Analysis of the Interbull Pilot Evaluation of SCC in French Units (Holstein Breed)

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1. Introduction

The aim of this study was to analyse the consistency between the results of the pilot Interbull evaluation on SCC in French units and the domestic proofs computed by INRA, for French as well as for foreign bulls.

The results presented focused on the Interbull proofs of the first test run, including SCC proofs of Canadian, Danish, German, Finish, French, UK, Swedish, and US bulls. The same conclusions, however, were observed, when Danish, Finish, and Swedish SCC proofs were replaced by MCC evaluations.

2. Comparison of National and Interbull proofs – Bulls with French daughters in the Interbull evaluation

Interbull proofs for SCC were compared to domestic proofs used for the pilot test run, ie national proofs computed and released in June 1999. French national SCC proofs are expressed in genetic standard deviation, on a male rolling basis whose definition is the same as for production traits (bulls born between years n-10 and n-7, progeny tested in France and having official SCC proofs). One of the "basic checks" was to verify that the Interbull proofs of the bulls having French daughters were consistent with domestic proofs.

Three samples of bulls were selected:

1- Bulls progeny tested in France with at least 50 French recorded daughters and without foreign daughters
2- Bulls progeny tested in France, with foreign daughters
3- Foreign bulls with 2nd crop daughters in France

French proofs of foreign bulls were included in the pilot test run. Therefore, the Interbull proofs are expected to be very close to the French domestic proofs and a potential bias on French proofs of foreign bulls is difficult to assess with such data.

Results of Table 1 show the very good consistency of domestic proofs and Interbull proofs, when bulls have only French daughters. As expected, when the bulls have foreign daughters, the correlation between French domestic and Interbull proofs is slightly lower but still very high, even when the number of foreign daughters is higher than in France. There are no difference between average proofs. As expected, the variability of Interbull proofs is very close to French proofs when the Interbull proofs are based only on French daughters, and higher when there are foreign daughters.

Table 1. Comparison of French domestic proofs and Interbull proofs in French units – Bulls progeny tested in France

	Bulls without foreign daughters	Bulls with foreign daughters (French daughters <= 60% total)	Bulls with foreign daughters (French daughters <= 40% total)
Nb bulls	5046	245	82
Proofs correlation	0.999	0.96	0.94
Average difference (Interbull – Domestic)	+0.004	-0.030	-0.029
Domestic proofs std	0.907	0.921	0.923
Interbull proofs std	0.910	0.999	1.014

Table 2. Comparison of French domestic proofs and Interbull proofs in French units – Foreign bulls with French daughters included in the Interbull evaluation

	Country with most daughters	
	CAN	**USA**
Nb bulls	38	117
Correlation between proofs	0.96	0.97
Average difference (ITB. – Domestic)	-0.007	-0.04
Domestic proofs std	0.812	1.009
Interbull proofs std	0.866	1.002

Table 2 shows that domestic and Interbull proofs are consistent for foreign bulls. However:

- The proofs variability of the bulls with most daughters in the USA is slightly lower with Interbull than French results, which was unexpected.
- Even if the proofs correlation is high, and even with a large number of French daughters, big differences between French domestic proofs and Interbull proofs can be observed, whereas French information, in this case, represent the most important source of information (figure 1). For these bulls at least, the difference between French domestic proofs and Interbull proofs would have been much higher, if French daughters had been excluded from the pilot Interbull evaluation.

The difference between SCC proofs computed by Interbull and by INRA, for these bulls, was not correlated neither to the genetic level of the bulls on production traits (correlation of –0.004 with Interbull proof on Protein), nor on the "bias" observed on these bulls on French proofs for production traits (correlation of 0.05 with the difference between Interbull and national proofs for Protein Yield). This difference was slightly correlated to the French Interbull proof on SCC (+0.19), but not with domestic proofs (-0.06).

3. Prediction of proofs of new bulls

66 new foreign bulls, have been recently used and have now more than 50 French daughters. Their French proof was not used in the pilot test run. French domestic proofs of these bulls computed in October 2000, adjusted to the 1999 French rolling basis (in order to express French results on the same basis than the Interbull ones) were compared to the proofs of the pilot test run. Both information used in the Interbull and domestic evaluations are here independent.

