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Introduction
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The latest routine international evaluation for females fertility traits took place
as scheduled at the Interbull Centre. Data from seventeen (17) countries were
included in this evaluation.

International genetic evaluations for female fertility traits of bulls from
Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany,
Ireland, Israel, Italy, Netherlands, New Zealand, Norway, Poland, Spain, Sweden,
Switzerland, South Africa, the United Kingdom  and the United States of America were computed.
Brown Swiss, Guernsey, Holstein, Jersey, Red Dairy Cattle and Simmental breed
data were included in this evaluation.

Based on a decision made by Interbull Steering committee in August 2007,
female fertility traits are classified as follows:

T1 (HC): Maiden (H)eifer's ability to (C)onceive. A measure of confirmed
         conception, such as conception rate (CR), will be considered for this
         trait group. In the absence of confirmed conception an alternative
         measure, such as interval first-last insemination (FL), interval first
         insemination-conception (FC), number of inseminations (NI), or
         non-return rate (NR,preferably NR56) can be submitted;
T2 (CR): Lactating (C)ow's ability to (R)ecycle after calving. The interval
         calving-first insemination (CF) is an example for this ability. In the
         abscence of such a trait, a measure of the interval calving-conception,
         such as says oprn (DO) or calving interval (CI) can be submitted;
T3 (C1): Lactating (C)ow's ability to conceive (1), expressed as a rate trait.
         Traits like conception rate (CR) and non-return rate (NR, preferably
         NR56) will be considered for this trait group;
T4 (C2): Lactating (C)ow's ability to conceive (2), expressed as an interval
         trait. The interval first insemination-conception (FC) or interval
         first-last insemination (FL) will be considered for this trait group.
         As an alternative, number of inseminations (NI) can be submitted.
         In the abscence of any of these traits, a measure of interval
         calving-conception such as days open (DO), or calving interval (CI)
         can be submitted. All countries are expected to submit data for this
         trait group, and as a last resort the trait submitted under T3 can be
         submitted for T4 as well.
T5 (IT): Lactating cow's measurements of (I)nterval (T)raits calving-conception,
         such as days open (DO) and calving interval (CI).


Based on the above trait definitions the following traits have been submitted for
international genetic evaluation of female fertility traits.

--------------------------------------------------------------------------------
Country  Traits  Submitted traits and their definitions
--------------------------------------------------------------------------------


AUS      T2=CY   Calving interval converted to 42 days pregnancy rate
         T4=C2   Calving interval converted to 42 days pregnancy rate
         T5=IT   Calving interval converted to 42 days pregnancy rate

BEL      T2=CY   PR=Pregnancy Rate (=[21/(DO-45+11)]*100, with DO=days open)
         T4=C2   PR=Pregnancy Rate (=[21/(DO-45+11)]*100, with DO=days open)
         T5=IT   PR=Pregnancy Rate (=[21/(DO-45+11)]*100, with DO=days open)

CAN      T1=HC   NR=Non Return Rate after 56 Days in heifers (NRR), %
         T2=CY   CF=Interval from Calving to First Service in cows(CF)
         T3=C1   NR=Non Return Rate after 56 Days in cows(NRR), %
         T4=C2   FC=Interval first insemination-conception in cows
         T5=IT   DO=Days open

CHE      T1=HC   CR=Heifers' Conception rate
         T2=CR   CF=Interval from Calving to First Service (ICF), days
         T3=C1   NR=Non Return Rate after 56 Days (NRR), %
         T4=C2   FL=Interval from first to last insemination cows

CZE      T1=HC   CR=Heifers' Conception rate (pregnant or not after 3 months)
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            T3=C1   CR=Cows' Conception rate (pregnant or not after 3 months)
            T4=C2   CR=Cows' Conception rate (pregnant or not after 3 months)

AUT/DEU   T1=HC   NR=Heifers' Non Return Rate after 56 days
          T2=CY   CF=Interval from calving to first insemination cows (days)
          T3=C1   NR=Cows' Non Return Rate after 56 days
          T4=C2   FL=Interval from first to last insemination cows (days)
          T5=IT   DO=Days open (days)

DFS       T1=HC   NR=Heifers' Non Return Rate after 56 days
          T2=CY   CF=Interval from calving to first insemination cows (days)
          T3=C1   NR=Cows' Non Return Rate after 56 days
          T4=C2   FL=Interval from first to last insemination cows (days)
          T5=IT   DO=Days open (days)

ESP       T2=CY   DO=Days open
          T4=C2   DO=Days open
          T5=IT   DO=Days open

FRA       T1=HC   CR=Heifers' Conception rate (binary trait) for maiden heifers
         T2=CY  Interval between calving and first AI
          T3=C1   CR=Cows' Conception rate (binary trait) for cows
          T4=C2   CR=Cows' Conception rate (binary trait) for cows

GBR       T2=CY   CI=days between 1st and 2nd calvings
          T3=C1   NR=1st lactation non return at 56 days
          T4=C2   CI=days between 1st and 2nd calvings
          T5=IT   CI=days between 1st and 2nd calvings

IRL       T2=CY   CI=Calving interval
          T4=C2   CI=Calving interval
          T5=IT   CI=Calving interval

ISR       T3=C1   CR=Inverse of the number of insemination to conception (%)
          T4=C2   CR=Inverse of the number of insemination to conception (%)

ITA       T2=CY   CF=Days to first service
          T3=C1   NR=Non-return rate at 56 days (%)
          T4=C2   CI=Calving Interval (days)
          T5=IT   CI=Calving interval (days)

ITA(BSW) T2=CY   CF=Interval calving to first insemination
          T4=C2   Days Open
          T5=IT   CI=Calving interval

NLD       T1=HC   CR=Heifers' Conception rate
          T2=CY   CF=Interval calving to first insemination (days)
          T3=C1   CR=Cows' Conception rate (binary trait) for cows
          T4=C2   FL=Interval from first to last insemination cows (days)
          T5=IT   CI=Calving Interval (days)

