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, , 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, , , 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:

DEU HOL -Introduced a mixed genomic reference population for German Holstein routine genomic evaluation
         -Base change

CAN HOL -Base change

FRA HOL -Base change

ITA HOL -Base change

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 April 2019

Country	Date
BEL	20181201
CAN	20190401
DEU	20190402
DFS	20190305
ESP	20190318
FRA	20190403
GBR	20190305
ITA	20190311
NLD	20190401

HUN 20190314
POL 20190228

Table 2.

Number of bulls in reference population for sta

BEL	2962.0										
CAN	1603.0	34929.0									
DEU	1172.0	3977.0	37654.0								
DFS	1000.0	3254.0	34940.0	36105.0							
ESP	1130.0	3484.0	35385.0	35439.0	36544.0						
FRA	1184.0	3439.0	33312.0	33249.0	33735.0	35495.0					
GBR	1178.0	28875.0	4015.0	3327.0	3561.0	3487.0	30422.0				
ITA	1502.0	29174.0	3389.0	2563.0	2740.0	2733.0	27850.0	29480.0			
NLD	1134.0	3355.0	34655.0	34592.0	35044.0	33273.0	3446.0	2644.0	36775.0		
HUN	618.0	1347.0	6667.0	6433.0	6645.0	6460.0	1341.0	1240.0	6657.0	7212.0	
POL	1635.0	3622.0	30688.0	30911.0	31234.0	29430.0	3337.0	2883.0	30516.0	6573.0	32859.0

Number of bulls in reference population for cwi

BEL	2962.0										
CAN	1603.0	34923.0									
DEU	1171.0	3977.0	36440.0								
DFS	999.0	3254.0	33736.0	34893.0							
ESP	1129.0	3484.0	34175.0	34232.0	35320.0						
FRA	1183.0	3439.0	32125.0	32069.0	32545.0	34295.0					
GBR	1178.0	28869.0	4015.0	3327.0	3561.0	3487.0	30416.0				
ITA	1502.0	29170.0	3389.0	2563.0	2740.0	2733.0	27846.0	29476.0			
NLD	1133.0	3355.0	33468.0	33403.0	33856.0	32112.0	3446.0	2644.0	35586.0		
HUN	618.0	1347.0	6131.0	5895.0	6107.0	5950.0	1341.0	1240.0	6119.0	6673.0	
POL	1634.0	3622.0	29539.0	29761.0	30084.0	28307.0	3337.0	2883.0	29374.0	6034.0	31707.0

Number of bulls in reference population for bde

BEL	2948.0										
CAN	1603.0	34929.0									
DEU	1172.0	3977.0	37096.0								
DFS	1000.0	3254.0	34382.0	35543.0							
ESP	1130.0	3484.0	34828.0	34880.0	35985.0						
FRA	1184.0	3439.0	32781.0	32717.0	33204.0	34963.0					
GBR	1178.0	28875.0	4015.0	3327.0	3561.0	3487.0	30422.0				
ITA	1502.0	29174.0	3389.0	2563.0	2740.0	2733.0	27850.0	29480.0			
NLD	1134.0	3355.0	34097.0	34032.0	34485.0	32741.0	3446.0	2644.0	36215.0		
HUN	618.0	1347.0	6156.0	5920.0	6132.0	5975.0	1341.0	1240.0	6144.0	6698.0	
POL	1635.0	3622.0	30176.0	30397.0	30720.0	28944.0	3337.0	2883.0	30002.0	6059.0	32344.0

Number of bulls in reference population for ang

BEL	2894.0										
CAN	1601.0	34487.0									
DEU	1162.0	3972.0	33886.0								
DFS	992.0	3249.0	31205.0	32360.0							
ESP	1120.0	3479.0	31623.0	31700.0	32761.0						
FRA	1174.0	3434.0	29629.0	29594.0	30048.0	31795.0					
GBR	1158.0	28858.0	4008.0	3320.0	3554.0	3480.0	29745.0				
ITA	1500.0	28992.0	3384.0	2558.0	2735.0	2728.0	27837.0	29296.0			
NLD	1102.0	3348.0	30917.0	30874.0	31306.0	29618.0	3361.0	2638.0	32574.0		
HUN	609.0	1342.0	3601.0	3385.0	3572.0	3473.0	1334.0	1235.0	3583.0	4101.0	
POL	1623.0	3617.0	26989.0	27231.0	27530.0	25813.0	3329.0	2876.0	26826.0	3500.0	29146.0

