

Towards life-long sensing of cow behaviour using accelerometers

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Introduction



The transition period may be defined as the period from 3 weeks before to 3 weeks after calving (Grummer, 1995 JAS 73:2820-2833)

We are now able to continuously measure individual cow behavior during the dry period and the full lactation.

Does cow behavior make us want to change that definition?



Cows and procedures

- ~100 Holstein cows at Harper Adams University
- IceQubes on 3 legs
- Milkings 2/day
- Cows go to pasture during the summer
- Visual mobility scoring 1/week, scale 1 to 5
- Health data: milk samples, udder score, body condition score, foot trimming, etc.

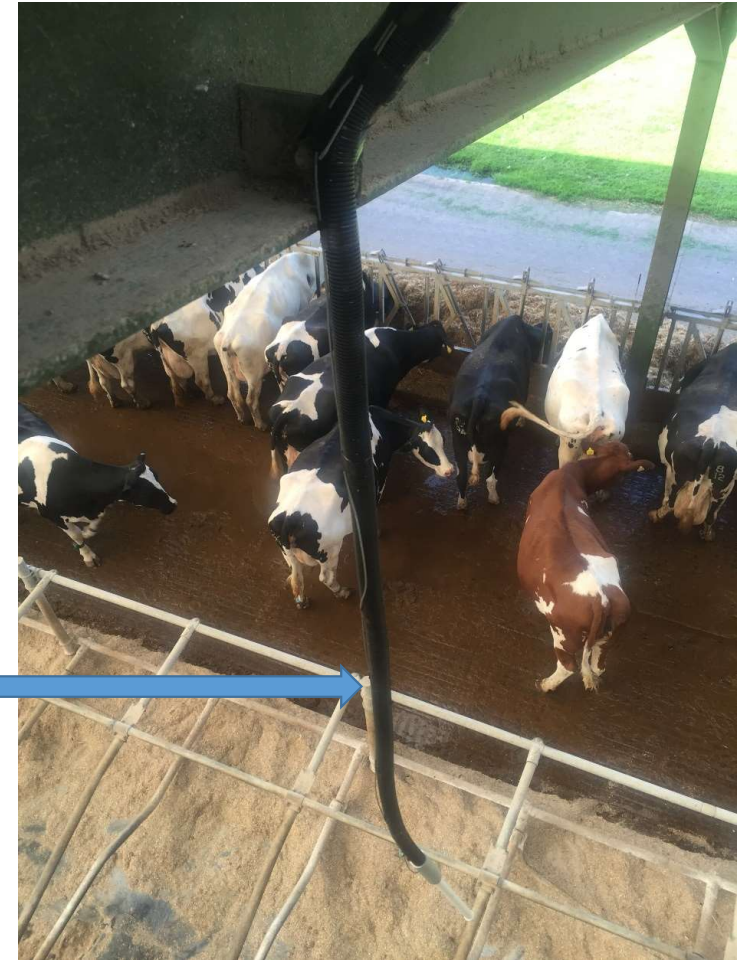


Charlton, G, C Gauld, E Bleach, M Rutter. 2016. Behavioural activity of dairy cows on the day of oestrus v. mid luteal phase, in Proc. ISAE, Edinburgh, July 15, p. 339

Data downloading

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- August 2014 - ongoing: data collection from lactating cows in milking parlour (not all 3 IceQubes attached from beginning)
- July 2015 - ongoing: data collection during dry period via continuous download antenna



Data selection

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- 2 years of data: 28th Aug. 2014 – 13th Sept. 2016
- Only data from hind right leg used
- Lactation period
 - 1 to 304 days from calving (DFC)
 - 215 lactations made by 117 cows, but no early lactation data from parity 1, and not all lactations complete
- Dry period
 - -39 to -1 DFC
 - 97 cows, but not the full period for all cows

Data selection



Parity groups: 1, 2, 3+

- Only days of > 9 cows included => lactation period: n=814 (ideally 3x304),
dry period: n=110 (ideally 3x39)

