Effects of early life strategies and free-range enrichment on the behaviour and welfare of hens

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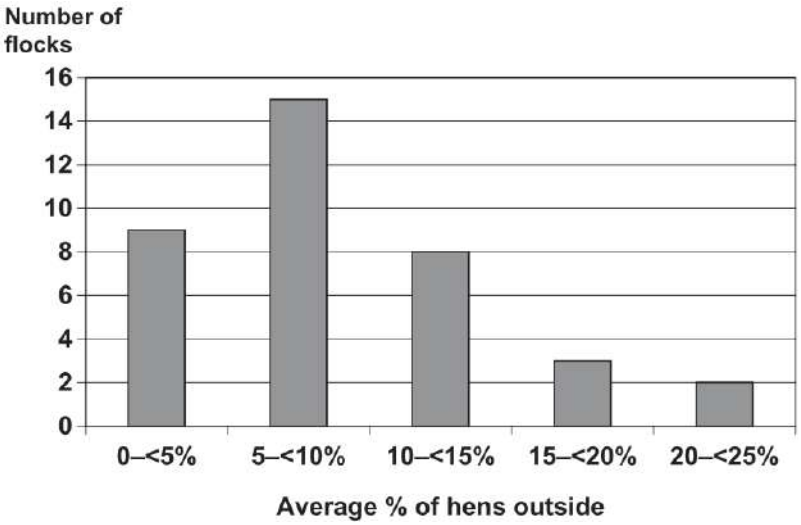
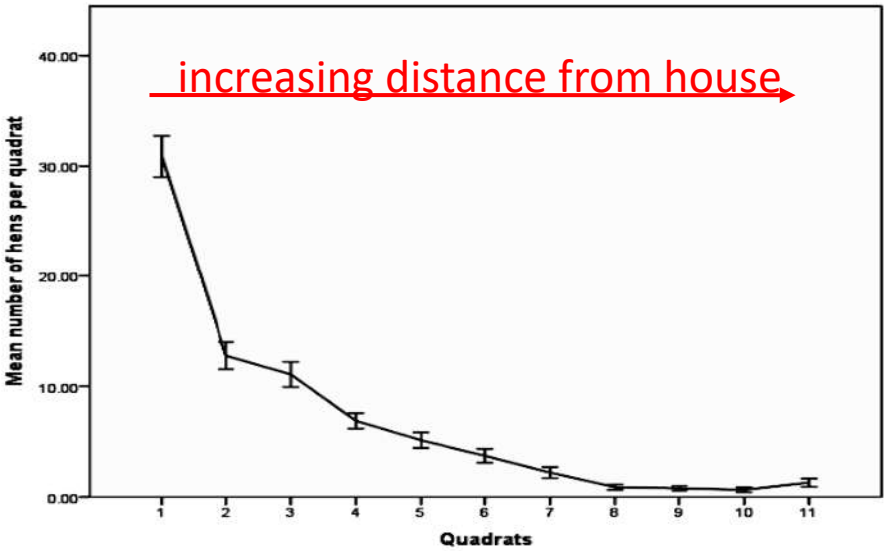
PPILOW WP4.2 - Introduction

- Early-life conditions important factors in welfare indicators
  - *e.g.* insufficient access to adequate substrate -> severe feather-pecking

- Range use is typically poor in commercial flocks
  - Low proportion of hens outside at given time
  - Few hens venturing very far from house



Hegelund et al. 2005



Modified from *Chielo et al. 2016*

- Why is poor range use a bad thing?
  - Risk factor for **negative** welfare indicators (e.g. FP)
  - Not receiving **positive** welfare benefits of system
    - …outweighed by downsides of system? (e.g. risk of disease)

PPILOW WP4.2 – Objectives and Predictions

- Evaluate novel management practices implemented at different life stages for improving the welfare of free-range laying hens in production
  - Incubation (green light)
  - Rearing (insect larvae)
  - Lay (insect larvae outdoors)

- Further elucidate factors in individual variation in range use

- **Predictions:**
  - Enrichment of the rearing environment will result in increased range use and less feather-pecking
  - Incubation in green light will result in better range use
  - Enrichment of the range will result in better range use
  - As found by others, range use will be negatively correlated with fearfulness
    - Other factors? (e.g. social influences -> tracking data)

PPILOW WP4.2 – Treatments

Incubation in green light (12D:12L)
(*control:* 24D)

Rearing enrichment with insect larvae
(*control:* no larvae)

Enrichment of outdoor run with
insect larvae
(*control:* no larvae)

