

Cherato-congiuntivite infettiva, sopravvivenza e eterozigosi media nello Stambecco alpino



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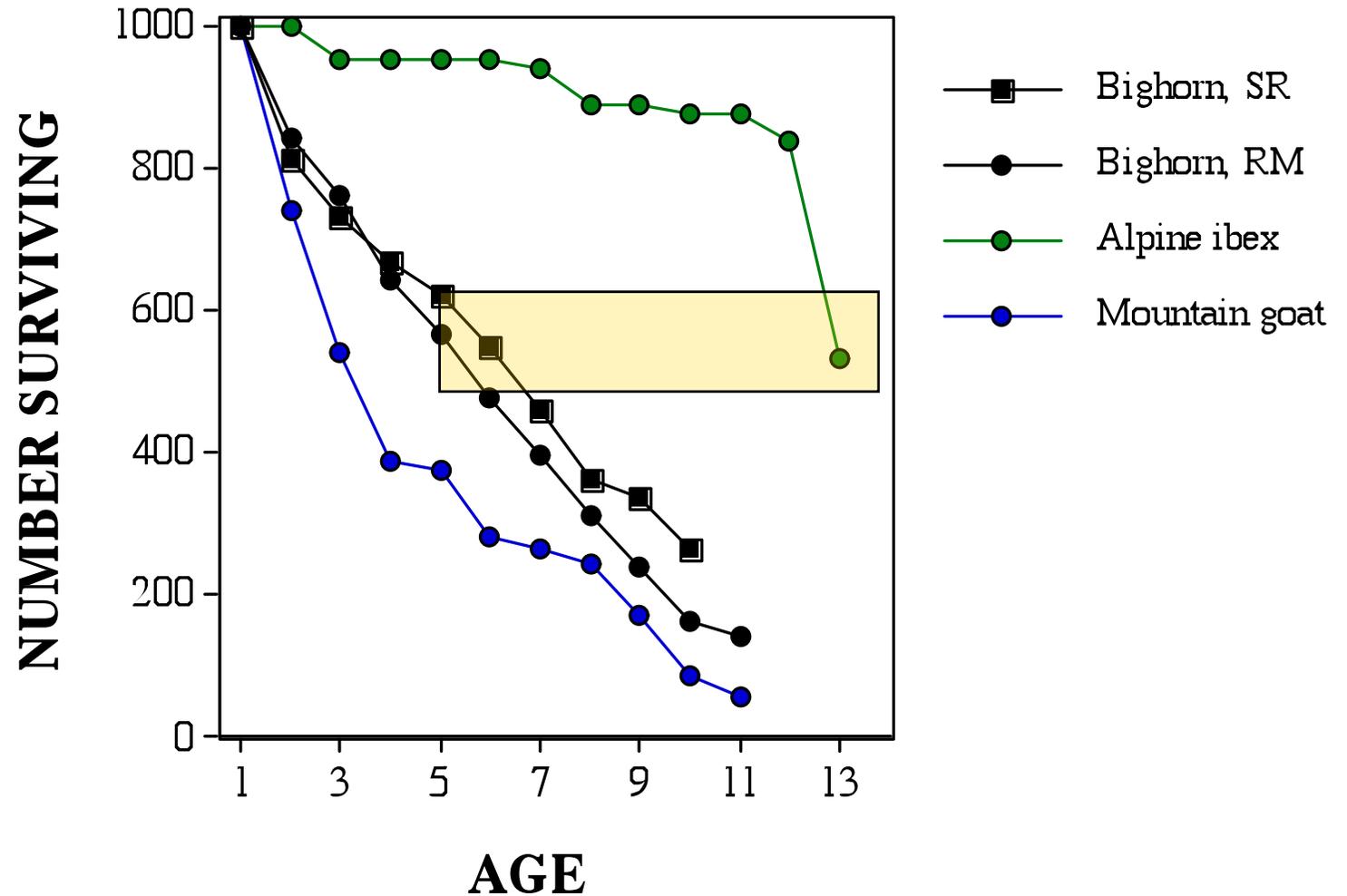
Photo: L. Ramires



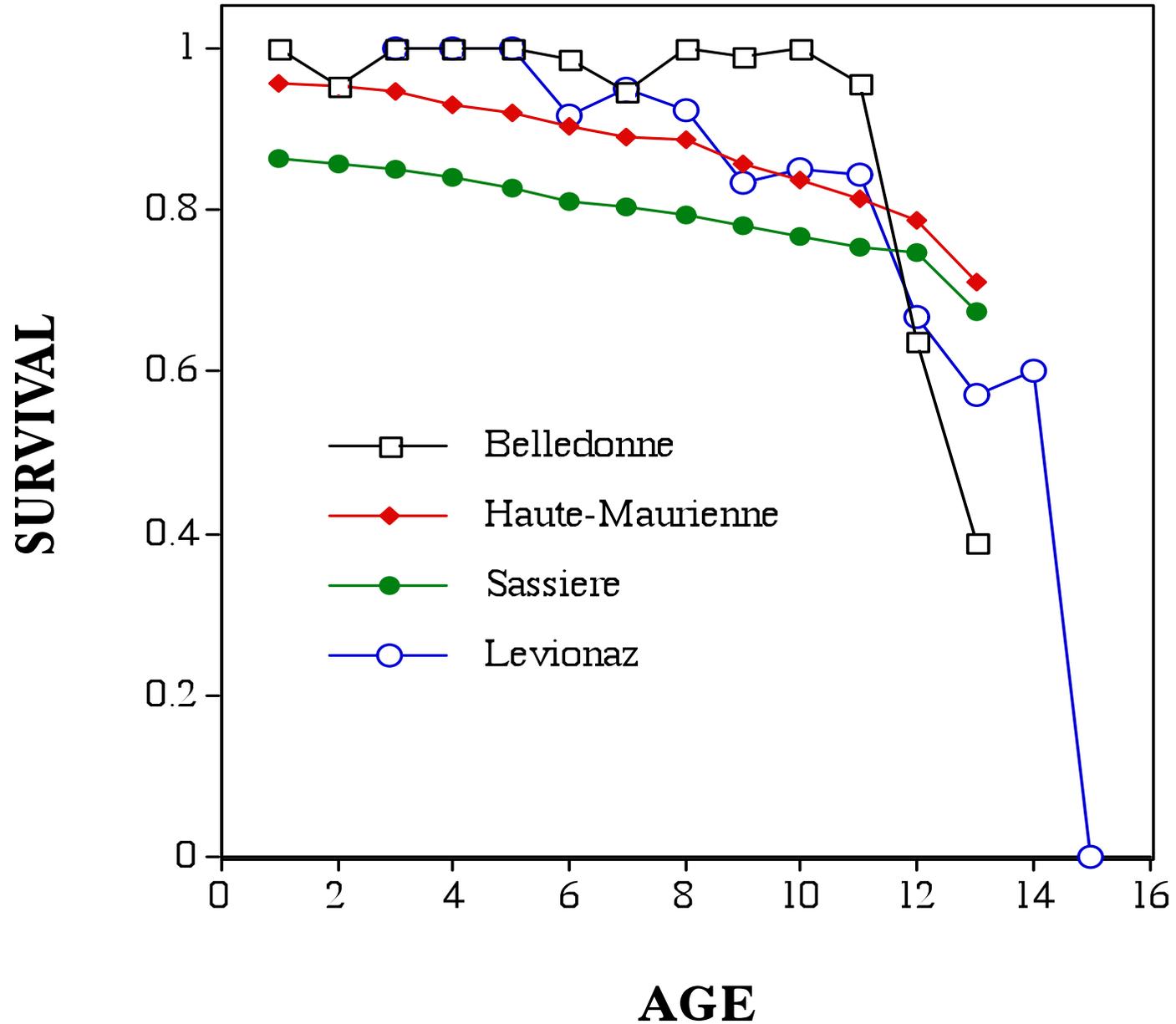
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Fino a 12 anni: probabilità di Sopravvivenza > 80%

