

INTRODUCTION

The latest routine international evaluation for calving traits took place as scheduled at the Interbull Centre. Data from eighteen (18) countries were included in this evaluation.

International genetic evaluations for calving traits of bulls from Australia, Austria-Germany, Belgium, Canada, Denmark-Finland-Sweden, France, Germany, Hungary, Ireland, Israel, Italy, Netherlands, Norway, Spain, Switzerland, the United Kingdom, Slovak Republic, Poland and the United States of America were computed. Brown Swiss, Holstein, and Red Dairy Cattle breed data were included in this evaluation.

CHANGES IN NATIONAL PROCEDURES

Changes in the national genetic evaluation of calving traits are as follows:

| | |
|---------------|--|
| BEL (HOL) | Changes in type of proofs caused by the program used to assign them. |
| ISR (HOL) | Some bulls had slight reductions in the numbers of records, due to editing and parentage corrections. |
| DEA (BSW) | Drops in info causing changes in rel |
| DFS (ALL) | Changes in type of proofs: Type of proof is based on information from production. When production information for foreign bulls become available they might change type of proof for other traits as well. Drops in information. |
| ITA (HOL) | Decrease in information due to data editing. |
| DEU (HOL,RDC) | Smaller decreases in herds, daughters or edc (less than 10%) are caused by data editing or pedigree correction. |
| POL (HOL) | Small decrease in number of herds and daughters due to data edits caused decrease of EDC. |
| USA (ALL) | Drops in observations due to data editings |
| ESP (HOL) | Drops in observations due to data editings |

INTERBULL CHANGES COMPARED TO THE PREVIOUS ROUTINE RUN

Post-processing Windows:

According to the decision taken by ITC in Orlando (2015) to review the post-processing windows every 5 years, during the 2020 the relative working group has been re-activated and new windows have been identified.

As before, the upper bounds have been set to 0.99 as these were judged to have very little effect on evaluations while the lower values have been reduced to the 10th percentile. This reduction would provide post-processed correlations to be closer to the real estimated ones. Over the past five years, in fact, the previous adopted lower value (25th percentile) had been found too high causing estimated and post-processed correlations to differ significantly from each other. The new lower values have been applied to all breeds and traits.

The weight assigned to the magnitude of the changes tested by each country has also been revised. The new weight will allow post-processed correlations to take more in consideration the value of the new estimated ones even when no changes are applied by the countries.

The new weights are as follows:

No changes :: 2
Small changes:: 1
Big changes :: 0

More information can be read on https://interbull.org/ib/rg_procedure

DATA AND METHOD OF ANALYSIS

Data were national genetic evaluations of AI sampled bulls with at least 10 daughters or 10 EDC (for clinical mastitis and maternal calving traits at least 50 daughters or 50 EDC, and for direct calving traits at least 50 calvings or 50 EDC) in at least 10 herds. Table 1 presents the amount of data included in this Interbull evaluation for all breeds.

National proofs were first de-regressed within country and then analysed jointly with a linear model including the effects of evaluation country, genetic group of bull and bull merit. Heritability estimates used in both the de-regression and international evaluation were as in each country's national evaluation.

Table 2 presents the date of evaluation as supplied by each country

Estimated genetic parameters and sire standard deviations are shown in APPENDIX I and the corresponding number of common bulls are listed in APPENDIX II.

SCIENTIFIC LITERATURE

The international genetic evaluation procedure is based on international work described in the following scientific publications:

International genetic evaluation computation:
Schaeffer. 1994. J. Dairy Sci. 77:2671-2678
Klei, 1998. Interbull Bulletin 17:3-7

Verification and Genetic trend validation:
Klei et al., 2002. Interbull Bulletin 29:178-182.
Boichard et al., 1995. J. Dairy Sci. 78:431-437

Weighting factors:
Fikse and Banos, 2001. J. Dairy Sci. 84:1759-1767

De-regression:
Sigurdsson and G. Banos. 1995. Acta Agric. Scand. 45:207-219
Jairath et al. 1998. J. Dairy Sci. Vol. 81:550-562

