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:

CAN (HOL) Base change.
DEU (HOL) Base change.
FRA (HOL) Base change. Corrections in pedigree, as a consequence changes were observed in number of daughters and number of herds (bulls are not directly concerned). The several decreases in reliability are due to either a change in the information used to calculate EBVs of their parents (french EBV or MACE) or parents GEBVs or decrease in the reliability of their polygenic information (correction of database). Bulls' change of status due to new publication rules at the national level following the introduction of Single Step.
GBR (HOL) Missing bulls due to genotypes checks or dams failing to pass parentage validation.
ITA (HOL) Base change. Cut off one year. Excluded bulls which are not publishable and do not belong to ITA. In pedigree loading excluded North America Partners bulls <2 years old. For "ous" submitted gebv in line with changes in mace. Two new traits have been included: rear teat placement and teat length. Consequently, all weights have been changed and heritability changed as well.

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 April 2022

Country	Date
BEL	20201201
CAN	20220401
DEU	20220405
DFS	20220301
ESP	20220310
FRA	20220406
GBR	20220304
ITA	20220310
NLD	20220401
HUN	20220127

POL 20220228
CZE 20220321
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Table 2.

Number of bulls in reference population for sta

BEL	1691.0											
CAN	723.0	38423.0										
DEU	726.0	7872.0	43052.0									
DFS	635.0	4944.0	37871.0	38840.0								
ESP	701.0	5793.0	39001.0	38063.0	40069.0							
FRA	710.0	4027.0	34708.0	34196.0	34787.0	36444.0						
GBR	683.0	32315.0	8293.0	5307.0	6248.0	4120.0	35083.0					
ITA	705.0	30975.0	6009.0	3657.0	4164.0	3202.0	30003.0	31459.0				
NLD	742.0	4113.0	36558.0	35942.0	36556.0	34242.0	4447.0	3247.0	38402.0			
HUN	513.0	2060.0	7994.0	7480.0	7860.0	7234.0	2190.0	1849.0	7604.0	8547.0		
POL	992.0	4554.0	33053.0	32821.0	33403.0	30331.0	4821.0	3229.0	31858.0	7499.0	34800.0	
CZE	842.0	1633.0	2104.0	1715.0	1972.0	1667.0	1580.0	1317.0	1724.0	1343.0	2443.0	3474.0

Number of bulls in reference population for cwi

CAN	38419.0											
DEU	7873.0	41831.0										
DFS	4946.0	36661.0	37623.0									
ESP	5795.0	37786.0	36852.0	38841.0								
FRA	4027.0	33514.0	33009.0	33591.0	35237.0							
GBR	32311.0	8294.0	5309.0	6250.0	4120.0	35079.0						
ITA	30973.0	6010.0	3658.0	4165.0	3202.0	30001.0	31457.0					
NLD	4114.0	35365.0	34747.0	35363.0	33074.0	4448.0	3248.0	37207.0				
HUN	2060.0	7457.0	6941.0	7321.0	6723.0	2190.0	1849.0	7065.0	8007.0			
POL	4554.0	31897.0	31664.0	32247.0	29201.0	4821.0	3229.0	30709.0	6959.0	33640.0		
CZE	1633.0	2101.0	1712.0	1969.0	1664.0	1580.0	1317.0	1722.0	1342.0	2440.0	3471.0	

Number of bulls in reference population for bde

CAN	38424.0											
DEU	7873.0	42494.0										
DFS	4945.0	37313.0	38278.0									
ESP	5794.0	38444.0	37504.0	39510.0								
FRA	4027.0	34176.0	33663.0	34255.0	35911.0							
GBR	32316.0	8294.0	5308.0	6249.0	4120.0	35084.0						
ITA	30976.0	6010.0	3658.0	4165.0	3202.0	30004.0	31460.0					
NLD	4114.0	36000.0	35382.0	35997.0	33709.0	4448.0	3248.0	37842.0				
HUN	2060.0	7482.0	6966.0	7346.0	6748.0	2190.0	1849.0	7090.0	8032.0			
POL	4554.0	32540.0	32306.0	32888.0	29844.0	4821.0	3229.0	31343.0	6984.0	34284.0		
CZE	1633.0	2103.0	1714.0	1971.0	1666.0	1580.0	1317.0	1723.0	1342.0	2442.0	3473.0	