NOR       T1=HC   NR=NR=Non-return rate 56 days (heifers)
          T2=CY   CF=Interval calving to first insemination (days)
          T3=C1   NR=NR=Non-return rate 56 days (cows)
          T4=C2   CI=Calving Interval (days)
          T5=IT   CI=Calving Interval (days)

NZL       T2=CY   PM=Lactating cow's ability to start cycling
          T4=C2   PC=Lactating cow's ability to conceive (CR42)
          T5=IT   PC=Lactating cow's ability to conceive (CR42)

POL       T1=HC       Non return rate at 56 days for heifer
         T2=CR  Interval from calving to first insemination
          T3=C1       Non return rate at 56 days for cows
          T4=IT       Days open
          T5=IT       Days open

URY       T5=IT   Days open expressed as Daughter Pregnancy Rate

USA       T1=HC   CR=Conception rate (heifer)
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        T2=CY   CF=Interval from calving to first insemination
        T3=C1   CR=Conception rate (cow)
        T4=C2   DP=Daughter Pregnancy Rate
        T5=IT   DP=Daughter Pregnancy Rate

ZAF     T4=IT   CI=Calving Interval
        T5=IT   CI=Calving Interval
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CHANGES IN NATIONAL PROCEDURES

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

ZAF (RDC): Inclusion of heterosis and recombination in the model
           New method of calculation of reliability based on PEVs
ZAF (JER): New method of calculation of reliability based on PEVs
ZAF (HOL): Inclusion of linear type traits in the multi-trait evaluation for cows that do not have
a calving interval measurement yet
CHE (BSW): Big change in pedigree with many bulls loosing information (missing sire, dam or both)
CHE (HOL): Change in type of proofs and publication rules
           Decreases in herds/daughters/EDC are explainable by pedigree modifications and slight
changes in definition of
           contemporary groups.
USA (BSW, GUE, HOL, JER, RDC): change of unknown parent group definitions
URY (HOL): participating for the first time for int
ESP (HOL): Base change
DEU (HOL, RDC): Herd-years with uninformative NonReturn56 were excluded
GBR (ALL): Some bulls lost herds/dtrs/EDCs due to changes in the data supplied for evaluation by
data providers.
ITA (HOL): loss of information for some bulls due to some pedigree corrections.
DEA (BSW): Slight decrease in number of daughters for several bulls due to minor corrections.
NOR (RDC): The rolling definition of hys is causing the daughters to distribute somewhat
differently over hys-classes at each evaluation. Therefore some bulls occasionally may
loose EDC although the number of daughters stay the same. Reliability changes is a function of the
EDC changes and have been .02 or lower.
DFS (HOL,JER): Change in publication status for quite many bulls.

INTERBULL CHANGES COMPARED TO THE DECEMBER ROUTINE RUN

Subsetting:

As decided by the ITC in Orlando, new subsetting was introduced
in the september test run. Sub-setting is necessary for operational
purposes and restrictions of time scales. To minimize the effect of
subsetting, larger subsets with 10-12 countries and with 4 link
providing countries have been applied.

Window:

According to the decision taken by ITC in Orlando, the following
changes have been introduced in regards to the windows used for
post processing:

The upper bounds have been set to 0.99 as these were judged to have
very little effect on evaluations. The lower values have been
set to about the 25% percentile value. The largest changes are for
the lower values for conformation traits, with the lowest window being
40% for OFL otherwise it is about 50% for all other confirmation traits.
It is anticipated that these low values may not have large impact on
evaluations since there were very few countries combinations whose
estimated correlations fell between the old limit of 0.30 and these new limits.

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
in the 01x-proof file.

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 TEST RUN

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

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^LTable 1. National evaluation data considered in the Interbull
evaluation for fertility (December Routine Evaluation 2015).
Number of records for lactating cow's ability to conceive (cc2) by breed
--------------------------------------------------------------------------------------
Country          BSW          GUE          HOL          JER          RDC          SIM
--------------------------------------------------------------------------------------
AUS                           115          7083         1446         594
BEL                                        1014
CAN              119          36           7296         369          433
CHE              2516                      2797
CZE                                        3348
DEA              5031
DEU                                        23621                     316
DFS                                        14487        2073         8903
ESP                                        2779
EST
FRA              319                       14732
FRM
FRR                                        164
GBR              70           204          5655         482          306
HUN
IRL                                        2193         119          48
ISR                                        1194
ITA              1451                      8805
JPN
KOR
LTU
LVA
NLD              148                       13653        116          57
NOR                                                                  3584
NZL              43           55           6645         4104         1171
POL                                        5615
PRT
SVK
SVN
URY
USA              971          712          33580        3836         609
ZAF                           31           1151         613          136
HRV
======================================================================================
No.Records       10668        1153         155812       13158        16157
Pub. Proofs      10111        957          134432       11164        15220        0
--------------------------------------------------------------------------------------

^LAPPENDIX I. Sire standard deviations in diagonal and genetic correlations below diagonal
--------------------------------------------------------------------------------------
--------------------------------------------------------------------------------------
BSW     hco
--------------------------------------------------------------------------------------
          CAN      DEA      FRA      USA      CHE      NLD
CAN      8.22
DEA      0.83     11.89
FRA      0.67     0.69     0.92
USA      0.75     0.78     0.90     2.70
CHE      0.80     0.91     0.88     0.88     12.94
NLD      0.77     0.72     0.81     0.88     0.88     3.65
--------------------------------------------------------------------------------------
BSW     crc
--------------------------------------------------------------------------------------
          CAN      CHE      DEA      NLD      NZL      USA      GBR      FRA      ITA
CAN      7.00
CHE      0.85     11.06
DEA      0.86     0.94     14.69
NLD      0.86     0.88     0.86     3.50
NZL      0.58     0.66     0.58     0.58     9.50
USA      0.85     0.86     0.85     0.85     0.62     3.36
GBR      0.77     0.76     0.83     0.81     0.62     0.83     4.03
FRA      0.86     0.96     0.91     0.91     0.59     0.87     0.81     1.69
ITA      0.86     0.85     0.85     0.87     0.65     0.85     0.83     0.88     14.14
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--------------------------------------------------------------------------------
BSW     cc1
--------------------------------------------------------------------------------
          CAN     CHE     DEA     NLD     USA     GBR     FRA
CAN       7.41
CHE       0.76   11.90
DEA       0.78    0.97   11.61
NLD       0.67    0.69    0.59    3.76
USA       0.74    0.68    0.66    0.90    2.94
GBR       0.64    0.82    0.78    0.66    0.67    0.04
FRA       0.64    0.68    0.60    0.78    0.90    0.64    0.94


