Allelic dropouts, null alleles or rare sex detection in clonal organisms: simulations and application to real data sets

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SERE Modou

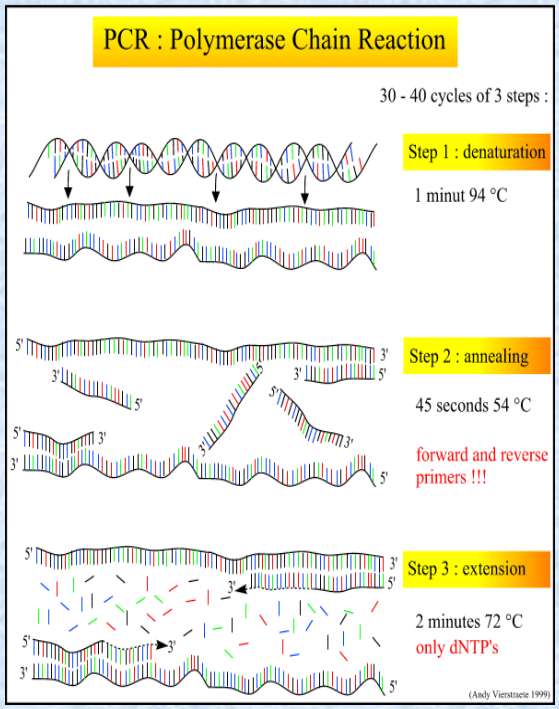
32ND MEETING OF INTERNATIONAL SCIENTIFIC COUNCIL FOR TRYPANOSOMIASIS RESEARCH AND CONTROL

Session 16

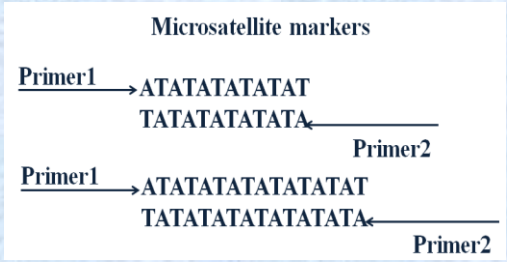
Introduction

Difficulty of direct observation for Pathogens and their vectors

improvement of DNA amplification techniques during the last few decades



spatio-temporal variability of molecular markers



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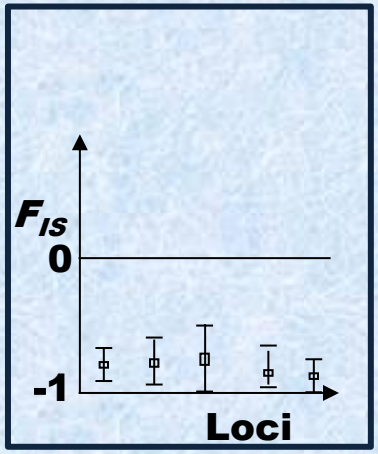
population genetics tools

Inferring of basic ecological Parameters such as: reproduction unit size, dispersal, spatial organization and mode of reproduction of the populations

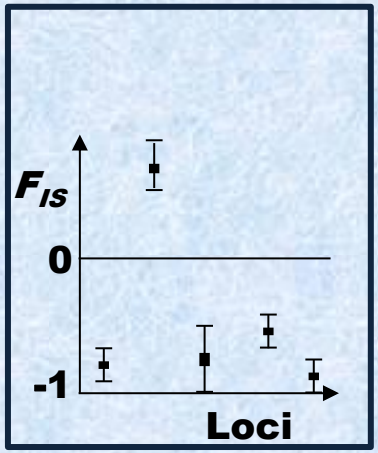
Introduction

F_{IS} : a measure of the deficit of heterozygote/panmixia, resulting from the reproductive system

For a clonal rate (*c*) of 100%
➔strongly negative F_{IS} values are expected (Balloux et al., 2003)



