Department of Biology, University of Athens, Hellenic Centre for Marine Research of Crete

Temporal and spatial genetic diversity of Fallow deer *(Dama dama)* on the island of Rhodes

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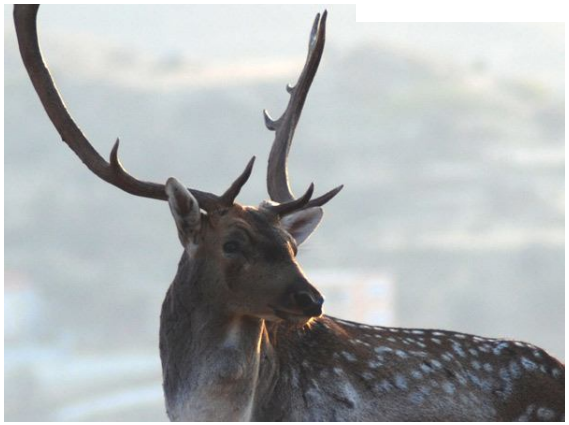
Main Points

- Main goal
- Overview
- Questions
- Methods
- Results - Answers
- Conclusions

Some photos



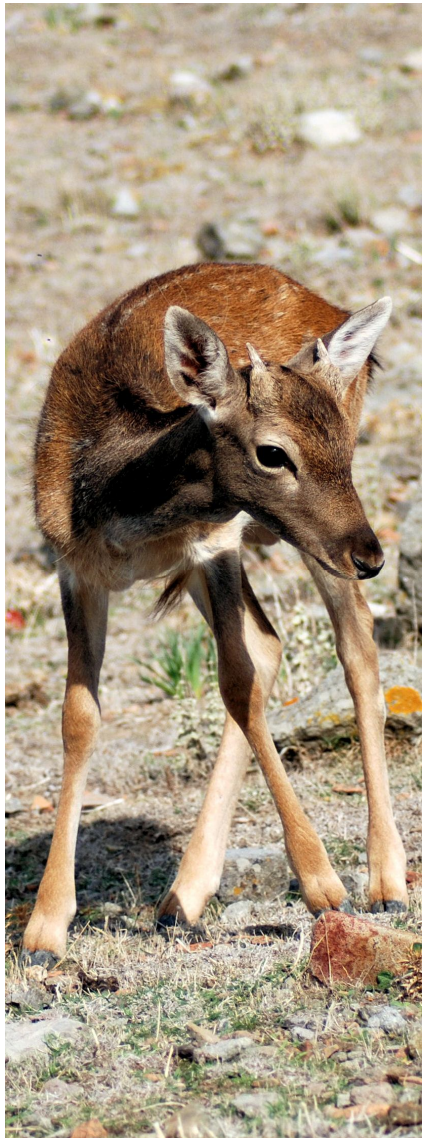
Main goal

To produce knowledge that will contribute to the genetic conservation of Rhodian fallow deer

Overview

- Rhodian Fallow deer:
  - Protected species
  - The only free-ranging population in Greece
  - Introduced by the man
  - Ancient population
  - Isolated on the island of Rhodes
  - Distinct mtDNA
  - Important population for IUCN

Genetic diversity



- Crucial for conservation
- Tasks within conservation genetics:

Prevention of loss of genetic diversity

Prevention of genetic introgression

- Research questions ⟷ True problems

1st Question Formulation

Fluctuation of population size and range

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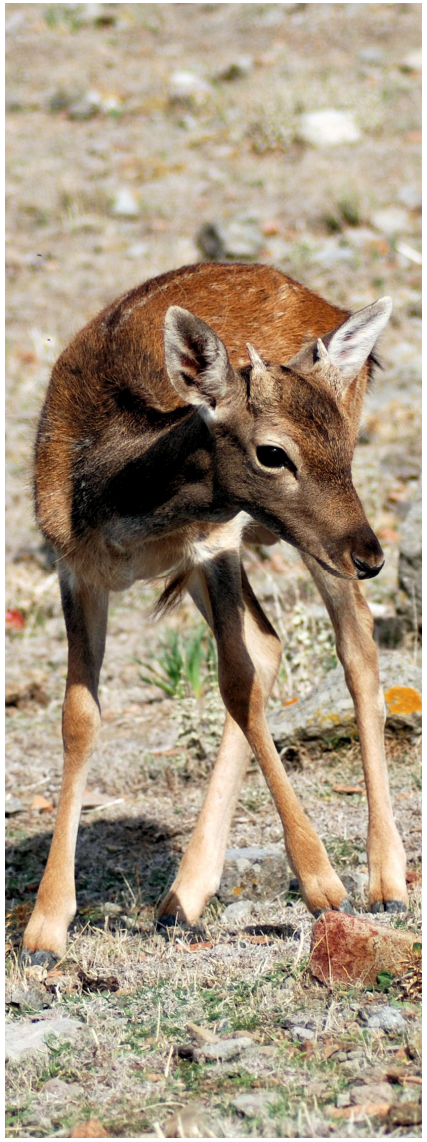
Loss of genetic diversity