Number of bulls in reference population for ang

BEL	1623.0											
CAN	720.0	37978.0										
DEU	716.0	7866.0	39261.0									
DFS	628.0	4941.0	34115.0	35075.0								
ESP	691.0	5789.0	35217.0	34304.0	36264.0							
FRA	700.0	4020.0	31020.0	30537.0	31095.0	32739.0						
GBR	662.0	32297.0	8285.0	5302.0	6242.0	4111.0	33979.0					
ITA	703.0	30780.0	6002.0	3652.0	4158.0	3194.0	29987.0	31258.0				
NLD	709.0	4104.0	32816.0	32221.0	32813.0	30582.0	4352.0	3239.0	34191.0			
HUN	504.0	2053.0	4926.0	4432.0	4784.0	4245.0	2179.0	1841.0	4526.0	5432.0		
POL	981.0	4547.0	29350.0	29138.0	29694.0	26709.0	4811.0	3219.0	28163.0	4424.0	31083.0	
CZE	833.0	1629.0	2064.0	1681.0	1932.0	1629.0	1576.0	1310.0	1685.0	1305.0	2400.0	3424.0

Number of bulls in reference population for ran

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---------------------------------------------------------
CAN 38423.0
DEU  7872.0 42956.0
DFS  4944.0 37775.0 38744.0
ESP  5793.0 38910.0 37972.0 39978.0
FRA  4027.0 34613.0 34101.0 34697.0 36349.0
GBR 32315.0  8293.0  5307.0  6248.0  4120.0 35083.0
ITA 30975.0  6009.0  3657.0  4164.0  3202.0 30003.0 31459.0
NLD  4113.0 36463.0 35847.0 36466.0 34147.0  4447.0  3247.0 38307.0
HUN  2060.0  7994.0  7480.0  7860.0  7234.0  2190.0  1849.0  7604.0  8547.0
POL  4554.0 33050.0 32818.0 33400.0 30328.0  4821.0  3229.0 31855.0  7499.0 34797.0
CZE  1633.0  2104.0  1715.0  1972.0  1667.0  1580.0  1317.0  1724.0  1343.0  2443.0  3474.0

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Number of bulls in reference population for        rwi
---------------------------------------------------------
CAN 37601.0
DEU  7872.0 42997.0
DFS  4944.0 37816.0 38785.0
ESP  5793.0 38947.0 38009.0 40015.0
FRA  4027.0 34653.0 34141.0 34733.0 36389.0
GBR 32315.0  8293.0  5307.0  6248.0  4120.0 35083.0
ITA 30975.0  6009.0  3657.0  4164.0  3202.0 30003.0 31459.0
NLD  4113.0 36503.0 35887.0 36502.0 34187.0  4447.0  3247.0 38347.0
HUN  2060.0  7985.0  7471.0  7851.0  7225.0  2190.0  1849.0  7595.0  8538.0
POL  4554.0 33043.0 32811.0 33393.0 30321.0  4821.0  3229.0 31848.0  7490.0 34790.0
CZE  1633.0  2104.0  1715.0  1972.0  1667.0  1580.0  1317.0  1724.0  1343.0  2443.0  3474.0

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Number of bulls in reference population for        rls
---------------------------------------------------------
CAN 38424.0
DEU  7873.0 43054.0
DFS  4945.0 37873.0 38842.0
ESP  5794.0 39003.0 38065.0 40071.0
FRA  4027.0 34709.0 34197.0 34788.0 36445.0
GBR 32316.0  8294.0  5308.0  6249.0  4120.0 35084.0
ITA 30976.0  6010.0  3658.0  4165.0  3202.0 30004.0 31460.0
NLD  4114.0 36560.0 35944.0 36558.0 34243.0  4448.0  3248.0 38404.0
HUN  2060.0  7994.0  7480.0  7860.0  7234.0  2190.0  1849.0  7604.0  8547.0
POL  4554.0 33053.0 32821.0 33403.0 30331.0  4821.0  3229.0 31858.0  7499.0 34800.0
CZE  1633.0  2104.0  1715.0  1972.0  1667.0  1580.0  1317.0  1724.0  1343.0  2443.0  3474.0

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Number of bulls in reference population for        rlr
---------------------------------------------------------
CAN 37496.0
DEU  7865.0 40940.0
DFS  4937.0 35789.0 36748.0
ESP  5786.0 36905.0 35977.0 37955.0
FRA  4019.0 32635.0 32147.0 32719.0 34305.0
GBR 31479.0  8284.0  5298.0  6239.0  4110.0 33162.0
ITA 30146.0  6002.0  3650.0  4157.0  3194.0 29173.0 30628.0
NLD  4103.0 34502.0 33885.0 34499.0 32223.0  4351.0  3239.0 35886.0
HUN  2058.0  7101.0  6586.0  6965.0  6377.0  2185.0  1847.0  6707.0  7647.0
POL  4545.0 31033.0 30799.0 31380.0 28346.0  4810.0  3220.0 29849.0  6603.0 32723.0
CZE  1632.0  2091.0  1702.0  1959.0  1655.0  1578.0  1316.0  1712.0  1335.0  2381.0  3383.0

