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, HUN submitted GEBVs.

ang: BEL, CAN, DEU, ESP, FRA, , DFS, GBR, ITA, NLD, POL, HUN
bcs: , CAN, DEU, ESP, 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

CHANGES IN NATIONAL PROCEDURES

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

ESP (HOL) Moved from a GBLUP to a SNPBLUP model
Base change

BEL (HOL) Changes in the reference population

AUS (HOL) Changes in the conventional evaluation

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

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 2019

Country	Date
BEL	20190801
CAN	20190801
DEU	20190813
DFS	20190813
ESP	20190710
FRA	20190814
GBR	20190703
ITA	20190711
NLD	20190801
HUN	20190723
POL	20190630

Table 2.

Number of bulls in reference population for	sta									
BEL	3096.0									
CAN	1712.0	35477.0								
DEU	1255.0	4177.0	37927.0							
DFS	1078.0	3486.0	35133.0	36463.0						
ESP	1221.0	3804.0	35632.0	35769.0	36974.0					
FRA	1259.0	3621.0	33515.0	33532.0	34050.0	35799.0				
GBR	1298.0	29383.0	4232.0	3559.0	3883.0	3672.0	30996.0			
ITA	1598.0	29819.0	3656.0	2826.0	3106.0	2918.0	28511.0	30212.0		
NLD	1201.0	3539.0	34802.0	34849.0	35323.0	33514.0	3629.0	2838.0	37062.0	
HUN	725.0	1531.0	6984.0	6746.0	6971.0	6750.0	1538.0	1434.0	6961.0	7568.0
POL	1703.0	3787.0	30859.0	31153.0	31494.0	29713.0	3501.0	3040.0	30763.0	6840.0 33123.0

Number of bulls in reference population for	cwi									
BEL	3096.0									
CAN	1712.0	35471.0								
DEU	1254.0	4177.0	36713.0							
DFS	1077.0	3486.0	33929.0	35251.0						
ESP	1220.0	3804.0	34422.0	34562.0	35750.0					
FRA	1258.0	3621.0	32328.0	32352.0	32860.0	34599.0				
GBR	1298.0	29377.0	4232.0	3559.0	3883.0	3672.0	30990.0			
ITA	1598.0	29815.0	3656.0	2826.0	3106.0	2918.0	28507.0	30208.0		
NLD	1200.0	3539.0	33615.0	33660.0	34135.0	32353.0	3629.0	2838.0	35873.0	
HUN	725.0	1531.0	6448.0	6208.0	6433.0	6240.0	1538.0	1434.0	6423.0	7029.0
POL	1702.0	3787.0	29710.0	30003.0	30344.0	28590.0	3501.0	3040.0	29621.0	6301.0 31971.0

Number of bulls in reference population for	bde									
BEL	3082.0									
CAN	1712.0	35477.0								
DEU	1255.0	4177.0	37369.0							
DFS	1078.0	3486.0	34575.0	35901.0						
ESP	1221.0	3804.0	35075.0	35210.0	36415.0					
FRA	1259.0	3621.0	32984.0	33000.0	33519.0	35267.0				
GBR	1298.0	29383.0	4232.0	3559.0	3883.0	3672.0	30996.0			
ITA	1598.0	29819.0	3656.0	2826.0	3106.0	2918.0	28511.0	30212.0		
NLD	1201.0	3539.0	34244.0	34289.0	34764.0	32982.0	3629.0	2838.0	36502.0	
HUN	725.0	1531.0	6473.0	6233.0	6458.0	6265.0	1538.0	1434.0	6448.0	7054.0
POL	1703.0	3787.0	30347.0	30639.0	30980.0	29227.0	3501.0	3040.0	30249.0	6326.0 32608.0

Number of bulls in reference population for	ang									
BEL	3027.0									
CAN	1710.0	35036.0								
DEU	1245.0	4172.0	34158.0							
DFS	1070.0	3481.0	31396.0	32716.0						
ESP	1211.0	3799.0	31869.0	32028.0	33190.0					
FRA	1249.0	3616.0	29830.0	29874.0	30361.0	32097.0				
GBR	1277.0	29367.0	4225.0	3552.0	3876.0	3665.0	30319.0			
ITA	1596.0	29638.0	3651.0	2821.0	3101.0	2913.0	28499.0	30029.0		
NLD	1168.0	3532.0	31063.0	31129.0	31584.0	29857.0	3543.0	2832.0	32858.0	
HUN	716.0	1526.0	3916.0	3696.0	3896.0	3760.0	1531.0	1429.0	3885.0	4455.0
POL	1691.0	3782.0	27159.0	27471.0	27789.0	26094.0	3493.0	3033.0	27072.0	3765.0 29409.0

