Jersey Mace for Conformation

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Introduction

Mace for Conformation for Holsteins has been part of the Interbull service package since August 1999. The World Jersey Bureau decided to investigate whether this service should be extended to the Jersey breed.

This report shows results from this exploratory study with an emphasis on the correlation estimates among the countries.

Material and Methods

Pedigree and cross-reference files were obtained from the Interbull Centre. Conformation data were directly obtained from Australia, Canada, Denmark, New Zealand and the United States. Evaluations for conformation traits were requested for the same traits as those used in Holstein Mace. Table 1 lists the traits that were actually supplied for the requested traits. This Table shows that not all countries define or observe the same traits.

The procedure used for calculating the correlations and Mace includes the following four steps.

1. Edit data.
2. Calculate de-regressed evaluations.
3. Estimate correlations.
4. Calculate the evaluations (MACE).

A detailed descriptions of the edits and steps involved can be found at the Interbull website (http://www.interbull.org).

Table 1. Evaluations submitted by each of the five countries for the traits requested

Trait Requested	AUS	CAN	DNK	NZL	USA
Stature	*[1]	*	*	*	*
Chest Width	*	*	*	Capacity[3]	*
Body Depth	*	Body Capacity	*	Capacity	*
Angularity	*	Dairy Character	*	Dairy Conformation	*
Rump Angle	*	*	*	*	*
Rump Width	Pin Width	Thurl Width	*	*	Thurl Width
Rear Leg Set	*	Rear Leg Side View	*	*	Rear Leg Side View
Foot Angle	*	*	*	*	*
Fore Udder	*	*	*	*	*
Rear Udder Height	*	*	Rear Udder Width	Rear Udder	*
Udder Support	*	*	*	*	*
Udder Depth	*	*	*	Udder Support	*
Teat Placement	*	*	*	*	*
Teat Length	*	o[2]	*	*	*
Overall Conformation	*	*	*	Dairy Conformation	*
Overall Udder	*	*	*	o	o
Overall Feet and Legs	*	*	*	o	o

[1]) * Indicates that trait was submitted in the form request.
[2]) o indicates that trait was not submitted.
[3]) Alternative trait used

Numbers of evaluations submitted by each country are in Table 2. This Table also shows the number of records that made it past the Interbull edits. The main editing requirement was that a bull's evaluation needed to be based on at least 10 daughters in at least 10 herds. NZL did not supply information on number of herds; therefore the number of daughters was used exclusively. The last column in Table 2 is the number of evaluations from each country that were used for estimating the correlations. Interbull procedure for estimating correlations is to use only records on a) bulls that have evaluations in more than one country and b) bulls that are members of ¾ sib groups (sire and maternal grandsire are the same) that have members in more than one country. Research by Sigurdsson and Banos (Interbull Bulletin, 1995) has shown that most of the information to estimate genetic correlations is from information on the bulls in common and the related bulls. Bulls outside these two groups add little information and may safely be excluded.

Table 2. Number of bulls in common (below diagonal) and number of bulls in 3/4 sib families (below diagonal) for each country combination

	AUS	CAN	DNK	NZL	USA
AUS		25	16	40	45
CAN	24		17	24	45
DNK	10	11		24	23
NZL	39	24	17		71
USA	34	34	14	73	

It is interesting to take a look at the number of bulls in common and number of bulls in ¾ sib families represented in each country (Table 3). It is clear that correlations for some country combinations are based on very little information (notably DNK with other countries). Low levels of connectedness can result in biased (low) correlation estimates.

Table 3. Number of records submitted, passed edits, and used for correlation estimation for each country

Country	Submitted	Edited	Correlation
AUS	259	154	109
CAN	328	169	70
DNK	822	787	80
NZL	1497	1089	289
USA	1441	1010	553

Results and Discussion

One of the important steps required in Mace is to obtain accurate estimates of the genetic correlations for the traits among the different countries. There are a number of reasons why estimates could be different from unity:

1. Genotype × Environment interaction.
2. Differences in trait definition.
3. Differences in national evaluation models.
4. Non-randomness of the group of bulls providing the ties between countries.

A complete set of correlation estimates can be found in the Appendix. In general, these correlations are as expected. High correlations for udder traits and stature, intermediate ones for the other body traits, and lower values for the feet and legs traits. When interpreting these results one has to keep in mind that for some of the traits the trait definition in each country can be quite different. For example, for NZL Dairy Conformation was used in place of Angularity, a trait not collected in NZL. This resulted in significantly lower correlations. The negative correlations for Teat Length for DNK can be explained by the fact that DNK's scale for this trait is reversed.