Survival of cohorts of 1000 males of 3 species of ungulates



survival of ibex males in 4 populations

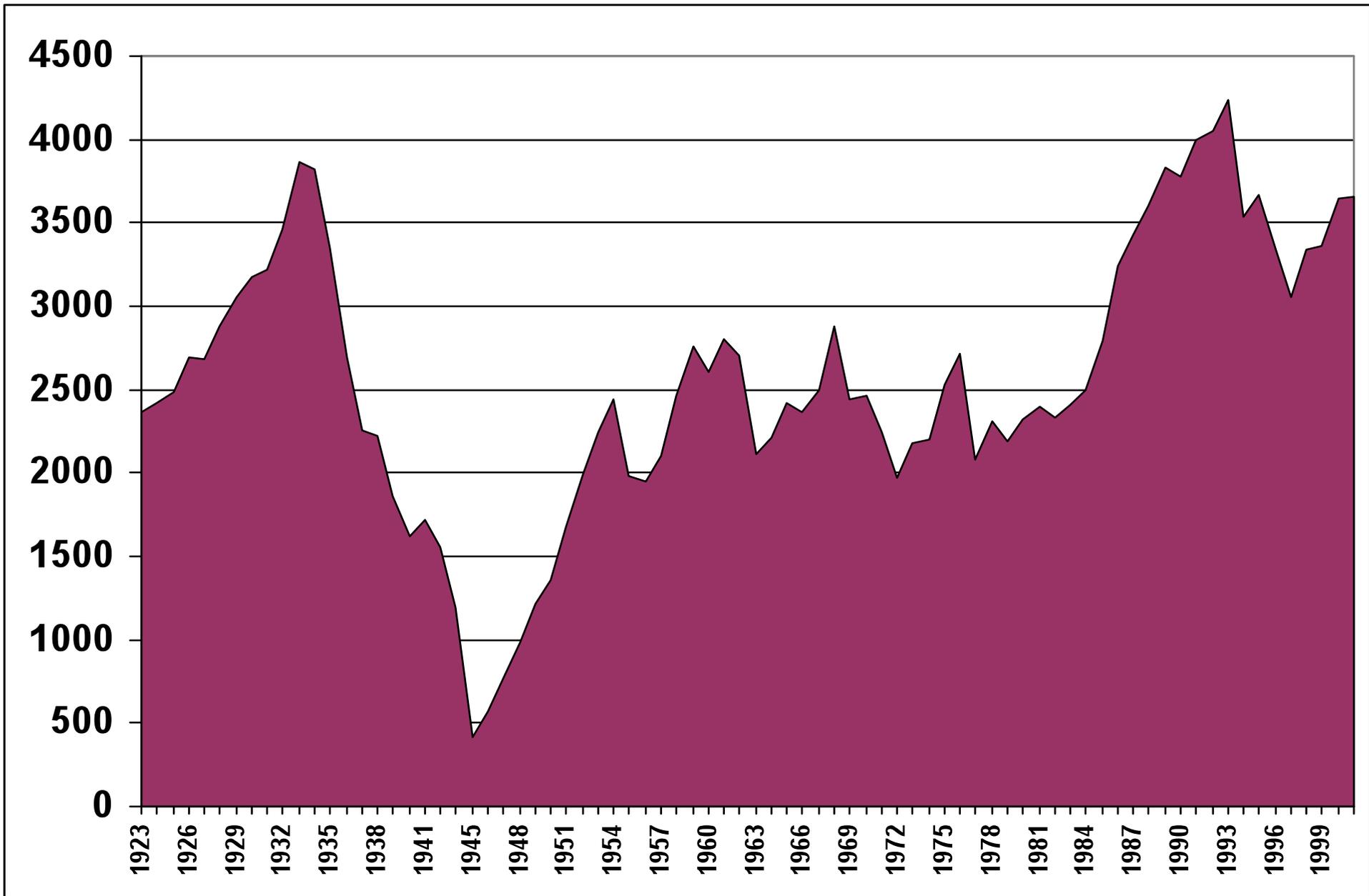


Analisi Capture-Mark-Recapture (CMR)

basata sui dati di ri-osservazione annuali dei maschi di stambecco

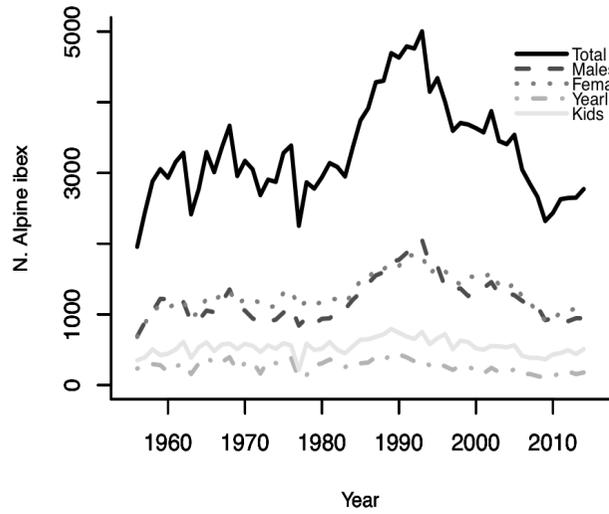
MODEL	AIC _c	Δ AIC _c	Num. Par.	Deviance
$\{\varphi(t)p(t)\}$	474.8323	0	17	439.487
$\{\varphi(t)p(\cdot)\}$	467.4243	7.41	10	446.948
$\{\varphi(t*age)p(t)\}$	440.0964	34.74	27	382.699
$\{\varphi(t*age)p(\cdot)\}$	429.6837	45.15	19	390.006
$\{\varphi(t+age)p(t)\}$	429.6827	45.15	19	390.005
$\{\varphi(t+age)p(\cdot)\}$	420.0901	54.74	11	397.517



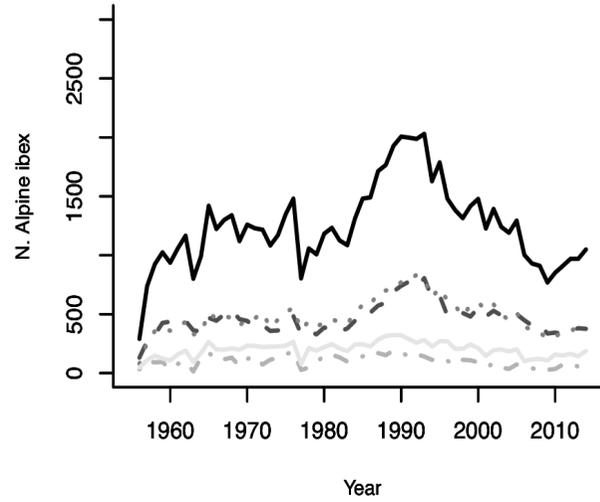


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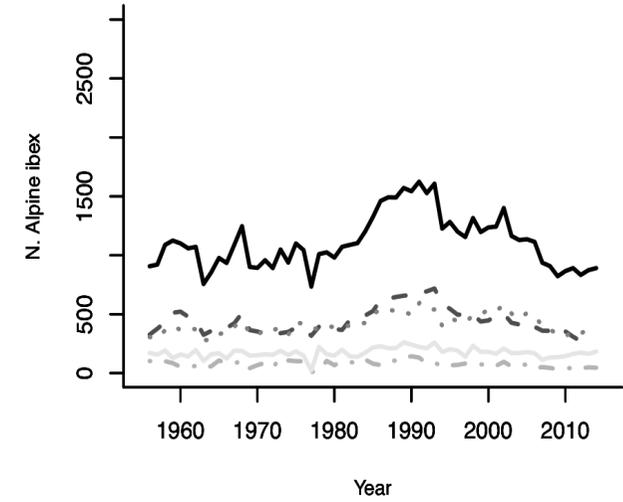
PNGP totale



