

Genetic analysis to support the re-establishment of the Kempen breed



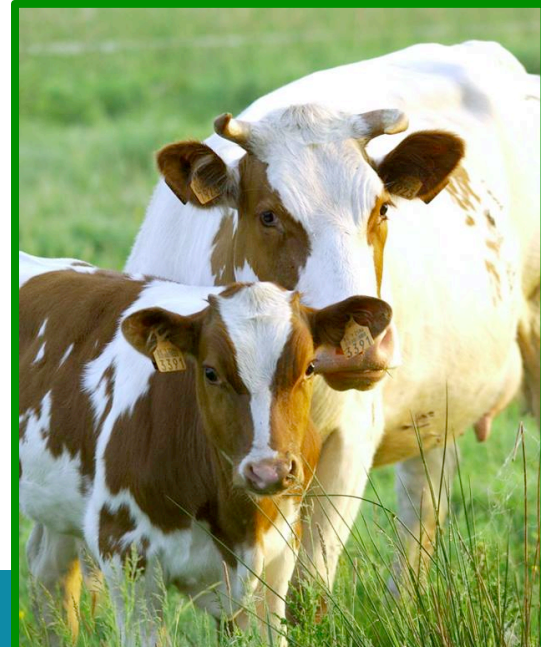
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Kempen Breed (KRB)

Dual purpose cattle breed in the region
“Kempen”

1972 All red-pied breeds merged into the
herdbook of the Belgian red-pied
→ Crosses with Holstein

2012 Re-establishment
→ With farmers still main-taining
the “old type”



Kempen Breed (KRB)

300 animals phenotypically registered (6 farms)

→ using breeding standard from 1954

BUT

No pedigree information

Many crosses

Many individuals still unregistered

Objective



Genetic diversity and population structure

Amount genetic information shared with related breeds

Within breed analysis

214 blood samples were genotyped on Illumina 54K

All breeding bulls

All cows > 7 years (<2007)

