INTRODUCTION

The latest genomic test international evaluation for conformation traits took place as scheduled at the Interbull Centre. Data from twenty-four (24) countries were included in this evaluation.

International genetic evaluations for conformation traits of bulls were computed from:
AUS BEL CAN CHE CZE DEU DFS ESP EST FRA GBR HUN IRL ITA JPN KOR NLD NZL POL PRT SVN USA ZAF LVA
Holstein data were included in this evaluation.

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

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

CHANGES IN NATIONAL PROCEDURES

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

FRA (HOL) Changes in proofs for some bulls due to changes in their information and consequent change in status.
CZE (HOL) Small adjustment of the G matrix
ITA (HOL) Drops in reliabilities due to update of information for some bulls
AUS (HOL) Genotypes updates for some bulls
ESP (HOL) New GEBVS are calculated with SNPBLUP applying afterwards the f factor described by the Interbull genomic reliability method for adjusting genomic reliabilities.

INTERBULL CHANGES COMPARED TO THE DECEMBER ROUTINE RUN

No changes in Interbull procedures

DATA AND METHOD OF ANALYSIS

Thirteen 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 thirteen 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

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 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 August 2021

Country	Date
BEL	20201201
CAN	20210801
DEU	20210810
DFS	20210810
ESP	20210701
FRA	20210811
GBR	20210309
ITA	20210714
NLD	20210801
HUN	20210723
POL	20210810
CZE	20210722

Table 2.

Number of bulls in reference population for	sta
BEL	1716.0
CAN	748.0 37945.0

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DEU   721.0  7115.0 41900.0
DFS   635.0  4636.0 37243.0 38319.0
ESP   700.0  5334.0 38192.0 37551.0 39337.0
FRA   710.0  4012.0 34653.0 34168.0 34746.0 36403.0
GBR   683.0 31658.0  7387.0  4884.0  5644.0  4100.0 33886.0
ITA   730.0 31238.0  5928.0  3601.0  4102.0  3194.0 30038.0 31774.0
NLD   742.0  4085.0 36382.0 35860.0 36468.0 34211.0  4377.0  3233.0 38279.0
HUN   513.0  1978.0  7850.0  7417.0  7778.0  7225.0  2097.0  1837.0  7593.0  8454.0
POL  1017.0  4514.0 32563.0 32407.0 32920.0 30311.0  4451.0  3422.0 31770.0  7453.0 34525.0
CZE   840.0  1522.0  1976.0  1637.0  1853.0  1653.0  1454.0  1307.0  1694.0  1284.0  2384.0  3329.0

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Number of bulls in reference population for        cwi
-----------------------------------------------------
CAN 37942.0
DEU  7118.0 40684.0
DFS  4638.0 36037.0 37105.0
ESP  5337.0 36981.0 36342.0 38112.0
FRA  4012.0 33462.0 32984.0 33552.0 35199.0
GBR 31655.0  7390.0  4886.0  5647.0  4100.0 33883.0
ITA 31237.0  5930.0  3603.0  4104.0  3194.0 30037.0 31773.0
NLD  4086.0 35192.0 34668.0 35277.0 33046.0  4378.0  3234.0 37087.0
HUN  1978.0  7313.0  6878.0  7239.0  6714.0  2097.0  1837.0  7054.0  7914.0
POL  4514.0 31410.0 31253.0 31766.0 29184.0  4451.0  3422.0 30624.0  6913.0 33369.0
CZE  1522.0  1973.0  1634.0  1850.0  1650.0  1454.0  1307.0  1692.0  1283.0  2381.0  3326.0

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Number of bulls in reference population for        bde
-----------------------------------------------------
CAN 37946.0
DEU  7116.0 41342.0
DFS  4637.0 36685.0 37757.0
ESP  5335.0 37635.0 36992.0 38778.0
FRA  4012.0 34121.0 33635.0 34214.0 35870.0
GBR 31659.0  7388.0  4885.0  5645.0  4100.0 33887.0
ITA 31239.0  5929.0  3602.0  4103.0  3194.0 30039.0 31775.0
NLD  4086.0 35824.0 35300.0 35909.0 33678.0  4378.0  3234.0 37719.0
HUN  1978.0  7338.0  6903.0  7264.0  6739.0  2097.0  1837.0  7079.0  7939.0
POL  4514.0 32050.0 31892.0 32405.0 29824.0  4451.0  3422.0 31255.0  6938.0 34009.0
CZE  1522.0  1975.0  1636.0  1852.0  1652.0  1454.0  1307.0  1693.0  1283.0  2383.0  3328.0

