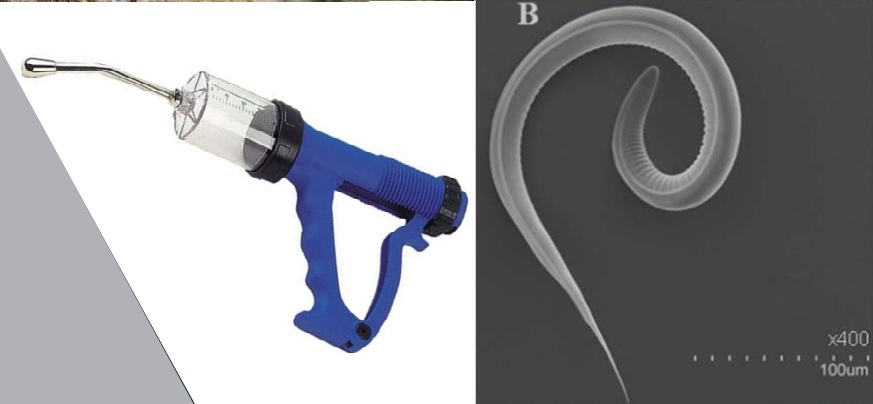




Cross-transmission of resistant nematodes between wild ibex and transhumant sheep in French Alps

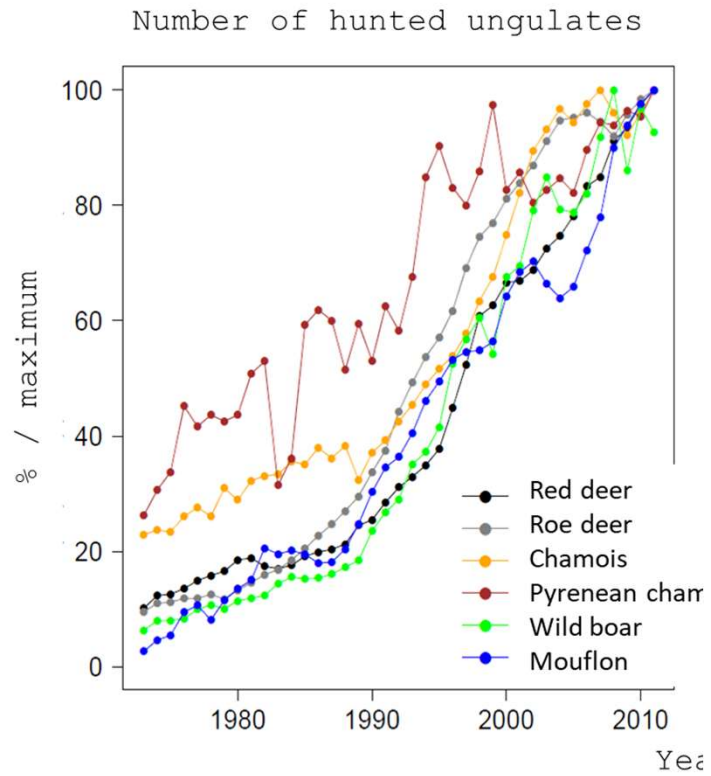


G Bourgoin, C Beaumelle, C Toïgo, R Papet, S Benabed, M Beurier, L Bordes, A Brignone, N Curt-Grand-Gaudin, M Garel, J Ginot, P Jacquiet, C Miquel, M-T Poirel, A Serafino, E Vannard, G Yannic