PPILOW WP4.2 – Treatments

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Incubation

Rearing

20 weeks old

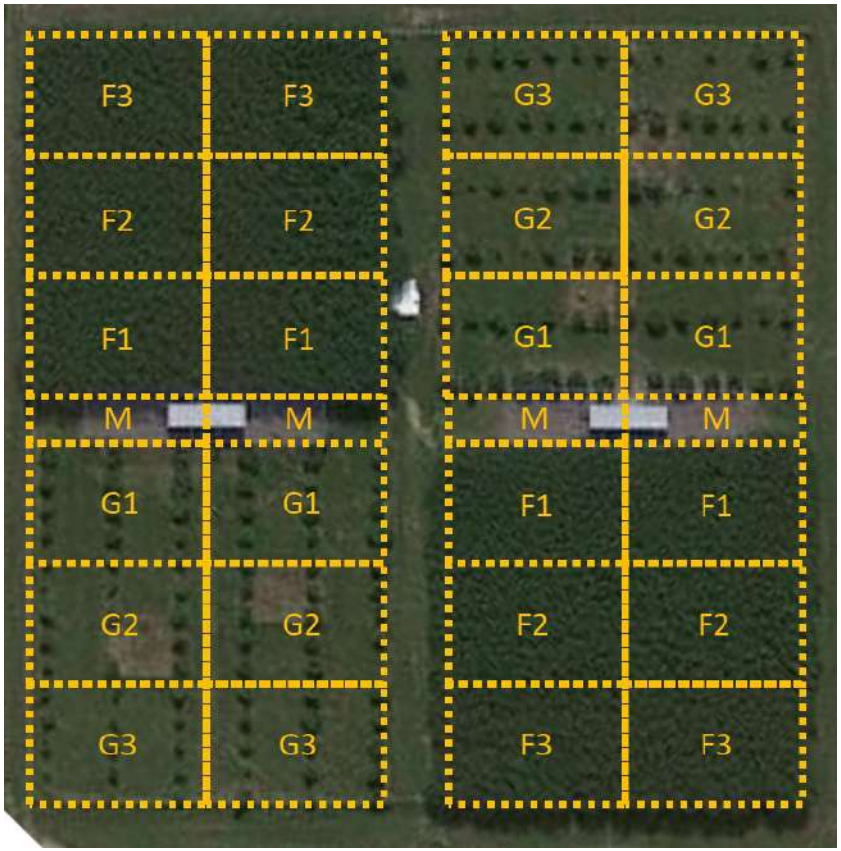
Laying Period

ISA Brown

x2 rounds

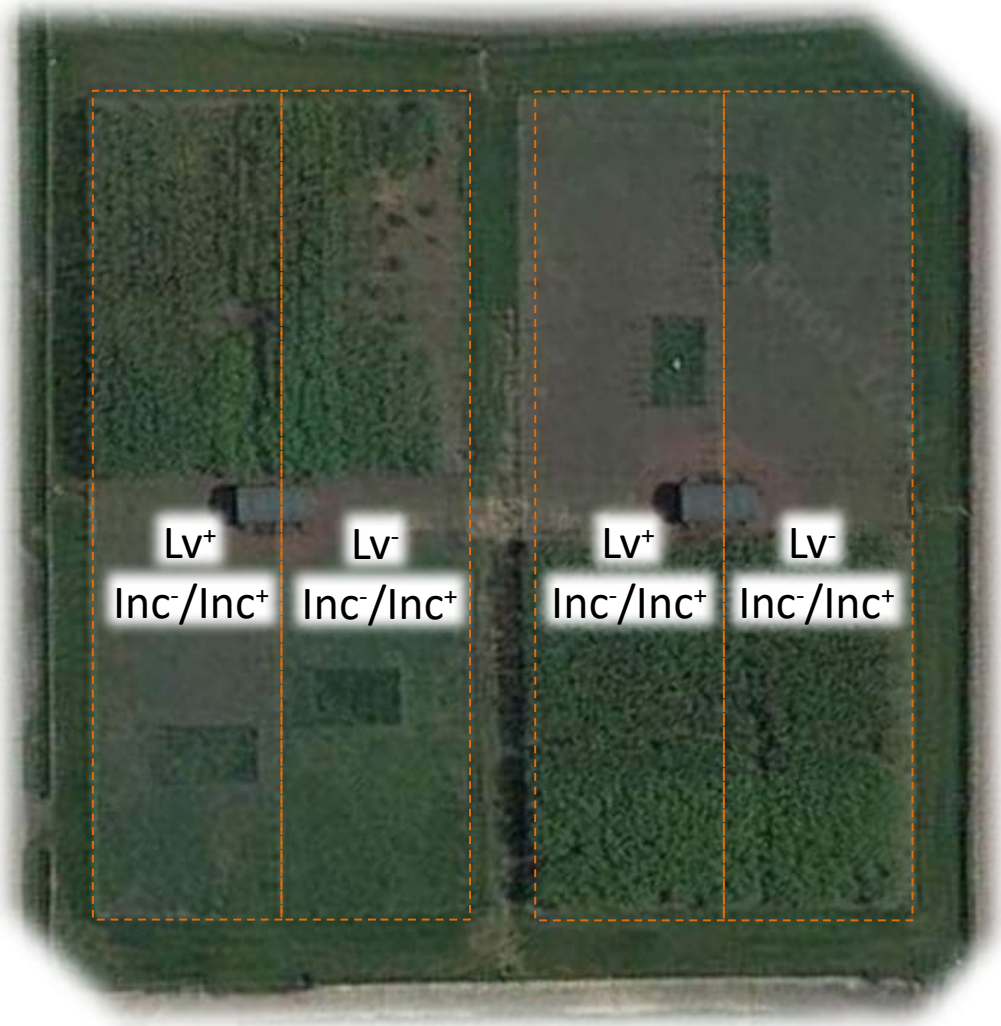
PPILOW WP4.2 – Range Layout

- Each laying group housed in a mobile stable (compartment) with one pophole on either side
- One half of ~20 x 44-m range is densely vegetated with willow trees (short rotation coppice; F), while other half is more open grassy area (G) with hazel trees
- Netted veranda/wintergarden