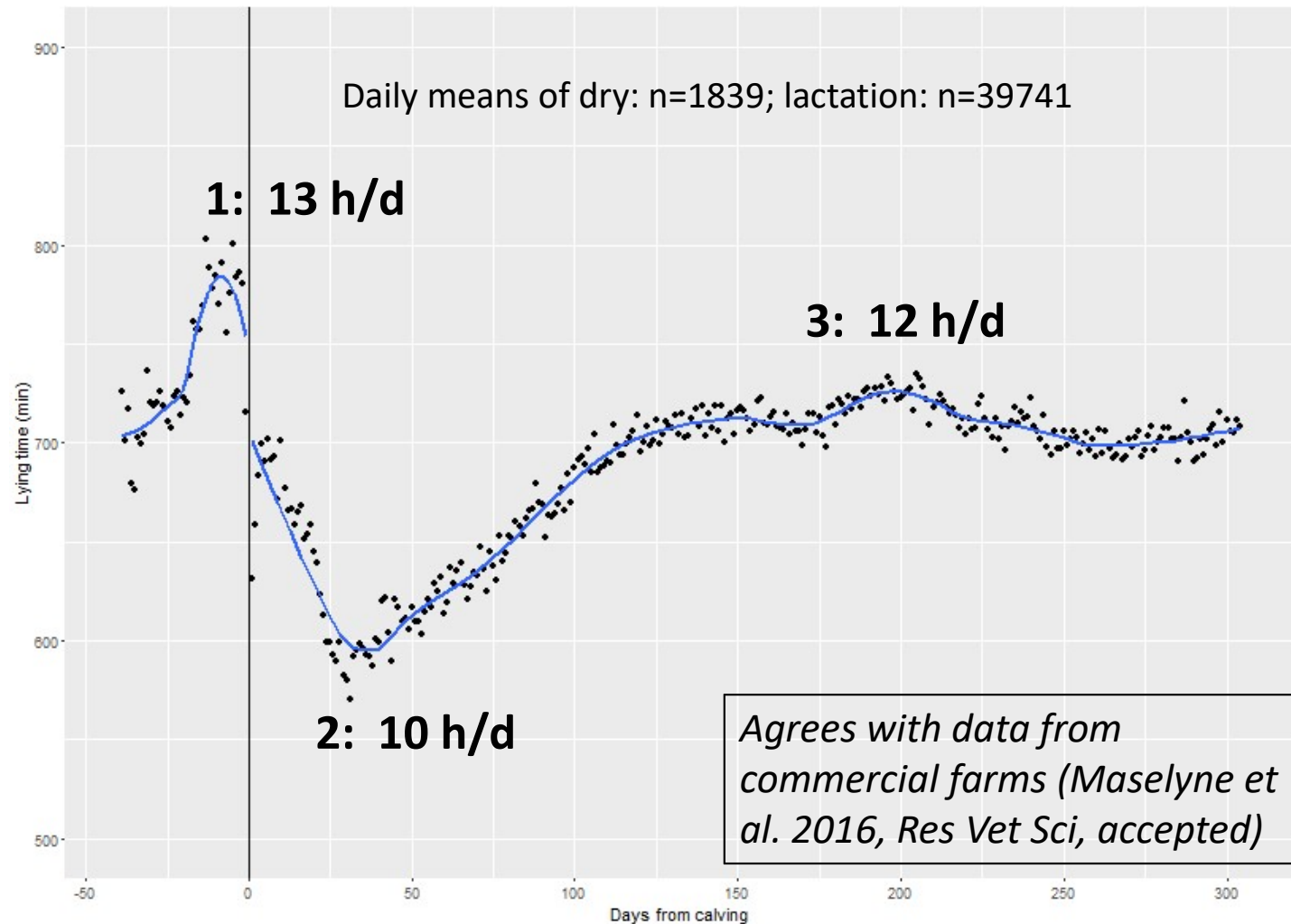
Curves smoothed using loess-function in R (i.e. polynomial fitting)

No statistical analysis performed yet!



