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STIFTUNG TIERÄRZTLICHE HOCHSCHULE HANNOVER 17 78

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Who's biting? Detecting pig screams for identifying tail biting events

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INTRODUCTION

- Tail biting is a problem in pig husbandry (Henry et al. 2021)
  - Influenced by a variety of risk factors (EFSA 2007)
  - Impact on animal health and welfare (EFSA 2007)
  - Especially in pigs with long tails (De Briyne et al. 2018)
- Methods for early identification and intervention needed
  - Animals' activity and tail posture (Statham et al. 2009)
  - Providing extra enrichment (Zonderland et al. 2008)
  - Removing biters from the pen (Taylor et al. 2010)

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INTRODUCTION

- Pig screams are a vocal response to stress/pain (Taylor et al. 2010)
  - High frequency calls that can be automatically identified (Schön et al. 2004; Vandermeulen et al. 2015)
  - Used as an indicator for stressful situations (Schön et al. 2004)

⇨ Can pig screams be used for identifying tail biting events and tail biters?

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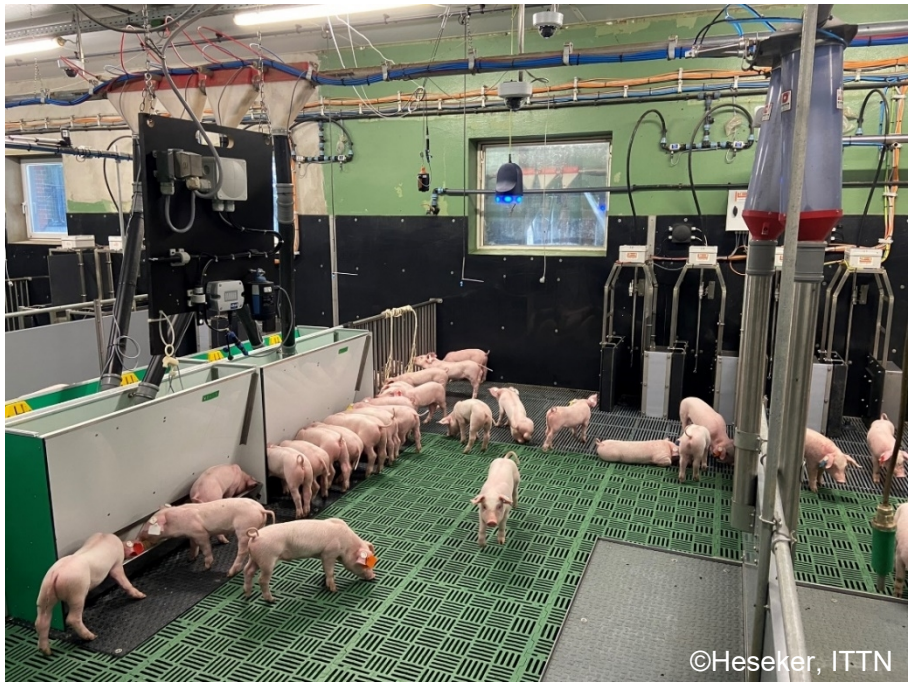
Data Collection

- 288 undocked weaner pigs from two batches
- One compartment with six pens (24 pigs/pen)
  - Individual coloured ear tags
  - Video cameras (Axis M3206-LVE)
    - 1,920 x 1,080 pixels, 20 FPS, top-down view
  - Microphone (Axis T8351 MkII)
    - 16 kHz sampling rate
- Biweekly tail examinations (Bönisch et al. 2017)
- Daily recording of fresh tail lesions and tail posture