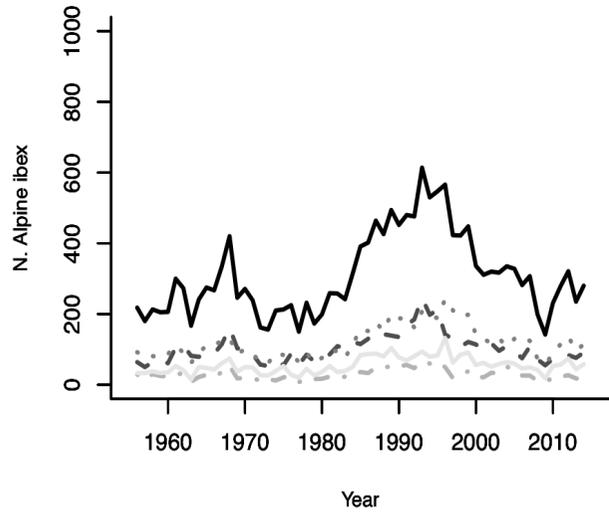
Valsavarenche



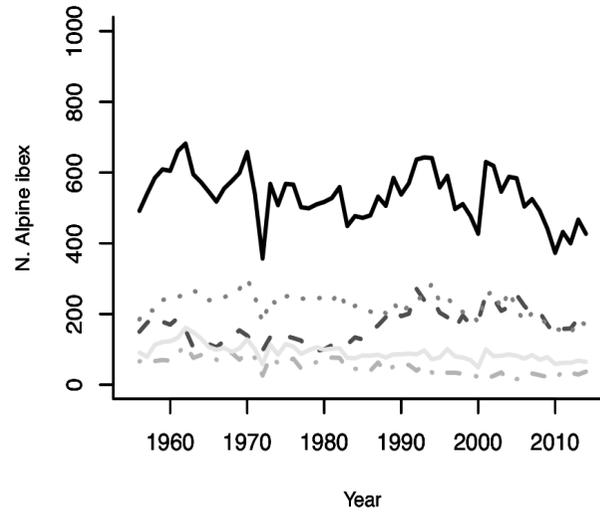
Valle di Cogne



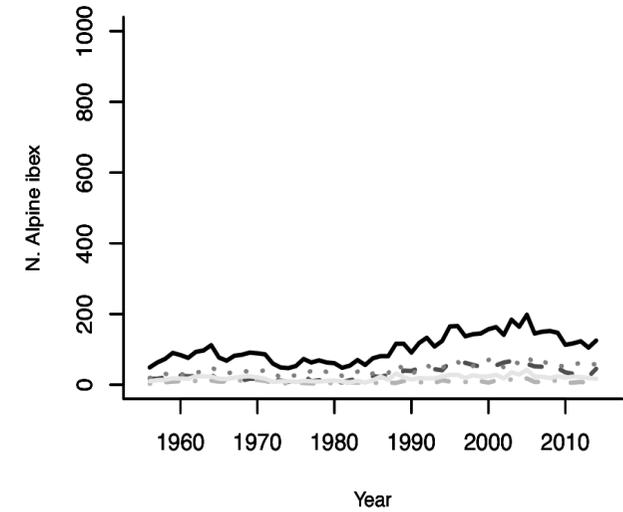
Val di Rhemes



Valle Orco



Val Soana



STAMBECCO

Cherato-congiuntivite infettiva

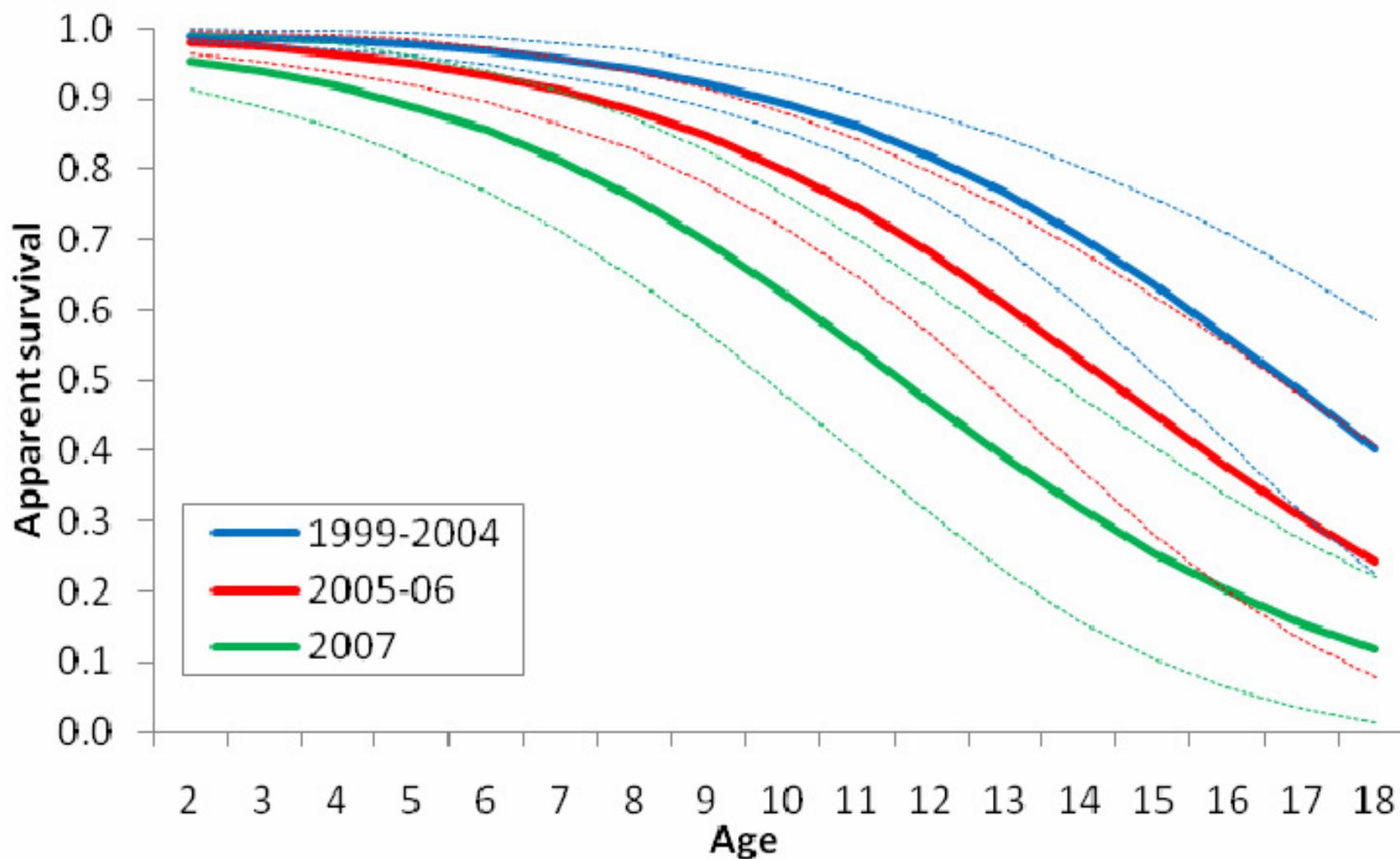


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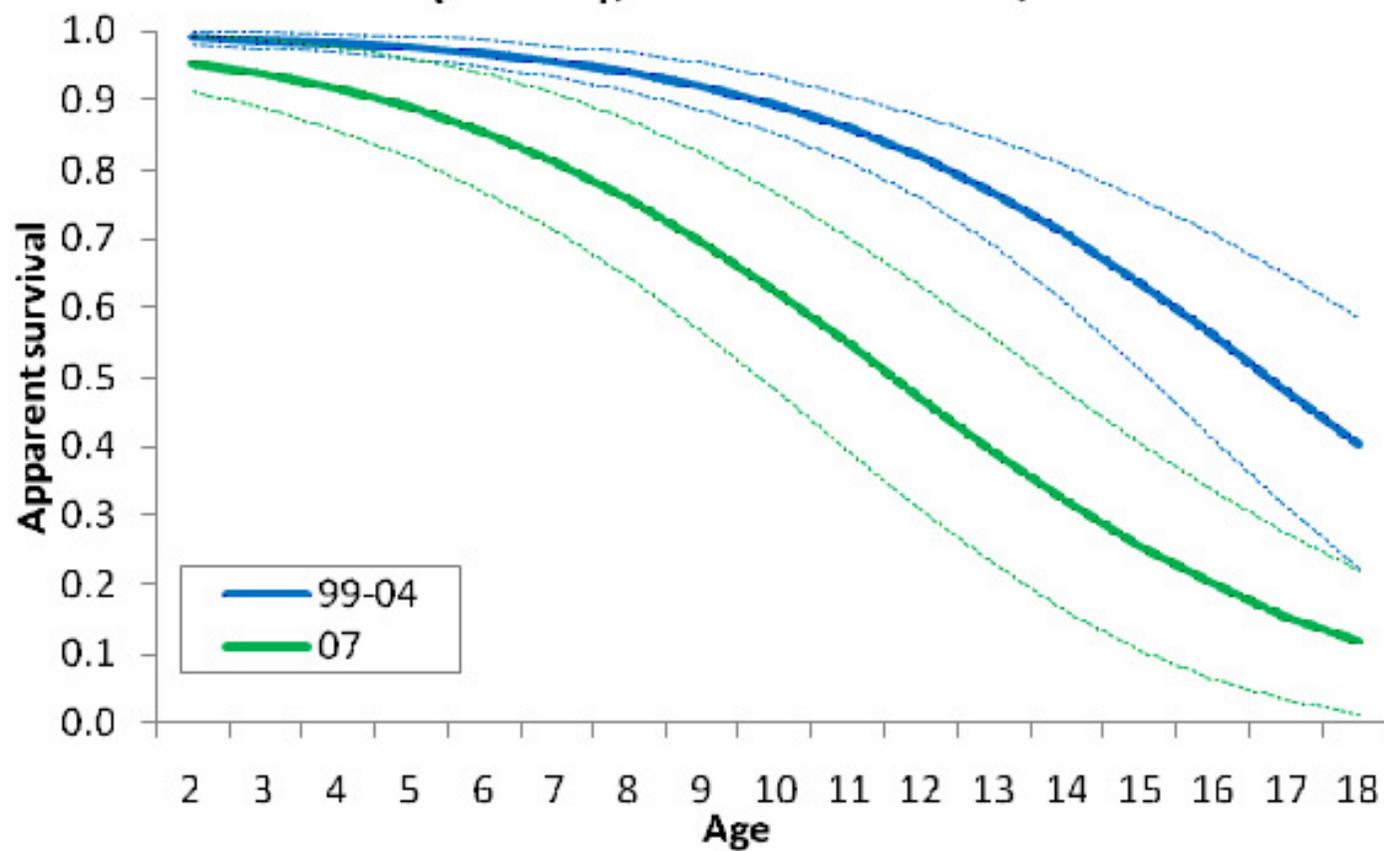


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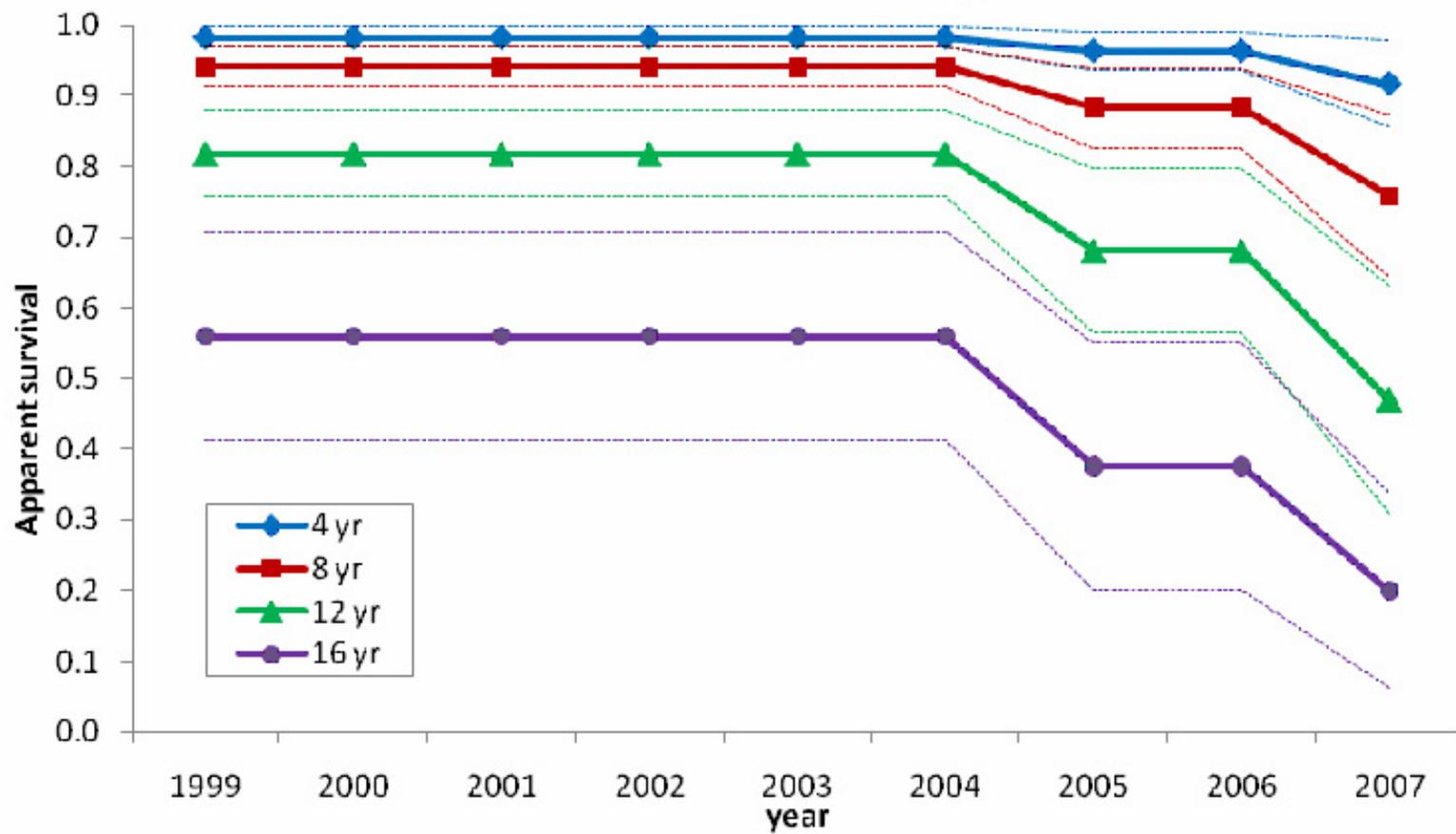
Survival (95%CI), Levionaz males, 1999-2007



