

EFFECTS OF KEEL BONE FRACTURES ON INDIVIDUAL PRODUCTIVITY AND MOBILITY



ONGOING STUDIES

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UNIVERSITÄT
BERN

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Center for Proper
Housing: Poultry and
Rabbits

Animal Welfare Division
University of Bern

TEAM

- **Funded by**
 - Federal Food Safety and Veterinary Office FSVO
 - Eva Husi Foundation
 - Haldimann Foundation

- **Project Team**
 - Official Supervisor: Hanno Würbel
 - Direct Supervisor: Mike Toscano
 - Co-Supervisor: Ariane Stratmann
 - Co-Advisor: Lars Schrader, FLI Celle
 - GCB Mentor: Willy Hofstetter

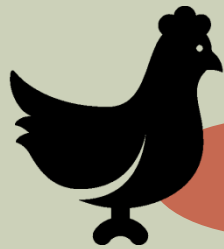
- **Collaboration**
 - Lars Schrader, FLI Celle
 - Alexandra Harlander-Matauschek, University of Guelph
 - Bret Tobalske, University of Montana

- **Radiology**
 - Urs Geissbühler
 - Sarah Baur (Master student)

- **Others**
 - Animal care: Aviforum staff
 - Technicians: Markus Schwab
Mischa Müller
 - Lab work: Selina Mühlemann

PRODUCTIVITY

PRODUCTIVITY



Fracture



Fitness ↓

Calcium demand ↑



Hypotheses:

Egg quantity

- Egg number
- Egg weight

Egg quality

- Shell breaking strength
- Shell width

DECREASE

PRODUCTIVITY - METHODS



- **150 focal hens**
 - 10 identical pens (commercial setting)
 - 2 hybrids, minority focal birds
- **11 time points**
 - 22, 25, 28, 33, 37, 40, 45, 49, 54, 57, 61 weeks of age
 - 5 days of data collection each
- **Dye administration**
 - → individual egg quality
- **Xrays after data collection**
 - → fractures
- **Blood sampling**
 - → reproduction hormones (2 time points)
- **Feather scoring / weighing**
 - → general condition (2 time points)
- **Crop content**
 - → estimate of feed intake

PRODUCTIVITY - METHODS

- Dye administration on 3 consecutive days
 - Fat soluble dye
 - 4 different colours
 - 15 distinct combinations



PRODUCTIVITY - OUTCOME



X-RAYS

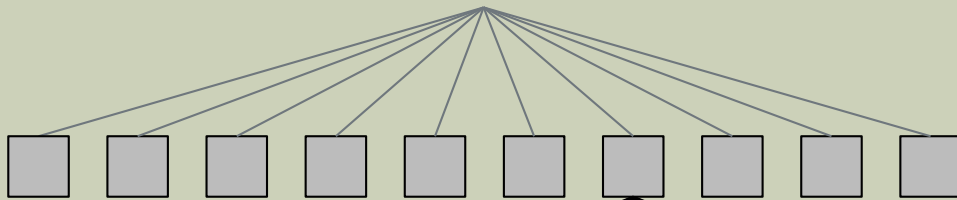
- Fracture / no fracture
 - Location
- Fracture Type
- Callus formation
 - Angles
 - Dislocation
 - ...



