

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:

| | |
|---------------|--|
| ISR (HOL) | Slight reductions for a few bulls in number of daughters due to edits and paternity corrections |
| SVN (ALL) | Some changes in information due to changes in data base related to the pedigree completeness and phenotypic data improvement. |
| FRA (ALL) | Some drops in information due to corrections made in pedigree |
| AUS (ALL) | Decrease in information as a result of data clean up such as pedigree changes, causing also changes in type of proofs. Change of status of bull which leads to a good number of bulls no longer being qualified. Decreases in EDC due to rounding. |
| DEU (HOL,RDC) | smaller decreases in herds, daughters or edc (less than 10%) are caused by data editing or pedigree correction. |
| POL (HOL) | Decrease in information due to data edits |
| ESP (HOL) | Decrease in information due to data editing |
| USA (ALL) | Drops in information due to pedigree corrections and her-year minimum edits. |
| CHE (HOL) | In-depth corrections and renewal of the database table containing bull information by one of our breeding associations lead to changes in status of bulls and type of proof as well as a fewer number of EBV delivered. Slight changes in number of daughters, number of herds and EDC are due to manual edits in the database. |
| NZL (ALL) | Daughter counts affects all traits. New Zealand has continuous DNA parentage testing so daughters will always change. Herd Count affects all traits. Affected by continuous DNA parentage testing. EDCs affects all traits. Affected by continuous DNA parentage testing and a bug was found in the EDC calculation so a fix was applied |

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 (December Routine Evaluation 2021).
Number of records for direct calving ease by breed

| Country | BSW | GUE | HOL | JER | RDC | SIM |
|-------------|------|-----|--------|-----|-------|-----|
| AUS | | | 6560 | | | |
| BEL | | | 1191 | | | |
| CAN | 163 | | 13111 | | 510 | |
| CHE | 1598 | | 2112 | | | |
| CZE | | | | | | |
| DEA | 3503 | | | | | |
| DEU | | | 19789 | | 280 | |
| DFS | | | 10649 | | 6469 | |
| ESP | | | 2308 | | | |
| EST | | | | | | |
| FRA | 367 | | 12784 | | | |
| FRM | | | | | | |
| GBR | | | 3133 | | | |
| HUN | | | 1765 | | | |
| IRL | | | 2192 | | 58 | |
| ISR | | | 527 | | | |
| ITA | | | 9575 | | | |
| JPN | | | | | | |
| KOR | | | | | | |
| LTU | | | | | | |
| LVA | | | | | | |
| NLD | 163 | | 15234 | | 76 | |
| NOR | | | | | 3860 | |
| NZL | | | 7542 | | 1107 | |
| POL | | | 6396 | | | |
| PRT | | | | | | |
| SVK | | | 687 | | | |
| SVN | | | | | | |
| URY | | | | | | |
| USA | 526 | | 36492 | | | |
| ZAF | | | | | | |
| HRV | | | | | | |
| CAM | | | | | | |
| No. Records | 6320 | | 152047 | | 12360 | |
| Pub. Proofs | 6723 | 0 | 131474 | 0 | 12833 | 0 |

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

BSW dce

| | DEA | NLD | USA | CHE | CAN | FRA |
|-----|------|------|------|-------|------|------|
| DEA | 9.24 | | | | | |
| NLD | 0.88 | 5.55 | | | | |
| USA | 0.69 | 0.85 | 0.13 | | | |
| CHE | 0.86 | 0.94 | 0.83 | 10.53 | | |
| CAN | 0.80 | 0.95 | 0.91 | 0.93 | 7.62 | |
| FRA | 0.76 | 0.88 | 0.83 | 0.83 | 0.87 | 0.76 |