Genetic parameter estimation:
Klei and Weigel, 1998, Interbull Bulletin 17:8-14
Sullivan, 1999. Interbull Bulletin 22:146-148

Post-processing of estimated genetic correlations:
Mark et al., 2003, Interbull Bulletin 30:126-135
Jorjani et al., 2003. J. Dairy Sci. 86:677-679
<https://wiki.interbull.org/public/rG%20procedure?action=print>

Time edits
Weigel and Banos. 1997. J. Dairy Sci. 80:3425-3430

International reliability estimation
Harris and Johnson. 1998. Interbull Bulletin 17:31-36

NEXT ROUTINE INTERNATIONAL EVALUATION

Dates for the next routine evaluation can be found on
<http://www.interbull.org/ib/servicecalendar>.

NEXT TEST INTERNATIONAL EVALUATION

Dates for the next test run can be found on
<http://www.interbull.org/ib/servicecalendar>.

PUBLICATION OF INTERBULL ROUTINE RUN

Results were distributed by the Interbull Centre to designated representatives in each country. The international evaluation file comprised international proofs expressed on the base and unit of each country included in the analysis. Such records readily provide more information on bull performance in various countries, thereby minimizing the need to resort to

conversions.

At the same time, all recipients of Interbull results are expected to honor the agreed code of practice, decided by the Interbull Steering Committee, and only publish international evaluations on their own country scale. Evaluations expressed on another country scale are confidential and may only be used internally for research and review purposes.

PUBLICATION OF INTERBULL TEST RUN

Test evaluation results are meant for review purposes only and should not be published.

^LTable 1. National evaluation data considered in the Interbull evaluation for calving (August Routine Evaluation 2021). Number of records for direct calving ease by breed

| Country | BSW | GUE | HOL | JER | RDC | SIM |
|-------------|------|-----|--------|-----|-------|-----|
| AUS | | | 6479 | | | |
| BEL | | | 1175 | | | |
| CAN | 163 | | 13015 | | 507 | |
| CHE | 1559 | | 2095 | | | |
| CZE | | | | | | |
| DEA | 3477 | | | | | |
| DEU | | | 19641 | | 278 | |
| DFS | | | 10607 | | 6457 | |
| ESP | | | 2263 | | | |
| EST | | | | | | |
| FRA | 365 | | 12687 | | | |
| FRM | | | | | | |
| GBR | | | 3100 | | | |
| HUN | | | 1767 | | | |
| IRL | | | 2190 | | 58 | |
| ISR | | | 520 | | | |
| ITA | | | 9462 | | | |
| JPN | | | | | | |
| KOR | | | | | | |
| LTU | | | | | | |
| LVA | | | | | | |
| NLD | 156 | | 15124 | | 75 | |
| NOR | | | | | 3832 | |
| NZL | | | 7542 | | 1107 | |
| POL | | | 6247 | | | |
| PRT | | | | | | |
| SVK | | | 683 | | | |
| SVN | | | | | | |
| URY | | | | | | |
| USA | 505 | | 36038 | | | |
| ZAF | | | | | | |
| HRV | | | | | | |
| CAM | | | | | | |
| No. Records | 6225 | | 150635 | | 12314 | |
| Pub. Proofs | 6662 | 0 | 130748 | 0 | 12793 | 0 |

^LAPPENDIX I. Sire standard deviations in diagonal and genetic correlations below diagonal

| BSW | dce | | | | | |
|-----|------|------|-----|-----|-----|-----|
| | DEA | NLD | USA | CHE | CAN | FRA |
| DEA | 9.26 | | | | | |
| NLD | 0.89 | 5.68 | | | | |

| | | | | | | |
|-----|------|------|------|-------|------|------|
| USA | 0.72 | 0.86 | 0.13 | | | |
| CHE | 0.88 | 0.94 | 0.85 | 10.54 | | |
| CAN | 0.81 | 0.95 | 0.92 | 0.94 | 7.61 | |
| FRA | 0.77 | 0.89 | 0.84 | 0.84 | 0.88 | 0.76 |