Number of bulls in reference population for	ran
BEL	3097.0

```
CAN  1712.0 35477.0
DEU  1255.0  4177.0 37831.0
DFS  1078.0  3486.0 35037.0 36367.0
ESP  1221.0  3804.0 35541.0 35678.0 36883.0
FRA  1259.0  3621.0 33420.0 33437.0 33960.0 35704.0
GBR  1298.0 29383.0  4232.0  3559.0  3883.0  3672.0 30996.0
ITA  1598.0 29819.0  3656.0  2826.0  3106.0  2918.0 28511.0 30212.0
NLD  1201.0  3539.0 34707.0 34754.0 35233.0 33419.0  3629.0  2838.0 36967.0
HUN   725.0  1531.0  6984.0  6746.0  6971.0  6750.0  1538.0  1434.0  6961.0  7568.0
POL  1703.0  3787.0 30856.0 31150.0 31491.0 29710.0  3501.0  3040.0 30760.0  6840.0 33120.0

---------------------------------------------------------
Number of bulls in reference population for        rwi
---------------------------------------------------------
BEL  3082.0
CAN  1712.0 34655.0
DEU  1255.0  4177.0 37872.0
DFS  1078.0  3486.0 35078.0 36408.0
ESP  1221.0  3804.0 35578.0 35715.0 36920.0
FRA  1259.0  3621.0 33460.0 33477.0 33996.0 35744.0
GBR  1298.0 29383.0  4232.0  3559.0  3883.0  3672.0 30996.0
ITA  1598.0 29819.0  3656.0  2826.0  3106.0  2918.0 28511.0 30212.0
NLD  1201.0  3539.0 34747.0 34794.0 35269.0 33459.0  3629.0  2838.0 37007.0
HUN   725.0  1531.0  6975.0  6737.0  6962.0  6741.0  1538.0  1434.0  6952.0  7559.0
POL  1703.0  3787.0 30849.0 31143.0 31484.0 29703.0  3501.0  3040.0 30753.0  6831.0 33113.0

---------------------------------------------------------
Number of bulls in reference population for        rls
---------------------------------------------------------
BEL  3097.0
CAN  1712.0 35477.0
DEU  1255.0  4177.0 37928.0
DFS  1078.0  3486.0 35134.0 36464.0
ESP  1221.0  3804.0 35633.0 35770.0 36975.0
FRA  1259.0  3621.0 33516.0 33533.0 34051.0 35800.0
GBR  1298.0 29383.0  4232.0  3559.0  3883.0  3672.0 30996.0
ITA  1598.0 29819.0  3656.0  2826.0  3106.0  2918.0 28511.0 30212.0
NLD  1201.0  3539.0 34803.0 34850.0 35324.0 33515.0  3629.0  2838.0 37063.0
HUN   725.0  1531.0  6984.0  6746.0  6971.0  6750.0  1538.0  1434.0  6961.0  7568.0
POL  1703.0  3787.0 30859.0 31153.0 31494.0 29713.0  3501.0  3040.0 30763.0  6840.0 33123.0

---------------------------------------------------------
Number of bulls in reference population for        rlr
---------------------------------------------------------
BEL  3045.0
CAN  1709.0 34548.0
DEU  1249.0  4169.0 35828.0
DFS  1072.0  3478.0 33062.0 34382.0
ESP  1215.0  3796.0 33547.0 33693.0 34872.0
FRA  1253.0  3613.0 31454.0 31494.0 31993.0 33672.0
GBR  1275.0 28556.0  4222.0  3549.0  3873.0  3662.0 29508.0
ITA  1596.0 28985.0  3648.0  2818.0  3098.0  2910.0 27689.0 29376.0
NLD  1172.0  3529.0 32757.0 32803.0 33277.0 31506.0  3540.0  2829.0 34561.0
HUN   722.0  1529.0  6096.0  5857.0  6081.0  5897.0  1535.0  1432.0  6071.0  6676.0
POL  1697.0  3778.0 28849.0 29141.0 29481.0 27738.0  3490.0  3031.0 28765.0  5949.0 31059.0

---------------------------------------------------------
Number of bulls in reference population for        fan
---------------------------------------------------------
BEL  3057.0
CAN  1710.0 35467.0
DEU  1254.0  4177.0 35737.0
DFS  1077.0  3486.0 33209.0 34521.0
ESP  1220.0  3804.0 33707.0 33847.0 35043.0
FRA  1258.0  3621.0 31659.0 31677.0 32193.0 33937.0
GBR  1278.0 29374.0  4232.0  3559.0  3883.0  3672.0 30334.0