--------------------------------------------------------------------------------
BSW     cc2
--------------------------------------------------------------------------------
          CAN     CHE     DEA     NLD     NZL     USA     GBR     FRA     ITA
CAN       6.57
CHE       0.69   10.98
DEA       0.83    0.92   13.57
NLD       0.85    0.82    0.85    3.51
NZL       0.52    0.56    0.51    0.51    6.80
USA       0.85    0.82    0.85    0.89    0.64    2.42
GBR       0.73    0.77    0.79    0.77    0.66    0.85    4.03
FRA       0.76    0.87    0.83    0.74    0.45    0.85    0.74    0.94
ITA       0.76    0.70    0.82    0.78    0.61    0.88    0.86    0.67   16.27


--------------------------------------------------------------------------------
BSW     int
--------------------------------------------------------------------------------
          CAN     DEA     NLD     NZL     USA     GBR     ITA
CAN       6.44
DEA       0.86   11.47
NLD       0.87    0.86    3.29
NZL       0.61    0.61    0.61    6.80
USA       0.89    0.87    0.88    0.57    2.42
GBR       0.86    0.87    0.89    0.63    0.87    4.03
ITA       0.86    0.92    0.88    0.63    0.89    0.88   15.59


--------------------------------------------------------------------------------
GUE     crc
--------------------------------------------------------------------------------
          CAN     GBR     NZL     USA     AUS
CAN       7.06
GBR       0.74    4.37
NZL       0.58    0.63   11.62
USA       0.84    0.86    0.62    3.32
AUS       0.72    0.86    0.68    0.74    6.96


--------------------------------------------------------------------------------
GUE     cc1
--------------------------------------------------------------------------------
          CAN     GBR     USA
CAN       6.64
GBR       0.68    0.03
USA       0.80    0.74    3.47


--------------------------------------------------------------------------------
GUE     cc2
--------------------------------------------------------------------------------
          CAN     GBR     NZL     USA     ZAF     AUS
CAN       6.59
GBR       0.74    4.37
NZL       0.47    0.66    8.16
USA       0.85    0.85    0.65    2.70
ZAF       0.75    0.85    0.66    0.85   13.75
AUS       0.70    0.82    0.73    0.81    0.85    6.96