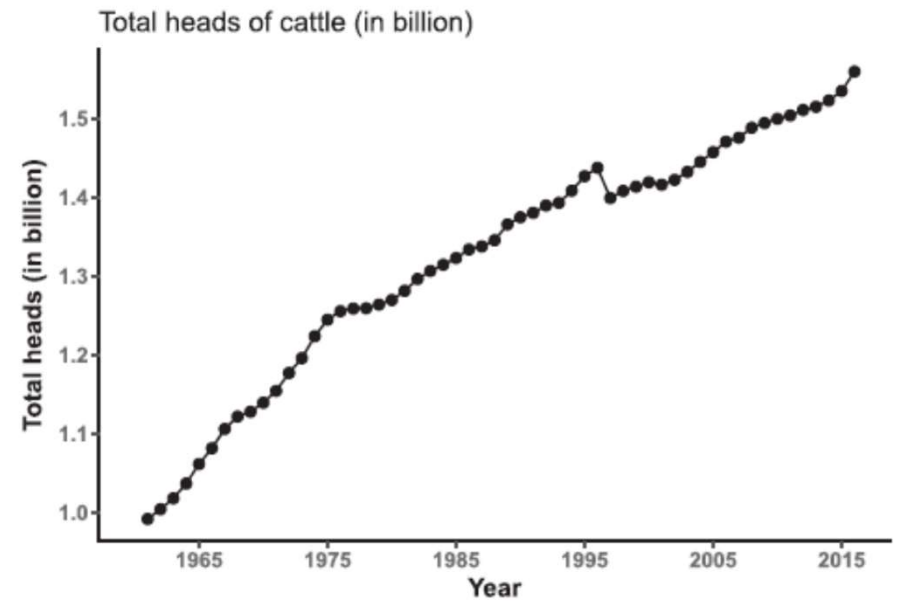
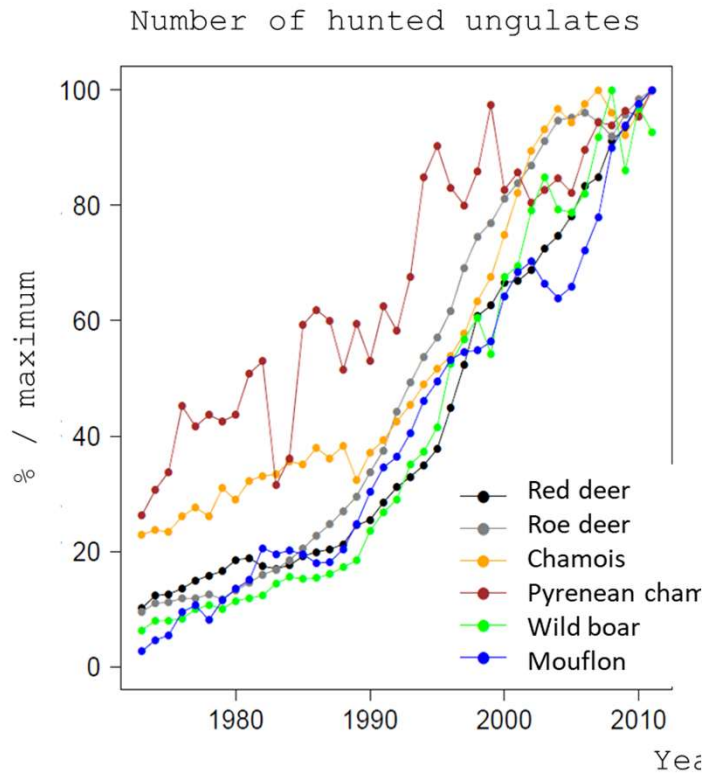
3rd Mountain Livestock Farming Systems Meeting, 5-7 June 2024, Clermont-Ferrand



Context



Context



Source: FAOSTAT



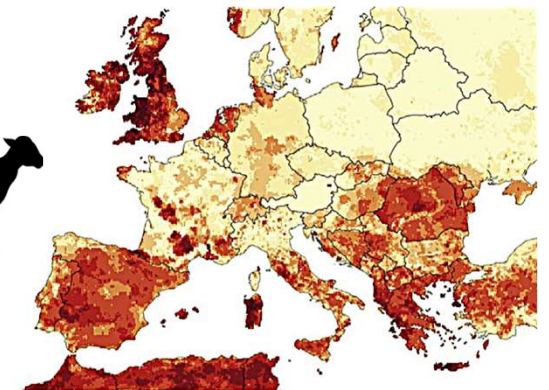
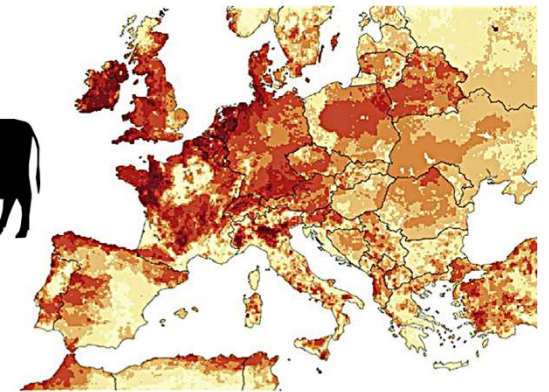
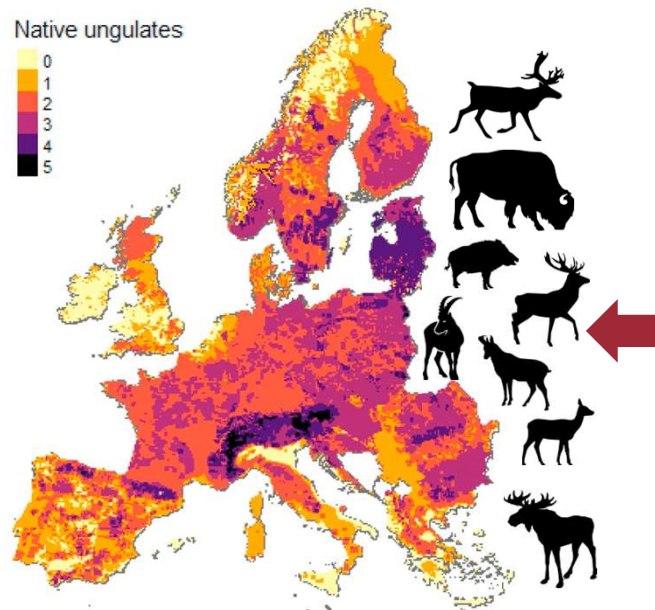
Réseau Ongulés sauvages ONCFS/FNC/FDC
Graphs: P. Marchand

