“InterGenomics-Holstein”

Interbull genomic evaluation of small Holstein populations

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Outline

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InterGenomics Holstein – the project

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- Methodology
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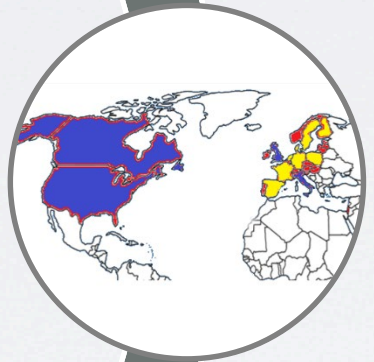
InterGenomics Holstein – the service

- First routine run's results

Background

Why InterGenomics Holstein

Increasing the size of reference population is crucial for gEBVs accuracy.



International genotypes exchange consortia have been created among large Holstein populations.

Small Holstein populations had limited chances for commercial driven implementation of genomic selection.

InterGenomics Holstein – the project

Interbull SC supported the development of the
“International genomic evaluation”
for small Holstein populations

- Dedicated working group appointed (M. Klopčič, S. Mattalia, B. Van Doormaal, T. Roozen)
- Interbull Centre resources allocated

Implementation of
“**InterGenomics Brown Swiss**”
methodology for Holstein breed.

InterGenomics Holstein – the project

Principles

Gathering genotypes from participating countries into the InterGenomics Holstein pool;

Unique reference population;

No sharing of genotypes among participants;

Evaluation results (gEBVs and genomic reliabilities) on **each IGHOL country scale**.

Participants

IGHOL countries, small Holstein populations' countries;

Contributors, larger Holstein populations' countries providing genotypes of:

- National progeny proven bulls:
  - Increase reference population size;
- young sires in AI:
  - access to small populations' markets.

InterGenomics Holstein – the project

Methodology

Genotypes converted to reference density (55,172 SNPs);

Parentage verification and quality checks;

Imputation (FindHap);

Y = deregressed MACE EBV; (ST by country)

GBLUP model

(Van Raden, 2008);

Interbull Method for approximation of genomic reliabilities.

Achievements

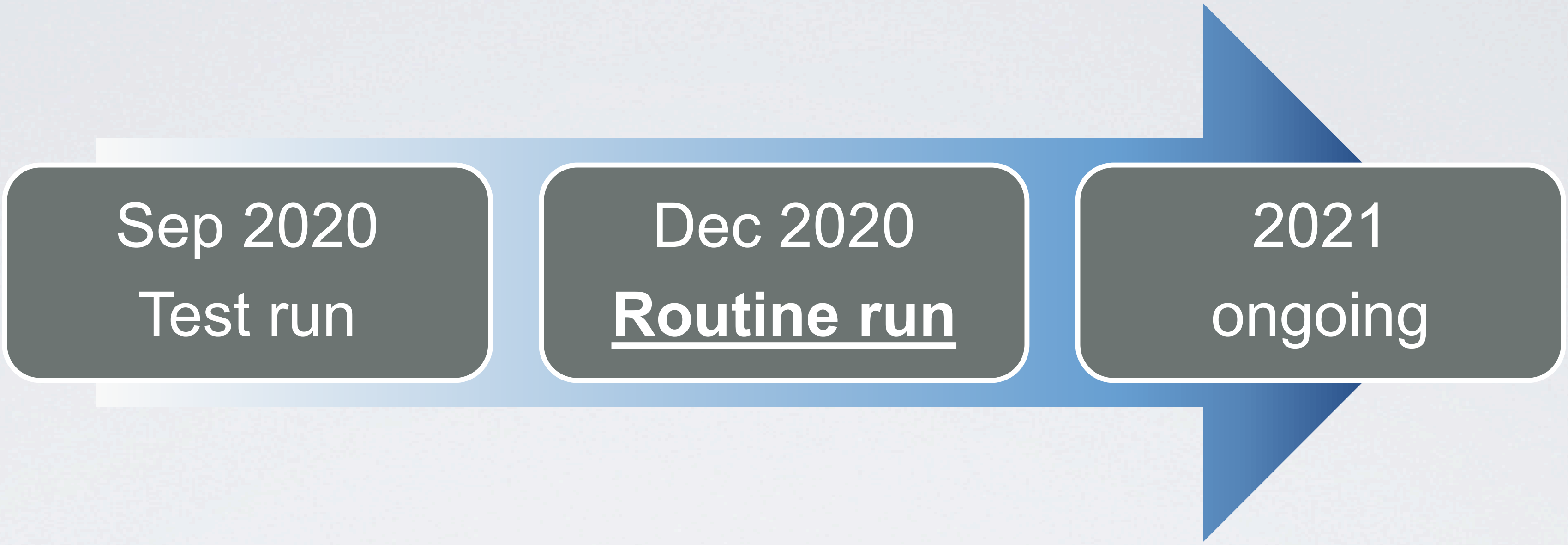
The **InterGenomics methodology worked** for small Holstein populations;

