

# Esercitazione N° 2: Ibridazione interspecifica

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**Che cos'è una specie?**

# Specie

Insieme di popolazioni di individui interfecondi, separato da altri insiemi ≈ ad opera di una **barriera riproduttiva**  
es. *Rupicapra rupicapra* (camoscio alpino)



# Specie

Ma sull'Appennino ci sono camosci che presentano un aspetto fenotipico differente...





RCI

## Specie

Most authors, on the base of significant differences among them, give the Alpine and the Abruzzo chamois the status of separate species, disregarding their interbreeding

In effetti, ciò che conta non è il fatto che due taxa siano potenzialmente interfecondi, ma che non ibridino in simpatria

Che cosa vuol dire significativamente diversi?

# Differenze fenotipiche

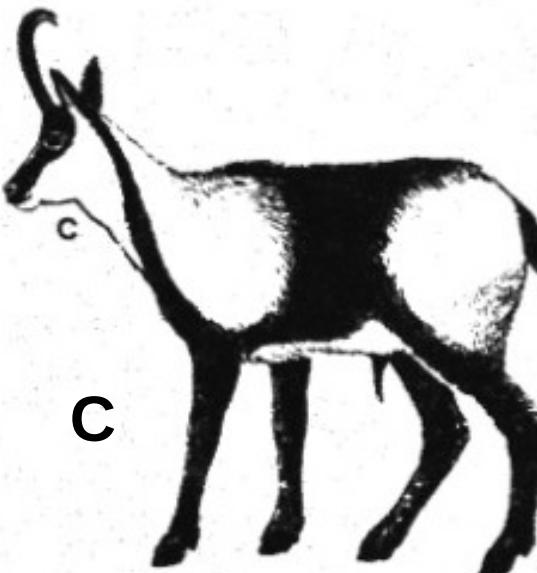
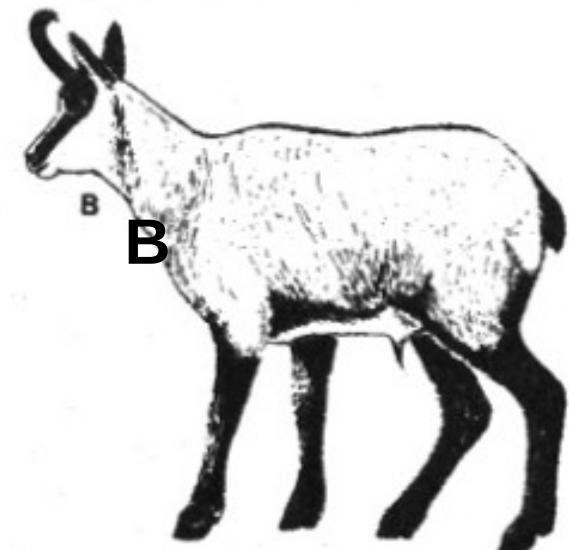
Coat patterns of the Alpine (above: *R. r. rupicapra*) and (below: *R. p. ornata*) chamois. All North-eastern populations show a close resemblance to the Alpine chamois (A: winter; B: summer). On the other hand, horn and body sizes increase from west to east in the South-western species, but no variation occurs in the distinctive coat pattern (C: winter; D: summer).  
Da Lovari, Sandro. "Behavioural Repertoire of the Abruzzo Chamois, *Rupicapra pyrenaica ornata* Neumann, 1899 (Artiodactyla: Bovidae) I." (1985).

INVERNO

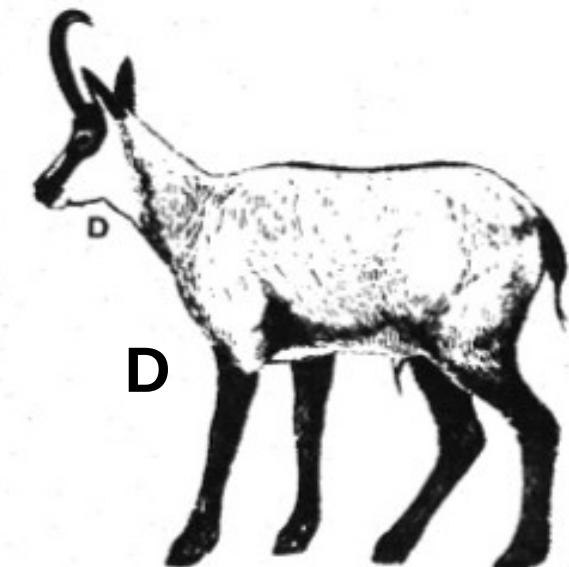


*Rupicapra rupicapra*

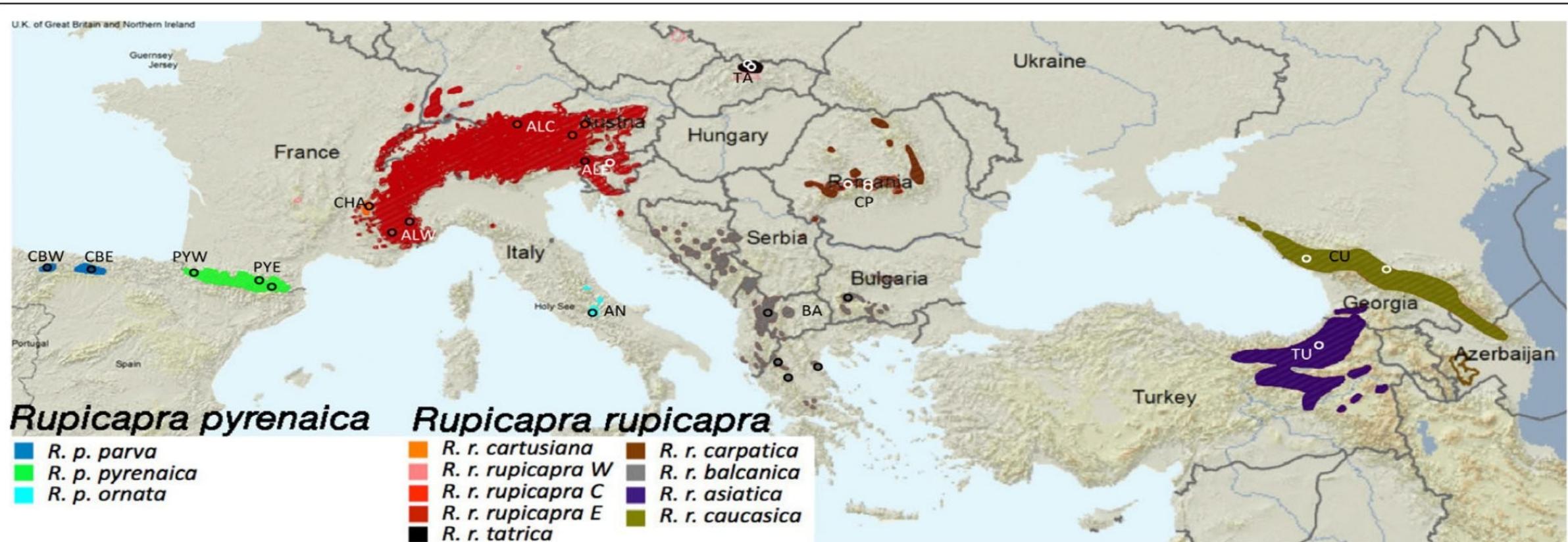
ESTATE



*Rupicapra pyrenaica ornata*



# Differenze biogeografiche



**Figure 1 Geographic distribution of the subspecies of the genus *Rupicapra*.** Sampling sites are indicated by circles and labelled with a letter code. The map was modified from the distribution map on the IUCN Red List [54].

# Differenze etologiche

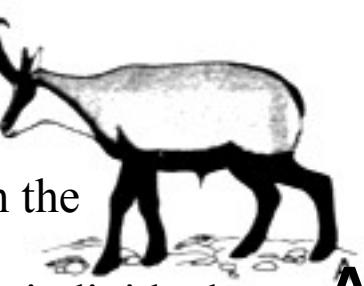
COMPORTAMENTO	<i>Rupicapra rupicapra</i>	<i>Rupicapra pyrenaica</i>	
Approach	+	+	
Body-head shake	+	+	
Butt	+	+	
Chase	+	+	
Conflict posture	-	+	
Flank stroke	-	+	
Gambol	+	+	
Head-down static	+	+	
Head-down dynamic	-	+	
Head up	+	+	
Hherding	+	-	
Hook	+	+	
Hop	+	+	
Horning (veget.)	+	+	

Comparison of the behaviour patterns recorded for the North-eastern chamois and the South-western chamois (original and from literature).  
+: present; (+): rare; ?: Dubious; -: absent.

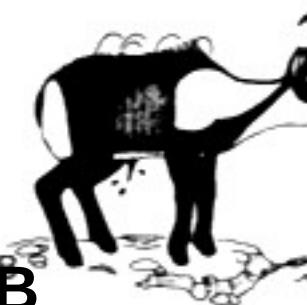
# Differenze etologiche

COMPORTAMENTO	<i>Rupicapra rupicapra</i>	<i>Rupicapra pyrenaica</i>
Kick	(+)	-
Lip-curl	+	+
Low-stretch	+	+
Marking (veget.)	+	+
Mock-suck	-	+
Naso-genital contact	(+)	(+)
Naso-nasal contact	(+)	+
Neck fight	+	(+)
Neck-up	+	+
Penile display	+	+
Rush	+	+
Side display	+	+
Stare	?	+
Urinating in female posture by males	+	+

**Approach:** visual, mild threat. Direct form of aggressive behaviour. The sender walks straight towards the receiver with the tail pressed to the rump and the ears turned backwards. Dominant individuals to subordinates, displaced from food sources or resting sites. Both sexes.