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Number of bulls in reference population for        ang
-----------------------------------------------------
BEL  1648.0
CAN   745.0 37499.0
DEU   711.0  7109.0 38129.0
DFS   628.0  4630.0 33506.0 34553.0
ESP   690.0  5329.0 34427.0 33790.0 35532.0
FRA   700.0  4005.0 30967.0 30510.0 31055.0 32700.0
GBR   662.0 31639.0  7379.0  4876.0  5637.0  4091.0 33114.0
ITA   728.0 31044.0  5921.0  3594.0  4096.0  3186.0 30023.0 31574.0
NLD   709.0  4076.0 32642.0 32140.0 32726.0 30553.0  4287.0  3225.0 34070.0
HUN   504.0  1971.0  4781.0  4367.0  4701.0  4235.0  2086.0  1829.0  4514.0  5338.0
POL  1006.0  4507.0 28862.0 28725.0 29212.0 26691.0  4441.0  3412.0 28077.0  4377.0 30811.0
CZE   831.0  1518.0  1935.0  1602.0  1812.0  1614.0  1450.0  1300.0  1654.0  1245.0  2340.0  3278.0

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Number of bulls in reference population for        ran
-----------------------------------------------------
CAN 37945.0
DEU  7115.0 41804.0
DFS  4636.0 37147.0 38223.0
ESP  5334.0 38101.0 37460.0 39246.0
FRA  4012.0 34558.0 34073.0 34656.0 36308.0
GBR 31658.0  7387.0  4884.0  5644.0  4100.0 33886.0
ITA 31238.0  5928.0  3601.0  4102.0  3194.0 30038.0 31774.0
NLD  4085.0 36287.0 35765.0 36378.0 34116.0  4377.0  3233.0 38184.0
HUN  1978.0  7850.0  7417.0  7778.0  7225.0  2097.0  1837.0  7593.0  8454.0
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POL  4514.0 32560.0 32404.0 32917.0 30308.0  4451.0  3422.0 31767.0  7453.0 34522.0
CZE  1522.0  1976.0  1637.0  1853.0  1653.0  1454.0  1307.0  1694.0  1284.0  2384.0  3329.0

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Number of bulls in reference population for        rwi
---------------------------------------------------------
CAN 37123.0
DEU  7115.0 41845.0
DFS  4636.0 37188.0 38264.0
ESP  5334.0 38138.0 37497.0 39283.0
FRA  4012.0 34598.0 34113.0 34692.0 36348.0
GBR 31658.0  7387.0  4884.0  5644.0  4100.0 33886.0
ITA 31238.0  5928.0  3601.0  4102.0  3194.0 30038.0 31774.0
NLD  4085.0 36327.0 35805.0 36414.0 34156.0  4377.0  3233.0 38224.0
HUN  1978.0  7841.0  7408.0  7769.0  7216.0  2097.0  1837.0  7584.0  8445.0
POL  4514.0 32553.0 32397.0 32910.0 30301.0  4451.0  3422.0 31760.0  7444.0 34515.0
CZE  1522.0  1976.0  1637.0  1853.0  1653.0  1454.0  1307.0  1694.0  1284.0  2384.0  3329.0

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Number of bulls in reference population for        rls
---------------------------------------------------------
CAN 37946.0
DEU  7116.0 41902.0
DFS  4637.0 37245.0 38321.0
ESP  5335.0 38194.0 37553.0 39339.0
FRA  4012.0 34654.0 34169.0 34747.0 36404.0
GBR 31659.0  7388.0  4885.0  5645.0  4100.0 33887.0
ITA 31239.0  5929.0  3602.0  4103.0  3194.0 30039.0 31775.0
NLD  4086.0 36384.0 35862.0 36470.0 34212.0  4378.0  3234.0 38281.0
HUN  1978.0  7850.0  7417.0  7778.0  7225.0  2097.0  1837.0  7593.0  8454.0
POL  4514.0 32563.0 32407.0 32920.0 30311.0  4451.0  3422.0 31770.0  7453.0 34525.0
CZE  1522.0  1976.0  1637.0  1853.0  1653.0  1454.0  1307.0  1694.0  1284.0  2384.0  3329.0

