Effect of calving ease and calf mortality on functional longevity in Polish Holstein-Friesian cows

Session 25: Free communications – molecular genetics
Abstract no.: 16790

M. Morek-Kopec[1] and A. Zarnecki[2]
[1]University of Agriculture in Krakow, Mickiewicza 24/28, 30-059 Krakow, Poland
[2]National Research Institute of Animal Production, Balice, 32-083 Krakow, Poland

OBJECTIVE: Survival analysis was applied to evaluate the effect of first and later calvings on longevity of Polish Holstein-Friesian cows

MATERIAL AND METHODS

Calving ease (**CE**) and **calf mortality** (**CM**) scores for 744,843 first and 1,418,583 later calvings were recorded in 2006 – 2012.

Length of productive live (LPL) of a cow was measured by number of days from first calving to culling or censoring.

- level of censoring: 50,2%
- mean LPL: 1097 days for uncensored records and 959 days for censored records

Functional longevity was defined as LPL corrected for production.

Subclasses of **CE or CM scores x parity (1, >=2) x sex of calf** were analyzed in a Weibull PH model based on the model used in the routine national longevity evaluation.

	Sex of calf		Parity of dam	
	Male	**Female**	**Heifer**	**Cow**
Calving ease CE				
without assistance	364,503	380,578	177,410	567,671
	31.56%	**37.74%**	**23.82%**	**40.02%**
with assistance	742,421	599,604	524,889	817,136
	64.28%	**59.46%**	**70.47%**	**57.60%**
difficult – hard pull	45824	27,430	40,908	32,346
	3.97%	**2.72%**	**5.49%**	**2.28%**
very difficult (embriotomy, C-section)	2,235	831	1,636	1,430
	0.19%	**0.08%**	**0.22%**	**0.10%**
Calf mortality CM				
alive	1,066,626	971,476	683,829	1,354,273
	92.35%	**96.33%**	**91.81%**	**95.47%**
stillborn or died within 24h	88,357	36,967	61,014	64,310
	7.65%	**3.67%**	**8.19%**	**4.53%**

Weibull proportional hazard model

$$h(t) = h_0(t) * exp[hys(t) + age + ys(t) + ls(t) + hsize(t) + fat(t) + prot(t) + CEclass(t)|CMclass(t)]$$

t – time from first calving to culling or censoring, **h(t)** – hazard function for a cow at time t, $h_0(t)$ – Weibull baseline hazard function

Random effect: **hys** – herd-year-season.

Fixed effects: **age** – age at first calving, **ys** – year-season , **ls** – lactation number x stage of lactation, **hsize** – herd size variation, **fat, prot** – fat and protein production levels, **CEclass/CMclass** – subclasses of **CE or CM scores x parity (1, >=2) x sex of calf.**

Estimation. Survival Kit v6.06 was used (Ducrocq V., Sölkner J., Mészáros G. ,2010).

- ❒ significance of effects based on the likelihood ratio test
- ❒ influence of fixed effects on longevity expressed as relative risk of culling (**RRC**)

RESULTS

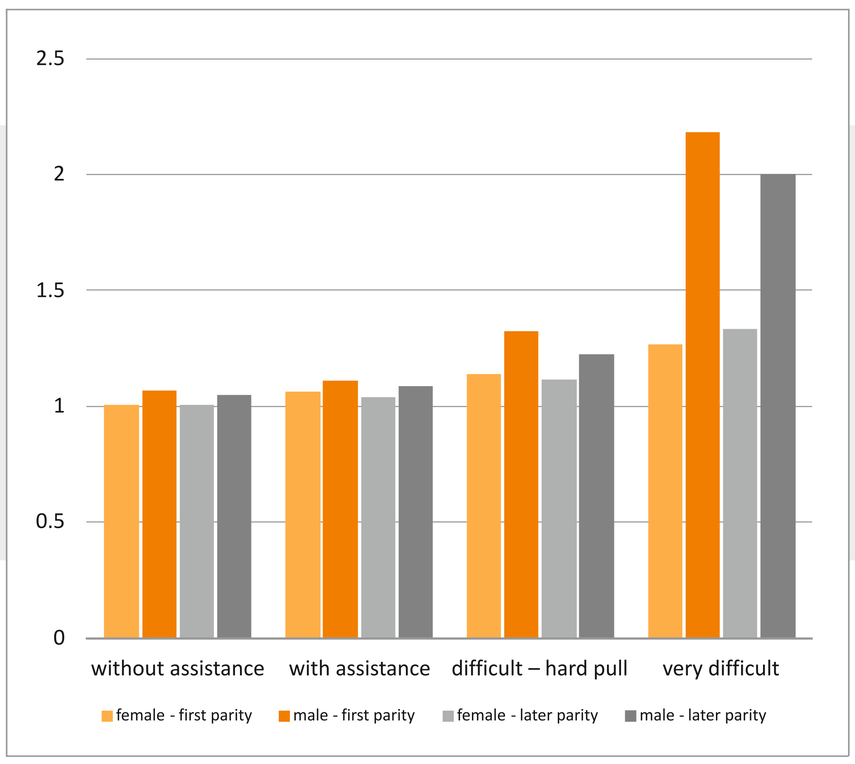

Figure 1. Relative risk of culling by CE category, parity of dam and sex of calf

❒ **Increased risk of culling was associated with difficult calvings of dams**

In first-parity cows, difficult birth of bull or heifer increased RRC 2.18 or 1.26 times, respectively, as compared with calving without assistance.
In later parities, RRC related to difficult calving category was 2.0 times higher for male and 1.33 times higher for female calves than RRC associated with calvings without assistance.

❒ **Calf mortality showed a negative impact on longevity in both heifers and cows**

First-parity stillbirth increased RRC depending on sex of calf by 18% in females, and by15% in males. The increase of RRC was smaller (respectively 7% and 9%) in later parities.

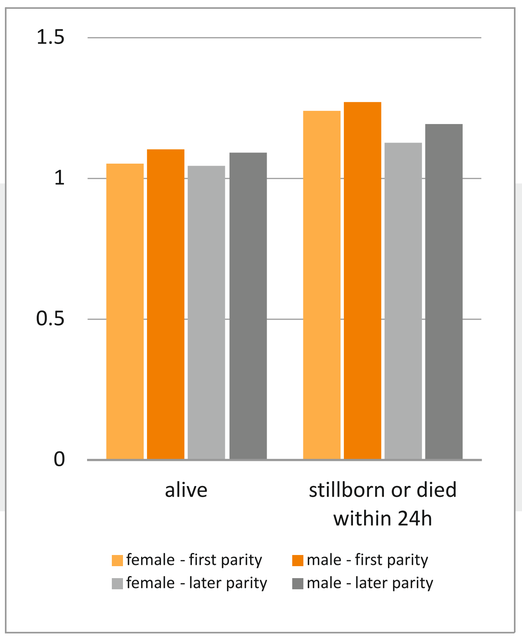

Figure 2. Relative risk of culling by CM category, parity of dam and sex of calf

Acknowledgement. *Data provided by the Polish Federation of Cattle Breeders and Dairy Farmers were extracted from the Polish National Recording System SYMLEK.*