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Rationalization and characterization of gene bank collections: a case study

C. Danchin, IDELE, France

coralie.danchin@idele.fr

IMAGE
Innovative Management of Animal Genetic Resources

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Conservation programs in French rare goat breeds

- Most programs started in the nineties
- Goat species specificities
  - ✓ Breeds not historically documented / acknowledged
  - ✓ Wide variety of phenotypes in most breeds

⇒ *Ex situ* buck sampling based on:

  - Phenotypes
  - Birth place / bucks exchanges between farmers
  - Pedigree (nowadays)

Case study: rare French goat breeds

Breed	Number of females	Number of bucks / Cryobank	Number of genotypes (incl. AI bucks)
Hedge Goat	1 200	15	34 - 9
Lorraine Goat	930	8	27 - 6
Poitou	3 700	30	52 - 9
Provençale	1 760	7	64 - 7
Pyrenean	4 270	13	32 - 7
Rove	9 000	3	13 - 2

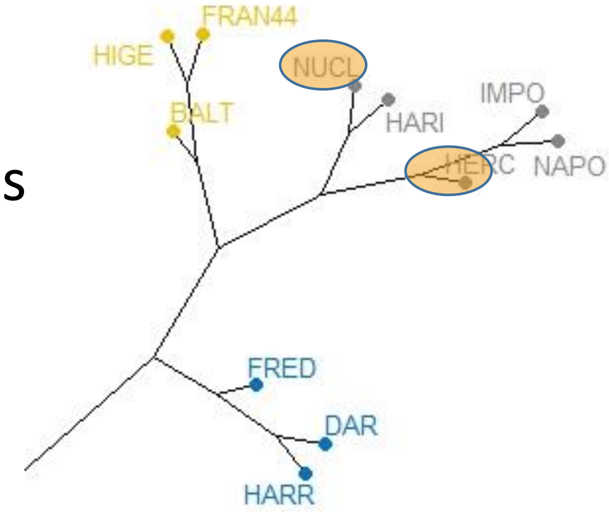
What farmers want to know

Real kinship level

Example:

Pedigree data => full sibs

SNP: half sibs?



What farmers want to know

Level of inbreeding *F*:

- **Founders animals (pedigree analysis: F= 0)**
- **Recent animals without pedigrees**

What farmers want to know

Animal	Molecular inbreeding	Pedigree inbreeding
H131 Sauze	0,150	11,0%
9028 Waroux	0,145	0 %
DALLIUS	0,123	0,5 %
9110 Sauze	0,120	11,0%
MARDI	0,114	1,2%
9009 Sauze	0,101	0 %
Luxembourg	0,093	3,7%
GROSOS	0,093	25,0%
GRELOT	0,083	6,4%
BOOSTER	0,083	0 %
ERMINIG	0,083	0,2%
CACAO_gamot	0,082	2,7%
8140	0,075	17,1%
JACOBIN	0,071	0 %

What farmers want to know

Genes introgression from other breeds?

Provençale “breed”

