plant bugs
  - More diversity and abundance in ungrazed, substantial community shift as well.
- Carbon
  - More carbon in vegetation and soils (modelled) in ungrazed





# Scientific conclusions

- Birds are better ecologists than people
- Pipits respond to vegetation structure (food availability)
- Plant species changes can be very slow (cold, nutrient poor)
- Predicting impacts of policy changes can be difficult using short-term experiments
- Most vegetation changes are the slow shuffling of dominance
- Changes constrained by grazing history
- Heterogeneity a problem turned into an opportunity

# Current directions

- Papers on functional changes and on species turnover (homogenisation)
- Currently looking at role of vegetation quality on pipit food quality and foraging



Thank you

Thanks to the Woodland Trust, and all our colleagues who have worked on the experiment.