BSW mce

| | DEA | NLD | USA | CHE | CAN | FRA |
|-----|------|------|------|-------|------|------|
| DEA | 9.74 | | | | | |
| NLD | 0.64 | 4.67 | | | | |
| USA | 0.79 | 0.77 | 0.15 | | | |
| CHE | 0.79 | 0.73 | 0.87 | 12.90 | | |
| CAN | 0.42 | 0.79 | 0.85 | 0.73 | 6.19 | |
| FRA | 0.84 | 0.77 | 0.92 | 0.93 | 0.80 | 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 | 6.83 | | | | | | | | | | | | | | | | |
| CHE | 0.71 | 0.92 | 9.14 | | | | | | | | | | | | | | | |
| DFS | 0.75 | 0.92 | 0.84 | 11.58 | | | | | | | | | | | | | | |
| FRA | 0.79 | 0.95 | 0.91 | 0.88 | 0.92 | | | | | | | | | | | | | |
| ISR | 0.70 | 0.82 | 0.67 | 0.83 | 0.79 | 2.75 | | | | | | | | | | | | |
| ITA | 0.57 | 0.67 | 0.64 | 0.66 | 0.69 | 0.68 | 7.23 | | | | | | | | | | | |
| NLD | 0.84 | 0.97 | 0.90 | 0.93 | 0.93 | 0.85 | 0.70 | 7.07 | | | | | | | | | | |
| USA | 0.74 | 0.91 | 0.87 | 0.86 | 0.91 | 0.78 | 0.66 | 0.87 | 0.13 | | | | | | | | | |
| GBR | 0.75 | 0.79 | 0.67 | 0.70 | 0.75 | 0.70 | 0.59 | 0.83 | 0.71 | 0.07 | | | | | | | | |
| HUN | 0.55 | 0.63 | 0.49 | 0.54 | 0.64 | 0.63 | 0.44 | 0.62 | 0.61 | 0.59 | 1.26 | | | | | | | |
| DEU | 0.80 | 0.93 | 0.88 | 0.89 | 0.94 | 0.79 | 0.64 | 0.93 | 0.86 | 0.75 | 0.64 | 12.70 | | | | | | |
| BEL | 0.61 | 0.66 | 0.65 | 0.68 | 0.68 | 0.52 | 0.56 | 0.68 | 0.68 | 0.53 | 0.64 | 0.65 | 9.47 | | | | | |
| IRL | 0.77 | 0.87 | 0.80 | 0.84 | 0.86 | 0.76 | 0.65 | 0.90 | 0.82 | 0.69 | 0.58 | 0.81 | 0.63 | 0.09 | | | | |
| NZL | 0.77 | 0.76 | 0.75 | 0.76 | 0.75 | 0.68 | 0.52 | 0.80 | 0.74 | 0.60 | 0.36 | 0.76 | 0.49 | 0.80 | 2.99 | | | |
| SVK | 0.50 | 0.45 | 0.33 | 0.44 | 0.44 | 0.43 | 0.44 | 0.45 | 0.44 | 0.44 | 0.48 | 0.44 | 0.44 | 0.41 | 0.24 | 13.01 | | |
| ESP | 0.63 | 0.81 | 0.75 | 0.72 | 0.80 | 0.66 | 0.61 | 0.78 | 0.78 | 0.60 | 0.61 | 0.80 | 0.63 | 0.74 | 0.62 | 0.40 | 11.18 | |
| POL | 0.51 | 0.58 | 0.44 | 0.60 | 0.58 | 0.51 | 0.46 | 0.55 | 0.56 | 0.54 | 0.45 | 0.54 | 0.47 | 0.55 | 0.23 | 0.46 | 0.43 | 14.12 |