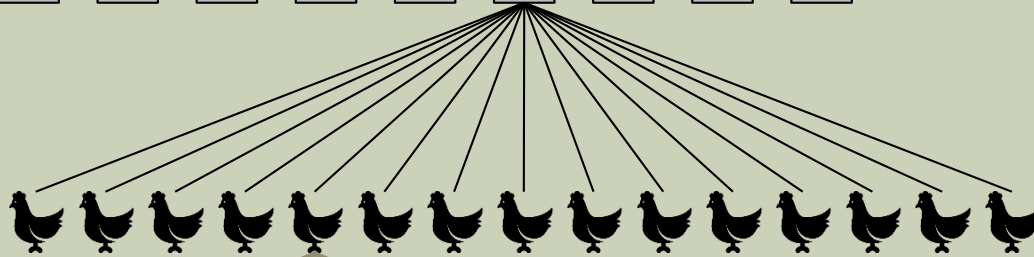
EGG PARAMETERS

- Number of eggs
- Egg weight
- Shell breaking strength
- Shell width

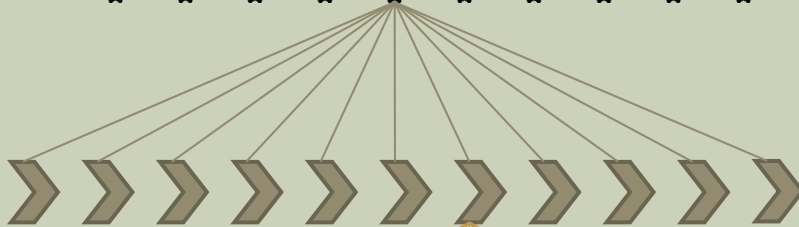
PRODUCTIVITY - OUTCOME



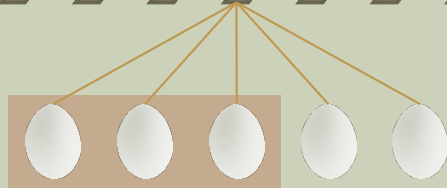
10 pens



144 hens

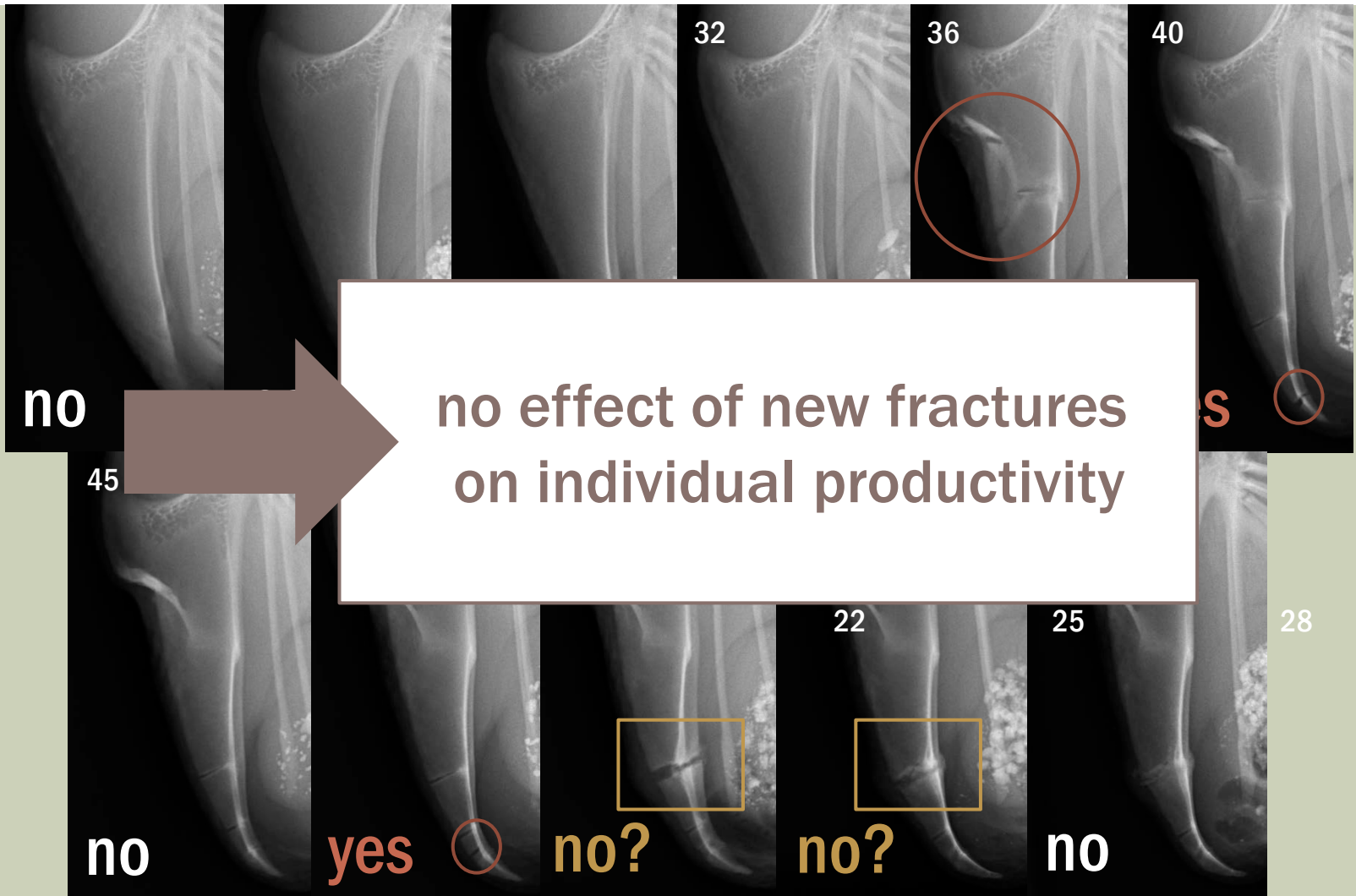


545 lesions

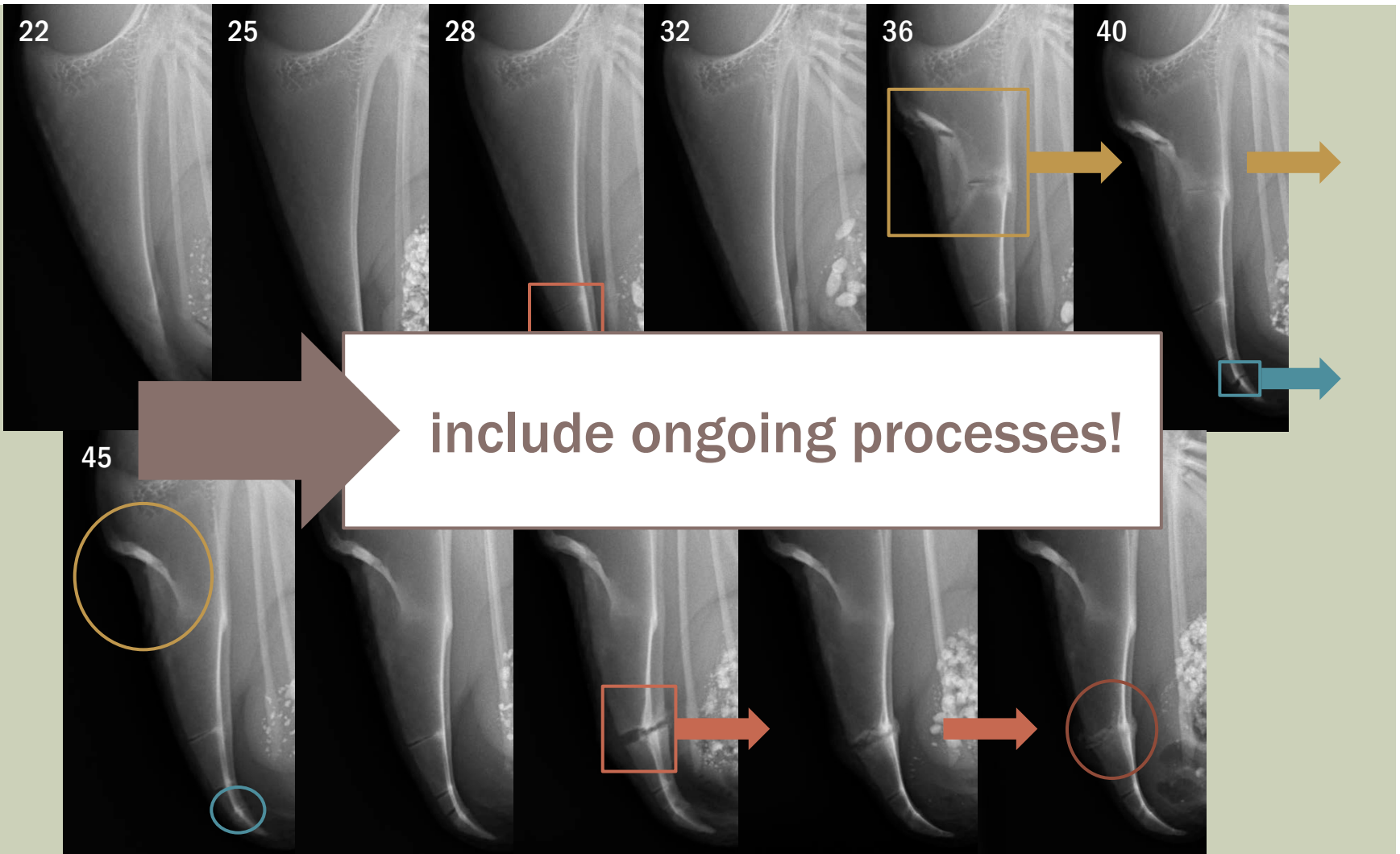


7373 eggs counted
4391 eggs analysed

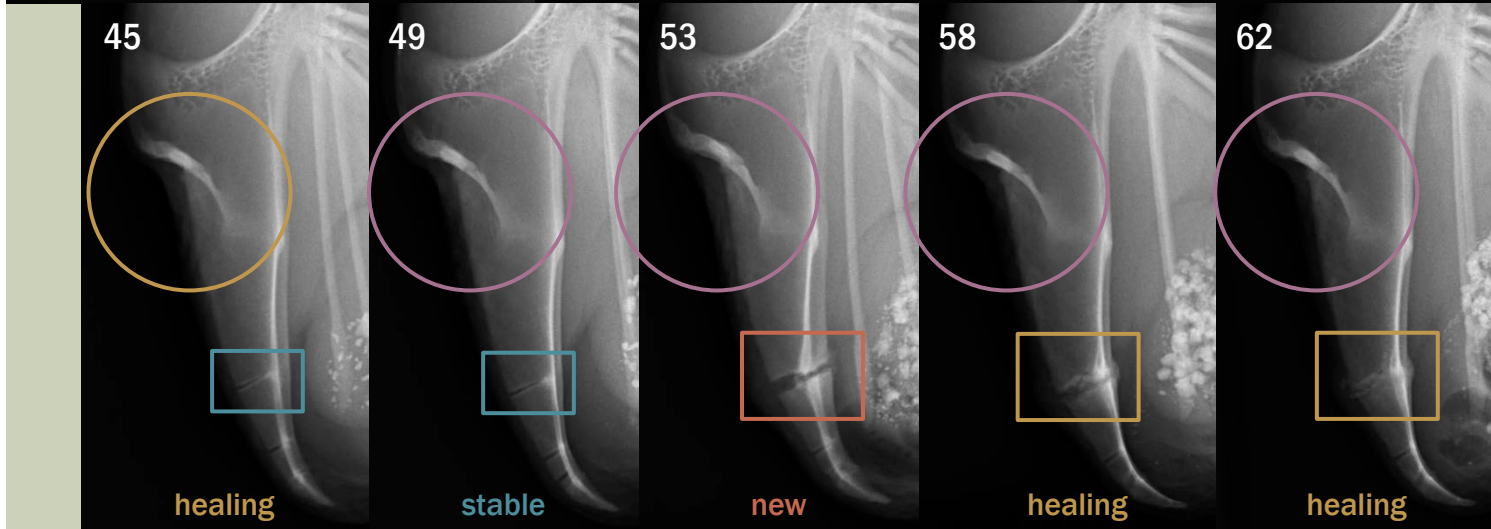
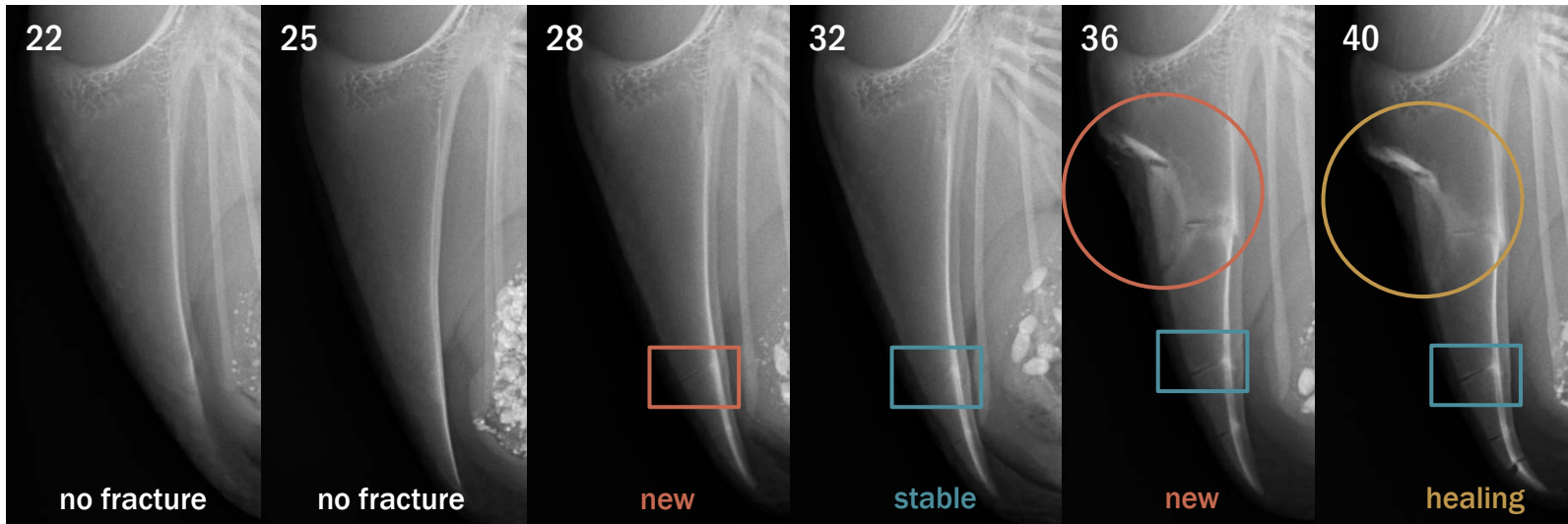
NEW FRACTURES



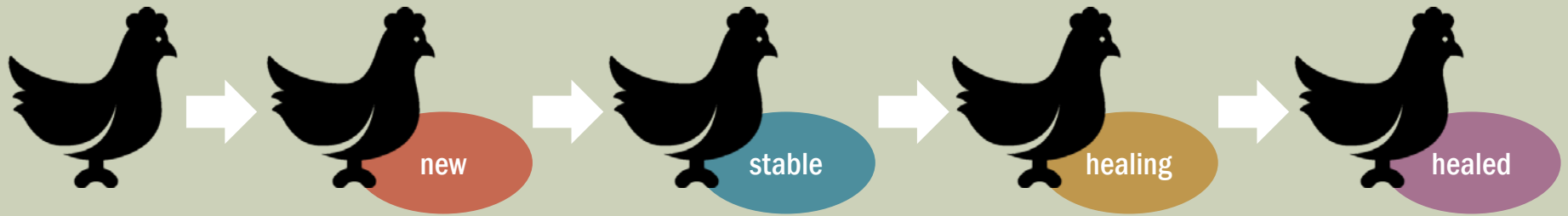
BUT...



HEALED << STABLE << NEW << HEALING

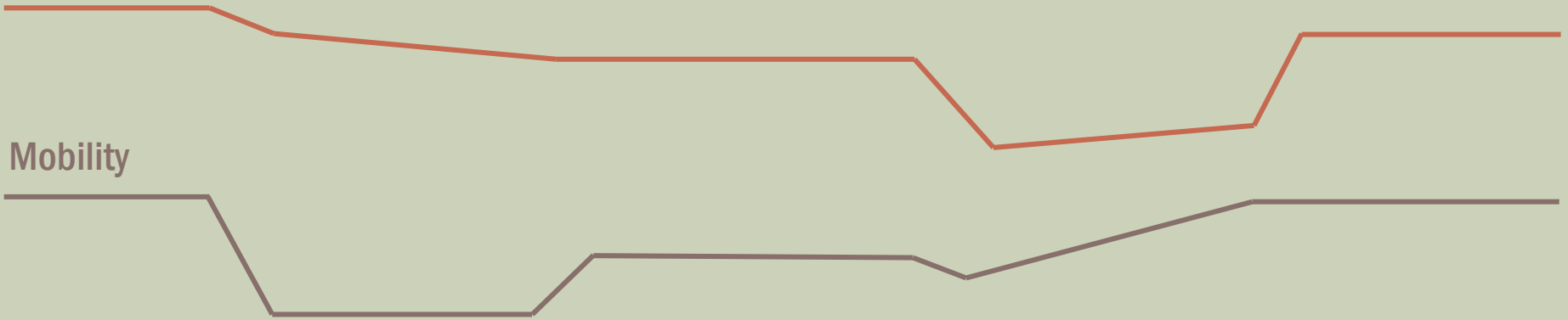


PRODUCTIVITY VS. MOBILITY



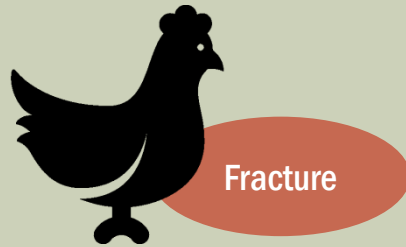
Productivity

Mobility



MOBILITY

MOBILITY - HYPOTHESES



Pain



Mobility

Hypotheses:

- **DECREASE** Level changes
 - **DECREASE** Duration of stay per level
- PRIMARY RESOURCES**

MOBILITY - METHODS

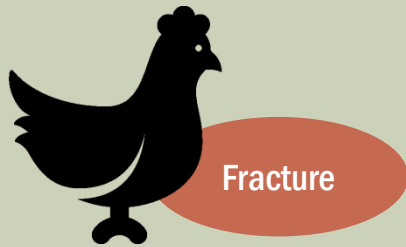
- 120 focal hens
 - 6 identical pens (commercial system)
 - 2 hybrids, minority
- 11 time points
 - 6 days of data
- Infr
 - 6 levels: litter, w
- X-rays after dat
 - → fractures
 - 3 time points: bef
- Feather scoring
 - → general cond
- Ana
 - ?
 - ? focal birds w
 - Treatments: Oproi
- Dye capsules
 - Last time point
 - 5 days

Experiment is still running!

