Ex situ conservation of Andean bears includes more than genetic and demographic management

the example of the European population

Lydia Kolter, Kölner Zoo

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Paradigm shift in the 80ties towards

***Ex situ* populations of threatened species becoming self-sustainable and serving to support or enhance the conservation of threatened wild populations:**

- **conservation education (ambassador role)**
- **conservation relevant research**
- **provision of animals for re-introduction**

  (if feasible and needed)

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Preservation of the adaptive potential of species in captivity

Problem: small highly fragmented populations

Population management according to principles derived from population genetics and demography

Close co-operation between holders of a continent and changing attitudes

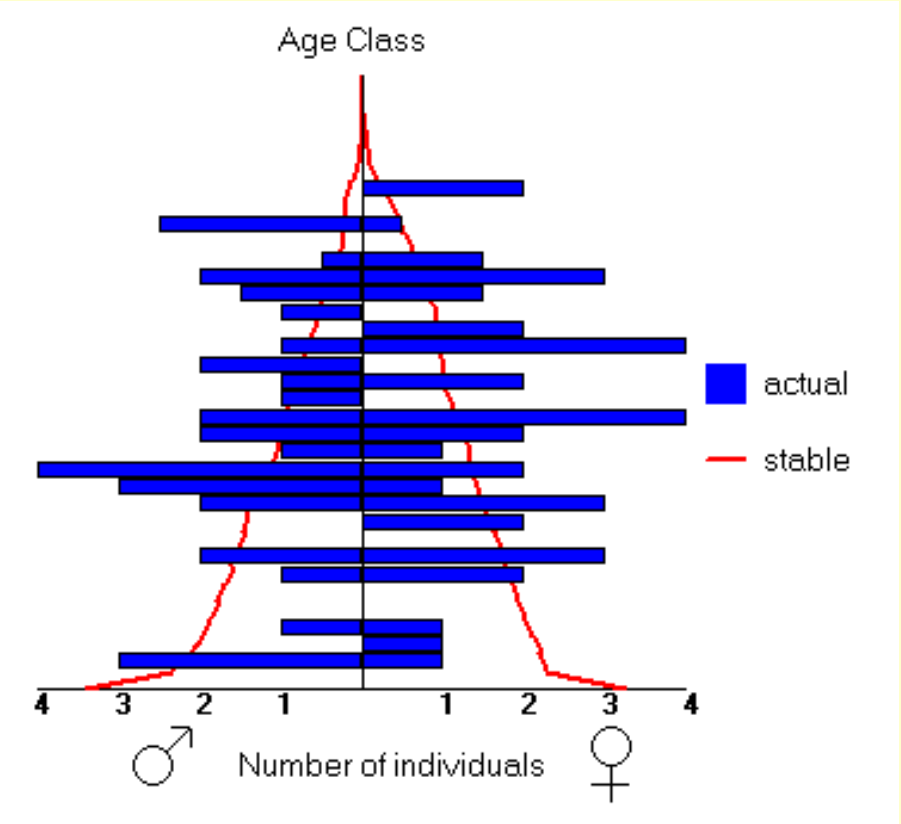
Requirements to maintain the demographic potential for growth

stable age distribution

reproduction &

population control

- **at carrying capacity**



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Reduction of population growth by application of reversible contraceptives

Caution

- in the 5 cases where „reversible“ methods were applied the females did not resume breeding after treatment of 1- 2 years.
- In one of these ageing might be the cause.
  - Up to now no female Andean bear older than 23 years reproduced