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Tail Lesion Scoring

Score 0

Score 1

Score 2

Score 3

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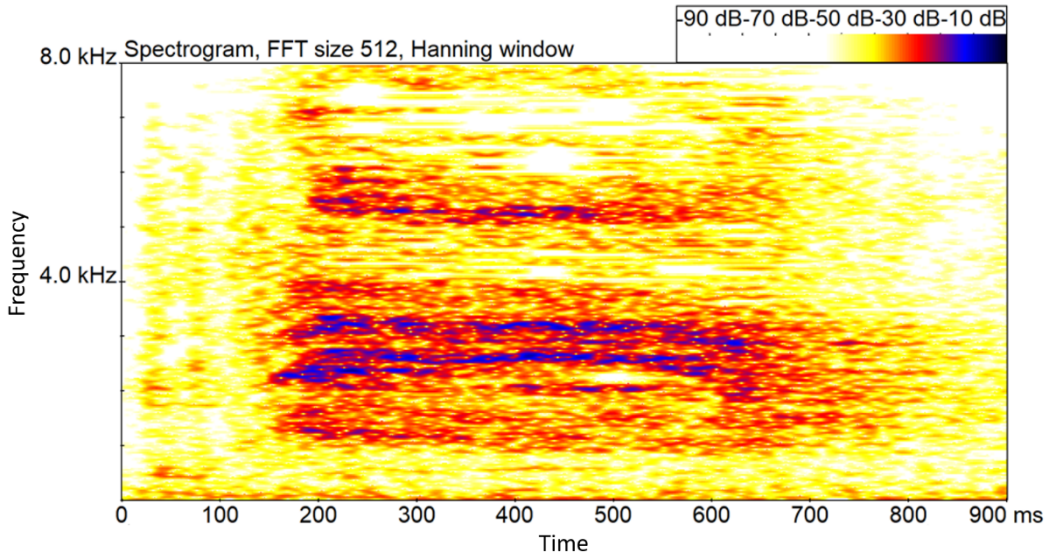
Data Collection

- Biters (n=7) were removed from the pens (n=4) by farmstaff if seen during daily inspections
- Audio files were analysed for pig screams (Audacity© 3.1.3)
  - Loudness threshold >50% with frequencies >1 kHz
- Screams were evaluated in video (VLC media player 3.0.16)
  - Assigned to different reasons
  - Tail biting: pig identification of biter and victim
  - Analysed until biter was not biting for one day



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Data Collection

Category	Description
Tail biting day*	A pig is chewing and forcefully biting into another pig's tail during day
Tail biting night	A pig is chewing and forcefully biting into another pig's tail during night
Other pen	Scream is clearly originating from a different pen
Not assignable	Scream was not assignable after several playbacks of the video
Other reason	Pig screams due to other reason (e.g. fighting)

*Light was switched on from 07.30 am until 05.30 pm

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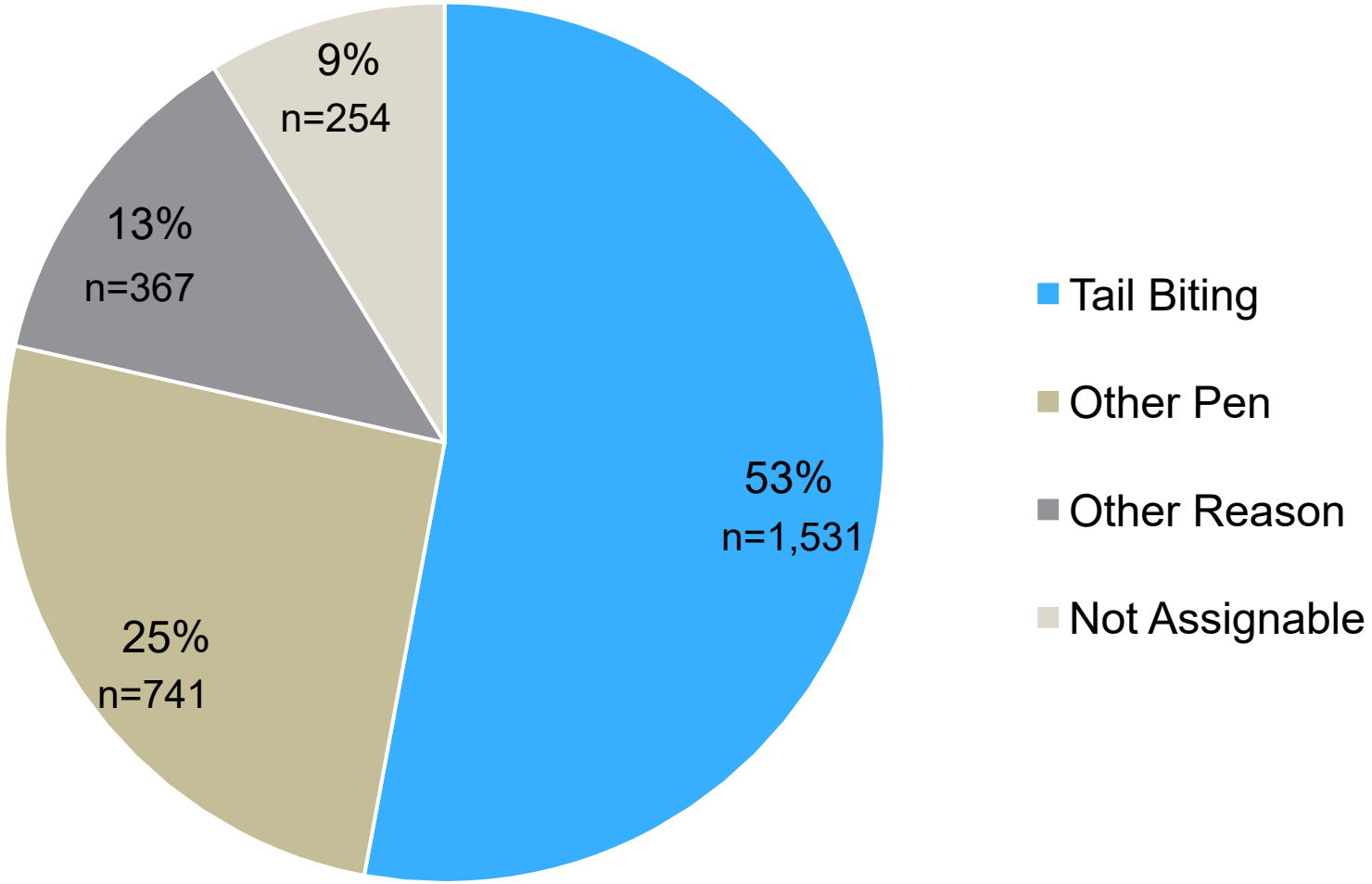
Reasons of Screams