Morand 2020
BiolConserv

Context

- ↗ densities
- ↗ species overlap

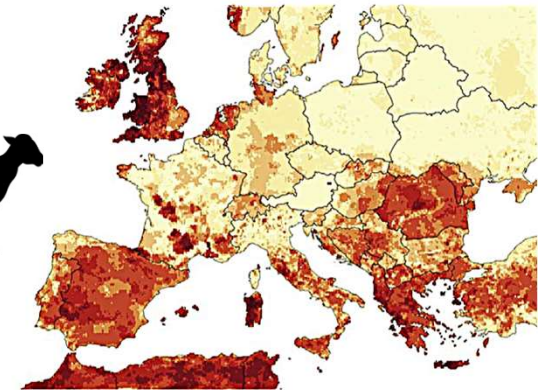
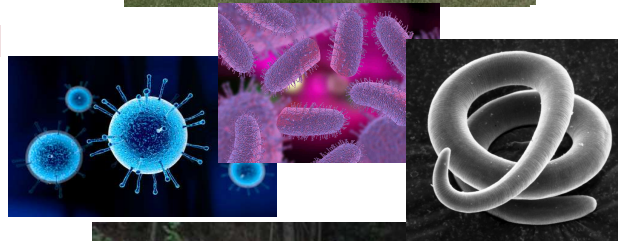
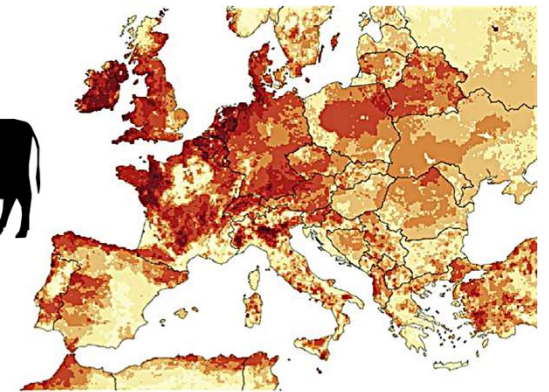
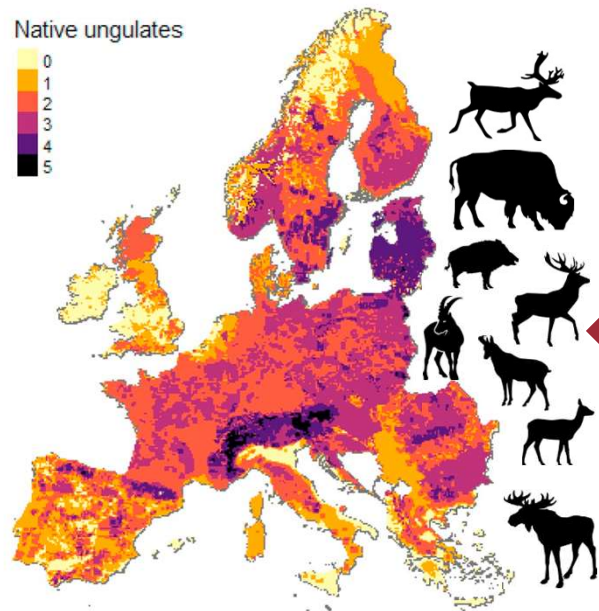
Native ungulates