Endocrinological study is running to detect the underlying hormonal processes

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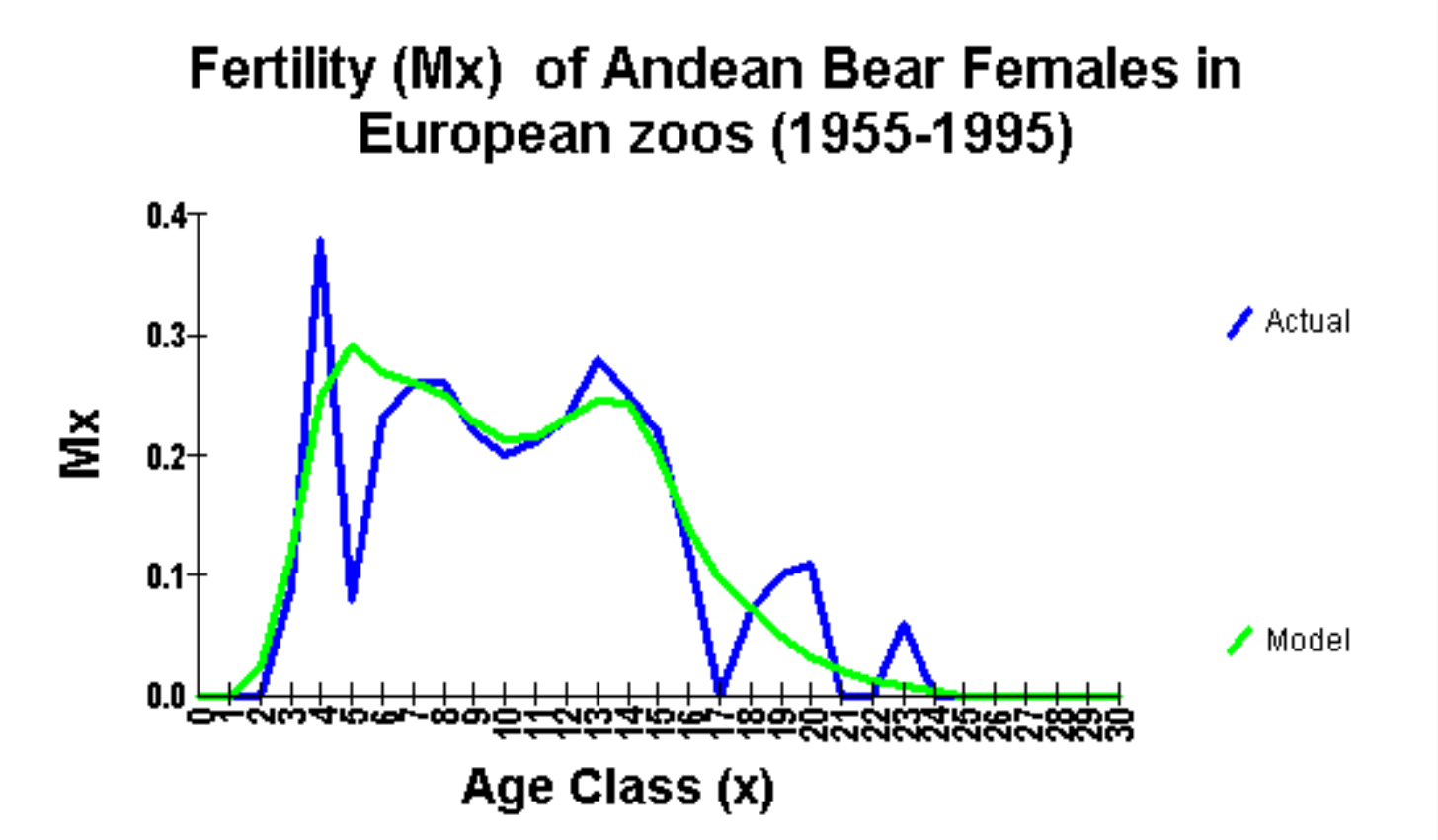
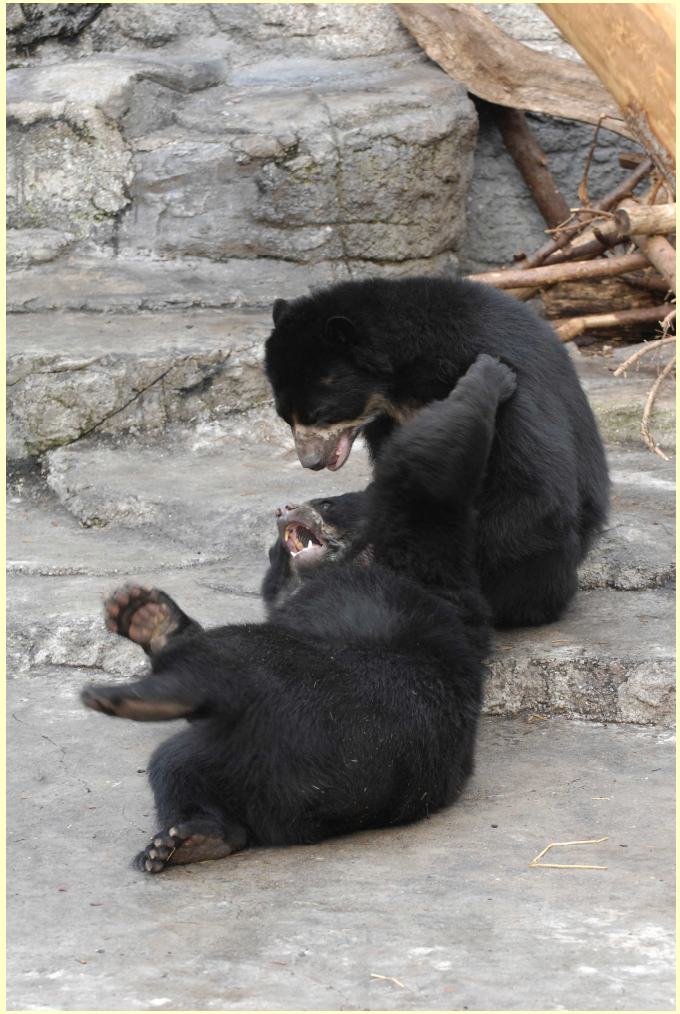
Reproductive age span of Andean bear females kept in Europe



Alternatives to chemical contraception:

bachelor groups ????

Two related males at Lyon zoo



Two unrelated males at Basel zoo

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Requirements to maintain the genetic potential of small populations

THE THEORY

- Sufficient number of wild-born founders (>20)
- Increase of generation time
- Rapid population growth after founding
- Large carrying capacity (~250 ind.)
- Equalisation of founder contributions
- Low variance in family size
- Prevention of inbreeding
- Equal sex ratio

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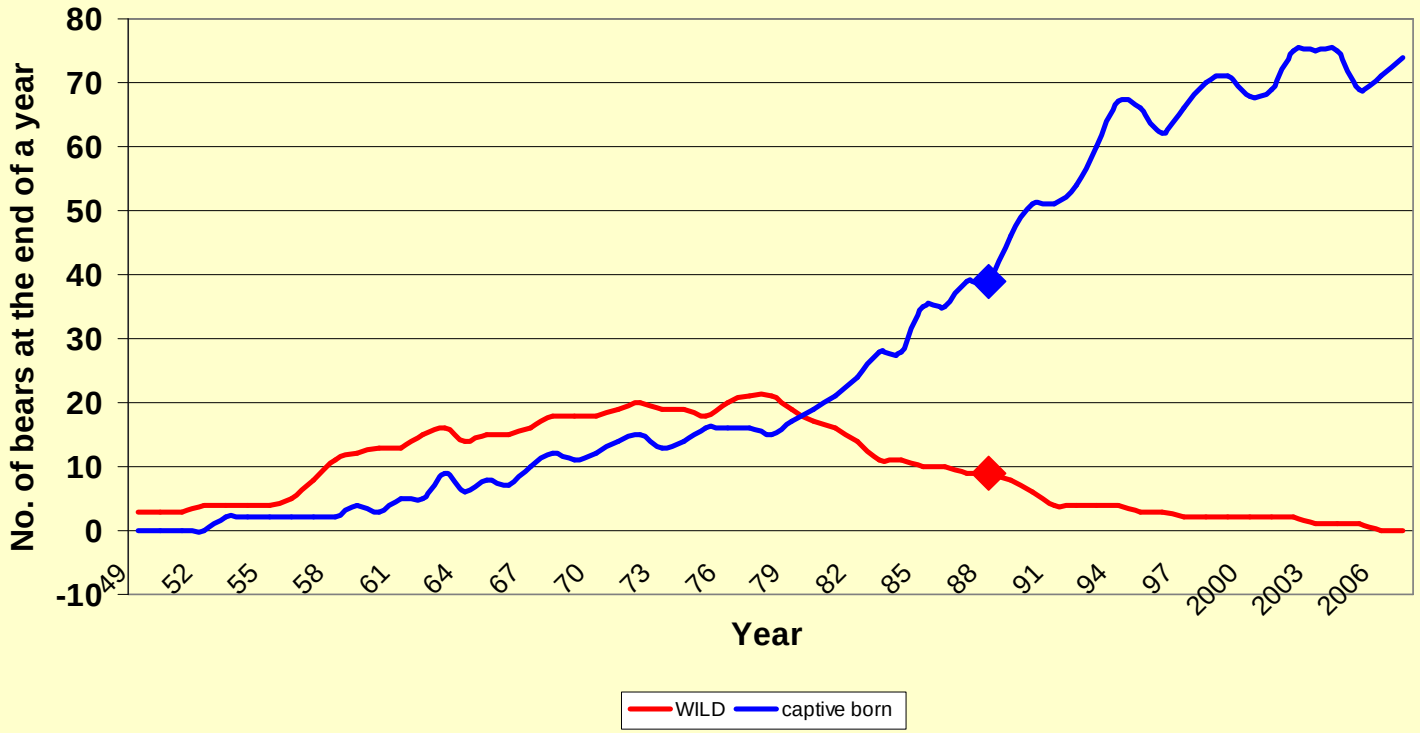
THE REALITY: Population growth