Table 3. General statistics on bulls recently used in France

Number of bulls	66
Correlation between proofs	0.86
Average difference (Interbull – Domestic)	-0.088
Domestic proofs std	0.952
Interbull proofs std	0.949

Table 3 shows that the correlation between proofs is acceptable (0.86) according to the French reliability of these bulls (0.79 on average) and that the French results are on average slightly higher than Interbull proofs.

The difference between Interbull and domestic proofs was negatively correlated (-0.27) to French domestic SCC. The low variability of Interbull proofs (no difference between Interbull and French proofs standard deviations in spite of a much higher reliability of Interbull proofs) might explain this problem, as most of the bulls recently used in France had a good SCC level (figure 2).

4. Full sibs analysis

This analysis was based on families of full sibs with at least two sons having most of their daughters in two different countries. These bulls had at least 50 recorded daughters on SCC. Only bulls born since 1990 were selected in order to avoid any problem of selection (see part 5). 1669 bulls born from 584 families met the minimum requirements. Their Interbull proofs in French units were analysed according to the following model (Mattalia and Bonaïti, 1993):

$$Y_{ijk} = C_i + F_j + e_{ijk}$$

where:

Y_{ijk} = SCC proof of the k^{th} bull of the j^{th} family, progeny tested in the i^{th} country
F_j = effect of the j^{th} family (fixed effect)
C_i = effect of the i^{th} country (country with most of daughters)
e_{ijk} = random residual effect with zero mean and variance σ^2_e

Table 4. Estimated Country effects obtained with full sibs analyses on Interbull proofs expressed in French units (effects relative to French bulls)**

Country	NB bulls	Country effect (relative to FRA)
CAN	179	-0.099 (0.074)
DEU	175	-0.041 (0.076)
DNK	128	-0.22 (0.091)
FIN	4	+0.75 (0.548)
GBR	36	+0.05 (0.147)
NLD	214	-0.01 (0.072)
SWE	24	-0.16 (0.188)
USA	398	-0.02 (0.052)
FRA	511	0.00

** Standard error in parentheses

Country effects were not significantly different from zero (p>27%). Table 4 shows the differences between France and other countries: the differences with results of French full sibs were never significantly different from zero, except for Danish bulls. However, the underestimation of Danish bulls is difficult to check, because of the lack of direct links between France and Denmark: there were only 32 full sib families between these two countries.

5. Variability of proofs and number of bulls according to birth year

The EBV variability depends on the genetic structure of the populations, but also on the reliability in the country of origin and on the genetic correlation between this country and France. Differences between proofs standard deviations within country of origin are observed when Interbull proofs are expressed in French units (Figure 3), and are not completely explained by the difference in average number of daughters after progeny test or in genetic correlations between France and abroad. For instance, the ratio of proofs variance within birth year of the US bulls on proofs variance of Dutch bulls is from 12 to 28% higher than the ratio of average reliabilities (reliabilities of Interbull proofs in French units).

At this level, it cannot be concluded that some genetic standard deviations are biased. However, Figure 4 shows that the number of bulls evaluated on SCC, when compared to the number of bulls included in the Interbull evaluation on production traits, is often low for the oldest bulls (the fact that there are more old Canadian and German bulls evaluated on SCC than on production traits may be explained by the recent implementation of a test day model in these countries). SCC evaluation started recently in many countries with a limited data history. Thus, most old bulls are highly selected. The birth year of the first batch of non selected sampling bulls varies according to the countries. Studies on the first Interbull evaluations on production traits had shown that the inclusion of old bulls had an impact on the estimated genetic standard deviations within country. One of the explanations was that the

oldest bulls were only selected ones. A strong common time edit common to all countries (bulls born after 1987-88 for instance) or customized to each country according to its SCC data history could be recommended

6. Conclusion

These first analyses showed a very good consistency between French proofs and domestic proofs in French units. Some questions still remain, such as the discrepancies between MACE proofs variability according to the country of origin. Moreover, these studies showed that differences between French domestic and Interbull proofs could be high on some foreign bulls, even when the weight of French information was very high. Further studies could be proceeded, particularly in order to verify the impact of the selection of the oldest bulls on the Interbull evaluations, and to check the consistency of French proofs of foreign bulls with Interbull proofs, when these domestic proofs are excluded from the MACE.

