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# SOCIOECONOMIC AND PEDIGREE FACTORS AFFECTING THE *ASININA DE MIRANDA* DONKEY BREED VIABILITY

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# INTRODUCTION

## Donkeys in Europe

- Marked decrease of donkey populations with agriculture mechanization→ *Asinina de Miranda*
- Lack of  studies on donkey breeds demography

# STUDY GOALS

Analyze the pedigree and herd records of the *Asinina de Miranda* donkey breed

Identify genealogical and socioeconomic factors that may affect the breed genetic diversity in the future

Predict the progression of the breed under current management and identify determinants for survival, by means of a population viability analysis (PVA) program

Suggest new management strategies for breed survival, if seen as deemed

# MATERIAL AND METHODS

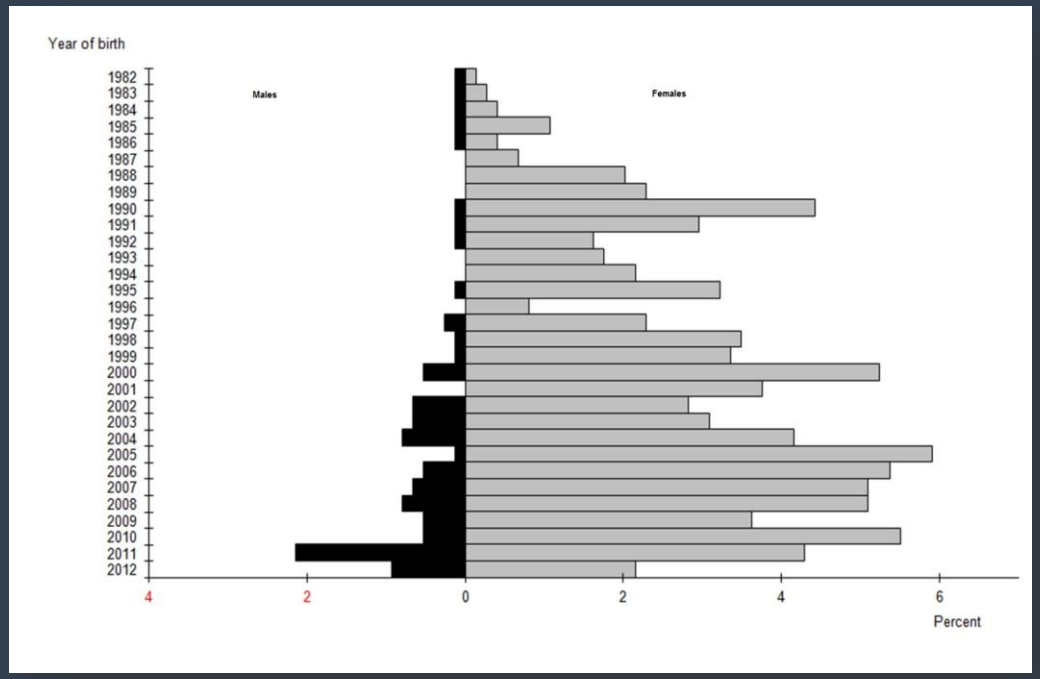
- Data for calculations was retrieved from the *Asinina de Miranda* breed Studbook, from 2002 to 2012
- Complemented with a survey to the owners
- Population Viability Analysis was done Vortex 9.99c
- Pedigree analysis was done with ENDOG v4.8

## Demographic analysis

# RESULTS AND DISCUSSION

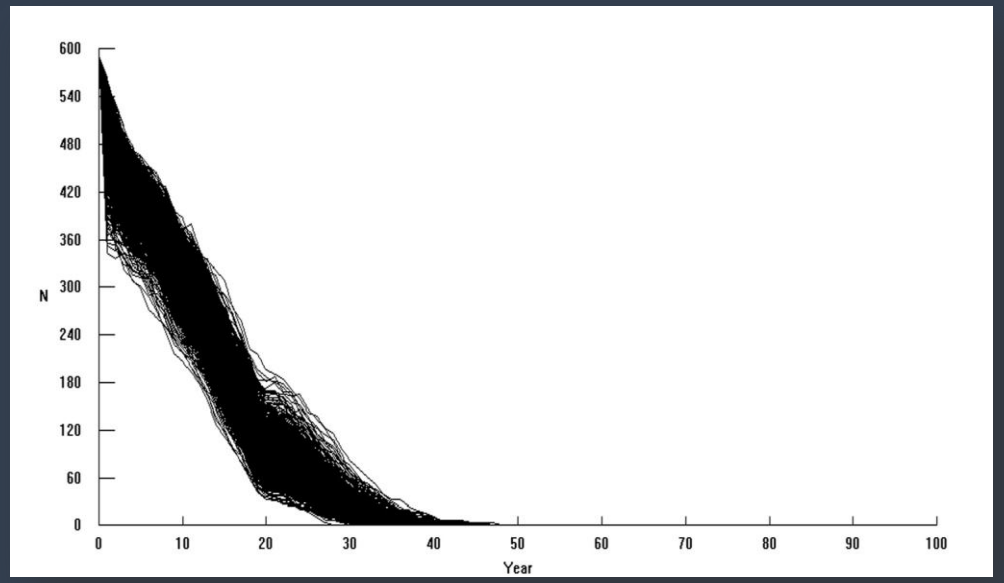
- At the end of 2012, the breed comprised a potentially reproductive population of 589 individuals with a total de 725 registered animals still alive