- slow population growth after founding in1949

- at the start of the EEP 9 living wild-born animals left

Birth origin of Andean bears in EAZA zoos



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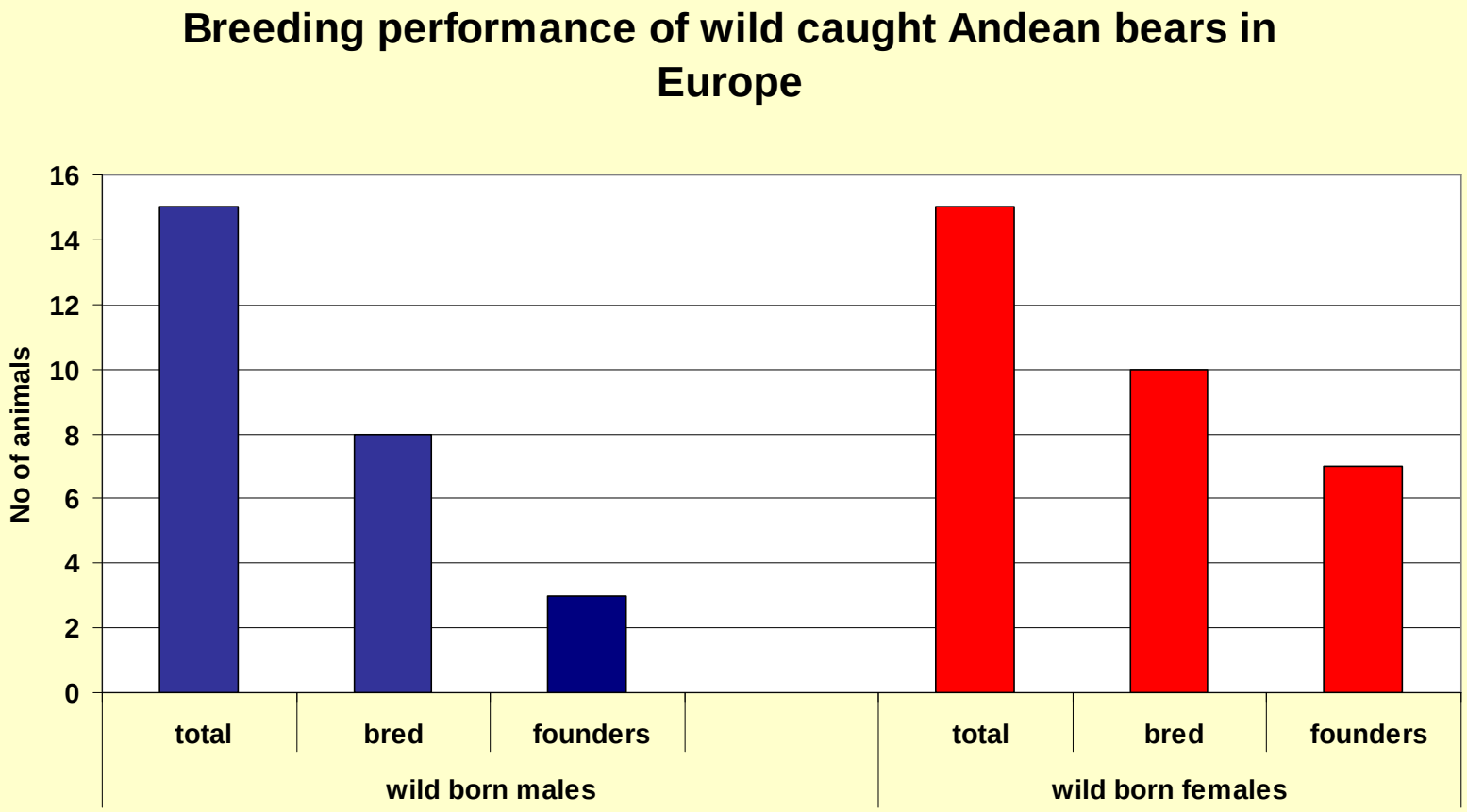
THE REALITY: Number of founders



