DEVELOPMENTS IN CARCASS AND MEAT QUALITY OF SWEDISH REINDEER (*RANGIFER TARANDUS TARANDUS*) FROM 1991-2011

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Abstract – Reindeer pre-slaughter handling can cause stress and negatively affect meat quality. A comprehensive survey of reindeer meat pH values (*n=3,400*) was carried out in 1991-1995 and demonstrated 29% of the measured pH values to be 5.8 and higher. New pH data from 2010/2011 (*n=2,800*) showed that the amount of high values had dropped to 12.8%. Compiled official data from the investigated period illustrated that the calf slaughter has increased from 50% to 72% of the total slaughter. At the same time, the proportion of carcasses given the best EUROP conformation scores decreased from 40.8% to 25.3%. Improved pH status gives better meat shelf life and opportunities to sell more fresh/chilled meat, something requested by consumers.

Key Words – Carcass weight, EUROP carcass grading, ultimate pH.

I. INTRODUCTION

Reindeer handling prior to slaughter includes various methods: gathering and herding using such aids like snow machines, helicopters, motor bikes; selecting animals for slaughter using a lasso or by hand in a system of corrals; road transport of animals on trucks; and holding in corrals outside the abattoir. Long road transports and the use of helicopters have been pointed out as factors that could cause severe stress to the animals [1]. New directives for reindeer slaughter in Sweden [2] resulted in the former outdoor slaughter sites being closed, the numbers of reindeer transported to slaughter increased, and new mobile slaughter facilities were developed. An extensive project was started in the 1990'ties to evaluate several handling routines for their effects on reindeer meat quality [3]. Among other quality variables, meat pH was measured. In 2010/2011 we had the opportunity to collect new pH data for reindeer in Sweden. In this paper, we present the new data and compare them with those of the original study. In addition, we have compiled official slaughter data [4] for the two actual time periods and relate these data to the pH measurements.

II. MATERIALS AND METHODS

Ultimate pH values were measured in 1991-1995 (*n=3,400*) and in 2010-2011 (*n=2,800*) in *M. longissimus dorsi* (LD; at the last rib) at 24 h *post mortem* in carcasses from reindeer bulls, cows, female, and male calves. The data was collected over the whole geographical area used for reindeer herding in Sweden, *i.e.* from Idre (WGS84 61°51'38.8"N 12°43'9.0"E) in the south to Gällivare (WGS84 67°8'1.2"N 20°39'9.1"E) in the north.

In 1991-1995, we used a KNICK Portamess 651-2 pH meter (Knick Elektronische Mäss-geräte GmbH & Co, Germany) equipped with an INGOLD electrode (Ingold Messtechnik AG, Switzerland, Lot 406 M-6 Xerolyt). In 2010/2011, a portable pH meter (pH 3310, WTW GmbH, Weilheim, Germany) equipped with a polymer electrode (SenTix®Sp, WTW GmbH, Weilheim, Germany) was used. Both pH meters were calibrated at pH 7.0 and 4.0 with buffers (Hamilton Duracal Buffer, Hamilton Bonaduz, Switzerland) stored at room temperature (20 °C). Complete official slaughter data for Swedish reindeer are available at the Swedish Sami Parliament's website [4] starting from the slaughter season 1996/1997. Prior to this date, only annual slaughter numbers can be found. Therefore, we use the data from 1996/1997 to match our pH measurements from 1991-1995.

III. RESULTS AND DISCUSSION

The data clearly demonstrate that the structure of reindeer slaughter has shifted dramatically between the two different time points. In 1996/1997, bulls and cows represented 50 % of the total slaughter compared with only 27 % in 2010/2011 (Table 1). This is a consequence of increased calf slaughter, which is a strategy used to improve meat production in the reindeer herd [5]. EUROP grading scores changed from 40.8 % of the carcasses being graded with the better conformation scores (O+, R-, R, and R+) in 1996/1997 to only 25.3 % in 2010/2011 (Fig. 1). The higher

proportion of calves, in combination with the lower number of slaughtered bulls, of the total reindeer slaughter probably explain this difference in carcass grading scores. Calves are slaughtered at the age of 6-9 months and don't have time to develop the amount of muscles required for the higher conformation scores. Our pH measurements from 1991-1995 demonstrated values of 5.8 and higher for 29 % of the carcasses [6] compared with 12.8 % in 2010/2011 (Fig. 1). In 1991-1995 we found that selecting reindeer for slaughter using a lasso were the handling routine that had the most negative effect on muscle glycogen content and meat pH values [3]. We believe that the new positive results are a combined effect of reduced usage of the lasso and an increased awareness among reindeer herders about the direct correlation between minimised stress during pre-slaughter handling and optimal meat quality.

Table 1. Slaughter data for Swedish reindeer from 1996/1997 and 2010/2011 [4].

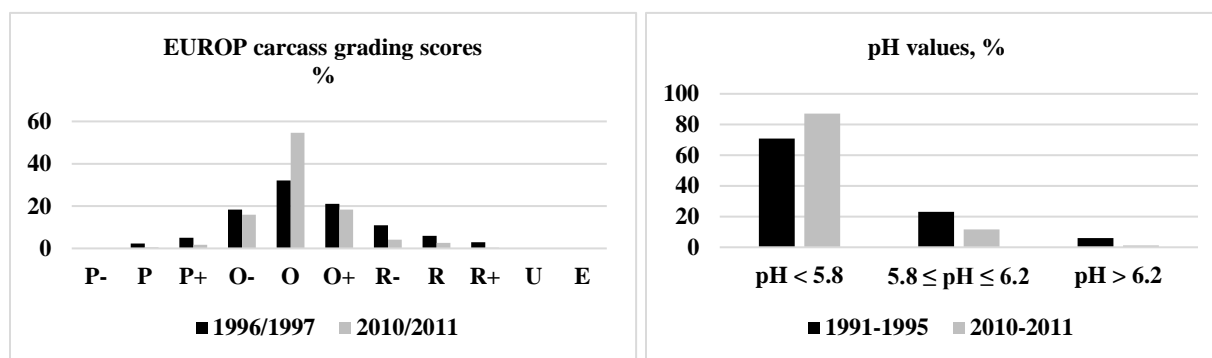|	1996/1997	2010/2011
Number of slaughtered reindeer	61,119	56,348
Bulls, %	23	9
Cows, %	26	18
Calves, %	50	72
Average carcass weight, kg	31.4	31.9
Bulls, kg	41.3	40.1
Cows, kg	32.1	35.4
Calves, kg	20.9	21.2

Figure 1. a) Average EUROP grading scores (%) for reindeer bulls, cows, and calves from 1996/1997 (*n*=61,119) and 2010/2011 (*n*=56,348) [4] and b) Distribution of ultimate pH values (%) in *M. longissimus dorsi* from reindeer bulls, cows, and calves from 1991-1995 (*n*=3,400) [6] and 2010/2011 (*n*=2,800).

IV.   CONCLUSION

The demonstrated change in size and meat content of reindeer carcasses over time present obvious challenges to the meat industry. However, the improved pH status gives better meat shelf life and opportunities to sell more fresh/chilled meat rather than the traditional frozen, smoked and dried products. The increasing requests for fresh meat is a trend seen among wholesalers, supermarkets, restaurants, as well as consumers.

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