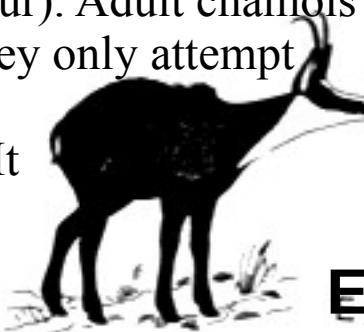
**A**



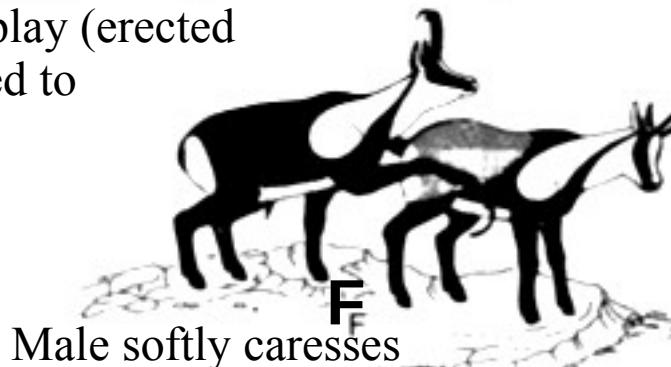
**B**



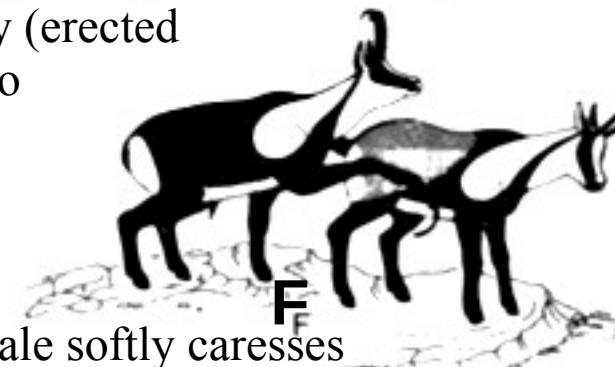
**C**



**D**



**E**



**F**

**Butt:** play in kids, visual threat in adults (direct aggressive behaviour). Adult chamois rarely clash; in most instances they only attempt to. Both sexes.

**Conflict posture:** visual display. It contains elements found in submissive behaviour (stretched head and neck, ears oriented forwards) and in dominance display (erected mane along backbone, tail pressed to hindquarters, hunched back).

Females only.

**Flank stroke:**

Visual (tactile) courtship pattern. Male softly caresses the female's hindquarters once or twice.

**Body-head shake:**

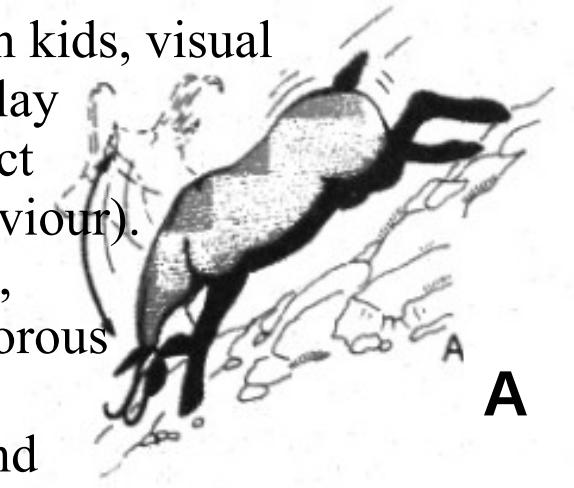
Visual/olfactory dominance display. Indirect form of aggressive behaviour.

The sender starts by shaking the body slowly, but the movement accelerates during performance. Urine may be eliminated, thus impregnating the flank pelage. A head-shake often follows. Males.

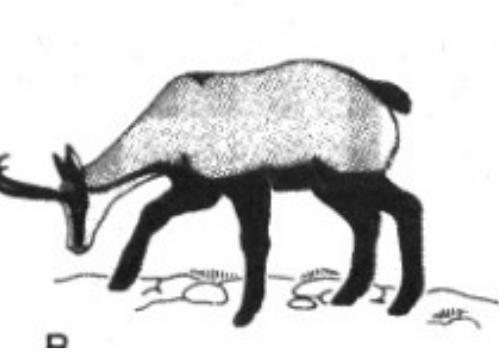
**Chase:** visual dominance display (aggressive behaviour). The pursuer and the chased individual may switch roles once or twice during their performance. In most cases it ends with after a run down- or up-hill. If the pursuer catches up (raggiunge) with the chased chamois, it may attempt to hook the latter in its abdomen, groin (inguine) and hind limbs. Both sexes.

**A:** approach; **B** Body-head shake (shaded area indicates the part of the body which becomes drenched with urine); **C:** butt; **D:** chase; **E:** conflict posture; **F:** flank stroke.

**Gambol:** play in kids, visual dominance display in adults (indirect aggressive behaviour). A run down-hill, inclusive of vigorous head nodding (oscillazione) and throwing up the hind quarters. Both sexes.



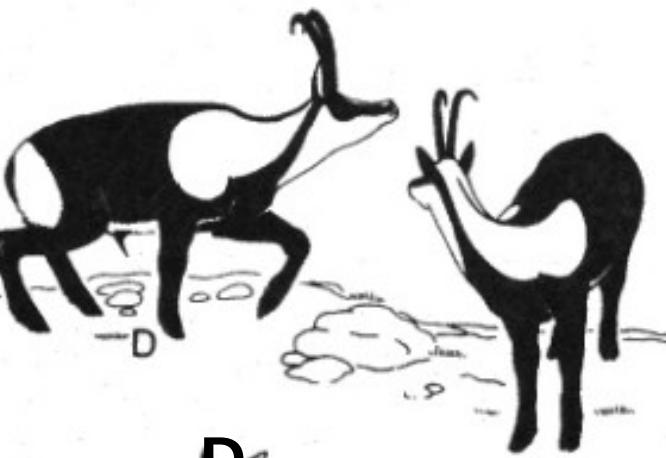
**A**



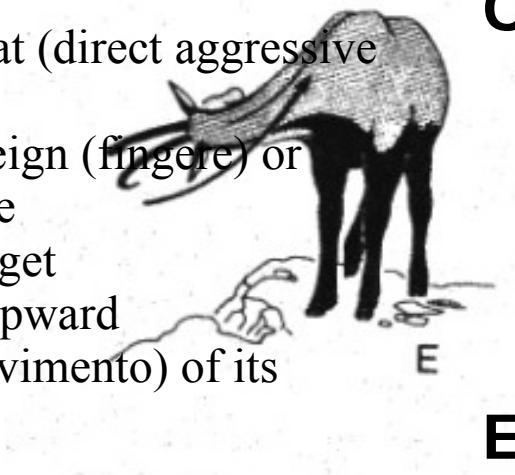
**B**



**C**



**D**



**E**

**Hook:** visual threat (direct aggressive behaviour). The sender may feign (fingere) or actually try to gore (incornare) the target individual by an upward sweep (rapido movimento) of its horns. Both sexes.



**F**

**Hop:** play behaviour of kids and, to a lesser extent, yearlings. The animal springs in the air, waving its legs and contorting energetically. Usually other kids and/or yearlings join in the play bout.

**Head-down:** **B:** static; **C:** **dynamic** visual threat (direct aggressive behaviour).

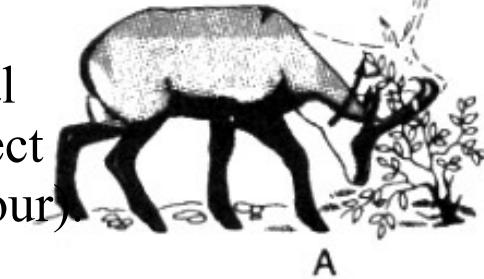
Head held lower than main body axes, ears turned backwards, tail pressed to the rump or half way (B). Both sexes.

**Head-up:** visual courtship pattern. Male approaches female with stiff and abrupt steps, uplifting its muzzle; especially common when females are in oestrus.

**A:** Gambol; **B:** Head-down static; **C:** Head-down dynamic; **D:** Head-up (male displaying on female on the right); **E:** Hook; **F:** Hop.

## **Horning:**

visual and perhaps olfactory dominance display, if performed in social interactions (indirect aggressive behaviour)



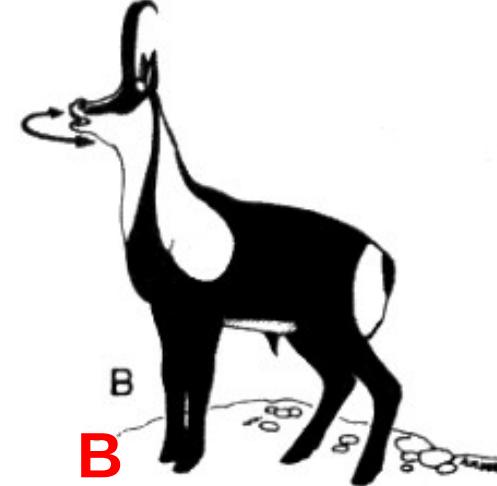
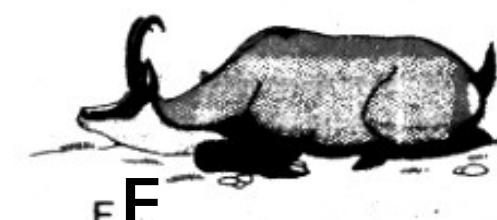
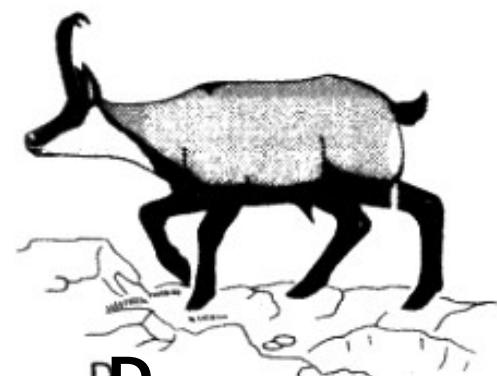
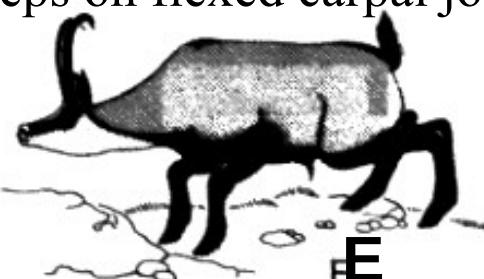
## The chamois

vigorously horns a bush or a low branch, every now and again sniffing at the horned vegetation, making conspicuous damages to the substratum. Both sexes.



## **Low-stretch:**

Visual submissive display performed by a subordinate to a dominant within each sex. The displaying animal faces the hindquarters of the dominant one, sometimes approaching the latter with quick steps on flexed carpal joints.



## **Lip-curl:**

Commonly shown during the courtship sequence. Male sniffs female's urine and subsequently curls its upper lip.