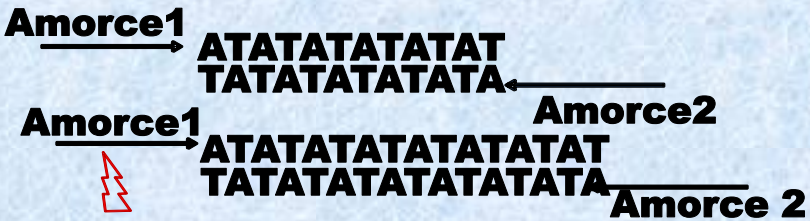
For 99.99≤ *c* ≤ 95
➔Large variance F_{IS} values are observed between loci

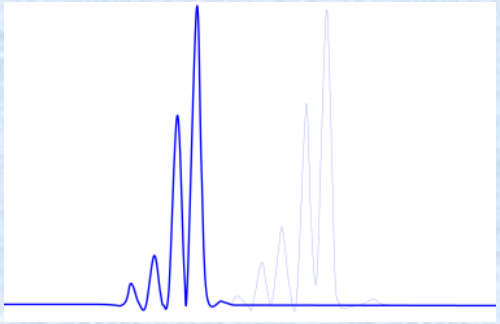


A useful criterion for detecting very low rates of recombination in clonal organisms

Allelic dropouts and null alleles

Genetic markers (microsatellite)





Methodology

❑**Genetic tools : H_S and F_{IS}**

H_S : Genetic diversity

$F_{IS\_obs/\ analysed\ data}$: Local heterozygote deficit

For purely clonal population

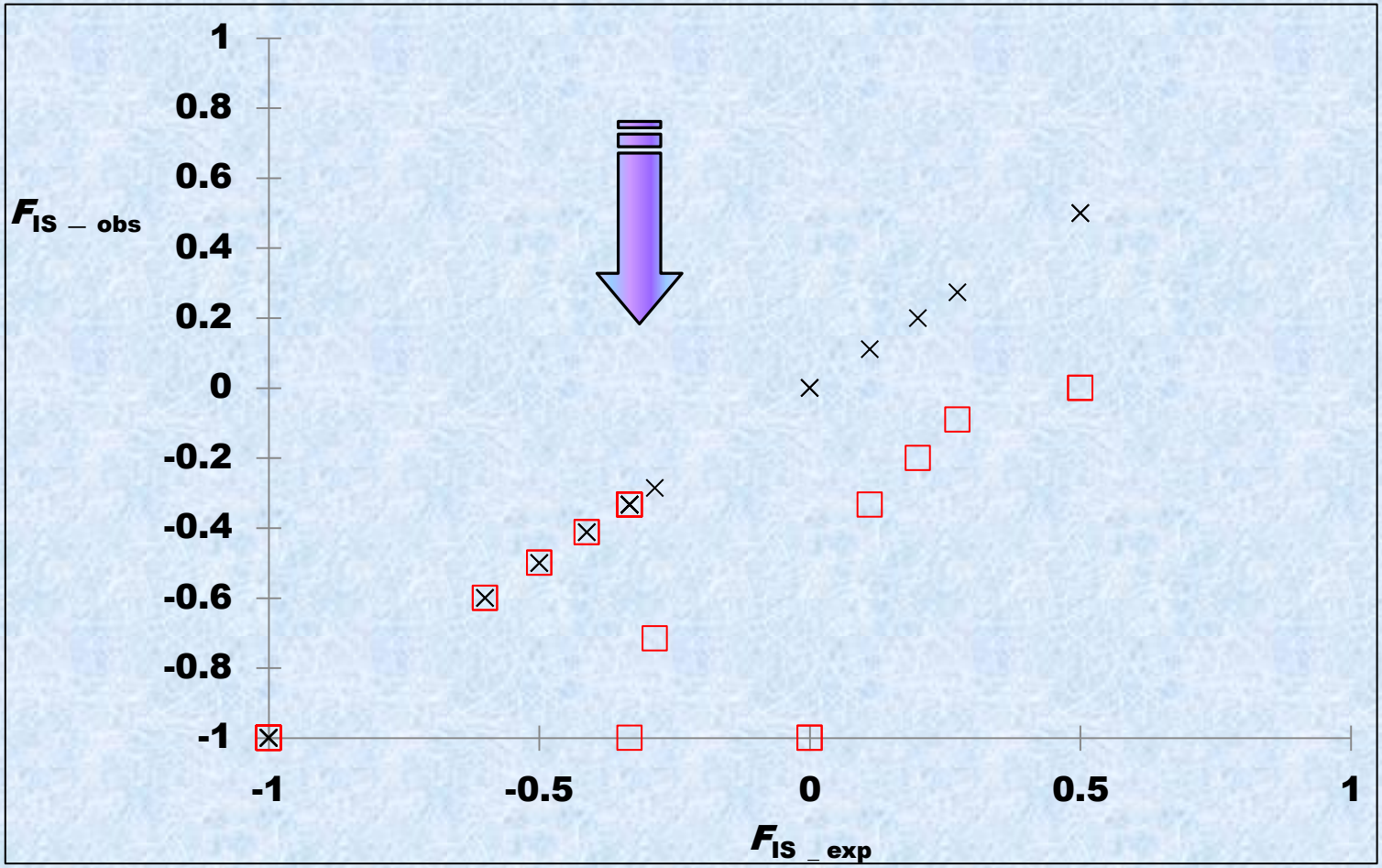
$$F_{IS} = \frac{H_S - 1}{H_S} = F_{IS\_exp/\ clonal.reproduction}$$