IR validation:
there is more!



MOBILITY - HYPOTHESES



Pain



Hypotheses:

Mobility

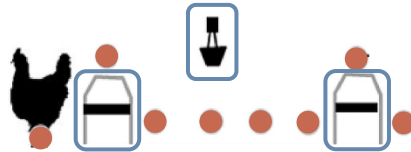
- DECREASE
 - Level changes
 - Duration of stay per level
- PRIMARY RESOURCES
- Behaviour patterns



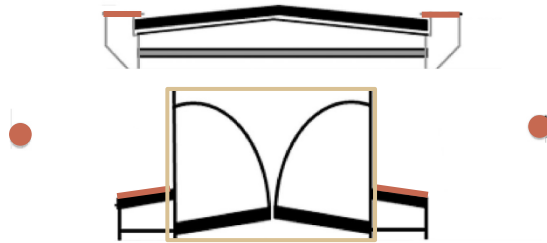
1 pen | 12 hens | 7-11 days | tracking only

IR VALIDATION - METHODS

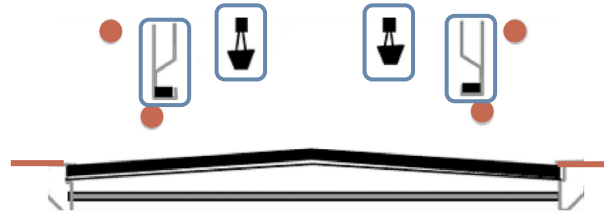
perches



nest boxes



food / water

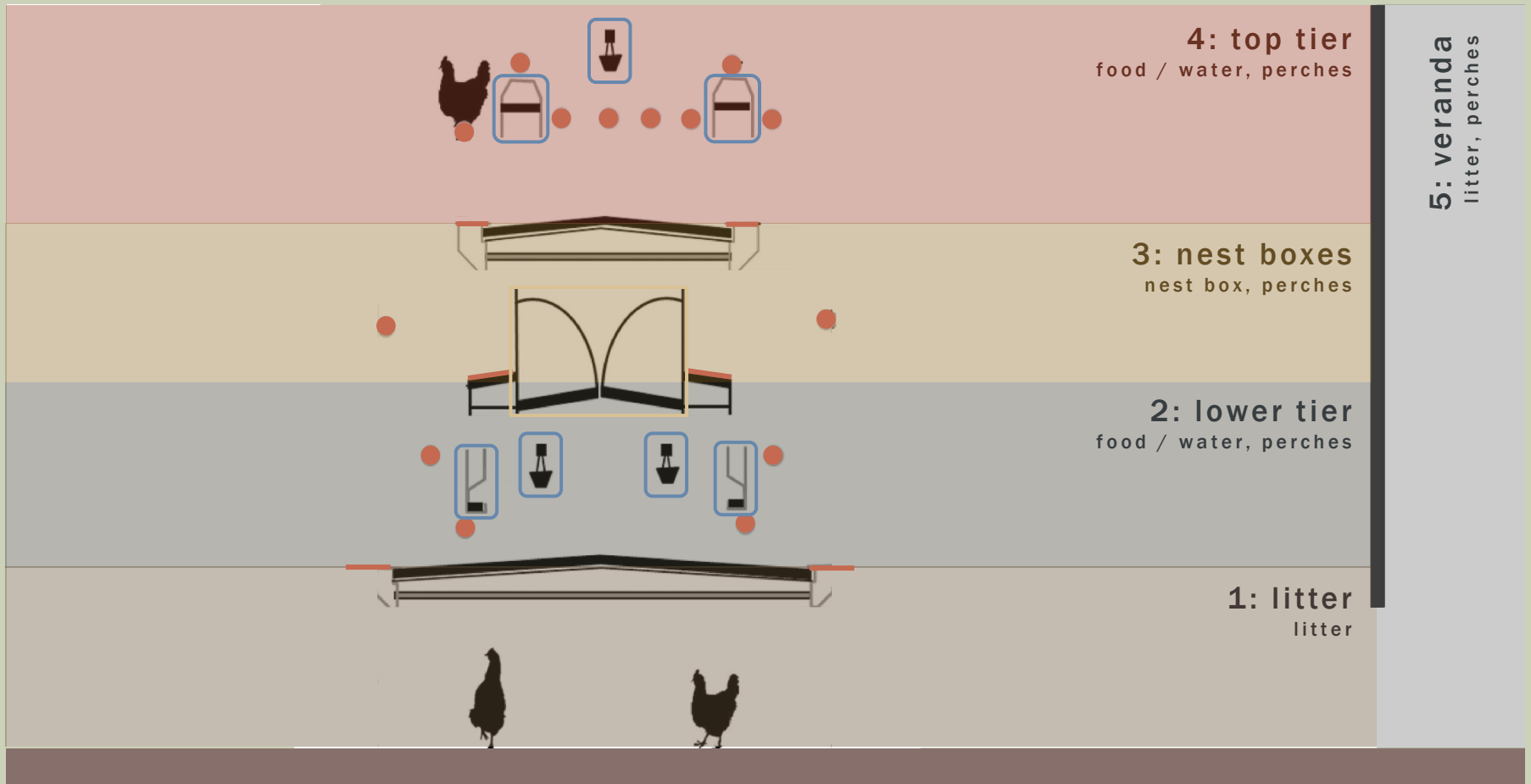


litter



outdoor area

MOBILITY - METHODS



VALIDATION TRIAL

■ Number of level changes per day

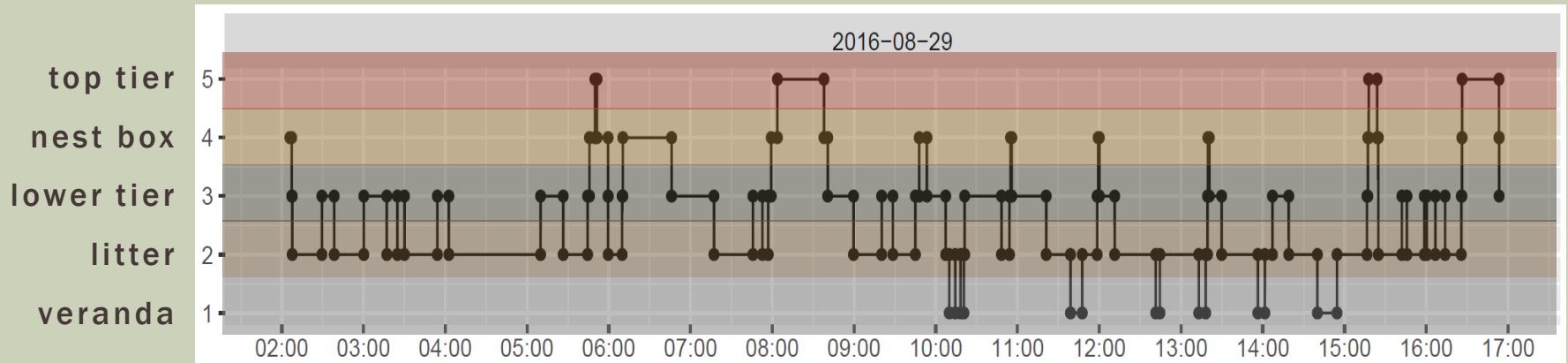
- \bar{x} 80.3 \pm 43.6
- 27.3 \pm 5.9 < x < 129.3 \pm 21.2
- Coefficients of variation (VC): 0.09 to 0.30, \bar{x} 0.17 \pm 0.06

■ Number of level entries per day

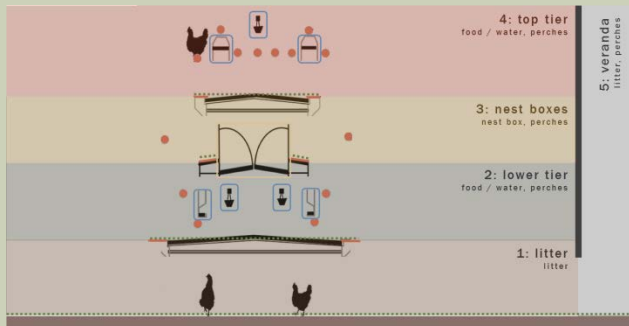
- | | | |
|---------------|---------------------------|---------------------|
| ■ Litter: | \bar{x} 27.7 \pm 11.4 | VC: 0.15 \pm 0.05 |
| ■ Lower tier: | \bar{x} 26.8 \pm 17.4 | VC: 0.21 \pm 0.10 |
| ■ Nest box: | \bar{x} 13.1 \pm 17.8 | VC: 0.40 \pm 0.22 |
| ■ Top tier: | \bar{x} 3.9 \pm 4.4 | VC: 0.46 \pm 0.26 |
| ■ Veranda: | \bar{x} 9.0 \pm 4.4 | VC: 0.26 \pm 0.13 |