HOL mce

| | CAN | CHE | DFS | FRA | ISR | ITA | NLD | USA | GBR | HUN | DEU | BEL | SVK | ESP | POL |
|-----|------|-------|-------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| CAN | 6.72 | | | | | | | | | | | | | | |
| CHE | 0.86 | 11.65 | | | | | | | | | | | | | |
| DFS | 0.84 | 0.69 | 12.06 | | | | | | | | | | | | |
| FRA | 0.91 | 0.96 | 0.77 | 1.28 | | | | | | | | | | | |
| ISR | 0.84 | 0.69 | 0.81 | 0.77 | 2.64 | | | | | | | | | | |
| ITA | 0.79 | 0.84 | 0.63 | 0.84 | 0.76 | 9.21 | | | | | | | | | |
| NLD | 0.84 | 0.74 | 0.86 | 0.81 | 0.71 | 0.58 | 5.29 | | | | | | | | |
| USA | 0.92 | 0.91 | 0.79 | 0.95 | 0.85 | 0.84 | 0.79 | 0.15 | | | | | | | |
| GBR | 0.62 | 0.69 | 0.52 | 0.72 | 0.54 | 0.60 | 0.55 | 0.66 | 0.04 | | | | | | |
| HUN | 0.44 | 0.40 | 0.46 | 0.44 | 0.50 | 0.39 | 0.45 | 0.44 | 0.42 | 1.28 | | | | | |
| DEU | 0.83 | 0.72 | 0.91 | 0.77 | 0.76 | 0.67 | 0.85 | 0.79 | 0.55 | 0.47 | 12.50 | | | | |
| BEL | 0.67 | 0.70 | 0.70 | 0.73 | 0.56 | 0.61 | 0.78 | 0.68 | 0.51 | 0.47 | 0.74 | 10.42 | | | |
| SVK | 0.37 | 0.37 | 0.38 | 0.38 | 0.49 | 0.38 | 0.37 | 0.37 | 0.53 | 0.38 | 0.37 | 0.46 | 15.79 | | |
| ESP | 0.71 | 0.59 | 0.75 | 0.67 | 0.69 | 0.52 | 0.73 | 0.67 | 0.51 | 0.51 | 0.76 | 0.61 | 0.36 | 11.77 | |
| POL | 0.52 | 0.48 | 0.54 | 0.51 | 0.52 | 0.49 | 0.50 | 0.52 | 0.43 | 0.37 | 0.54 | 0.50 | 0.38 | 0.48 | 15.61 |

| HOL | dsb | | | | | | | | | | | |
|-----|------|------|-------|-------|------|------|------|------|------|------|-------|-------|
| | AUS | CAN | CHE | DFS | FRA | ISR | ITA | NLD | USA | HUN | DEU | POL |
| AUS | 0.04 | | | | | | | | | | | |
| CAN | 0.62 | 7.60 | | | | | | | | | | |
| CHE | 0.30 | 0.64 | 17.69 | | | | | | | | | |
| DFS | 0.67 | 0.87 | 0.60 | 12.51 | | | | | | | | |
| FRA | 0.46 | 0.75 | 0.62 | 0.65 | 0.76 | | | | | | | |
| ISR | 0.82 | 0.73 | 0.41 | 0.75 | 0.50 | 1.67 | | | | | | |
| ITA | 0.63 | 0.54 | 0.31 | 0.55 | 0.38 | 0.70 | 7.22 | | | | | |
| NLD | 0.36 | 0.78 | 0.73 | 0.71 | 0.67 | 0.50 | 0.30 | 4.48 | | | | |
| USA | 0.38 | 0.68 | 0.62 | 0.57 | 0.66 | 0.38 | 0.32 | 0.61 | 0.07 | | | |
| HUN | 0.60 | 0.47 | 0.26 | 0.48 | 0.29 | 0.65 | 0.41 | 0.26 | 0.30 | 1.10 | | |
| DEU | 0.51 | 0.89 | 0.70 | 0.85 | 0.67 | 0.67 | 0.44 | 0.81 | 0.65 | 0.44 | 12.34 | |
| POL | 0.34 | 0.57 | 0.56 | 0.63 | 0.51 | 0.37 | 0.30 | 0.57 | 0.51 | 0.24 | 0.63 | 16.63 |