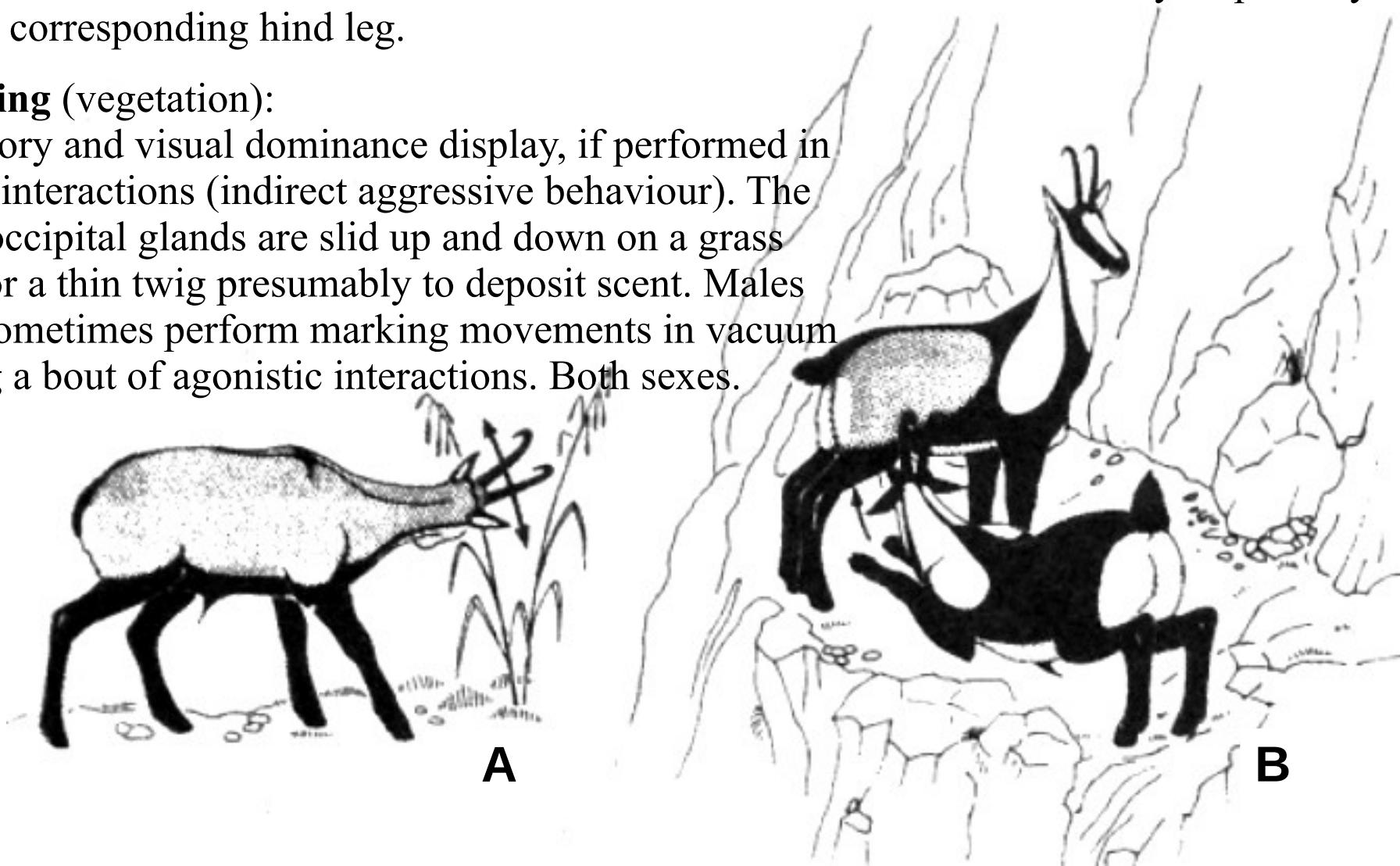
**A:** Horning (vegetation); **B:** Lip-curl; **C:** Low-stretch (mild); **D:** Low-stretch (medium); **E:** Low-stretch (intense); **F:** Low-stretch (extreme). Forelimbs may be outstretched in **E** and **F**.

## Mock-suck:

Visual (tactile) behaviour pattern, shown by males during courtship on the pick of the rut. The male, in low-stretch, approaches a female, squats with its forelimbs, inserts its muzzle under the female's udder area and delivers 2-3 blows like kids do to stimulate lactation. The female may respond by slightly lifting its corresponding hind leg.

## Marking (vegetation):

Olfactory and visual dominance display, if performed in social interactions (indirect aggressive behaviour). The supraoccipital glands are slid up and down on a grass stem or a thin twig presumably to deposit scent. Males may sometimes perform marking movements in vacuum during a bout of agonistic interactions. Both sexes.



A: Marking (vegetation); B: Mock-suck.



**Mount (copulative):**  
Copulative behaviour shown by adult male and females during the rut.



**Mount (non-copulative):**  
Non-copulative mounting is shown commonly by kids during play bouts, sometimes by yearlings as well.

**C**

**D**



**E**



**F**

### **Neck-fight:**

Play behaviour (kids, rarely yearlings). No real push seems to be exerted, an animal simply resting its neck on the other's neck, withers or even rump.

**C: Mount (copulative); D: Mount (non-copulative); E: Neck fight; F: Neck-up.**

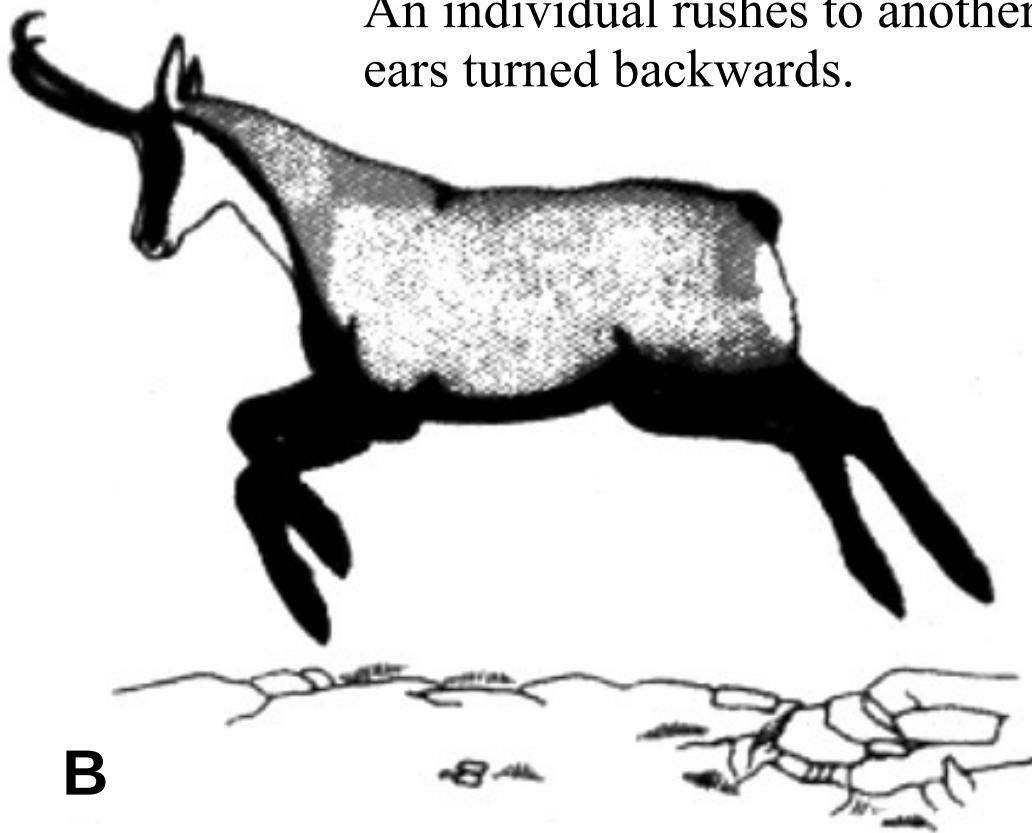
### **Neck-up:**

Visual dominance display (indirect aggressive behaviour). An individual stands on fairly (abbastanza, piuttosto, alquanto) stiff legs, sometimes moving slowly or else trotting towards the opponent along a tangential line. The head is held high; mane or withers and rear part of the backbone is fully erected; tail is pressed to the rump; mouth is often open. Males.

A: Penile display; B: Rush.



A



B

Rush:

Visual threat (direct aggressive behaviour). An individual rushes to another with its ears turned backwards.

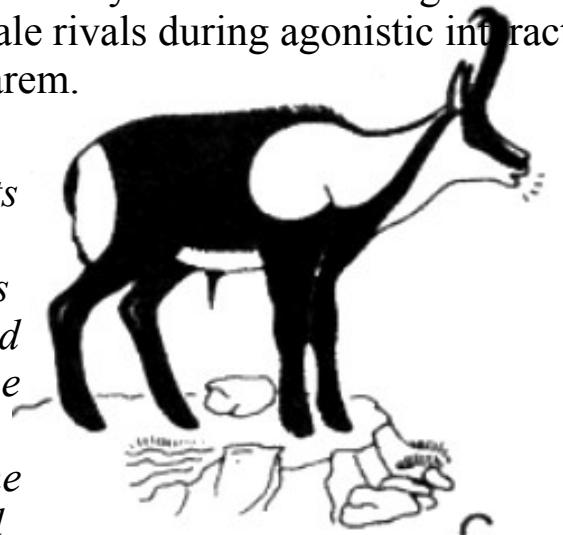
**Penile display:**

Visual (and olfactory) dominance display (indirect aggressive behaviour). The male squats slightly and unsheathes its penis. Ejaculation may also occur.

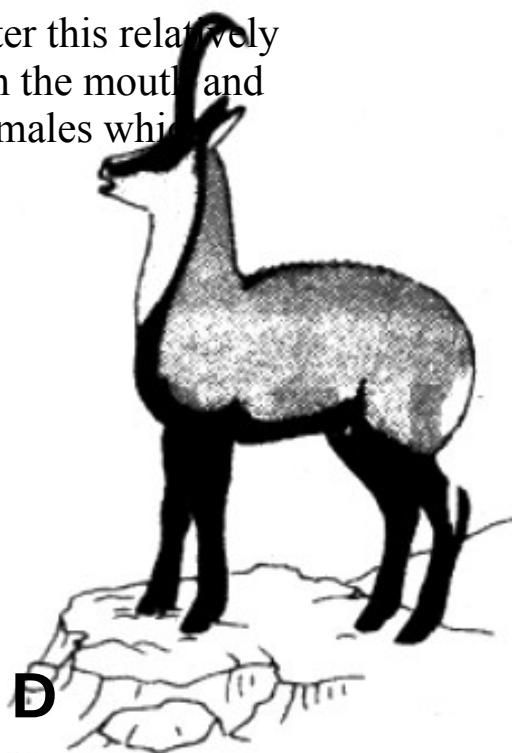
It is shown frontally by dominant individuals to male subordinates, whereas it is performed from behind to females during the rut. In the latter case, copulatory movements in vacuum may follow.

**Rut call:** Vocal dominance display. Rutting males quite often utter this relatively low pitched grunt. It may be emitted through the nose or through the mouth and is addressed to male rivals during agonistic interactions, or to females which try to leave the harem.