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GUE     int
---------------------------------------------------------------------------------------
         CAN     GBR     NZL     USA     ZAF     AUS
CAN      6.23
GBR      0.86    4.37
NZL      0.58    0.62    8.16
USA      0.89    0.87    0.58    2.70
ZAF      0.86    0.87    0.64    0.87   13.75
AUS      0.86    0.86    0.70    0.87    0.88    6.96
---------------------------------------------------------------------------------------
HOL     hco
---------------------------------------------------------------------------------------
         CAN     CZE     DEU     DFS     FRA     USA     POL     FRR     CHE     NLD
CAN      7.31
CZE      0.74   17.58
DEU      0.88    0.80   14.72
DFS      0.89    0.86    0.93   16.11
FRA      0.75    0.84    0.81    0.83    0.85
USA      0.77    0.89    0.86    0.87    0.91    2.43
POL      0.72    0.58    0.76    0.70    0.57    0.68   18.39
FRR      0.71    0.72    0.58    0.65    0.75    0.78    0.60    0.79
CHE      0.94    0.82    0.93    0.93    0.84    0.88    0.71    0.71   13.78
NLD      0.78    0.80    0.79    0.77    0.84    0.88    0.67    0.74    0.80    4.12
---------------------------------------------------------------------------------------
HOL     crc
---------------------------------------------------------------------------------------
         BEL     CAN     CHE     DEU     DFS     ESP     GBR     IRL     ITA     NLD     NZL
USA      POL     FRA     FRR     AUS
BEL      4.70
CAN      0.73    6.62
CHE      0.79    0.85   12.32
DEU      0.71    0.86    0.89   10.99
DFS      0.81    0.88    0.94    0.91   12.05
ESP      0.86    0.74    0.76    0.76    0.76   11.28
GBR      0.87    0.74    0.76    0.74    0.81    0.91    4.74
IRL      0.85    0.70    0.71    0.70    0.71    0.85    0.85    3.65
ITA      0.78    0.85    0.89    0.90    0.92    0.86    0.83    0.71    8.11
NLD      0.82    0.86    0.92    0.91    0.96    0.76    0.80    0.71    0.88    4.67
NZL      0.66    0.57    0.63    0.57    0.61    0.63    0.62    0.60    0.68    0.57    8.28
USA      0.83    0.84    0.84    0.84    0.84    0.88    0.87    0.78    0.84    0.84    0.60
3.31
POL      0.74    0.88    0.90    0.87    0.89    0.76    0.71    0.70    0.89    0.86    0.60
0.84    13.84
FRA      0.75    0.87    0.94    0.93    0.94    0.79    0.80    0.71    0.92    0.95    0.59
0.84    0.87    1.18
FRR      0.72    0.81    0.78    0.91    0.81    0.71    0.69    0.69    0.81    0.89    0.58
0.76    0.84    0.83    1.51
AUS      0.85    0.70    0.71    0.70    0.71    0.85    0.85    0.88    0.71    0.71    0.60
0.73    0.69    0.70    0.69    4.93
---------------------------------------------------------------------------------------
HOL     cc1
---------------------------------------------------------------------------------------
         CAN     CHE     CZE     DEU     DFS     FRA     GBR     ISR     ITA     NLD     USA
POL      FRR
CAN      6.57
CHE      0.87   10.97
CZE      0.78    0.74   18.06
DEU      0.81    0.93    0.72   13.72
DFS      0.80    0.90    0.68    0.90   13.53
FRA      0.71    0.74    0.87    0.65    0.64    1.00
GBR      0.66    0.76    0.65    0.76    0.75    0.67    0.03
ISR      0.65    0.61    0.81    0.64    0.68    0.78    0.68    3.08
ITA      0.77    0.88    0.70    0.93    0.87    0.62    0.74    0.68    0.05
NLD      0.71    0.70    0.81    0.68    0.67    0.83    0.67    0.79    0.66    4.58
USA      0.78    0.72    0.95    0.68    0.68    0.89    0.66    0.85    0.70    0.91    2.83
POL      0.69    0.76    0.55    0.83    0.76    0.54    0.62    0.54    0.83    0.59    0.65
17.53
FRR      0.45    0.45    0.50    0.53    0.41    0.47    0.41    0.50    0.41    0.69    0.59
0.54    1.11
```

HOL   cc2

	BEL	CAN	CHE	CZE	DEU	DFS	ESP	FRA	GBR	IRL	ISR	ITA	NLD	NZL	USA	POL	ZAF	FRR	AUS
BEL	4.70																		
CAN	0.73	6.13																	
CHE	0.77	0.86	11.14																
CZE	0.63	0.80	0.84	18.07															
DEU	0.78	0.87	0.90	0.88	12.17														
DFS	0.81	0.84	0.86	0.79	0.92	12.99													
ESP	0.86	0.73	0.73	0.65	0.79	0.78	11.27												
FRA	0.78	0.83	0.91	0.77	0.85	0.81	0.70	0.98											
GBR	0.89	0.73	0.71	0.61	0.77	0.81	0.92	0.73	4.74										
IRL	0.84	0.74	0.78	0.65	0.77	0.76	0.85	0.77	0.84	3.65									
ISR	0.46	0.58	0.58	0.75	0.68	0.58	0.48	0.62	0.49	0.57	3.07								
ITA	0.84	0.76	0.77	0.74	0.83	0.84	0.94	0.73	0.88	0.84	0.57	17.99							
NLD	0.77	0.85	0.87	0.81	0.90	0.89	0.77	0.81	0.77	0.79	0.65	0.81	4.64						
NZL	0.72	0.45	0.51	0.47	0.51	0.50	0.68	0.49	0.67	0.71	0.34	0.63	0.51	5.58					
USA	0.84	0.85	0.84	0.87	0.89	0.89	0.88	0.85	0.84	0.85	0.68	0.94	0.89	0.64	2.34				
POL	0.82	0.71	0.65	0.58	0.73	0.73	0.84	0.63	0.83	0.78	0.43	0.86	0.73	0.61	0.83	12.94			
ZAF	0.75	0.72	0.80	0.72	0.83	0.79	0.87	0.80	0.79	0.86	0.62	0.90	0.80	0.68	0.88	0.75	15.80		
FRR	0.42	0.37	0.38	0.38	0.62	0.44	0.34	0.37	0.32	0.32	0.29	0.36	0.54	0.22	0.40	0.51	0.39	1.11	
AUS	0.82	0.69	0.77	0.66	0.71	0.69	0.81	0.77	0.81	0.87	0.53	0.82	0.70	0.70	0.79	0.75	0.84	0.22	4.97

HOL   int

	BEL	CAN	DEU	DFS	ESP	GBR	IRL	ITA	NLD	NZL	USA	POL	ZAF	AUS	FRA	URY
BEL	4.70															
CAN	0.85	6.08														
DEU	0.86	0.86	10.43													
DFS	0.90	0.87	0.93	12.94												
ESP	0.86	0.86	0.88	0.86	11.27											
GBR	0.88	0.86	0.86	0.90	0.91	4.74										
IRL	0.86	0.86	0.86	0.86	0.86	0.86	3.65									
ITA	0.86	0.86	0.90	0.90	0.95	0.88	0.86	17.99								
NLD	0.91	0.86	0.91	0.94	0.87	0.90	0.86	0.89	4.50							
NZL	0.65	0.58	0.60	0.60	0.64	0.63	0.65	0.62	0.60	5.58						
USA	0.87	0.89	0.87	0.89	0.87	0.87	0.87	0.92	0.87	0.59	2.34					
POL	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.88	0.86	0.63	0.87	12.94				
ZAF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.92	0.87	0.64	0.87	0.86	15.81			
AUS	0.86	0.86	0.86	0.86	0.86	0.86	0.88	0.86	0.86	0.65	0.87	0.86	0.87	4.97		
FRA	0.85	0.86	0.86	0.86	0.86	0.85	0.85	0.86	0.86	0.56	0.87	0.86	0.87	0.85	0.97	
URY	0.88	0.86	0.87	0.86	0.87	0.87	0.87	0.87	0.87	0.75	0.87	0.87	0.87	0.86	0.86	1.45

JER   hco

	CAN	DFS	USA	NLD
CAN	7.63			
DFS	0.84	18.87		
USA	0.82	0.86	2.63	
NLD	0.78	0.76	0.88	4.27