Context

→ ↗ densities
→ ↗ species overlap

Native ungulates



↗ risk of pathogen transmission

The issue of parasites

- Strongyles =
 - Major health issue
 - Production and economic loss

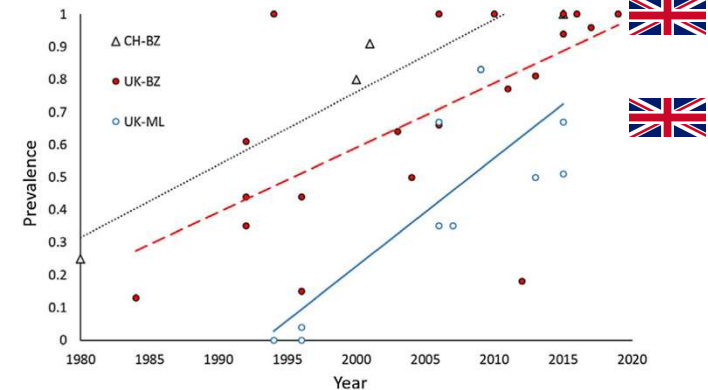
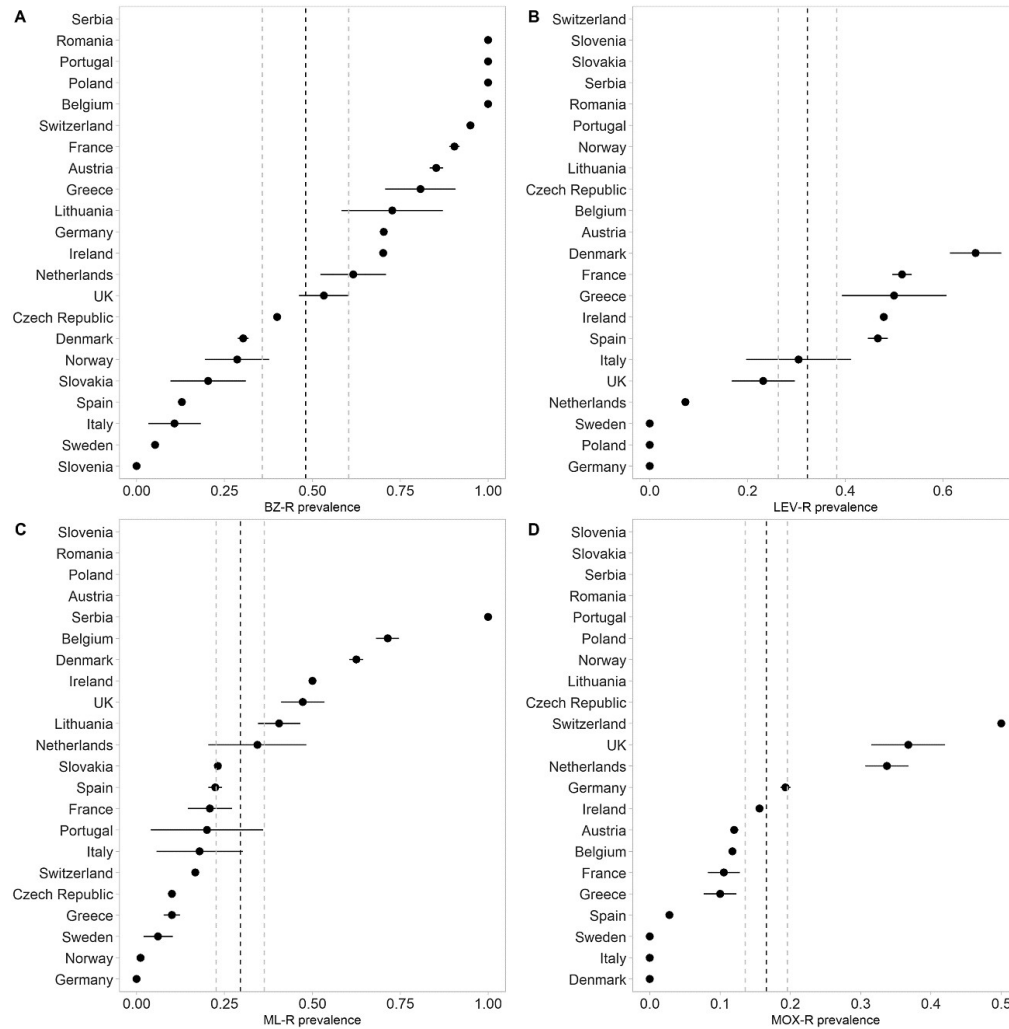


- → Control of strongyle population with drugs (anthelmintics)
 - Easy to use
 - Cheap
 - Sure
 - Efficient to control infestation

... but ...