Number of bulls in reference population for ran

BEL	2963.0										
CAN	1603.0	34929.0									
DEU	1172.0	3977.0	37558.0								
DFS	1000.0	3254.0	34844.0	36009.0							
ESP	1130.0	3484.0	35294.0	35348.0	36453.0						
FRA	1184.0	3439.0	33217.0	33154.0	33645.0	35400.0					
GBR	1178.0	28875.0	4015.0	3327.0	3561.0	3487.0	30422.0				
ITA	1502.0	29174.0	3389.0	2563.0	2740.0	2733.0	27850.0	29480.0			
NLD	1134.0	3355.0	34560.0	34497.0	34954.0	33178.0	3446.0	2644.0	36680.0		
HUN	618.0	1347.0	6667.0	6433.0	6645.0	6460.0	1341.0	1240.0	6657.0	7212.0	
POL	1635.0	3622.0	30685.0	30908.0	31231.0	29427.0	3337.0	2883.0	30513.0	6573.0	32856.0

Number of bulls in reference population for rwi

BEL	2948.0										
CAN	1603.0	34107.0									
DEU	1172.0	3977.0	37599.0								
DFS	1000.0	3254.0	34885.0	36050.0							
ESP	1130.0	3484.0	35331.0	35385.0	36490.0						
FRA	1184.0	3439.0	33257.0	33194.0	33681.0	35440.0					
GBR	1178.0	28875.0	4015.0	3327.0	3561.0	3487.0	30422.0				
ITA	1502.0	29174.0	3389.0	2563.0	2740.0	2733.0	27850.0	29480.0			
NLD	1134.0	3355.0	34600.0	34537.0	34990.0	33218.0	3446.0	2644.0	36720.0		
HUN	618.0	1347.0	6658.0	6424.0	6636.0	6451.0	1341.0	1240.0	6648.0	7203.0	
POL	1635.0	3622.0	30678.0	30901.0	31224.0	29420.0	3337.0	2883.0	30506.0	6564.0	32849.0

Number of bulls in reference population for rls

BEL	2963.0										
CAN	1603.0	34929.0									
DEU	1172.0	3977.0	37655.0								
DFS	1000.0	3254.0	34941.0	36106.0							
ESP	1130.0	3484.0	35386.0	35440.0	36545.0						
FRA	1184.0	3439.0	33313.0	33250.0	33736.0	35496.0					
GBR	1178.0	28875.0	4015.0	3327.0	3561.0	3487.0	30422.0				
ITA	1502.0	29174.0	3389.0	2563.0	2740.0	2733.0	27850.0	29480.0			
NLD	1134.0	3355.0	34656.0	34593.0	35045.0	33274.0	3446.0	2644.0	36776.0		
HUN	618.0	1347.0	6667.0	6433.0	6645.0	6460.0	1341.0	1240.0	6657.0	7212.0	
POL	1635.0	3622.0	30688.0	30911.0	31234.0	29430.0	3337.0	2883.0	30516.0	6573.0	32859.0

Number of bulls in reference population for rlr

BEL	2912.0										
CAN	1600.0	34000.0									
DEU	1166.0	3969.0	35555.0								
DFS	994.0	3246.0	32869.0	34024.0							
ESP	1124.0	3476.0	33300.0	33363.0	34442.0						
FRA	1178.0	3431.0	31251.0	31211.0	31678.0	33368.0					
GBR	1156.0	28048.0	4005.0	3317.0	3551.0	3477.0	28935.0				
ITA	1500.0	28340.0	3381.0	2555.0	2732.0	2725.0	27028.0	28644.0			
NLD	1106.0	3345.0	32610.0	32546.0	32998.0	31265.0	3358.0	2635.0	34276.0		
HUN	616.0	1346.0	5782.0	5547.0	5758.0	5610.0	1339.0	1239.0	5770.0	6323.0	
POL	1629.0	3613.0	28678.0	28899.0	29221.0	27455.0	3326.0	2874.0	28518.0	5685.0	30795.0

