Estimation of inbreeding coefficient and generation interval in Pag Sheep

baseline for development of optimum contribution selection

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15.02.2023. | Dubrovnik | Croatia

Pag sheep

- Croatian Autochthonous breed
- Population size ~ 30,000
- DAIRY orientated breed
- Wool – historical imortance
- HARSH environment
  (“BURA” > 200 km/h)
- Forage enriched with sea salt
- Exotic Aromatic plants

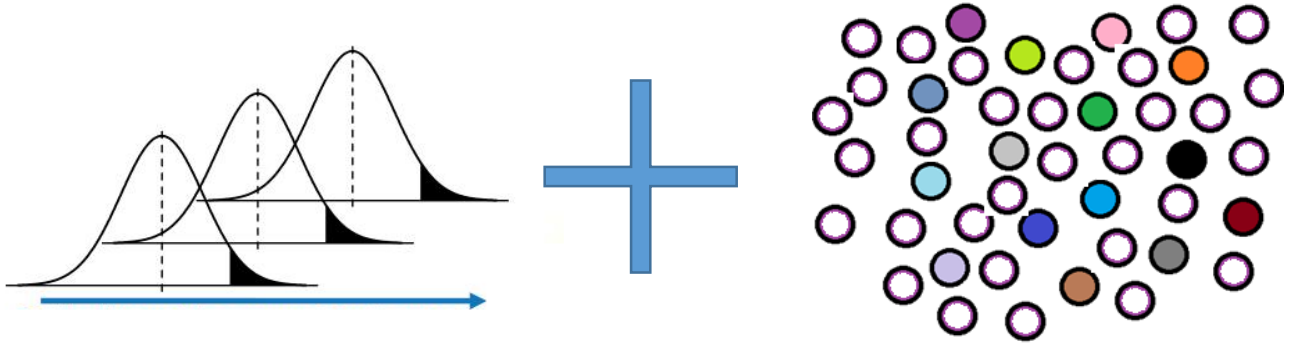
Pag sheep

- Modest milk yield ~ 0.8 Kg/day
  (120 kg in 5 months of milking)

- OUTSTANDING profitability
  fresh milk (~2 €/L) – no surpluses
  cheese (30-40 €/kg)
  curd cheese (8 €/kg)
  fresh meat (~12 €/kg)

Pag sheep

- Long term goal → to increase milk yield
- Selection ~ 4,500 sheep
- Pedigree records + Milk control (ICAR)
- Pedigree BLUP → Single step GBLUP
- OCS – optimum contribution selection



Aim of the study

1) Coefficient of inbreeding (F_{ped}) → the probability that two alleles at any locus are 'identical by descent'

- important for posing restrictions in mating plans in OCS

2) Generation interval → The weighted average age of parents when their offspring are born

- important for response to selection → $\Delta G_{year} = (h^2 * SD) / GI$

RELATIONSHIP BETWEEN GI and SD

$\Delta G_{year} = (h^2 * SD) / GI$

People CAN make an impact on SD and GI, but Can we SIMULTENEOUSLY increase SD and decrease GI to provide faster genetic gain??