The issue of anthelmintic resistance

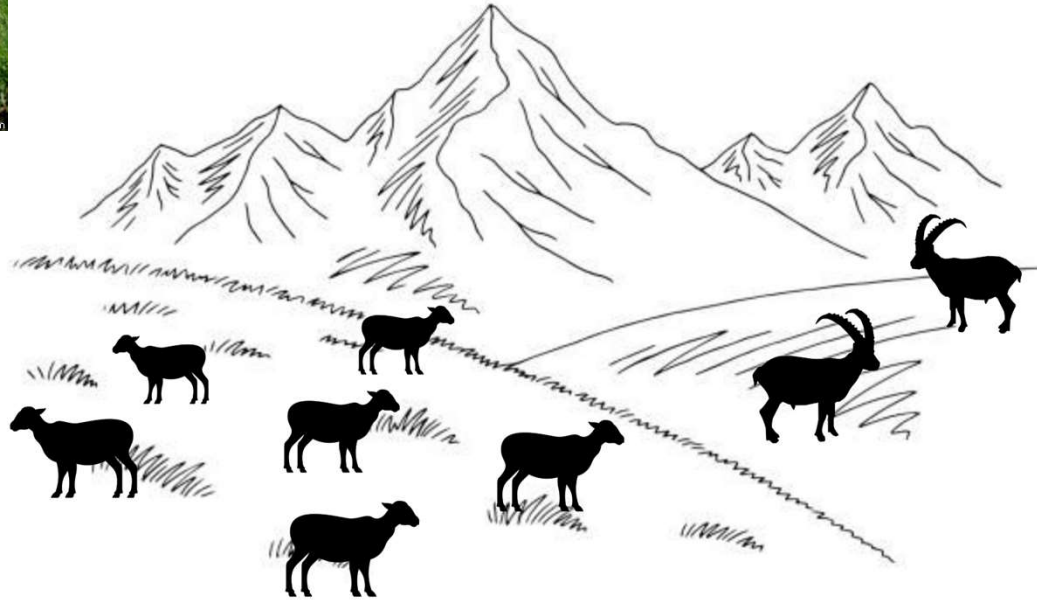


Worldwide

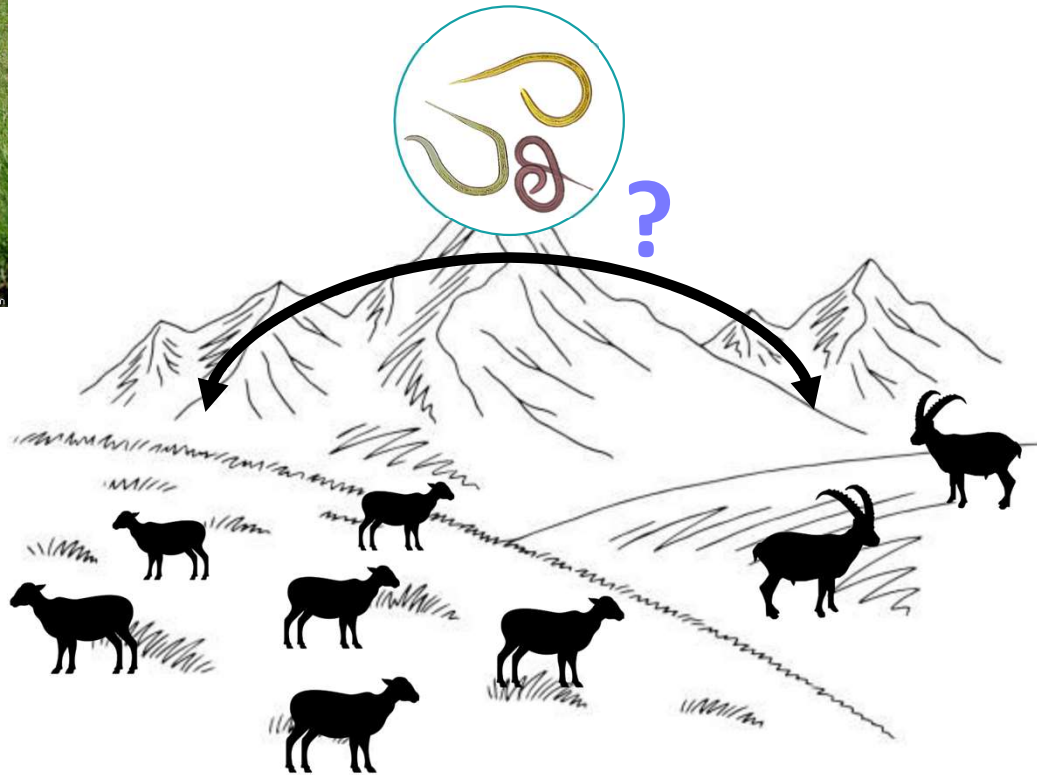
Increasing

Multiresistance

Transhumant sheep and wild ibex

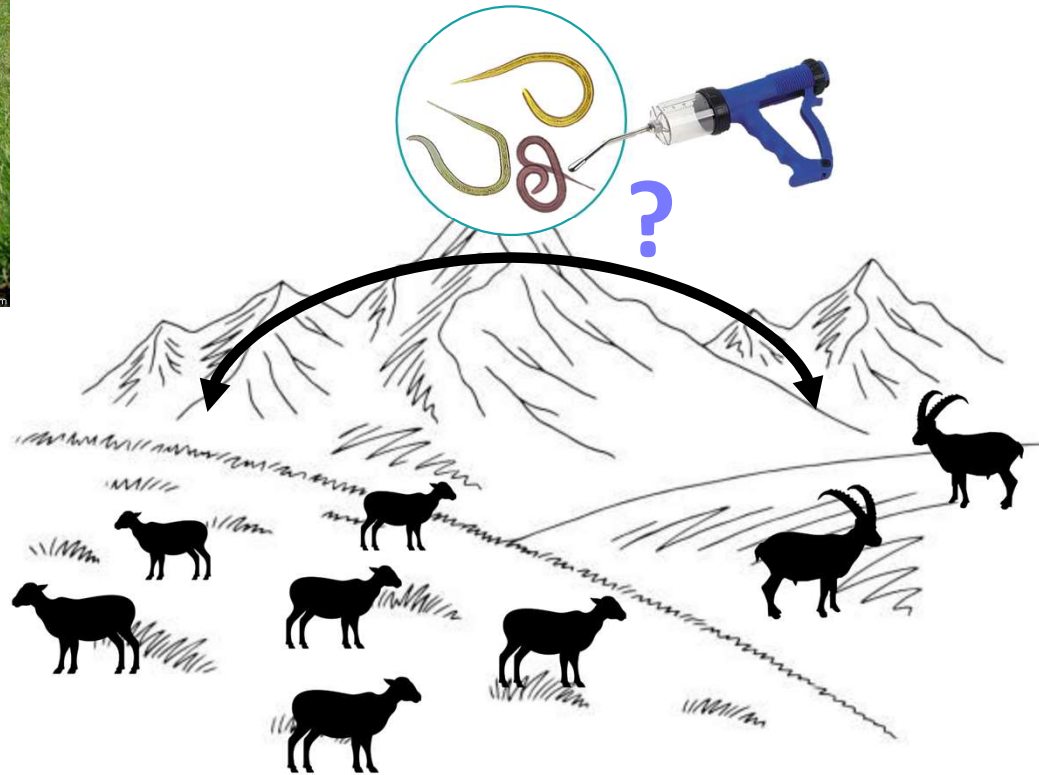