OUTPUT: EXAMPLE

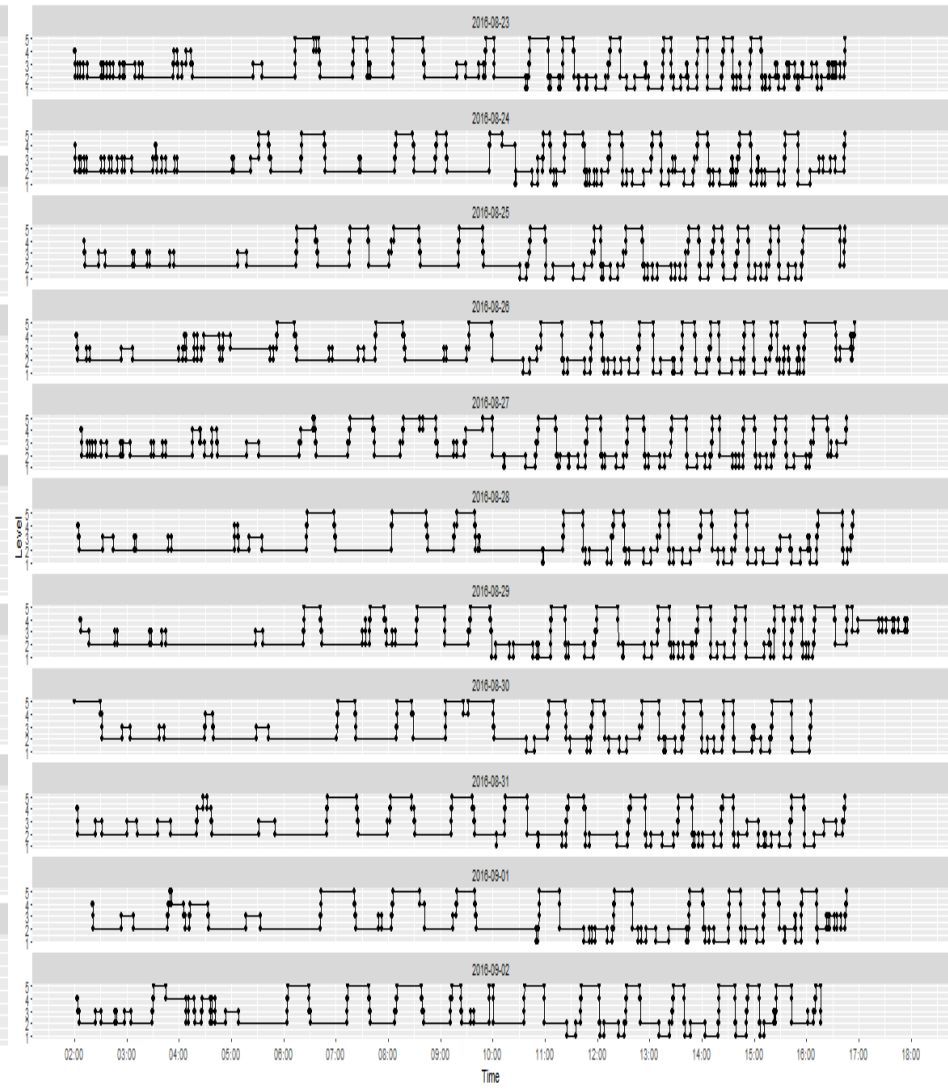
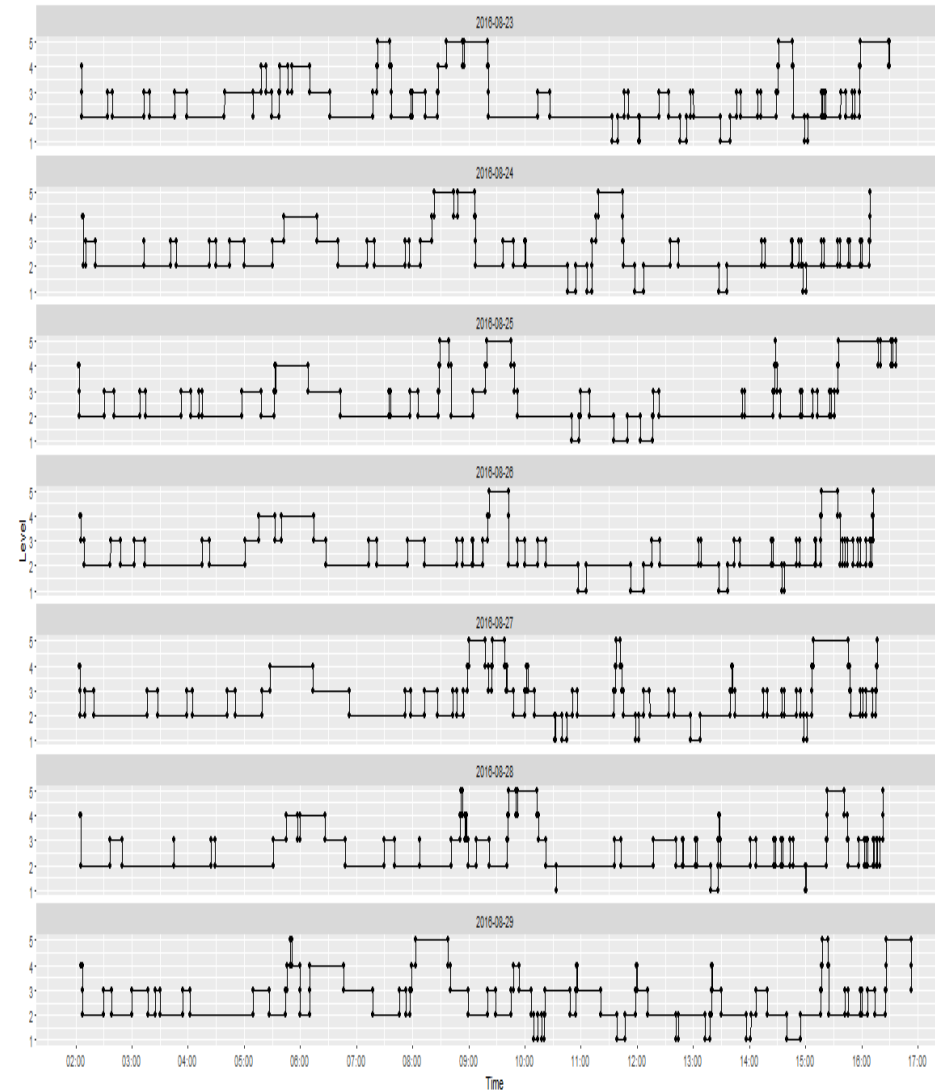
light