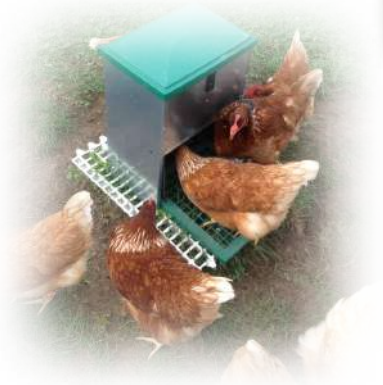
PPILOW WP4.2 – Groups

- Each laying group contains ~45 hens from a single rearing enrichment treatment, split by rearing treatment (Lv)
  - Intake error during second experimental round resulted in an imbalance, withone group having only 38 and another 50 hens
  - Two chickens were also in the wrong group according to rearing treatment



PPILOW WP4.2 – Range Enrichment

- Outdoor larvae enrichment administered in crossover-crossback design
  - 12-weeklong treatment periods (4 periods over yearlong experimental round)
  - In each period, 2 adjacent groups receive enrichment
- Delivered in operant feeders for biosecurity
- First round used black soldier fly larvae supplied by a PPILOW partner organization
- Due to the company's recent bankruptcy, a new local supplier was found for larvae,
  - Mealworms *(Tenebria sp.)*
  - Same enrichment effect expected



PPILOW WP4.2 – Tracking System

- Ultra-wideband
  - Time difference of arrival (TDoA)
  - 3D-printed housing for electronics
  - Omnidirectional anchors throughout range area

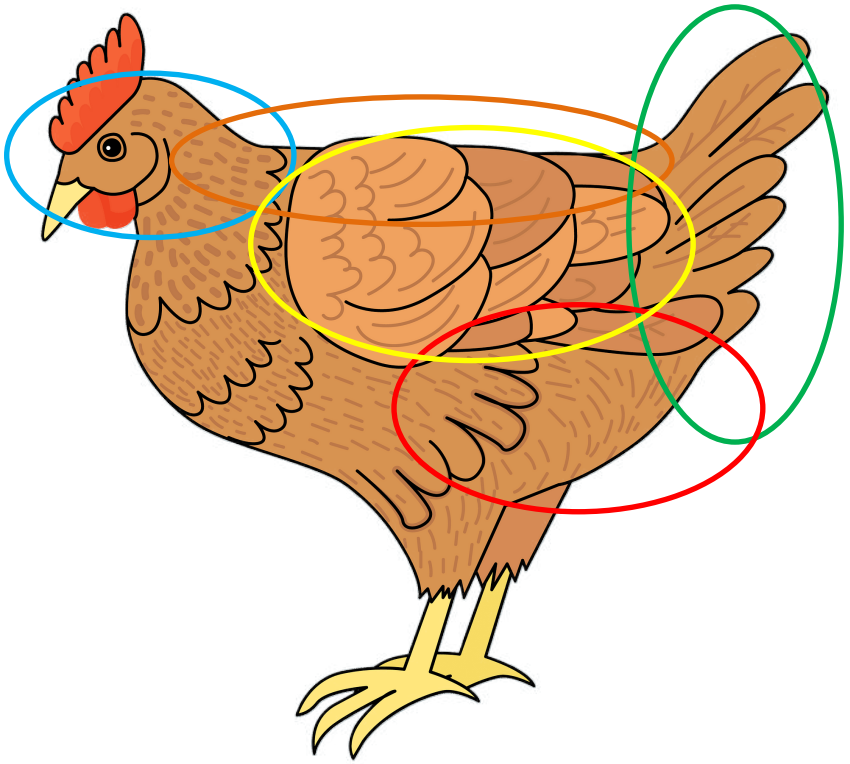
- Due to difficulties, tracking only for 23 days in second round

- Wearables found to harbour poultry red mites!!