BSW mce

| | | | | | | |
|-----|------|------|------|-------|------|------|
| | DEA | NLD | USA | CHE | CAN | FRA |
| DEA | 9.76 | | | | | |
| NLD | 0.64 | 4.63 | | | | |
| USA | 0.82 | 0.76 | 0.15 | | | |
| CHE | 0.84 | 0.73 | 0.89 | 12.87 | | |
| CAN | 0.48 | 0.79 | 0.86 | 0.74 | 6.12 | |
| FRA | 0.87 | 0.77 | 0.92 | 0.94 | 0.81 | 1.02 |

HOL dce

| | | | | | | | | | | | | | | | | | | |
|-----|------|------|------|-------|------|------|------|------|------|------|------|-------|------|------|------|-------|-------|-------|
| | AUS | CAN | CHE | DFS | FRA | ISR | ITA | NLD | USA | GBR | HUN | DEU | BEL | IRL | NZL | SVK | ESP | POL |
| AUS | 0.04 | | | | | | | | | | | | | | | | | |
| CAN | 0.77 | 6.84 | | | | | | | | | | | | | | | | |
| CHE | 0.70 | 0.92 | 9.16 | | | | | | | | | | | | | | | |
| DFS | 0.76 | 0.92 | 0.83 | 11.60 | | | | | | | | | | | | | | |
| FRA | 0.80 | 0.95 | 0.91 | 0.89 | 0.92 | | | | | | | | | | | | | |
| ISR | 0.71 | 0.83 | 0.67 | 0.83 | 0.80 | 2.77 | | | | | | | | | | | | |
| ITA | 0.62 | 0.71 | 0.64 | 0.71 | 0.72 | 0.69 | 7.23 | | | | | | | | | | | |
| NLD | 0.85 | 0.97 | 0.89 | 0.93 | 0.93 | 0.86 | 0.73 | 7.09 | | | | | | | | | | |
| USA | 0.75 | 0.91 | 0.87 | 0.86 | 0.92 | 0.79 | 0.70 | 0.86 | 0.13 | | | | | | | | | |
| GBR | 0.75 | 0.79 | 0.66 | 0.72 | 0.76 | 0.70 | 0.66 | 0.84 | 0.73 | 0.07 | | | | | | | | |
| HUN | 0.61 | 0.68 | 0.51 | 0.62 | 0.69 | 0.67 | 0.57 | 0.68 | 0.67 | 0.67 | 1.25 | | | | | | | |
| DEU | 0.81 | 0.93 | 0.88 | 0.89 | 0.93 | 0.79 | 0.69 | 0.92 | 0.86 | 0.76 | 0.69 | 12.73 | | | | | | |
| BEL | 0.65 | 0.70 | 0.64 | 0.71 | 0.71 | 0.57 | 0.64 | 0.71 | 0.72 | 0.62 | 0.69 | 0.69 | 9.50 | | | | | |
| IRL | 0.77 | 0.88 | 0.79 | 0.85 | 0.87 | 0.77 | 0.70 | 0.91 | 0.82 | 0.72 | 0.64 | 0.82 | 0.68 | 0.09 | | | | |
| NZL | 0.76 | 0.76 | 0.77 | 0.76 | 0.75 | 0.69 | 0.53 | 0.80 | 0.74 | 0.60 | 0.37 | 0.76 | 0.49 | 0.79 | 2.99 | | | |
| SVK | 0.56 | 0.57 | 0.36 | 0.56 | 0.57 | 0.53 | 0.57 | 0.57 | 0.56 | 0.56 | 0.60 | 0.57 | 0.56 | 0.51 | 0.26 | 13.00 | | |
| ESP | 0.64 | 0.75 | 0.67 | 0.71 | 0.75 | 0.63 | 0.67 | 0.73 | 0.75 | 0.67 | 0.66 | 0.75 | 0.68 | 0.71 | 0.56 | 0.59 | 11.22 | |
| POL | 0.58 | 0.65 | 0.45 | 0.67 | 0.65 | 0.60 | 0.58 | 0.63 | 0.64 | 0.62 | 0.58 | 0.63 | 0.58 | 0.63 | 0.23 | 0.59 | 0.60 | 14.10 |