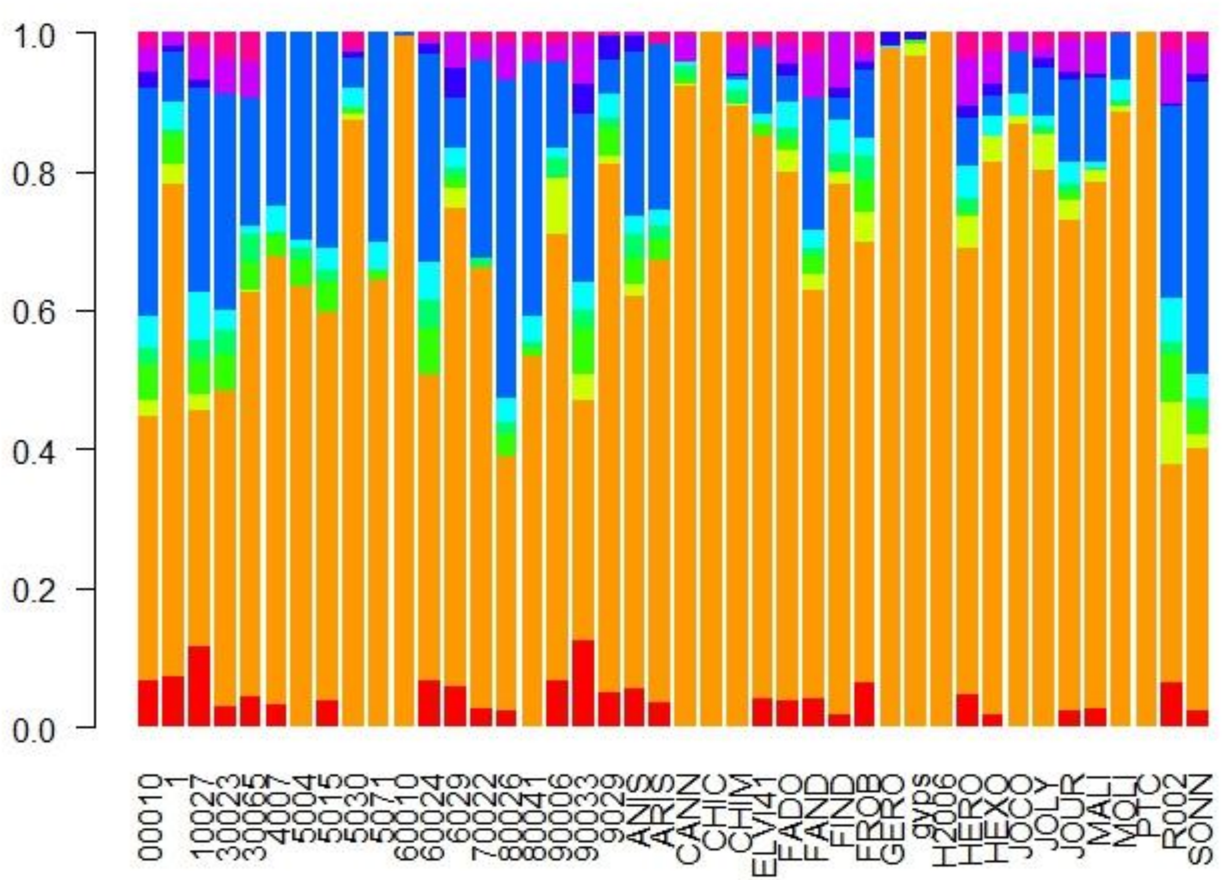
Breed ,