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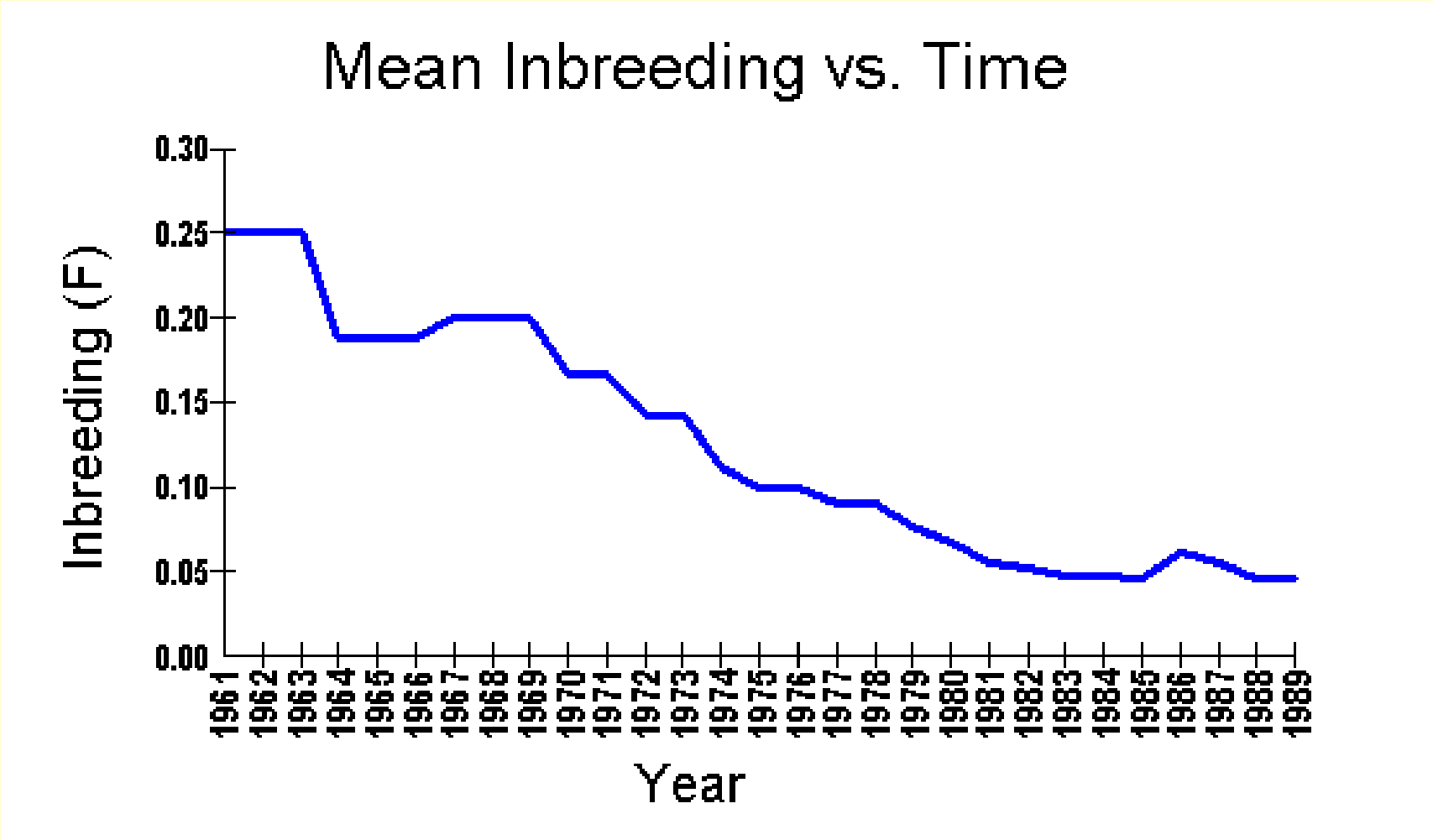
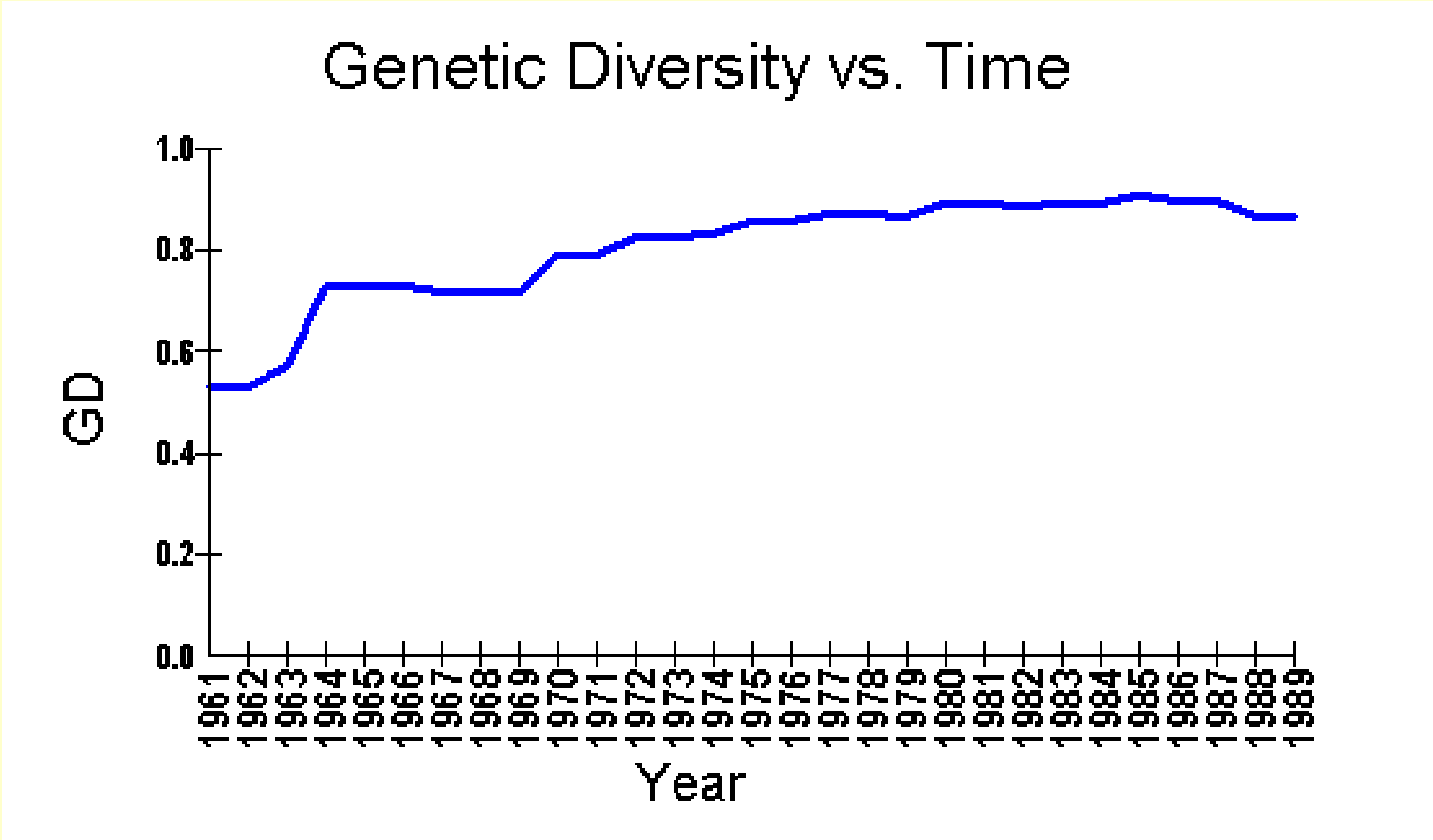
THE REALITY: Influenced and fixed by the breeding history of the Andean bear in Europe

- **1st birth and rearing in January 1953 by a wild-caught female imported pregnant to Basel zoo**
- **More wild caught bears imported to different zoos in Europe between 1958 and 1977**
- **Successful breeding with three wild caught pairs at Dresden and Berlin TP in 1963, in Jersey from 1975 & with 3 wild-caught females at Köln, Leipzig, Berlin**