gEBVs validated with Interbull GEBV test;

Gain in reliability thanks to genomic information;

Methodology approved by Interbull Technical Committee.

InterGenomics Holstein – the Service



Sep 2020
Test run

Dec 2020
Routine run

2021
ongoing

IGHOL countries

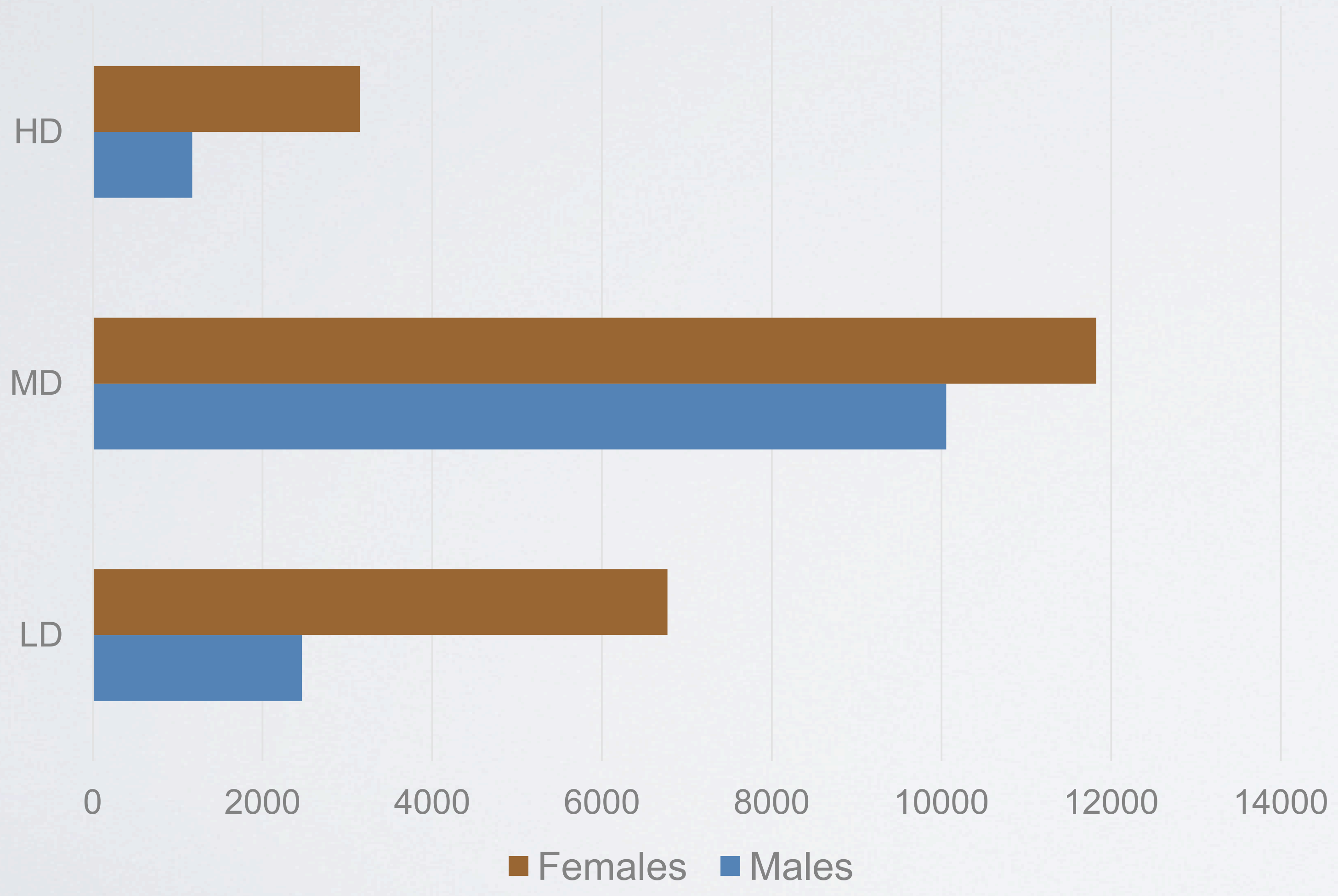
- ☐ Ireland
- ☐ Israel
- ☐ Slovenia
- ☐ South Korea