Number of bulls in reference population for fan

BEL	2924.0										
CAN	1601.0	34919.0									
DEU	1171.0	3977.0	35464.0								
DFS	999.0	3254.0	33016.0	34163.0							

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ESP  1129.0  3484.0 33460.0 33517.0 34613.0
FRA  1183.0  3439.0 31456.0 31394.0 31878.0 33633.0
GBR  1159.0 28866.0  4015.0  3327.0  3561.0  3487.0 29761.0
ITA  1501.0 29167.0  3389.0  2563.0  2740.0  2733.0 27844.0 29473.0
NLD  1111.0  3353.0 32739.0 32678.0 33130.0 31426.0  3368.0  2643.0 34402.0
HUN   617.0  1347.0  5989.0  5754.0  5965.0  5815.0  1341.0  1240.0  5977.0  6530.0
POL  1634.0  3622.0 28824.0 29047.0 29368.0 27635.0  3337.0  2883.0 28658.0  5893.0 30989.0

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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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BEL  2963.0
CAN  1603.0 34928.0
DEU  1172.0  3977.0 36837.0
DFS  1000.0  3254.0 34129.0 35288.0
ESP  1130.0  3484.0 34570.0 34625.0 35721.0
FRA  1184.0  3439.0 32522.0 32463.0 32943.0 34700.0
GBR  1178.0 28874.0  4015.0  3327.0  3561.0  3487.0 30421.0
ITA  1502.0 29173.0  3389.0  2563.0  2740.0  2733.0 27849.0 29479.0
NLD  1134.0  3355.0 33856.0 33791.0 34243.0 32500.0  3446.0  2644.0 35974.0
HUN   618.0  1347.0  6133.0  5897.0  6109.0  5952.0  1341.0  1240.0  6121.0  6675.0
POL  1635.0  3622.0 29885.0 30106.0 30429.0 28653.0  3337.0  2883.0 29716.0  6036.0 32053.0

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Number of bulls in reference population for        ruh
----------------------------------------------------------
BEL  2963.0
CAN  1603.0 34928.0
DEU  1172.0  3977.0 36525.0
DFS  1000.0  3254.0 33812.0 34944.0
ESP  1130.0  3484.0 34258.0 34282.0 35383.0
FRA  1184.0  3439.0 32217.0 32153.0 32639.0 34396.0
GBR  1178.0 28874.0  4015.0  3327.0  3561.0  3487.0 30419.0
ITA  1502.0 29173.0  3389.0  2563.0  2740.0  2733.0 27849.0 29479.0
NLD  1134.0  3355.0 33546.0 33480.0 33934.0 32196.0  3446.0  2644.0 35663.0
HUN   618.0  1347.0  6148.0  5912.0  6124.0  5967.0  1341.0  1240.0  6136.0  6690.0
POL  1635.0  3622.0 30022.0 30243.0 30566.0 28790.0  3337.0  2883.0 29852.0  6051.0 32190.0

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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  2963.0
CAN  1603.0 34929.0
DEU  1172.0  3977.0 37653.0
DFS  1000.0  3254.0 34939.0 36104.0
ESP  1130.0  3484.0 35384.0 35438.0 36543.0
FRA  1184.0  3439.0 33311.0 33248.0 33734.0 35494.0
GBR  1178.0 28875.0  4015.0  3327.0  3561.0  3487.0 30422.0
ITA  1502.0 29174.0  3389.0  2563.0  2740.0  2733.0 27850.0 29480.0
NLD  1134.0  3355.0 34654.0 34591.0 35043.0 33272.0  3446.0  2644.0 36774.0
HUN   618.0  1347.0  6666.0  6432.0  6644.0  6459.0  1341.0  1240.0  6656.0  7211.0
POL  1635.0  3622.0 30686.0 30909.0 31232.0 29428.0  3337.0  2883.0 30514.0  6572.0 32857.0