Survival (95%CI), Levionaz males, 1999-2007



Survival for 4 different ages



categorie IUCN



2 “colli di bottiglia”
inizi 19th secolo
Il guerra mondiale

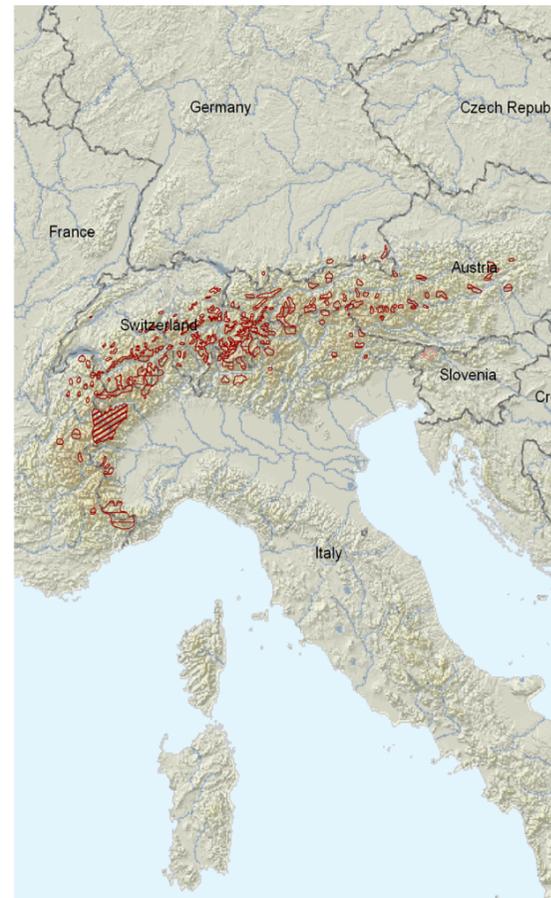
variabilità genetica molto bassa

crash di alcune popolazioni
2435 individui nel PNGP (anno 2010)

rogna sarcoptica



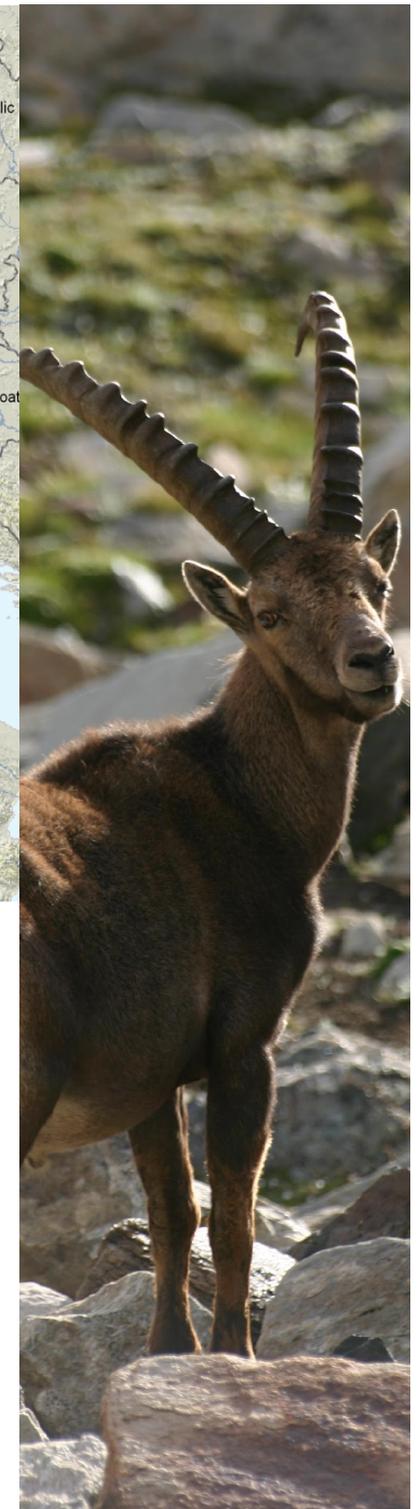
Esigenza di una conoscenza
più approfondita dello status
della specie



Capra ibex

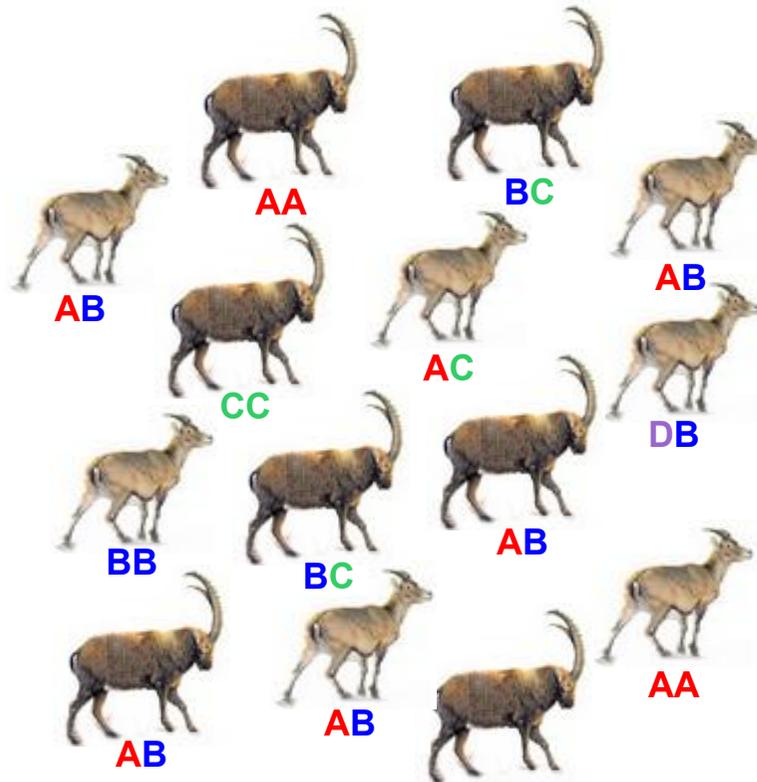
range type

- native (resident)
 - native (breeding)
 - native (non breeding)
 - reintroduced
 - introduced
 - origin uncertain
 - possibly extinct
 - extinct
 - national boundaries
 - subnational boundaries
 - lakes, rivers, canals
 - salt pans, intermittent rivers
- data source:
IUCN (International Union for Conservation of Nature)



Effetti genetici di un “collo di bottiglia”

- diminuzione del numero di effettivi della popolazione
- deriva genetica casuale
- perdita permanente di alleli