---------------------------------------------------------
Number of bulls in reference population for        fan
---------------------------------------------------------
CAN 38396.0
DEU  7873.0 40897.0
DFS  4946.0 35983.0 36935.0
ESP  5795.0 37112.0 36178.0 38175.0
FRA  4027.0 32884.0 32373.0 32962.0 34614.0
GBR 32291.0  8294.0  5309.0  6250.0  4120.0 33982.0
ITA 30952.0  6010.0  3658.0  4165.0  3202.0 29981.0 31436.0
NLD  4111.0 34678.0 34064.0 34678.0 32427.0  4361.0  3247.0 36060.0
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HUN  2060.0  7305.0  6791.0  7170.0  6581.0  2188.0  1849.0  6911.0  7852.0
POL  4554.0 31224.0 30992.0 31572.0 28567.0  4821.0  3229.0 30035.0  6809.0 32965.0
CZE  1632.0  2102.0  1713.0  1970.0  1665.0  1580.0  1316.0  1722.0  1341.0  2441.0  3471.0

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Number of bulls in reference population for        hde
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Number of bulls in reference population for        fua
---------------------------------------------------------
CAN 38424.0
DEU  7873.0 42234.0
DFS  4946.0 37060.0 38024.0
ESP  5795.0 38186.0 37250.0 39247.0
FRA  4027.0 33917.0 33409.0 33994.0 35648.0
GBR 32316.0  8294.0  5309.0  6250.0  4120.0 35084.0
ITA 30975.0  6010.0  3658.0  4165.0  3202.0 30003.0 31459.0
NLD  4114.0 35759.0 35141.0 35755.0 33468.0  4448.0  3248.0 37601.0
HUN  2060.0  7459.0  6943.0  7323.0  6725.0  2190.0  1849.0  7067.0  8009.0
POL  4554.0 32249.0 32015.0 32597.0 29553.0  4821.0  3229.0 31057.0  6961.0 33993.0
CZE  1633.0  2103.0  1714.0  1971.0  1666.0  1580.0  1317.0  1723.0  1342.0  2442.0  3473.0

---------------------------------------------------------
Number of bulls in reference population for        ruh
---------------------------------------------------------
CAN 38423.0
DEU  7873.0 41922.0
DFS  4945.0 36742.0 37678.0
ESP  5794.0 37873.0 36905.0 38907.0
FRA  4027.0 33611.0 33098.0 33689.0 35343.0
GBR 32315.0  8294.0  5308.0  6249.0  4120.0 35081.0
ITA 30975.0  6010.0  3658.0  4165.0  3202.0 30003.0 31459.0
NLD  4114.0 35437.0 34818.0 35434.0 33152.0  4448.0  3248.0 37278.0
HUN  2060.0  7472.0  6956.0  7336.0  6738.0  2190.0  1849.0  7080.0  8022.0
POL  4554.0 32386.0 32152.0 32734.0 29690.0  4821.0  3229.0 31193.0  6976.0 34130.0
CZE  1633.0  2103.0  1714.0  1971.0  1666.0  1580.0  1317.0  1723.0  1342.0  2442.0  3473.0

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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  1692.0
CAN   723.0 38426.0
DEU   726.0  7873.0 43052.0
DFS   635.0  4947.0 37871.0 38842.0
ESP   701.0  5796.0 39001.0 38065.0 40071.0
FRA   710.0  4027.0 34707.0 34195.0 34786.0 36443.0
GBR   683.0 32318.0  8294.0  5310.0  6251.0  4120.0 35086.0
ITA   705.0 30977.0  6010.0  3659.0  4166.0  3202.0 30005.0 31461.0
NLD   742.0  4114.0 36558.0 35942.0 36556.0 34241.0  4448.0  3248.0 38402.0
HUN   513.0  2060.0  7993.0  7479.0  7859.0  7233.0  2190.0  1849.0  7603.0  8546.0
POL   992.0  4554.0 33051.0 32819.0 33401.0 30329.0  4821.0  3229.0 31856.0  7498.0 34798.0
CZE   842.0  1633.0  2104.0  1715.0  1972.0  1667.0  1580.0  1317.0  1724.0  1343.0  2443.0  3474.0