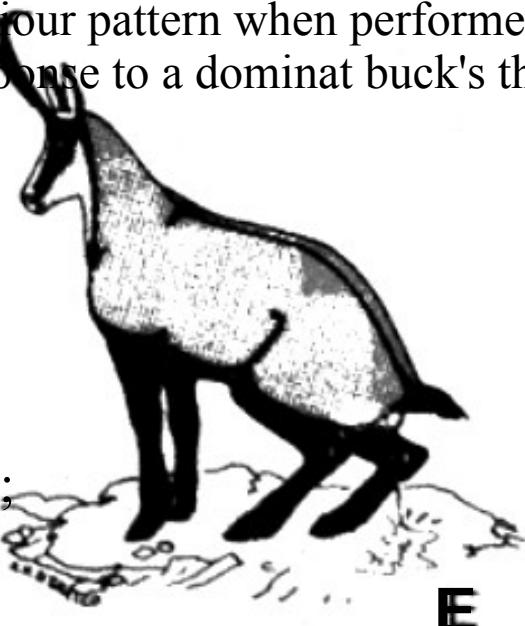
*It is uncertain whether the grunts sometimes uttered by females in side display and by males out of the rut, especially in late spring, are the same vocal signal.*



C



D



E



F

### Urinating (female posture):

Submissive behaviour pattern when performed by subordinate adult males in response to a dominant buck's threat.

### Side display:

Visual dominance display (indirect aggressive behaviour). An individual stands on stiffly stretched legs, broadside on; back is hunched; hair along backbone may be slightly erected; head is held high; mouth is usually open and closed intermittently; ears are drooping (pendenti) and turned backwards; tail is flat on the hindquarters. Sometimes a low pitch grunt may be uttered. It is usually performed by yearlings and up to class 4 females and by class 1 bucks.

### Urinating (male posture):

Visual dominance display when performed by dominant females to subordinate ones.

# Differenze genetiche

Il camoscio appenninico è più ≈ geneticamente a quello dei Pirenei (*Rupicapra pyrenaica*), di cui è considerato una sottospecie



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## Integrating phylogeographic patterns of microsatellite and mtDNA divergence to infer the evolutionary history of chamois (genus *Rupicapra*)

Research article | [Open access](#) | Published: 22 July 2010

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Quaternary Research

Volume 30, Issue 3, November 1988, Pages 339-349



# Systematics, phylogenetic relationships, and dispersal of the chamois (*Rupicapra* spp.)

Federico Masini, Sandro Lovari

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[https://doi.org/10.1016/0033-5894\(88\)90009-9](https://doi.org/10.1016/0033-5894(88)90009-9) ↗

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## Abstract

The Rupicaprini originated during the Miocene in Asia and dispersed during the late Miocene-early Pliocene, the Villafranchian, and the middle Pleistocene. *Rupicapra* and

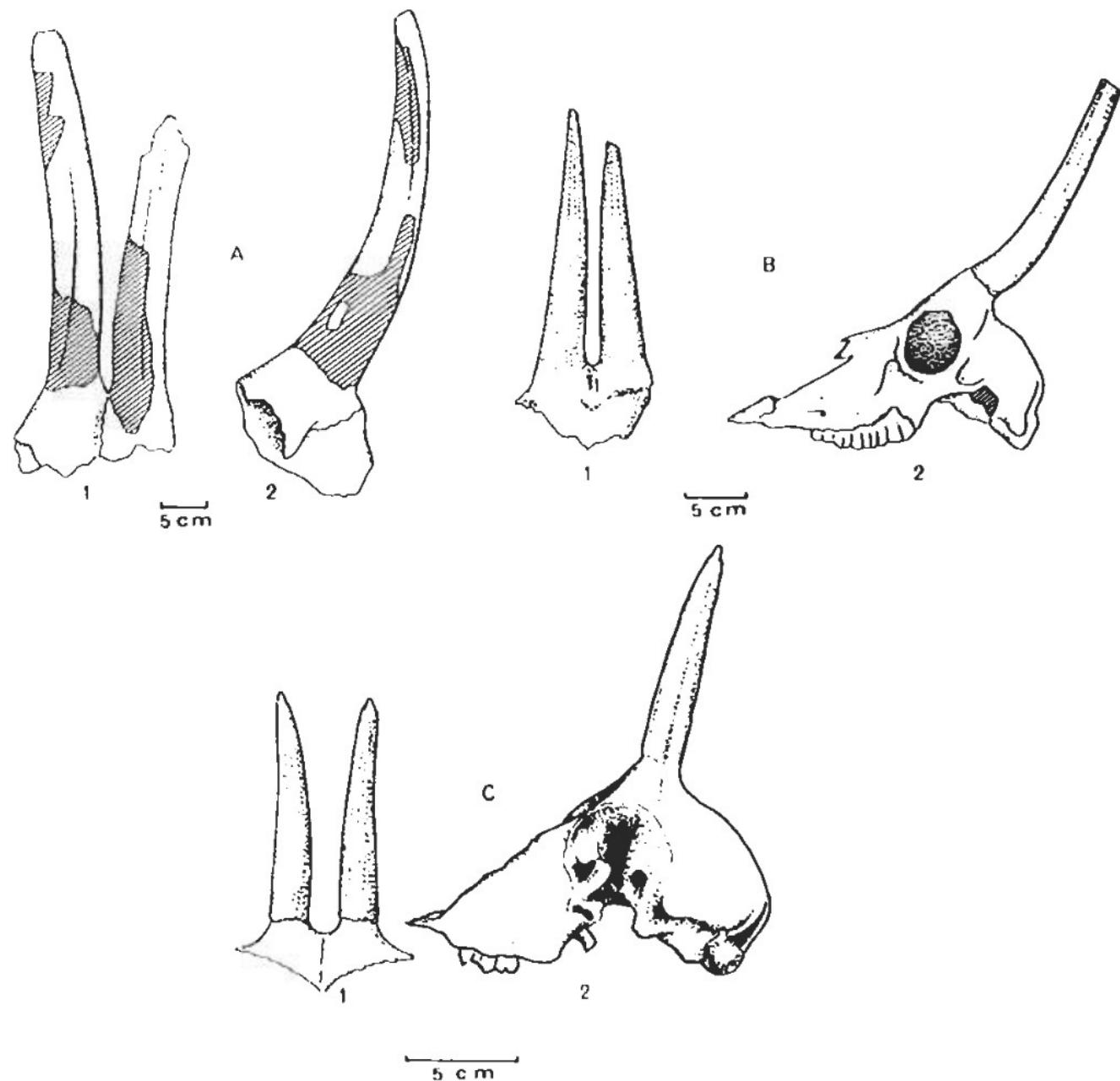
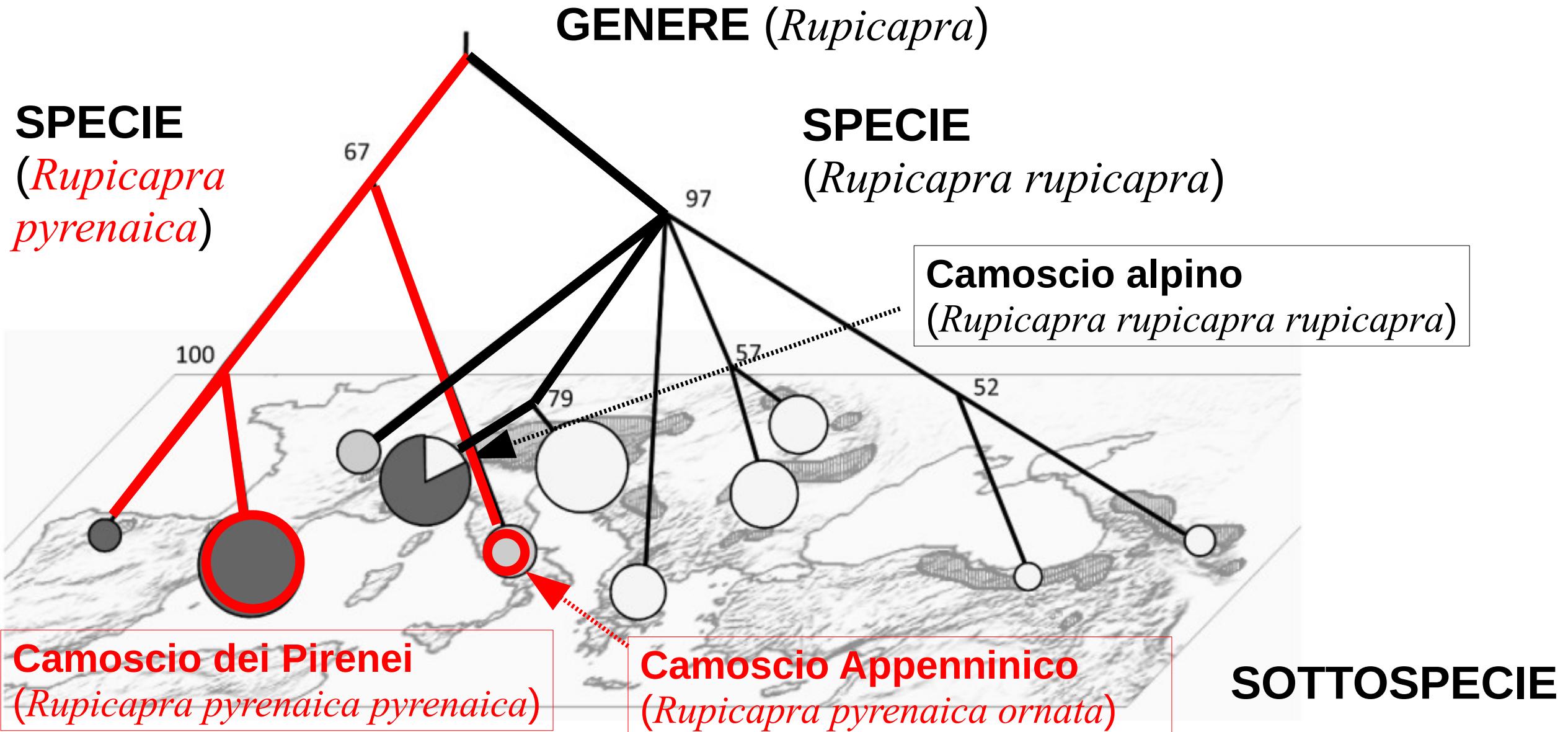