Quality Control

MAF: 1%

SNP call rate: 5%

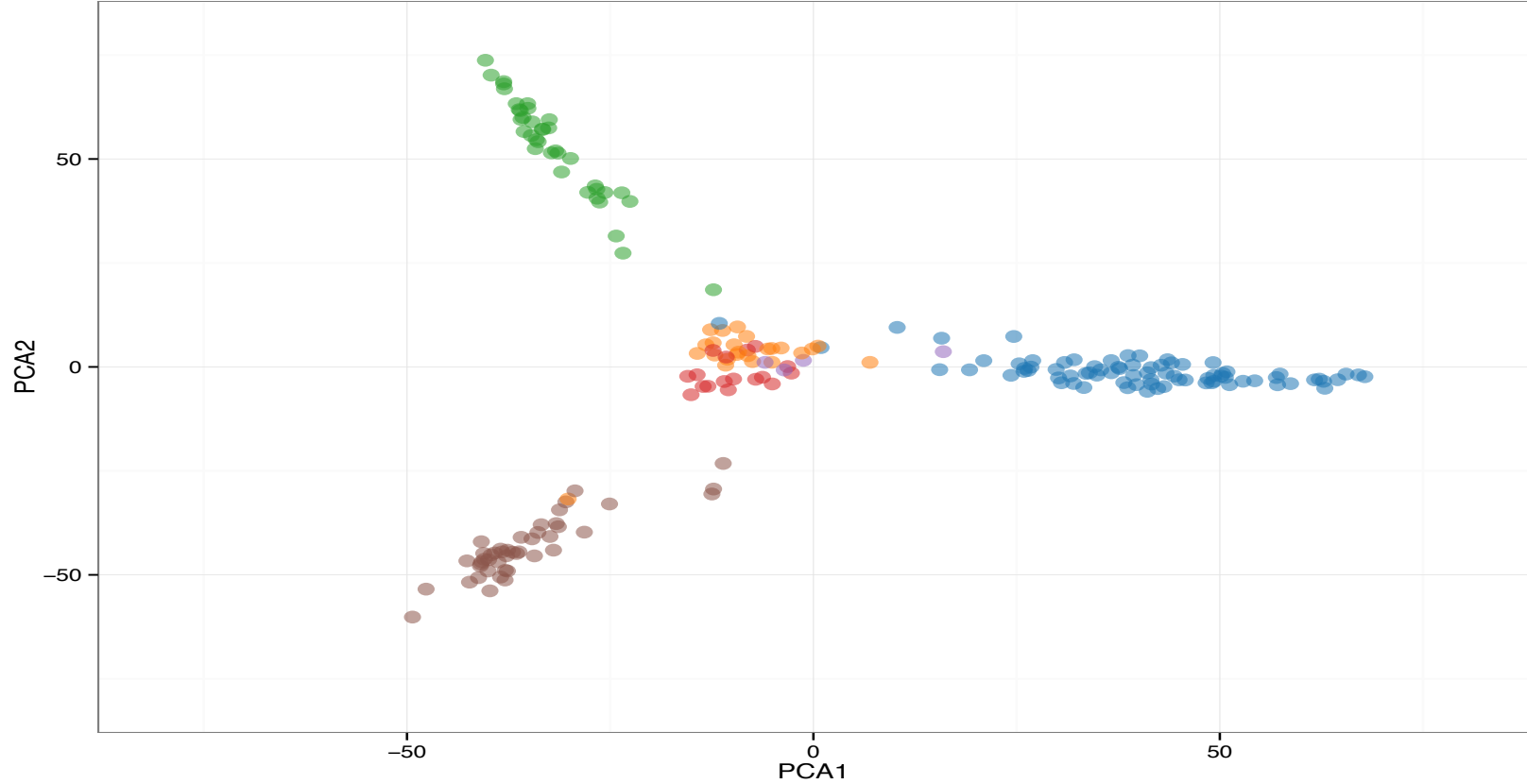
Individual call rate: 5%

→ 207 individuals and 45 022 SNPs



"It has nothing to do with you, Bessie. It's just that I'm lactose intolerant."

Within breed: PCA



Within breed: diversity

Effective population size = 55

(Weir & Hill 1980 adapted by Waples 2006)

Average inbreeding = 2.7%

(Yang et al. 2010)

Between breeds analysis

Relation between KRB and 9 related breeds

→ 654 individuals on Illumina 54K or 770K

Belgian Blue, Deep Red Cattle, MRY, Maine Anjou, Eastern
Belgium Red and White, Red Holstein, Black Holstein,
Flemish Red, Improved Red