Contributors

- ☐ DFS (Denmark/Finland/Sweden)
- ☐ France
- ☐ Germany

Dec 2020 Routine run - Data

35,431 genotypes

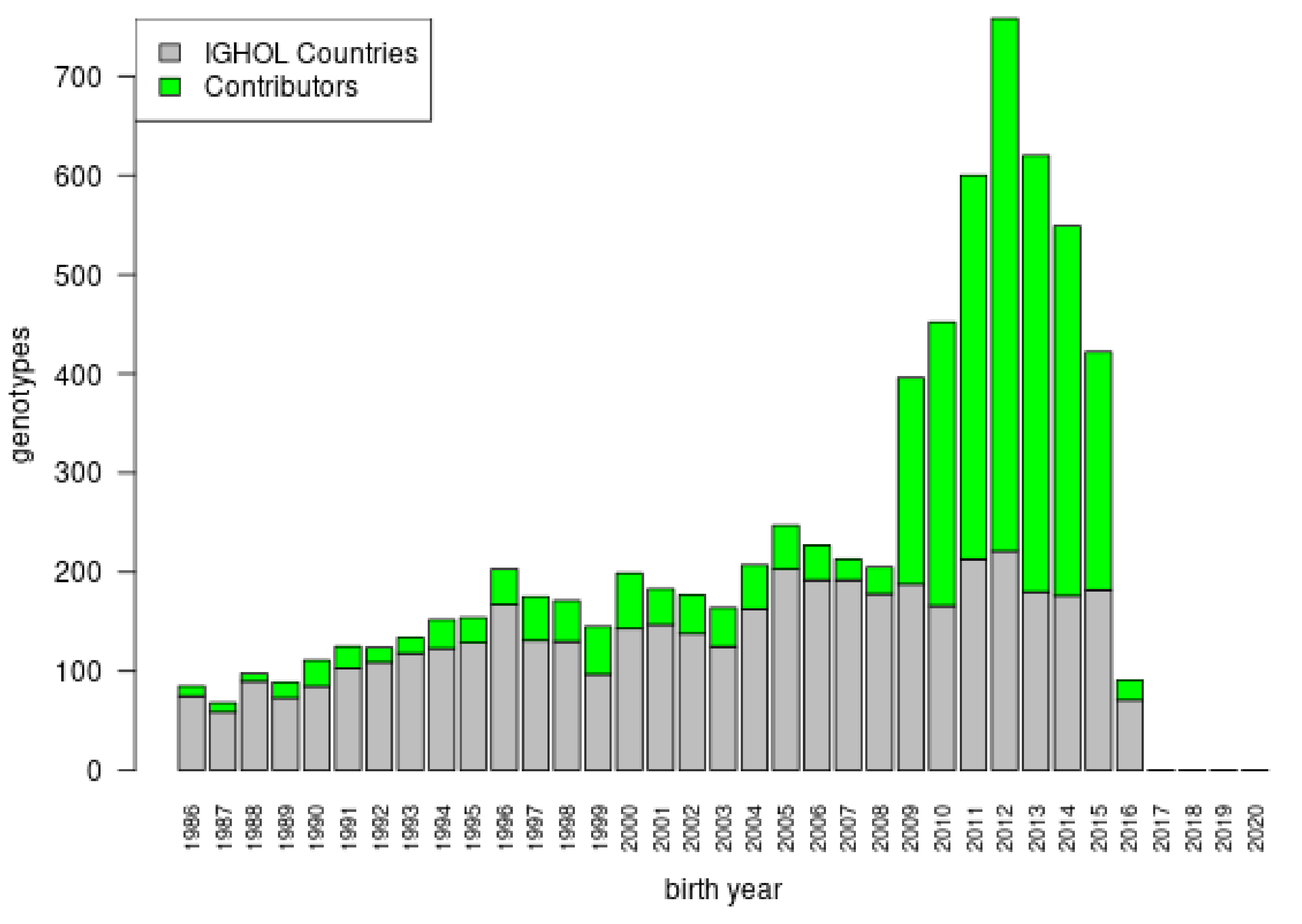


30 MACE traits