- 748 hours of video analysed
- 2,893 screams detected



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Biter Characteristics

	Biter						
	1	2	3	4	5	6	7
Pen	1	1	2	2	3	4	4
Day of first biting event before removal	3	4	1	8	4	9	4
Total biting events	97	45	19	143	244	279	42
Max. biting events per day	30	22	18	129	107	58	23

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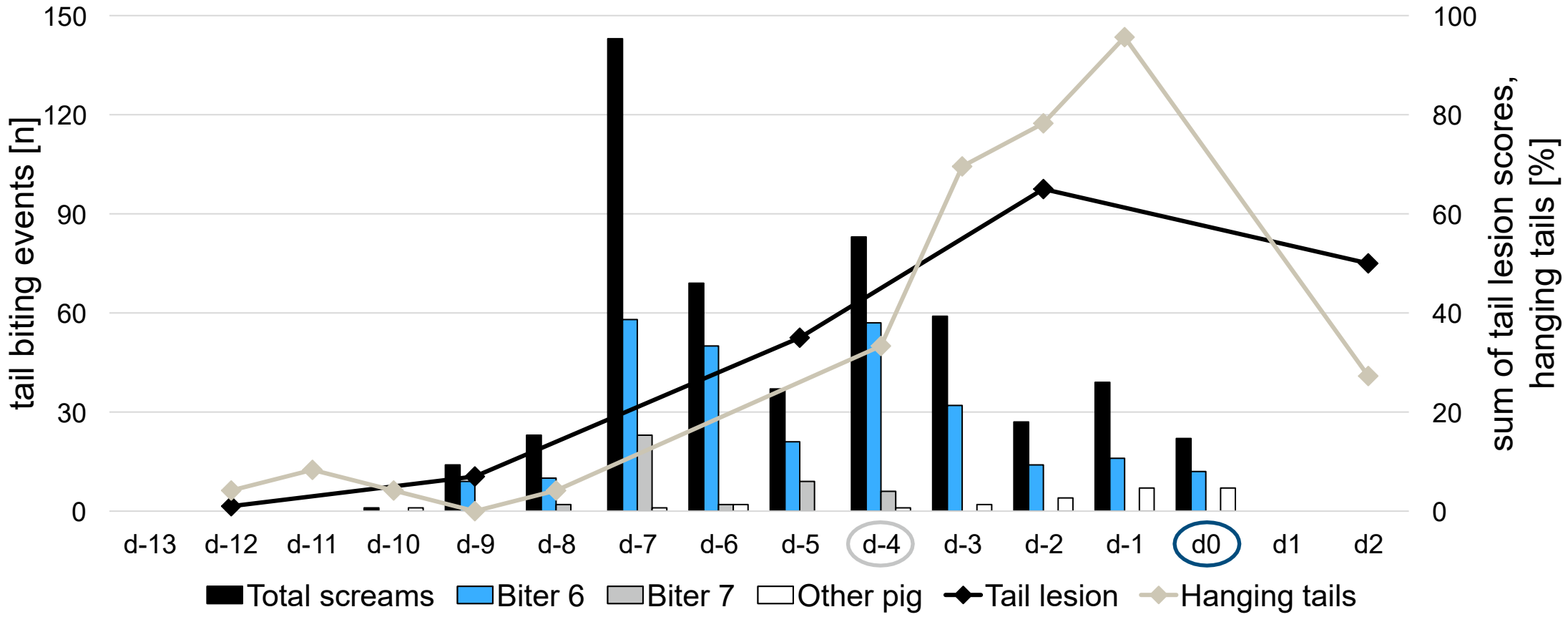
Comparison of Tail Biting Indicators (Biter 6)