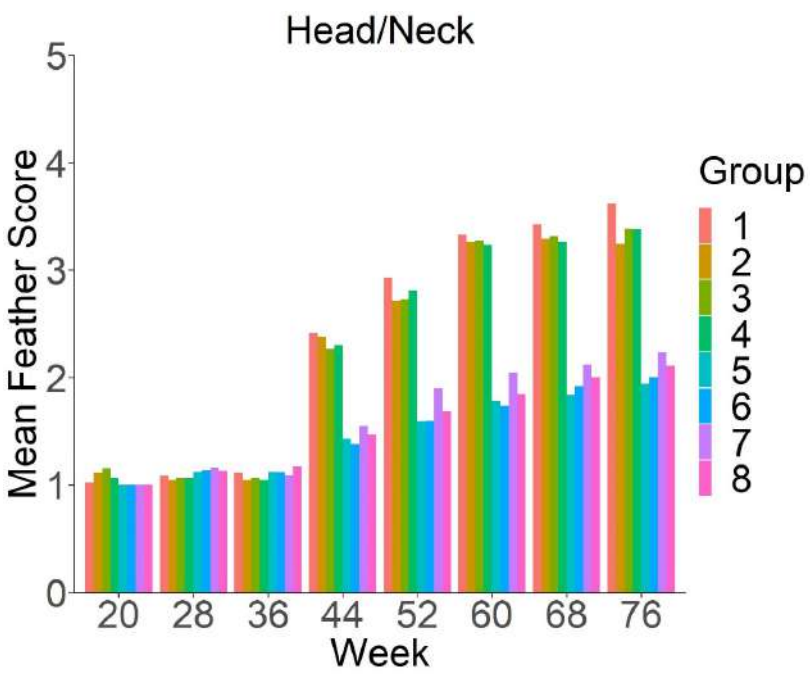
PPILOW WP4.2 – Feather Scoring

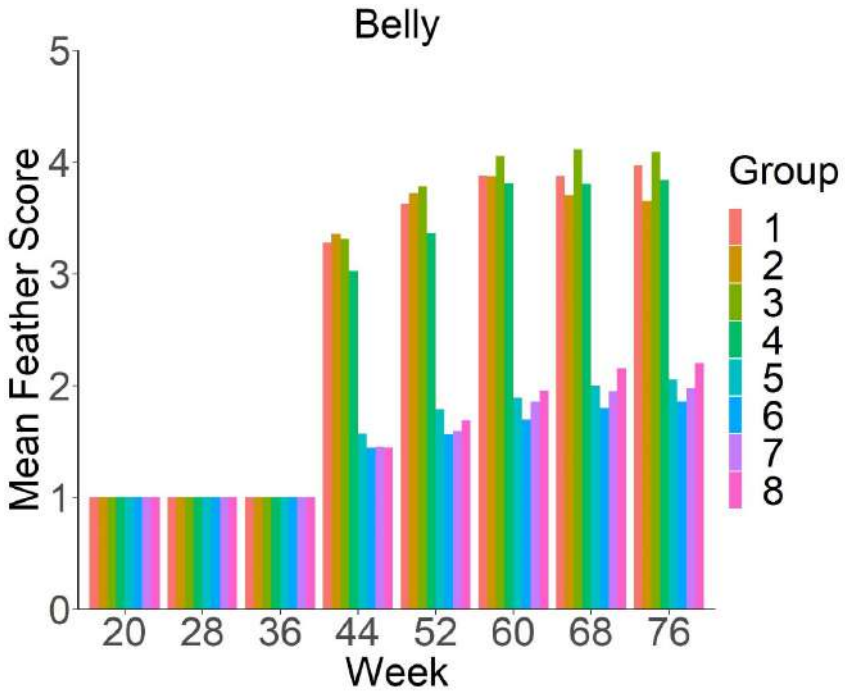
- Body scoring (every ~8 weeks)
- Feather and skin condition according to body region
  - Head/neck
  - Back/rump
  - Tail
  - Belly
  - Wings

- Score of 0 = perfect feathers/skin



PPILOW WP4.2 – Feather Scoring





CLMM=>

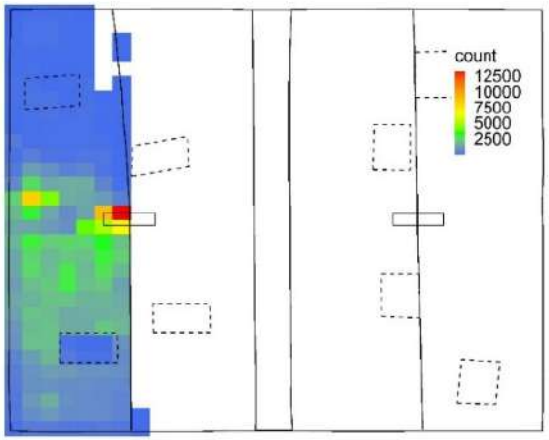
Week: 0.102, p<0.0001
Round: -1.94, p<0.0001