89 country-trait combinations

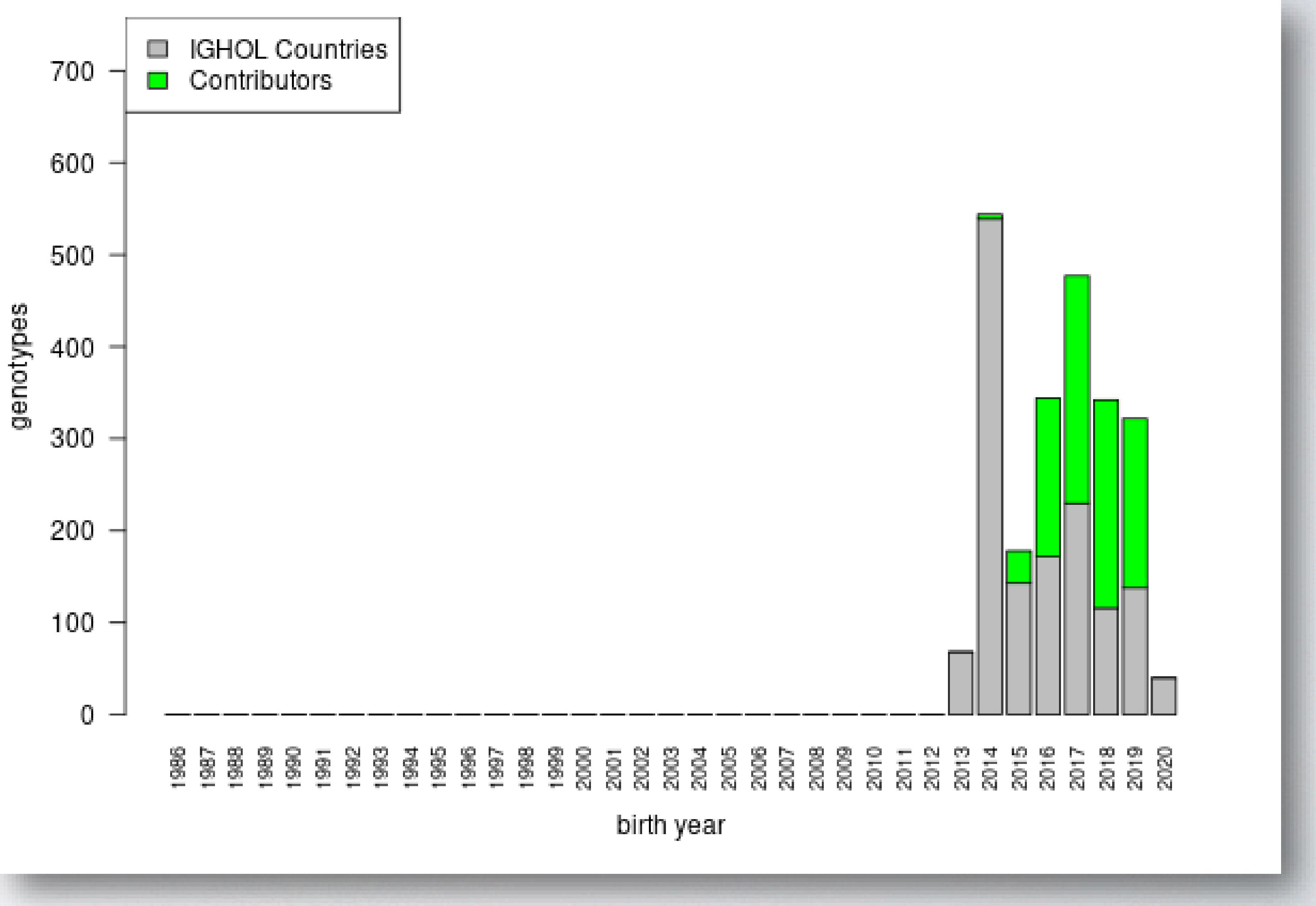
MACE trait group	IGHOL countries
Calving	2
Conformation	3
Fertility	2
Longevity	3
Production	4
Udder Health	4