veranda open

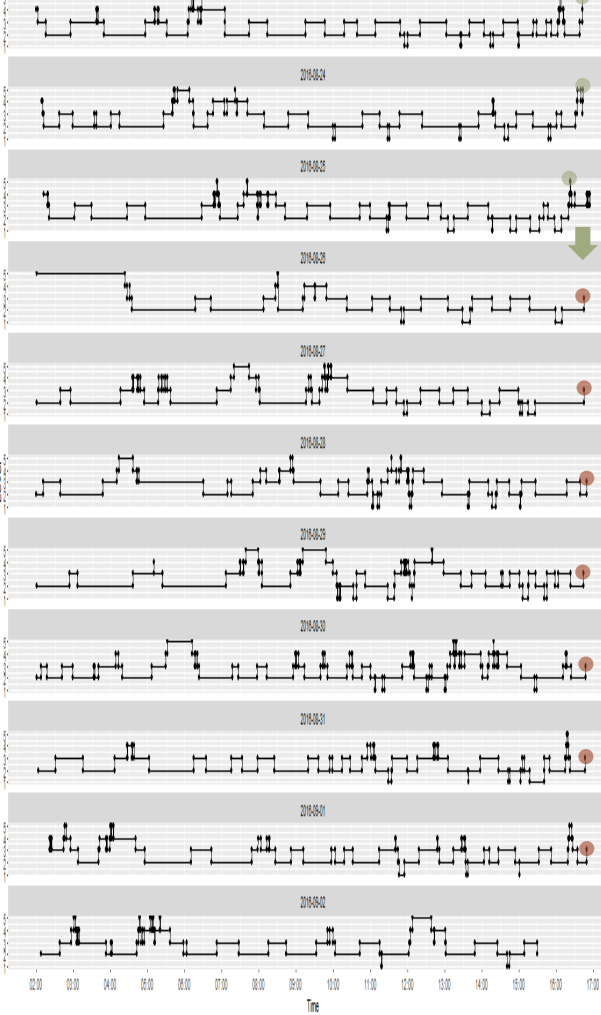


FRACTURES ~ CONSISTENCY

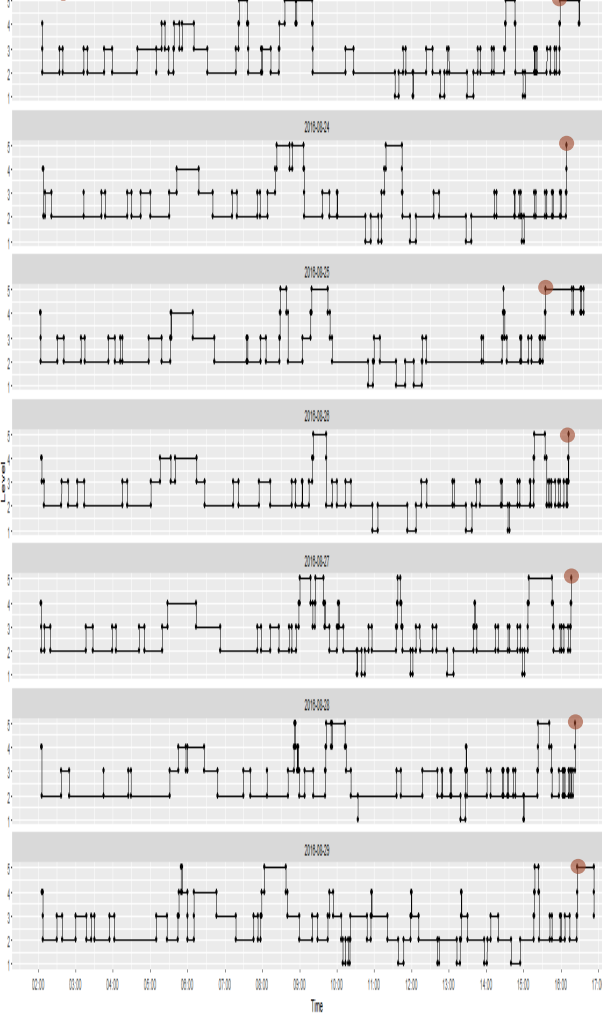


FRACTURES ~ ROOSTING LOCATION

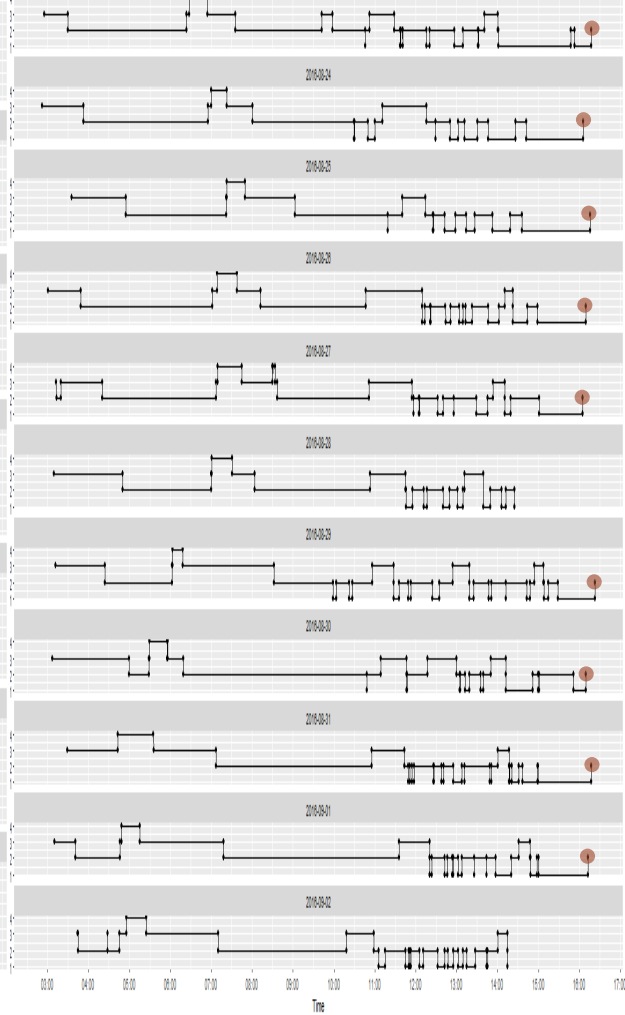
Lower tier



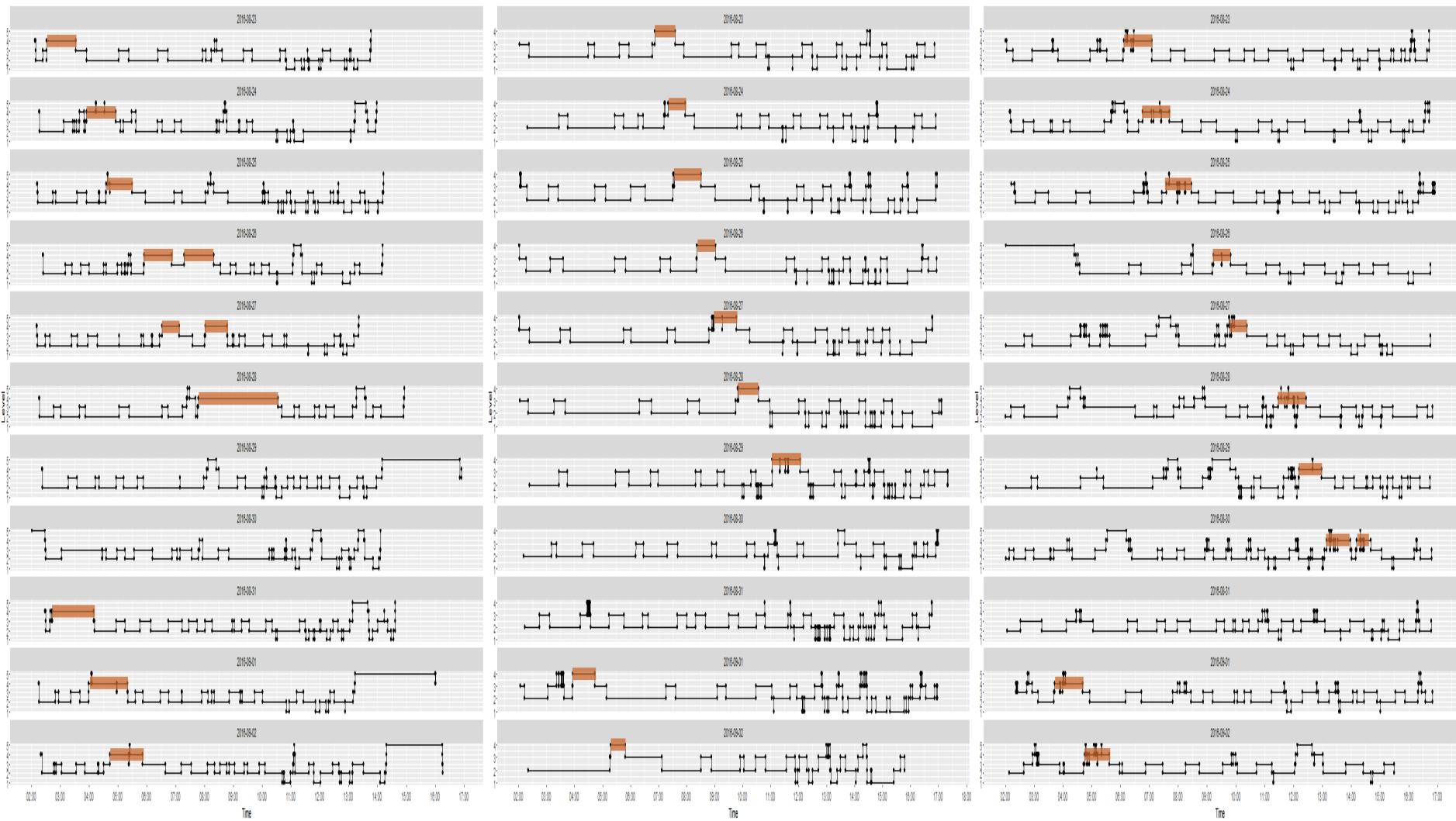
Top tier



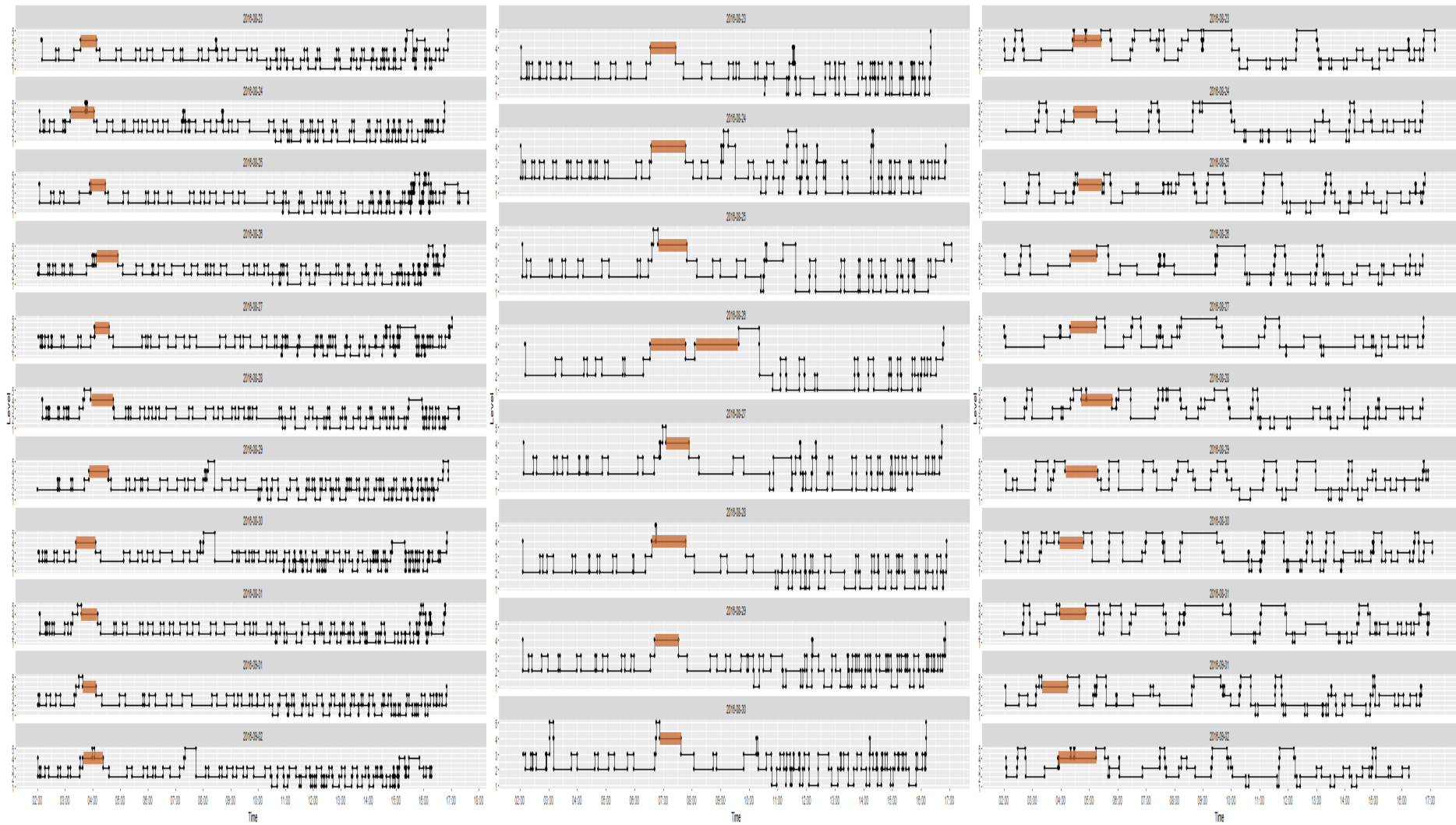
Litter



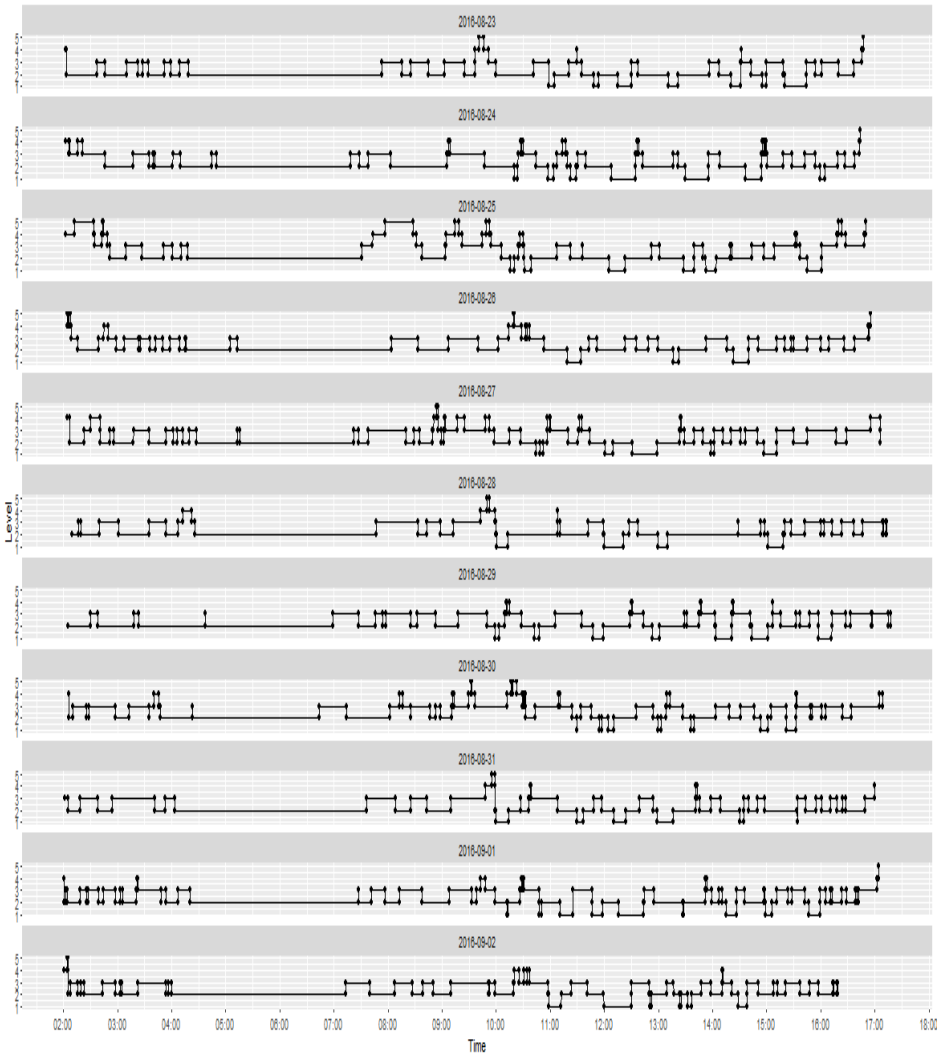