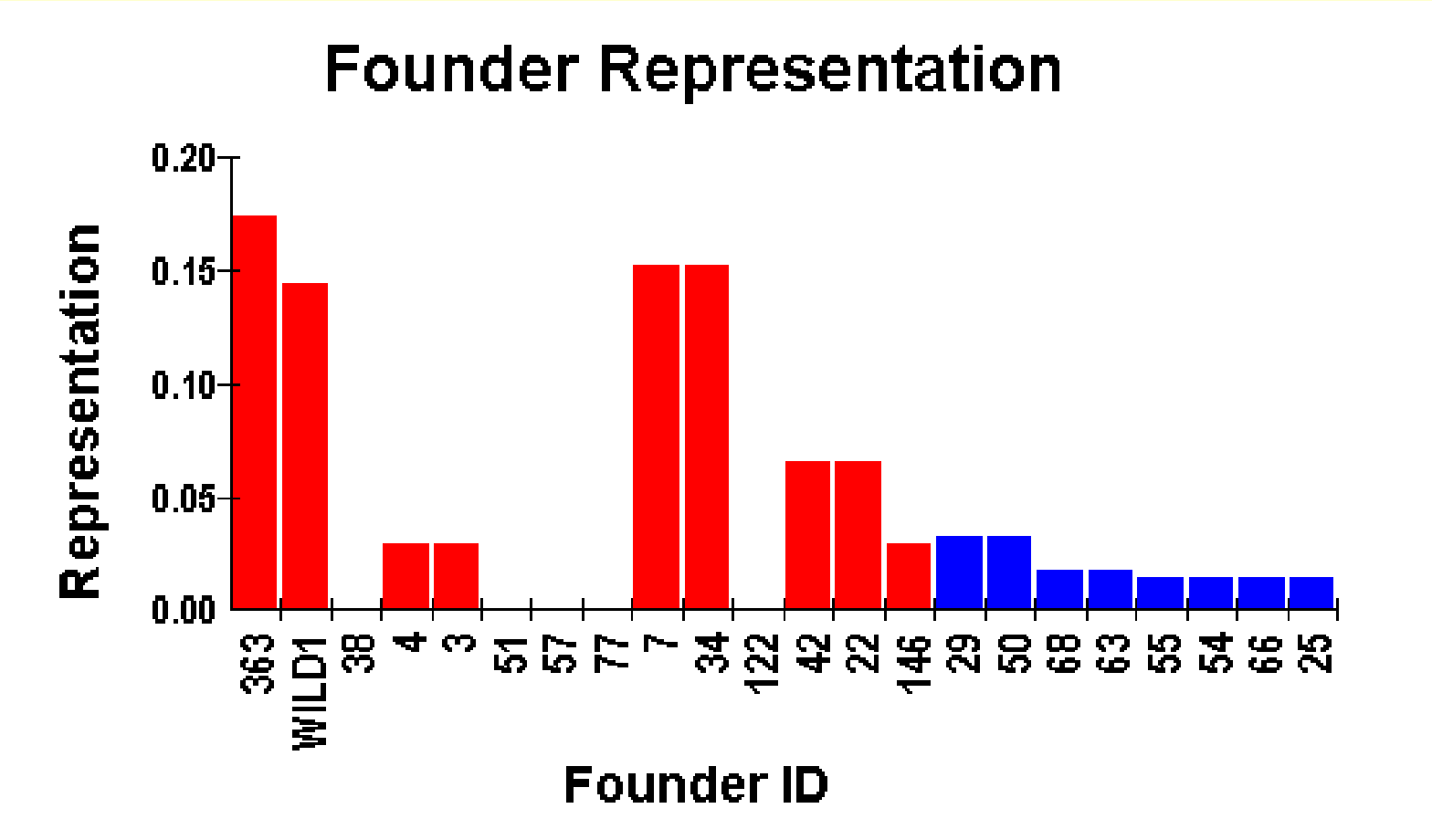
THE REALITY: Inbreeding at the beginning of the EPP in 1988



THE REALITY: Gene diversity at the beginning of the EEP in 1988



THE REALITY: Founder representation at the beginning of the EEP in 1988



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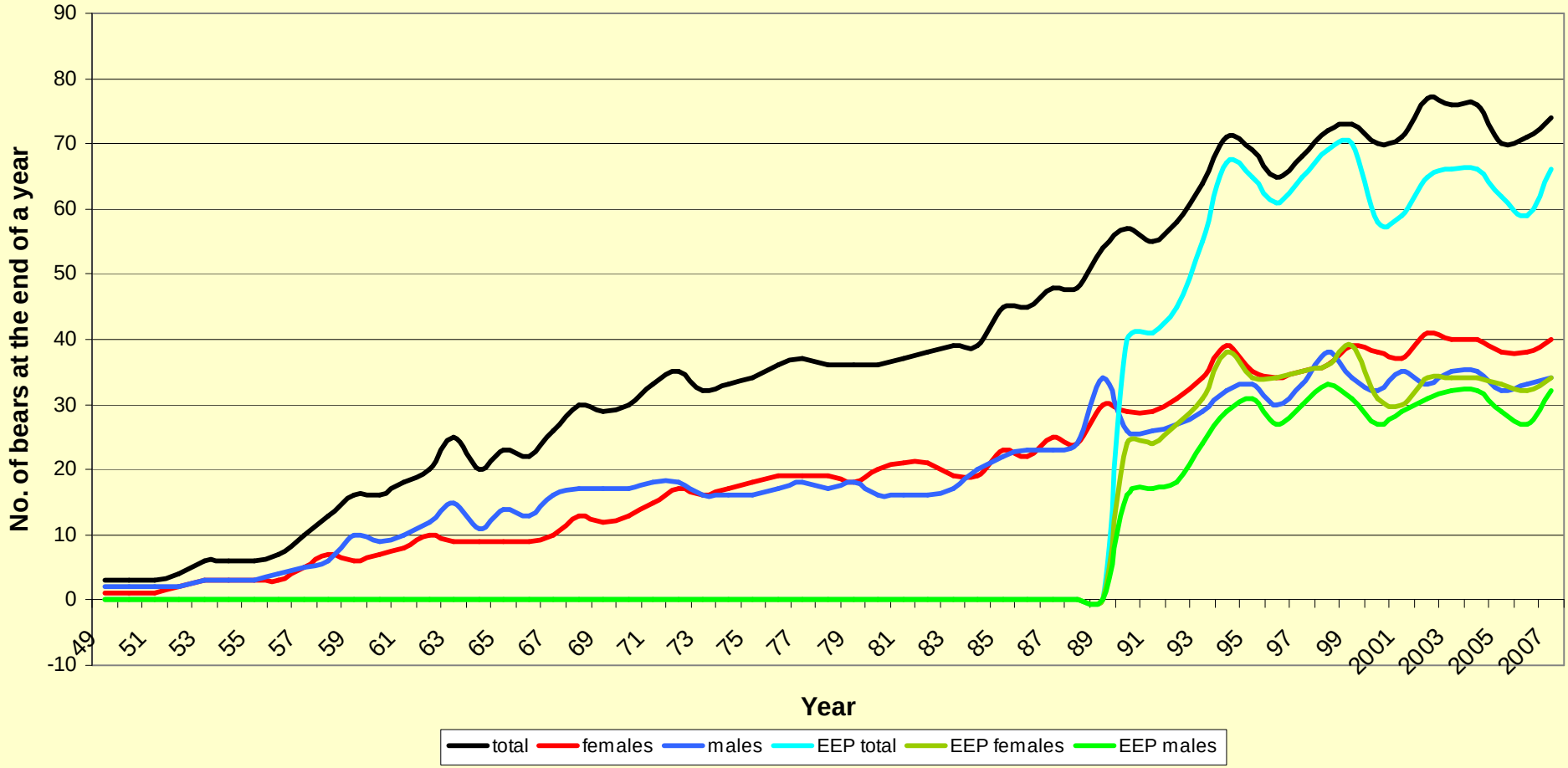
Development of the Andean bear population within the EEP