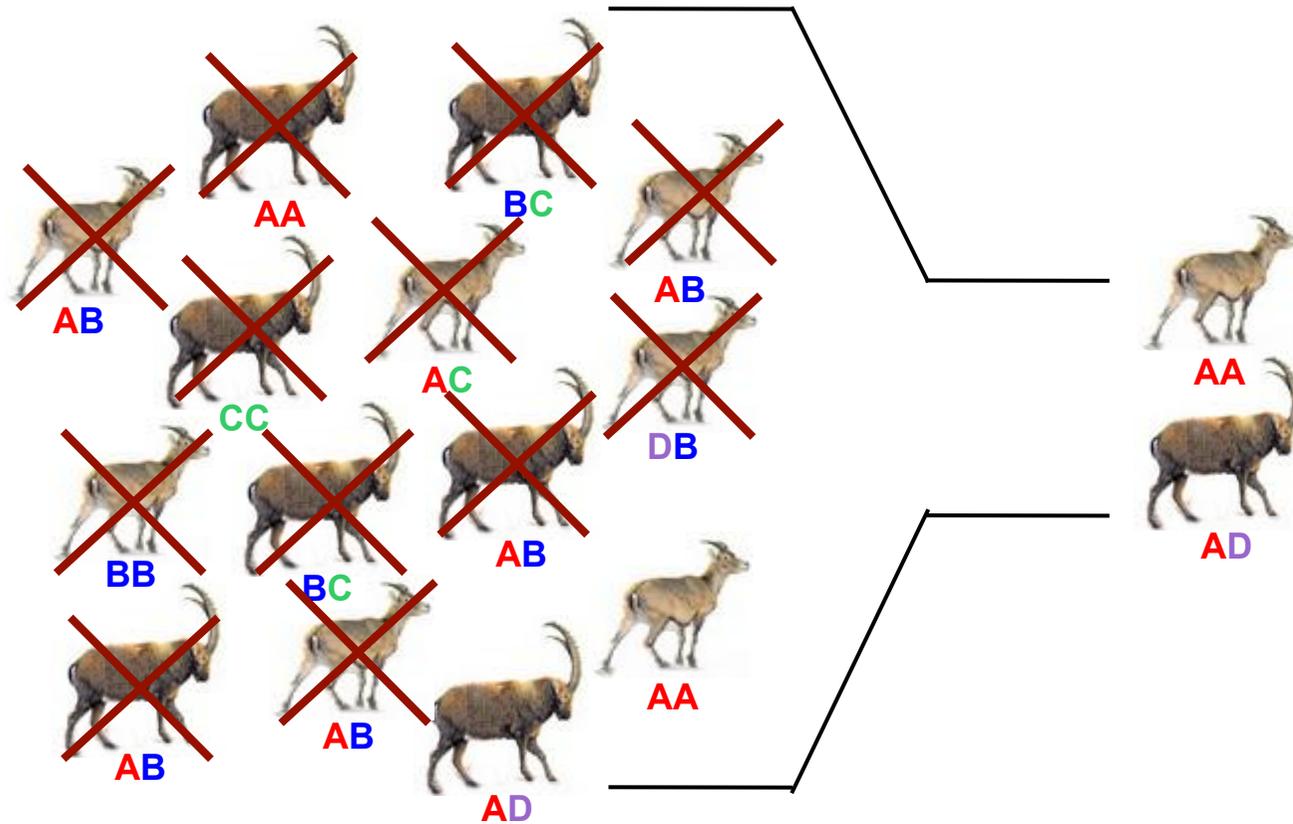


AD

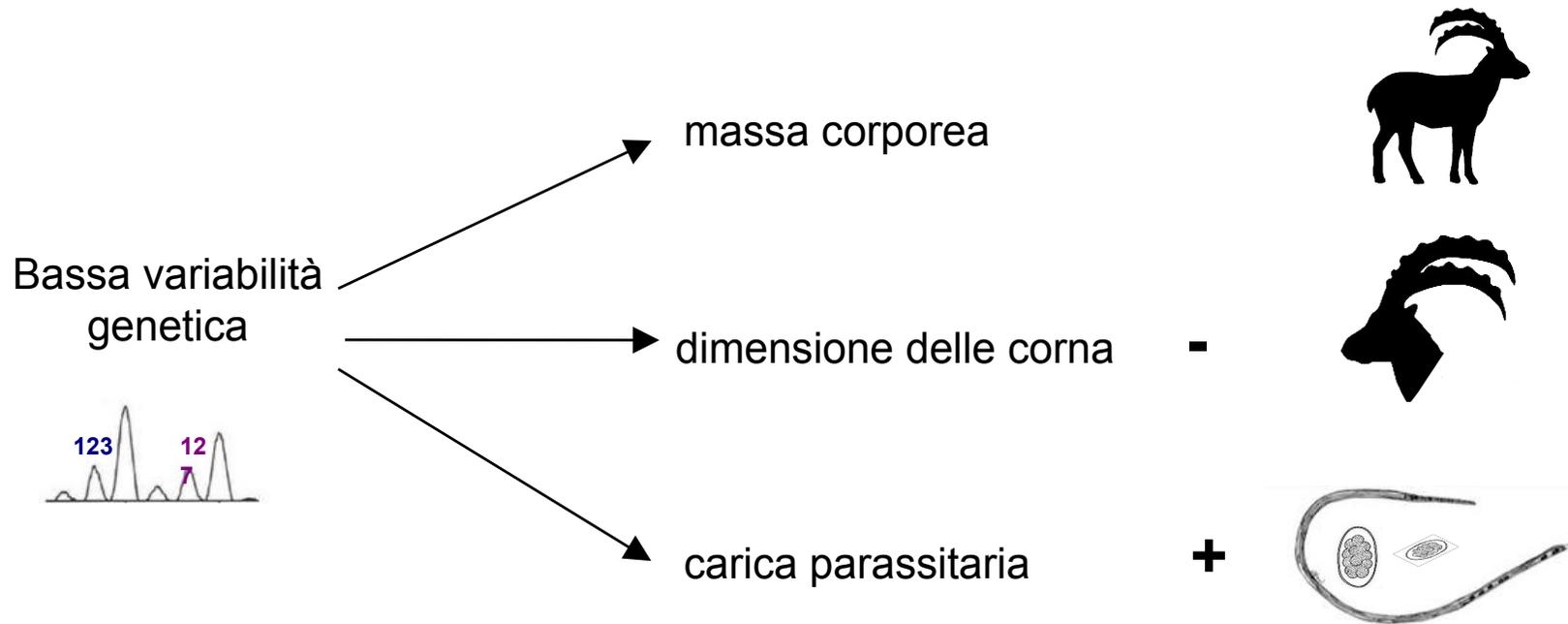


Effetti genetici di un “collo di bottiglia”

- diminuzione del numero di effettivi della popolazione
- deriva genetica casuale
- perdita permanente di alleli



Effetti della bassa variabilità genetica nella popolazione del PNGP



Rischi per la specie

Diminuzione del potenziale adattativo

Diminuzione della resistenza a malattie

Depressione da inbreeding



1) Correlation between heterozygosity and fitness traits

Full model:

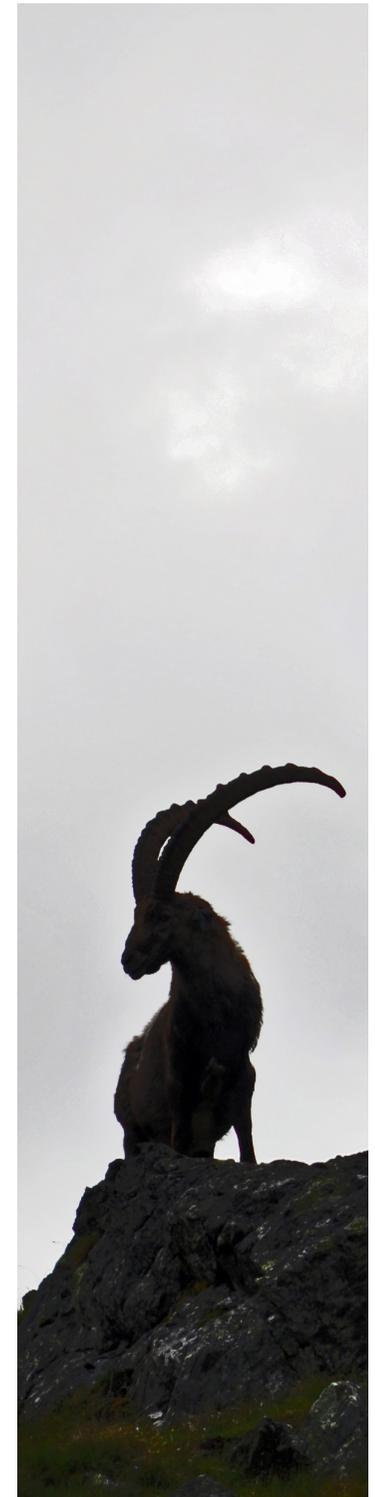
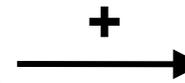
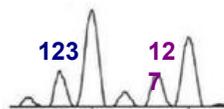
BODY MASS ~ MLH + Age + Age² + Age*MLH, random=id, random=year

Components of the model	df	log likelihood	AICc	Δ AICc	Weight
Age + Age ² + MLH	7	-227.18	468.67	0.00	0.87
Age + Age ² + MLH + Age*MLH	8	-228.06	472.52	3.85	0.13
Age + Age ²	6	-238.27	488.75	20.08	0.00

Model averaged coefficients ($\beta \pm$ s.e.)

MLH = 0.043 ± 0.058

Age*MLH = -0.060 ± 0.053



1) Correlation between heterozygosity and fitness traits

Full model:

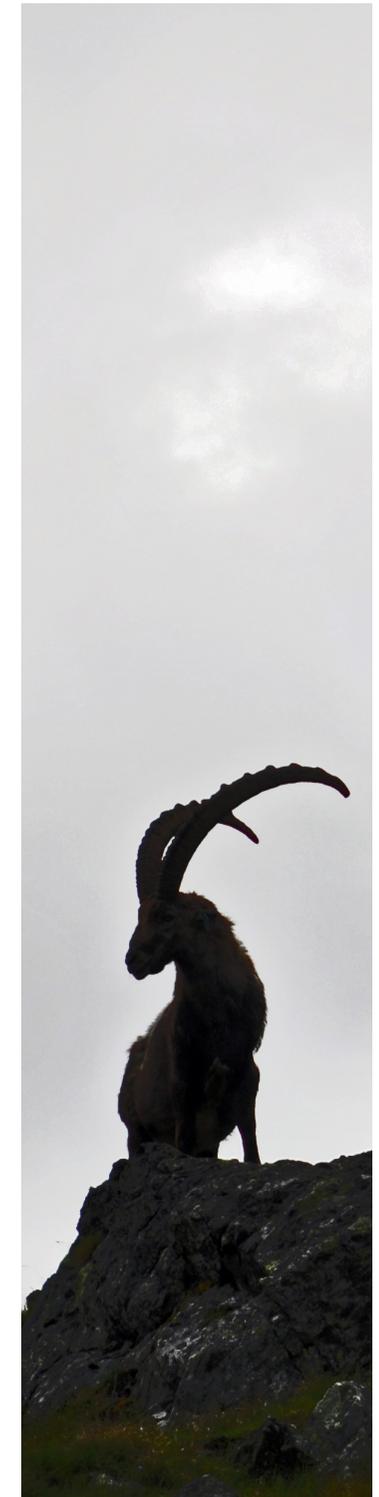
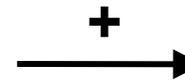
HORN GROWTH ~ MLH + Age + Age² + Age*MLH, random=id, random=year

Components of the model	df	log likelihood	AICc	Δ AICc	Weight
Age + Age ² + MLH	7	-989.28	1992.7	0.00	0.81
Age + Age ² + MLH + Age*MLH	8	-989.71	1995.59	2.88	0.19
Age + MLH	6	-1006.6	2025.29	32.59	0.00

Model averaged coefficients ($\beta \pm$ s.e.)