Dec 2020 Routine run – Reference & young bulls

Reference bulls:
bulls born after 1985 with own MACE EBV;
7,544 (production traits)

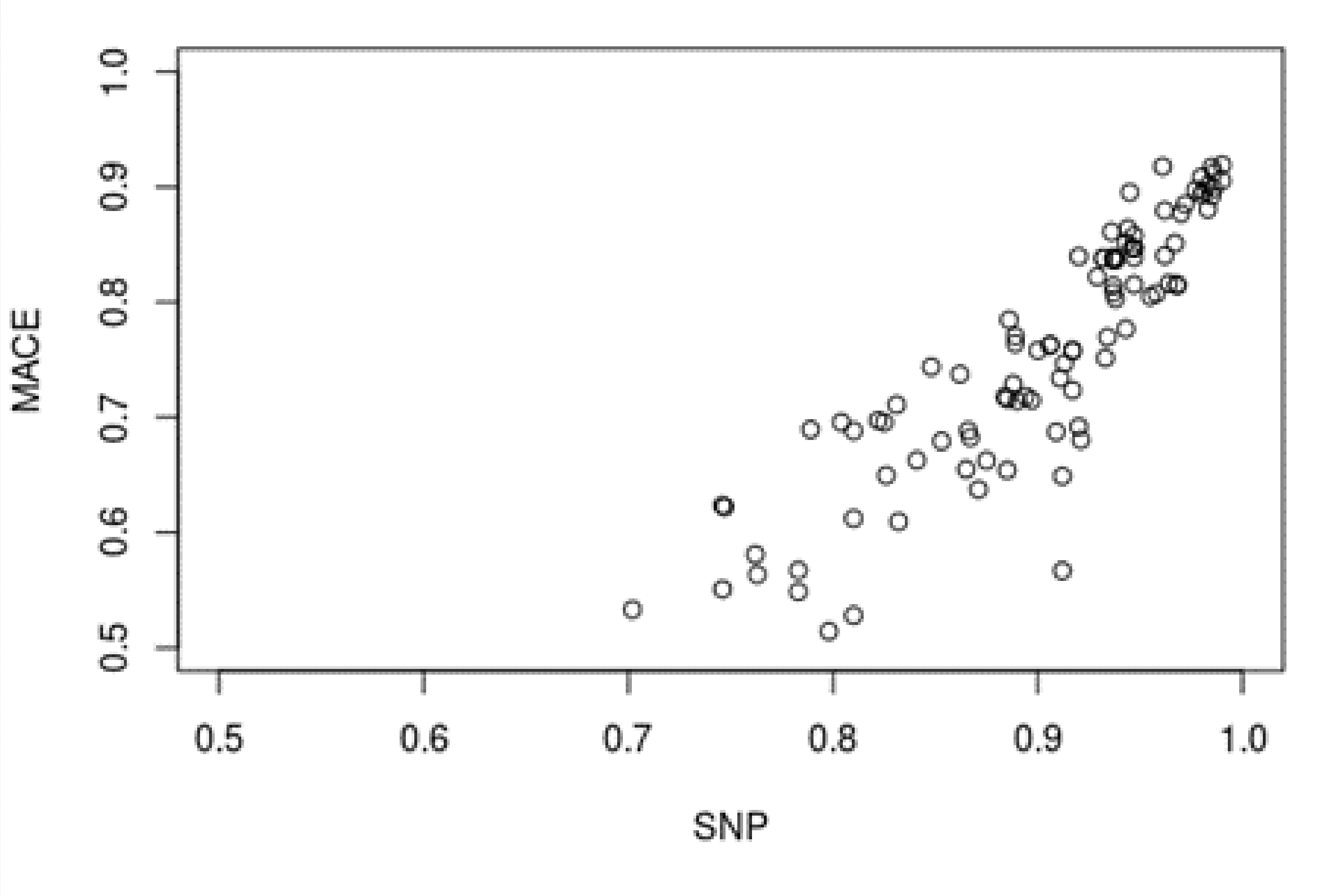


Young bulls:
males younger than 7 years old without MACE EBV;
2,315 (production traits)



Dec 2020 Routine run – SNP effects

- 45,895 SNPs retained for the evaluation
- SNP effects estimated for all 89 country-trait combinations
- Correlations of SNP effects across country ranged from 0.70 to 0.99, in agreement with across country genetic correlations used in the Interbull MACE evaluation.

