INTRODUCTION

The latest genomic routine international evaluation for **conformation traits** took place
as scheduled at the Interbull Centre. Data from twenty (22) countries were
included in this evaluation.

International genetic evaluations for calving traits of bulls from
Australia, Belgium, Canada, Switzerland, Czech Republic, Germany, Denmark-Finland-Sweden,
Spain, France, United Kingdom, Hungary, Ireland, Italy, Japan, Korea, The Netherlands, Norway,
New Zealand, Poland, South Africa, Estonia, Slovenia, Portugal and the United States
of America were computed.
Holstein data were included in this evaluation.

BEL, CAN, DEU, ESP, FRA, AUS, DFS, GBR, ITA, NLD, POL submitted GEBVs.

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ang: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
bcs: BEL, CAN, DEU,    , FRA,    ,    , GBR, ITA, NLD,
bde: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
cwi: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
fan: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
ftl: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
ftp: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
fua: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
loc: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD,
ocs: BEL, CAN, DEU, ESP, FRA, AUS,    , GBR, ITA, NLD, POL, HUN
ofl: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
ous: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
ran: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
rlr: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
rls: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
rtp: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL
ruh: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
rwi: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
sta: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
ude: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
usu: BEL, CAN, DEU, ESP, FRA,    , DFS, GBR, ITA, NLD, POL, HUN
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CHANGES IN NATIONAL PROCEDURES

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

CAN (HOL)   Base change

DFS (HOL)   Inclusion of females in reference population

FRA (HOL)   Base change

ITA (HOL)   Cut off one year of data and base change

NLD (HOL)   Introduced   the cow   reference population in   genomics.

INTERBULL CHANGES COMPARED TO THE DECEMBER ROUTINE RUN

No changes in Interbull procedures

DATA AND METHOD OF ANALYSIS

Eleven Holstein populations sent GEBV data for up to 38 traits, while
classical EBVs for the same traits were used in the analyses. Young bull
GEBVs from the GEBV providers have been converted to the scales of all
countries participating in classical MACE. A bull will get a MACE EBV or
a GMACE EBV but not both.
From those eleven countries, National GEBVs of bulls less than seven years of age and
with no
classical MACE proofs were included for the breeding value prediction
with a further requirement of either a MACE-PA or a GMACE-PA (for young
genomic bulls with young genomic sires) being available.

The parameter-space approach is used for the GMACE genetic evaluations (Sullivan,
2016)

SCIENTIFIC LITERATURE

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

Sullivan, P.G. 2016. Defining a Parameter Space for GMACE. Interbull Bulletin 50, p
85-93.

VanRaden, P.M. and Sullivan, P.G. 2010. International genomic evaluation methods for
dairy cattle. Gen. Sel. Evol. 42:7

Sullivan, P.G. and Jakobsen, J.H. 2012. Robust GMACE for young bulls methodology.
Interbull Bulletin 45, Article 1.

Sullivan, P.G. 2012a. GMACE reliability approximation. Report to the GMACE working
group of Interbull. GMACE_rels 2013

Sullivan, P.G. 2012b. GMACE variance estimation. Report to the GMACE working group of
Interbull. GMACE_vce 2013

Sullivan, P.G. 2012c. GMACE Weighting Factors. Report to the GMACE working group of
Interbull. GMACE_gedcs 2013

Jakobsen, J.H. and Sullivan, P.G. 2013. Trait specific computation of shared
reference population. Reference sharing Nov 2013

NEXT ROUTINE INTERNATIONAL EVALUATION

Dates for next routine run can be found on
http://www.interbull.org/ib/servicecalendar

NEXT TEST INTERNATIONAL EVALUATION

Dates for next routine run can be found on
http://www.interbull.org/ib/servicecalendar

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PUBLICATION OF INTERBULL ROUTINE RUN
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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 minimising the need to resort to
conversions.

At the same time, all recipients of Interbull results are expected to honour
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.