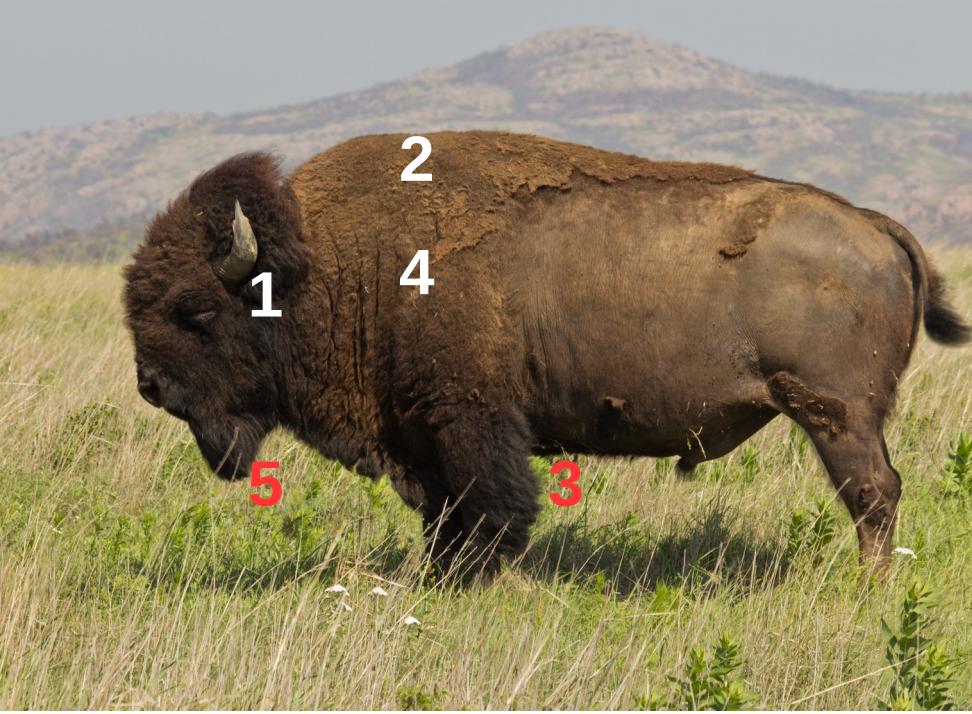
FIG. 3. (A) *Numidocapra crassicornis*, Ain Hanech, Algeria (from Arambourg, 1949). (B) *Procampoceras brivatense*, Seneze, France (from Schaub, 1923). (C) *Rupicapra pyrenaica ornata*, Ripa Grande, Italy (present study). (1) Caudal view; (2) lateral view. Not to scale.

# Differenze genetiche



## Sottospecie o razza

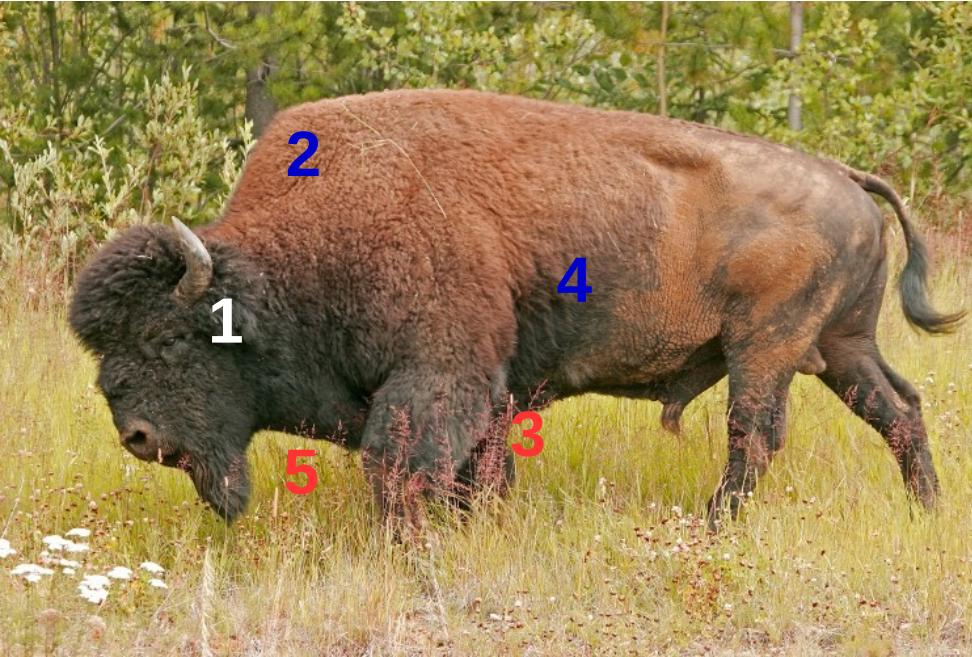
Gruppo di individui,  $\in$  alla stessa specie, che si riproducono e in cui lo stato di determinati caratteri è  $\approx$  e si differenzia da quello riscontrabile negli individui di altre popolazioni geografiche



## BISONTE DI PIANURA

(*Bison bison bison*)

1. Corna circondate da un folto strato di pelo lanoso
2. Profilo di garrese e dorso leggermente convesso
3. Braccio rivestito posteriormente da folto pelo
4. Mantello anteriore nettamente distinto
5. Criniera molto sviluppata sul canale delle ganasce e sul collo.



## BISONTE DEI BOSCHI

(*Bison bison athabascae*)

1. Lo strato che circonda le corna non è lanoso
2. Grande gobba (coppo), situata cranialmente all'asse dell'arto ant.
3. Braccio non rivestito da folto pelo
4. Mantello anteriore non distinto
5. Criniera meno sviluppata

# Le razze canine «antiche»



Shar-Pei



Akita



Eurasier



Saluki



Basenji



Levriero afgano



Dingo



Finnish Spitz

## Le razze canine «antiche»

Le razze canine antiche conservano una > **variabilità fenotipica** e, quindi, genetica probabilmente grazie al fatto che:

- discendono da un N° più elevato di fondatori
- nella loro storia evolutiva hanno avuto il tempo (migliaia di anni) per andare incontro a molte mutazioni genetiche



## Lo standard di razza

**Gli allevatori di qualsivoglia specie animale non apprezzano la variabilità fra individui ma perseguono l'omogeneità nei caratteri morfologici (e produttivi):** gli stati dei vari caratteri devono uniformarsi ad un preciso «**standard di razza**», pena l'esclusione del soggetto dal registro che annovera tutti gli individui riconosciuti come appartenenti ad una determinata razza (Libro Genealogico, Registro Anagrafico, *Studbook*, *Zuchtbuch*) e, quindi, dalla riproduzione.

**Gli stati dei vari caratteri devono**, quindi, essere standardizzati, ossia **uniformarsi il più possibile ad un modello ideale di riferimento**; ogni scostamento da tale modello è considerato un'anomalia, un difetto.

## Lo standard di razza

I criteri che gli allevatori applicano per scegliere i riproduttori sono spesso influenzati da **preferenze estetiche** per particolari varianti legate al colore ed alla pezzatura del mantello, alla pigmentazione delle mucose apparenti nonché alla forma ed alle dimensioni delle corna e, in alcune specie come il cane e il gatto, anche della testa. Tali stati dei suddetti caratteri compaiono, raramente, in qualche esemplare in seguito a mutazioni genetiche cosicché, ogni tanto, nasce un soggetto diverso dagli altri che, suscitando curiosità ed interesse, viene scelto come riproduttore con la speranza che trasmetta le proprie caratteristiche alla prole.

# Come nasce una nuova razza?



## Come nasce una nuova razza?

**Come nel caso del dromedario bianco**, almeno nelle prime generazioni, un certo ricorso alla consanguineità è pressochè inevitabile se si vuole selezionare una popolazione di esemplari che presentino caratteristiche uniformi. Quindi, se il ♂ bianco viene usato per montare più ♀♀, assumendo che nascano due piccoli bianchi, un ♂ e una ♀, da madri ≠, questi due individui della F1 verranno allevati e fatti accoppiare per produrre la generazione successiva di dromedari bianchi: si tratta di un accoppiamento fra mezzi fratelli.

Tutti i cavalli di razza Purosangue Inglese, per esempio, discendono da 50 fattrici, le *Royal Mares*, e da appena quattro stalloni: Byerly Turk, Darley Arabian, Godolphin Barb e Curwen Bay Barb dai quali si stima provenga circa un terzo dei geni della popolazione attuale.

# Che cos'è una «razza»?

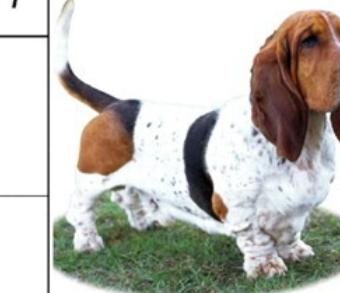
Le differenti combinazioni di alleli a tre loci sono responsabili di sette fenotipi diversi del mantello nel cane. I segni più (+) e meno (-) indicano la presenza o l'assenza di una variante genotipica comparsa per mutazione. Ad ognuno dei sette tipi di mantello corrisponde una razza rappresentativa:

- (A) pelo corto;
- (B) pelo filamentoso;
- (C) pelo filamentoso riccio;
- (D) pelo lungo;
- (E) pelo lungo e morbido con baffi e sopracciglia;
- (F) pelo lungo e riccio;
- (G) pelo lungo e riccio con baffi e sopracciglia.

Da Cadieu *et al.* (2009).

	PHENOTYPE	<i>FGF5</i>	<i>RSPO2</i>	<i>KRT71</i>
A	Short	-	-	-
B	Wire	-	+	-
C	Wire and Curly	-	+	+
D	Long	+	-	-
E	Long with Furnishings	+	+	-
F	Curly	+	-	+
G	Curly with Furnishings	+	+	+