Week: 0.121, p<0.0001
Round: -2.64, p<0.0001

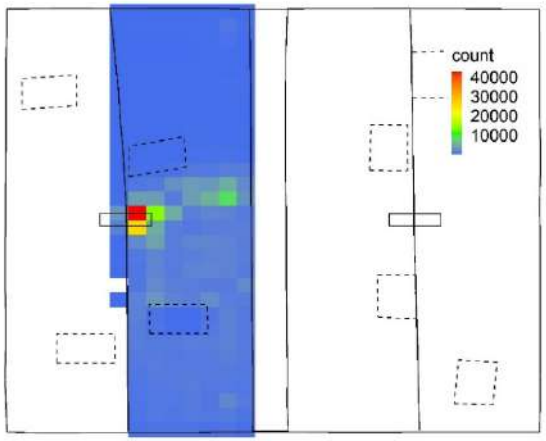
Inc, Lv not significant

PPILOW WP4.2 – Range Use – Heat Maps

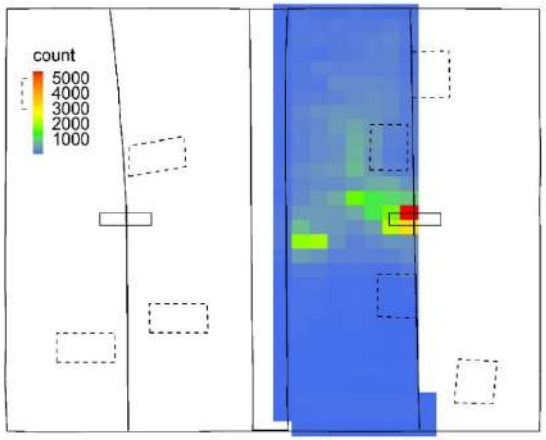
Group 1



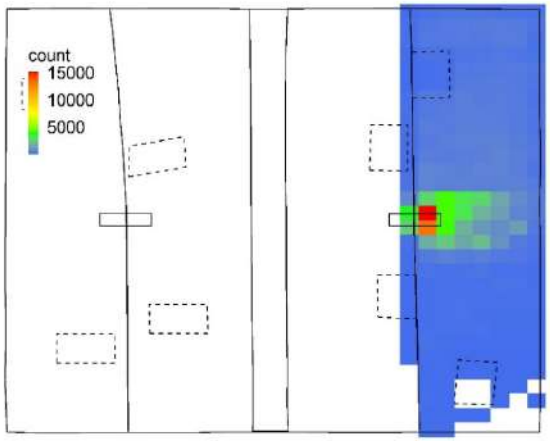
Group 2



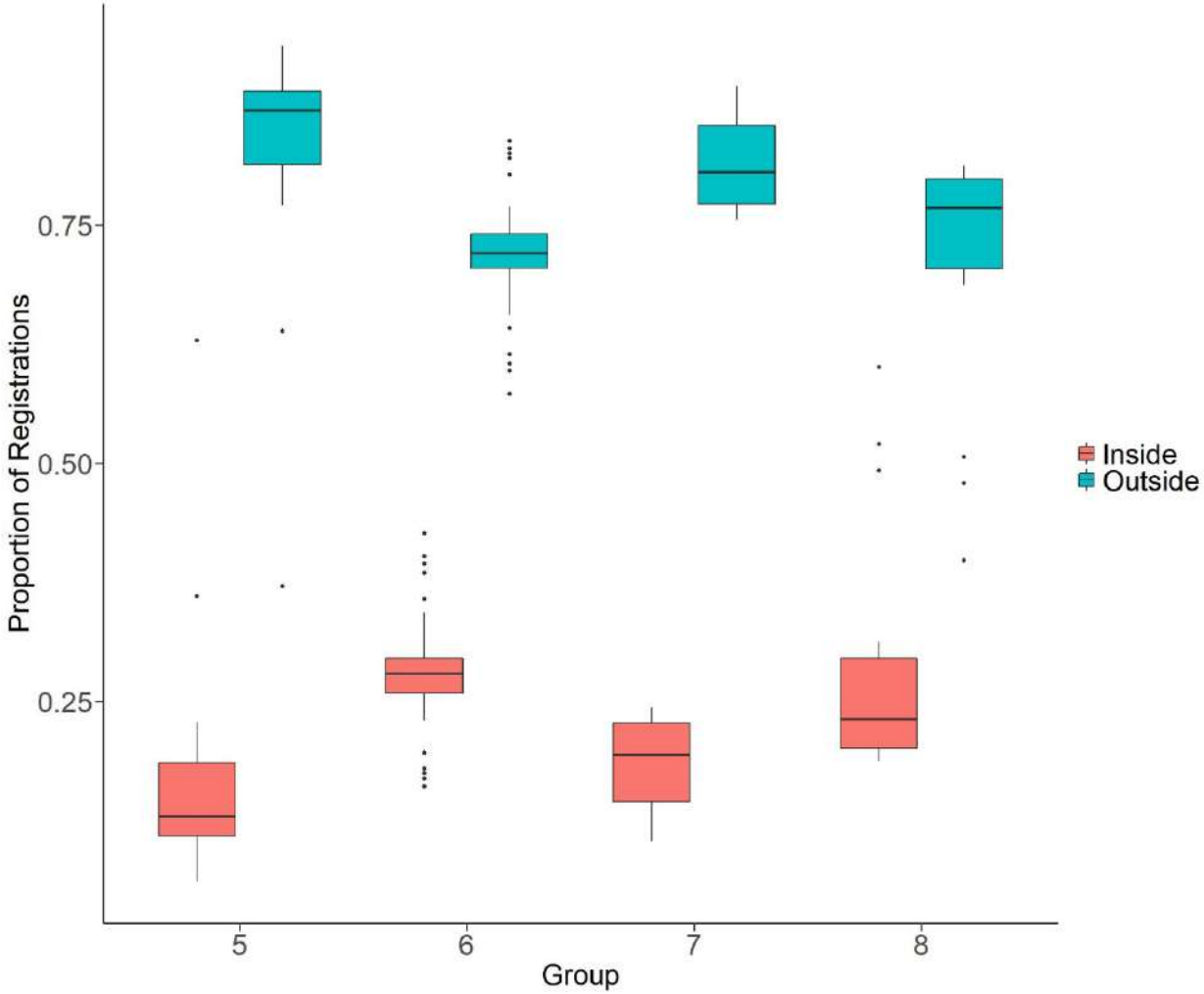