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- Pigs scream in different situations with negative context:
  - Competition for feed and immobilisation (Schön et al. 2004)
  - Pigs are fighting, stressed or startled (Briefer et al. 2022)
  - Vocal response to tail bite (Taylor et al. 2010)
- Three types of tail biting:
  - Two-stage, sudden-forceful and obsessive tail biting (Taylor et al. 2010)
- Limitations:
  - Difficulty of localisation of screams (other pens) (Silvia et al. 2008)
  - Tail biting at night → other animal identification, e.g. paint marks (Zonderland et al. 2011)
  - Automatic monitoring of screams possible (Schön et al. 2004; Vandermeulen et al. 2015)

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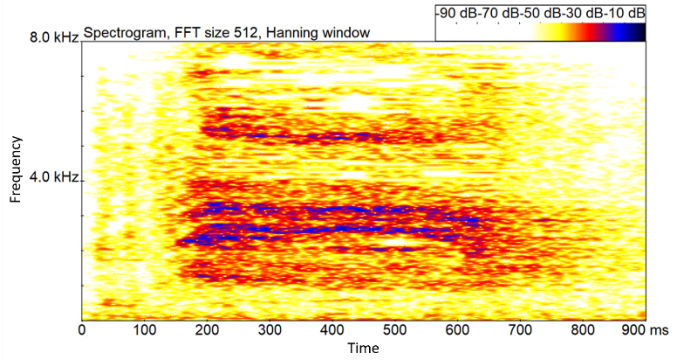
CONCLUSION

- Pigs scream due to a variety of reasons
  - Majority is vocal response due to tail biting
  - Indicator for ongoing tail biting behaviour
- Earlier detection of biting by screams than tail posture
  - Animal identification enables monitoring on animal level
- Method enables timely intervention by biter identification
  - Only few intensively biting pigs in a pen
  - Separation up to nine days earlier
  - Maintain animal health and welfare
- Promising approach for an early warning system



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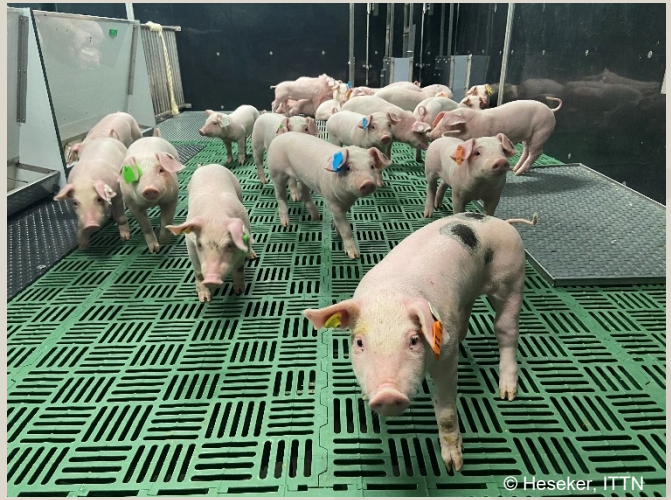
Thank you for your attention!