Materials and methods – pedigree QC

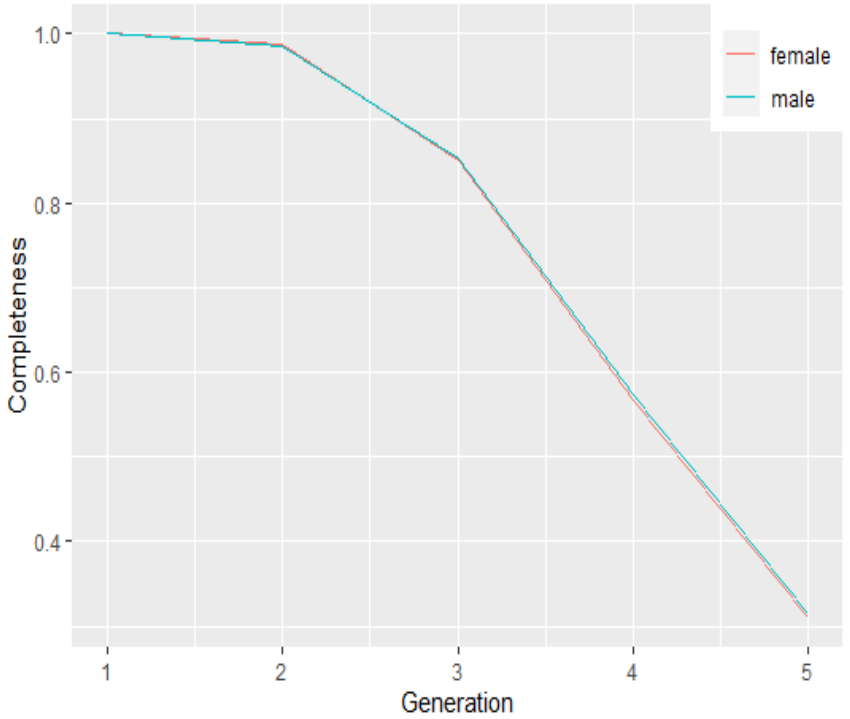
- Data → CMA & HAPIH
- Pedigree → n=281760 animals born from 1981 to 2019

- OptiSel package in R software (Wellmann, 2021.)

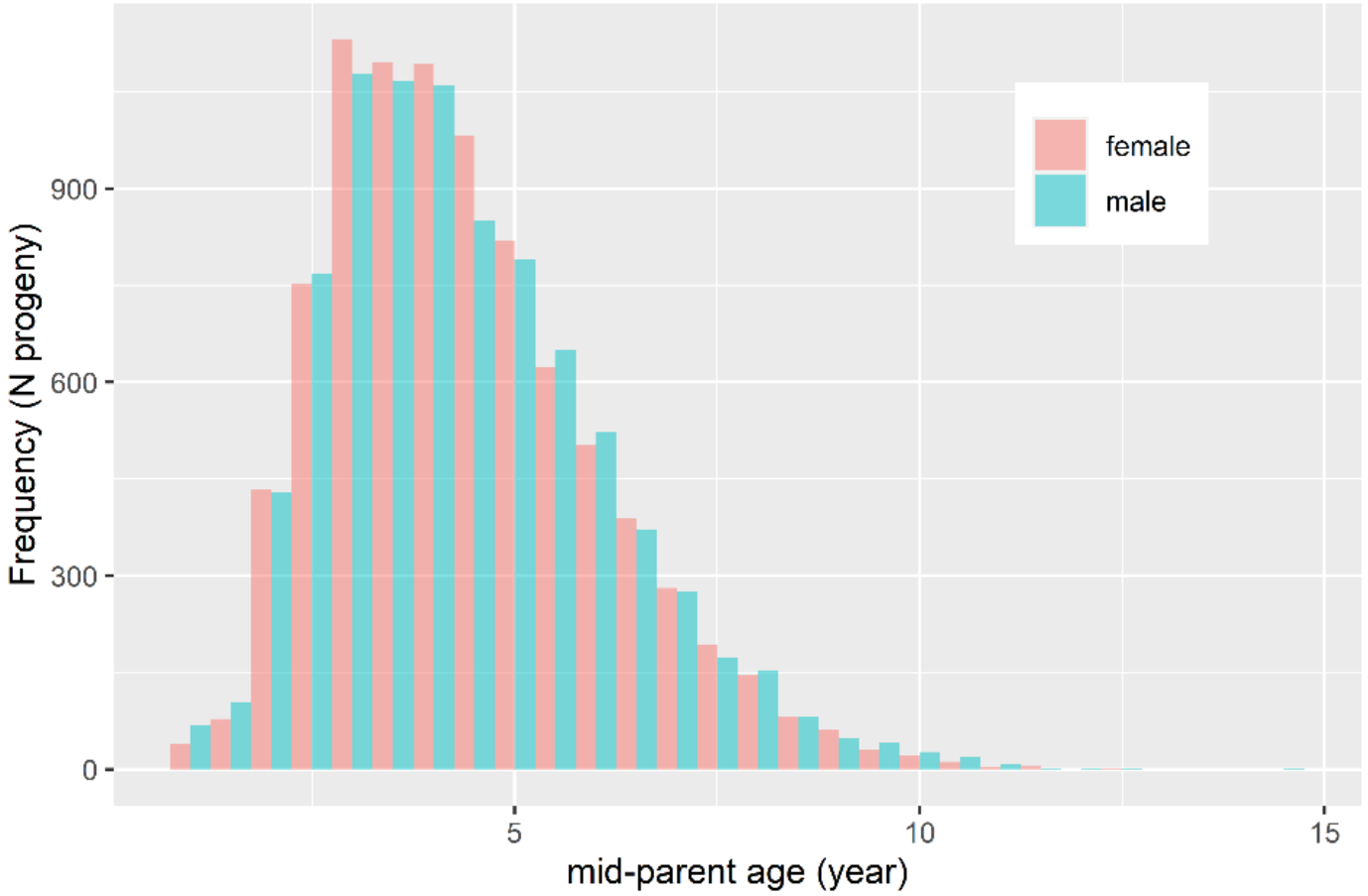
- Pedigree QC→ **NEG, NFG, NMG, PCI**
- **Reference population for (N_e)** → *NFG*≥3 & born after 2010