```

```
ITA  1597.0 29812.0  3656.0  2826.0  3106.0  2918.0 28505.0 30205.0
NLD  1177.0  3537.0 32886.0 32935.0 33409.0 31667.0  3550.0  2837.0 34687.0
HUN   724.0  1531.0  6301.0  6062.0  6286.0  6101.0  1538.0  1434.0  6276.0  6881.0
POL  1702.0  3787.0 28995.0 29289.0 29628.0 27918.0  3501.0  3040.0 28905.0  6155.0 31253.0

-----------------------------------------------------
Number of bulls in reference population for        hde
-----------------------------------------------------

-----------------------------------------------------
Number of bulls in reference population for        fua
-----------------------------------------------------
BEL  3097.0
CAN  1712.0 35476.0
DEU  1255.0  4177.0 37110.0
DFS  1078.0  3486.0 34322.0 35646.0
ESP  1221.0  3804.0 34817.0 34955.0 36151.0
FRA  1259.0  3621.0 32725.0 32746.0 33258.0 35004.0
GBR  1298.0 29382.0  4232.0  3559.0  3883.0  3672.0 30995.0
ITA  1598.0 29818.0  3656.0  2826.0  3106.0  2918.0 28510.0 30211.0
NLD  1201.0  3539.0 34003.0 34048.0 34522.0 32741.0  3629.0  2838.0 36261.0
HUN   725.0  1531.0  6450.0  6210.0  6435.0  6242.0  1538.0  1434.0  6425.0  7031.0
POL  1703.0  3787.0 30056.0 30348.0 30689.0 28936.0  3501.0  3040.0 29963.0  6303.0 32317.0

-----------------------------------------------------
Number of bulls in reference population for        ruh
-----------------------------------------------------
BEL  3097.0
CAN  1712.0 35476.0
DEU  1255.0  4177.0 36798.0
DFS  1078.0  3486.0 34005.0 35302.0
ESP  1221.0  3804.0 34505.0 34612.0 35813.0
FRA  1259.0  3621.0 32420.0 32436.0 32954.0 34700.0
GBR  1298.0 29382.0  4232.0  3559.0  3883.0  3672.0 30993.0
ITA  1598.0 29818.0  3656.0  2826.0  3106.0  2918.0 28510.0 30211.0
NLD  1201.0  3539.0 33693.0 33737.0 34213.0 32437.0  3629.0  2838.0 35950.0
HUN   725.0  1531.0  6464.0  6224.0  6449.0  6256.0  1538.0  1434.0  6439.0  7045.0
POL  1703.0  3787.0 30193.0 30485.0 30826.0 29073.0  3501.0  3040.0 30099.0  6318.0 32454.0

-----------------------------------------------------
Number of bulls in reference population for        ruw
-----------------------------------------------------

-----------------------------------------------------
Number of bulls in reference population for        usu
-----------------------------------------------------
BEL  3097.0
CAN  1712.0 35478.0
DEU  1255.0  4177.0 37926.0
DFS  1078.0  3486.0 35132.0 36462.0
ESP  1221.0  3804.0 35631.0 35768.0 36973.0
FRA  1259.0  3621.0 33514.0 33531.0 34049.0 35798.0
GBR  1298.0 29384.0  4232.0  3559.0  3883.0  3672.0 30997.0
ITA  1598.0 29820.0  3656.0  2826.0  3106.0  2918.0 28512.0 30213.0
NLD  1201.0  3539.0 34801.0 34848.0 35322.0 33513.0  3629.0  2838.0 37061.0
HUN   725.0  1531.0  6983.0  6745.0  6970.0  6749.0  1538.0  1434.0  6960.0  7567.0
POL  1703.0  3787.0 30857.0 31151.0 31492.0 29711.0  3501.0  3040.0 30761.0  6839.0 33121.0

-----------------------------------------------------
Number of bulls in reference population for        ude
-----------------------------------------------------
BEL  3060.0
CAN  1710.0 35473.0
DEU  1255.0  4177.0 37925.0
DFS  1078.0  3486.0 35131.0 36461.0
ESP  1221.0  3804.0 35630.0 35767.0 36972.0
```

```
FRA  1259.0  3621.0 33514.0 33531.0 34049.0 35798.0