Lying time

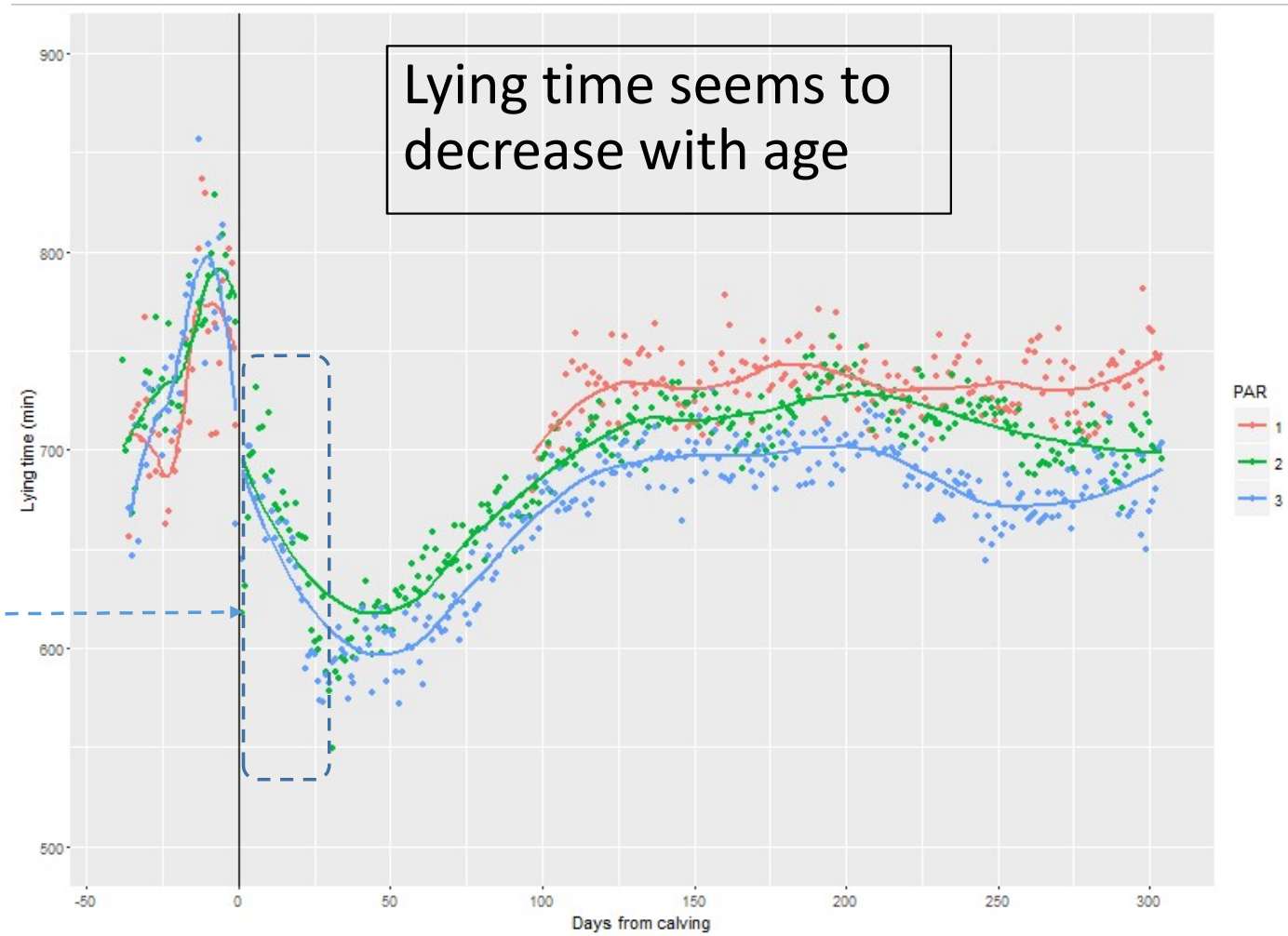
1. Peak just before calving
2. Marked nadir around 4 weeks after calving - coinciding with feeding peak?
3. Plateau from mid to late lactation