HOL mce

| | | | | | | | | | | | | | | | |
|-----|------|-------|-------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| | CAN | CHE | DFS | FRA | ISR | ITA | NLD | USA | GBR | HUN | DEU | BEL | SVK | ESP | POL |
| CAN | 6.73 | | | | | | | | | | | | | | |
| CHE | 0.87 | 11.66 | | | | | | | | | | | | | |
| DFS | 0.83 | 0.69 | 12.07 | | | | | | | | | | | | |
| FRA | 0.91 | 0.96 | 0.77 | 1.28 | | | | | | | | | | | |
| ISR | 0.83 | 0.69 | 0.81 | 0.78 | 2.65 | | | | | | | | | | |
| ITA | 0.79 | 0.84 | 0.62 | 0.84 | 0.75 | 9.22 | | | | | | | | | |
| NLD | 0.83 | 0.75 | 0.85 | 0.80 | 0.70 | 0.57 | 5.29 | | | | | | | | |
| USA | 0.92 | 0.92 | 0.78 | 0.95 | 0.86 | 0.85 | 0.78 | 0.15 | | | | | | | |
| GBR | 0.63 | 0.71 | 0.54 | 0.73 | 0.56 | 0.61 | 0.56 | 0.67 | 0.04 | | | | | | |
| HUN | 0.49 | 0.44 | 0.50 | 0.48 | 0.53 | 0.45 | 0.49 | 0.48 | 0.47 | 1.28 | | | | | |
| DEU | 0.83 | 0.73 | 0.91 | 0.77 | 0.76 | 0.67 | 0.84 | 0.79 | 0.56 | 0.50 | 12.52 | | | | |
| BEL | 0.67 | 0.69 | 0.70 | 0.73 | 0.58 | 0.60 | 0.78 | 0.67 | 0.53 | 0.50 | 0.74 | 10.44 | | | |
| SVK | 0.45 | 0.42 | 0.45 | 0.45 | 0.55 | 0.45 | 0.45 | 0.45 | 0.55 | 0.45 | 0.44 | 0.50 | 15.88 | | |
| ESP | 0.66 | 0.60 | 0.66 | 0.65 | 0.67 | 0.56 | 0.67 | 0.65 | 0.54 | 0.51 | 0.67 | 0.61 | 0.47 | 11.82 | |
| POL | 0.53 | 0.50 | 0.54 | 0.52 | 0.54 | 0.52 | 0.52 | 0.53 | 0.48 | 0.44 | 0.54 | 0.52 | 0.45 | 0.52 | 15.59 |

HOL dsb

| | | | | | | | | | | | | |
|-----|------|------|-------|-------|------|------|-----|-----|-----|-----|-----|-----|
| | AUS | CAN | CHE | DFS | FRA | ISR | ITA | NLD | USA | HUN | DEU | POL |
| AUS | 0.04 | | | | | | | | | | | |
| CAN | 0.63 | 7.60 | | | | | | | | | | |
| CHE | 0.36 | 0.63 | 17.81 | | | | | | | | | |
| DFS | 0.69 | 0.87 | 0.59 | 12.52 | | | | | | | | |
| FRA | 0.47 | 0.75 | 0.63 | 0.65 | 0.76 | | | | | | | |
| ISR | 0.83 | 0.72 | 0.41 | 0.75 | 0.49 | 1.69 | | | | | | |

| | | | | | | | | | | | | |
|-----|------|------|------|------|------|------|------|------|------|------|-------|-------|
| ITA | 0.63 | 0.54 | 0.33 | 0.56 | 0.39 | 0.69 | 7.23 | | | | | |
| NLD | 0.39 | 0.78 | 0.73 | 0.71 | 0.68 | 0.50 | 0.32 | 4.49 | | | | |
| USA | 0.40 | 0.65 | 0.62 | 0.54 | 0.64 | 0.38 | 0.33 | 0.60 | 0.07 | | | |
| HUN | 0.61 | 0.49 | 0.30 | 0.50 | 0.32 | 0.66 | 0.45 | 0.30 | 0.32 | 1.10 | | |
| DEU | 0.52 | 0.88 | 0.67 | 0.85 | 0.67 | 0.66 | 0.44 | 0.81 | 0.63 | 0.43 | 12.36 | |
| POL | 0.38 | 0.56 | 0.55 | 0.63 | 0.52 | 0.36 | 0.32 | 0.56 | 0.52 | 0.29 | 0.62 | 16.63 |