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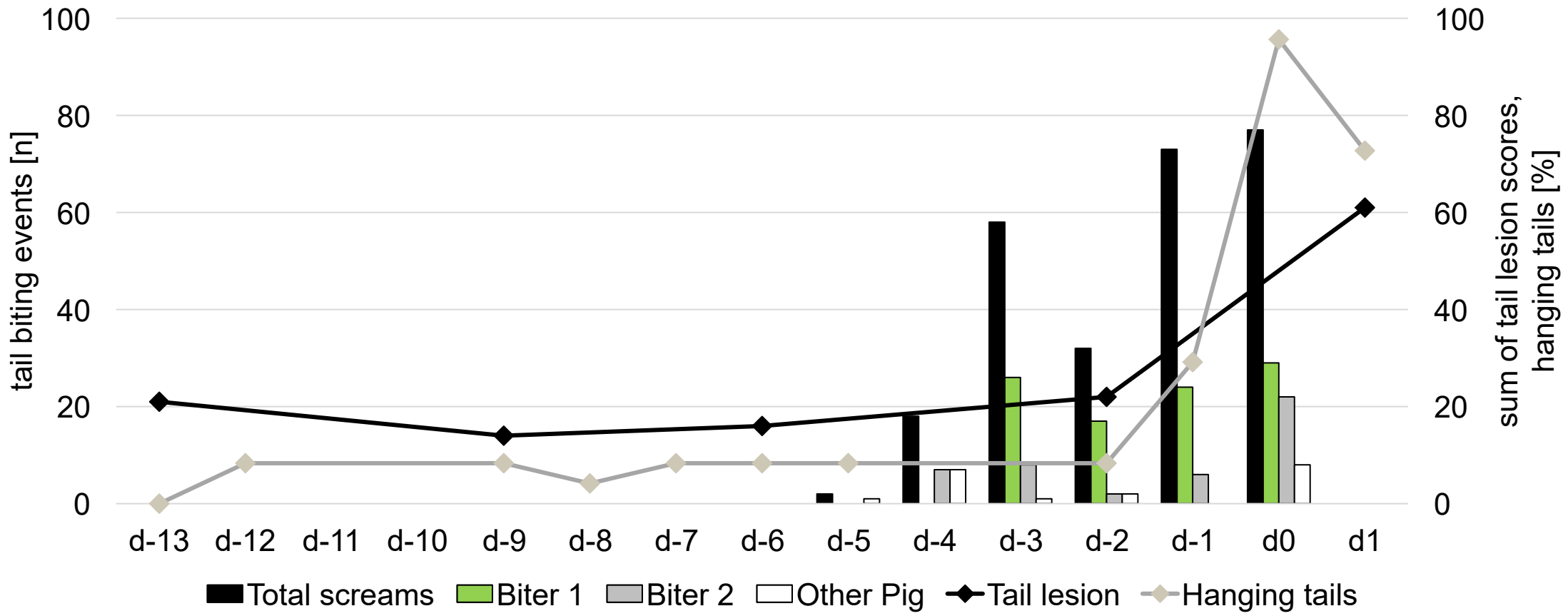
Comparison Of Tail Biting Indicators (Pen 1)