Previously, Weigel (Pers. Comm. 1999) analyzed Jersey conformation evaluations from DNK, NZL, and USA. A method based on proof correlations (Calo et al, JAS 1973) was used to estimate genetic correlations. Estimates obtained through this method are generally considered to be lower bounds on the true values. However, it has been shown that the method is sensitive to selection (Klei, PhD thesis, 1995).

The following three tables show: estimates from the Jersey evaluation; estimates obtained by Weigel; and estimates used in the Holstein Mace for Conformation.

Table 4. Correlation estimates obtained for three traits obtained by three studies

Stature	DNK NZL	DNK USA	NZL USA
Jersey	.90	.83	.77
Weigel	.95	.89	.94
Holstein	.77	.89	.80

Rear Legs Side	DNK NZL	DNK USA	NZL USA
Jersey	.63	.87	.89
Weigel	.51	.89	.48
Holstein	.54	.90	.59

Teat Plcmnt.	DNK NZL	DNK USA	NZL USA
Jersey	.89	.93	.83
Weigel	.99	.99	.86
Holstein	.87	.91	.83

Table 4 shows that the estimates obtained in the current Jersey study and those obtained in the Jersey study by Weigel are in agreement. The major difference was found for NZL-USA for Rear Legs Side View. As expected, all correlations are not higher than those estimated by Weigel. This can largely be attributed to the small number of bulls in common between countries. Weigel had 23, 23 and 77, respectively for the three groups.

When comparing the results with the Holstein parameters a general agreement can be observed. Again, the major difference is for the trait Rear Legs Side View between NZL and USA. A complete set of the Holstein parameters can be obtained from the Interbull website.

Conclusions and Recommendations

Mace for Conformation for Jerseys is quite feasible. Even though correlations for some of the trait and country combinations are lower than desired. It may be advisable to exclude NZL data for some of the traits. In particular those traits in which the trait definition is not in close agreement. The increased use of Jersey bulls on a global basis will increase ties between countries leading to more accurate Mace. Mace can help to identify foreign bulls that can improve each country's cow population.

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Stature

	AUS	CAN	DNK	NZL
CAN	.80			
DNK	.82	.85		
NZL	.72	.69	.90	
USA	.78	.97	.83	.77

Chest Width

	AUS	CAN	DNK	NZL
CAN	.59			
DNK	.70	.79		
NZL	.78	.64	.49	
USA	.72	.83	.82	.61

Body Depth

	AUS	CAN	DNK	NZL
CAN	.56			
DNK	.61	.67		
NZL	.78	.61	.72	
USA	.82	.82	.83	.63

Angularity

	AUS	CAN	DNK	NZL
CAN	.67			
DNK	.88	.86		
NZL	.30	.45	.15	
USA	.70	.68	.74	.18

Rump Angle

	AUS	CAN	DNK	NZL
CAN	.82			
DNK	.76	.97		
NZL	.97	.87	.84	
USA	.91	.95	.89	.90

Rump Width

	AUS	CAN	DNK	NZL
CAN	.67			
DNK	.70	.79		
NZL	.75	.64	.49	
USA	.46	.83	.82	.61

Rear Leg Set

	AUS	CAN	DNK	NZL
CAN	.26			
DNK	.37	.98		
NZL	.73	.63	.63	
USA	.75	.82	.87	.89

Foot Angle

	AUS	CAN	DNK	NZL
CAN	.78			
DNK	.46	.60		
NZL				
USA	.83	.82	.55	

Fore Udder

	AUS	CAN	DNK	NZL
CAN	.48			
DNK	.66	.58		
NZL	.75	.58	.64	
USA	.73	.94	.90	.66

Rear Udder Height

	AUS	CAN	DNK	NZL
CAN	.67			
DNK	.28	.59		
NZL	.68	.60	.49	
USA	.74	.86	.52	.66

Udder Support

	AUS	CAN	DNK	NZL
CAN	.75			
DNK	.44	.62		
NZL	.55	.55	.12	
USA	.68	.73	.68	.29

Udder Depth

	AUS	CAN	DNK	NZL
CAN	.85			
DNK	.84	.91		
NZL	.53	.47	.46	
USA	.78	.91	.91	.42

Teat Placement

	AUS	CAN	DNK	NZL
CAN	.78			
DNK	.72	.98		
NZL	.79	.89	.89	
USA	.85	.97	.93	.83

Teat Length

	AUS	CAN	DNK	NZL
CAN				
DNK	-.80			
NZL				
USA	.74		-.90	

Overall Conformation

	AUS	CAN	DNK	NZL
CAN	.48			
DNK	.41	.88		
NZL	.46	.46	.34	
USA	.72	.63	.66	.13

Overall Udder

	AUS	CAN
CAN	.30	
DNK	.29	.87

Overall Feet and Legs

	AUS	CAN
CAN	.85	
DNK	.70	.52