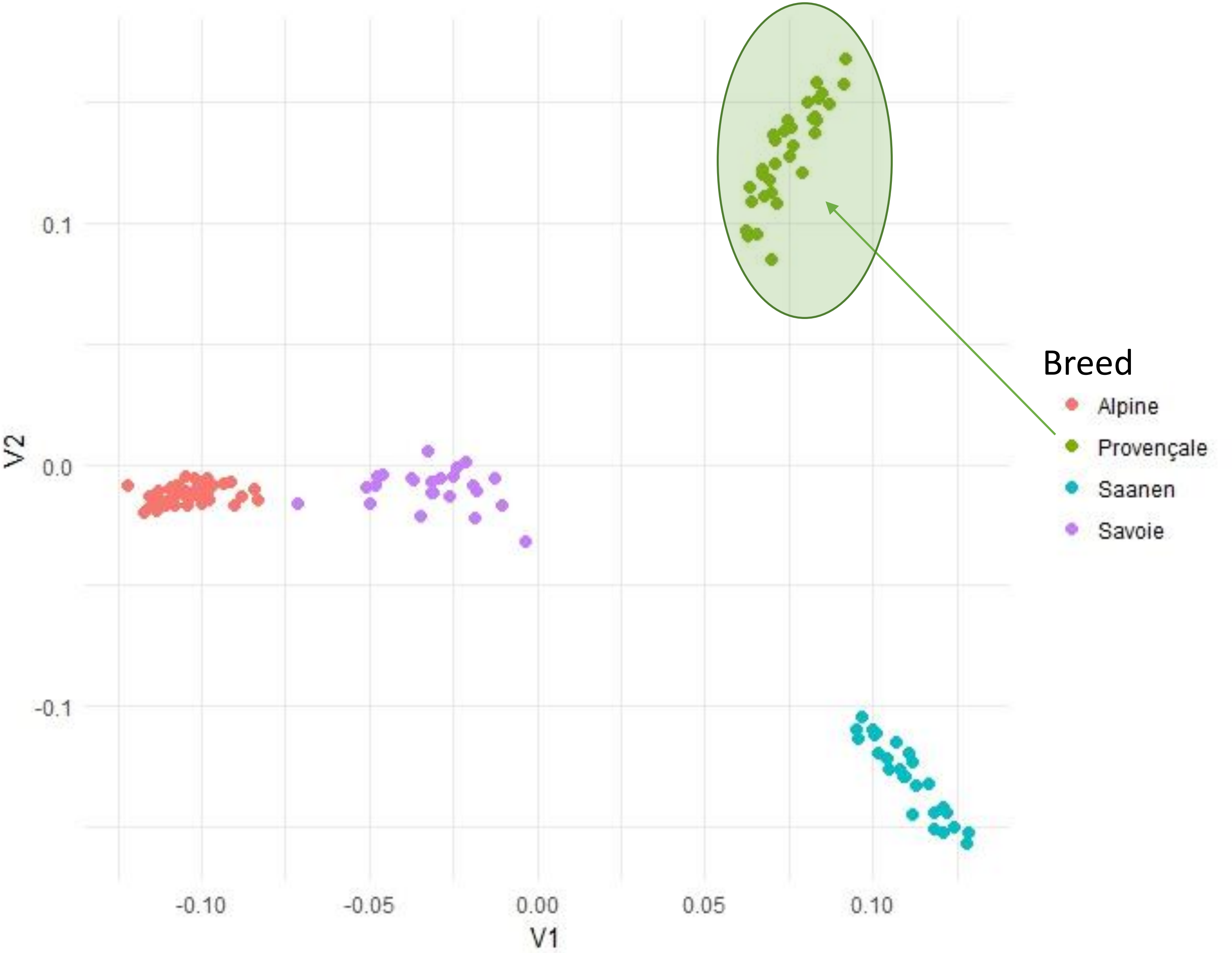
”

… Not so easy to answer…

Provençale “breed”