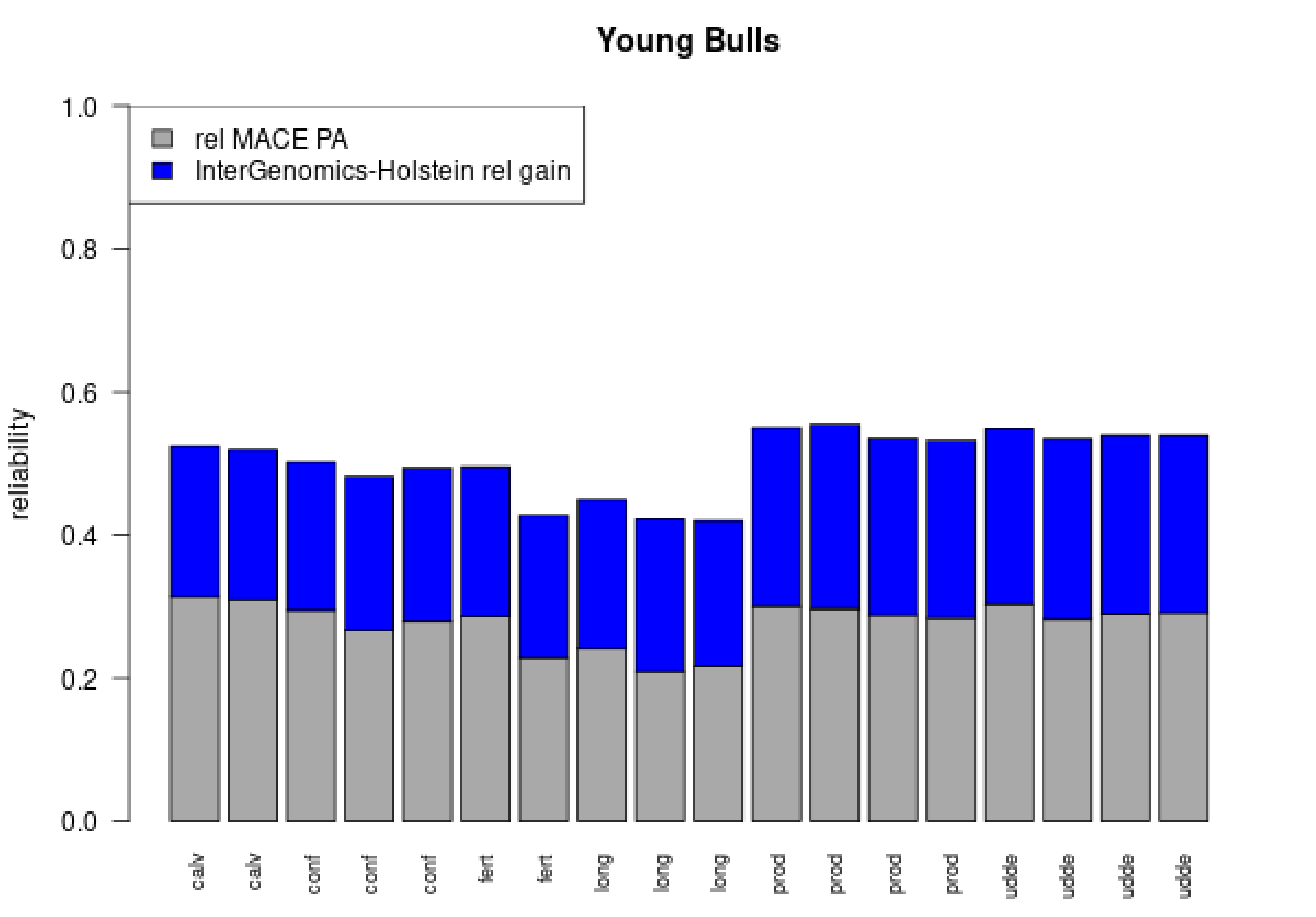


Dec 2020 Routine run – Reliabilities

- Reliability gain observed for reference and young bulls in all 89 country-trait combinations;

Reference bulls vs MACE rel:	Young bulls vs MACE PA rel:
• + 0.03 min	• + 0.17 min
• + 0.09 max	• + 0.25 max
• **+ 0.06 avg**	• **+ 0.22 avg**

- Differences among traits and populations due to difference in reference population sizes (across traits) and across countries correlations.



Conclusions

- InterGenomics machinery showed to be **adaptable to new populations**
- **Genotypes provided by Contributors** almost doubled the size of the reference population, improving significantly the quality of the Service.
- **SNP effects showed consistency** with the across countries correlations used in the Interbull MACE evaluation.
- A **reliability gain** was observed in all 89 country-trait combinations.
- **InterGenomics-Holstein** showed to be a **valuable Service**, especially for countries with small Holstein populations.

Acknowledgments

Interbull Centre would like to acknowledge:

- Small Holstein population countries joining the InterGenomics Holstein Service;
- Contributors to the InterGenomics Holstein Service;
- Interbull Steering Committee for supporting the development of the new Service;
- Interbull Technical Committee for recommendations and support allowing Service implementation, with a special thanks to Dr. Zengting LIU;
- InterGenomics Holstein working group members.

Please, feel free to contact Interbull@slu.se if you are interested in the InterGenomics-Holstein Service.