| HOL | msb | | | | | | | | | | |
|-----|------|-------|-------|------|------|------|------|------|------|-------|-------|
| | CAN | CHE | DFS | FRA | ISR | ITA | NLD | USA | HUN | DEU | POL |
| CAN | 6.06 | | | | | | | | | | |
| CHE | 0.79 | 16.91 | | | | | | | | | |
| DFS | 0.95 | 0.78 | 11.56 | | | | | | | | |
| FRA | 0.87 | 0.81 | 0.85 | 0.93 | | | | | | | |
| ISR | 0.88 | 0.76 | 0.85 | 0.78 | 1.72 | | | | | | |
| ITA | 0.48 | 0.61 | 0.44 | 0.54 | 0.62 | 9.22 | | | | | |
| NLD | 0.93 | 0.75 | 0.95 | 0.81 | 0.81 | 0.40 | 4.20 | | | | |
| USA | 0.87 | 0.80 | 0.84 | 0.84 | 0.80 | 0.51 | 0.79 | 0.12 | | | |
| HUN | 0.31 | 0.34 | 0.34 | 0.35 | 0.50 | 0.44 | 0.31 | 0.37 | 1.22 | | |
| DEU | 0.95 | 0.80 | 0.97 | 0.83 | 0.86 | 0.44 | 0.95 | 0.83 | 0.32 | 12.77 | |
| POL | 0.85 | 0.76 | 0.81 | 0.73 | 0.82 | 0.38 | 0.78 | 0.74 | 0.32 | 0.80 | 14.31 |

| RDC | dce | | | | | | |
|-----|------|-------|-------|------|-------|------|------|
| | CAN | DFS | NOR | NLD | DEU | IRL | NZL |
| CAN | 6.55 | | | | | | |
| DFS | 0.92 | 11.33 | | | | | |
| NOR | 0.82 | 0.92 | 13.66 | | | | |
| NLD | 0.95 | 0.91 | 0.90 | 4.87 | | | |
| DEU | 0.92 | 0.89 | 0.88 | 0.92 | 13.72 | | |
| IRL | 0.84 | 0.83 | 0.89 | 0.87 | 0.80 | 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 | 0.64 | 0.89 | 15.66 | |
| DEU | 0.81 | 0.86 | 0.72 | 12.06 |

^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 | 105 | 180 | 401 | 94 | 181 |
| NLD | 97 | 0 | 41 | 69 | 19 | 49 |
| USA | 136 | 36 | 0 | 152 | 103 | 67 |
| CHE | 332 | 65 | 118 | 0 | 84 | 108 |
| CAN | 82 | 17 | 94 | 72 | 0 | 53 |
| FRA | 128 | 37 | 49 | 73 | 45 | 0 |

BSW

common bulls below diagonal
common three quarter sib group above diagonal
DEA NLD USA CHE CAN FRA