Group 3



Group 4

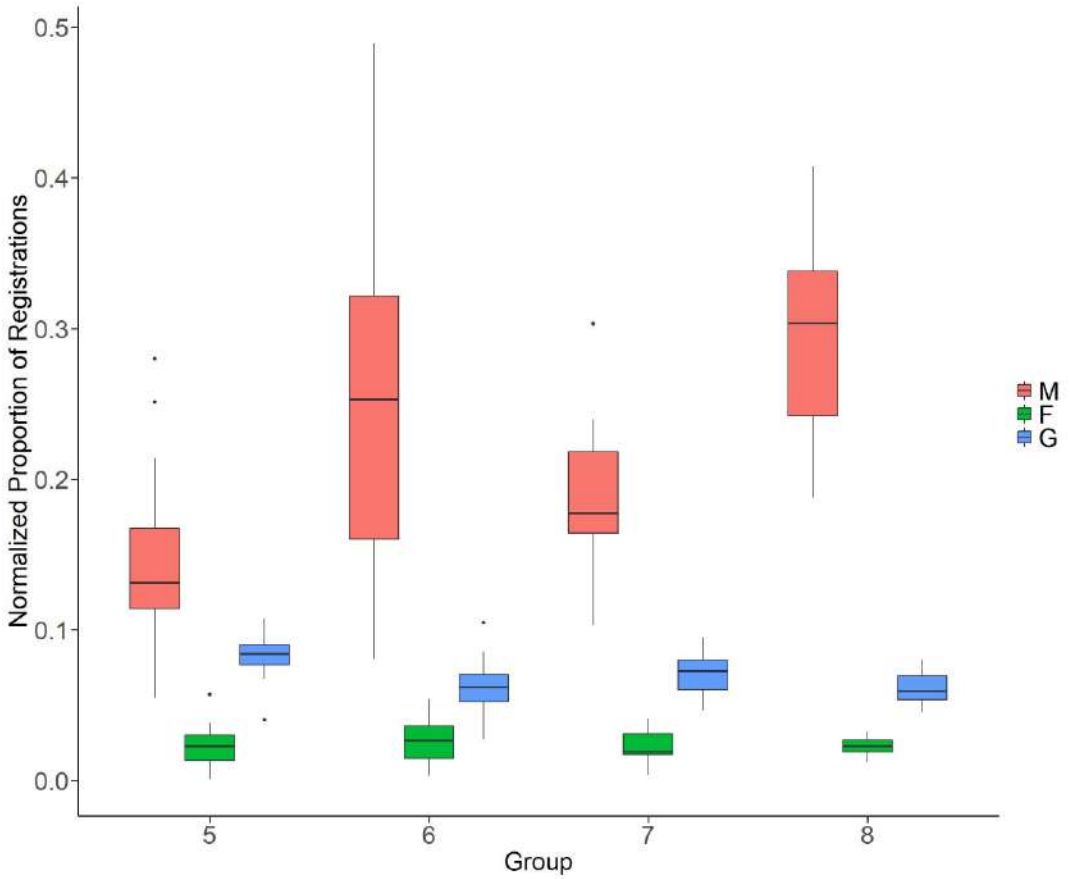


PPILOW WP4.2 – Range Use – Indoors vs Outdoors



- Hens more likely to be found outside
  - GLMM: 0.532, $p<0.0001$

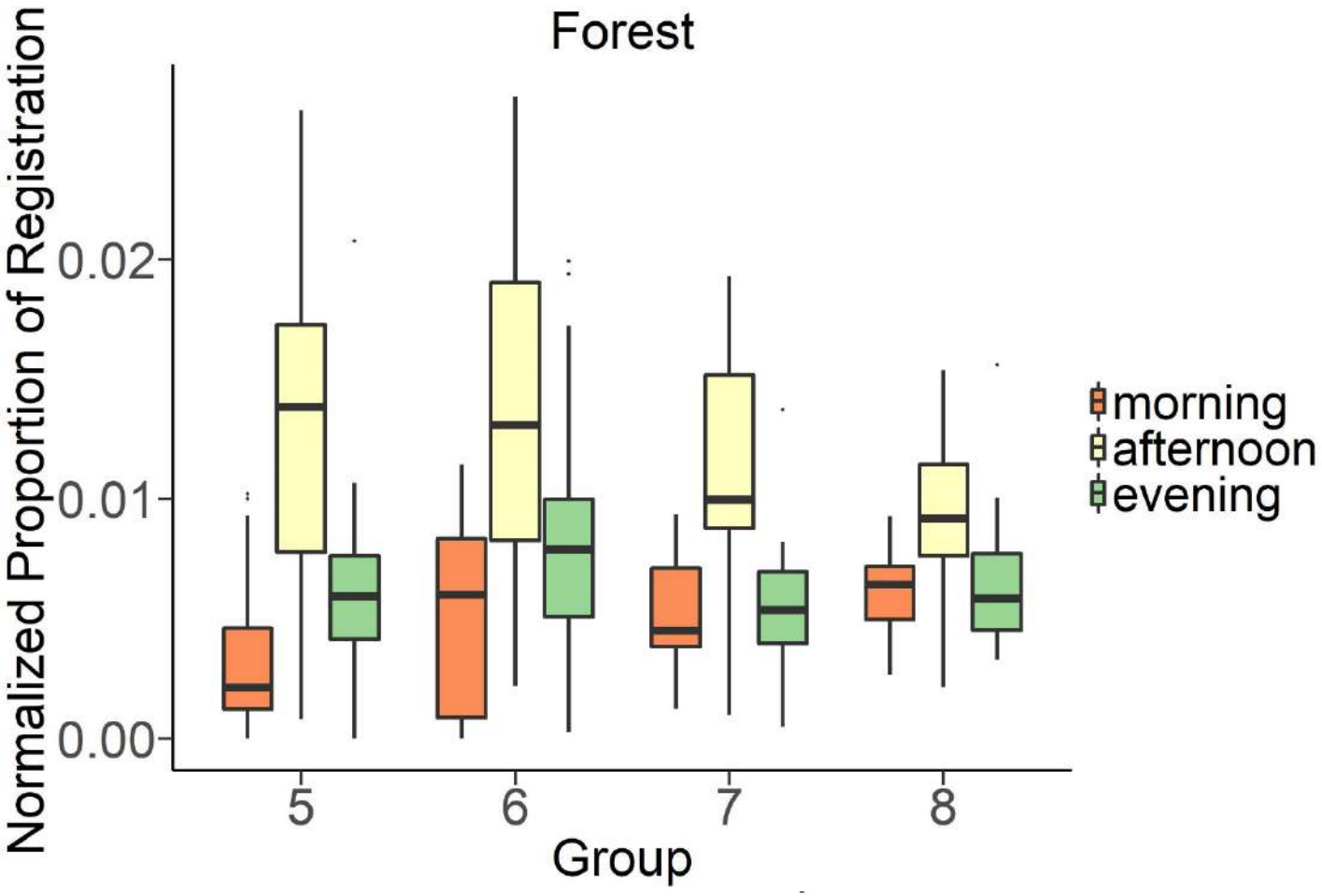
PPILOW WP4.2 – Range Use – Vegetation Preference