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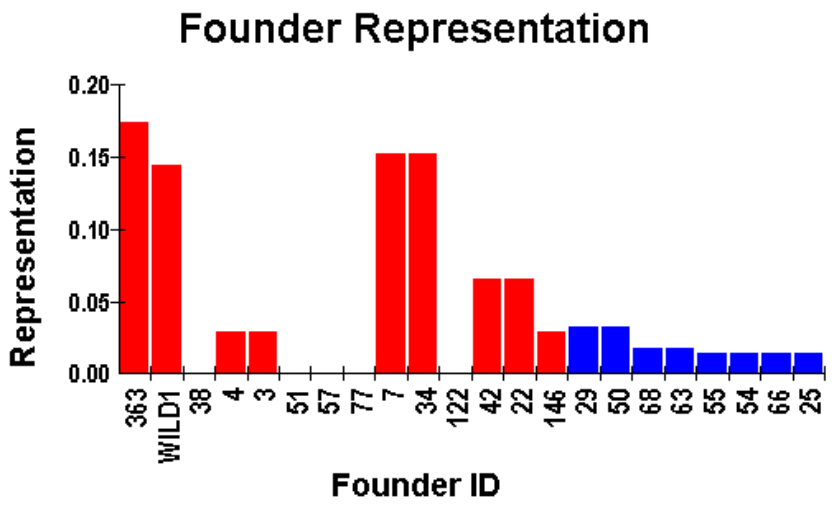
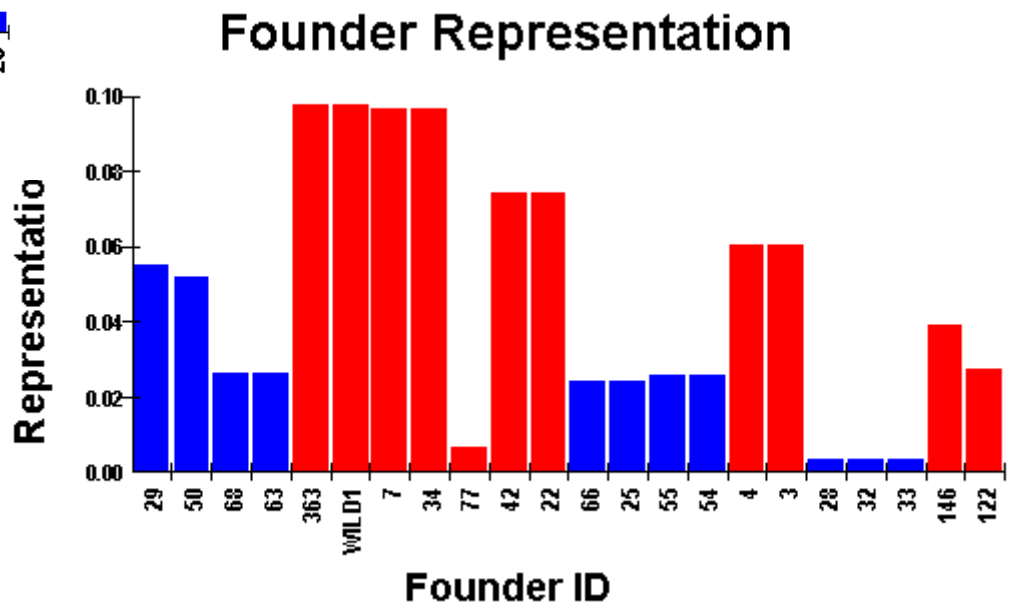
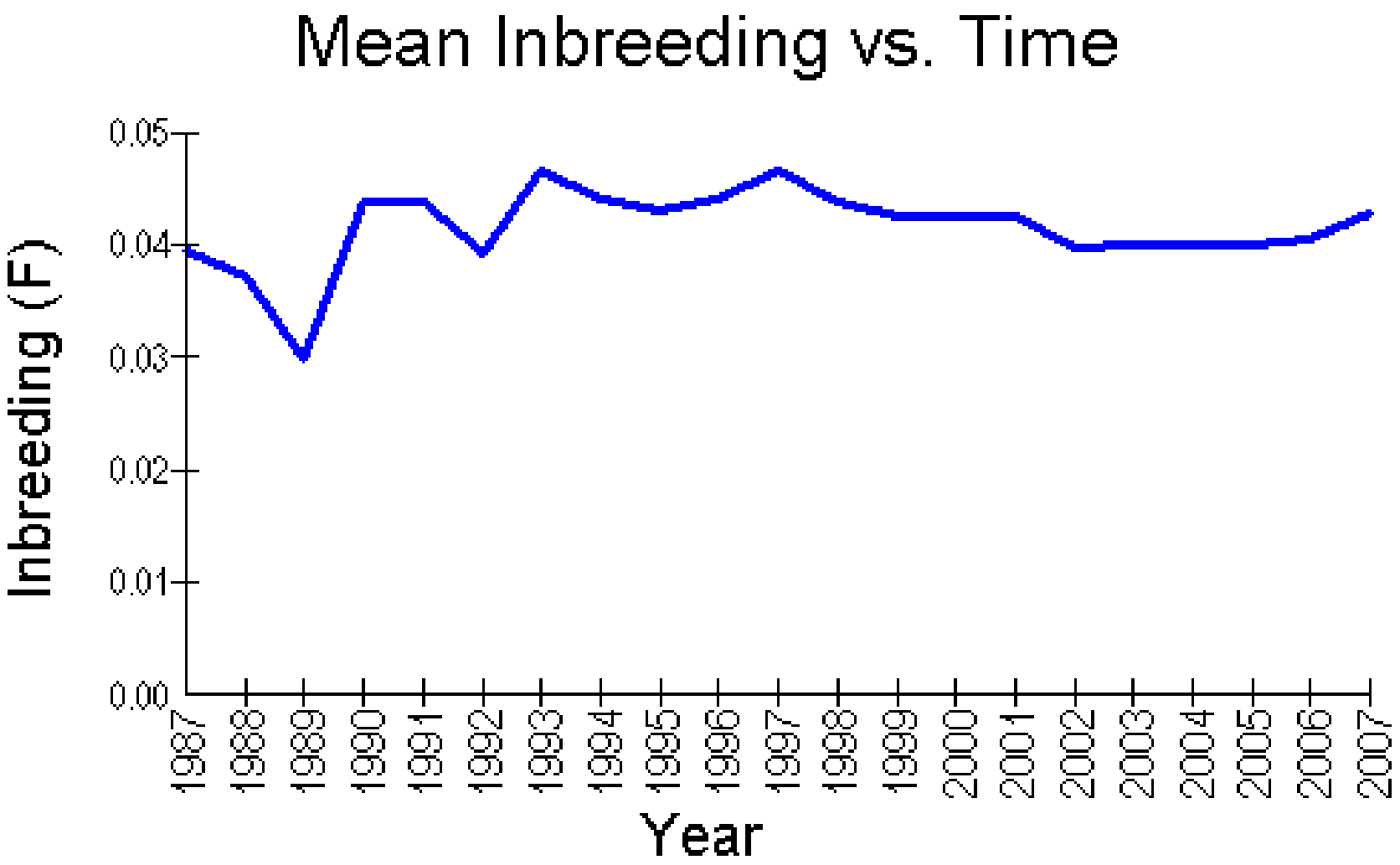
Situation 1988