HOL msb

| | | | | | | | | | | | |
|-----|------|-------|-------|------|------|------|------|------|------|-------|-------|
| | CAN | CHE | DFS | FRA | ISR | ITA | NLD | USA | HUN | DEU | POL |
| CAN | 6.08 | | | | | | | | | | |
| CHE | 0.80 | 16.96 | | | | | | | | | |
| DFS | 0.95 | 0.79 | 11.58 | | | | | | | | |
| FRA | 0.87 | 0.82 | 0.86 | 0.93 | | | | | | | |
| ISR | 0.88 | 0.77 | 0.85 | 0.78 | 1.73 | | | | | | |
| ITA | 0.50 | 0.61 | 0.48 | 0.54 | 0.63 | 9.22 | | | | | |
| NLD | 0.93 | 0.75 | 0.95 | 0.81 | 0.82 | 0.46 | 4.19 | | | | |
| USA | 0.86 | 0.81 | 0.84 | 0.83 | 0.80 | 0.52 | 0.79 | 0.12 | | | |
| HUN | 0.40 | 0.38 | 0.42 | 0.43 | 0.52 | 0.45 | 0.40 | 0.43 | 1.22 | | |
| DEU | 0.95 | 0.81 | 0.97 | 0.84 | 0.87 | 0.48 | 0.95 | 0.83 | 0.40 | 12.77 | |
| POL | 0.85 | 0.76 | 0.82 | 0.71 | 0.83 | 0.45 | 0.78 | 0.73 | 0.41 | 0.81 | 14.34 |

RDC dce

| | | | | | | | |
|-----|------|-------|-------|------|-------|------|------|
| | CAN | DFS | NOR | NLD | DEU | IRL | NZL |
| CAN | 6.56 | | | | | | |
| DFS | 0.92 | 11.33 | | | | | |
| NOR | 0.85 | 0.93 | 13.68 | | | | |
| NLD | 0.96 | 0.92 | 0.91 | 5.01 | | | |
| DEU | 0.92 | 0.89 | 0.90 | 0.92 | 13.71 | | |
| IRL | 0.85 | 0.83 | 0.90 | 0.88 | 0.81 | 0.07 | |
| NZL | 0.73 | 0.72 | 0.68 | 0.78 | 0.73 | 0.75 | 2.78 |

RDC mce

| | | | | |
|-----|------|-------|-------|-------|
| | CAN | DFS | NOR | DEU |
| CAN | 6.93 | | | |
| DFS | 0.80 | 12.16 | | |
| NOR | 0.67 | 0.89 | 15.42 | |
| DEU | 0.81 | 0.85 | 0.72 | 11.98 |

^LAPPENDIX II. Number of common bulls

BSW

common bulls below diagonal
common three quarter sib group above diagonal

| | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|
| | DEA | NLD | USA | CHE | CAN | FRA |
| DEA | 0 | 100 | 177 | 395 | 94 | 180 |
| NLD | 92 | 0 | 38 | 67 | 19 | 49 |
| USA | 133 | 34 | 0 | 149 | 103 | 66 |
| CHE | 326 | 62 | 115 | 0 | 84 | 105 |
| CAN | 82 | 17 | 93 | 72 | 0 | 53 |
| FRA | 127 | 37 | 49 | 70 | 45 | 0 |

BSW

common bulls below diagonal
common three quarter sib group above diagonal

| | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|
| | DEA | NLD | USA | CHE | CAN | FRA |
| DEA | 0 | 100 | 100 | 458 | 35 | 137 |
| NLD | 92 | 0 | 31 | 64 | 14 | 47 |
| USA | 88 | 28 | 0 | 95 | 30 | 44 |

| | | | | | | |
|-----|-----|----|----|----|----|----|
| CHE | 366 | 63 | 81 | 0 | 32 | 93 |
| CAN | 31 | 11 | 28 | 26 | 0 | 23 |
| FRA | 97 | 41 | 39 | 65 | 21 | 0 |