**A** Basset Hound



**B** Australian Terrier



**C** Airedale Terrier



**D** Golden Retriever



**E** Bearded Collie



**F** Irish Water Spaniel



**G** Bichon Frisé



# Ibridazione interspecifica

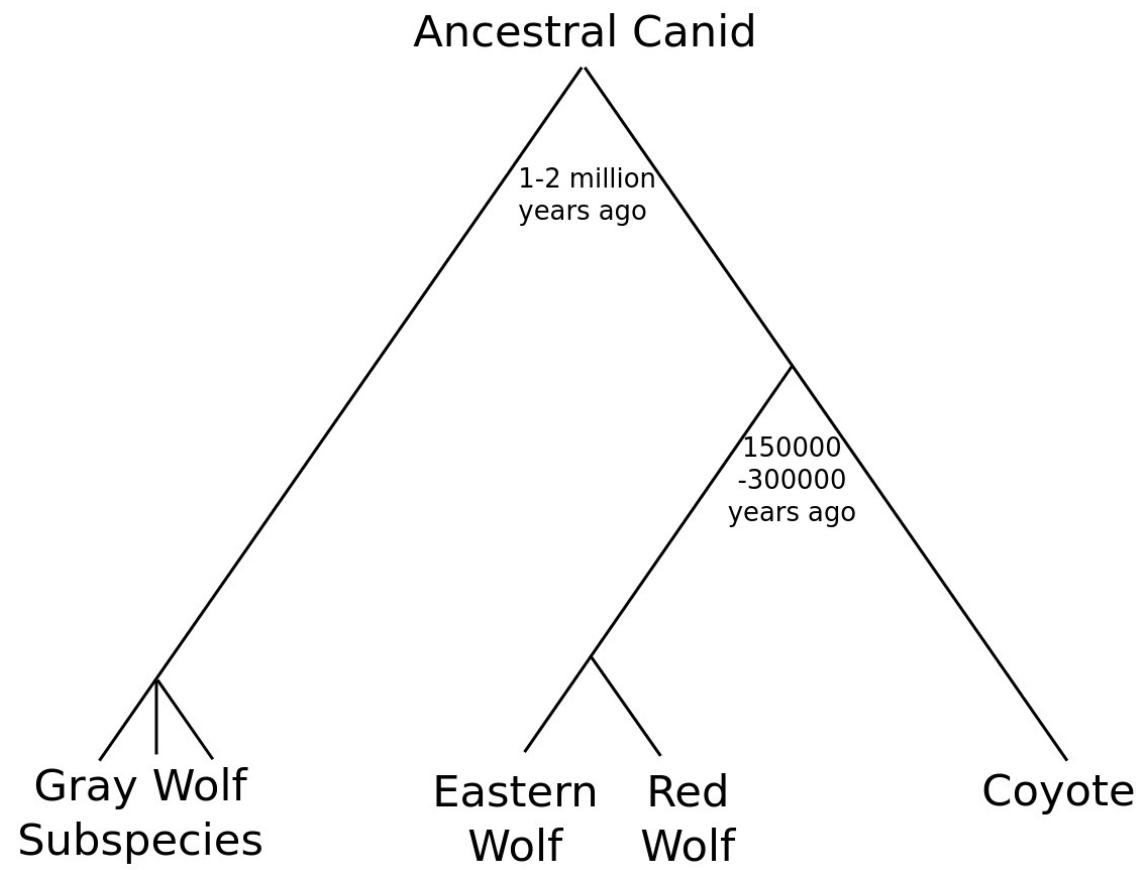
incrocio fra individui  $\in$  a specie  $\neq \rightarrow$  soggetto ibrido sterile  
**(ma sono note molte eccezioni)**

Es.

ASINO X CAVALLA = MULO (sterile)

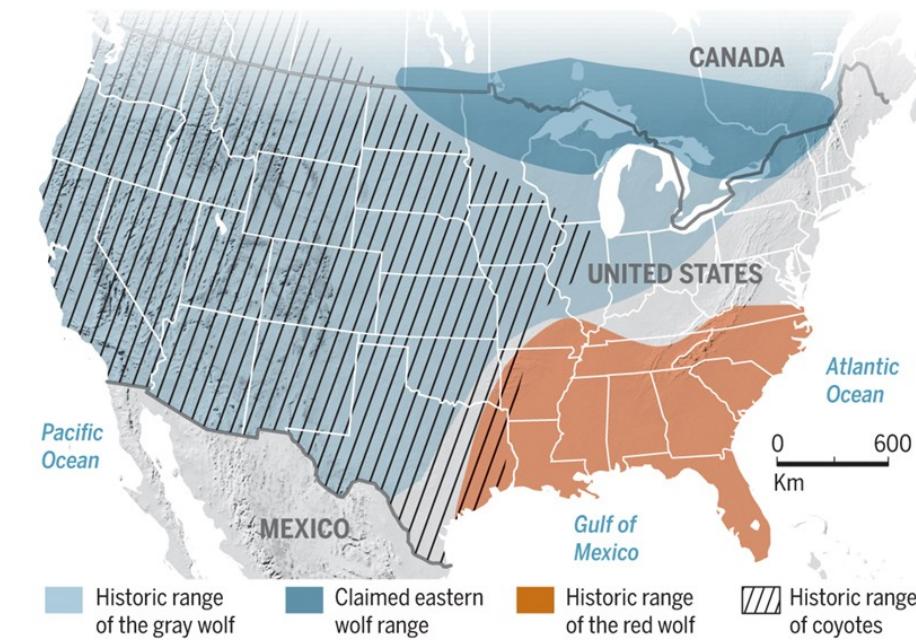


# Ibridazione interspecifica



## A continent of canids

Opinions vary on wolf ranges and identities, but most researchers agree that the gray wolf once roamed across much of North America (including into Mexico, not shown) and that the coyote ranged across the west. A new genetic study finds that the red wolf and the eastern wolf (one from Quebec in Canada, bottom) arose later by mixing with coyotes as they expanded eastward.



# Caso studio: lupi, coyote ed ungulati in Nordamerica

Lupo orientale X coyote = **coywolve**



*Canis lycaon*



*Canis latrans*



# Caso studio: lupi, coyote ed ungulati in Nordamerica



Article

## **Ungulate predation and ecological roles of wolves and coyotes in eastern North America**

John F. Benson , Karen M. Loveless, Linda Y. Rutledge, Brent R. Patterson

First published: 08 January 2017 | <https://doi.org/10.1002/eap.1499> | Citations: 26

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# Caso studio: lupi, coyote ed ungulati in Nordamerica

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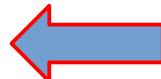
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**Ecology**

[Resource selection at homesites by wolves](#)

Advertisement

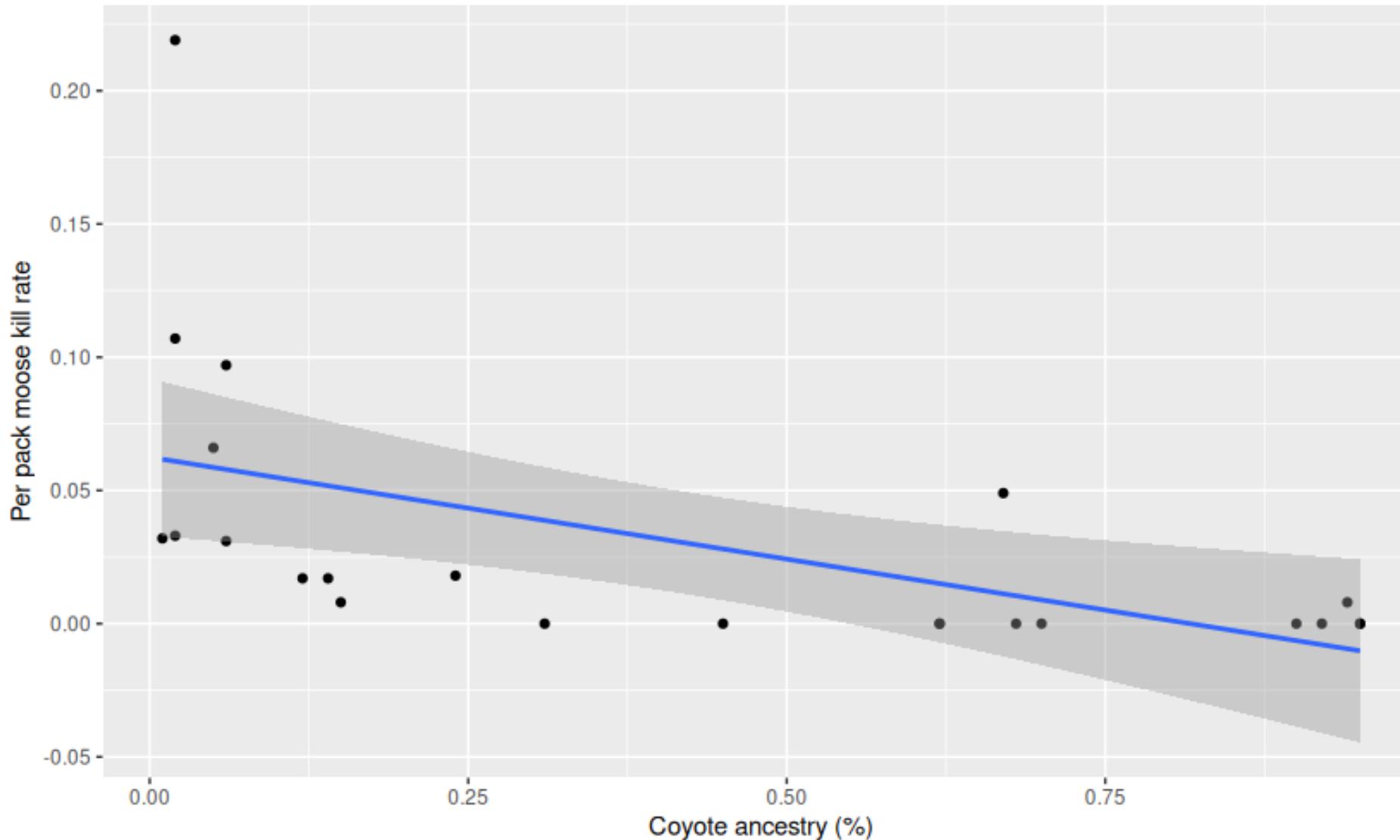
# Ibridazione lupo-cane



# Caso studio: lupi, coyote ed ungulati in Nordamerica

Coyote ancestry and per pack moose kill rates

Ungulate predation and ecological roles of wolves and coyotes in eastern North America, Benson et al., 2017



# Installazione di pacchetti in R

ctrl-alt-t

# apriamo il terminale

```
$ sudo apt install libssl-dev libcurl4-openssl-dev  
 unixodbc-dev libxml2-dev libmariadb-dev libfontconfig1-  
 dev libharfbuzz-dev libfribidi-dev libfreetype6-dev  
 libpng-dev libtiff5-dev libjpeg-dev
```