Table 1.  National evaluation dates in GMACE run April 2018
-----------------------------------------------------------
Country  Date
-----------------------------------------------------------
BEL      20171201
CAN      20180401
DEU      20180404
DFS      20180306
ESP      20180313
FRA      20180404
GBR      20180308
ITA      20180309
NLD      20180401
HUN      20180315
POL      20180228
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Table 2.
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Number of bulls in reference population for       sta
--------------------------------------------------------
BEL  2704.0
CAN  1433.0 33435.0
DEU  1053.0  3190.0 35922.0
DFS   914.0  2592.0 33234.0 34122.0
ESP   994.0  2811.0 33781.0 33444.0 34919.0
FRA  1074.0  3038.0 32083.0 31595.0 32465.0 34343.0
GBR   960.0 27174.0  2979.0  2435.0  2644.0  2829.0 28236.0
ITA  1170.0 26167.0  1973.0  1567.0  1617.0  1833.0 24909.0 26303.0
NLD  1022.0  2837.0 33539.0 33065.0 33625.0 31991.0  2698.0  1795.0 35289.0
HUN   490.0  1031.0  6178.0  5787.0  6095.0  6011.0   982.0   821.0  6163.0  6661.0
POL  1514.0  3097.0 29125.0 28931.0 29645.0 28182.0  2533.0  1927.0 29124.0  6129.0
31338.0
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----------------------------------------------------------
Number of bulls in reference population for        cwi
----------------------------------------------------------
BEL  2704.0
CAN  1433.0 33429.0
DEU  1052.0  3190.0 34708.0
DFS   913.0  2592.0 32154.0 33035.0
ESP   993.0  2811.0 32571.0 32362.0 33695.0
FRA  1073.0  3038.0 30896.0 30528.0 31275.0 33143.0
GBR   960.0 27168.0  2979.0  2435.0  2644.0  2829.0 28230.0
ITA  1170.0 26163.0  1973.0  1567.0  1617.0  1833.0 24905.0 26299.0
NLD  1021.0  2837.0 32352.0 32001.0 32437.0 30830.0  2698.0  1795.0 34099.0
HUN   490.0  1031.0  5651.0  5378.0  5566.0  5510.0   982.0   821.0  5633.0  6131.0
POL  1513.0  3097.0 27977.0 27906.0 28495.0 27060.0  2533.0  1927.0 27981.0  5599.0
30187.0

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Number of bulls in reference population for        bde
----------------------------------------------------------
BEL  2690.0
CAN  1433.0 33435.0
DEU  1053.0  3190.0 35364.0
DFS   914.0  2592.0 32790.0 33675.0
ESP   994.0  2811.0 33224.0 33000.0 34360.0
FRA  1074.0  3038.0 31552.0 31166.0 31934.0 33811.0
GBR   960.0 27174.0  2979.0  2435.0  2644.0  2829.0 28236.0
ITA  1170.0 26167.0  1973.0  1567.0  1617.0  1833.0 24909.0 26303.0
NLD  1022.0  2837.0 32981.0 32620.0 33066.0 31459.0  2698.0  1795.0 34728.0
HUN   490.0  1031.0  5674.0  5395.0  5589.0  5533.0   982.0   821.0  5656.0  6154.0
POL  1514.0  3097.0 28613.0 28532.0 29131.0 27696.0  2533.0  1927.0 28609.0  5622.0
30823.0