Acknowledgments

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Reference

Mattalia, S. & Bonaiti, B. 1993. Use of full sibs to estimate the ‘a’ coefficients of conversion formulas between countries. *Proc. Interbull Meet., Aarhus, Denmark, August 19-20 1994. Interbull Bull. 8.*

Figure 1: Difference between Interbull and Domestic SCC proofs in French units
Foreign bulls with French 2nd crop daughters

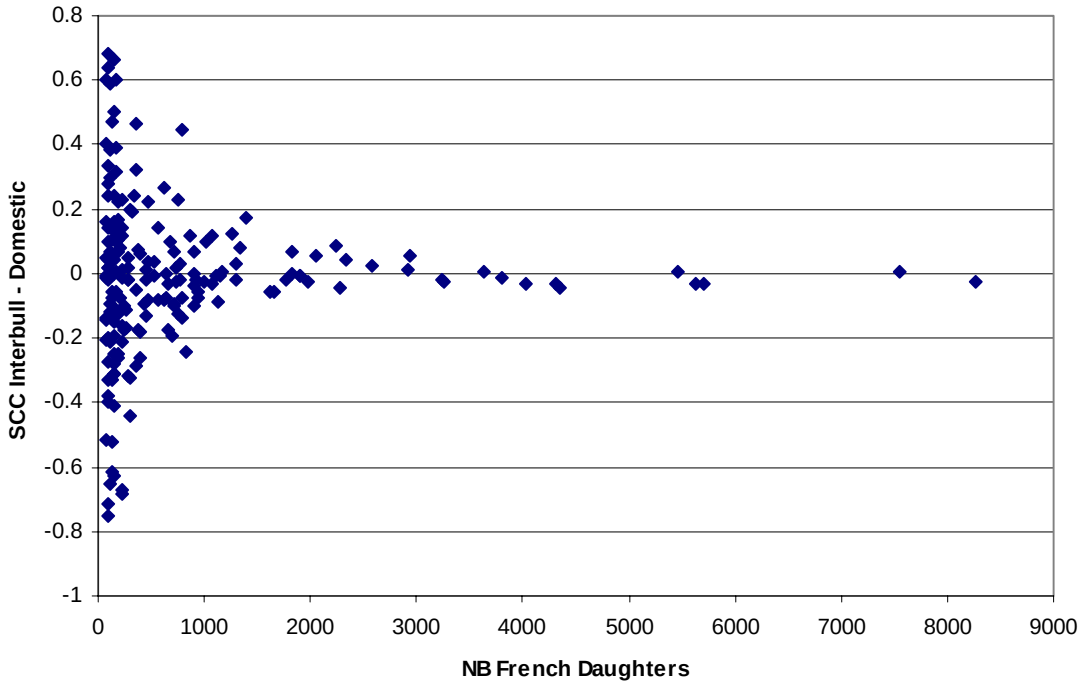

Figure 2: New foreign bulls: difference between Interbull and French SCC proofs according to the French domestic proof
Bulls with at least 100 French daughters in October 2000