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Number of bulls in reference population for        rlr
---------------------------------------------------------
CAN 37019.0
DEU  7110.0 39793.0
DFS  4630.0 35165.0 36231.0
ESP  5329.0 36100.0 35468.0 37227.0
FRA  4004.0 32583.0 32122.0 32680.0 34267.0
GBR 30823.0  7380.0  4876.0  5637.0  4090.0 32299.0
ITA 30410.0  5922.0  3595.0  4096.0  3186.0 29209.0 30944.0
NLD  4075.0 34329.0 33806.0 34413.0 32195.0  4286.0  3225.0 35766.0
HUN  1976.0  6957.0  6523.0  6883.0  6368.0  2092.0  1835.0  6696.0  7554.0
POL  4505.0 30545.0 30387.0 30898.0 28328.0  4440.0  3413.0 29763.0  6557.0 32451.0
CZE  1521.0  1963.0  1624.0  1840.0  1641.0  1452.0  1306.0  1682.0  1276.0  2322.0  3238.0

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Number of bulls in reference population for        fan
---------------------------------------------------------
CAN 37923.0
DEU  7116.0 39746.0
DFS  4637.0 35356.0 36414.0
ESP  5335.0 36304.0 35666.0 37443.0
FRA  4012.0 32830.0 32346.0 32922.0 34574.0
GBR 31639.0  7388.0  4885.0  5645.0  4100.0 33123.0
ITA 31222.0  5929.0  3602.0  4103.0  3194.0 30023.0 31758.0
NLD  4083.0 34503.0 33983.0 34591.0 32397.0  4296.0  3233.0 35938.0
HUN  1978.0  7161.0  6728.0  7088.0  6572.0  2095.0  1837.0  6900.0  7759.0
POL  4514.0 30735.0 30579.0 31090.0 28548.0  4451.0  3422.0 29948.0  6763.0 32691.0
CZE  1521.0  1974.0  1635.0  1851.0  1651.0  1454.0  1306.0  1692.0  1282.0  2382.0  3326.0

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Number of bulls in reference population for        hde
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Number of bulls in reference population for        fua
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CAN 37945.0
DEU  7116.0 41082.0
DFS  4637.0 36432.0 37502.0
ESP  5335.0 37377.0 36737.0 38514.0
FRA  4012.0 33862.0 33381.0 33953.0 35607.0
GBR 31658.0  7388.0  4885.0  5645.0  4100.0 33886.0
ITA 31238.0  5929.0  3602.0  4103.0  3194.0 30038.0 31774.0
NLD  4086.0 35583.0 35059.0 35667.0 33437.0  4378.0  3234.0 37478.0
HUN  1978.0  7315.0  6880.0  7241.0  6716.0  2097.0  1837.0  7056.0  7916.0
POL  4514.0 31759.0 31601.0 32114.0 29533.0  4451.0  3422.0 30969.0  6915.0 33718.0
CZE  1522.0  1975.0  1636.0  1852.0  1652.0  1454.0  1307.0  1693.0  1283.0  2383.0  3328.0

---------------------------------------------------------
Number of bulls in reference population for        ruh
---------------------------------------------------------
CAN 37945.0
DEU  7116.0 40770.0
DFS  4637.0 36114.0 37157.0
ESP  5335.0 37064.0 36393.0 38175.0
FRA  4012.0 33556.0 33070.0 33648.0 35302.0
GBR 31658.0  7388.0  4885.0  5645.0  4100.0 33884.0
ITA 31238.0  5929.0  3602.0  4103.0  3194.0 30038.0 31774.0
NLD  4086.0 35261.0 34736.0 35346.0 33121.0  4378.0  3234.0 37155.0
HUN  1978.0  7328.0  6893.0  7254.0  6729.0  2097.0  1837.0  7069.0  7929.0
POL  4514.0 31896.0 31738.0 32251.0 29670.0  4451.0  3422.0 31105.0  6930.0 33855.0
CZE  1522.0  1975.0  1636.0  1852.0  1652.0  1454.0  1307.0  1693.0  1283.0  2383.0  3328.0

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Number of bulls in reference population for        ruw
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---------------------------------------------------------
Number of bulls in reference population for        usu
---------------------------------------------------------
BEL  1717.0
CAN   748.0 37947.0
DEU   721.0  7116.0 41900.0
DFS   635.0  4637.0 37243.0 38319.0
ESP   700.0  5336.0 38192.0 37551.0 39338.0
FRA   710.0  4012.0 34652.0 34167.0 34745.0 36402.0
GBR   683.0 31660.0  7388.0  4885.0  5646.0  4100.0 33888.0
ITA   730.0 31240.0  5929.0  3602.0  4104.0  3194.0 30040.0 31776.0
NLD   742.0  4086.0 36382.0 35860.0 36468.0 34210.0  4378.0  3234.0 38279.0
HUN   513.0  1978.0  7849.0  7416.0  7777.0  7224.0  2097.0  1837.0  7592.0  8453.0
POL  1017.0  4514.0 32561.0 32405.0 32918.0 30309.0  4451.0  3422.0 31768.0  7452.0 34523.0
CZE   840.0  1522.0  1976.0  1637.0  1853.0  1653.0  1454.0  1307.0  1694.0  1284.0  2384.0  3329.0