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Number of bulls in reference population for        ang
----------------------------------------------------------
BEL  2657.0
CAN  1431.0 32993.0
DEU  1042.0  3185.0 32150.0
DFS   905.0  2588.0 29667.0 30547.0
ESP   983.0  2806.0 30026.0 29884.0 31143.0
FRA  1063.0  3033.0 28407.0 28104.0 28785.0 30650.0
GBR   947.0 27158.0  2972.0  2429.0  2637.0  2822.0 27717.0
ITA  1168.0 25989.0  1968.0  1563.0  1612.0  1828.0 24897.0 26123.0
NLD   999.0  2830.0 29797.0 29516.0 29889.0 28342.0  2612.0  1789.0 31162.0
HUN   480.0  1026.0  3125.0  2917.0  3046.0  3047.0   975.0   816.0  3096.0  3563.0
POL  1501.0  3092.0 25422.0 25421.0 25946.0 24571.0  2525.0  1920.0 25423.0  3067.0
27621.0
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----------------------------------------------------------
Number of bulls in reference population for        ran
----------------------------------------------------------
BEL   2705.0
CAN   1433.0 33435.0
DEU   1053.0  3190.0 35826.0
DFS    914.0  2592.0 33138.0 34026.0
ESP    994.0  2811.0 33690.0 33353.0 34828.0
FRA   1074.0  3038.0 31988.0 31500.0 32375.0 34248.0
GBR    960.0 27174.0  2979.0  2435.0  2644.0  2829.0 28236.0
ITA   1170.0 26167.0  1973.0  1567.0  1617.0  1833.0 24909.0 26303.0
NLD   1022.0  2837.0 33444.0 32970.0 33535.0 31896.0  2698.0  1795.0 35194.0
HUN    490.0  1031.0  6178.0  5787.0  6095.0  6011.0   982.0   821.0  6163.0  6661.0
POL   1514.0  3097.0 29122.0 28928.0 29642.0 28179.0  2533.0  1927.0 29121.0  6129.0
31335.0

----------------------------------------------------------
Number of bulls in reference population for        rwi
----------------------------------------------------------
BEL   2690.0
CAN   1433.0 32615.0
DEU   1053.0  3190.0 35867.0
DFS    914.0  2592.0 33182.0 34070.0
ESP    994.0  2811.0 33727.0 33393.0 34865.0
FRA   1074.0  3038.0 32028.0 31543.0 32411.0 34288.0
GBR    960.0 27174.0  2979.0  2435.0  2644.0  2829.0 28236.0
ITA   1170.0 26167.0  1973.0  1567.0  1617.0  1833.0 24909.0 26303.0
NLD   1022.0  2837.0 33484.0 33013.0 33571.0 31936.0  2698.0  1795.0 35234.0
HUN    490.0  1031.0  6169.0  5781.0  6086.0  6002.0   982.0   821.0  6154.0  6652.0
POL   1514.0  3097.0 29115.0 28924.0 29635.0 28172.0  2533.0  1927.0 29114.0  6120.0
31328.0

----------------------------------------------------------
Number of bulls in reference population for        rls
----------------------------------------------------------
BEL   2705.0
CAN   1433.0 33435.0
DEU   1053.0  3190.0 35923.0
DFS    914.0  2592.0 33235.0 34123.0
ESP    994.0  2811.0 33782.0 33445.0 34920.0
FRA   1074.0  3038.0 32084.0 31596.0 32466.0 34344.0
GBR    960.0 27174.0  2979.0  2435.0  2644.0  2829.0 28236.0
ITA   1170.0 26167.0  1973.0  1567.0  1617.0  1833.0 24909.0 26303.0
NLD   1022.0  2837.0 33540.0 33066.0 33626.0 31992.0  2698.0  1795.0 35290.0
HUN    490.0  1031.0  6178.0  5787.0  6095.0  6011.0   982.0   821.0  6163.0  6661.0
POL   1514.0  3097.0 29125.0 28931.0 29645.0 28182.0  2533.0  1927.0 29124.0  6129.0
31338.0
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---------------------------------------------------------
Number of bulls in reference population for        rlr
---------------------------------------------------------
BEL  2676.0
CAN  1431.0 32500.0
DEU  1047.0  3182.0 33820.0
DFS   908.0  2584.0 31322.0 32201.0
ESP   988.0  2803.0 31693.0 31528.0 32813.0
FRA  1068.0  3030.0 30019.0 29705.0 30404.0 32212.0
GBR   946.0 26340.0  2969.0  2425.0  2634.0  2819.0 26899.0
ITA  1169.0 25327.0  1965.0  1559.0  1609.0  1825.0 24081.0 25461.0
NLD  1004.0  2827.0 31491.0 31178.0 31575.0 29979.0  2609.0  1786.0 32869.0
HUN   489.0  1031.0  5305.0  5056.0  5220.0  5173.0   981.0   821.0  5287.0  5784.0
POL  1508.0  3088.0 27113.0 27079.0 27628.0 26204.0  2522.0  1918.0 27121.0  5253.0
29271.0