---------------------------------------------------------
Number of bulls in reference population for        ude
---------------------------------------------------------
CAN 38417.0
DEU  7872.0 43050.0
DFS  4944.0 37869.0 38838.0
ESP  5793.0 38999.0 38061.0 40067.0
FRA  4027.0 34707.0 34195.0 34786.0 36443.0
GBR 32311.0  8293.0  5307.0  6248.0  4120.0 34002.0
ITA 30974.0  6009.0  3657.0  4164.0  3202.0 30002.0 31458.0
NLD  4110.0 36556.0 35940.0 36554.0 34241.0  4360.0  3246.0 37945.0
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HUN  2060.0  7994.0  7480.0  7860.0  7234.0  2188.0  1849.0  7602.0  8545.0
POL  4554.0 33052.0 32820.0 33402.0 30330.0  4821.0  3229.0 31857.0  7499.0 34799.0
CZE  1633.0  2104.0  1715.0  1972.0  1667.0  1580.0  1317.0  1724.0  1343.0  2443.0  3474.0

----------------------------------------------------------
Number of bulls in reference population for        ftp
----------------------------------------------------------
CAN 38424.0
DEU  7873.0 43006.0
DFS  4945.0 37825.0 38794.0
ESP  5794.0 38956.0 38018.0 40024.0
FRA  4027.0 34661.0 34149.0 34741.0 36397.0
GBR 32316.0  8294.0  5308.0  6249.0  4120.0 35084.0
ITA 30976.0  6010.0  3658.0  4165.0  3202.0 30004.0 31460.0
NLD  4114.0 36512.0 35896.0 36511.0 34195.0  4448.0  3248.0 38356.0
HUN  2060.0  7993.0  7479.0  7859.0  7233.0  2190.0  1849.0  7603.0  8546.0
POL  4554.0 33051.0 32819.0 33401.0 30329.0  4821.0  3229.0 31856.0  7498.0 34798.0
CZE  1633.0  2104.0  1715.0  1972.0  1667.0  1580.0  1317.0  1724.0  1343.0  2443.0  3474.0

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Number of bulls in reference population for        ftl
----------------------------------------------------------
BEL  1663.0
CAN   721.0 38407.0
DEU   726.0  7872.0 43050.0
DFS   635.0  4944.0 37869.0 38838.0
ESP   701.0  5793.0 38999.0 38061.0 40067.0
FRA   710.0  4027.0 34707.0 34195.0 34786.0 36443.0
GBR   668.0 32311.0  8293.0  5307.0  6248.0  4120.0 34623.0
ITA   704.0 30974.0  6009.0  3657.0  4164.0  3202.0 30002.0 31458.0
NLD   722.0  4111.0 36556.0 35940.0 36554.0 34241.0  4367.0  3246.0 37977.0
HUN   513.0  2060.0  7994.0  7480.0  7860.0  7234.0  2188.0  1849.0  7602.0  8545.0
POL   992.0  4554.0 33052.0 32820.0 33402.0 30330.0  4821.0  3229.0 31857.0  7499.0 34799.0
CZE   842.0  1633.0  2104.0  1715.0  1972.0  1667.0  1580.0  1317.0  1724.0  1343.0  2443.0  3474.0

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Number of bulls in reference population for        rtp
----------------------------------------------------------
CAN 35321.0
DEU  7866.0 40741.0
DFS  4938.0 35565.0 36441.0
ESP  5787.0 36692.0 35674.0 37675.0
FRA  4021.0 32480.0 31918.0 32506.0 34161.0
GBR 30479.0  8287.0  5301.0  6242.0  4114.0 33239.0
ITA 29132.0  6004.0  3652.0  4159.0  3197.0 28337.0 29612.0
NLD  4090.0 34253.0 33586.0 34197.0 31965.0  4424.0  3224.0 35894.0
POL  4547.0 31563.0 31273.0 31858.0 28839.0  4814.0  3223.0 30317.0 33181.0
CZE  1628.0  2088.0  1700.0  1956.0  1652.0  1575.0  1312.0  1708.0  2368.0  3389.0