2008




Mean Inbreeding vs. Time
Inbreeding (F)
0.05
0.04
0.03
0.02
0.01
0.00
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Year

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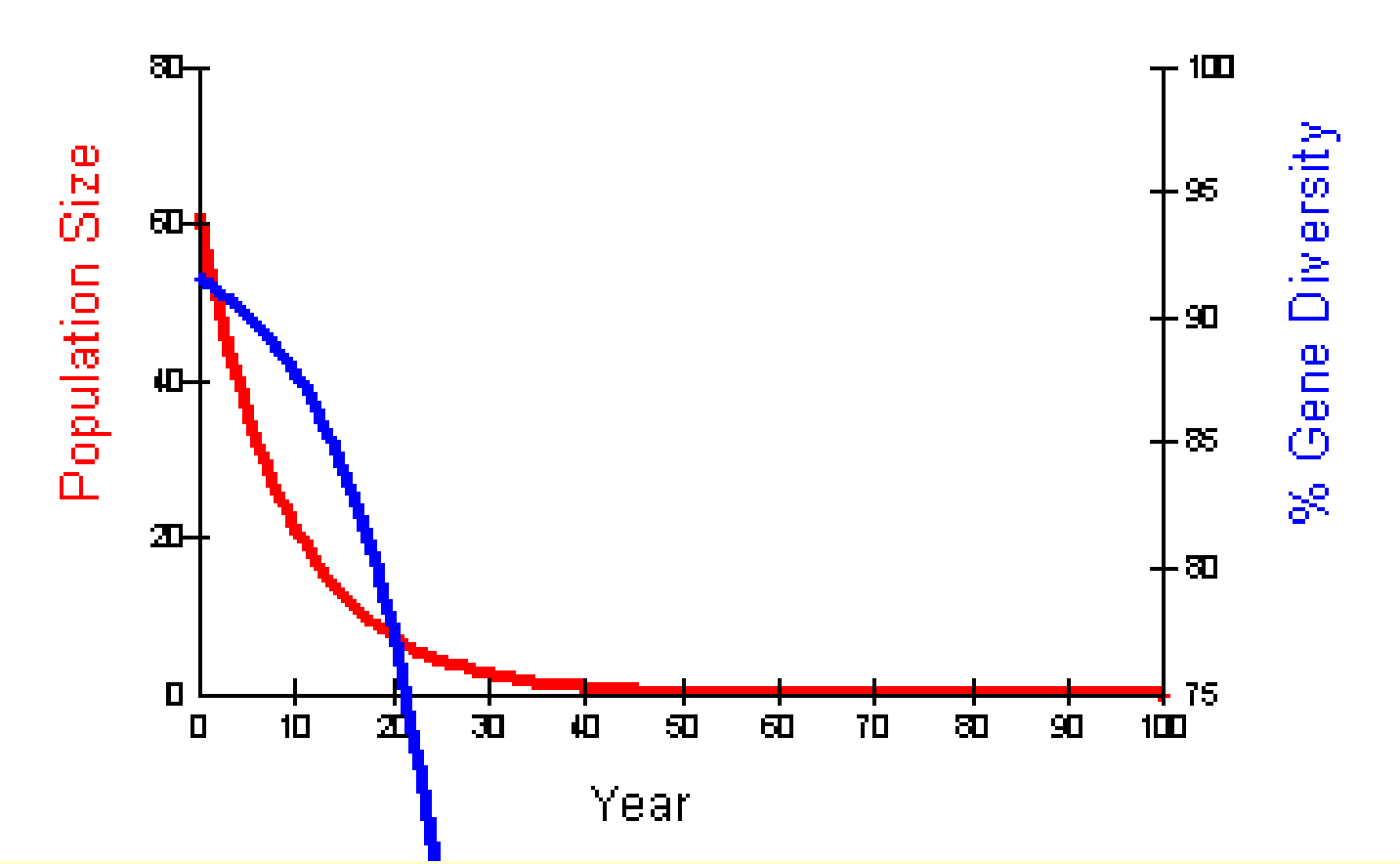
Situation in the future with the current population parameters



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Closer co-operation between regions necessary

- co-ordinated and well-considered import of Andean bears from range countries into non-range countries to maintain genetic diversity
- alleviate space problems
- exchange of information to prevent running into the problems outlined here