```
JER    crc
--------------------------------------------------------------------------------
          CAN     DFS     GBR     NLD     NZL     USA     AUS     IRL
CAN      6.40
DFS      0.87    13.93
GBR      0.72    0.87     4.05
NLD      0.87    0.91     0.77    3.96
NZL      0.55    0.61     0.62    0.56    6.65
USA      0.84    0.85     0.83    0.85    0.63    3.78
AUS      0.71    0.72     0.86    0.71    0.60    0.73    3.67
IRL      0.72    0.72     0.86    0.71    0.61    0.77    0.87    1.99
--------------------------------------------------------------------------------
JER    cc1
--------------------------------------------------------------------------------
          CAN     DFS     GBR     NLD     USA
CAN      6.75
DFS      0.71    14.42
GBR      0.67    0.66     0.03
NLD      0.69    0.63     0.65    3.50
USA      0.71    0.73     0.69    0.91    2.86
--------------------------------------------------------------------------------
JER    cc2
--------------------------------------------------------------------------------
          CAN     DFS     GBR     NLD     NZL     USA     ZAF     AUS     IRL
CAN      6.74
DFS      0.85    16.11
GBR      0.74    0.77     4.05
NLD      0.86    0.88     0.78    3.71
NZL      0.55    0.53     0.68    0.53    4.44
USA      0.85    0.87     0.85    0.88    0.68    2.60
ZAF      0.67    0.73     0.79    0.74    0.74    0.88   12.71
AUS      0.69    0.71     0.81    0.71    0.67    0.71    0.81    3.64
IRL      0.76    0.76     0.85    0.79    0.65    0.85    0.80    0.84    1.99
--------------------------------------------------------------------------------
JER    int
--------------------------------------------------------------------------------
          CAN     DFS     GBR     NLD     NZL     USA     ZAF     AUS     IRL
CAN      6.41
DFS      0.87    15.83
GBR      0.86    0.88     4.05
NLD      0.87    0.90     0.88    3.67
NZL      0.59    0.62     0.64    0.60    4.44
USA      0.88    0.88     0.87    0.87    0.66    2.60
ZAF      0.87    0.87     0.87    0.88    0.74    0.89   12.71
AUS      0.86    0.86     0.86    0.86    0.64    0.87    0.87    3.64
IRL      0.86    0.86     0.86    0.86    0.59    0.88    0.88    0.87    1.99
--------------------------------------------------------------------------------
RDC    hco
--------------------------------------------------------------------------------
          CAN     DEU     DFS     NOR     USA     NLD
CAN      7.01
DEU      0.86    13.59
DFS      0.83    0.83    15.77
NOR      0.84    0.70     0.78   13.13
USA      0.82    0.85     0.89    0.86    2.74
NLD      0.79    0.79     0.72    0.72    0.88    4.81
--------------------------------------------------------------------------------
RDC    crc
--------------------------------------------------------------------------------
          CAN     DEU     DFS     GBR     NOR     NZL     USA     NLD     AUS     IRL
CAN      6.30
DEU      0.87     9.60
DFS      0.86    0.90    12.93
GBR      0.73    0.74     0.77    4.27
NOR      0.90    0.88     0.90    0.75   12.27
NZL      0.57    0.58     0.55    0.62    0.56    9.96
USA      0.84    0.84     0.84    0.84    0.85    0.72    3.57
NLD      0.87    0.91     0.93    0.79    0.87    0.58    0.85    2.82
AUS      0.71    0.71     0.71    0.86    0.73    0.63    0.73    0.71    4.69
IRL      0.71    0.71     0.72    0.86    0.73    0.61    0.78    0.71    0.88    2.58
```

```
--------------------------------------------------------------------------------
RDC     cc1
--------------------------------------------------------------------------------
          CAN      DEU      DFS      GBR      NOR      NLD      USA
CAN      6.58
DEU      0.81    12.15
DFS      0.81     0.90    14.07
GBR      0.67     0.76     0.83     0.03
NOR      0.80     0.70     0.74     0.74    12.24
NLD      0.71     0.69     0.65     0.67     0.62     4.27
USA      0.82     0.70     0.69     0.67     0.70     0.92     2.85


--------------------------------------------------------------------------------
RDC     cc2
--------------------------------------------------------------------------------
          CAN      DEU      DFS      GBR      NOR      NZL      USA      ZAF      NLD      AUS      IRL
CAN      6.29
DEU      0.88     9.95
DFS      0.85     0.93    13.07
GBR      0.74     0.77     0.78     4.26
NOR      0.79     0.78     0.75     0.87    13.63
NZL      0.54     0.52     0.51     0.65     0.62     6.80
USA      0.85     0.89     0.87     0.86     0.86     0.68     2.44
ZAF      0.67     0.83     0.80     0.73     0.70     0.72     0.86    18.08
NLD      0.85     0.90     0.86     0.79     0.87     0.53     0.89     0.79     3.89
AUS      0.70     0.71     0.69     0.81     0.81     0.66     0.72     0.77     0.73     4.53
IRL      0.75     0.78     0.77     0.85     0.86     0.71     0.86     0.84     0.80     0.87     2.58


--------------------------------------------------------------------------------
RDC     int
--------------------------------------------------------------------------------
          CAN      DEU      DFS      GBR      NOR      NZL      USA      ZAF      NLD      AUS      IRL
CAN      6.22
DEU      0.86     9.19
DFS      0.86     0.93    13.33
GBR      0.86     0.86     0.88     4.26
NOR      0.89     0.89     0.86     0.88    13.63
NZL      0.61     0.60     0.59     0.62     0.56     6.80
USA      0.88     0.87     0.88     0.88     0.87     0.67     2.44
ZAF      0.88     0.87     0.88     0.88     0.88     0.67     0.89    18.08
NLD      0.86     0.91     0.92     0.89     0.88     0.60     0.87     0.87     3.20
AUS      0.86     0.86     0.86     0.86     0.87     0.62     0.87     0.88     0.86     4.53
IRL      0.86     0.86     0.86     0.86     0.87     0.63     0.87     0.87     0.86     0.88     2.58
```

----
^LAPPENDIX II. Number of common bulls

BSW

```
 common bulls below diagonal
 common three quarter sib group above diagonal
       CAN  DEA  FRA  USA  CHE  NLD
 ----------------------------------------------------------------------
   CAN    0   63   41   68   68   23
   DEA   51    0  166  139  491  107
   FRA   36  122    0   63  136   64
   USA   60   98   46    0  160   35
   CHE   54  392   99  133    0   70
   NLD   20   97   53   31   64    0
 ----------------------------------------------------------------------
```