Quality Control

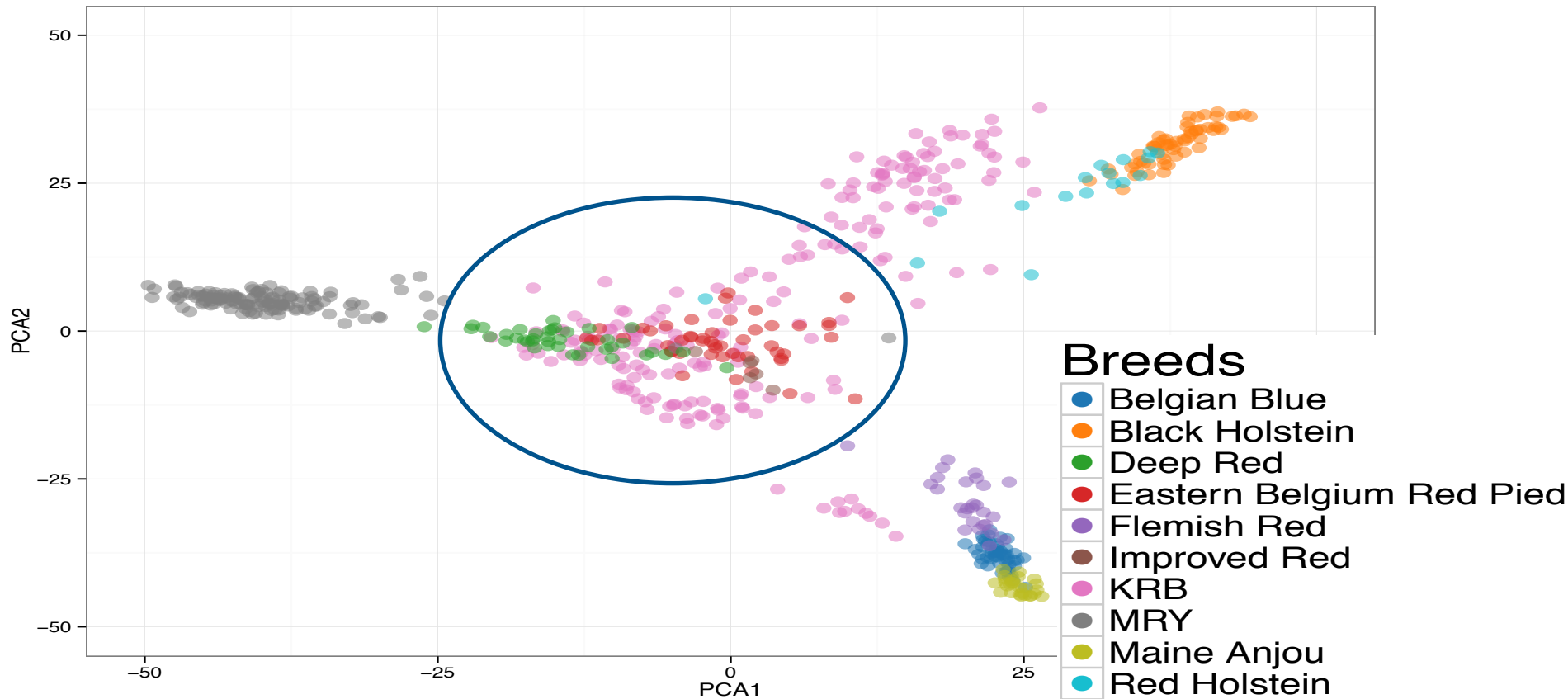
MAF 1%

SNP call rate 5%

Individual call rate 5%

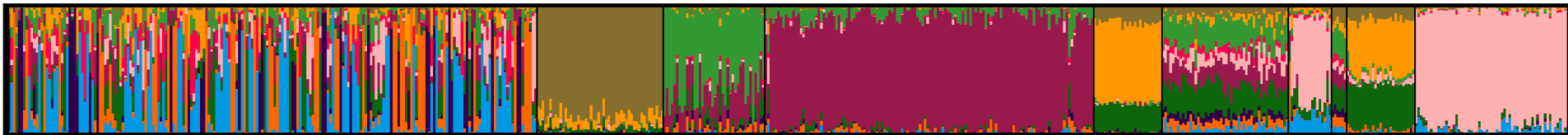
→ 616 individuals with 32 943 SNPs

Between breeds: PCA



Between breeds: STRUCTURE

Burn in: 10 000
MCMC rep: 30 000



KRB

BBB

DR

MRY

MA

EBRW

IR

RH FR

BH

KRB: Kempen Breed

BBB: Belgian Blue

DR: Deep Red (Brandrood)

MRY: Meuse-Rhin-Yssel

MA: Maine-Anjou

EBRW: Eastern Belgium Red and White

RH: Red Holstein

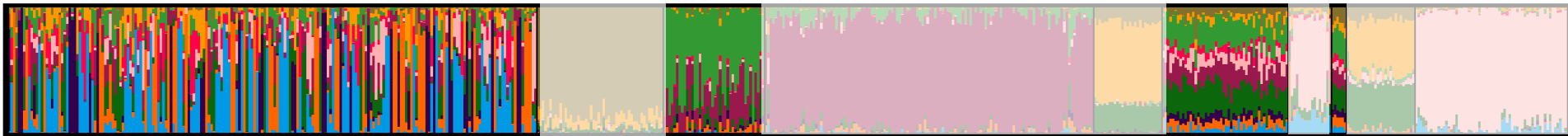
IR: Improved Red

FR: Flemish Red

BH/ Black Holstein

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BH/ Black Holstein

Between populations: Clustering

Clustering of these 3 populations using DAPC (R)

Breed	Cluster	Cluster 1	Cluster 2	Cluster 3
Deep Red Cattle Breed		40	0	0
Kempen Breed		84	77	46
Eastern Belgian Red Pied		50	0	0

Conclusion

Variable breed, low average inbreeding

However

- Low effective population size
- Limited amount of unrelated breeding bulls

The Kempen breed is similar to Eastern Belgium Red Pied, Deep Red and Improved Red

- Possible to exchange genetic material without losing its characteristics and maintain the breed in the future

We would like to thank
Gembloux Agro-Bio Tech

Wageningen UR

Gautier *et al.* (2009)

Vlaamse Overheid, Departement Landbouw en Visserij