- Just 54.1% of the adult females registered in the Studbook ever foaled and, of these, 37.3 % foaled more than once
- Only 49% of the females and 18% of the males born (Foalbook) were latter registered on the Studbook



# RESULTS AND DISCUSSION

- The PVA pointed to a high probability of **extinction in less than 50 years**, with less than 100 live animals in 30 years
- The most critical factor for breed survival was the percentage of females breeding per year (<15%)




Other important factors were:

- Female mortality, in particular neonatal mortality
- Age at production of first offspring
- Failure of registration in the Studbook and tracking of the foals

# RESULTS AND DISCUSSION

- Extinction risk of the ***Asinina de Miranda*** breed under different management scenarios, with a carrying capacity of 600 animals

| Scenario | Probability of extinction | Stochastic growth ± SD. | Final expected allele diversity ± SD | Mean time to *quasi*-extinction (years) |
|---|---|---|---|---|
| **Maintenance of the current Scenario** | 1.00 | –0.064 ± 0.047 | 0.0000 ± 0.0000 | 27.0 |
| **Scenario with all the bellow suggested measures** | **0.00** | **0.002 ± 0.042** | **0.9221 ± 0.0173** | **0.00** |
| **Increase of adult females breeding to 35% *per* year** | 0.32 | –0.014 ± 0.040 | 0.9240 ± 0.0190 | 77.0 |
| **Decrease female mortality rate (first years of life) to 15%** | 1.00 | –0.061 ± 0.047 | 0.0000 ± 0.0000 | 28.4 |
| **Decrease annual female mortality from year 1 to 20 from 3% to 2%** | 1.00 | –0.044 ± 0.047 | 0.0000 ± 0.0000 | 38.3 |
| **Reduction to a maximum of 5 females harvest per year** | 1.00 | –0.051 ± 0.044 | 0.0000 ± 0.0000 | 33.6 |
| **Reduction age at first offspring of females to 4 years old** | 1.00 | –0.058 ± 0.047 | 0.0000 ± 0.0000 | 29.5 |