MLH = 0.080 \pm 0.040

Age*MLH = -0.067 \pm 0.033



1) Correlation between heterozygosity and fitness traits

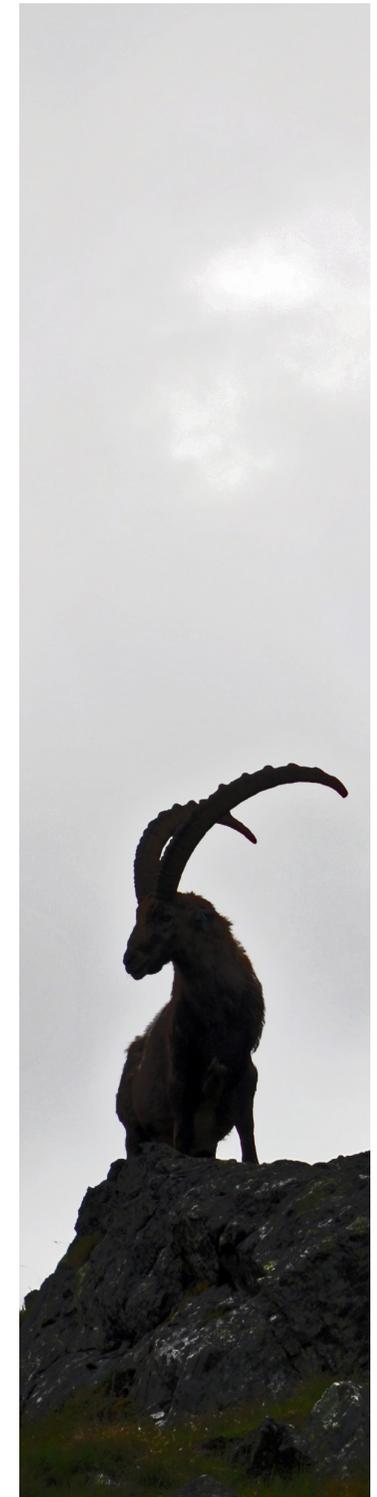
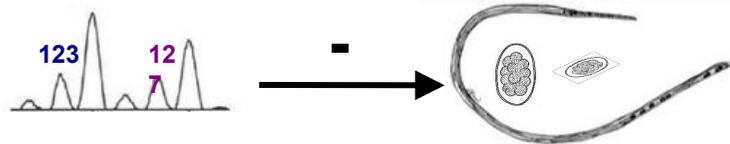
Full model:

FEC ~ MLH + Age + Age*MLH, random=id, random=year

Components of the model	df	log likelihood	AICc	Δ AICc	Weight
Age + MLH	6	-591.49	1195.16	0.00	0.95
Age + MLH + Age*MLH	7	-593.43	1201.1	5.94	0.05
MLH	5	-610.88	1231.89	36.73	0.00

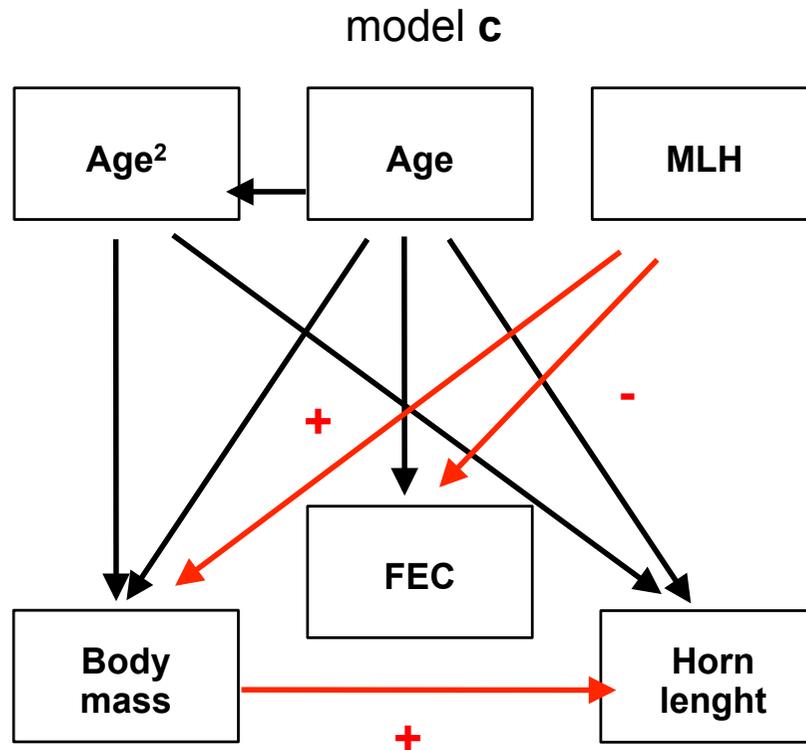
Model averaged coefficients ($\beta \pm$ s.e.)

MLH = -0.087 \pm 0.053

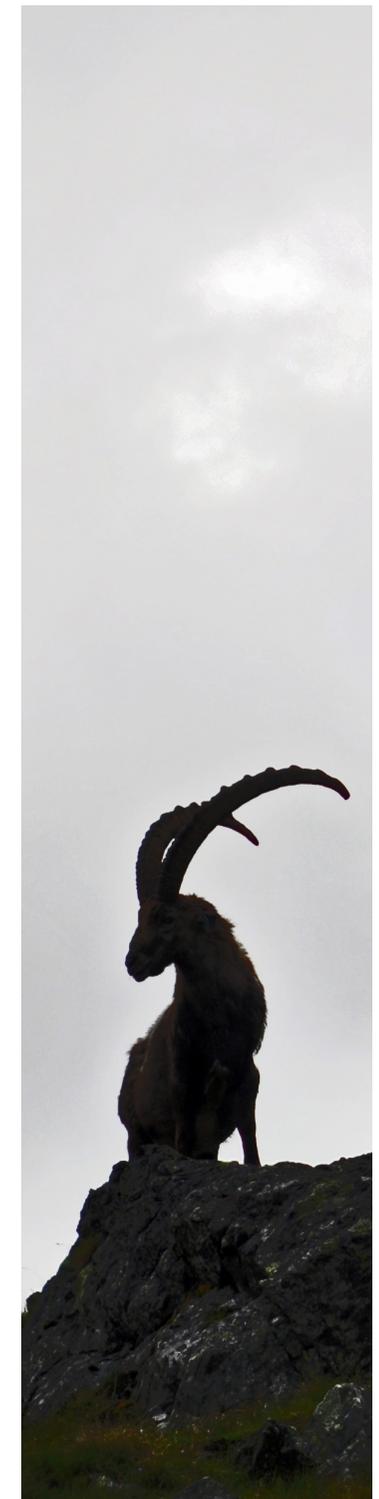


2) confirmatory path analysis

cause-effect relationship between heterozygosity and fitness traits



model	k	C	p-value	decision
model a	6	42.07	0.00	rejected
model b	5	18.95	0.04	rejected
model c	6	19.09	0.09	accepted

