



BIOINFORMATICS APPROACHES IN ANIMAL BREEDING

Zagreb, July 9-11 2025

University of Zagreb Faculty of Agriculture

BIOINFORMATICS APPROACHES IN ANIMAL BREEDING

About us

Summer school is organised by the University of Zagreb and the University of Ljubljana.



University of Zagreb

University of Zagreb

- Dubravko Škorput
- Ino Čurik
- Vladimir Brajković
- Mario Shihabi

University of Ljubljana



University of Ljubljana

- Minja Zorc
- Peter Dovč
- Tamara Ferme
- Anja Tanšek
- Mateja Dolinar
- Jelena Kotiščak

BASIC INFO

- Summer school is organised by the University of Zagreb and the University of Ljubljana
- Bs and Ms students are granted 1 ECTS point
- 9-11 July
- [Programme](#)



GENETIC DIVERSITY IN LIVESTOCK

Dubravko Škorput, PhD

University of Zagreb Faculty of Agriculture
Division of Animal Science



FOOD SUPPLY CHAIN

- Several high output breeds in every species
- In this process many breeds are set aside
- Extinction or conservation
- Cosmopolitan breeds: intensive selection
- Consequence: reduction of genetic variability!
- Awareness of genetic resources



BREEDS AND LINES...

- Intensification of livestock systems
- High input high output systems: few breeds and lines
- Pigs and poultry: limited number of multinational companies
- What are the challenges?



Topigs Norsvin



CHALLENGES FOR BREED SURVIVAL

- Ecosystem
- Country policies (exmaple?)
- Deseases
- Market
- Climate changes
- ...?



CATTLE

- Decreased effective population size due to intensive selection and semen exchange from small number of bulls
- Opportunity: organic farming
- Multipurpose breeds



PIG

- Europe, North America, Australia: Multinational genetic companies are dominant
- Asia, Africa: local breeds
- Conservation programmes: TREASURE project
- Geronimo project



<https://www.geronimo-h2020.eu/>

SHEEP AND GOATS

- North America, Australia, Western Europe – intensive breeding
- Wool – lower price – threatened breeds
- Small scale breeding: Asia, Africa, Southern and Eastern Europe
- Meat and mil production – drivers for breed sustainability



HORSES

- Sports and hobbies as main drivers
- „Heavy” breeds are threatened breeds
- Horse meat?
- Cultural and national heritage



CHICKEN

- Most specialised and industrialised compared to all livestock species
- Highly specific layers and broilers for a few breeding companies
- Small scale breeding
- Avian flu?



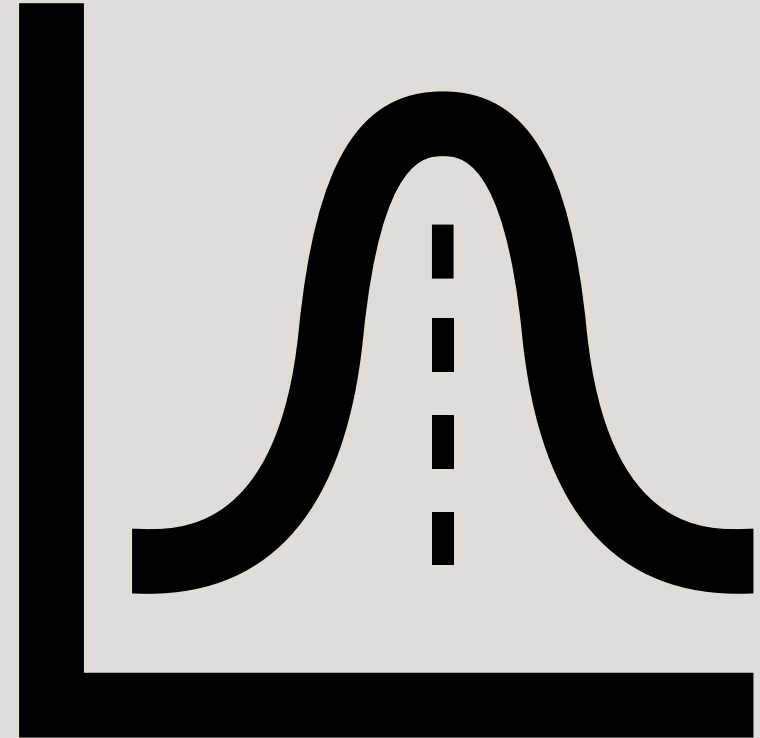
GENETIC DIVERSITY

- Threat of genetic erosion is most severe in pigs, while not much expressed in sheep and goats
- Diversity between or within breeds
- What are main forces that keep breeds alive?
- **Conservation to utilisation**
- Many studies deal with genetic diversity parameters...but after?



WHAT IS GENETIC DIVERSITY?