- Hens more likely to be in the middle area, followed by the grassy area (-0.160, $p<0.0001$), followed by the forest area (-0.204, $p<0.0001$)

- Inc, Lv and Rg not significant

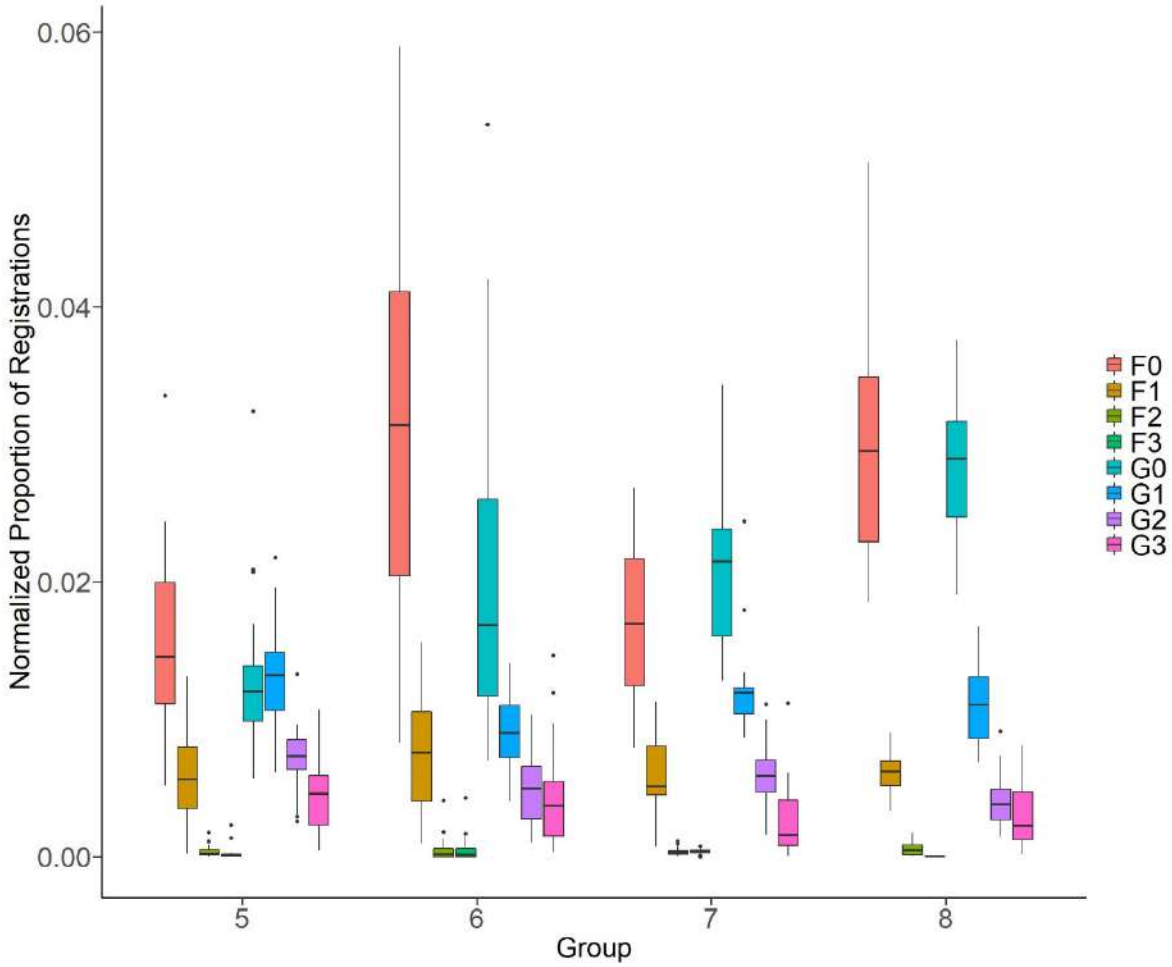
PPILOW WP4.2 – Range Use – Time of Day Effects