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Number of bulls in reference population for        ude
----------------------------------------------------------
BEL  2927.0
CAN  1601.0 34925.0
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DEU  1172.0  3977.0 37652.0
DFS  1000.0  3254.0 34938.0 36103.0
ESP  1130.0  3484.0 35383.0 35437.0 36542.0
FRA  1184.0  3439.0 33311.0 33248.0 33734.0 35494.0
GBR  1159.0 28871.0  4015.0  3327.0  3561.0  3487.0 29766.0
ITA  1501.0 29173.0  3389.0  2563.0  2740.0  2733.0 27849.0 29479.0
NLD  1112.0  3353.0 34653.0 34590.0 35042.0 33272.0  3368.0  2643.0 36323.0
HUN   618.0  1347.0  6667.0  6433.0  6645.0  6460.0  1341.0  1240.0  6657.0  7212.0
POL  1635.0  3622.0 30686.0 30909.0 31232.0 29429.0  3337.0  2883.0 30514.0  6573.0 32857.0

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Number of bulls in reference population for        ftp
-----------------------------------------------------
BEL  2963.0
CAN  1603.0 34929.0
DEU  1172.0  3977.0 37607.0
DFS  1000.0  3254.0 34893.0 36058.0
ESP  1130.0  3484.0 35339.0 35393.0 36498.0
FRA  1184.0  3439.0 33265.0 33202.0 33689.0 35448.0
GBR  1178.0 28875.0  4015.0  3327.0  3561.0  3487.0 30422.0
ITA  1502.0 29174.0  3389.0  2563.0  2740.0  2733.0 27850.0 29480.0
NLD  1134.0  3355.0 34608.0 34545.0 34998.0 33226.0  3446.0  2644.0 36728.0
HUN   618.0  1347.0  6666.0  6432.0  6644.0  6459.0  1341.0  1240.0  6656.0  7211.0
POL  1635.0  3622.0 30686.0 30909.0 31232.0 29428.0  3337.0  2883.0 30514.0  6572.0 32857.0

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Number of bulls in reference population for        ftl
-----------------------------------------------------
BEL  2927.0
CAN  1601.0 34914.0
DEU  1172.0  3977.0 37652.0
DFS  1000.0  3254.0 34938.0 36103.0
ESP  1130.0  3484.0 35383.0 35437.0 36542.0
FRA  1184.0  3439.0 33311.0 33248.0 33734.0 35494.0
GBR  1159.0 28871.0  4015.0  3327.0  3561.0  3487.0 29766.0
ITA  1501.0 29174.0  3389.0  2563.0  2740.0  2733.0 27849.0 29480.0
NLD  1112.0  3353.0 34653.0 34590.0 35042.0 33272.0  3368.0  2643.0 36323.0
HUN   618.0  1347.0  6667.0  6433.0  6645.0  6460.0  1341.0  1240.0  6657.0  7212.0
POL  1635.0  3622.0 30686.0 30909.0 31232.0 29429.0  3337.0  2883.0 30514.0  6573.0 32857.0

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Number of bulls in reference population for        rtp
-----------------------------------------------------
BEL  2943.0
CAN  1603.0 31816.0
DEU  1170.0  3971.0 35320.0
DFS   998.0  3248.0 32612.0 33684.0
ESP  1128.0  3478.0 33055.0 33028.0 34129.0
FRA  1182.0  3433.0 31067.0 30953.0 31437.0 33195.0
GBR  1176.0 27027.0  4009.0  3321.0  3555.0  3481.0 28568.0
ITA  1502.0 27221.0  3384.0  2558.0  2735.0  2728.0 26062.0 27527.0
NLD  1132.0  3331.0 32351.0 32237.0 32686.0 31001.0  3422.0  2621.0 34265.0
POL  1632.0  3615.0 29177.0 29342.0 29668.0 27921.0  3330.0  2877.0 28954.0 31219.0