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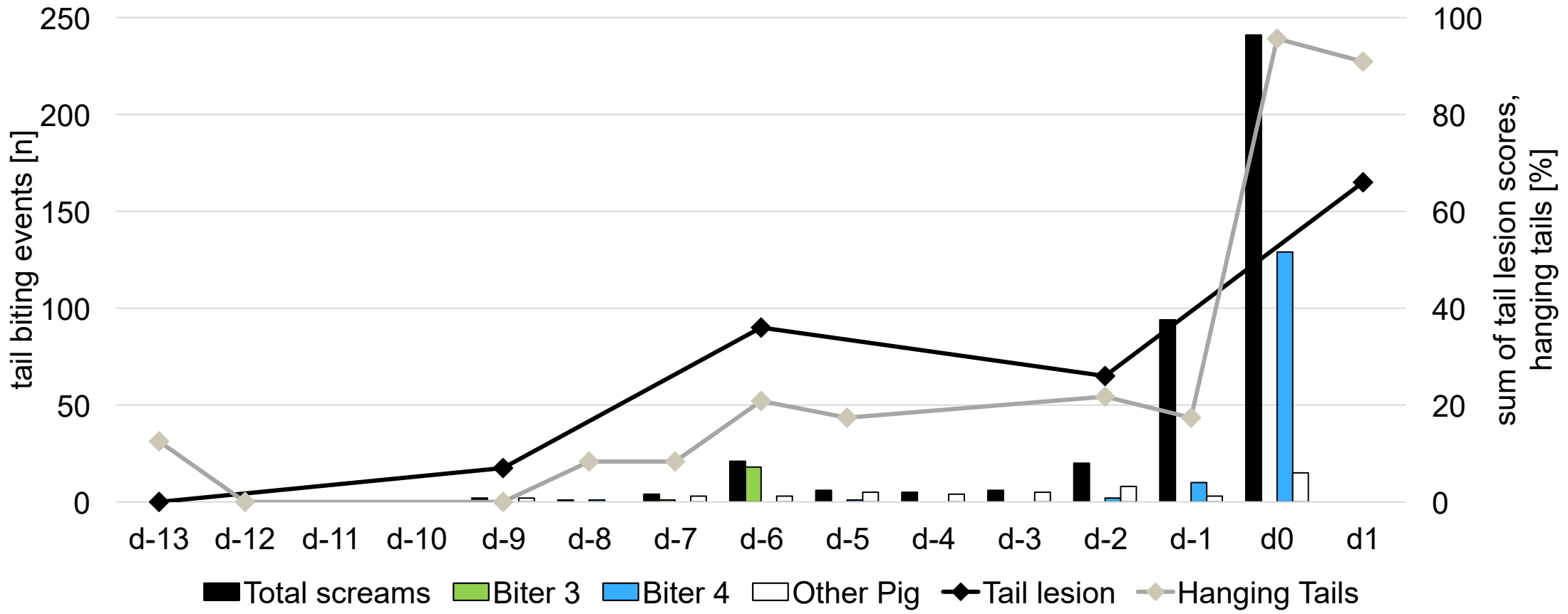
Comparison Of Tail Biting Indicators (Pen 2)



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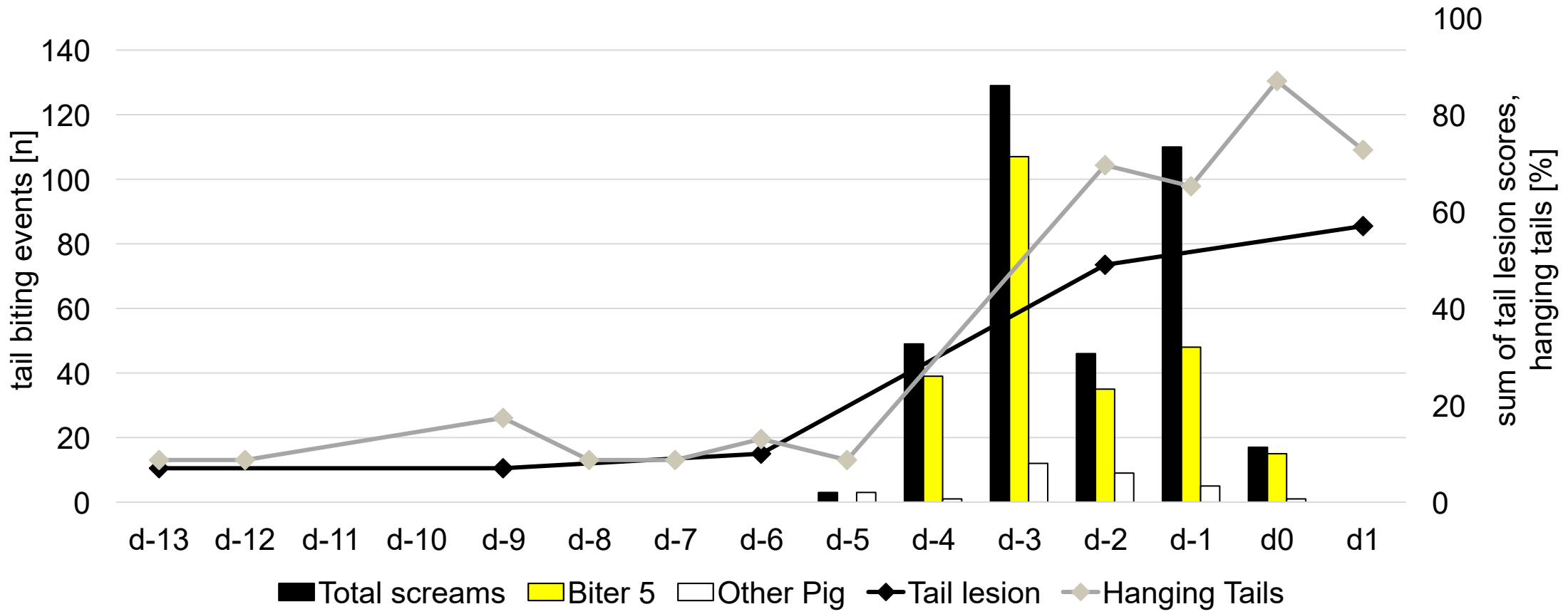
Comparison Of Tail Biting Indicators (Pen 3)



