A Pilot Study on Mace for Conformation for Guernseys

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Introduction

Mace for conformation has become a routine part of the Interbull services. This started in August 1999 with Holsteins followed in May 2001 by Jerseys. At the Interbull meetings in 2001 in Budapest research was presented on Mace for conformation for Ayrshire (Klei & Lawlor, 2001) and Brown Swiss (Bagnato *et al.*, 2001). As a result of these studies Brown Swiss has now been included in a test run by the Interbull Centre. Results for Ayrshires showed that some concerns in regard to the correlation estimates were warranted. Possible reasons were lack of uniformity in trait definition and lack of genetic ties.

Recently, the World Guernsey Cattle Federation decided to start cooperative research with Holstein Association USA in trying to determine the possibility of Mace for conformation for Guernseys. This report shows results of this project.

Material and Methods

Conformation data were obtained from Canada (CAN), Great Britain (GBR) and the United States (USA). The three countries submitted evaluations that were official in February 2002. Traits were chosen to be the same as those for the routine Interbull Holstein and Jersey evaluations (http://www.interbull.org). The countries also provided information on heritabilities. If countries use a standardized scale the formulas for obtaining these were also requested. Pedigree and cross-reference information were obtained from the Interbull Centre. The same method as is used for the routine Mace was used in this project. Critical steps involved are:

1. Data edits
2. Calculation of deregressed evaluations
3. Estimation of correlations
4. Calculation of evaluations (Mace).

A detailed description of the data edits and methodology can be found at the Interbull website (http://www.interbull.org).

Numbers of submitted records for each country are in Table 1. This table also shows the number of records that passed the data edits as well as the number of records that were used in the correlation step. The main reason a number of bulls from USA did not pass the edits was that these bulls were not sampled through an official AI program. Also, the requirement for daughters in a minimum of 10 herds caused some bulls to be omitted. Correlations are estimated using only records on bulls with evaluations in two or more countries, and ¾ sib families with members with evaluations in two or more countries. Table 1 also shows the number of bulls that eventually received a Mace for conformation. Additional edits on birth year (minimum 1980), and the requirement that imported bulls have at least 15 daughters in 10 herds as well as a progeny test record in another country are imposed for calculating evaluations. The requirement of being a common bull or a member of a common ¾ sib family is lifted for this step. This explains the difference in the last two columns of Table 1.

Table 1. Record counts at various steps of Mace for the three countries.

Country	Number of Records			
	Submitted	After Edits	Correlations	Evaluations
CAN	137	137	70	61
GBR	135	135	46	95
USA	784	620	182	452

Table 2. Common bulls and 3/4 sib families for the country combinations for different breeds.

	CAN GBR		CAN USA		GBR USA	
Breed	Bulls	¾ Sib Fam	Bulls	¾ Sib Fam	Bulls	¾ Sib Fam
Guernsey	14	17	48	59	31	33
Jersey	26	34	101	97	30	30
Holstein	529	559	1079	1212	487	652

Table 2 shows the number of common bulls and ¾ sib families. Also in this table are these numbers for Holstein and Jersey for the March 2002 Interbull test run. It shows that even though Guernsey is a small breed a sufficient number of ties appear to exist among the populations. Therefore, it is expected that reasonable estimates can be obtained for the correlations. The combination of some concern is CAN- GBR.

Results and Discussion

Table 3 shows the correlation estimates for the 15 linear and 3 composite traits. Country combinations with missing correlations indicate that either one or both countries did not submit information for that particular trait. Correlations can vary due to a variety of reasons. The most important reasons are differences in trait definition, differences in analysis methods, lack of genetic ties, and genotype by environment interaction. This table shows a similar pattern as was observed in other breeds, high correlations for most of the udder traits and lower ones for the feet and legs. In contrast to most other breeds, where correlations for body traits tend to be intermediate, the ones for Guernsey are high.

Table 3. Correlation estimates for the various country combinations.

Trait	CAN GBR	CAN USA	GBR USA
Stature	.99	.97	.95
Chest Width	.89	.79	.96
Body Depth	.97	.84	.94
Angularity	.97	.76	.80
Rump Angle	.91	.99	.91
Rump Width	.80	.96	.85
Rear Legs Side View	.57	.84	.80
Rear Legs Rear View	--	--	--
Foot Angle	.61	.65	.68
Fore Udder Attachment	.94	.97	.94
Rear Udder Height	.81	.90	.50
Udder Support	.69	.70	.77
Udder Depth	.92	.93	.96
Teat Placement	.86	.99	.85
Teat Length	--	--	.98
Overall Conformation	.76	.81	.72
Overall Udder	.23	--	--
Overall Feet & Legs	.67	--	--

Guernsey correlations for body depth, foot angle, udder depth, and overall conformation are compared to those for Jersey and Holstein in Table 4. From this table it can be observed that the correlations for Guernsey are similar to those for the other two breeds. Foot Angle is the only trait for which correlations are substantially lower than those for Holstein but similar for Jersey. This might indicate that some work needs to be done on increasing uniformity or scoring procedures for this trait when compared to Holstein.