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Number of bulls in reference population for        ocs
-----------------------------------------------------
BEL  2947.0
CAN  1603.0 34899.0
DEU  1171.0  3975.0 37019.0
ESP  1129.0  3482.0 34753.0 35900.0
FRA  1183.0  3437.0 32677.0 33097.0 34844.0
GBR  1178.0 28850.0  4014.0  3560.0  3486.0 30397.0
ITA  1502.0 29151.0  3388.0  2739.0  2732.0 27827.0 29457.0
NLD  1133.0  3354.0 34050.0 34439.0 32668.0  3445.0  2643.0 36166.0
HUN   618.0  1347.0  6667.0  6645.0  6460.0  1341.0  1240.0  6657.0  7212.0
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POL  1634.0  3620.0 30073.0 30620.0 28815.0  3336.0  2882.0 29913.0  6573.0 32244.0

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Number of bulls in reference population for        ous
--------------------------------------------------------
BEL  2942.0
CAN  1603.0 34928.0
DEU  1172.0  3977.0 37653.0
DFS  1000.0  3254.0 34939.0 36104.0
ESP  1130.0  3484.0 35384.0 35438.0 36543.0
FRA  1184.0  3439.0 33311.0 33248.0 33734.0 35490.0
GBR  1177.0 28874.0  4015.0  3327.0  3561.0  3487.0 30416.0
ITA  1502.0 29173.0  3389.0  2563.0  2740.0  2733.0 27849.0 29479.0
NLD  1134.0  3355.0 34656.0 34593.0 35045.0 33274.0  3446.0  2644.0 36775.0
HUN   618.0  1347.0  6667.0  6433.0  6645.0  6460.0  1341.0  1240.0  6657.0  7212.0
POL  1635.0  3622.0 30686.0 30909.0 31232.0 29428.0  3337.0  2883.0 30516.0  6573.0 32857.0

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Number of bulls in reference population for        ofl
--------------------------------------------------------
BEL  2905.0
CAN  1601.0 34783.0
DEU  1171.0  3978.0 37018.0
DFS   999.0  3254.0 34313.0 35475.0
ESP  1129.0  3484.0 34751.0 34810.0 35898.0
FRA  1183.0  3439.0 32676.0 32621.0 33096.0 34843.0
GBR  1157.0 28749.0  4016.0  3327.0  3561.0  3487.0 29640.0
ITA  1501.0 29057.0  3389.0  2563.0  2740.0  2733.0 27733.0 29363.0
NLD  1110.0  3353.0 34047.0 33984.0 34436.0 32666.0  3367.0  2643.0 35690.0
HUN   618.0  1347.0  6666.0  6432.0  6644.0  6459.0  1341.0  1240.0  6656.0  7211.0
POL  1634.0  3622.0 30071.0 30295.0 30618.0 28814.0  3337.0  2883.0 29910.0  6572.0 32242.0

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Number of bulls in reference population for        loc
--------------------------------------------------------
BEL  2881.0
CAN  1593.0 28854.0
DEU  1166.0  3917.0 30983.0
DFS   994.0  3192.0 28523.0 29400.0
ESP  1124.0  3422.0 29104.0 28966.0 30002.0
FRA  1178.0  3375.0 27164.0 26933.0 27559.0 29031.0
GBR  1152.0 26354.0  3960.0  3270.0  3504.0  3430.0 27217.0
ITA  1492.0 26565.0  3345.0  2520.0  2697.0  2691.0 25558.0 26804.0
NLD  1104.0  3299.0 28577.0 28379.0 28982.0 27187.0  3317.0  2603.0 30038.0
HUN   614.0  1342.0  4971.0  4742.0  4945.0  4820.0  1334.0  1236.0  4959.0  5507.0

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Number of bulls in reference population for        bcs
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BEL  2762.0
DEU  1157.0 27461.0
FRA  1169.0 23786.0 25426.0
GBR  1138.0  3949.0  3415.0 25709.0
ITA  1491.0  3333.0  2679.0 24063.0 25551.0
NLD  1092.0 25172.0 23850.0  3293.0  2584.0 26584.0
CAN  1591.0  3894.0  3343.0 24875.0 25323.0  3260.0 29180.0
ESP  1115.0 25633.0 24166.0  3490.0  2686.0 25541.0  3390.0 26447.0
HUN   613.0  5777.0  5610.0  1336.0  1235.0  5766.0  1342.0  5755.0  6318.0
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