Spatial differentiation

1st Question Formulation

- Late Italian Occupancy
  - Deer range = island size
  - Deer population = a few thousands
- Early 70s to late 90s
  - Deer range: restricted
  - Deer population: decreased
- Late 90s to 2006
  - Deer range: expanded
  - Deer population: increased

1st Question



Does the current population contain less genetic diversity then it did a few decades ago?

↓

To compare the genetic diversity of current population with the genetic diversity of deer population some decades ago

1st Question: Methods

- Samples: antler powder
  - 80 samples (1990 – 2007)

    ↓

    Current population

  - 42 samples (40s – 1987)

    ↓

    Old population

- Molecular marker
  - 9 microsatellite loci

1st Question: Methods

- Quantitative analysis
  - Allelic diversity, Average heterozygosity
  - Hardy-Weinberg equilibrium
  - Fixation index, Fst
  - Bottleneck

- Spatial analysis

Quantitative analysis: Results

Measures	Old pop	Current pop	P-val
Alleles	25	24	>0.05
Av.Al	2.78	2.67	>0.05
He	0.4191	0.3773	>0.05
Ho	0.3773	0.3452	>0.05

- Hardy – Weinberg equilibrium
  - Old pop: in equilibrium
  - Recent pop: not in equilibrium
- Fst: 0.018
- Bottleneck: detected

Quantitative analysis: Answer

Does the current population contain less genetic diversity then it did a few decades ago based on quantitative criteria?

↓

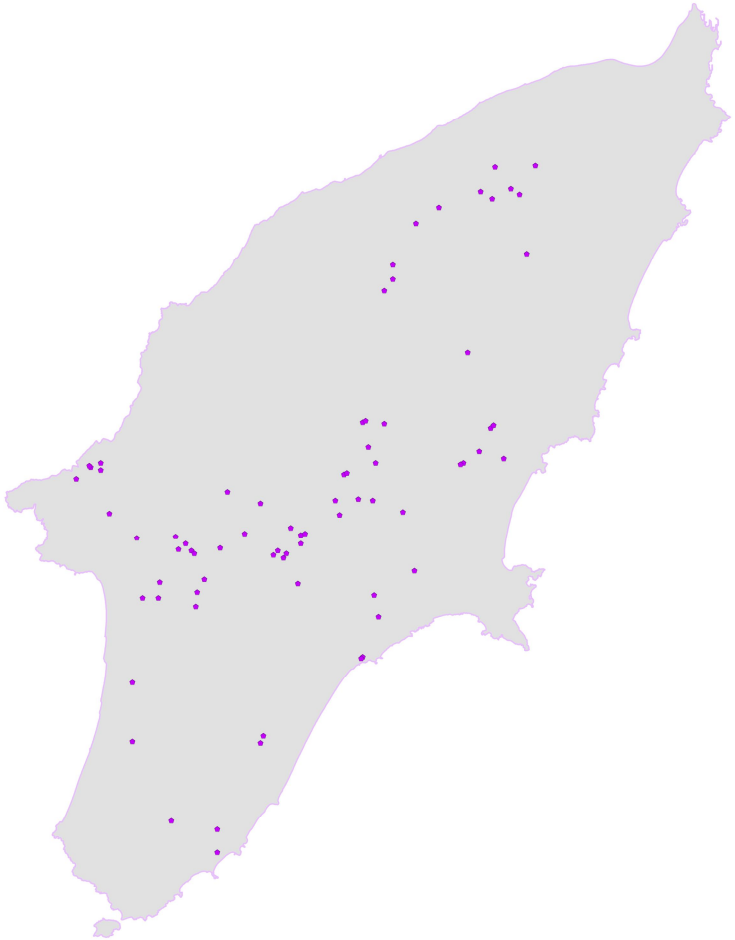
Not really!!!