| | | | | | | |
|-----|-----|-----|-----|-----|----|-----|
| DEA | 0 | 100 | 100 | 463 | 35 | 139 |
| NLD | 92 | 0 | 31 | 64 | 15 | 47 |
| USA | 89 | 28 | 0 | 96 | 31 | 44 |
| CHE | 370 | 63 | 83 | 0 | 32 | 95 |
| CAN | 31 | 12 | 29 | 27 | 0 | 23 |
| FRA | 99 | 41 | 39 | 67 | 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 | 1322 | 400 | 992 | 1036 | 80 | 1105 | 1147 | 1655 | 716 | 446 | 1300 | 491 | 460 | 942 | 190 | 528 | 711 |
| CAN | 1265 | 0 | 634 | 1279 | 1379 | 96 | 1838 | 1405 | 3601 | 870 | 696 | 2286 | 592 | 420 | 691 | 288 | 867 | 1239 |
| CHE | 345 | 548 | 0 | 380 | 446 | 28 | 496 | 532 | 674 | 328 | 196 | 775 | 345 | 209 | 241 | 107 | 305 | 440 |
| DFS | 651 | 997 | 321 | 0 | 1319 | 99 | 1374 | 1515 | 1760 | 779 | 522 | 1998 | 550 | 443 | 708 | 235 | 581 | 983 |
| FRA | 717 | 984 | 383 | 715 | 0 | 82 | 1653 | 1585 | 2098 | 869 | 648 | 2107 | 632 | 454 | 702 | 283 | 714 | 1257 |
| ISR | 49 | 68 | 15 | 68 | 45 | 0 | 102 | 116 | 131 | 70 | 53 | 107 | 46 | 58 | 84 | 32 | 60 | 85 |
| ITA | 803 | 1543 | 433 | 972 | 962 | 69 | 0 | 1570 | 2657 | 1017 | 723 | 2439 | 610 | 482 | 726 | 304 | 891 | 1344 |
| NLD | 866 | 1210 | 498 | 996 | 870 | 81 | 1116 | 0 | 2237 | 988 | 560 | 2733 | 717 | 575 | 963 | 323 | 658 | 1370 |
| USA | 1553 | 3895 | 581 | 1187 | 1146 | 119 | 1999 | 1639 | 0 | 1234 | 843 | 3200 | 632 | 551 | 980 | 355 | 972 | 1734 |
| GBR | 524 | 699 | 279 | 443 | 451 | 37 | 660 | 619 | 862 | 0 | 379 | 1157 | 406 | 428 | 446 | 171 | 462 | 733 |
| HUN | 272 | 554 | 131 | 334 | 385 | 34 | 510 | 313 | 656 | 213 | 0 | 832 | 276 | 233 | 328 | 174 | 386 | 480 |
| DEU | 985 | 1785 | 695 | 1337 | 1171 | 84 | 1623 | 2242 | 2332 | 712 | 542 | 0 | 818 | 589 | 841 | 488 | 962 | 1942 |
| BEL | 453 | 568 | 340 | 480 | 649 | 23 | 604 | 732 | 584 | 357 | 207 | 846 | 0 | 304 | 342 | 152 | 392 | 500 |
| IRL | 402 | 379 | 193 | 358 | 391 | 36 | 399 | 489 | 515 | 379 | 183 | 514 | 289 | 0 | 531 | 112 | 242 | 334 |
| NZL | 833 | 620 | 206 | 476 | 446 | 62 | 559 | 797 | 925 | 281 | 198 | 664 | 291 | 474 | 0 | 168 | 344 | 433 |
| SVK | 90 | 201 | 45 | 122 | 178 | 15 | 197 | 202 | 245 | 71 | 110 | 383 | 80 | 45 | 101 | 0 | 162 | 243 |
| ESP | 391 | 630 | 250 | 460 | 546 | 30 | 676 | 530 | 683 | 332 | 267 | 611 | 379 | 213 | 259 | 73 | 0 | 640 |
| POL | 579 | 1164 | 344 | 793 | 896 | 65 | 1105 | 1262 | 1795 | 590 | 360 | 1721 | 460 | 284 | 358 | 162 | 465 | 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 | 587 | 1167 | 1117 | 85 | 1410 | 1122 | 2337 | 766 | 650 | 1937 | 519 | 254 | 865 | 1063 |
| CHE | 493 | 0 | 480 | 466 | 38 | 498 | 588 | 645 | 360 | 237 | 802 | 358 | 111 | 344 | 418 |
| DFS | 1002 | 433 | 0 | 1458 | 108 | 1378 | 1829 | 1741 | 775 | 635 | 2463 | 599 | 242 | 679 | 1170 |
| FRA | 772 | 405 | 759 | 0 | 85 | 1419 | 1566 | 1812 | 677 | 671 | 2167 | 632 | 243 | 762 | 1229 |
| ISR | 54 | 19 | 72 | 43 | 0 | 99 | 115 | 129 | 80 | 62 | 121 | 46 | 26 | 62 | 85 |
| ITA | 1132 | 422 | 1038 | 772 | 64 | 0 | 1399 | 2101 | 797 | 708 | 2122 | 571 | 252 | 861 | 1161 |
| NLD | 1057 | 558 | 1514 | 931 | 85 | 1093 | 0 | 1838 | 818 | 644 | 2719 | 747 | 294 | 714 | 1332 |
| USA | 2338 | 562 | 1365 | 939 | 115 | 1584 | 1485 | 0 | 972 | 853 | 2857 | 580 | 303 | 1003 | 1593 |
| GBR | 850 | 349 | 790 | 651 | 56 | 874 | 902 | 1154 | 0 | 400 | 933 | 419 | 161 | 476 | 588 |
| HUN | 545 | 176 | 437 | 394 | 40 | 534 | 436 | 719 | 364 | 0 | 899 | 298 | 174 | 430 | 489 |
| DEU | 1387 | 707 | 1673 | 1042 | 91 | 1342 | 2256 | 1975 | 1007 | 599 | 0 | 785 | 367 | 1029 | 1908 |
| BEL | 515 | 356 | 564 | 637 | 25 | 544 | 804 | 534 | 474 | 237 | 810 | 0 | 143 | 403 | 473 |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|----|-----|------|------|-----|-----|------|-----|-----|-----|-----|
| SVK | 175 | 44 | 127 | 127 | 11 | 172 | 188 | 212 | 98 | 117 | 265 | 77 | 0 | 161 | 200 |
| ESP | 551 | 262 | 503 | 520 | 27 | 596 | 558 | 622 | 441 | 302 | 573 | 370 | 73 | 0 | 626 |
| POL | 919 | 312 | 937 | 769 | 60 | 888 | 1176 | 1578 | 635 | 355 | 1581 | 417 | 145 | 377 | 0 |