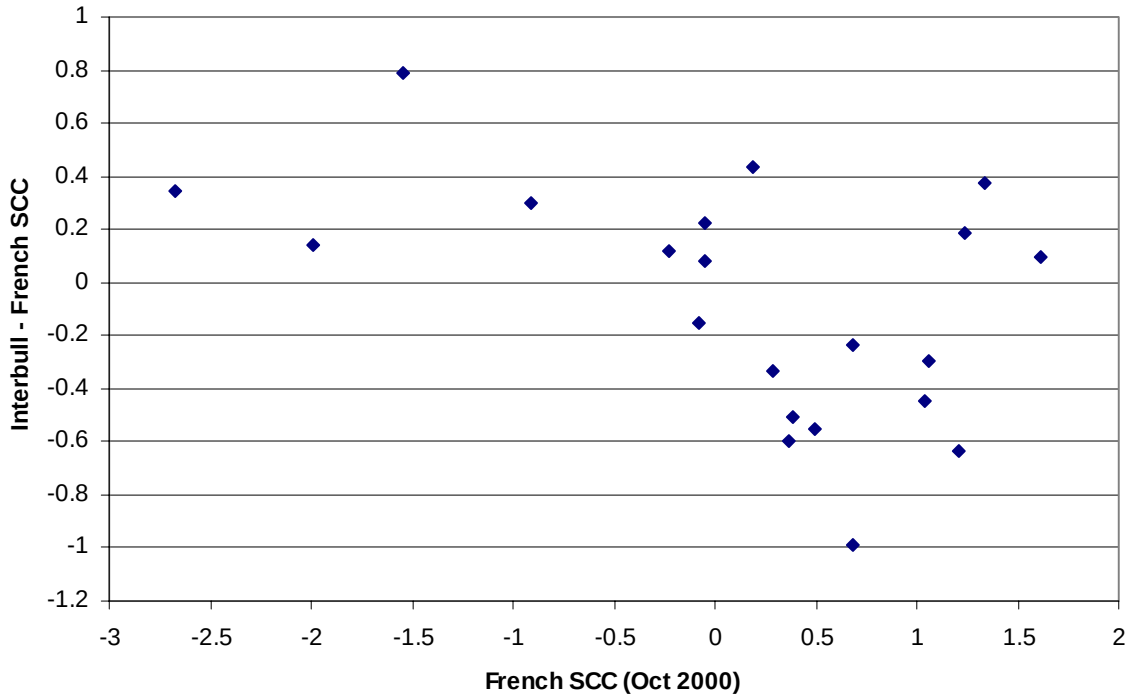

Figure 3: SCC Proofs standard deviations in French units according to Birth Year and to country with most of daughters

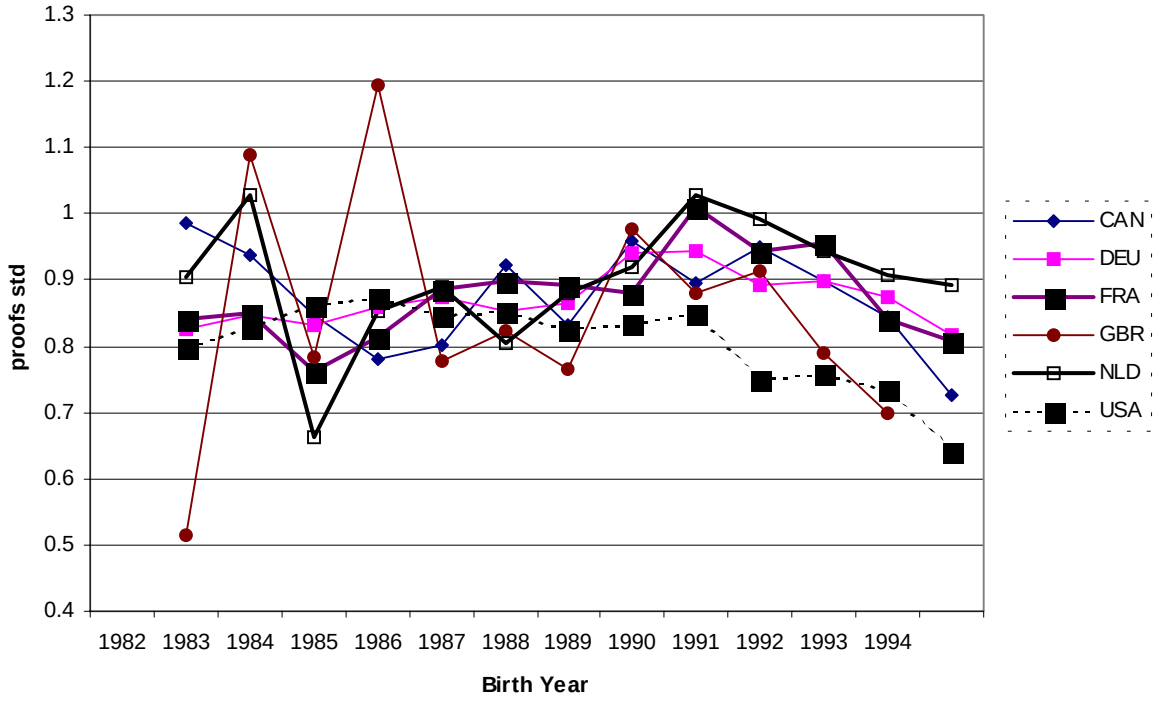

Figure 4: ratio between the number of bulls evaluated on production and on SCC