

# Exploring pedigrees: an overall picture of small Italian ruminant biodiversity

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## INTRODUCTION

- To avoid the reduction of biodiversity and genetic erosion, local breed conservation continues to be a relevant topic of rural development policy. Optimal breed management requires careful control of the inbreeding level within a breed together with the availability of accurate demographic information.
- The calculation of the main demographic and genetic parameters allows us to better estimate the short- and long-term breed risk status, as well as to determine the best management practices for breeds with unreliable data that require particular attention.

## AIM

- The Italian sheep and goat breeders association (ASSO.NA.PA) monitored all goats and sheep breeds in a national project entitled "Conservation, Health and Efficiency Empowerment of Small Ruminant" (CHEESR-PSRN 2014-2020).
- We described the panorama of pedigree information for Italian sheep and goat breeds.

## MATERIAL AND METHODS

- We analyzed **81 pedigrees** (35 for goats and 46 for sheep). Using optiSel R package we calculated the **pedigree depth** (full and maximum generation traced) and **completeness**, and the **effective size (Ne)** applying Wright's formula (Figure 2).
- Furthermore, for the 10 case-study breeds, we **estimated the longevity and the percentage of animals eliminated from pedigree during their first 3 years of life** (for the triennium 2007-2009).

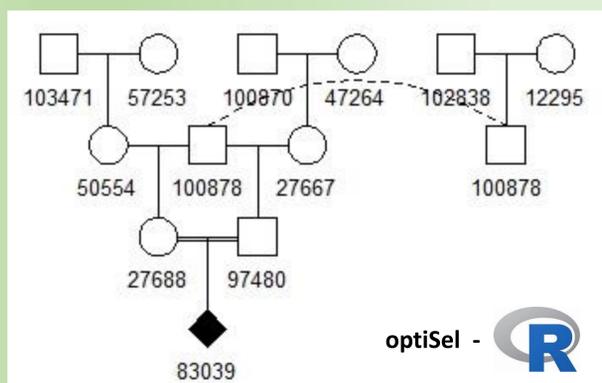


Figure 2. A pedigree example with optiSel (Rpackage)



Figure 1. Some Italian breeds (\*Merinizzata, \*Sarda, and \*Sopravissana sheep and \*Camosciata delle Alpi, \*Vallesana, \*Garganica, and \*\*Nicastrese goats)

## RESULTS AND DISCUSSION

The analyses showed:

- The median pedigree **depth**, **completeness**, and **Ne** were higher in sheep than in goats (Table A).
- The mean **longevity** was similar, with a marked difference (equal to 3 years) between more and less selected goat breeds (Table B).

	GOATS MEDIAN (IQR)	SHEEP MEDIAN (IQR)
Full Generation traced	2 generations	3 generations
Maximum generation traced	5 generations	7 generations
First complete generation (% of total breeds analysed)	14 (5 - 28)	34 (19 - 47)
Effective Size (Ne)	176 (74 - 547)	234 (128 - 774)

Table A. Summary statistics of depth, completeness, and effective size of the 81 pedigrees analysed

	GOATS MEAN ± SD (RANGE)	SHEEP MEAN ± SD (RANGE)
Longevity (years)	5.6 ± 1.8 (3.9 - 7.5)	5.5 ± 1.1 (4.3 - 7.6)
Animals eliminated with < 3 years of age (%)	16 ± 22 (1 - 41)	25 ± 11 (5 - 40)

Table B. Summary statistics of longevity for the 10 case - study breeds analysed

**Figure 3** shows the percentage of breeds grouped by maximum number of full generation. **Figure 4** illustrates the percentage of breeds grouped by class of complete first generation.

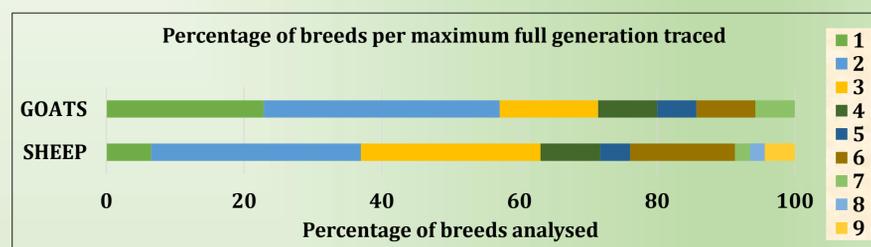


Figure 3. Percentage of breed per class of full generation traced

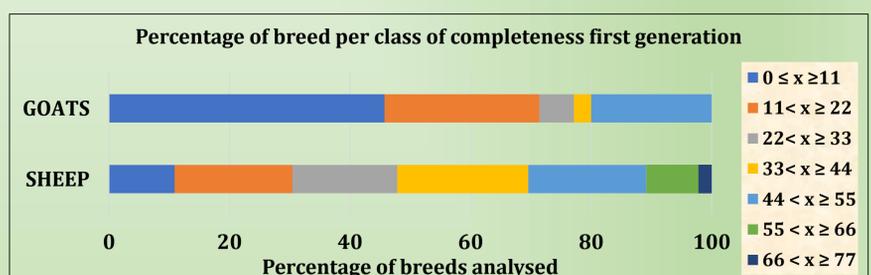


Figure 4. Percentage of breed per class of completeness first generation

## CONCLUSIONS

- ✓ The Italian panorama is very variable and the pedigree analyses depict very different situations.
- ✓ Ovine populations are characterised by greater effective size, pedigree depth, and completeness than caprine populations.
- ✓ **When information is lacking, pedigree analyses can be corroborated by genomics to improve good practice in breed management.**

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