Results – pedigree QC

	NEG	NFG	NMG	PCI
min	3.00	1.00	3.00	0.32
max	6.43	5.00	11.00	1.00
average	3.96	2.48	6.9	0.73



Results – generation interval



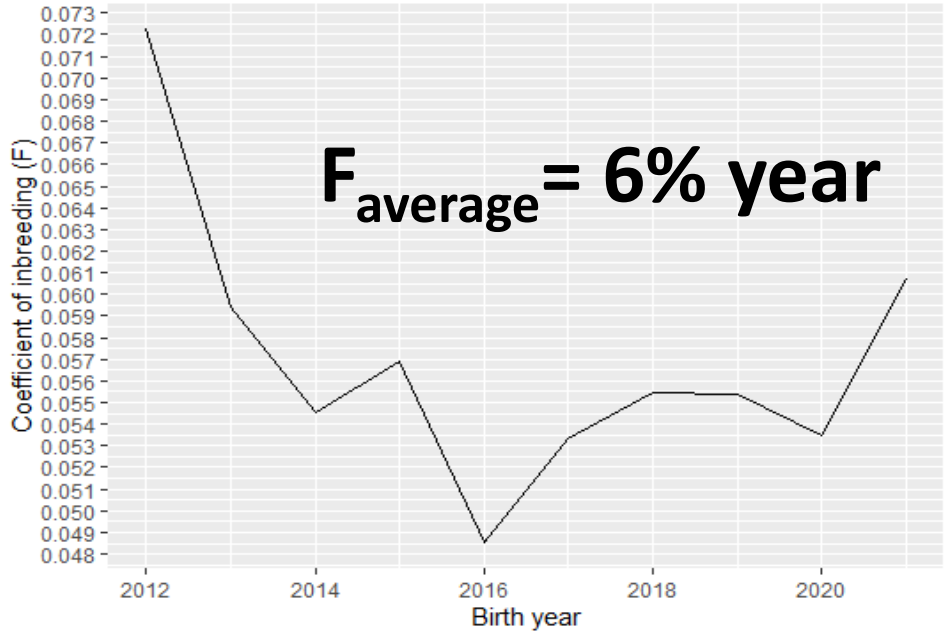
$GI_{average}$=4.44 year

- GI in line with reports for Spanish and French **dairy** sheep breeds
- GI notably above reports for sheep **meat** breeds worldwide
- **Low culling rate** –> potential for higher selection intensity