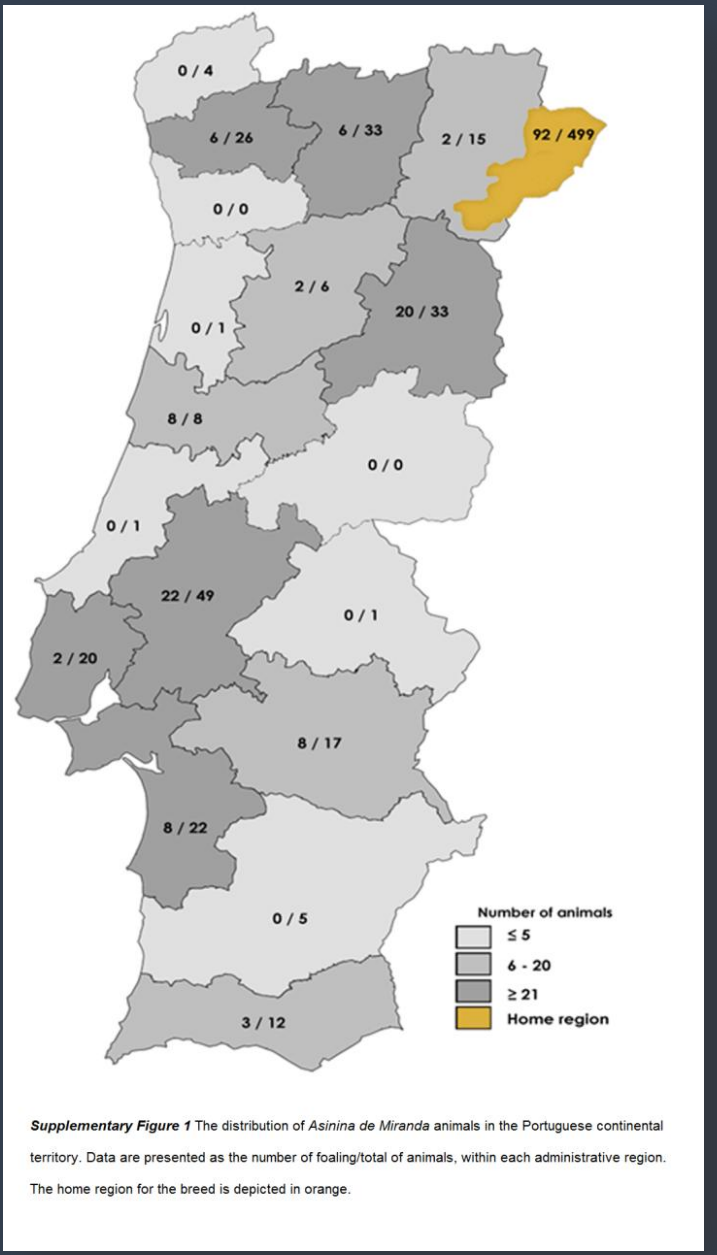
# RESULTS AND DISCUSSION

The number of effective founders contributing to the reference population was 128

The reference population were the 160 animals with known parents

There were 600 founders with no known parents

A clear **loss of genetic diversity** can be seen, despite the shallow pedigree, when the number of founders is compared with the efective number of founders




***Supplementary Figure 1*** The distribution of *Asinina de Miranda* animals in the Portuguese continental territory. Data are presented as the number of foaling/total of animals, within each administrative region. The home region for the breed is depicted in orange.

# RESULTS AND DISCUSSION

- At the end of 2012 there were **353 registered owners** of Asinina de Miranda donkeys but only **64 had registered foals**
- There was a negative correlation between the age of the owners and the number of animals and registered births on the herd (P<0,001)

| Number of animals alive on herd | | Number of foals registered by herd size | | Owners age (years) Mean ± SEM |
|---|---|---|---|---|
| | Frequency(%) | Mean | Total | |
| ≤2 | 305 (86.4) | 0,15 | 44 | 67.18 ± 0.924 |
| 3 to 7 | 44 (12.47) | 1,66 | 68 | 62.68 ± 1.920 |
| **≥8** | **4 (1.13)** | **9,6** | **48** | **45.60 ± 3.501** |
| Total | 353 (100) | 3,80 | 160 | 65.50 ± 0.884 |

- The presence of a male on the herd was also positively associated with the number of foaling registered (P<0,001)

# RESULTS AND DISCUSSION

- The herd type, its size and the number of foaling registered was significantly different between the Home Region and Dispersal Regions of the breed

| | Regions | | | |
|---|---|---|---|---|
| Herd type | HR | DR | Total | HR (%) |
| **Leisure** | 0 | **8** | 8 | 0.00 |
| Preservation | 1 | 1 | 2 | 50.00 |
| **Production** | 2 | **18** | 20 | 10.00 |
| **Traditional** | **274** | 46 | 320 | 85.63 |
| Tourism | 0 | 3 | 3 | 0.00 |
| Total | 277 | 76 | 353 | **78.5** |

# CONCLUSIONS

- The Asinina de Miranda is objectively in risk of extinction. The main biological responsible factor is the low percentage of females foaling each year

- Reducing female mortality to less than 2% a year and reducing age at production of first offspring to 4 years old, assuring registration in the Studbook, and tracking the foals will significantly foster this donkey breed's recovery and maintenance

- The main identified risk factors for loss of genetic diversity were: low breeding rates; low number of animals contribution to the genetic pool, with a largely unequal number of descents; unequal contribution of the herds to genetic pool

# CONCLUSIONS

- The advanced age of donkey owners, the reduced number of foaling in the breed Home Region and the small size of the herds are related with the low fertility rates presented.
- Larger herds, with a resident male, owned by younger people are proportionally responsible for a larger number of foaling

There is still the chance to revert the risk of extinction.

Measures to be taken must start before it is to late and to expensive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# Viability analyses of an endangered donkey breed: the case of the Asinina de Miranda (*Equus asinus*)

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# Pedigree and herd characterization of a donkey breed vulnerable to extinction

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