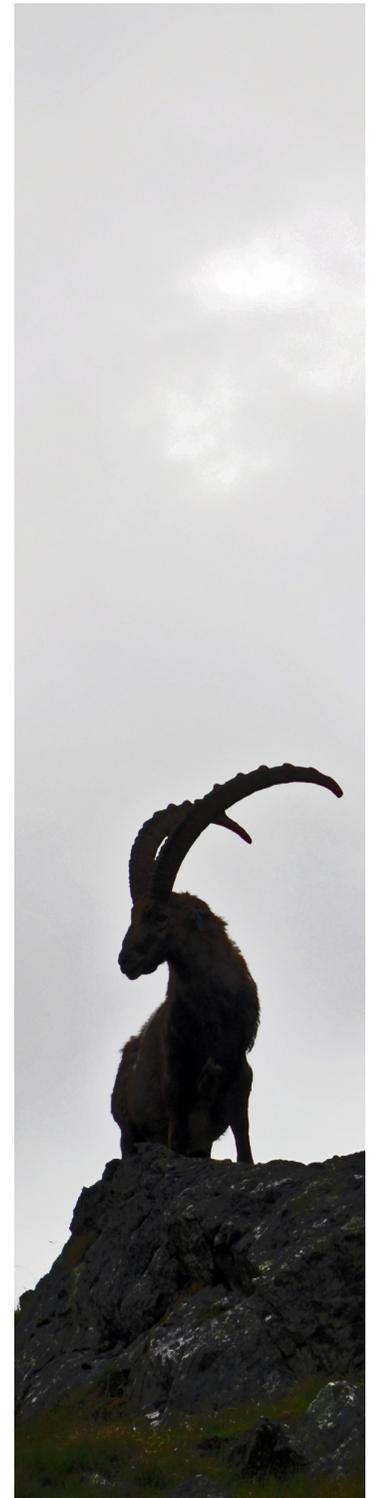


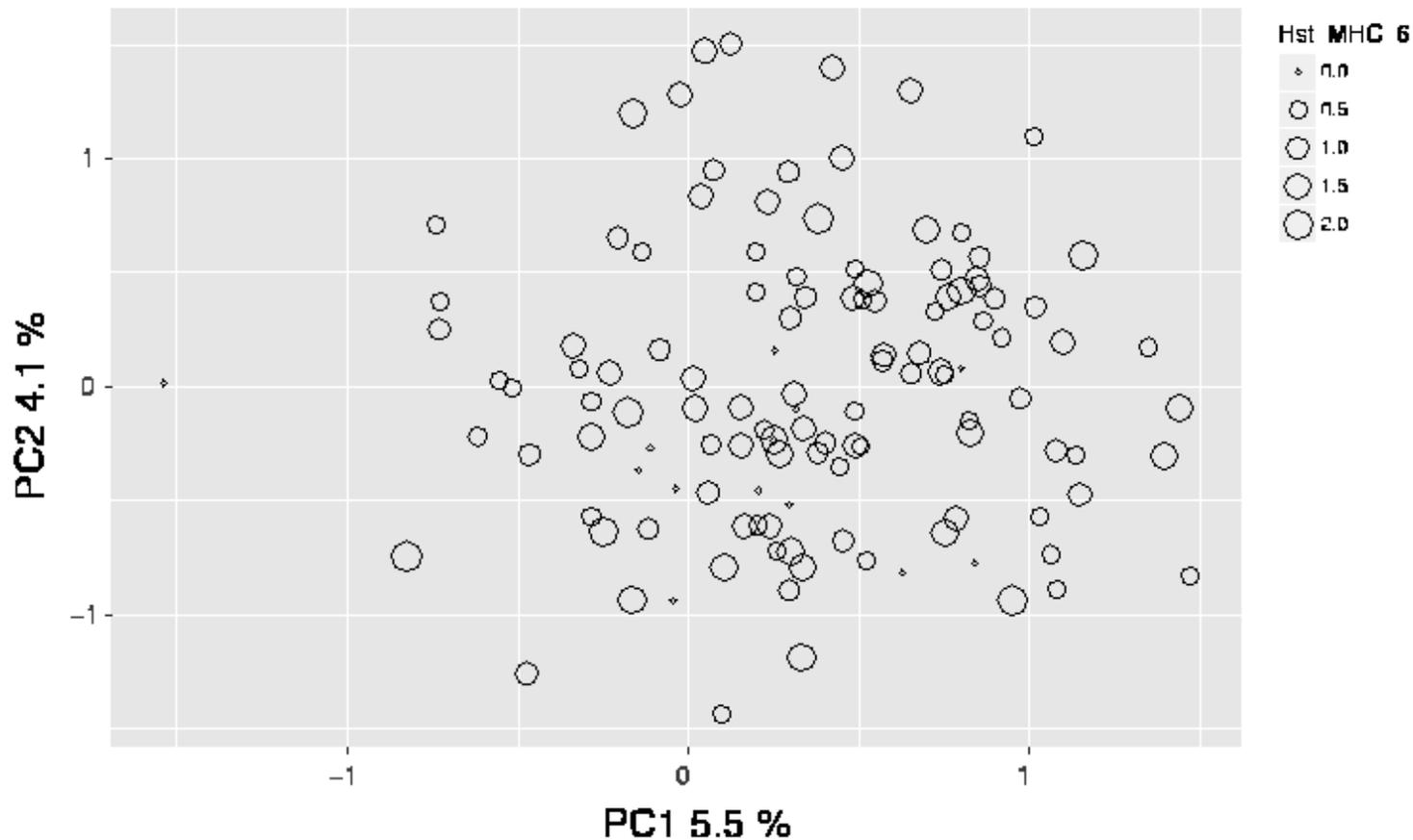
Relazione tra MHL e IKC

A = Stambecchi con sintomi di IKC

B = Stambecchi senza sintomi di IKC

?





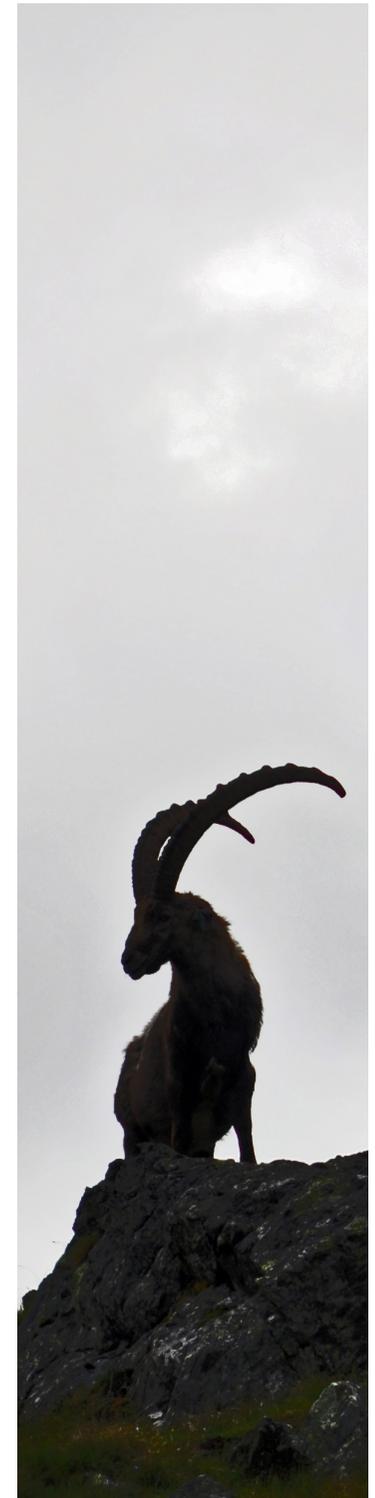
Principle component analysis based on 37 microsatellites of the Gran Paradiso individuals used for the heterozygosity fitness correlations. Each circle represents an individual and the size of the circle shows its multilocus heterozygosity at the MHC markers.

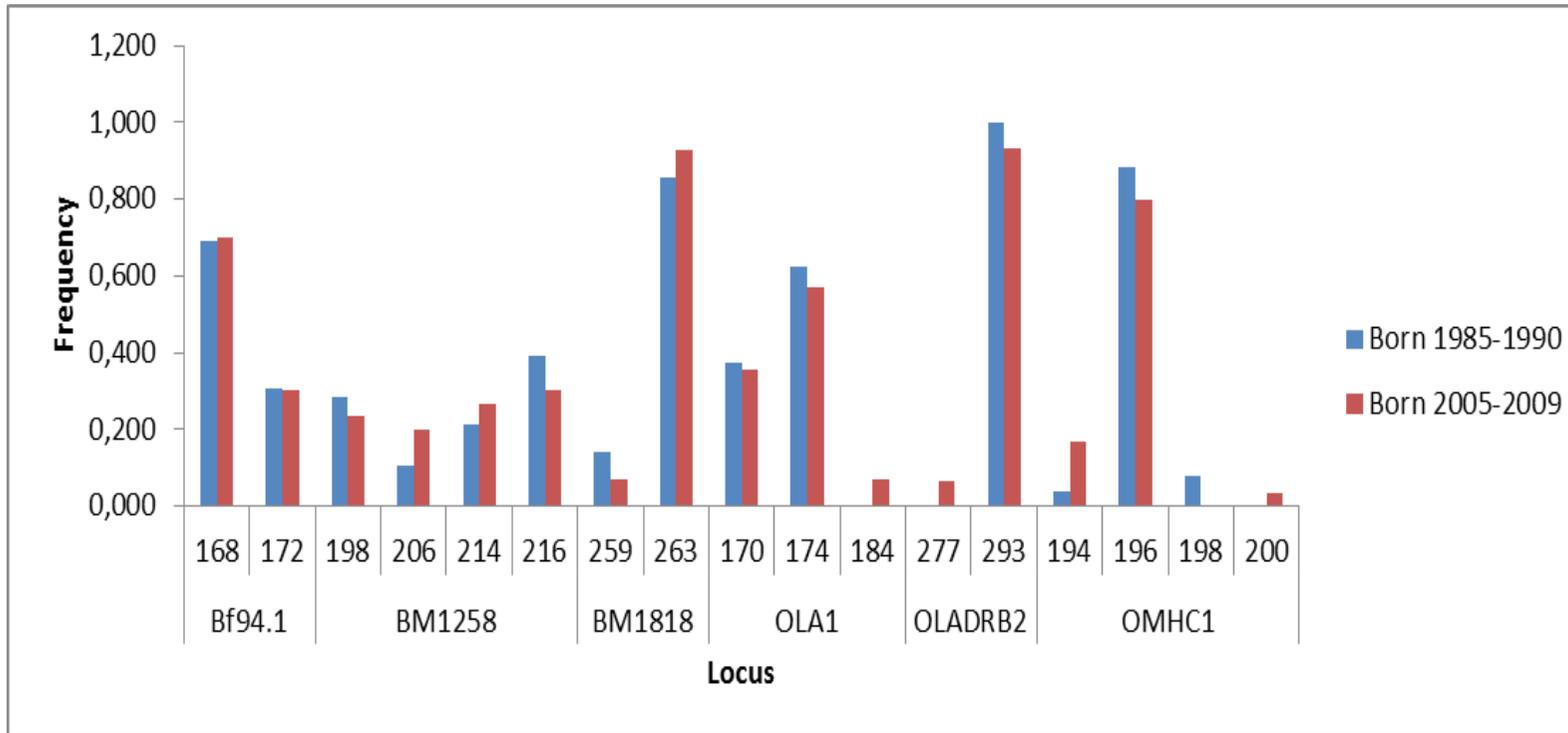
Heterozygosity-fitness correlation at the major histocompatibility complex despite low variation in Alpine ibex (*Capra ibex*)

(Brambilla et al., in prep.)