GBR  1278.0 29379.0  4232.0  3559.0  3883.0  3672.0 30339.0
ITA  1597.0 29818.0  3656.0  2826.0  3106.0  2918.0 28510.0 30211.0
NLD  1178.0  3537.0 34800.0 34847.0 35321.0 33513.0  3550.0  2837.0 36608.0
HUN   725.0  1531.0  6984.0  6746.0  6971.0  6750.0  1538.0  1434.0  6961.0  7568.0
POL  1703.0  3787.0 30857.0 31151.0 31492.0 29712.0  3501.0  3040.0 30761.0  6840.0 33121.0

------------------------------------------------------
Number of bulls in reference population for        ftp
------------------------------------------------------
BEL  3097.0
CAN  1712.0 35477.0
DEU  1255.0  4177.0 37880.0
DFS  1078.0  3486.0 35086.0 36416.0
ESP  1221.0  3804.0 35586.0 35723.0 36928.0
FRA  1259.0  3621.0 33468.0 33485.0 34004.0 35752.0
GBR  1298.0 29383.0  4232.0  3559.0  3883.0  3672.0 30996.0
ITA  1598.0 29819.0  3656.0  2826.0  3106.0  2918.0 28511.0 30212.0
NLD  1201.0  3539.0 34755.0 34802.0 35277.0 33467.0  3629.0  2838.0 37015.0
HUN   725.0  1531.0  6983.0  6745.0  6970.0  6749.0  1538.0  1434.0  6960.0  7567.0
POL  1703.0  3787.0 30857.0 31151.0 31492.0 29711.0  3501.0  3040.0 30761.0  6839.0 33121.0

------------------------------------------------------
Number of bulls in reference population for        ftl
------------------------------------------------------
BEL  3060.0
CAN  1710.0 35461.0
DEU  1255.0  4177.0 37925.0
DFS  1078.0  3486.0 35131.0 36461.0
ESP  1221.0  3804.0 35630.0 35767.0 36972.0
FRA  1259.0  3621.0 33514.0 33531.0 34049.0 35798.0
GBR  1278.0 29379.0  4232.0  3559.0  3883.0  3672.0 30339.0
ITA  1597.0 29818.0  3656.0  2826.0  3106.0  2918.0 28510.0 30211.0
NLD  1178.0  3537.0 34800.0 34847.0 35321.0 33513.0  3550.0  2837.0 36608.0
HUN   725.0  1531.0  6984.0  6746.0  6971.0  6750.0  1538.0  1434.0  6961.0  7568.0
POL  1703.0  3787.0 30857.0 31151.0 31492.0 29712.0  3501.0  3040.0 30761.0  6840.0 33121.0

------------------------------------------------------
Number of bulls in reference population for        rtp
------------------------------------------------------
BEL  3077.0
CAN  1712.0 32363.0
DEU  1253.0  4171.0 35593.0
DFS  1076.0  3480.0 32805.0 34042.0
ESP  1219.0  3798.0 33302.0 33358.0 34559.0
FRA  1257.0  3615.0 31270.0 31236.0 31752.0 33499.0
GBR  1296.0 27535.0  4226.0  3553.0  3877.0  3666.0 29142.0
ITA  1598.0 27907.0  3651.0  2821.0  3101.0  2913.0 26765.0 28300.0
NLD  1199.0  3515.0 32498.0 32494.0 32965.0 31242.0  3605.0  2815.0 34552.0
POL  1700.0  3780.0 29348.0 29584.0 29928.0 28204.0  3494.0  3034.0 29201.0 31483.0

------------------------------------------------------
Number of bulls in reference population for        ocs
------------------------------------------------------
AUS  2899.0
BEL   434.0  3081.0
CAN  1068.0  1712.0 35447.0
DEU   744.0  1254.0  4174.0 37269.0
ESP   708.0  1220.0  3801.0 34977.0 36306.0
FRA   706.0  1258.0  3619.0 32858.0 33390.0 35126.0
GBR  1208.0  1298.0 29357.0  4230.0  3881.0  3671.0 30970.0
ITA   860.0  1598.0 29796.0  3654.0  3104.0  2917.0 28488.0 30189.0
NLD   764.0  1200.0  3538.0 34175.0 34695.0 32887.0  3628.0  2837.0 36430.0
HUN   562.0   725.0  1531.0  6984.0  6971.0  6750.0  1538.0  1434.0  6961.0  7568.0
POL   658.0  1702.0  3784.0 30221.0 30856.0 29076.0  3499.0  3038.0 30137.0  6840.0 32484.0
```