$\Delta F_{IS} = F_{IS\_exp} - F_{IS\_obs}$

$|\Delta F_{IS}| \leq 0.05 \times |F_{IS\_exp}|$ = Superimposition des F_{IS}

Methodology

❑Criterion for allelic dropouts, null alleles and rare sex detection



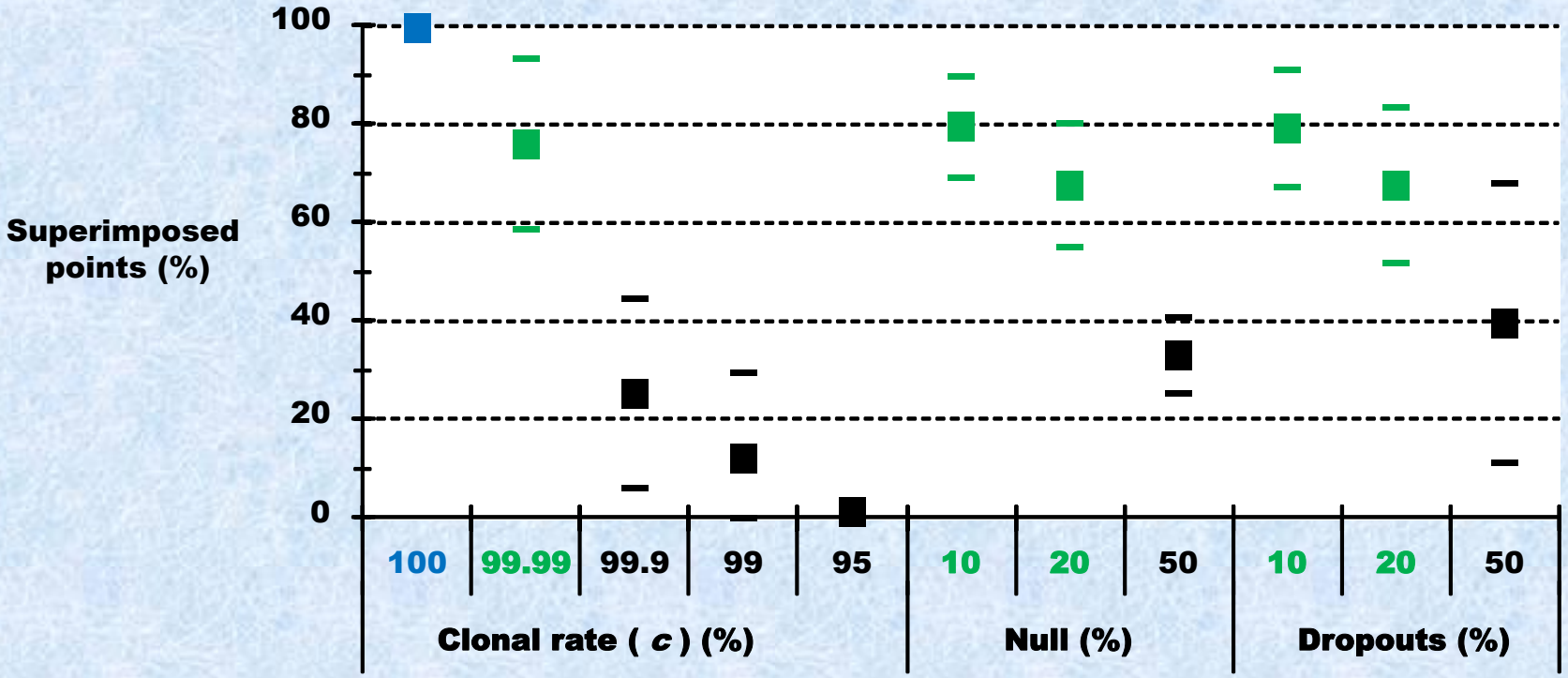
Proportion of superimposed points (%) => Criterion