---------------------------------------------------------
Number of bulls in reference population for        fan
---------------------------------------------------------
BEL  2687.0
CAN  1431.0 33425.0
DEU  1052.0  3190.0 33731.0
DFS   914.0  2592.0 31459.0 32331.0
ESP   993.0  2811.0 31856.0 31673.0 32988.0
FRA  1073.0  3038.0 30227.0 29877.0 30608.0 32481.0
GBR   948.0 27165.0  2979.0  2435.0  2644.0  2829.0 27731.0
ITA  1169.0 26160.0  1973.0  1567.0  1617.0  1833.0 24903.0 26296.0
NLD  1009.0  2835.0 31624.0 31301.0 31712.0 30145.0  2619.0  1794.0 33000.0
HUN   489.0  1031.0  5515.0  5254.0  5430.0  5380.0   982.0   821.0  5497.0  5994.0
POL  1513.0  3097.0 27262.0 27218.0 27781.0 26387.0  2533.0  1927.0 27266.0  5464.0
29470.0

---------------------------------------------------------
Number of bulls in reference population for        hde
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Number of bulls in reference population for        fua
---------------------------------------------------------
BEL  2705.0
CAN  1433.0 33434.0
DEU  1053.0  3190.0 35105.0
DFS   914.0  2592.0 32546.0 33429.0
ESP   994.0  2811.0 32966.0 32754.0 34096.0
FRA  1074.0  3038.0 31293.0 30921.0 31673.0 33548.0
GBR   960.0 27173.0  2979.0  2435.0  2644.0  2829.0 28235.0
ITA  1170.0 26166.0  1973.0  1567.0  1617.0  1833.0 24908.0 26302.0
NLD  1022.0  2837.0 32740.0 32388.0 32824.0 31218.0  2698.0  1795.0 34487.0
HUN   490.0  1031.0  5653.0  5380.0  5568.0  5512.0   982.0   821.0  5635.0  6133.0
POL  1514.0  3097.0 28322.0 28250.0 28840.0 27405.0  2533.0  1927.0 28323.0  5601.0
30532.0
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----------------------------------------------------------
Number of bulls in reference population for        ruh
----------------------------------------------------------
BEL   2705.0
CAN   1433.0 33434.0
DEU   1053.0  3190.0 34793.0
DFS    914.0  2592.0 32227.0 33083.0
ESP    994.0  2811.0 32654.0 32409.0 33758.0
FRA   1074.0  3038.0 30988.0 30609.0 31369.0 33244.0
GBR    960.0 27173.0  2979.0  2435.0  2644.0  2829.0 28235.0
ITA   1170.0 26167.0  1973.0  1567.0  1617.0  1833.0 24909.0 26303.0
NLD   1022.0  2837.0 32419.0 32064.0 32504.0 30903.0  2698.0  1795.0 34165.0
HUN    490.0  1031.0  5667.0  5391.0  5582.0  5526.0   982.0   821.0  5649.0  6147.0
POL   1514.0  3097.0 28459.0 28381.0 28977.0 27542.0  2533.0  1927.0 28459.0  5615.0
30669.0

----------------------------------------------------------
Number of bulls in reference population for        ruw
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----------------------------------------------------------
Number of bulls in reference population for        usu
----------------------------------------------------------
BEL   2705.0
CAN   1433.0 33435.0
DEU   1053.0  3190.0 35921.0
DFS    914.0  2592.0 33233.0 34121.0
ESP    994.0  2811.0 33780.0 33443.0 34918.0
FRA   1074.0  3038.0 32082.0 31594.0 32464.0 34342.0
GBR    960.0 27174.0  2979.0  2435.0  2644.0  2829.0 28236.0
ITA   1170.0 26167.0  1973.0  1567.0  1617.0  1833.0 24909.0 26303.0
NLD   1022.0  2837.0 33538.0 33064.0 33624.0 31990.0  2698.0  1795.0 35288.0
HUN    490.0  1031.0  6177.0  5786.0  6094.0  6010.0   982.0   821.0  6162.0  6660.0
POL   1514.0  3097.0 29123.0 28929.0 29643.0 28180.0  2533.0  1927.0 29122.0  6128.0
31336.0