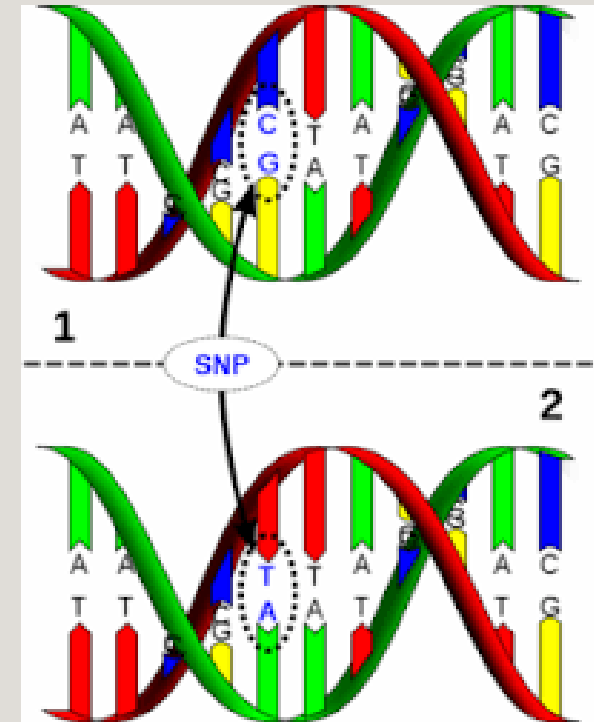
- Observation of different forms and function between/within species
- Qualitative and quantitative differences between individuals
- Differences are result of four main evolutionary forces: genetic drift, migration, selection, and mutation
- Main statistical concept: **VARIANCE**



HOW DO WE MEASURE GENETIC DIVERSITY?

- Source of information:
- Pedigree: low cost, but highly dependent on depth and quality
- Works fine only when assumptions are fulfilled
- DNA Markers (STR, RFLP, SNP...)

Inbreeding coefficient
Inbreeding rate
Effective population size



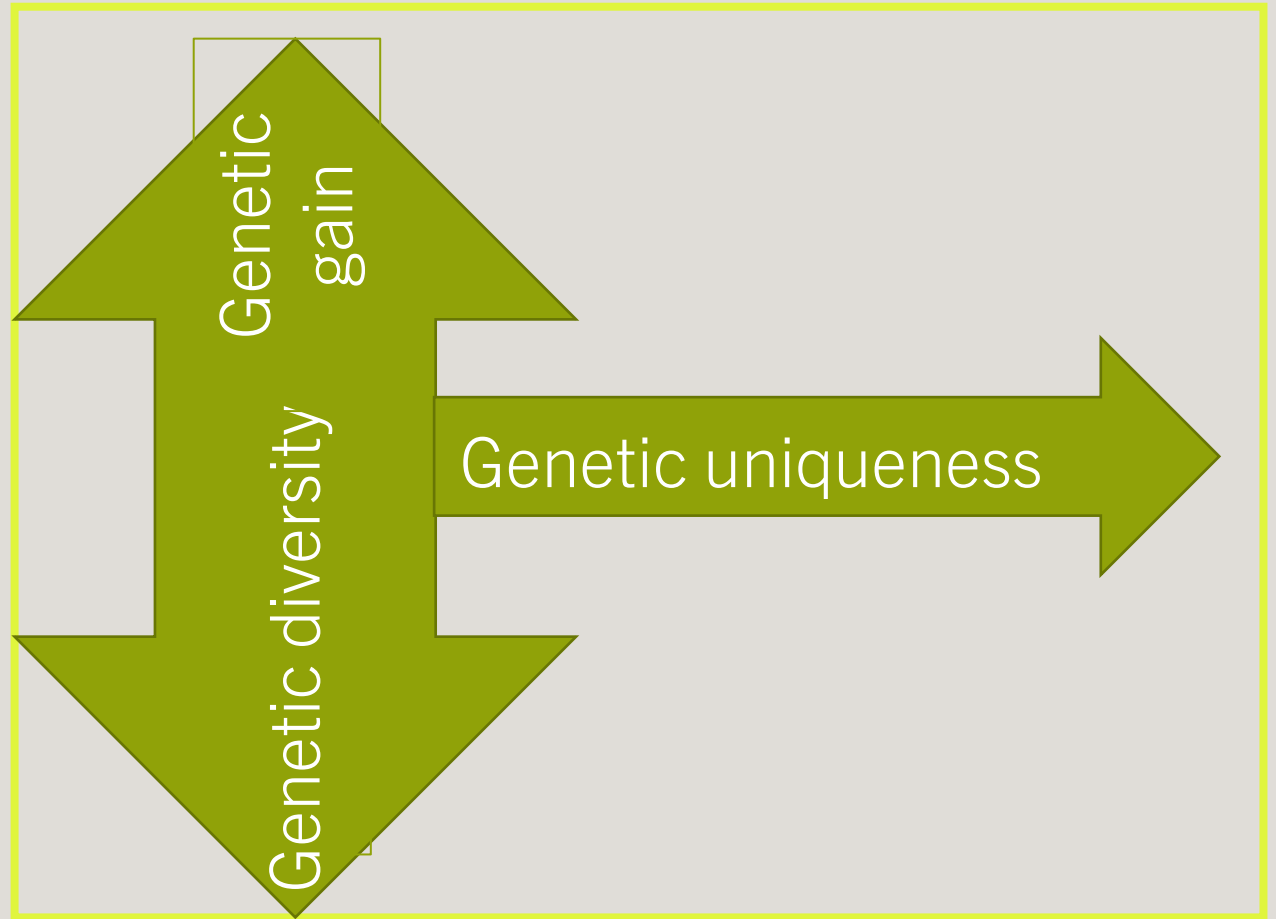
REDUCED GENETIC DIVERSITY

- Consequences of reduced genetic diversity:
- INBREEDING DEPRESSION – decline in fitness traits due to increased homozygosity
- Example: litter size in pigs



POPULATION MANAGEMENT

- What can we do?
- Matings plans
- Introgression?
- Optimal contribution selection



GOOD LUCK!