Lying time by parity

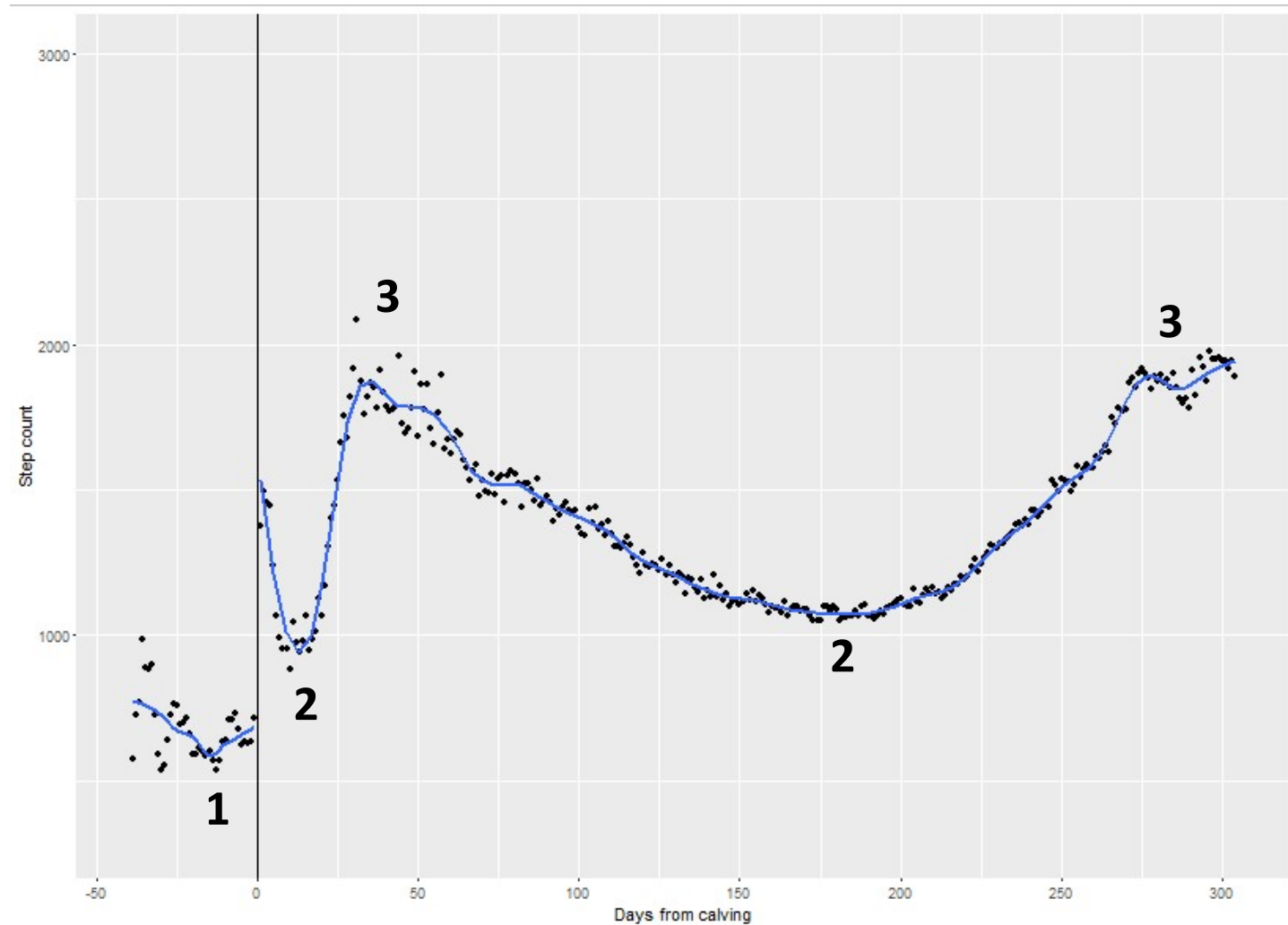
Need parity 1 data
from early lactation

*In contrast to study on
healthy multiparous cows, 3
milkings/d, max. lying time
500-650 min/d, 1-28 DFC
(Steensels et al. 2014, AABS
136: 88-95)*