----------------------------------------------------------
Number of bulls in reference population for        ude
----------------------------------------------------------
BEL   2690.0
CAN   1431.0 33431.0
DEU   1053.0  3190.0 35920.0
DFS    914.0  2592.0 33232.0 34120.0
ESP    994.0  2811.0 33779.0 33442.0 34917.0
FRA   1074.0  3038.0 32082.0 31594.0 32464.0 34342.0
GBR    948.0 27170.0  2979.0  2435.0  2644.0  2829.0 27736.0
ITA   1169.0 26166.0  1973.0  1567.0  1617.0  1833.0 24908.0 26302.0
NLD   1010.0  2835.0 33537.0 33063.0 33623.0 31990.0  2619.0  1794.0 34921.0
HUN    490.0  1031.0  6178.0  5787.0  6095.0  6011.0   982.0   821.0  6163.0  6661.0
POL   1514.0  3097.0 29123.0 28929.0 29643.0 28181.0  2533.0  1927.0 29122.0  6129.0
31336.0
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----------------------------------------------------------
Number of bulls in reference population for      ftp
----------------------------------------------------------
BEL  2705.0
CAN  1433.0 33435.0
DEU  1053.0  3190.0 35875.0
DFS   914.0  2592.0 33187.0 34075.0
ESP   994.0  2811.0 33735.0 33398.0 34873.0
FRA  1074.0  3038.0 32036.0 31548.0 32419.0 34296.0
GBR   960.0 27174.0  2979.0  2435.0  2644.0  2829.0 28236.0
ITA  1170.0 26167.0  1973.0  1567.0  1617.0  1833.0 24909.0 26303.0
NLD  1022.0  2837.0 33492.0 33018.0 33579.0 31944.0  2698.0  1795.0 35242.0
HUN   490.0  1031.0  6177.0  5786.0  6094.0  6010.0   982.0   821.0  6162.0  6660.0
POL  1514.0  3097.0 29123.0 28929.0 29643.0 28180.0  2533.0  1927.0 29122.0  6128.0
31336.0

----------------------------------------------------------
Number of bulls in reference population for      ftl
----------------------------------------------------------
BEL  2690.0
CAN  1431.0 33419.0
DEU  1053.0  3190.0 35920.0
DFS   914.0  2592.0 33232.0 34120.0
ESP   994.0  2811.0 33779.0 33442.0 34917.0
FRA  1074.0  3038.0 32082.0 31594.0 32464.0 34342.0
GBR   948.0 27170.0  2979.0  2435.0  2644.0  2829.0 27736.0
ITA  1169.0 26166.0  1973.0  1567.0  1617.0  1833.0 24908.0 26302.0
NLD  1010.0  2835.0 33537.0 33063.0 33623.0 31990.0  2619.0  1794.0 34921.0
HUN   490.0  1031.0  6178.0  5787.0  6095.0  6011.0   982.0   821.0  6163.0  6661.0
POL  1514.0  3097.0 29123.0 28929.0 29643.0 28181.0  2533.0  1927.0 29122.0  6129.0
31336.0

----------------------------------------------------------
Number of bulls in reference population for      rtp
----------------------------------------------------------
BEL  2681.0
CAN  1433.0 30311.0
DEU  1051.0  3183.0 33586.0
DFS   912.0  2586.0 31113.0 31910.0
ESP   992.0  2804.0 31453.0 31244.0 32505.0
FRA  1072.0  3031.0 29840.0 29494.0 30168.0 32044.0
GBR   957.0 25315.0  2972.0  2429.0  2637.0  2822.0 26371.0
ITA  1170.0 24243.0  1967.0  1562.0  1611.0  1827.0 23148.0 24379.0
NLD  1020.0  2811.0 31209.0 30893.0 31244.0 29697.0  2672.0  1770.0 32749.0
POL  1511.0  3089.0 27611.0 27566.0 28079.0 26673.0  2525.0  1920.0 27557.0 29694.0
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--------------------------------------------------------
Number of bulls in reference population for        ocs
--------------------------------------------------------
AUS   2715.0
BEL    339.0   2688.0
CAN    888.0   1433.0 33409.0
DEU    624.0   1052.0  3189.0 35288.0
ESP    598.0    993.0  2810.0 33150.0 34276.0
FRA    621.0   1073.0  3037.0 31449.0 31828.0 33693.0
GBR   1000.0    960.0 27150.0  2979.0  2644.0  2829.0 28212.0
ITA    643.0   1170.0 26146.0  1973.0  1617.0  1833.0 24888.0 26282.0
NLD    692.0   1021.0  2837.0 32935.0 33021.0 31387.0  2698.0  1795.0 34681.0
HUN    388.0    490.0  1031.0  6178.0  6095.0  6011.0   982.0   821.0  6163.0  6661.0
POL    573.0   1513.0  3096.0 28512.0 29032.0 27569.0  2533.0  1927.0 28522.0  6129.0
30725.0