Results – coefficient of inbreeding

Class of F_{PED}	Frequency	Percent (%)
0.0000-0.0875	12323	76.43
0.0875-0.1750	2760	17.12
0.1750-0.2625	682	4.23
0.2625-0.3500	339	2.10
0.3500-0.4375	19	0.12
Total	16123	100

Distribution of the coefficient of inbreeding (F_{PED})



Trend of inbreeding in the reference population

Discussion

- F_{PED} did not exceed the 6.25% → acceptable for small populations undergoing selection

- PRELIMINARY RESULTS:
  → inbreeding depression for birth weight
  → no inbreeding depression on dairy traits (milk yield & %MF and %MP)
  → F_{ROH}~ 3% (high correlations with F_{PED})

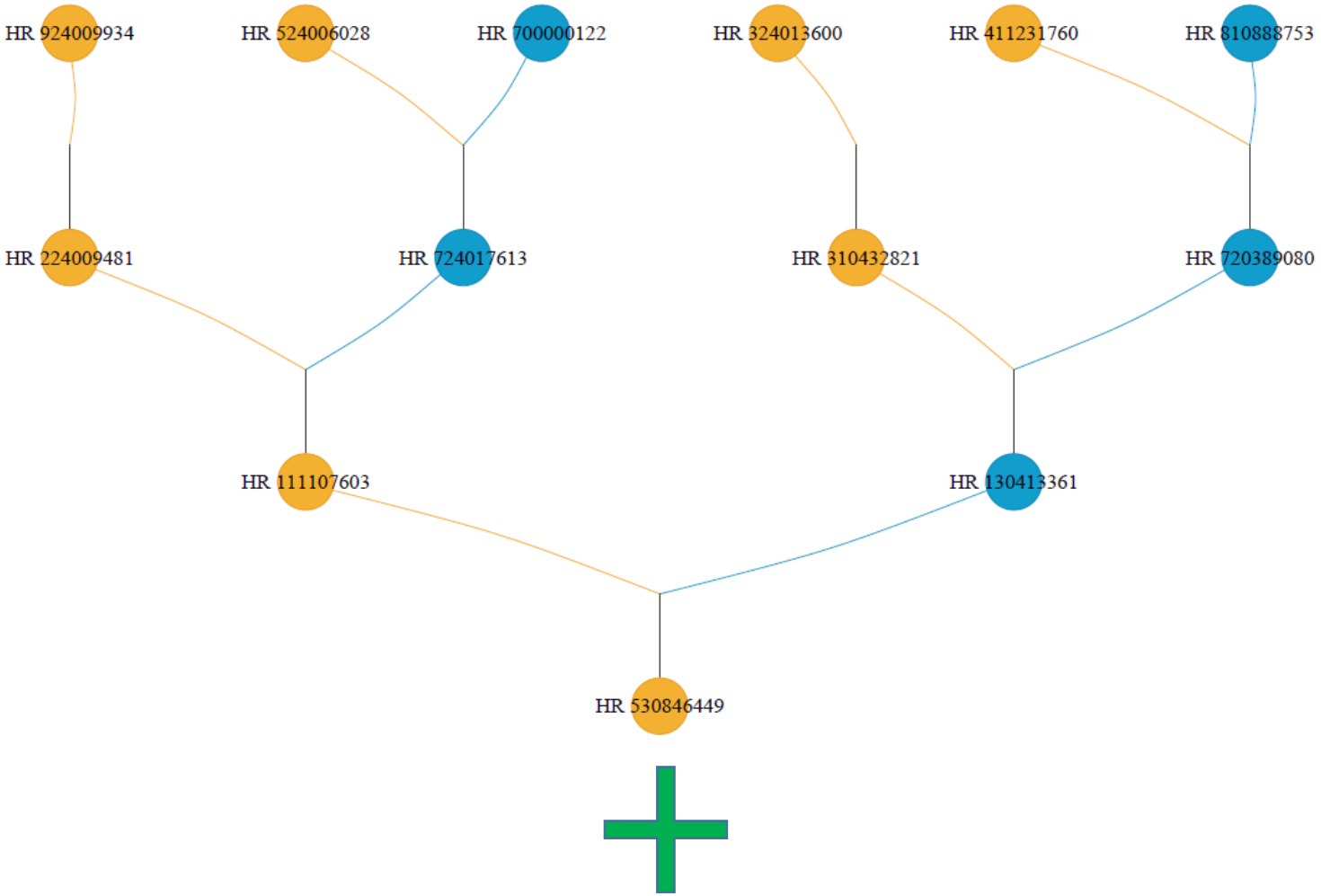
Conclusion

The results represent baseline to develop:

- optimal relationsihp between GI and SD → maximal response to selection
- solutions to provide selection progrees with minimum loss of genetic variation by following the OCS

Further research under framework of **genomics** will provide more evidence to support above goals