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Number of bulls in reference population for        ocs
----------------------------------------------------------
AUS  2901.0
CAN  1075.0 38358.0
DEU   785.0  7842.0 42316.0
ESP   740.0  5781.0 38319.0 39367.0
FRA   718.0  4023.0 34033.0 34107.0 35751.0
GBR  1222.0 32261.0  8259.0  6235.0  4118.0 35017.0
ITA   865.0 30934.0  5988.0  4157.0  3200.0 29959.0 31415.0
NLD   767.0  4107.0 35908.0 35909.0 33597.0  4437.0  3242.0 37742.0
HUN   617.0  2057.0  7992.0  7859.0  7234.0  2186.0  1847.0  7604.0  8543.0
POL   655.0  4548.0 32398.0 32747.0 29677.0  4816.0  3226.0 31214.0  7499.0 34140.0
CZE   374.0  1633.0  2102.0  1970.0  1665.0  1580.0  1317.0  1723.0  1343.0  2441.0  3472.0

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Number of bulls in reference population for        ous
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CAN 38391.0
DEU  7848.0 42982.0
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DFS 4939.0 37861.0 38824.0
ESP 5784.0 38978.0 38055.0 40039.0
FRA 4025.0 34695.0 34190.0 34771.0 36425.0
GBR 32290.0 8264.0 5303.0 6237.0 4119.0 35041.0
ITA 30959.0 5993.0 3655.0 4159.0 3201.0 29984.0 31440.0
NLD 4108.0 36542.0 35942.0 36543.0 34231.0 4438.0 3243.0 38380.0
HUN 2057.0 7992.0 7479.0 7859.0 7234.0 2186.0 1847.0 7604.0 8543.0
POL 4551.0 33040.0 32818.0 33388.0 30318.0 4818.0 3228.0 31846.0 7499.0 34784.0
CZE 1633.0 2104.0 1715.0 1972.0 1667.0 1580.0 1317.0 1724.0 1343.0 2443.0 3474.0

Number of bulls in reference population for ofl

CAN 38241.0
DEU 7849.0 42340.0
DFS 4940.0 37229.0 38190.0
ESP 5785.0 38340.0 37423.0 39390.0
FRA 4025.0 34054.0 33557.0 34128.0 35772.0
GBR 32162.0 8265.0 5304.0 6238.0 4119.0 33836.0
ITA 30866.0 5994.0 3655.0 4159.0 3201.0 29891.0 31347.0
NLD 4106.0 35928.0 35327.0 35929.0 33617.0 4352.0 3243.0 37288.0
HUN 2057.0 7991.0 7478.0 7858.0 7233.0 2184.0 1847.0 7601.0 8540.0
POL 4551.0 32420.0 32199.0 32770.0 29698.0 4818.0 3228.0 31235.0 7498.0 34163.0
CZE 1633.0 2102.0 1713.0 1970.0 1665.0 1580.0 1317.0 1723.0 1343.0 2441.0 3472.0

Number of bulls in reference population for loc

CAN 32823.0
DEU 7790.0 38238.0
DFS 4889.0 33370.0 34194.0
ESP 5733.0 34503.0 33504.0 35434.0
FRA 3980.0 30383.0 29816.0 30412.0 31995.0
GBR 30121.0 8208.0 5259.0 6191.0 4082.0 31763.0
ITA 28864.0 5958.0 3627.0 4129.0 3175.0 28069.0 29312.0
NLD 4065.0 32253.0 31580.0 32209.0 29998.0 4315.0 3213.0 33505.0
CZE 1624.0 2068.0 1682.0 1938.0 1634.0 1573.0 1307.0 1691.0 3347.0
HUN 2050.0 6276.0 5771.0 6139.0 5580.0 2175.0 1842.0 5885.0 1314.0 6816.0
POL 4503.0 28601.0 28277.0 28890.0 25993.0 4777.0 3197.0 27523.0 2329.0 5779.0 30104.0

Number of bulls in reference population for bcs

DEU 34895.0
FRA 27228.0 28681.0
GBR 8133.0 4049.0 31241.0
ITA 5935.0 3163.0 26540.0 27970.0
NLD 28891.0 26760.0 4362.0 3197.0 30603.0
CZE 2063.0 1631.0 1562.0 1299.0 1689.0 3222.0
CAN 7687.0 3934.0 28597.0 27529.0 4008.0 1615.0 32999.0
ESP 31176.0 27253.0 6102.0 4109.0 28822.0 1934.0 5634.0 32060.0
HUN 7069.0 6357.0 2175.0 1836.0 6679.0 1329.0 2047.0 6936.0 7612.0
POL 27380.0 24781.0 4700.0 3177.0 26196.0 2258.0 4417.0 27618.0 6581.0 28812.0