BSW

BSW

GUE

GUE

GUE

GUE

HOL

common bulls below diagonal

common three quarter sib group above diagonal

| | AUS | CAN | CHE | DFS | FRA | ISR | ITA | NLD | USA | GBR | HUN | DEU | BEL | IRL | NZL | SVK | ESP | POL |
|-----|------|------|-----|------|------|-----|------|------|------|------|-----|------|-----|-----|-----|-----|-----|------|
| AUS | 0 | 1291 | 395 | 973 | 1027 | 79 | 1083 | 1121 | 1609 | 699 | 446 | 1269 | 482 | 458 | 939 | 189 | 519 | 695 |
| CAN | 1231 | 0 | 636 | 1262 | 1365 | 95 | 1800 | 1371 | 3525 | 853 | 698 | 2267 | 584 | 419 | 691 | 285 | 853 | 1199 |
| CHE | 337 | 537 | 0 | 384 | 451 | 28 | 503 | 533 | 673 | 324 | 201 | 786 | 346 | 213 | 247 | 108 | 301 | 435 |
| DFS | 634 | 978 | 318 | 0 | 1308 | 99 | 1348 | 1493 | 1738 | 768 | 523 | 1981 | 541 | 442 | 708 | 233 | 570 | 951 |
| FRA | 709 | 973 | 379 | 702 | 0 | 82 | 1642 | 1570 | 2087 | 859 | 649 | 2087 | 623 | 452 | 702 | 283 | 703 | 1229 |
| ISR | 48 | 67 | 15 | 67 | 45 | 0 | 101 | 113 | 130 | 68 | 53 | 106 | 46 | 58 | 84 | 32 | 60 | 84 |
| ITA | 783 | 1497 | 431 | 948 | 947 | 68 | 0 | 1536 | 2610 | 1004 | 725 | 2398 | 600 | 477 | 726 | 301 | 879 | 1297 |
| NLD | 845 | 1176 | 496 | 972 | 852 | 79 | 1088 | 0 | 2191 | 966 | 560 | 2680 | 701 | 573 | 962 | 320 | 643 | 1324 |
| USA | 1500 | 3804 | 573 | 1165 | 1133 | 118 | 1943 | 1589 | 0 | 1216 | 845 | 3160 | 623 | 550 | 981 | 352 | 957 | 1676 |
| GBR | 509 | 683 | 272 | 432 | 437 | 35 | 652 | 596 | 837 | 0 | 379 | 1136 | 395 | 423 | 444 | 170 | 450 | 710 |
| HUN | 272 | 555 | 131 | 334 | 385 | 34 | 511 | 315 | 657 | 212 | 0 | 835 | 278 | 234 | 329 | 174 | 387 | 482 |
| DEU | 961 | 1754 | 695 | 1316 | 1150 | 83 | 1581 | 2182 | 2275 | 689 | 544 | 0 | 804 | 587 | 839 | 485 | 942 | 1884 |
| BEL | 449 | 561 | 335 | 471 | 637 | 23 | 596 | 718 | 572 | 349 | 208 | 829 | 0 | 301 | 339 | 151 | 385 | 492 |
| IRL | 400 | 377 | 194 | 356 | 390 | 36 | 394 | 484 | 513 | 372 | 183 | 510 | 285 | 0 | 531 | 112 | 239 | 330 |
| NZL | 828 | 620 | 209 | 475 | 446 | 62 | 559 | 795 | 924 | 276 | 198 | 661 | 288 | 474 | 0 | 168 | 342 | 430 |
| SVK | 89 | 198 | 45 | 118 | 178 | 14 | 196 | 199 | 241 | 70 | 110 | 380 | 79 | 45 | 100 | 0 | 161 | 241 |
| ESP | 384 | 616 | 241 | 451 | 535 | 28 | 663 | 516 | 664 | 321 | 269 | 593 | 372 | 209 | 257 | 72 | 0 | 623 |
| POL | 564 | 1121 | 334 | 767 | 871 | 63 | 1053 | 1219 | 1732 | 568 | 359 | 1661 | 451 | 276 | 354 | 158 | 446 | 0 |