Conclusion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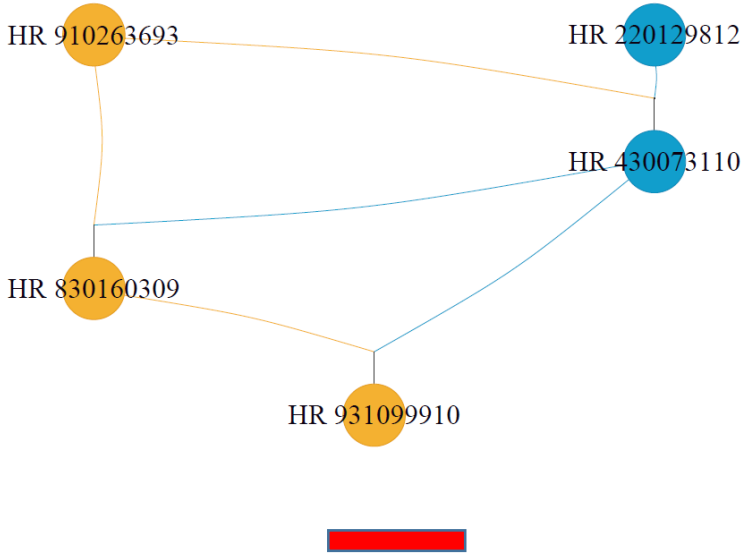
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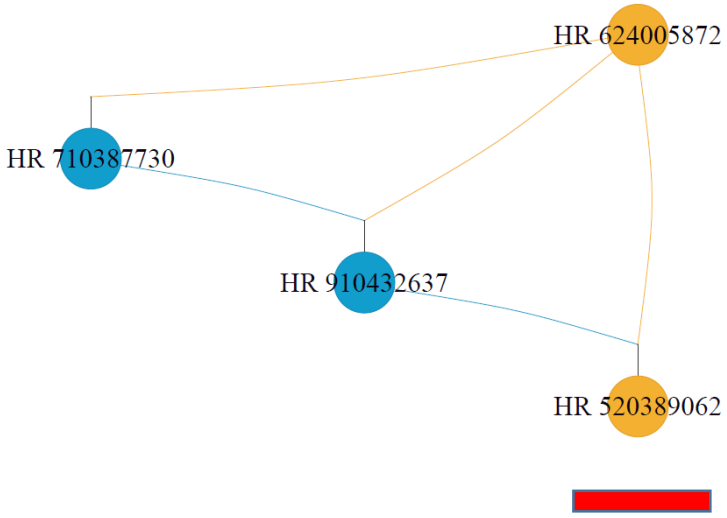
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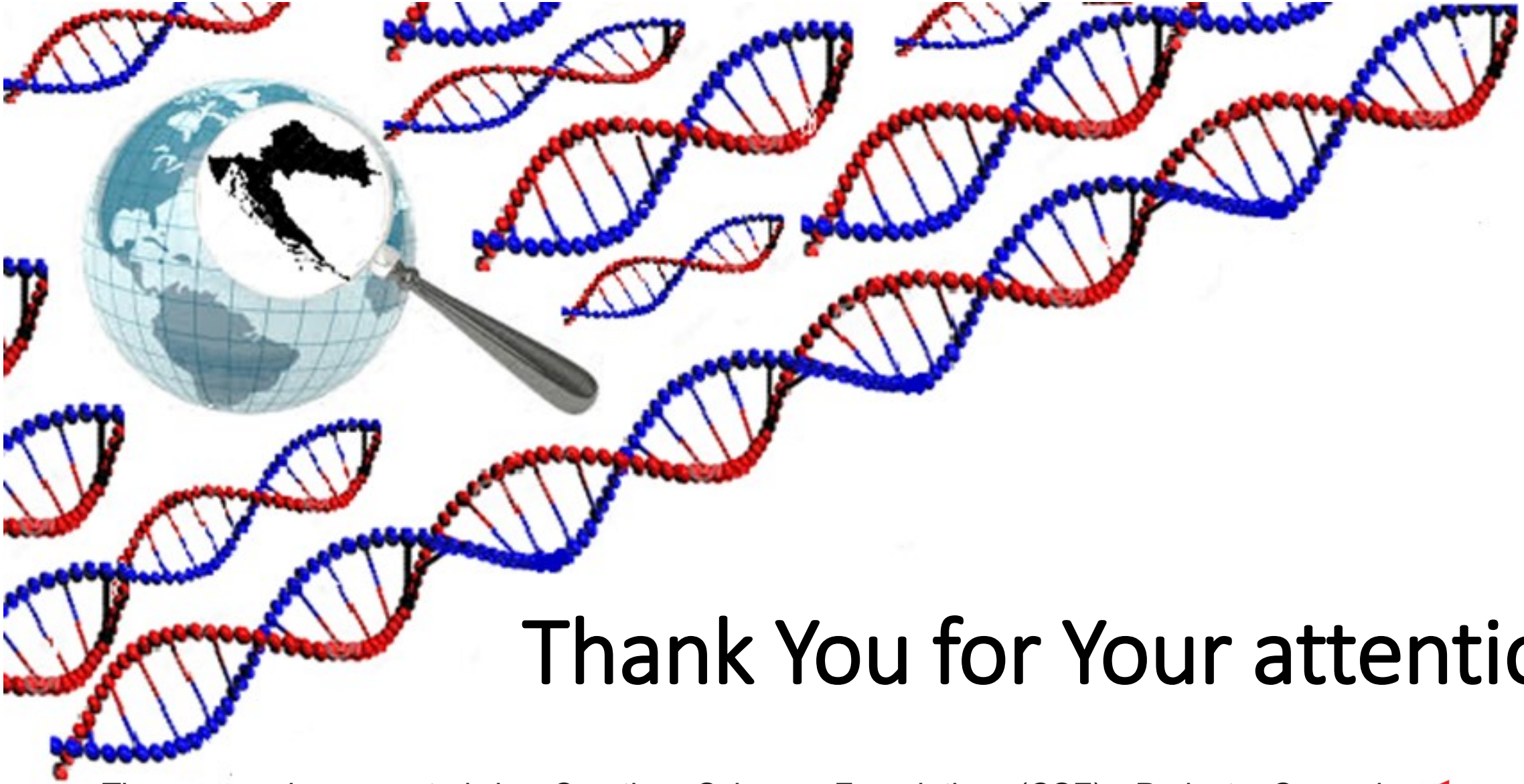

Thank You for Your attention

The research supported by Croatian Science Foundation (CSF). Project: *Genomic characterization, preservation, and optimum contribution selection of Croatian dairy sheep (OPTI-SHEEP). IP-2019-04-3559*

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Croatian Science Foundation