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Number of bulls in reference population for        ude
---------------------------------------------------------
CAN 37938.0
DEU  7115.0 41898.0
DFS  4636.0 37241.0 38317.0
ESP  5334.0 38190.0 37549.0 39335.0
FRA  4012.0 34652.0 34167.0 34745.0 36402.0
GBR 31653.0  7387.0  4884.0  5644.0  4100.0 33137.0
ITA 31237.0  5928.0  3601.0  4102.0  3194.0 30037.0 31773.0
NLD  4082.0 36380.0 35858.0 36466.0 34210.0  4295.0  3232.0 37822.0
HUN  1978.0  7850.0  7417.0  7778.0  7225.0  2095.0  1837.0  7591.0  8452.0
POL  4514.0 32562.0 32406.0 32919.0 30310.0  4451.0  3422.0 31769.0  7453.0 34524.0
CZE  1522.0  1976.0  1637.0  1853.0  1653.0  1454.0  1307.0  1694.0  1284.0  2384.0  3329.0

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Number of bulls in reference population for        ftp
---------------------------------------------------------
CAN 37948.0
DEU  7118.0 41856.0
DFS  4638.0 37198.0 38274.0
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ESP  5337.0 38149.0 37507.0 39294.0
FRA  4012.0 34606.0 34121.0 34700.0 36356.0
GBR 31661.0  7390.0  4886.0  5647.0  4100.0 33889.0
ITA 31240.0  5930.0  3603.0  4104.0  3194.0 30040.0 31776.0
NLD  4086.0 36336.0 35814.0 36423.0 34164.0  4378.0  3234.0 38233.0
HUN  1978.0  7849.0  7416.0  7777.0  7224.0  2097.0  1837.0  7592.0  8453.0
POL  4514.0 32561.0 32405.0 32918.0 30309.0  4451.0  3422.0 31768.0  7452.0 34523.0
CZE  1522.0  1976.0  1637.0  1853.0  1653.0  1454.0  1307.0  1694.0  1284.0  2384.0  3329.0

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Number of bulls in reference population for        ftl
------------------------------------------------------
BEL  1681.0
CAN   745.0 37929.0
DEU   721.0  7118.0 41901.0
DFS   635.0  4638.0 37243.0 38319.0
ESP   700.0  5337.0 38193.0 37551.0 39338.0
FRA   710.0  4012.0 34652.0 34167.0 34745.0 36402.0
GBR   663.0 31656.0  7390.0  4886.0  5647.0  4100.0 33140.0
ITA   729.0 31239.0  5930.0  3603.0  4104.0  3194.0 30039.0 31775.0
NLD   719.0  4082.0 36380.0 35858.0 36466.0 34210.0  4295.0  3232.0 37822.0
HUN   513.0  1978.0  7850.0  7417.0  7778.0  7225.0  2095.0  1837.0  7591.0  8452.0
POL  1017.0  4514.0 32562.0 32406.0 32919.0 30310.0  4451.0  3422.0 31769.0  7453.0 34524.0
CZE   840.0  1522.0  1976.0  1637.0  1853.0  1653.0  1454.0  1307.0  1694.0  1284.0  2384.0  3329.0

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Number of bulls in reference population for        rtp
------------------------------------------------------
CAN 34846.0
DEU  7113.0 39593.0
DFS  4632.0 34940.0 35922.0
ESP  5331.0 35887.0 35164.0 36946.0
FRA  4006.0 32425.0 31890.0 32465.0 34120.0
GBR 29825.0  7385.0  4880.0  5641.0  4094.0 32045.0
ITA 29395.0  5926.0  3598.0  4099.0  3189.0 28372.0 29927.0
NLD  4062.0 34077.0 33504.0 34109.0 31934.0  4354.0  3210.0 35770.0
POL  4507.0 31073.0 30859.0 31375.0 28819.0  4444.0  3416.0 30229.0 32906.0
CZE  1517.0  1960.0  1622.0  1837.0  1638.0  1449.0  1302.0  1678.0  2309.0  3244.0