```
BSW
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
       CAN   CHE   DEA   NLD   NZL   USA   GBR   FRA   ITA
 --------------------------------------------------------------------------------
   CAN     0    87    81    32    15    95    39    55    71
   CHE    70     0   491    75    17   225    48   130   317
   DEA    66   387     0   117    25   185    46   162   409
   NLD    27    67   104     0    17    43    28    66    89
   NZL    14    13    18    10     0    15    12    15    18
   USA    91   194   139    39    13     0    47    81   126
   GBR    36    36    33    23     9    46     0    36    46
   FRA    47    92   119    53    11    53    30     0   135
   ITA    59   260   273    70    13    84    33    98     0
 --------------------------------------------------------------------------------
BSW
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
       CAN   CHE   DEA   NLD   USA   GBR   FRA
 --------------------------------------------------------------------------------
   CAN     0    88    82    32    96    41    61
   CHE    71     0   490    74   224    53   139
   DEA    67   385     0   116   185    53   174
   NLD    27    66   104     0    43    32    71
   USA    92   194   139    39     0    51    87
   GBR    37    39    36    24    48     0    43
   FRA    53   103   134    59    60    35     0
 --------------------------------------------------------------------------------
BSW
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
       CAN   CHE   DEA   NLD   NZL   USA   GBR   FRA   ITA
 --------------------------------------------------------------------------------
   CAN     0    79    74    29    14    93    38    56    67
   CHE    62     0   482    75    17   285    48   139   317
   DEA    61   380     0   116    25   281    45   173   402
   NLD    25    67   104     0    17    66    28    71    89
   NZL    13    13    18    10     0    24    12    16    18
   USA    84   267   248    54    21     0    57   108   171
   GBR    34    36    33    23     9    56     0    37    46
   FRA    48   103   134    59    12    74    32     0   142
   ITA    55   260   270    70    13   115    33   107     0
 --------------------------------------------------------------------------------
BSW
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
       CAN   DEA   NLD   NZL   USA   GBR   ITA
 --------------------------------------------------------------------------------
   CAN     0    74    30    14    93    38    66
   DEA    61     0   119    25   281    45   437
   NLD    26   107     0    17    68    28    92
   NZL    13    18    10     0    24    12    18
   USA    84   248    57    21     0    57   179
   GBR    34    33    23     9    56     0    46
   ITA    55   286    71    13   119    33     0
 --------------------------------------------------------------------------------
```

```
GUE
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN  GBR  NZL  USA  AUS
 -------------------------------------------------------------------------------
   CAN    0   13    2   31   18
   GBR   10    0   13   39   28
   NZL    1   11    0    9   24
   USA   30   37    7    0   19
   AUS   13   22   22   16    0
 -------------------------------------------------------------------------------
GUE
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN  GBR  USA
 -------------------------------------------------------------------------------
   CAN    0   13   31
   GBR   10    0   41
   USA   30   39    0
 -------------------------------------------------------------------------------
GUE
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN  GBR  NZL  USA  ZAF  AUS
 -------------------------------------------------------------------------------
   CAN    0   10    1   27    1   15
   GBR    7    0   13   69    5   29
   NZL    1   11    0   28    3   24
   USA   25   71   29    0   10   51
   ZAF    1    4    1    6    0    5
   AUS   11   23   23   48    4    0
 -------------------------------------------------------------------------------
GUE
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN  GBR  NZL  USA  ZAF  AUS
 -------------------------------------------------------------------------------
   CAN    0   10    1   27    1   15
   GBR    7    0   13   69    5   29
   NZL    1   11    0   28    3   24
   USA   25   71   29    0   10   51
   ZAF    1    4    1    6    0    5
   AUS   11   23   23   48    4    0
 -------------------------------------------------------------------------------
HOL
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN  CZE  DEU  DFS  FRA  USA  POL  FRR  CHE  NLD
 -------------------------------------------------------------------------------
   CAN    0  787 1595  857  898 1795  674    0  580  862
   CZE  513    0 1458  902  937 1034  702    9  373 1077
   DEU  989  987    0 2151 1935 2010 1186   67  894 2465
   DFS  684  498 1175    0 1296 1084  743   13  523 1542
   FRA  598  499  904  606    0 1223  803    2  479 1474
   USA 1817  727 1201  796  603    0  958    3  581 1194
   POL  460  442  770  474  352  769    0   46  295  830
   FRR    0    3   44    2    0    0   52    0    6   39
   CHE  468  240  744  446  429  499  205    3    0  675
   NLD  726  858 1824 1120  822  872  571    9  643    0
 -------------------------------------------------------------------------------
```

HOL
----
 common bulls below diagonal
 common three quarter sib group above diagonal
      BEL CAN CHE DEU DFS ESP GBR IRL ITA NLD NZL USA POL FRA FRR AUS

  BEL   0 373 336 644 461 356 474 300 447 684 296 390 202 510   11 395
  CAN 328   0 607 1667 921 877 1088 374 1246 953 518 1909 584 940   2 763
  CHE 301 497   0 915 539 427 548 301 564 698 319 643 252 481   12 408
  DEU 556 1012 762   0 2221 1177 1707 713 2189 2722 808 2235 1036 2035   77 1211
  DFS 364 730 456 1200   0 765 1213 586 1299 1545 665 1220 660 1296   13 890
  ESP 315 514 326 688 512   0 827 387 954 813 419 953 434 839   2 595
  GBR 400 1060 498 1113 796 628   0 745 1277 1386 750 1330 548 1248   5 986
  IRL 268 360 300 595 450 361 741   0 537 714 566 449 198 592   1 546
  ITA 339 847 490 1207 808 645 842 435   0 1431 646 1719 707 1532   1 890
  NLD 707 833 667 2174 1153 669 1096 642 989   0 851 1400 751 1543   41 1053
  NZL 213 479 262 586 437 302 623 469 448 757   0 604 257 663   0 946
  USA 321 1914 567 1296 860 545 1106 415 979 1069 517   0 847 1379   3 871
  POL 127 398 172 611 395 203 286 120 397 489 159 634   0 717   42 344
  FRA 449 604 414 889 565 562 691 445 677 815 356 645 285   0   3 931
  FRR   7   1   4   50   3   0   1   1   1   10   0   0   47   0   0   4
  AUS 297 625 333 720 498 394 751 434 522 808 899 698 157 531   1   0

HOL
----
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN CHE CZE DEU DFS FRA GBR ISR ITA NLD USA POL FRR

  CAN   0 607 807 1672 925 950 1131   67 1249 961 1944 613   2
  CHE 497   0 379 912 539 492 554   39 564 698 643 278   12
  CZE 534 248   0 1452 888 931 783   73 972 1095 1104 676   10
  DEU 1002 758 994   0 2213 2044 1754 108 2182 2686 2206 1094   75
  DFS 732 456 498 1187   0 1306 1238   97 1297 1543 1220 707   13
  FRA 633 423 486 912 587   0 1278   89 1544 1567 1382 746   3
  GBR 1111 504 441 1138 812 713   0   91 1306 1419 1384 591   6
  ISR   49   26   53   87   78   49   63   0   96 104   85   52   0
  ITA 849 490 566 1195 807 697 859   70   0 1431 1717 743   1
  NLD 839 667 871 2129 1153 847 1130   85 986   0 1401 802   41
  USA 1959 567 757 1263 860 667 1174   70 979 1069   0 885   3
  POL 425 196 436 693 453 312 318   34 437 553 668   0   42
  FRR   1   4   3   50   3   0   1   0   1   10   0   47   0