Step count

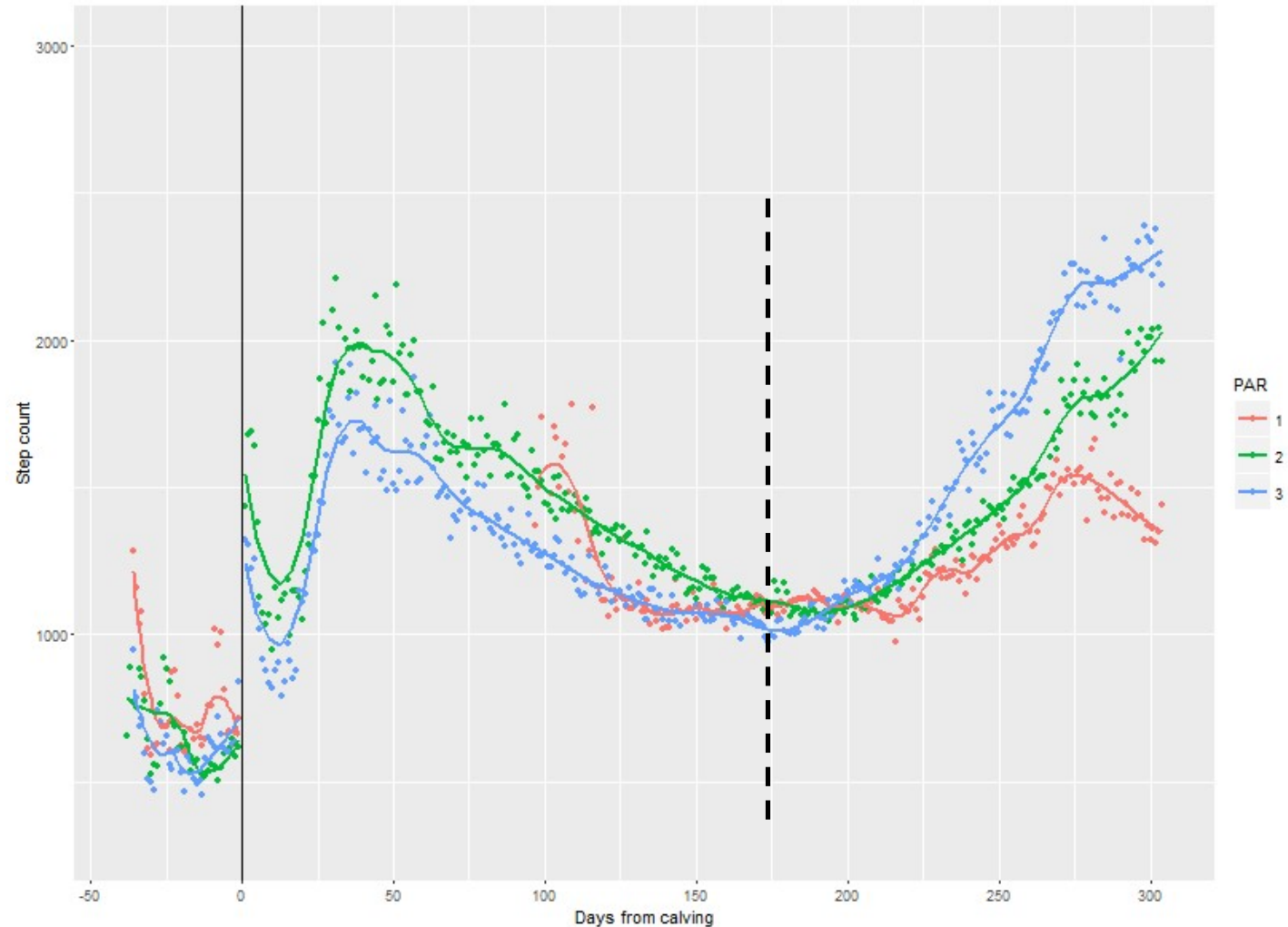
1. Very few steps prior to calving
2. Two nadirs during lactation
3. Two peaks during lactation



Steps by parity

Interaction between parity and stage of lactation?

Need parity 1 data!