HOL

common bulls below diagonal

common three quarter sib group above diagonal

| | CAN | CHE | DFS | FRA | ISR | ITA | NLD | USA | GBR | HUN | DEU | BEL | SVK | ESP | POL |
|-----|------|-----|------|------|-----|------|------|------|-----|-----|------|-----|-----|------|------|
| CAN | 0 | 603 | 1146 | 1102 | 84 | 1379 | 1094 | 2279 | 741 | 650 | 1907 | 510 | 250 | 853 | 1037 |
| CHE | 489 | 0 | 483 | 473 | 39 | 503 | 592 | 645 | 355 | 243 | 820 | 358 | 112 | 346 | 415 |
| DFS | 983 | 428 | 0 | 1442 | 107 | 1350 | 1793 | 1711 | 755 | 633 | 2431 | 590 | 239 | 670 | 1131 |
| FRA | 760 | 403 | 739 | 0 | 84 | 1407 | 1549 | 1798 | 660 | 670 | 2141 | 621 | 241 | 749 | 1199 |
| ISR | 53 | 19 | 70 | 43 | 0 | 98 | 114 | 127 | 80 | 62 | 120 | 46 | 25 | 61 | 83 |
| ITA | 1104 | 420 | 1012 | 756 | 62 | 0 | 1367 | 2061 | 771 | 705 | 2083 | 563 | 249 | 845 | 1124 |
| NLD | 1028 | 547 | 1477 | 911 | 83 | 1068 | 0 | 1797 | 795 | 641 | 2663 | 738 | 291 | 699 | 1289 |
| USA | 2269 | 551 | 1326 | 927 | 112 | 1541 | 1443 | 0 | 938 | 851 | 2808 | 572 | 299 | 987 | 1547 |
| GBR | 827 | 341 | 766 | 635 | 56 | 847 | 880 | 1112 | 0 | 398 | 906 | 410 | 158 | 466 | 563 |
| HUN | 544 | 176 | 436 | 394 | 40 | 532 | 435 | 717 | 364 | 0 | 898 | 297 | 171 | 430 | 488 |
| DEU | 1359 | 699 | 1635 | 1019 | 90 | 1310 | 2198 | 1920 | 983 | 599 | 0 | 774 | 363 | 1012 | 1852 |
| BEL | 505 | 355 | 553 | 625 | 25 | 539 | 792 | 524 | 466 | 236 | 800 | 0 | 143 | 397 | 462 |
| SVK | 172 | 44 | 126 | 127 | 10 | 169 | 186 | 209 | 97 | 116 | 263 | 77 | 0 | 158 | 196 |
| ESP | 541 | 259 | 493 | 506 | 27 | 579 | 547 | 607 | 433 | 302 | 564 | 362 | 71 | 0 | 607 |
| POL | 892 | 302 | 900 | 737 | 54 | 858 | 1133 | 1525 | 608 | 355 | 1517 | 402 | 142 | 361 | 0 |

HOL

common bulls below diagonal

common three quarter sib group above diagonal

| | AUS | CAN | CHE | DFS | FRA | ISR | ITA | NLD | USA | HUN | DEU | POL |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