```
HOL
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      BEL  CAN  CHE  CZE  DEU  DFS  ESP  FRA  GBR  IRL  ISR  ITA  NLD  NZL  USA  POL  ZAF  FRR
AUS
     -----------------------------------------------------------------------------
  BEL    0  364  336  308  632  461  356  508  474  301   40  446  684  296  500  199  213   11
428
  CAN  322    0  600  775 1570  894  872  894 1068  367   65 1191  914  502 2030  559  371    2
852
  CHE  301  486    0  380  897  540  427  473  548  301   39  555  699  319  762  245  221   12
462
  CZE  200  504  248    0 1429  890  586  916  771  338   73  965 1097  445 1248  625  272   10
615
  DEU  537  883  730  956    0 2177 1174 1991 1683  704  107 2127 2596  798 2873  991  500   75
1317
  DFS  364  701  457  498 1141    0  769 1283 1215  586   98 1284 1549  667 1613  644  437   13
980
  ESP  315  508  326  341  678  513    0  838  831  388   71  957  818  421 1158  432  369    2
649
  FRA  440  558  404  467  831  542  553    0 1239  593   90 1511 1532  662 2064  700  405    3
1006
  GBR  400 1034  498  435 1065  797  628  671    0  745   91 1272 1388  750 1712  539  432    5
1085
  IRL  268  350  300  220  581  450  361  437  741    0   66  537  715  566  616  192  283    1
568
  ISR   22   47   26   53   85   78   45   47   62   54    0   94  105   75  109   47   49    0
73
  ITA  337  781  477  553 1112  780  640  647  823  431   67    0 1413  640 2176  689  441    1
977
  NLD  707  791  667  871 1968 1155  670  787 1097  642   85  960    0  854 1964  731  431   41
1155
  NZL  213  458  262  275  565  438  302  345  623  469   64  436  759    0  895  247  314    0
995
  USA  374 1977  665  825 1524  988  684  915 1352  517   88 1113 1485  816    0  864  554    7
1443
  POL  122  372  165  378  561  375  199  263  276  116   28  378  465  155  615    0  154   42
399
  ZAF  161  339  179  169  359  308  314  263  367  242   34  315  349  244  512   87    0    2
407
  FRR    7    1    4    3   50    3    0    0    1    1    0    1   10    0    1   47    1    0
5
  AUS  326  749  385  327  806  593  432  590  858  464   50  587  916  964 1265  205  337    1
0
     -----------------------------------------------------------------------------
HOL
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      BEL  CAN  DEU  DFS  ESP  GBR  IRL  ITA  NLD  NZL  USA  POL  ZAF  AUS  FRA  URY
     -----------------------------------------------------------------------------
  BEL    0  364  632  461  356  474  301  446  684  296  500  199  213  428  499  174
  CAN  322    0 1568  894  871 1068  367 1191  917  502 2030  559  370  852  851  467
  DEU  537  883    0 2180 1172 1684  707 2128 2612  801 2878  991  499 1320 1928  522
  DFS  364  701 1144    0  768 1215  586 1284 1553  667 1613  644  436  980 1256  423
  ESP  315  508  678  513    0  830  388  956  818  420 1156  431  368  647  812  355
  GBR  400 1034 1067  797  628    0  745 1272 1390  750 1712  539  431 1085 1210  449
  IRL  268  350  584  450  361  741    0  537  718  566  616  192  283  568  591  247
  ITA  337  781 1114  780  640  823  431    0 1416  640 2176  689  441  977 1464  476
  NLD  710  797 1992 1161  675 1101  645  966    0  854 1969  731  430 1158 1490  441
  NZL  213  458  568  438  302  623  469  436  760    0  895  247  313  995  652  347
  USA  374 1977 1529  988  684 1352  517 1113 1491  816    0  863  553 1443 2009  747
  POL  122  372  563  375  199  276  116  378  465  155  615    0  154  399  677  219
  ZAF  161  339  359  308  314  367  242  315  350  244  512   87    0  406  403  246
  AUS  326  749  808  593  432  858  464  587  922  964 1265  205  337    0  979  422
  FRA  426  507  777  503  528  628  428  602  733  332  854  238  261  558    0  390
  URY  111  425  327  271  263  349  183  305  315  263  896  149  202  310  202    0
     -----------------------------------------------------------------------------
```