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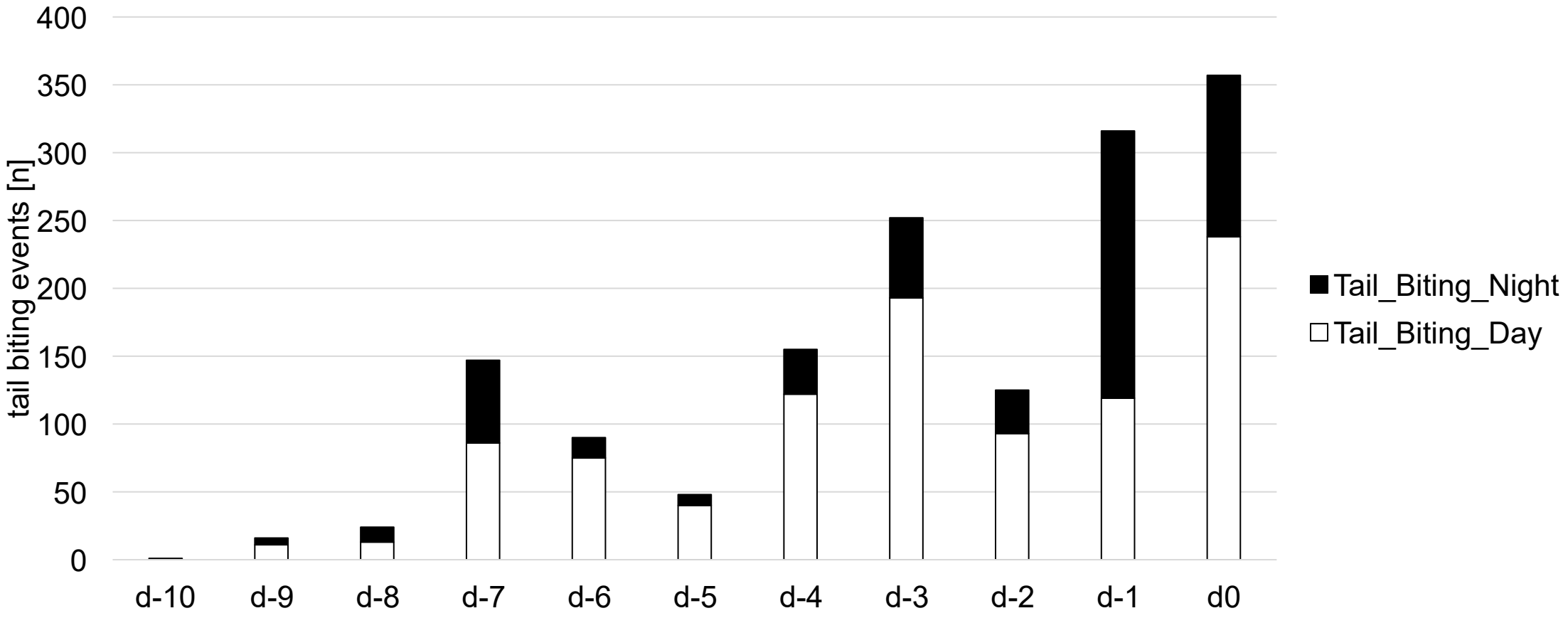
Comparison Of Tail Biting On Day And Night