Methodology

- **Simulations**
  - **Different models of populations**
  - **Variable proportions of allelic dropouts, null alleles and rare sex**
- **Reinterpretation of real datasets**
  - ***T. brucei gambiense*s of Guinean foci (Kaboré *et al*. 2011)**
  - ***T. evansi* from Sudan (Salim *et al*., 2011)**

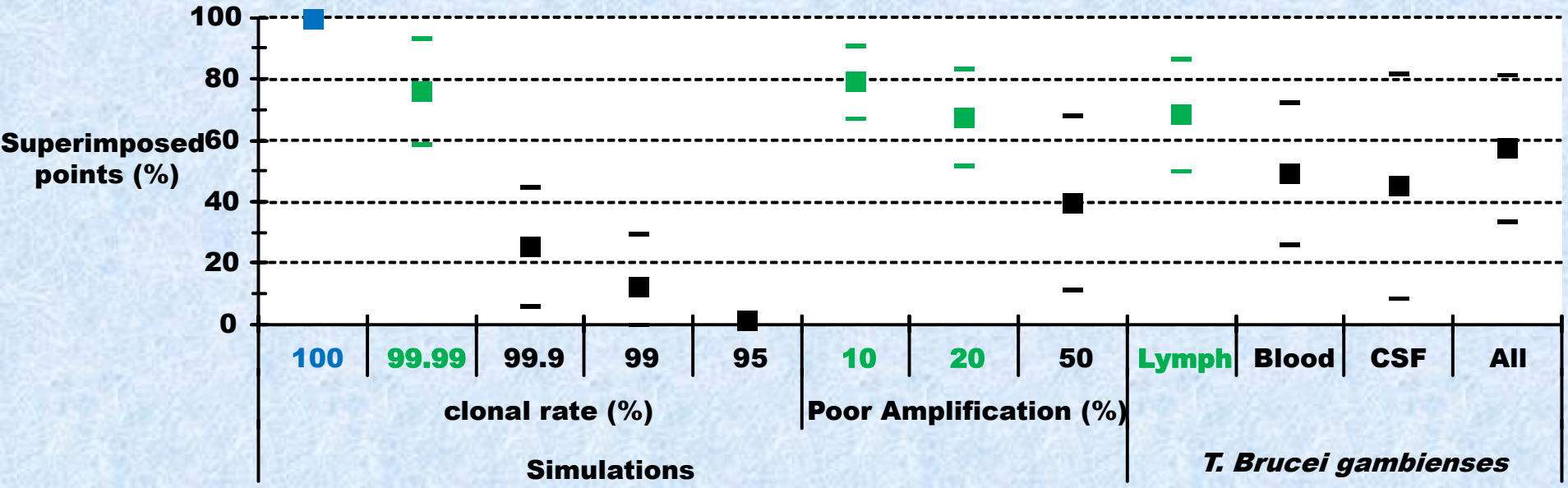
Results

Comparison of allelic dropouts, null allele and rare sex effects



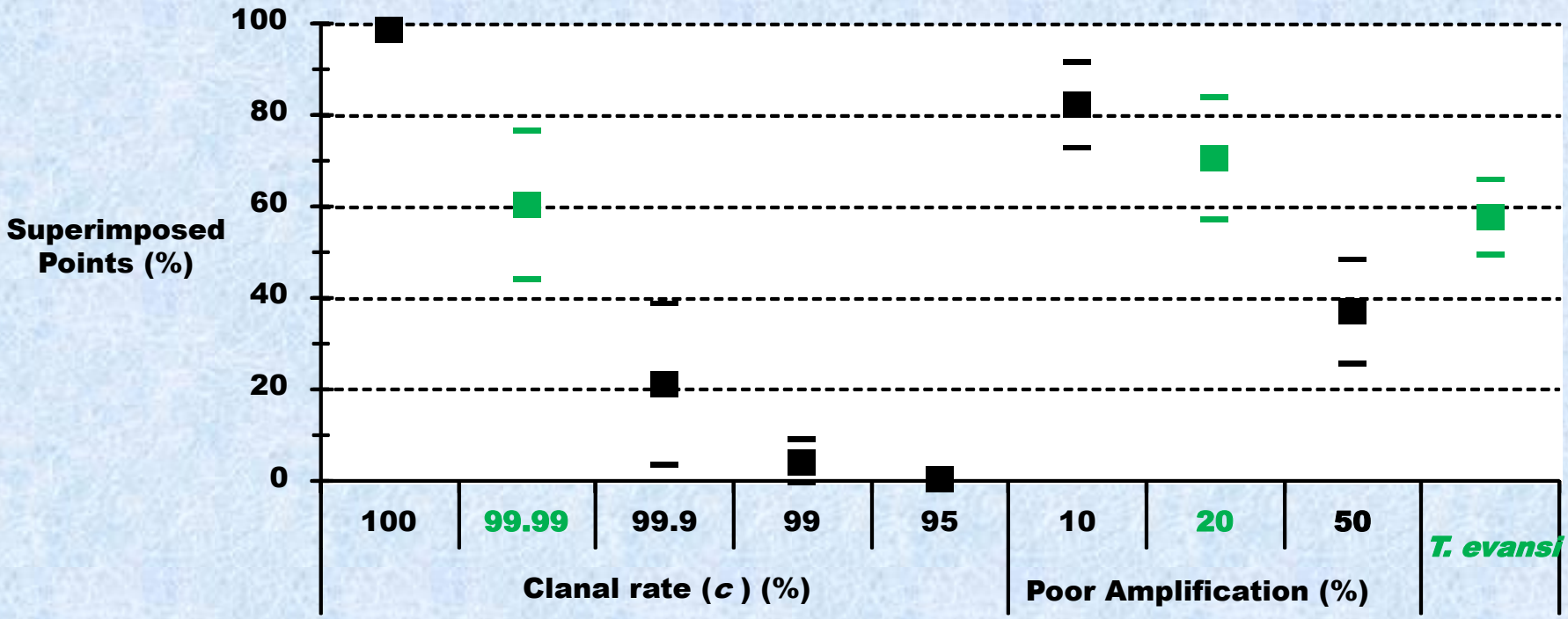
Results

Reinterpretation: *T. brucei gambienses* of Guinean foci (Kaboré *et al.* 2011)



Results

Reinterpretation: *T. evansi* from Sudan (Salim *et al.*, 2011)



Conclusion

✓**The method based on the relationship between H_S and F_{IS} under the hypothesis of clonal reproduction is useful**

✓**It is valid for less than 50% of poorly amplified alleles**

✓ **It is not a palliative but represent a useful decision criterion for regenotyping problematic data**

شکرا

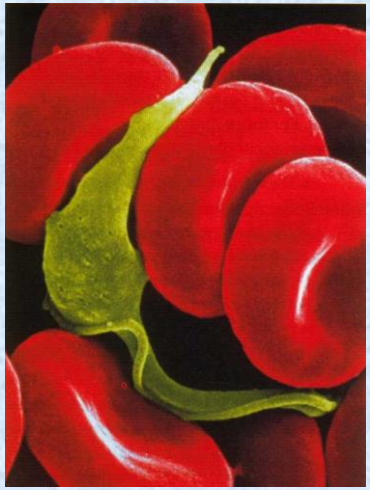
Thank you

Merci

For your

Grazie

Attention



Gracias