HOL

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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 1277  391  996  901   80 1102 1252 1531  318 1297  701
CAN 1255   0  611 1239 1237   92 1823 1493 3283  487 2273 1224
CHE  338  528   0  372  441   27  482  534  621  129  754  427
DFS  655 1000  315   0 1182  101 1377 1583 1624  408 2013  977
FRA  656  924  379  670   0   71 1543 1516 1676  472 2016 1245
ISR   49   67   15   68   43   0  102  117  127   35  108   82
ITA  802 1541  420  977  897   69   0 1707 2500  532 2435 1328
NLD 1047 1410  503 1166 1026   89 1343   0 2141  461 2884 1374
USA 1465 3665  527 1132  936  115 1912 1758   0  574 2973 1665
HUN  199  382   89  256  282   26  368  310  428   0  634  292
DEU  988 1792  671 1342 1139   84 1624 2491 2204  419   0 1931
POL  579 1171  339  797  896   65 1105 1277 1766  216 1736   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  585 1156 1043   84 1397 1092 2136  469 1884 1017
CHE  491   0  491  461   38  496  581  607  178  788  394
DFS 1019  444   0 1356  109 1383 1867 1537  510 2461 1134
FRA  745  398  746   0   80 1366 1485 1444  505 2025 1177
ISR   54   19   73   41   0   99  116  124   45  119   82
ITA 1130  421 1057  743   64   0 1387 1888  543 2090 1111
NLD 1028  543 1542  870   83 1060   0 1626  510 2671 1212
USA 2229  530 1354  835  113 1537 1358   0  580 2469 1458
HUN  387  134  347  296   27  399  356  508   0  708  295
DEU 1332  688 1673  962   89 1308 2132 1807  464   0 1757
POL  883  289  911  722   57  845 1033 1457  198 1411   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  162   5   3  11   3   60
DFS  166   0  132  52  79  18  127
NOR   4  107   0  42  25  51  39
NLD   3   50  41   0  23  11  20
DEU  11   72  24  22   0   6  21
IRL   3   15  50  11   6   0  13
NZL  61  110  38  20  21  13   0
-----

```

RDC

```

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

```

| | | | | |
|-----|-----|-----|-----|----|
| CAN | 0 | 102 | 4 | 9 |
| DFS | 102 | 0 | 132 | 48 |
| NOR | 4 | 105 | 0 | 14 |
| DEU | 9 | 40 | 13 | 0 |

RDC

SIM

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