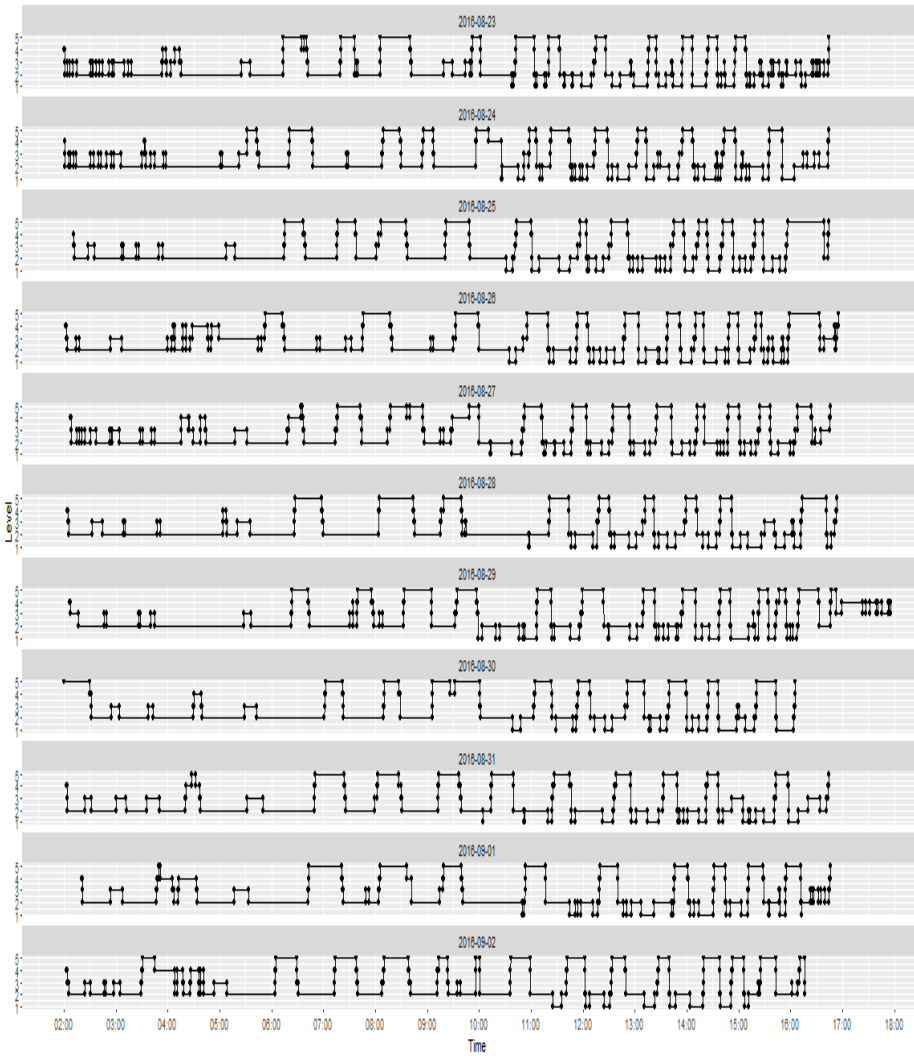
NEST BOX VISITS - 25.5H



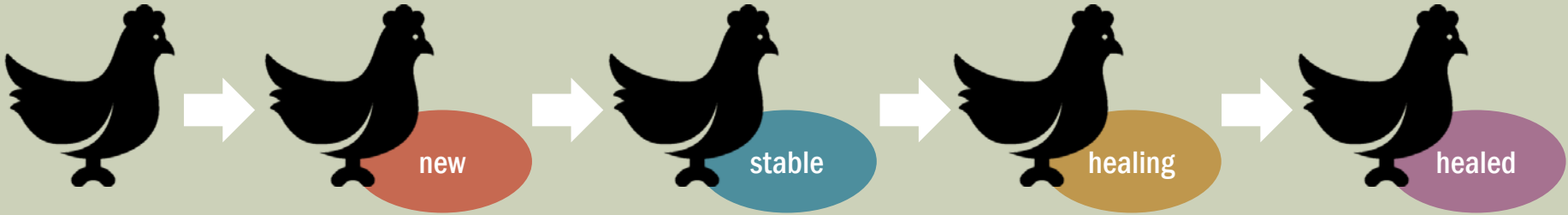
NEST BOX VISITS – 24H



NEST BOX VISITS – NEVER?



PRODUCTIVITY AND MOBILITY

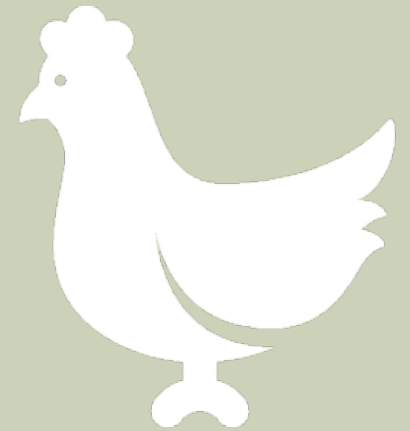


Productivity

Mobility



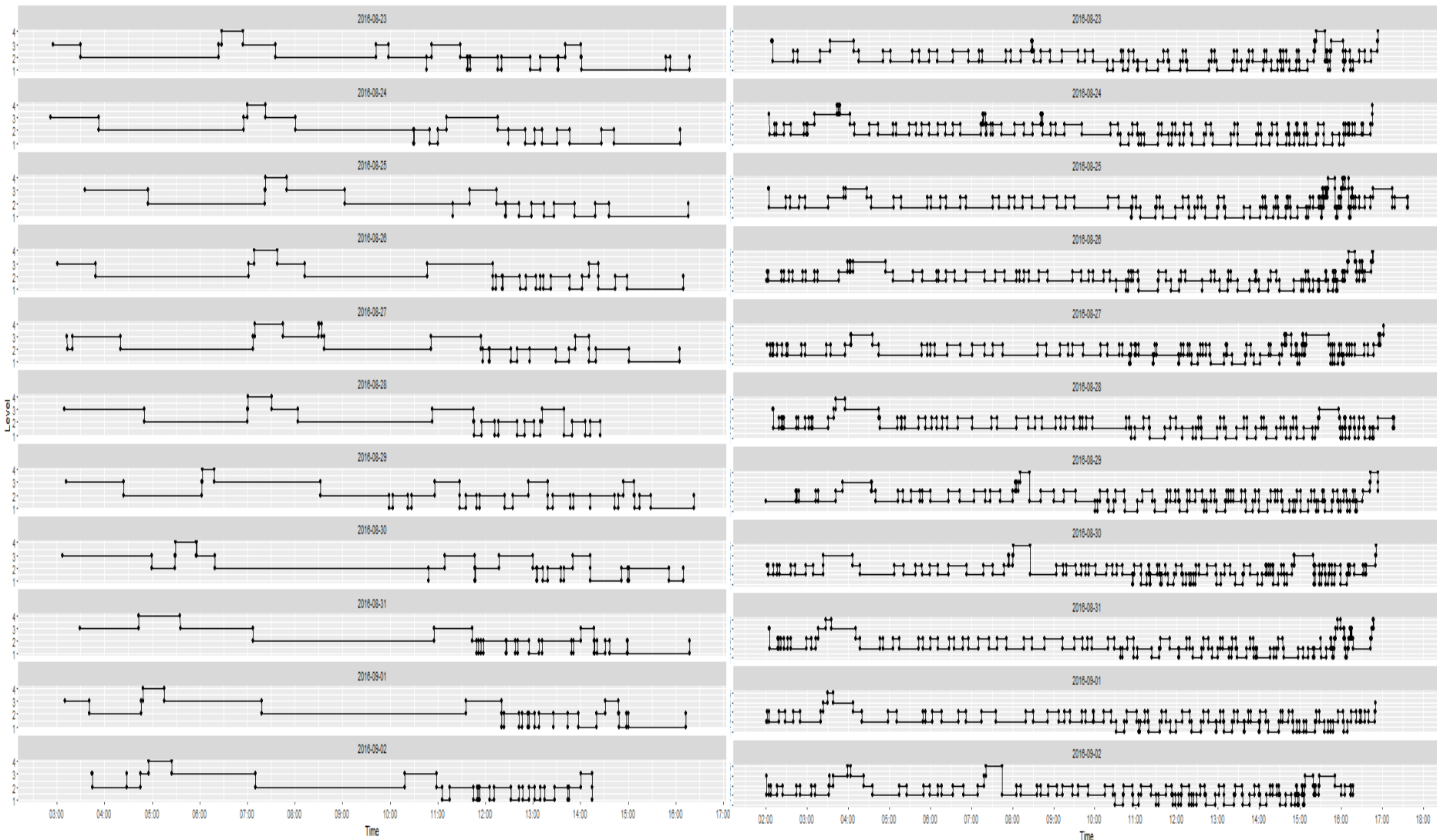
Thank you for your attention!
Questions?