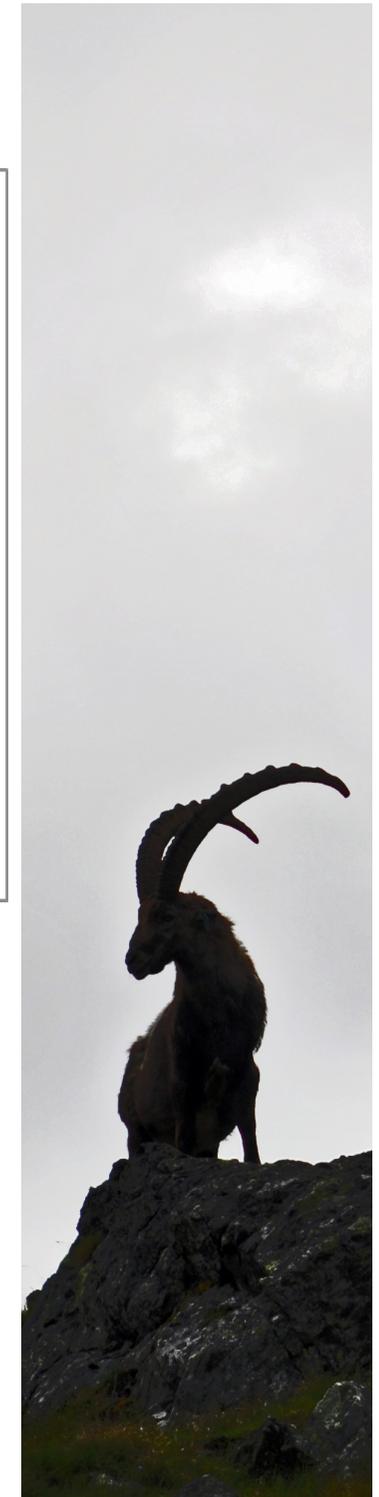


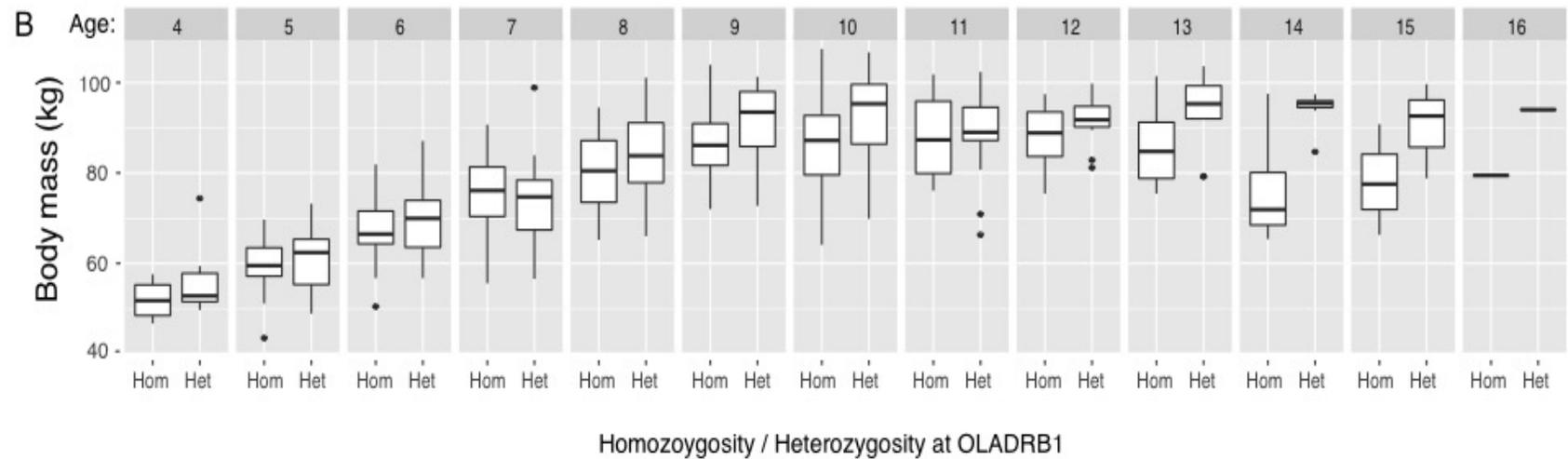
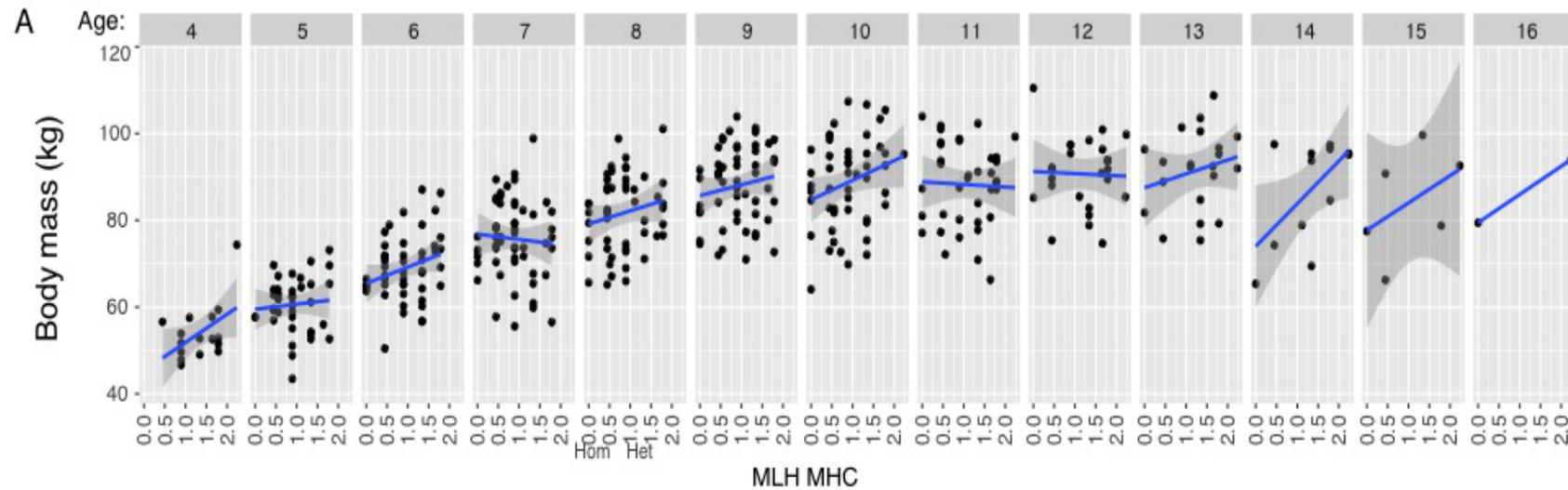
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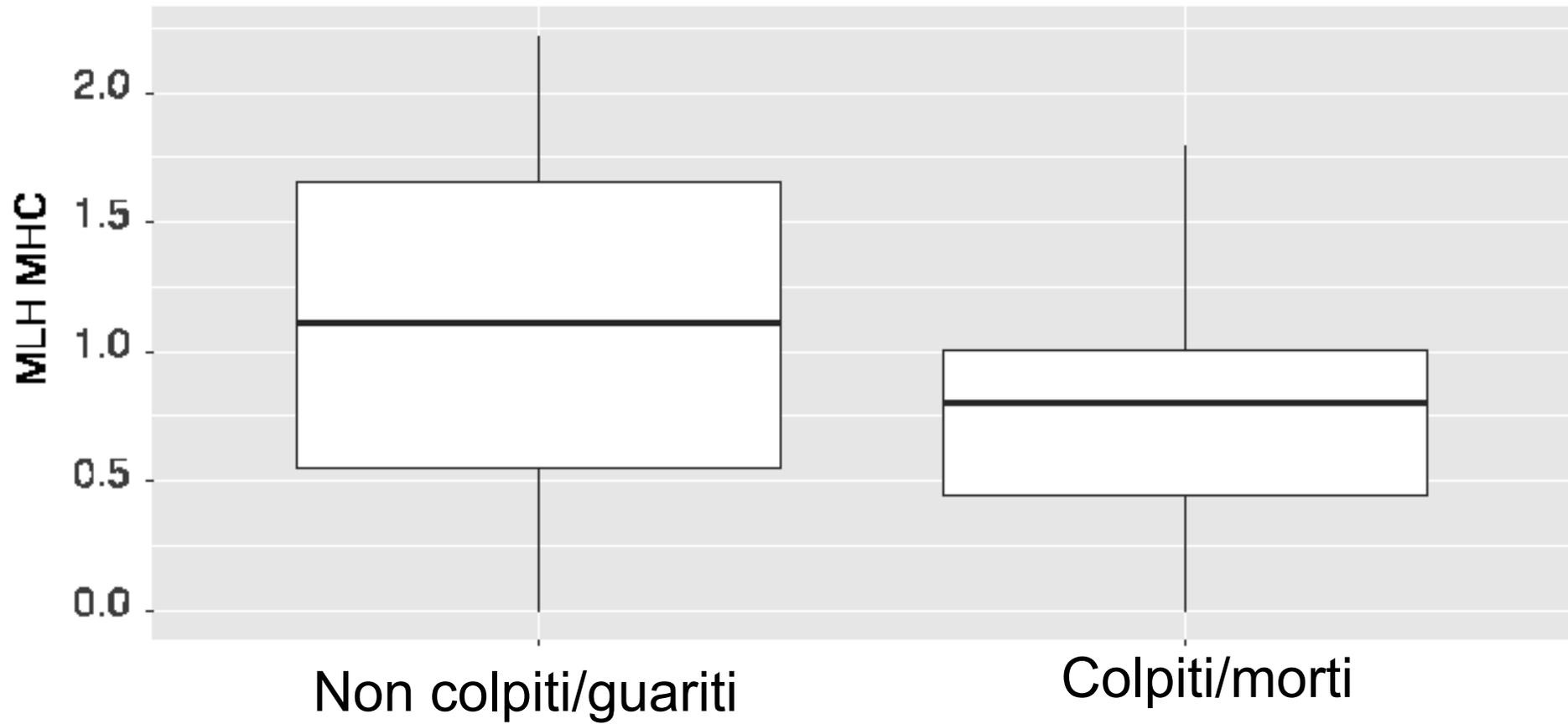
Allele frequencies of all six MHC markers calculated for two subsets of individuals. N=15 individuals born between 1985 and 1990 and N=15 individuals born between 2005 and 2009.





A) Correlation between body mass and MLH MHC, each plot represents body mass at a different age (from age 4 to age 15). **B)** Boxplots of body mass and heterozygosity of OLADRB1. Each plot represents body mass at a different age (from age 4 to age 15).





Relazione tra MHL-MHC e IKC





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Grazie!