1st Question: Methods

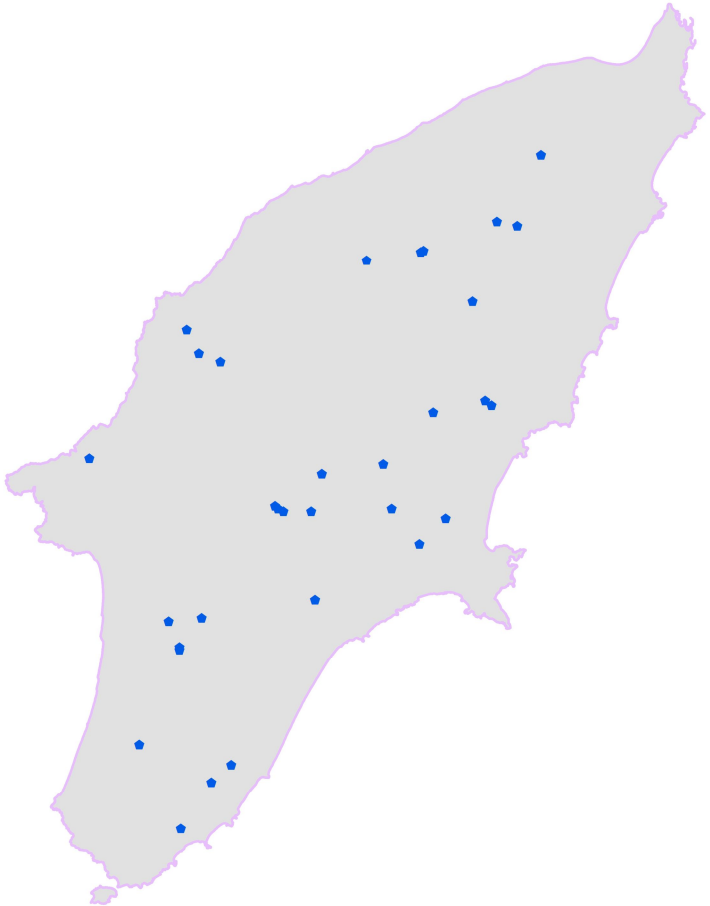
- Quantitative analysis
  - Allelic diversity, Average heterozygosity
  - Hardy-Weinberg equilibrium
  - Fixation index, Fst
  - Bottleneck

- Spatial analysis
  - Distribution of alleles (visual method)