| | | | | | | | | | | | | |
|-----|------|------|-----|------|------|-----|------|------|------|-----|------|------|
| AUS | 0 | 1246 | 385 | 977 | 891 | 79 | 1080 | 1227 | 1487 | 318 | 1266 | 686 |
| CAN | 1221 | 0 | 611 | 1221 | 1222 | 91 | 1785 | 1471 | 3208 | 487 | 2252 | 1187 |
| CHE | 331 | 519 | 0 | 376 | 442 | 27 | 488 | 540 | 614 | 131 | 761 | 424 |
| DFS | 638 | 980 | 313 | 0 | 1170 | 101 | 1351 | 1570 | 1604 | 408 | 1995 | 947 |
| FRA | 648 | 913 | 374 | 657 | 0 | 71 | 1531 | 1498 | 1665 | 472 | 1995 | 1216 |
| ISR | 48 | 66 | 15 | 67 | 43 | 0 | 101 | 115 | 126 | 35 | 107 | 81 |
| ITA | 782 | 1495 | 418 | 953 | 882 | 68 | 0 | 1677 | 2452 | 532 | 2395 | 1283 |
| NLD | 1026 | 1381 | 501 | 1151 | 1007 | 87 | 1315 | 0 | 2103 | 460 | 2847 | 1338 |
| USA | 1414 | 3576 | 517 | 1112 | 925 | 114 | 1855 | 1712 | 0 | 575 | 2934 | 1609 |
| HUN | 199 | 382 | 89 | 256 | 282 | 26 | 368 | 310 | 429 | 0 | 634 | 292 |
| DEU | 964 | 1757 | 669 | 1320 | 1118 | 83 | 1582 | 2447 | 2149 | 419 | 0 | 1878 |
| POL | 563 | 1127 | 330 | 771 | 871 | 63 | 1055 | 1239 | 1703 | 216 | 1676 | 0 |

HOL

common bulls below diagonal
common three quarter sib group above diagonal
CAN CHE DFS FRA ISR ITA NLD USA HUN DEU POL

| | | | | | | | | | | | |
|-----|------|-----|------|------|-----|------|------|------|-----|------|------|
| CAN | 0 | 599 | 1139 | 1029 | 83 | 1366 | 1072 | 2079 | 469 | 1854 | 991 |
| CHE | 486 | 0 | 494 | 466 | 39 | 500 | 583 | 607 | 184 | 801 | 394 |
| DFS | 1004 | 438 | 0 | 1342 | 107 | 1358 | 1837 | 1509 | 510 | 2434 | 1099 |
| FRA | 735 | 395 | 729 | 0 | 79 | 1355 | 1468 | 1431 | 505 | 2002 | 1149 |
| ISR | 53 | 19 | 70 | 41 | 0 | 98 | 116 | 122 | 45 | 118 | 81 |
| ITA | 1102 | 418 | 1033 | 729 | 62 | 0 | 1365 | 1849 | 543 | 2052 | 1076 |
| NLD | 1007 | 531 | 1512 | 848 | 83 | 1041 | 0 | 1594 | 509 | 2627 | 1178 |
| USA | 2156 | 516 | 1315 | 824 | 110 | 1495 | 1331 | 0 | 580 | 2419 | 1409 |
| HUN | 387 | 134 | 347 | 296 | 27 | 399 | 356 | 507 | 0 | 708 | 295 |
| DEU | 1304 | 673 | 1643 | 944 | 88 | 1276 | 2082 | 1750 | 464 | 0 | 1710 |
| POL | 853 | 281 | 877 | 692 | 54 | 813 | 998 | 1402 | 198 | 1360 | 0 |

JER

JER

JER

JER

RDC

common bulls below diagonal
common three quarter sib group above diagonal
CAN DFS NOR NLD DEU IRL NZL

| | | | | | | | |
|-----|-----|-----|-----|----|----|----|-----|
| CAN | 0 | 160 | 5 | 4 | 11 | 3 | 60 |
| DFS | 164 | 0 | 127 | 52 | 79 | 18 | 127 |
| NOR | 4 | 102 | 0 | 40 | 24 | 51 | 39 |
| NLD | 4 | 50 | 39 | 0 | 22 | 12 | 21 |
| DEU | 11 | 72 | 23 | 21 | 0 | 6 | 21 |
| IRL | 3 | 15 | 50 | 12 | 6 | 0 | 13 |
| NZL | 61 | 110 | 38 | 21 | 21 | 13 | 0 |

RDC

common bulls below diagonal
common three quarter sib group above diagonal
CAN DFS NOR DEU

| | | | | |
|-----|-----|-----|-----|----|
| CAN | 0 | 101 | 4 | 9 |
| DFS | 102 | 0 | 130 | 48 |
| NOR | 4 | 103 | 0 | 14 |
| DEU | 9 | 40 | 13 | 0 |

RDC

RDC

SIM

SIM

SIM

SIM