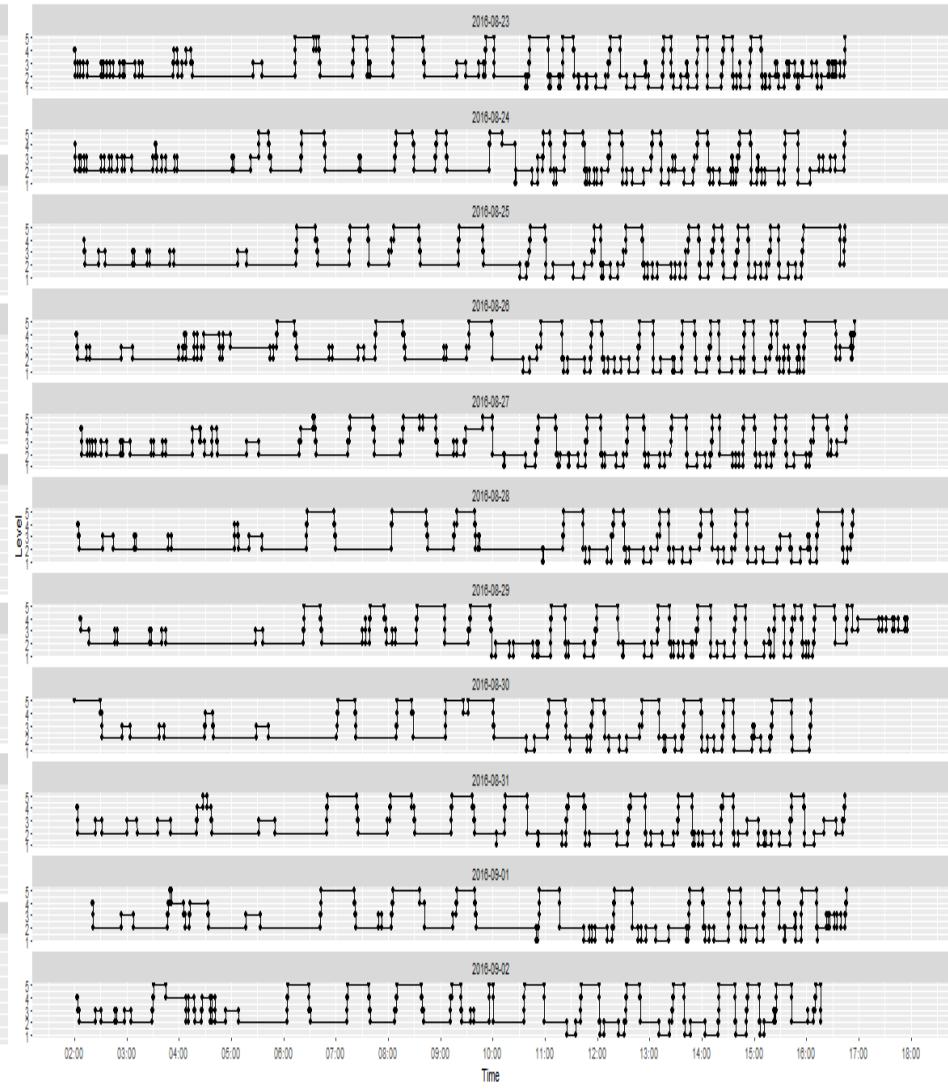
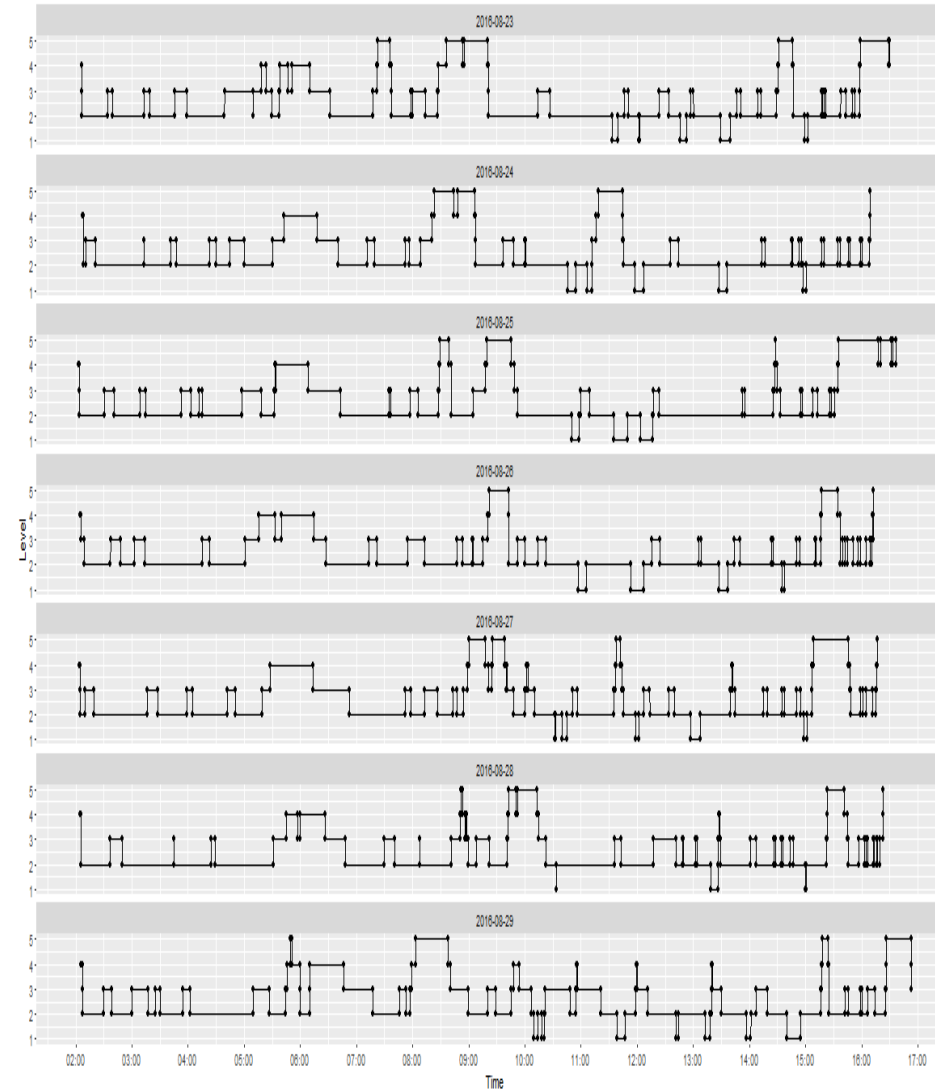
PRODUCTIVITY - STATS

- Outcome variables
 - Laying performance [%]
 - Egg mass [g]
 - Shell breaking strength [N]
 - Shell thickness [mm]
- Fix effects
 - Hybrid
 - Age
 - Fracture
- Crossed random effect
 - Pen / hen / time point / egg
 - time point / group