Spatial analysis: Methods

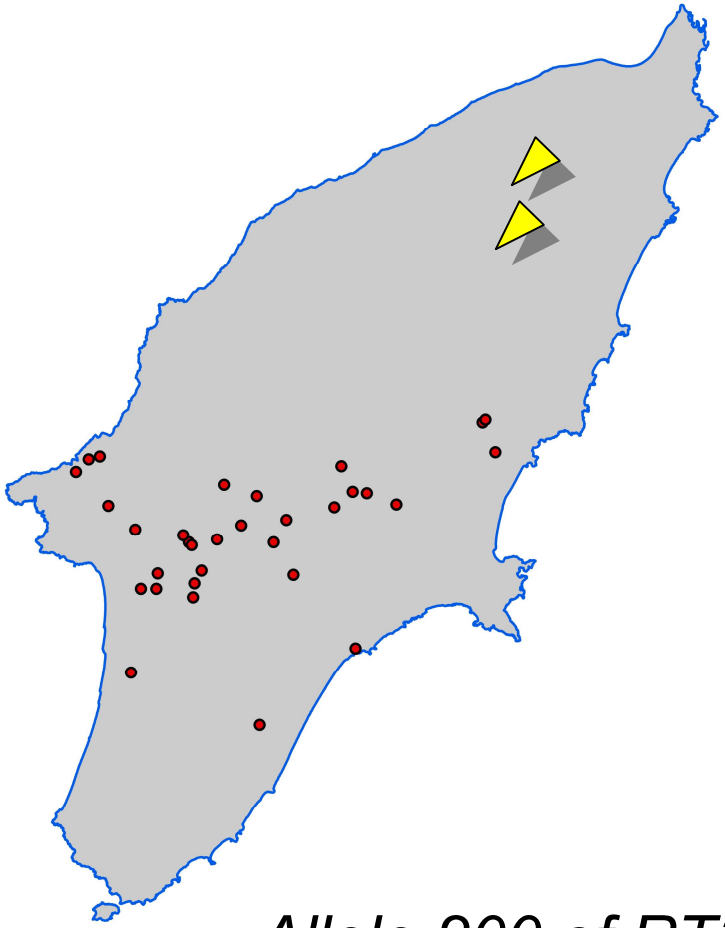


Recent samples

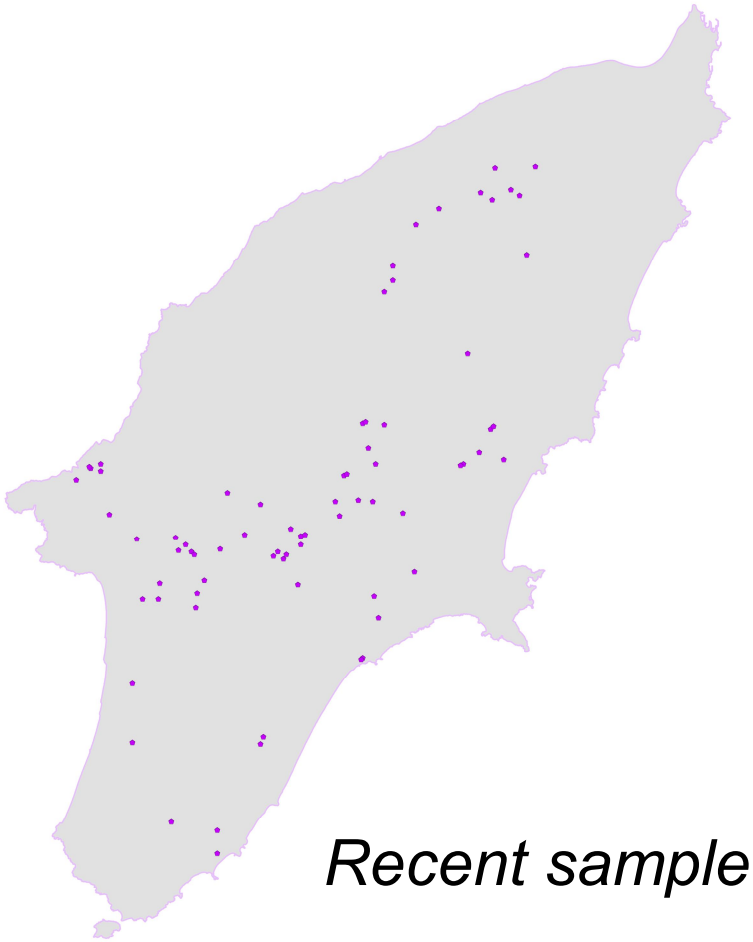


Old samples

Spatial Analysis: Results

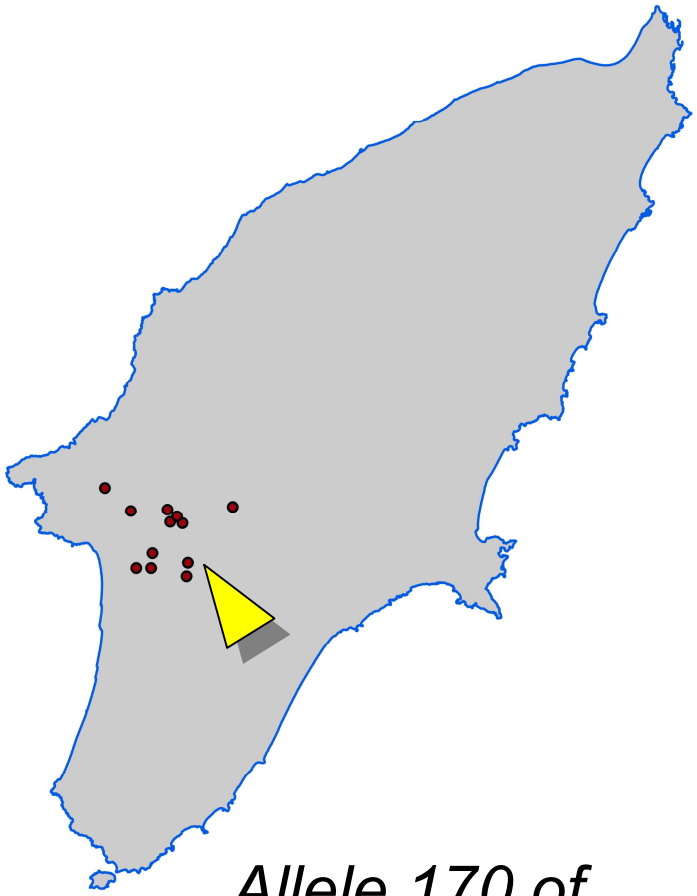


Allele 200 of RT30

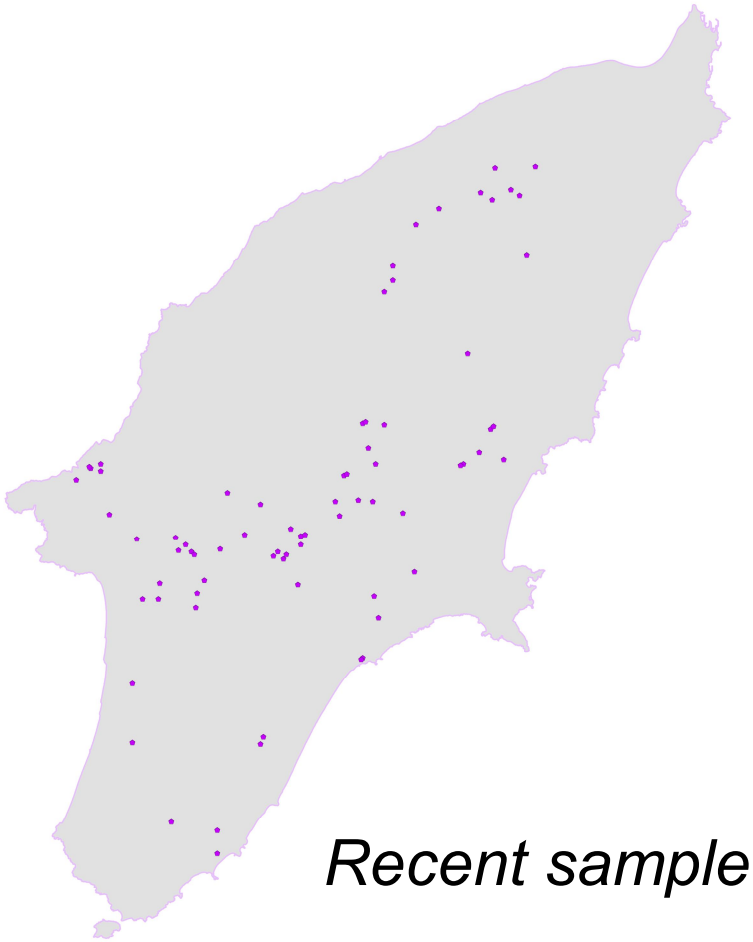


Recent samples

Spatial Analysis: Results



Allele 170 of OarFCB48



Recent samples

Quantitative analysis: Answer

Does the current population contain less genetic diversity then it did a few decades ago based on spatial criteria?

Yes, it does!!! Also, spatial structure!

1st Question

Does the current population contain less genetic diversity then it did a few decades ago?

↓

Not on quantitative level, but yes on spatial level! It is less homogeneous!

2nd Question

- Captive population in the city of Rhodes
  - Since 1950s
  - 6-8 founders
  - No genetic management
  - Considered as genetic stock

Could the captive bred population of fallow deer be considered as genetic stock?

2nd Question: Methods

- Samples: antler powder
  - 80 samples (1990 – 2007)
  - 30 samples (captive pop)
- Molecular marker
  - 9 microsatellite loci
- Analysis
  - Allelic diversity, Average heterozygosity
  - Fixation index, Fst

2nd Question: Results

Measures	Current pop	Captive pop	P-val
Alleles	24	16	>0.05
Av.Al	2.67	1.78	>0.05
He	0.3773	0.1302	>0.05
Ho	0.3452	0.1259	>0.05