```
JER
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN  DFS  USA  NLD
 ------------------------------------------------------------------------------
  CAN    0   48  199   19
  DFS   36    0   84   48
  USA  183   64    0   38
  NLD   15   43   37    0
 ------------------------------------------------------------------------------
JER
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN  DFS  GBR  NLD  NZL  USA  AUS  IRL
 ------------------------------------------------------------------------------
  CAN    0   49  103   22  112  225  119    5
  DFS   34    0  116   65  104   94   88   24
  GBR  101  106    0   61  159  151  144   39
  NLD   17   57   56    0   55   53   49   16
  NZL  121   75  164   48    0  197  323   71
  USA  221   72  161   55  225    0  231   23
  AUS  117   51  147   43  355  237    0   34
  IRL    4   19   40   16   78   25   30    0
 ------------------------------------------------------------------------------
JER
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN  DFS  GBR  NLD  USA
 ------------------------------------------------------------------------------
  CAN    0   49  104   22  228
  DFS   34    0  115   65   93
  GBR  101  105    0   61  152
  NLD   17   57   56    0   53
  USA  224   72  162   55    0
 ------------------------------------------------------------------------------
JER
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN  DFS  GBR  NLD  NZL  USA  ZAF  AUS  IRL
 ------------------------------------------------------------------------------
  CAN    0   49  100   22  110  230   88  145    5
  DFS   34    0  116   65  105  141  104   97   24
  GBR   98  106    0   61  160  181  130  160   39
  NLD   17   57   56    0   56   66   55   53   16
  NZL  116   75  164   49    0  298  166  350   71
  USA  225  105  197   70  375    0  230  386   32
  ZAF   86   75  131   50  173  242    0  183   26
  AUS  138   58  163   46  385  418  173    0   37
  IRL    4   19   40   16   78   33   27   33    0
 ------------------------------------------------------------------------------
JER
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN  DFS  GBR  NLD  NZL  USA  ZAF  AUS  IRL
 ------------------------------------------------------------------------------
  CAN    0   49  100   22  110  230   88  145    5
  DFS   34    0  116   67  105  141  104   97   24
  GBR   98  106    0   65  160  181  130  160   39
  NLD   18   60   60    0   59   70   57   55   17
  NZL  116   75  164   53    0  298  166  350   71
  USA  225  105  197   75  375    0  230  386   32
  ZAF   86   75  131   53  173  242    0  183   26
  AUS  138   58  163   48  385  418  173    0   37
  IRL    4   19   40   16   78   33   27   33    0
 ------------------------------------------------------------------------------
```

```
RDC
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
       CAN  DEU  DFS  NOR  USA  NLD
--------------------------------------------------------------------------------
   CAN    0    8   99    4   71    3
   DEU    7    0   43   13   10   10
   DFS   96   33    0  112  102   33
   NOR    4   13   82    0   42   25
   USA   67   10   97   42    0   22
   NLD    3   10   32   24   20    0
--------------------------------------------------------------------------------
RDC
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
       CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  AUS  IRL
--------------------------------------------------------------------------------
   CAN    0   10   99   49    4   51   96    3   54    2
   DEU    9    0   51    4   15   14   17   12   21    3
   DFS   96   42    0   47   98  143  113   35  136   11
   GBR   50    4   47    0   14   41   46   11   36    7
   NOR    4   15   75   15    0   35   48   25   34   42
   NZL   52   14  138   40   34    0   61    9  105    7
   USA   94   17  110   44   48   62    0   25   52   13
   NLD    3   12   34   11   24    9   23    0   12    6
   AUS   53   20  116   35   29  106   50   10    0    8
   IRL    2    3    7    7   41    7   13    5    7    0
--------------------------------------------------------------------------------
RDC
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
       CAN  DEU  DFS  GBR  NOR  NLD  USA
--------------------------------------------------------------------------------
   CAN    0    9   99   51    4    3   96
   DEU    8    0   45    4   13   10   11
   DFS   96   36    0   49  101   35  113
   GBR   52    4   49    0   18   13   50
   NOR    4   13   76   19    0   25   48
   NLD    3   10   34   13   24    0   25
   USA   94   11  110   48   48   23    0
--------------------------------------------------------------------------------
RDC
--------
 common bulls below diagonal
 common three quarter sib group above diagonal
       CAN  DEU  DFS  GBR  NOR  NZL  USA  ZAF  NLD  AUS  IRL
--------------------------------------------------------------------------------
   CAN    0    8   94   47    4   49  119   64    3   53    2
   DEU    7    0   43    4   11   10   12    1   10   26    3
   DFS   92   33    0   47   88  143  132   48   35  152   11
   GBR   48    4   47    0   13   42   60   34   11   42    7
   NOR    4   10   67   14    0   34   47    0   25   43   42
   NZL   50   10  138   41   33    0   87   32    9  115    7
   USA  123   11  132   60   47   88    0   63   25   90   14
   ZAF   68    1   46   32    0   30   58    0    2   34    2
   NLD    3    9   34   11   24    9   23    2    0   17    6
   AUS   52   24  129   41   36  116   90   34   15    0    9
   IRL    2    3    7    7   41    7   14    2    5    8    0
--------------------------------------------------------------------------------
```

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RDC
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 common bulls below diagonal
 common three quarter sib group above diagonal
      CAN   DEU   DFS   GBR   NOR   NZL   USA   ZAF   NLD   AUS   IRL
-----------------------------------------------------------------------
 CAN    0     9    94    47     4    49   119    64     4    53     2
 DEU    8     0    47     4    13    12    16     1    11    28     3
 DFS   92    37     0    47    88   143   132    48    35   152    11
 GBR   48     4    47     0    13    42    60    34    11    42     7
 NOR    4    12    67    14     0    34    47     0    26    43    42
 NZL   50    12   138    41    33     0    87    32     9   115     7
 USA  123    15   132    60    47    88     0    63    27    90    14
 ZAF   68     1    46    32     0    30    58     0     2    34     2
 NLD    4    10    34    11    25     9    24     2     0    17     6
 AUS   52    26   129    41    36   116    90    34    15     0     9
 IRL    2     3     7     7    41     7    14     2     5     8     0
-----------------------------------------------------------------------
```