INDIVIDUALITY / CONSISTENCY

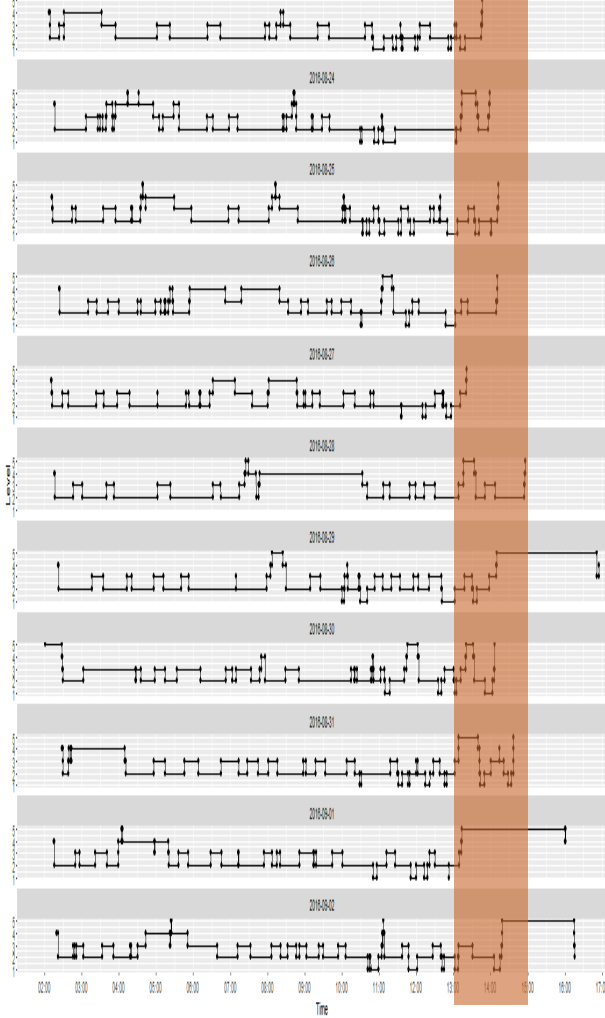


CONSISTENCY

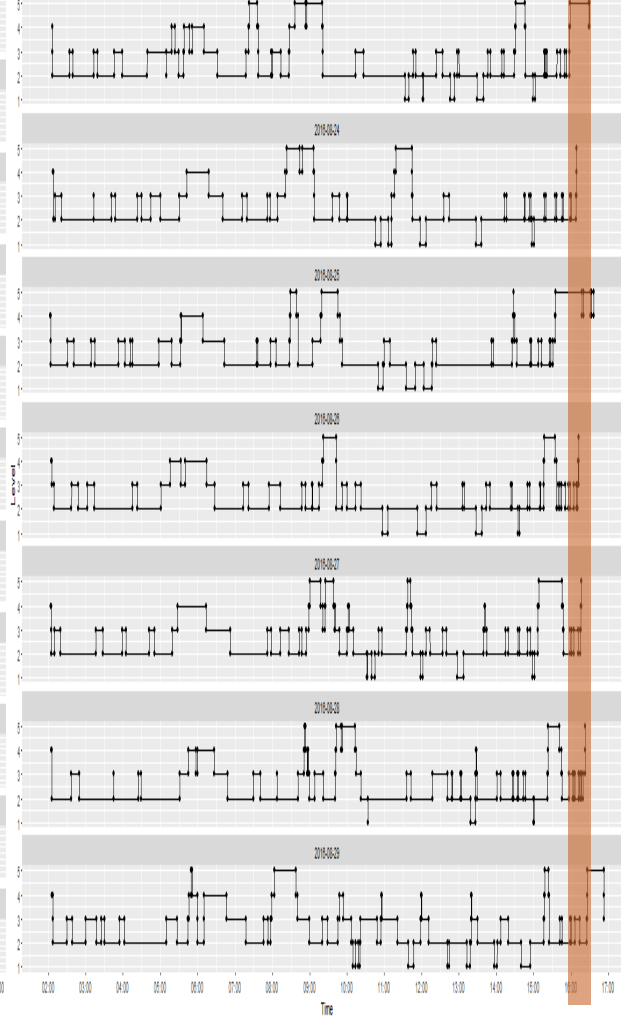


ROOSTING – WHEN?

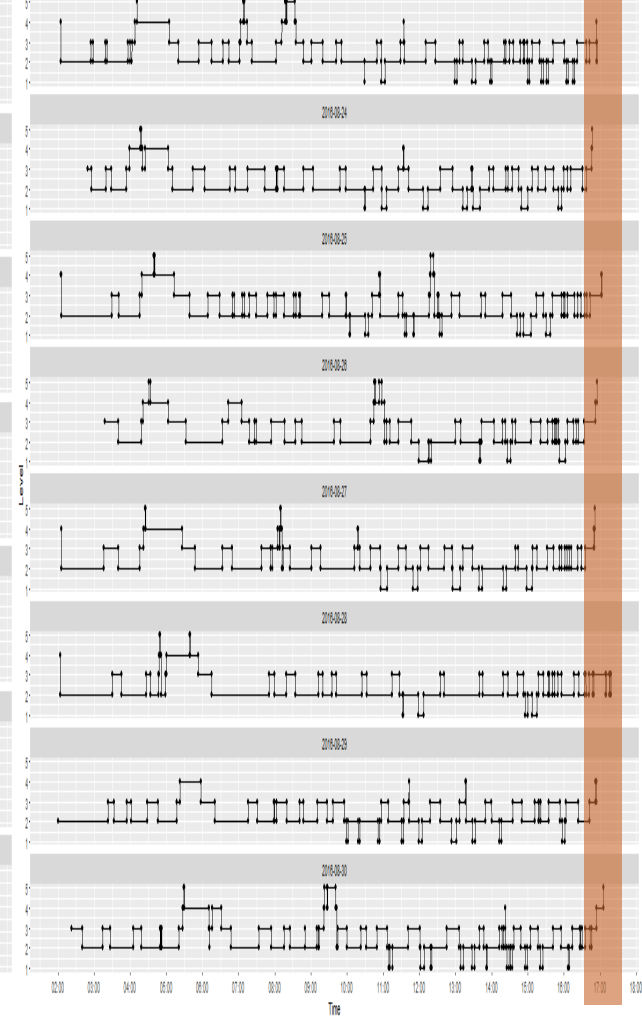
13:15 – 14:55



16:00 – 16:30

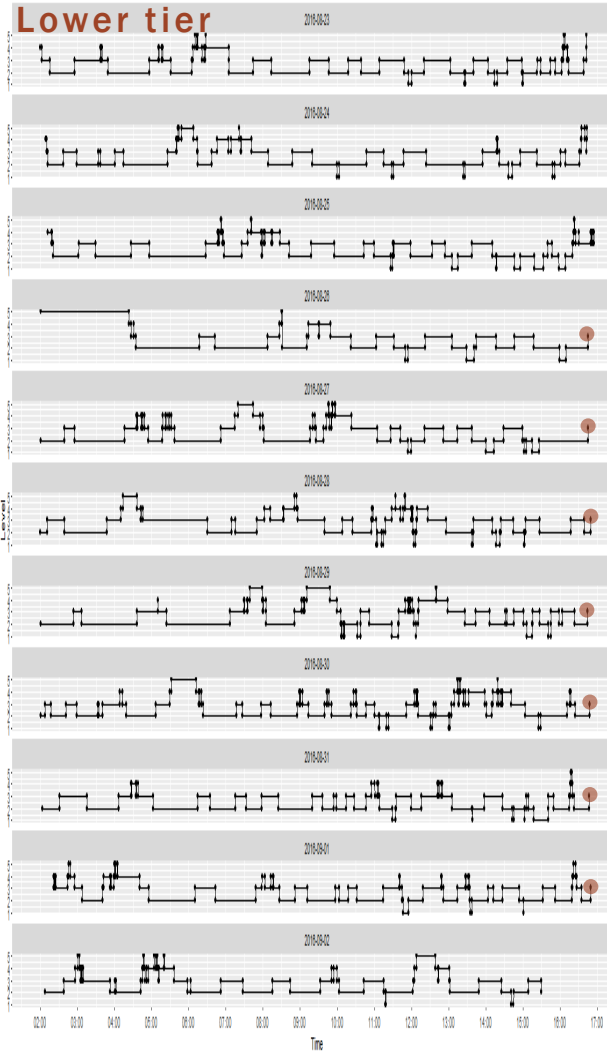


16:40 – 17:00

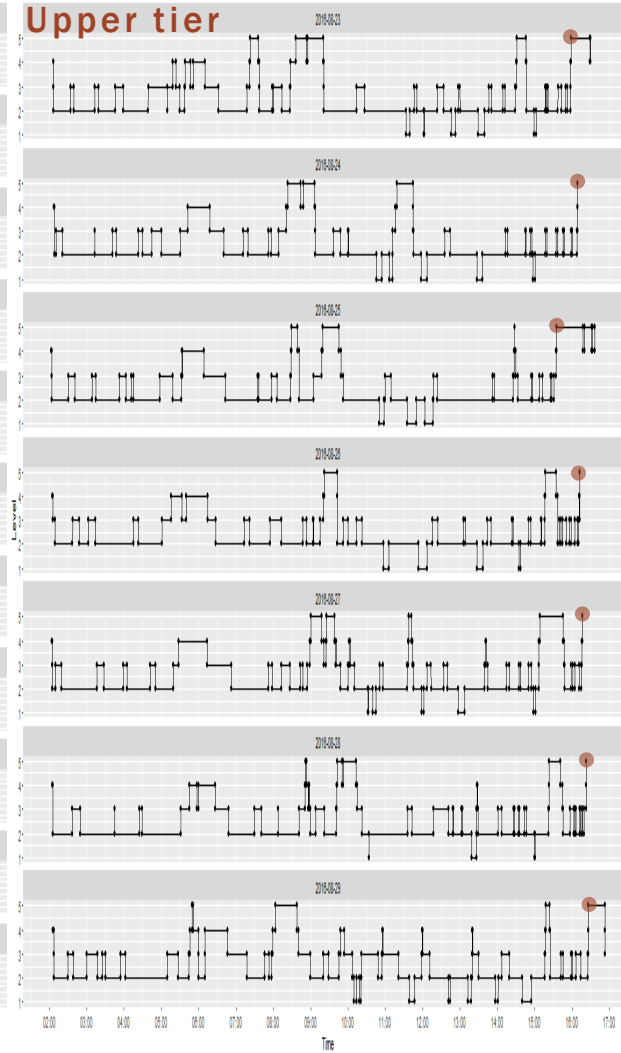


ROOSTING – WHERE?

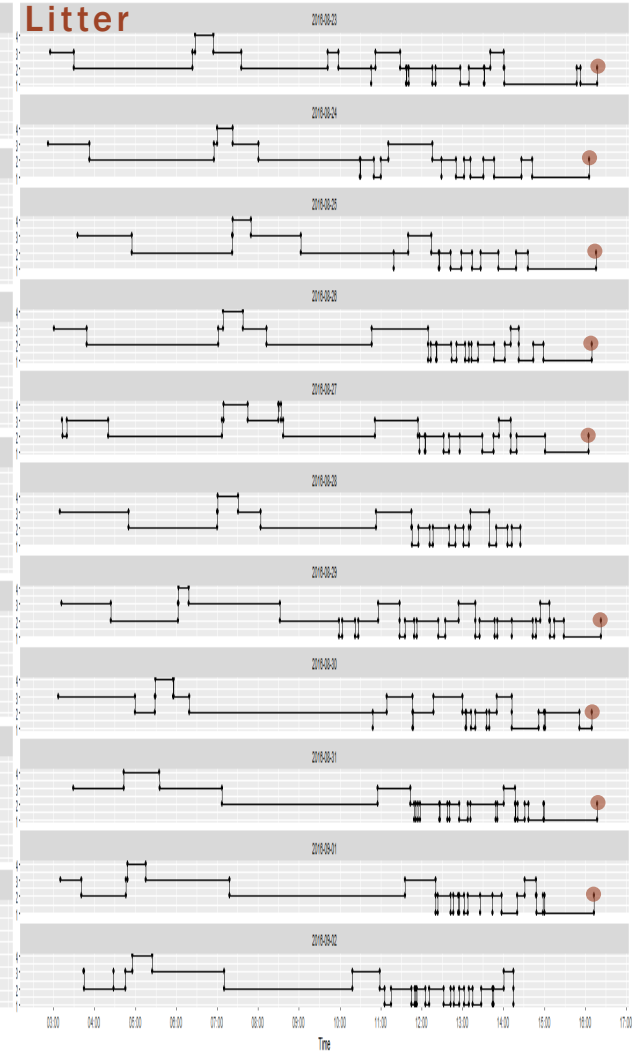
Lower tier



Upper tier



Litter



FALLS