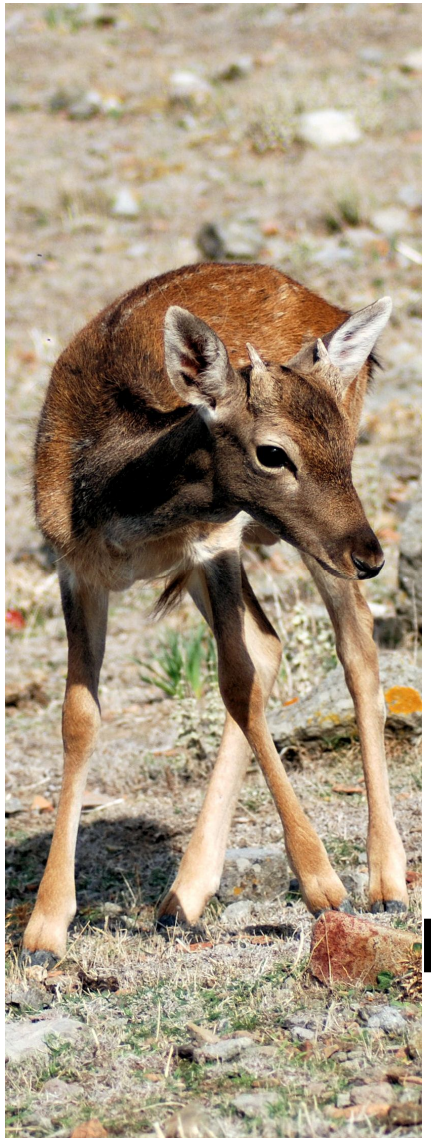
- 66,6% of alleles and 30% Ho
- Fst: 0.184 (captive – recent)

2nd Question: Answer

Could the captive bred population of fallow deer be considered as genetic stock?

No, it is not!!! It contains significantly less genetic diversity

3rd Question



- Rhodian fallow deer
  - Distinct mtDNA
- Private enclosures
  - Fallow deer of european origin

Is Rhodian Fallow deer a distinct population also on microsatellite level? Is it wise to keep Fallow deer of european origin on the island?

3rd Question: Methods + Results

- Samples: antler powder
  - 152 samples (1990 – 2007)
  - 3 samples (European fallow deer)
- Molecular marker
  - 9 microsatellite loci
- Analysis
  - Different alleles in European deer
- Results
  - 6 alleles not found in the Rhodian population

3rd Question: Answer

Is Rhodian Fallow deer a distinct population also at microsatellite level?

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Evidence for genetic differentiation

Is it wise to keep Fallow deer of European origin on the island?

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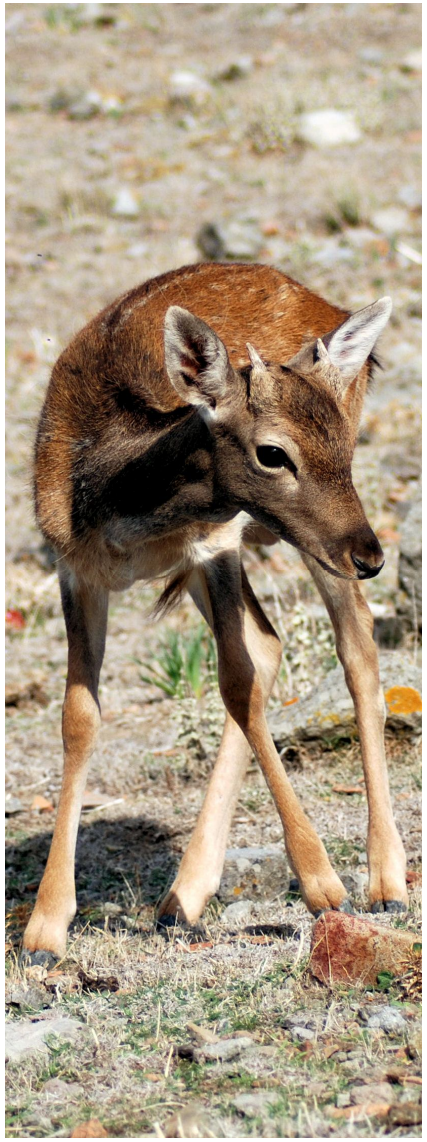
No, it is not!!!

Conclusions



Population bottleneck seems to have affected the genetic diversity on spatial level.

The captive bred population of fallow deer can not be considered as genetic stock.

There is evidence that Rhodian Fallow deer is a genetically distinct population, also, on microsatellite DNA.

It is not wise to keep Fallow deer of European origin on the island of Rhodes.

Acknowledgments

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Thank you for your attention!