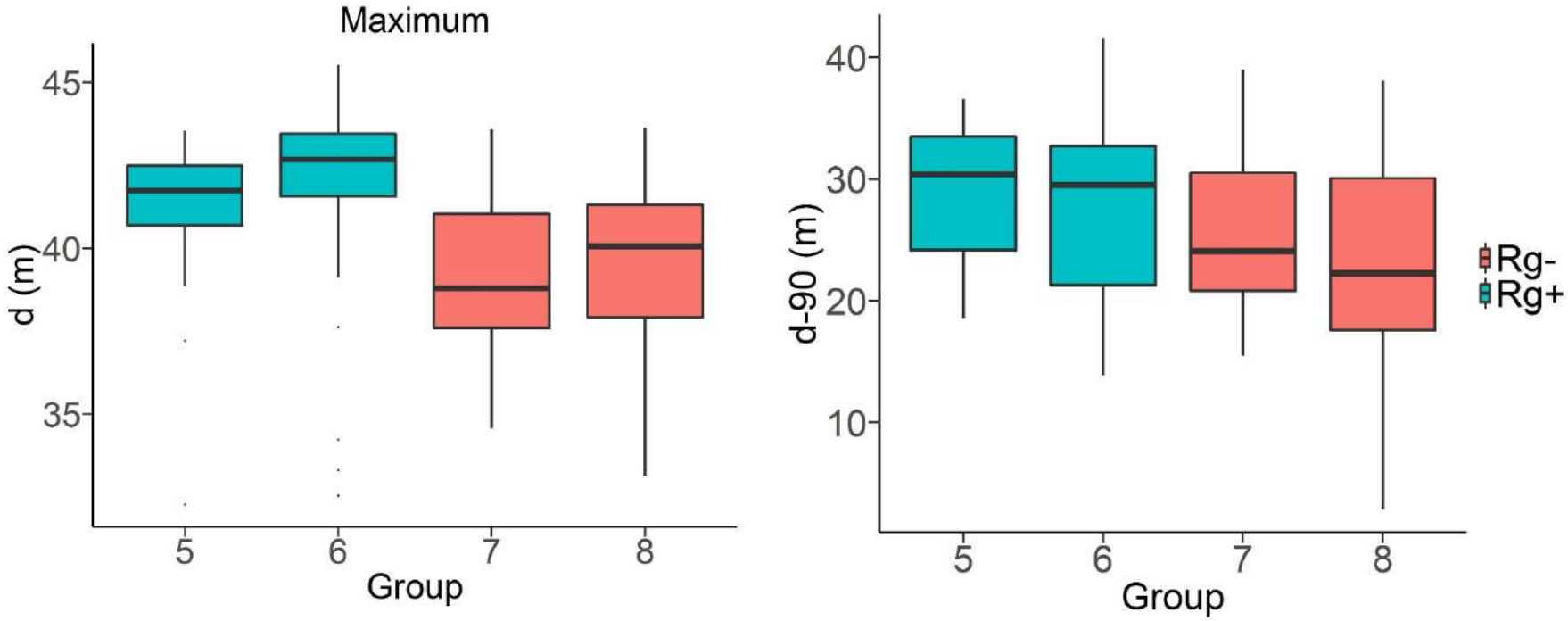
- Slight uptick in Forest usage in afternoon
  - Dust-bathing?

PPILOW WP4.2 – Range Use – Zone Preference

- Hens more likely to be found in: (ranked list)
  - F0
  - G0
  - G1
  - F1
  - G2
  - G3
  - F2
  - F3



PPILOW WP4.2 – Range Use – Distance from House



- No effect of any treatment on maximum distance from house or 90th percentile

PPILOW WP4.2 – Summary of Results

- Early-life treatments had no large effect on feather condition
- Confinement due to avian influenza (round effect) and time (feathers worsen over time) had largest effects on feather condition
- Hens overall preferred grassy area of range
  - Still contained trees for shade and protection, but plentiful grass
    - Foraging?
  - Slight differences depending on time of day
- Treatments had no effect on range use