Table 4. Correlations estimates* for the country combiantions for different breeds.

	CAN GBR	CAN USA	GBR USA		CAN GBR	CAN USA	GBR USA
Body Depth				Udder Depth			
Guernsey	.97	.84	.94		.92	.93	.96
Jersey	.32	.83	.49		.84	.98	.91
Holstein	.77	.76	.89		.94	.93	.96
Foot Angle				Overall Conformation			
Guernsey	.61	.65	.68		.76	.81	.72
Jersey	.55	.91	.66		.74	.52	.49
Holstein	.84	.89	.84		.75	.86	.81

**All data for Jersey and Holstein from March 2002 Interbull Test Run.*

The reason to implement Mace is for comparison of bulls from different countries. The benefit may be greatest for smaller populations who can potentially identify bulls from other countries that can benefit a local selection program. This is illustrated in Table 5. In this table comparisons are made between the average Mace of the top bulls currently used in one's own country (Local) with the average Mace of the same number of top bulls worldwide (ALL) on that country's scale. Different numbers of top bulls were chosen for each country to reflect differences in population size. As expected the average for ALL is higher than that for Local for all traits and country combinations. This shows that for each country the other two countries have genetics that can be used to benefit its selection program. The table also shows the advantage of using Mace when dealing with small populations. The advantage for the All group is much bigger for the two smaller populations (CAN and GBR) than it is for the USA population. Another explanation for this result might be that the USA population is genetically superior making bulls in other countries not competitive. A final explanation could be "home field advantage". This term is used because Mace tends to favor bulls from ones own country. Since the results in Table 5 are expressed on each country's own scale, each country should have its own "home field advantage". "Home field advantage" is more pronounced when dealing with lower correlated traits, such as seen for Foot Angle and Overall Conformation. Results in Table 5 do not support the latter explanation.

Another way to look at the influence of correlations is shown in Table 6. This table shows the number of bulls that are in common in the Top 10 for each of the country combinations.

Table 5. Average Mace for the Top Local and ALL bulls for the three countries (number of bulls considered between brackets).

Trait	CAN (5)		GBR (10)		USA (20)	
	Local	All	Local	All	Local	All
Body Depth	11.39	12.08	2.12	3.20	3.07	3.08
Foot Angle	9.79	10.51	2.56	2.84	1.33	1.39
Udder Depth	7.55	11.03	2.42	3.08	3.25	3.40
Overall Conformation	8.27	11.72	2.67	3.03	2.06	2.09

Table 6. Number of common bulls in the Top 10 for each country for different traits.

Trait	CAN GBR	CAN USA	GBR USA
Body Depth	8	7	9
Foot Angle	4	5	7
Udder Depth	9	9	10
Overall Conformation	4	7	5

When correlations are high it indicates that that countries measure and analyze the same trait and one would expect that bulls rank similarly. On the other hand, when correlations are lower, the trait in one country is not equal to the trait in another country and one expects that bulls will re-rank. Even though there is no one-to-one relation between magnitude of the correlation and the number of bulls in common, the general trend follows expectations.

Table 7. Rank in CAN and GBR of the Top 10 bulls in USA for Body Depth and Overall Conformation.

Body Depth			Overall Conformation		
Rank(USA)	Rank(CAN)	Rank(GBR)	Rank(USA)	Rank(CAN)	Rank(GBR)
1	3	1	1	3	4
2	1	2	2	2	2
3	6	5	3	1	1
4	4	3	4	*7*	*21*
5	8	6	5	6	*14*
6	*12*	8	6	*11*	9
7	*21*	*11*	7	*15*	*15*
8	*15*	10	8	9	*24*
9	2	4	9	*12*	*11*
10	10	9	10	4	5

Table 7 shows this in more detail for Foot Angle and Udder Depth. In this table, the Top 10 bulls in the USA for each trait are listed with their rank in the other two countries. For Body Depth where many of the same bulls rank in the top 10 in each country some individual re-ranking occurs. On the other hand, we see that for Overall Conformation, having lower correlations, considerable re-ranking occurs. As an example bull 4 in the US ranks 7th in CAN and 21st in GBR

Conclusions

Results of this indicate that Mace for Guernseys is feasible for these three countries. Correlations for a majority of the traits are in the desirable range. The results of this study can be used by the World Guernsey Cattle Federation in identifying those traits in which more uniformity in scoring is desired.

This study also shows that Mace can help in identifying individuals that can help a local breeding program. It clearly showed the benefits of being able to compare and select bulls from a larger population.

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Literature Cited

Bagnato, A., Ghiroldi, S. & Santus, E. 2001. Type traits MACE correlation coefficients estimation in Brown Swiss. *Interbull Bulletin 27,* 56-59.

Klei, B. & Lawlor, T.. 2001. Mace for conformation – Ayrshire. *Interbull Bulletin 27,* 51-55.