Number of bulls in reference population for ous

BEL 3076.0
CAN 1712.0 35476.0
DEU 1255.0 4177.0 37926.0
DFS 1078.0 3486.0 35132.0 36462.0
ESP 1221.0 3804.0 35631.0 35768.0 36973.0
FRA 1259.0 3621.0 33514.0 33531.0 34049.0 35794.0
GBR 1297.0 29382.0 4232.0 3559.0 3883.0 3672.0 30990.0
ITA 1598.0 29818.0 3656.0 2826.0 3106.0 2918.0 28510.0 30211.0
NLD 1201.0 3539.0 34803.0 34850.0 35324.0 33515.0 3629.0 2838.0 37062.0
HUN 725.0 1531.0 6984.0 6746.0 6971.0 6750.0 1538.0 1434.0 6961.0 7568.0
POL 1703.0 3787.0 30857.0 31151.0 31492.0 29711.0 3501.0 3040.0 30763.0 6840.0 33121.0

Number of bulls in reference population for ofl

BEL 3039.0
CAN 1710.0 35331.0
DEU 1254.0 4178.0 37291.0
DFS 1077.0 3486.0 34506.0 35833.0
ESP 1220.0 3804.0 34998.0 35140.0 36328.0
FRA 1258.0 3621.0 32879.0 32904.0 33411.0 35147.0
GBR 1277.0 29257.0 4233.0 3559.0 3883.0 3672.0 30213.0
ITA 1597.0 29711.0 3656.0 2826.0 3106.0 2918.0 28403.0 30104.0
NLD 1177.0 3537.0 34194.0 34241.0 34715.0 32907.0 3550.0 2837.0 35977.0
HUN 725.0 1531.0 6983.0 6745.0 6970.0 6749.0 1538.0 1434.0 6960.0 7567.0
POL 1702.0 3787.0 30242.0 30537.0 30878.0 29097.0 3501.0 3040.0 30157.0 6839.0 32506.0

Number of bulls in reference population for loc

BEL 3015.0
CAN 1702.0 29402.0
DEU 1249.0 4119.0 31244.0
DFS 1072.0 3422.0 28697.0 29748.0
ESP 1215.0 3740.0 29339.0 29286.0 30429.0
FRA 1253.0 3557.0 27362.0 27212.0 27876.0 29336.0
GBR 1272.0 26863.0 4179.0 3502.0 3826.0 3617.0 27792.0
ITA 1588.0 27219.0 3610.0 2780.0 3060.0 2874.0 26228.0 27542.0
NLD 1171.0 3481.0 28725.0 28635.0 29261.0 27431.0 3500.0 2794.0 30325.0
HUN 721.0 1525.0 5281.0 5048.0 5264.0 5105.0 1530.0 1429.0 5256.0 5856.0

Number of bulls in reference population for bcs

BEL 2895.0
DEU 1240.0 27715.0
FRA 1243.0 23975.0 25695.0
GBR 1258.0 4165.0 3594.0 26274.0
ITA 1587.0 3597.0 2860.0 24722.0 26279.0
NLD 1158.0 25316.0 24065.0 3469.0 2773.0 26843.0
CAN 1700.0 4092.0 3515.0 25379.0 25966.0 3434.0 29718.0
ESP 1205.0 25861.0 24448.0 3804.0 3047.0 25793.0 3698.0 26840.0
HUN 719.0 6078.0 5886.0 1530.0 1426.0 6054.0 1523.0 6065.0 6657.0