Admixture

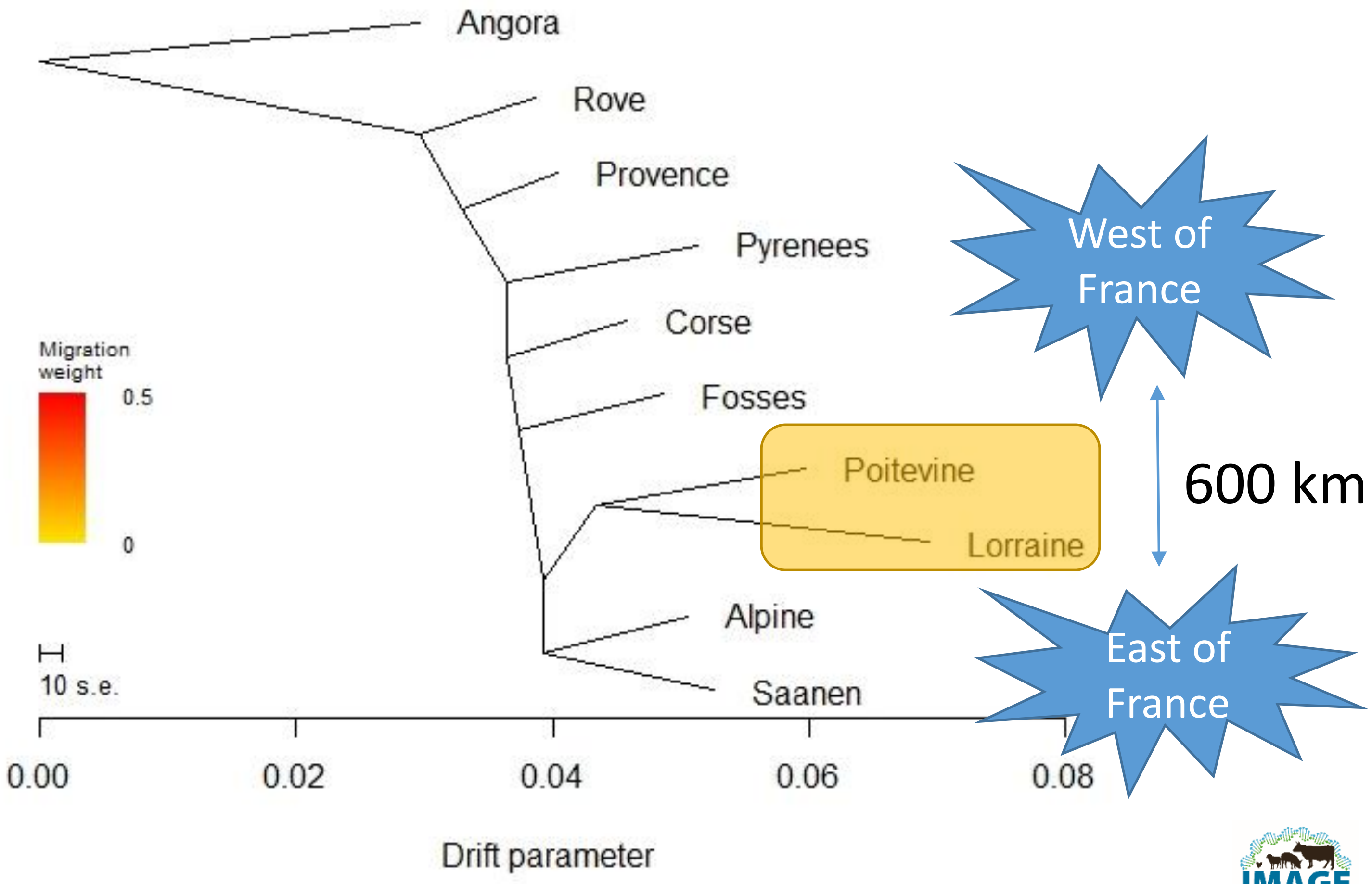



0.1
0.0
-0.1
V2
-0.10
-0.05
0.00
0.05
0.10
V1
Breed
● Alpine
● Provençale
● Saanen
● Savoie

What farmers want to know

How breeds are related ?

Treemix



West of France

600 km

East of France

SNP data analysis
From research to “everyday” use

- MAF, Genotype rate, HWF: rates ? Pruning ?
- ROH (inbreeding): which length ?
- Software well adapted to rare breeds (breeds size, recent bottlenecks)? Adaptation needed?

Sampling need to exclude animals with high:

✓ Kinship

✓ Inbreeding

+ Results can shift a great depending on the number of breeds / type of breeds included in the set

SNP data analysis
From research to everyday use

- Which indicators are:
  - the most relevant
  - most accurate and/or less sensitive to SNP bias ?
  - the easiest to vulgarize

Examples of indicators that are difficult to explain:

- Negative inbreeding and kinships
- Kinship and inbreeding vary with the number of samples
- Numerous kinship and inbreeding indicators, different values
- Comparison between pedigree kinship/inbreeding (%) and molecular ones

Thank you for your attention

Thanks to the breeders associations for their help

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