Conclusions

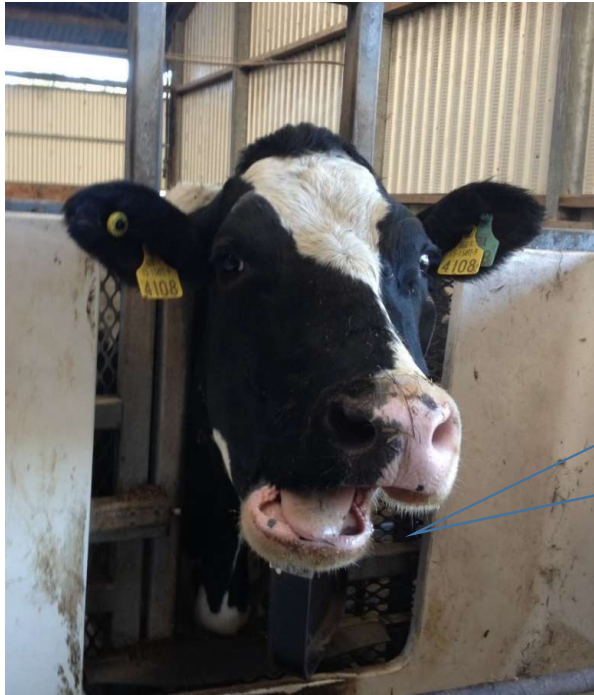


- Lying time NOT linearly correlated with days from calving
- Steps: parity and stage of calving may interact

- Should the transition period extend to after lying time nadir at 4 weeks?
- How much is explained by management?
- New lessons to be learned about the transition period via continuous download in dry barn
- We need more data to cover all parity and lameness groups



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Thank you for
your attention

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COWALERT
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University

Steensels et al. 2014, AABS
136: 88-95

Summer:

par 2 (n=79): 491 min/d^a

par 3+ (n=61): 520 min/d^b

Winter:

par 2 (n=41): 531 min/d^b

par 3+ (n=65): 579 min/d^c

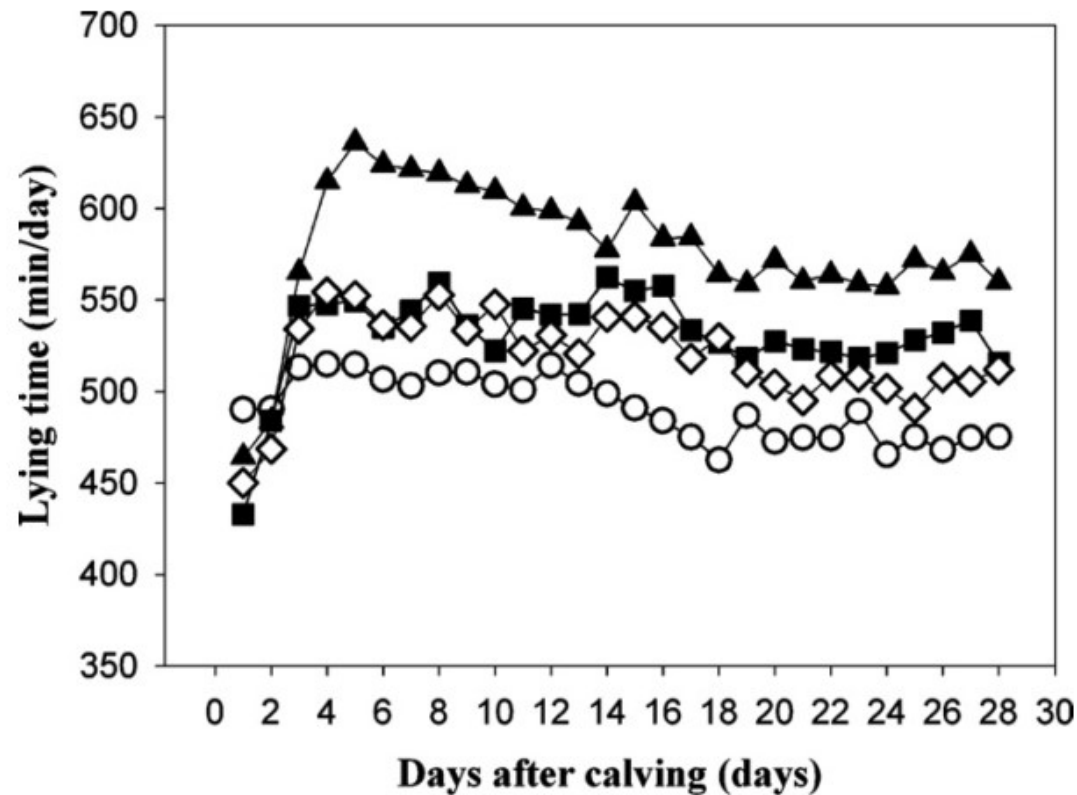
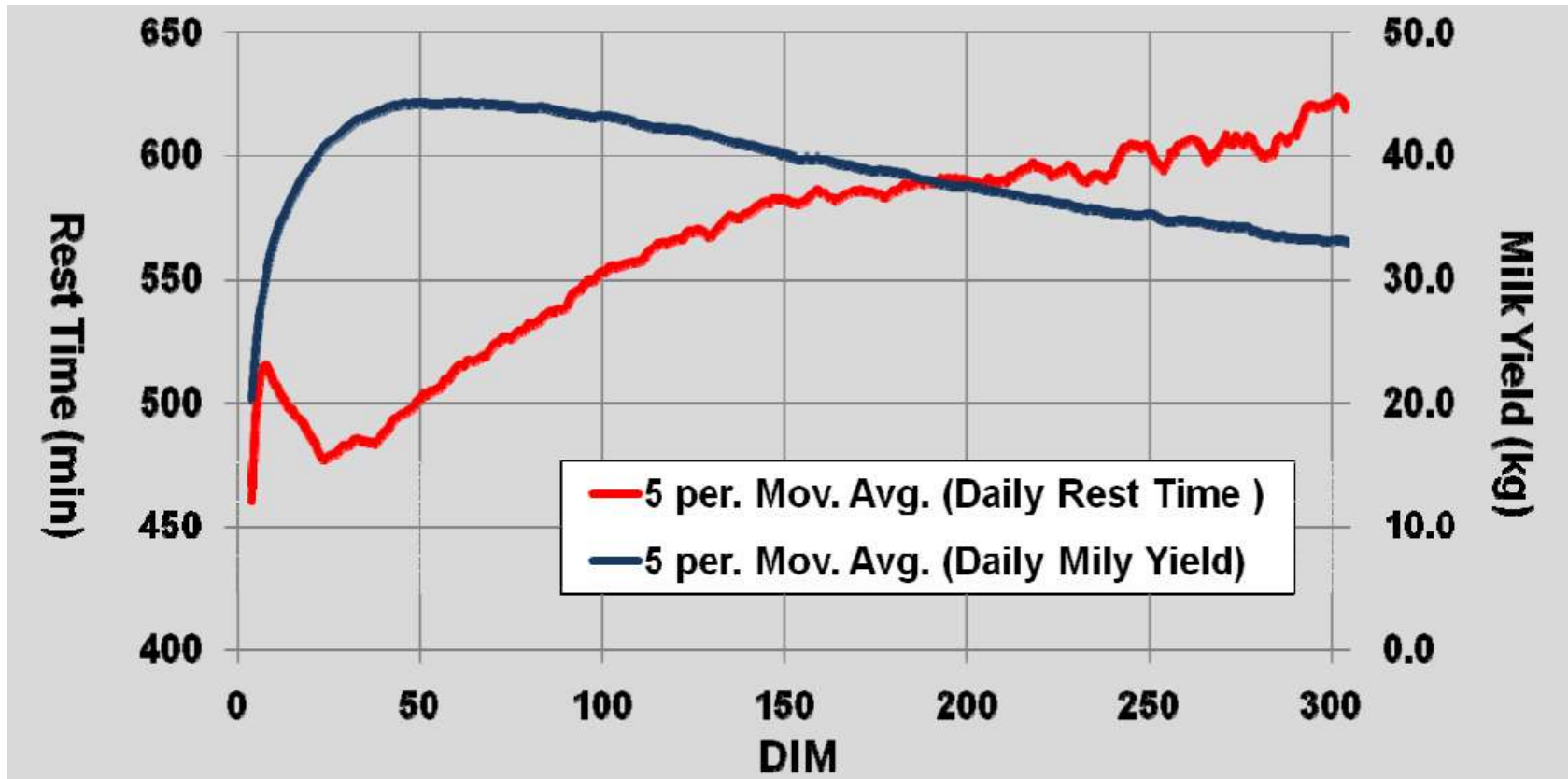


Fig. 1. Summer and winter lying time of cows with two lactations and with three or more lactations (○, summer–lactation 2; ■, winter–lactation 2; ◇, summer–lactation 3 and more; ▲, winter–lactation 3 and more).



Data from 6 herds, 1810 lactating cows, average MY 11,832 kg/lactation (Arazi et al. 2010, presentation at ICAR)