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Statistical Analyses (R 4.3.0, RStudio 2023.06.0 Build 421)

- Descriptive analysis of tail biting behaviour (Microsoft Excel 2016)
- Data tested for normal distribution (Shapiro-Wilk test)
- Comparison of tail bites per hour among the biters
  - Only hours with at least one tail bite
  - Kruskal-Wallis and Dunn's all-pairs test
- Mean duration of screams compared between different categories
  - Kruskal-Wallis and Dunn's all-pairs test
- Significant differences at $p<0.05$

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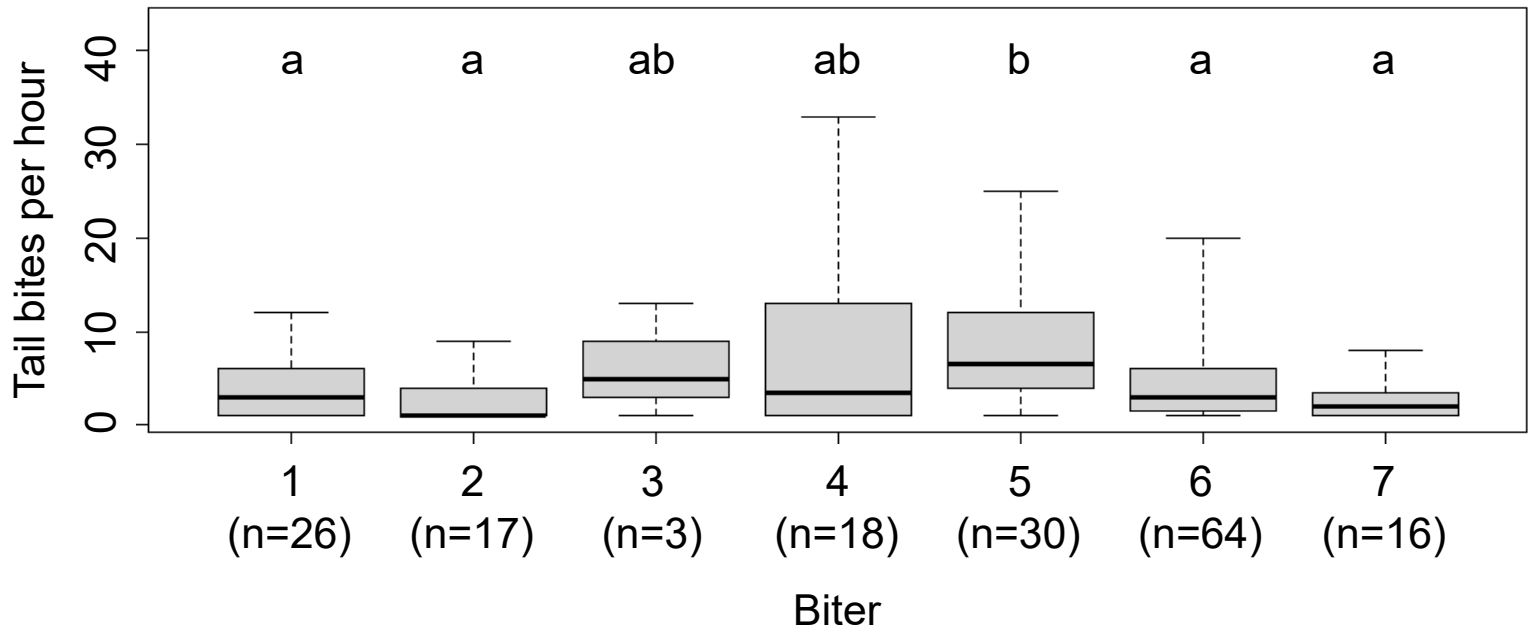
Tail Bites Per Hour

- Intensity of tail biting differed between the biters ($p<0.05$)*
- Biting at night excluded
  - Max. 54 bites/hour



*only hours with at least one tail bite

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Duration of screams in the categories

Category	n	Average scream duration (seconds)*	Standard deviation (seconds)
Not assignable	254	0.64[a]	0.9
Other pen	741	0.82[b]	1.7
Other reason	367	0.81[b]	1.3
Tail biting day	991	0.83[c]	0.6
Tail biting night	540	0.94[d]	0.7

min. 0.1 s
max. 4.2 s

*p<0.05