# installiamo le dipendenze

```
piero@piero-XPS-9320:~$ R
```

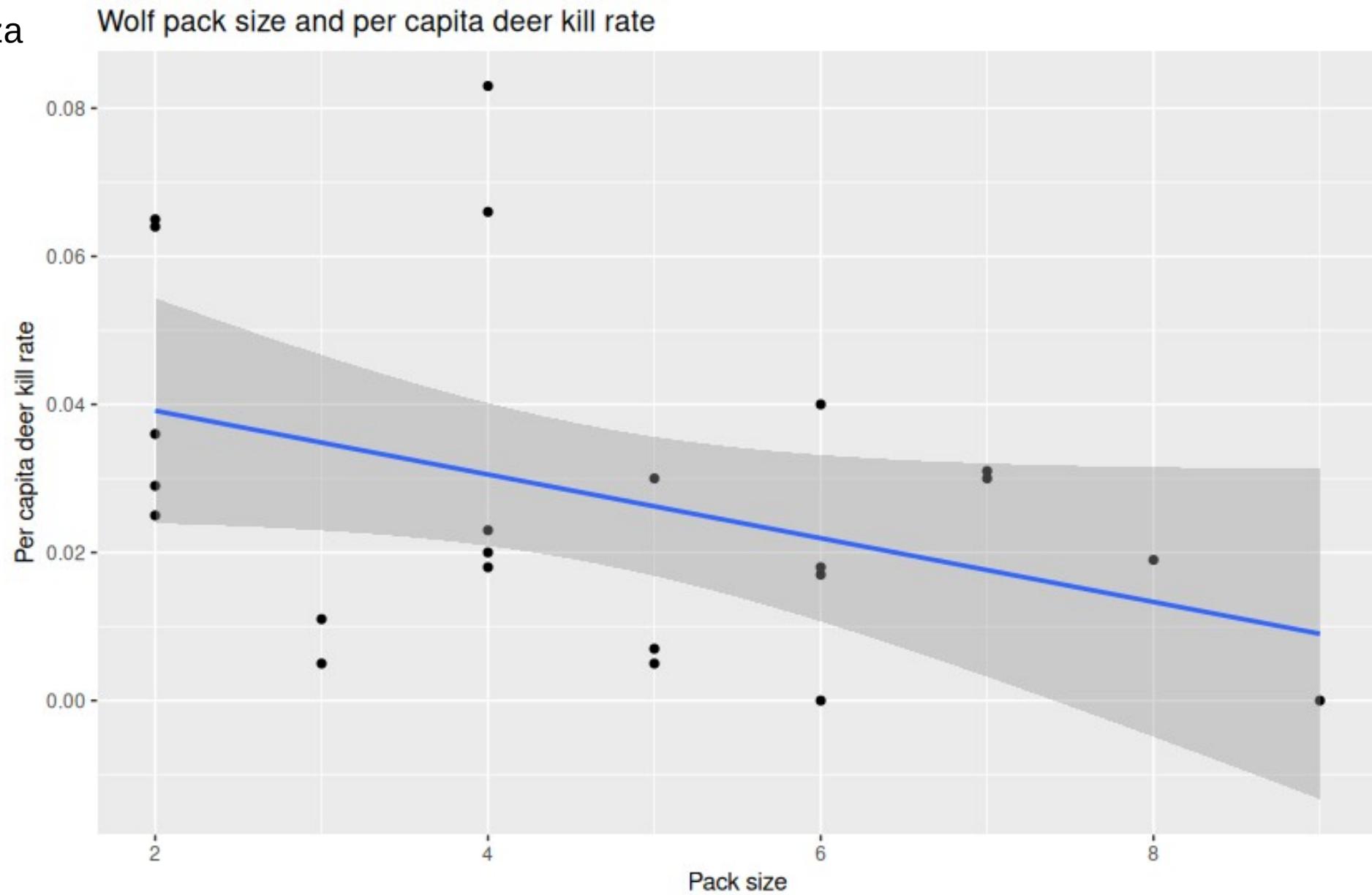
```
...  
> install.packages('tidyverse')  
> install.packages('ggplot2')  
> install.packages('ggthemes')  
> library(tidyverse)  
> library(ggplot2)  
> library(ggthemes)
```

# Caso studio: lupi, coyote ed ungulati in Nordamerica

```
> ggplot(  
data = wolves,  
mapping = aes(x = coyote_ancestry,  
y = per_pack_moose_kill_rates)) +  
geom_point() +  
geom_smooth(method = 'lm') +  
labs(title = "Coyote ancestry and per pack moose kill rates",  
subtitle = "Ungulate predation and ecological roles of wolves  
and coyotes in eastern North America, Benson et al., 2017",  
x = "Coyote ancestry (%)", y = "Per pack moose kill rate") +  
scale_color_colorblind()
```

# Esercizio: ricreare il seguente grafico

Intervallo di confidenza  
al 95%



## Indicazioni:

- Scaricare i *files* <eap1499-sup-0002-appendixs2.pdf> e <eap1499-sup-0004-appendixs4.pdf> da Supporting Information (<https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/eap.1499>)
- \$ sudo apt install poppler-utils
- \$ pdftotext eap1499-sup-0002-appendixs2.pdf  
# trasforma il pdf in *file* di testo
- copiare i dati della colonna Pack Size per creare il vettore pack\_size in **R**:  
> pack\_size = c(5, 3, 2...)
- copiare la colonna Deer kill rates per capita dal file eap1499-sup-0004-appendixs4.pdf e creare il vettore per\_capita\_deer\_kill\_rates in **R**:  
> per\_capita\_deer\_kill\_rates = c(0.005, 0.011, 0.029...)