--------------------------------------------------------
Number of bulls in reference population for        ous
--------------------------------------------------------
BEL   2683.0
CAN   1433.0 33434.0
DEU   1053.0  3190.0 35921.0
DFS    914.0  2592.0 33233.0 34121.0
ESP    994.0  2811.0 33780.0 33443.0 34918.0
FRA   1074.0  3038.0 32082.0 31594.0 32464.0 34338.0
GBR    959.0 27173.0  2979.0  2435.0  2644.0  2829.0 28233.0
ITA   1170.0 26167.0  1973.0  1567.0  1617.0  1833.0 24909.0 26303.0
NLD   1022.0  2837.0 33540.0 33066.0 33626.0 31992.0  2698.0  1795.0 35289.0
HUN    490.0  1031.0  6178.0  5787.0  6095.0  6011.0   982.0   821.0  6163.0  6661.0
POL   1514.0  3097.0 29123.0 28929.0 29643.0 28180.0  2533.0  1927.0 29124.0  6129.0
31336.0

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Number of bulls in reference population for        ofl
--------------------------------------------------------
BEL   2668.0
CAN   1431.0 33283.0
DEU   1052.0  3190.0 35285.0
DFS    913.0  2592.0 32610.0 33495.0
ESP    993.0  2811.0 33147.0 32818.0 34273.0
FRA   1073.0  3038.0 31447.0 30970.0 31826.0 33691.0
GBR    947.0 27042.0  2979.0  2435.0  2644.0  2829.0 27606.0
ITA   1169.0 26059.0  1973.0  1567.0  1617.0  1833.0 24801.0 26195.0
NLD   1009.0  2835.0 32931.0 32460.0 33017.0 31384.0  2619.0  1794.0 34290.0
HUN    490.0  1031.0  6177.0  5786.0  6094.0  6010.0   982.0   821.0  6162.0  6660.0
POL   1513.0  3097.0 28509.0 28318.0 29029.0 27567.0  2533.0  1927.0 28518.0  6128.0
30722.0

--------------------------------------------------------
Number of bulls in reference population for        loc
--------------------------------------------------------
BEL   2645.0
CAN   1424.0 27319.0
DEU   1047.0  3142.0 29378.0
DFS    909.0  2545.0 27189.0 27828.0
ESP    988.0  2759.0 27637.0 27386.0 28478.0
FRA   1068.0  2986.0 26027.0 25622.0 26372.0 27951.0
GBR    943.0 24612.0  2929.0  2388.0  2594.0  2778.0 25149.0
ITA   1161.0 23546.0  1952.0  1547.0  1597.0  1813.0 22603.0 23664.0
NLD   1003.0  2795.0 27502.0 27150.0 27614.0 25959.0  2578.0  1773.0 28682.0
```

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--------------------------------------------------------
Number of bulls in reference population for         bcs
--------------------------------------------------------
BEL  2536.0
DEU  1040.0 25986.0
FRA  1061.0 22763.0 24462.0
GBR   935.0  2919.0  2767.0 23660.0
ITA  1162.0  1939.0  1800.0 21110.0 22410.0
NLD   994.0 24163.0 22715.0  2561.0  1755.0 25329.0
CAN  1425.0  3122.0  2965.0 23144.0 22303.0  2769.0 27660.0
```