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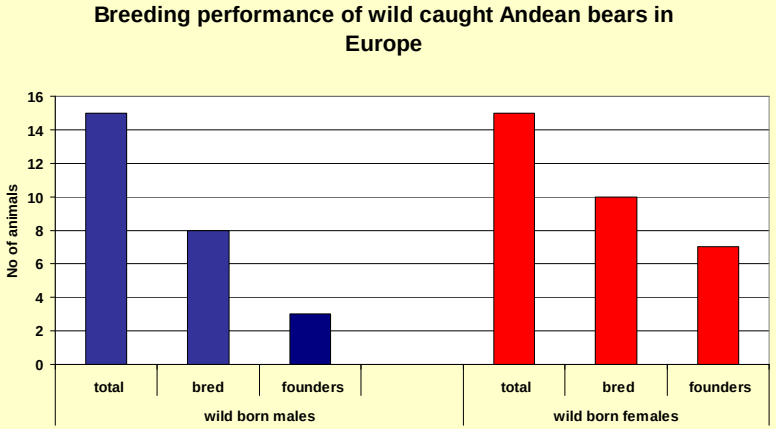
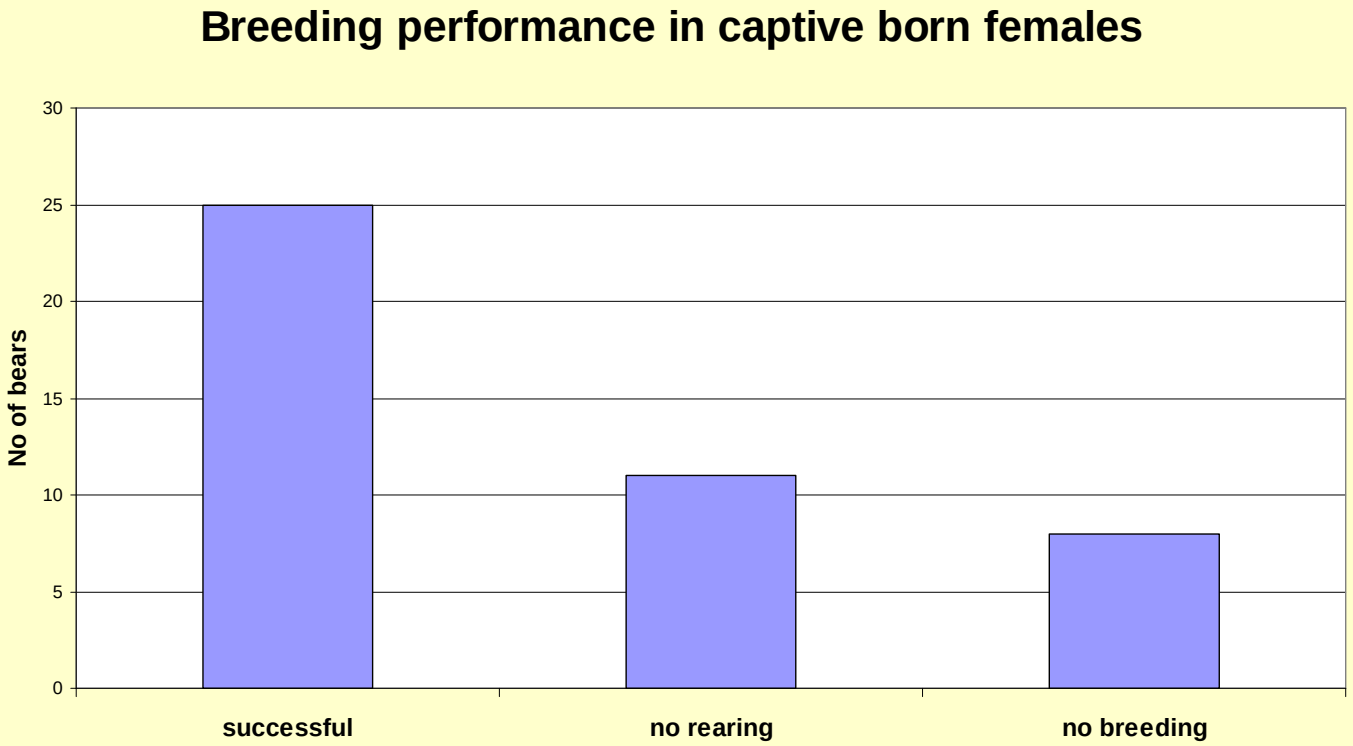


Gene diversity was not only lost by non-breeding wild born bears, bottle necks also occurred due to non-reproducing captive born females.



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Potential reasons for failure to rear cubs:

- **inappropriate denning facilities due to insufficient separation of the female**
  - **– from keepers**
  - **– from con-specifics of both sexes**

Ignoring the pregnant female‘s need for a safe birthing place for rearing altricial young

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Potential reasons for failure to rear cubs:

Obviously the female‘s perception on safety for cubs differs from our knowledge that there is no risk by other bears or keepers

Solution:

Identification of key features and conditions in the natural habitat to which the species is adapted

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Creation of a separable/lockable denning area!!!!

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Potential reasons for failure to breed/give birth:

- tendency in group living females: stop to reproduce, when younger animals start
- 6 of the 8 non-breeding females were/are kept in groups with other adult females which successfully reproduced under the same conditions

Ignoring the fact that Andean bears are not gregarious and avoid other adults

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Selection factors in our systems?

which favor pre-adapted individuals

- **tolerant towards conspecifics/humans**

and select against other individuals:

- **wary, easily aroused, less tolerant against the presence of con-specifics and humans**

Social stress involved?

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Social stress seems to play a role in the development of alopecia:

- symmetrical alopecia, restricted to females was recorded for 19% of the females living between 1953 and 2005

- 16 of 17 females with alopecia live(d) in groups with at least one other female

Veterinary research to solve that problem is going on in the EEP

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Animals like these are not useful in conservation education

female with beginning alopecia 2005

the same female 2008

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Conclusions from these findings

In order to manage captive populations properly

the biology, ecology and social systems of the species have

- **to be considered,**
- **to be interpreted and to be translated,**

so that the results can be used to design a favourable captive environment

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Improvements of the captive environment to benefit the population and the individuals

Recommendations in the EAZA Husbandry guidelines for Ursids

- **plan as many separable/linkable exhibit units as adult animals should be kept**
- **equip each unit with the relevant structures**
- **if more than a pair should be kept, create maternal female lines**

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Example of Zürich Zoo

exhibit 2500 m²

three separable linkable units

equiped with appropriate resting and feeding places