eap1499-sup-0002-appendixs2.txt 

1 Pack Size

2 5

3 3

4 2

5 6

6 2

7 2

8 4

9 2

10 2

11 7

12 6

13 6

14 9

15 5

16 3

17 6

18 5

19 7

20 8

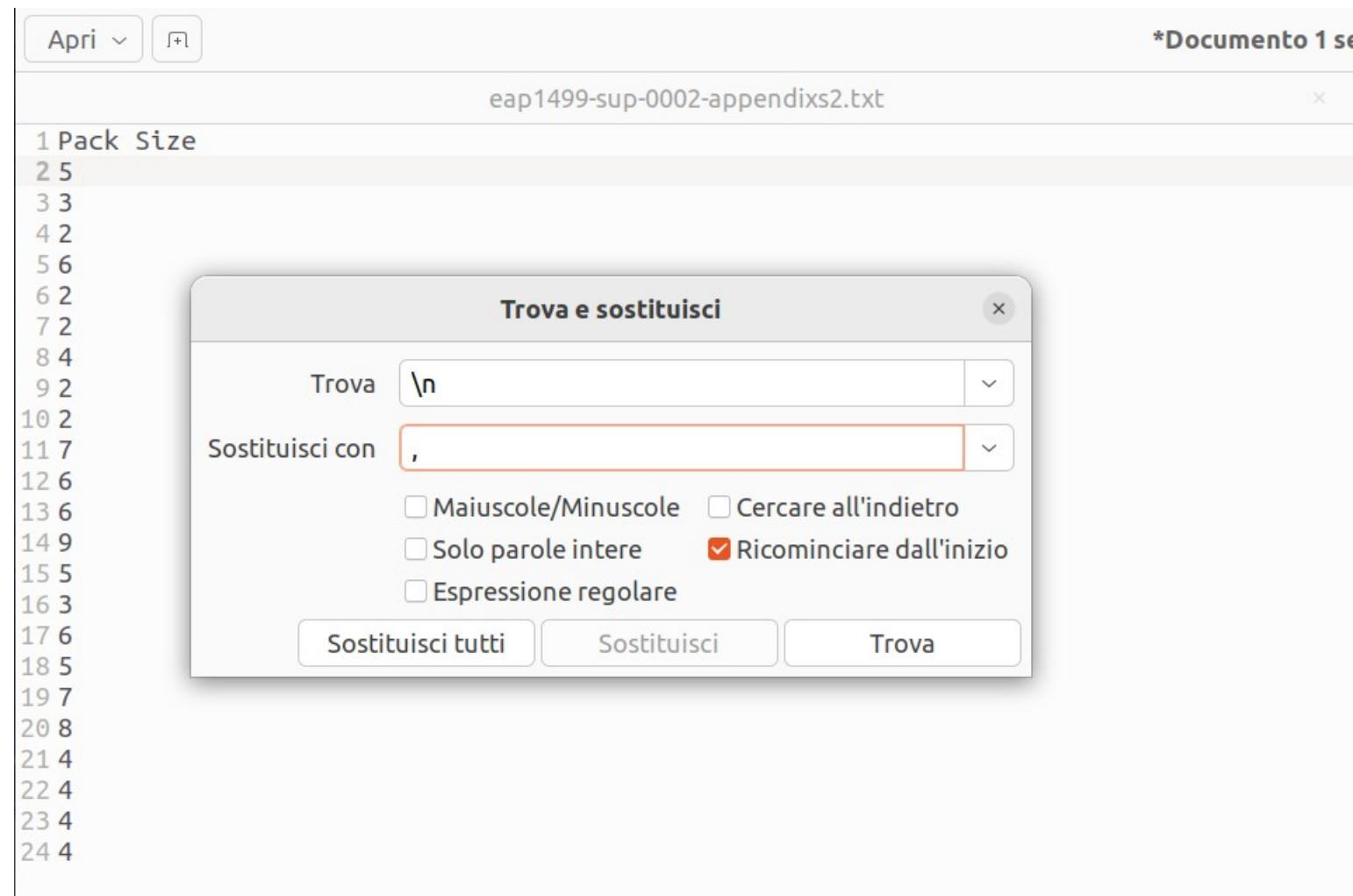
21 4

22 4

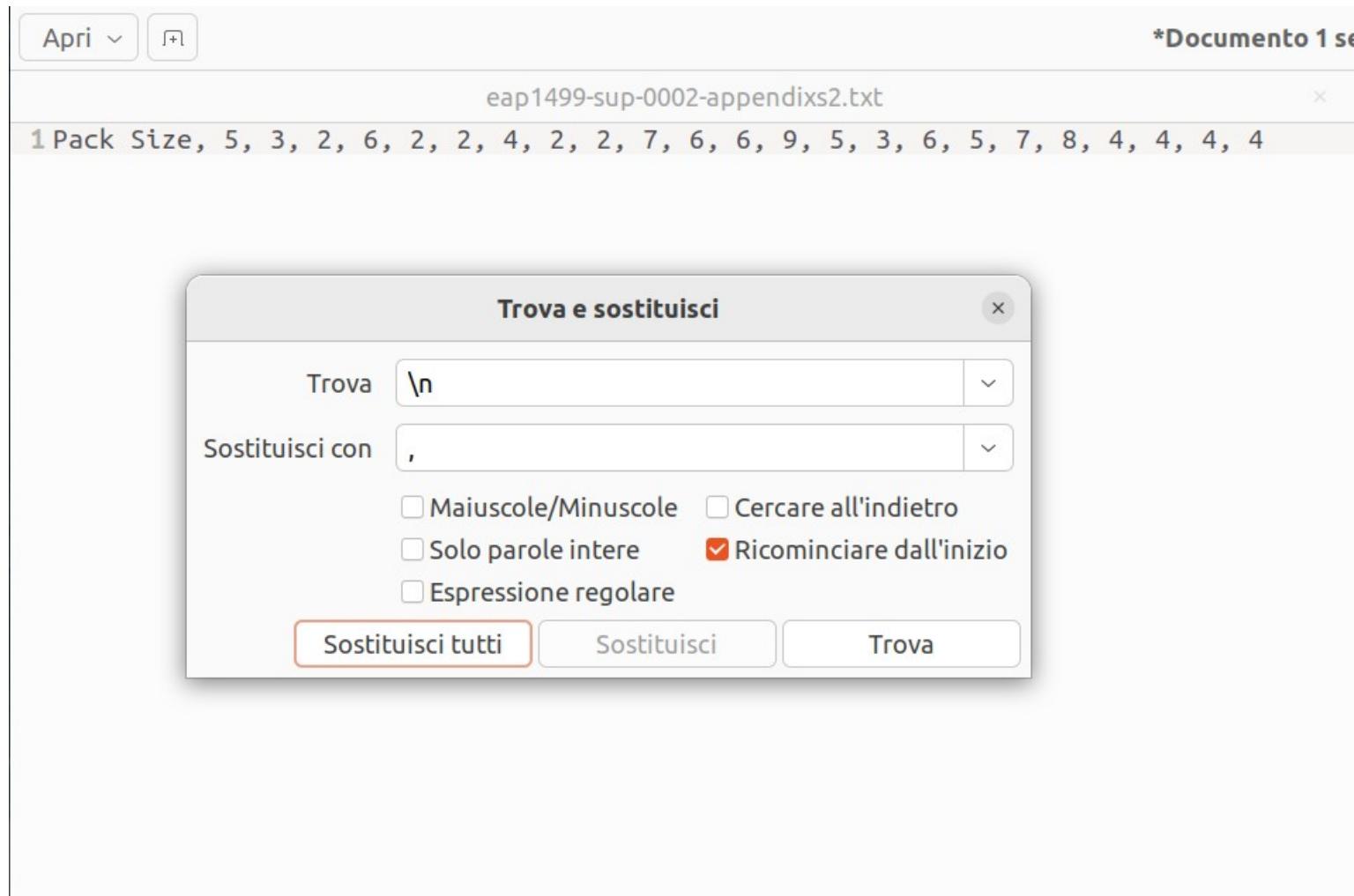
23 4

24 4

# Indicazioni:



# Indicazioni:



# Indicazioni

- creare un tibble (o un data\_frame) con i due vettori:

```
> wolves = tibble(pack_size, per_capita_deer_kill_rates)  
> wolves_df = data.frame(pack_size, per_capita_deer_kill_rates)
```

- ...

# Indicazioni

> coyot >  
e\_anc pack  
estry \_siz  
[1] e [1]

**Appendix S2.** Focal canid packs in central Ontario 2005-2010. Shown are pack names, Q-scores for eastern coyote (% coyote), eastern wolf (% Eastern), and gray wolf (% Gray) ancestry, winter of study, number of days monitored, area (Algonquin Provincial Park, APP) or (Wildlife Management Unit 49, WMU49), number of individuals in pack (pack size), territory size and the dominant *Canis* ancestry: eastern coyote (Coyote), eastern and Great Lakes boreal (GLB) wolf (Wolf), or mixed coyote and wolf (Mixed).

		Pack	% Coyote	% Eastern	% GLB	Winter	Days	Area	Pack Size	Terr Size (km <sup>2</sup> )	Dominant Ancestry
0.67	5 3	Axe	0.67	0.31	0.02	2009-10	82	WMU49	5	142	Coyote
0.92	2 6	Golden City	0.92	0.05	0.04	2009-10	121	WMU49	3	7	Coyote
0.68	2 2	Horseshoe	0.68	0.29	0.02	2009-10	70	WMU49	2	83	Coyote
0.95	4 2	North Yearley	0.95	0.03	0.02	2009-10	28	WMU49	6	24	Coyote
0.90	2 7	Ripple	0.90	0.05	0.05	2009-10	70	WMU49	2	37	Coyote
0.94	6 6	Skeleton	0.94	0.03	0.03	2009-10	121	WMU49	2	46	Coyote
0.95	9 5	Turtle	0.95	0.04	0.02	2009-10	38	WMU49	4	53	Coyote
0.62	3 6	Wier	0.62	0.31	0.07	2009-10	70	WMU49	2	82	Coyote
0.70	5 7	Wolf	0.70	0.26	0.04	2009-10	69	WMU49	2	26	Coyote
0.06	8 4	Storm	0.06	0.62	0.32	2009-10	121	WMU49	7	146	Wolf
0.05	4 4	Achray	0.05	0.83	0.12	2005-06	64	APP	6	107	Wolf
0.14	4	Louis	0.14	0.85	0.02	2005-06	31	APP	6	180	Wolf
0.06		McKaskill	0.06	0.81	0.13	2005-06	64	APP	9	434	Wolf
0.02		Radiant	0.02	0.91	0.07	2005-06	121	APP	5	315	Wolf
0.02		Rain	0.02	0.95	0.03	2005-06	121	APP	3	190	Wolf
0.12		Sunday	0.12	0.85	0.03	2005-06	62	APP	6	190	Wolf
0.02		Big Crow	0.02	0.96	0.02	2006-07	121	APP	5	460	Wolf
0.15		Jocko	0.15	0.80	0.05	2006-07	121	APP	7	188	Wolf
0.01		Potter	0.01	0.97	0.02	2006-07	75	APP	8	493	Wolf
0.31		Lafleur	0.31	0.64	0.05	2005-06	45	APP	4	45	Mixed
0.62		Stevenson	0.62	0.20	0.18	2005-06	56	APP	4	80	Mixed
0.45		Buck Hill	0.45	0.54	0.02	2006-07	66	APP	4	84	Mixed
0.24		Pine	0.24	0.23	0.54	2006-07	121	APP	4	151	Mixed

# Indicazioni

>  
per\_capita  
\_deer\_kill  
\_rates

```
[1] 0.005  
0.011  
0.029  
0.000  
0.036  
0.025  
0.020  
0.064  
0.065  
0.031  
0.018  
0.040  
0.000  
0.007  
0.005  
0.017  
0.030  
0.030  
0.019  
0.023  
0.083  
0.066  
[23] 0.018
```

**Appendix S4.** Ungulate kill rates and biomass in diet of canid packs in central Ontario, 2005-2010. Shown are packs, dominant ancestry type in pack, deer and moose kill rates per pack (prey/day) and per capita (prey/day/animals in pack), and proportion of deer and moose biomass from kills in diet of each pack.

Pack	Ancestry	Deer kill rates		Moose kill rates		Biomass from kills	
		Per pack	Per capita	Per pack	Per capita	% deer	% moose
Axe	Coyote	0.024	0.005	0.049	0.010	0.12	0.88
Golden City*	Coyote	0.033	0.011	0.000	0.000	1.00	0.00
Horseshoe	Coyote	0.057	0.029	0.000	0.000	1.00	0.00
North Yearley*	Coyote	0.000	0.000	0.000	0.000	0.00	0.00
Ripple	Coyote	0.071	0.036	0.000	0.000	1.00	0.00
Skeleton	Coyote	0.050	0.025	0.008	0.004	0.60	0.40
Turtle	Coyote	0.079	0.020	0.000	0.000	1.00	0.00
Wier	Coyote	0.064	0.064	0.000	0.000	1.00	0.00
Wolf	Coyote	0.130	0.065	0.000	0.000	1.00	0.00
Achray	Wolf	0.188	0.031	0.031	0.005	0.70	0.30
Big Crow	Wolf	0.091	0.018	0.066	0.013	0.20	0.80
Jocko	Wolf	0.281	0.040	0.017	0.002	0.78	0.22
Louisa	Wolf	0.000	0.000	0.097	0.016	0.00	1.00
McKaskill	Wolf	0.063	0.007	0.219	0.024	0.05	0.95
Potter	Wolf	0.040	0.005	0.107	0.013	0.07	0.93
Radiant	Wolf	0.083	0.017	0.017	0.003	0.47	0.53
Rain	Wolf	0.091	0.030	0.033	0.011	0.40	0.60
Storm	Wolf	0.207	0.030	0.008	0.001	0.81	0.19
Sunday	Wolf	0.113	0.019	0.032	0.005	0.36	0.64
Buck Hill	Mixed	0.091	0.023	0.000	0.000	1.00	0.00
Lafleur	Mixed	0.333	0.083	0.000	0.000	1.00	0.00
Pine	Mixed	0.264	0.066	0.000	0.000	1.00	0.00
Stevenson	Mixed	0.071	0.018	0.018	0.004	0.46	0.54

\* Substantial anthropogenic food consumed

## Il mio data frame <wolves\_df>

```
> packs = c('Axe', 'Golden City', 'Horseshoe', 'North Yearley', 'Ripple',
'Skeleton', 'Turtle', 'Wier', 'Wolf', 'Storm', 'Achray', 'Louis',
'McKaskill', 'Radiant', 'Rain', 'Sunday', 'Big Crow', 'Jocko', 'Potter',
'Lafleur', 'Stevenson', 'Buck Hill', 'Pine')

> wolves_df = data.frame(packs, pack_size, coyote_ancestry,
per_capita_deer_kill_rates, per_pack_deer_kill_rates,
per_capita_moose_kill_rates, per_pack_moose_kill_rates)

> View(wolves_df)
# per visualizzarne il contenuto

> write.csv(wolves_df, "wolves.csv")
# esportiamo il data frame <wolves_df> come file csv (comma-separated values)
```

# Il mio data frame <wolves\_df>

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins

penguins Progetto\_Suolo.Rmd wolves wolves\_df

Filter

	packs	pack_size	coyote_ancestry	per_capita_deer_kill_rates	per_pack_deer_kill_rates	per_capita_moose_kill_rates	per_pack_moose_kill_rates
1	Axe	5	0.67	0.005	0.024	0.010	0.
2	Golden City	3	0.92	0.011	0.033	0.000	0.
3	Horseshoe	2	0.68	0.029	0.057	0.000	0.
4	North Yearley	6	0.95	0.000	0.000	0.000	0.
5	Ripple	2	0.90	0.036	0.071	0.000	0.
6	Skeleton	2	0.94	0.025	0.050	0.004	0.
7	Turtle	4	0.95	0.020	0.079	0.000	0.
8	Wier	2	0.62	0.064	0.064	0.000	0.
9	Wolf	2	0.70	0.065	0.130	0.000	0.
10	Storm	7	0.06	0.031	0.188	0.005	0.
11	Achray	6	0.05	0.018	0.091	0.013	0.
12	Louis	6	0.14	0.040	0.281	0.002	0.
13	McKaskill	9	0.06	0.000	0.000	0.016	0.
14	Radiant	5	0.02	0.007	0.063	0.024	0.
15	Rain	3	0.02	0.005	0.040	0.013	0.
16	Sunday	6	0.12	0.017	0.083	0.003	0.
17	Big Crow	5	0.02	0.030	0.091	0.011	0.
18	Jocko	7	0.15	0.030	0.207	0.001	0.
19	Potter	8	0.01	0.019	0.113	0.005	0.
20	Lafleur	4	0.31	0.023	0.091	0.000	0.
21	Stevenson	4	0.62	0.083	0.333	0.000	0.

Showing 1 to 21 of 23 entries, 7 total columns

## Il mio data frame <wolves\_df>

```
> write.csv(wolves_df, "wolves.csv")  
# esportiamo il data frame <wolves_df> come file csv (comma-separated  
values)
```