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Number of bulls in reference population for        ocs
------------------------------------------------------
AUS  2901.0
CAN  1074.0 37912.0
DEU   781.0  7110.0 41236.0
ESP   735.0  5331.0 37533.0 38665.0
FRA   715.0  4009.0 33991.0 34081.0 35726.0
GBR  1215.0 31630.0  7384.0  5643.0  4099.0 33858.0
ITA   865.0 31214.0  5925.0  4101.0  3193.0 30014.0 31750.0
NLD   767.0  4085.0 35753.0 35838.0 33581.0  4377.0  3233.0 37645.0
HUN   616.0  1978.0  7850.0  7778.0  7225.0  2097.0  1837.0  7593.0  8454.0
POL   657.0  4511.0 31922.0 32279.0 29671.0  4449.0  3420.0 31141.0  7453.0 33883.0
CZE   374.0  1522.0  1974.0  1851.0  1651.0  1454.0  1307.0  1693.0  1284.0  2382.0  3327.0

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Number of bulls in reference population for        ous
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CAN 37944.0
DEU  7115.0 41898.0
DFS  4636.0 37241.0 38317.0
ESP  5334.0 38190.0 37549.0 39335.0
FRA  4011.0 34650.0 34165.0 34743.0 36397.0
GBR 31658.0  7388.0  4885.0  5645.0  4100.0 33881.0
ITA 31238.0  5929.0  3602.0  4103.0  3194.0 30038.0 31774.0
NLD  4086.0 36384.0 35862.0 36470.0 34212.0  4378.0  3234.0 38280.0
HUN  1978.0  7850.0  7417.0  7778.0  7225.0  2097.0  1837.0  7593.0  8454.0
POL  4514.0 32561.0 32405.0 32918.0 30309.0  4451.0  3422.0 31770.0  7453.0 34523.0
CZE  1522.0  1976.0  1637.0  1853.0  1653.0  1454.0  1307.0  1694.0  1284.0  2384.0  3329.0
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Number of bulls in reference population for ofl

CAN	37792.0										
DEU	7116.0	41259.0									
DFS	4637.0	36613.0	37686.0								
ESP	5335.0	37555.0	36919.0	38688.0							
FRA	4011.0	34012.0	33535.0	34102.0	35747.0						
GBR	31528.0	7389.0	4886.0	5646.0	4100.0	33007.0					
ITA	31145.0	5930.0	3603.0	4104.0	3194.0	29945.0	31681.0				
NLD	4083.0	35772.0	35250.0	35858.0	33601.0	4296.0	3233.0	37190.0			
HUN	1978.0	7849.0	7416.0	7777.0	7224.0	2095.0	1837.0	7590.0	8451.0		
POL	4515.0	31945.0	31790.0	32303.0	29692.0	4452.0	3423.0	31162.0	7452.0	33907.0	
CZE	1522.0	1974.0	1635.0	1851.0	1651.0	1454.0	1307.0	1693.0	1284.0	2382.0	3327.0

Number of bulls in reference population for loc

CAN	32144.0										
DEU	7065.0	37167.0									
DFS	4589.0	32761.0	33693.0								
ESP	5285.0	33725.0	33004.0	34737.0							
FRA	3966.0	30331.0	29784.0	30378.0	31962.0						
GBR	29405.0	7338.0	4847.0	5604.0	4062.0	30852.0					
ITA	28922.0	5895.0	3574.0	4073.0	3167.0	28034.0	29374.0				
NLD	4045.0	32091.0	31496.0	32132.0	29974.0	4262.0	3206.0	33399.0			
CZE	1512.0	1940.0	1604.0	1819.0	1620.0	1446.0	1296.0	1661.0	3201.0		
HUN	1972.0	6134.0	5708.0	6057.0	5570.0	2087.0	1832.0	5873.0	1255.0	6727.0	
POL	4338.0	28128.0	27872.0	28428.0	25977.0	4415.0	3273.0	27440.0	2270.0	5732.0	29719.0

Number of bulls in reference population for bcs

DEU	33857.0										
FRA	27182.0	28651.0									
GBR	7273.0	4030.0	30026.0								
ITA	5870.0	3155.0	26504.0	28102.0							
NLD	28736.0	26742.0	4304.0	3189.0	30502.0						
CZE	1936.0	1618.0	1437.0	1289.0	1660.0	3078.0					
CAN	6974.0	3919.0	27880.0	27656.0	3987.0	1504.0	32399.0				
ESP	30430.0	27223.0	5537.0	4050.0	28751.0	1817.0	5187.0	31400.0			
HUN	6927.0	6348.0	2086.0	1826.0	6668.0	1270.0	1968.0	6855.0	7523.0		
POL	26944.0	24770.0	4361.0	3316.0	26121.0	2201.0	4322.0	27194.0	6535.0	28535.0	