Transhumant sheep and wild ibex



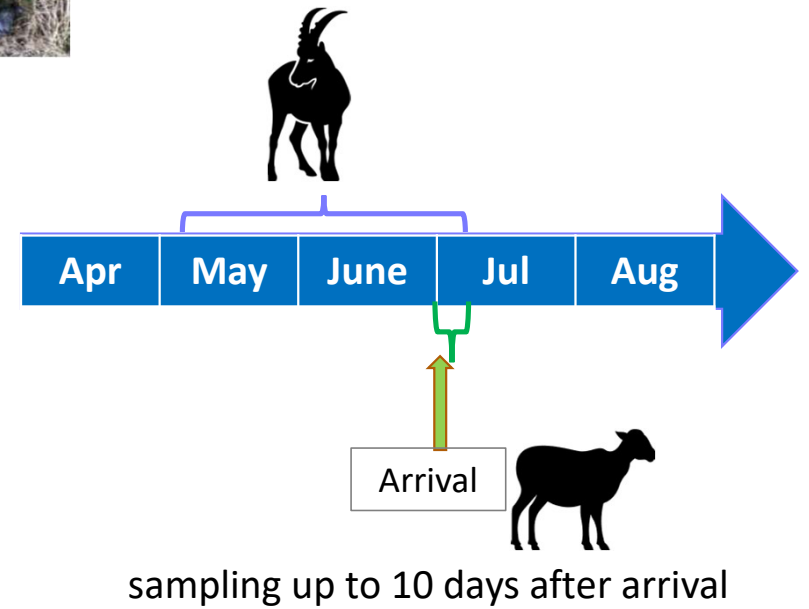
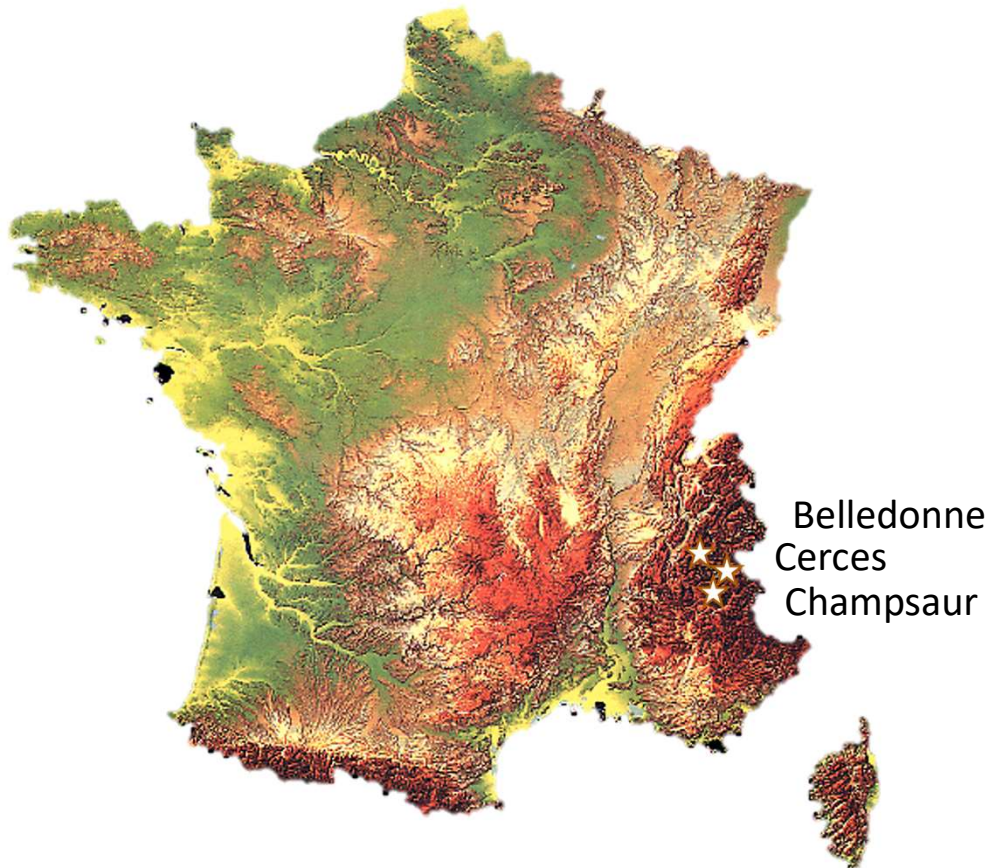
Do domestic sheep and wild ibex have similar communities of nematode (= nemabiome)?

Transhumant sheep and wild ibex



Are ibex contaminated by parasites resistant to anthelmintic?

Material & Methods





Coproculture



**DNA extraction
of a pool of L3
(10 – 1000 L3)**

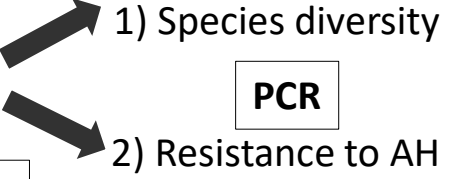
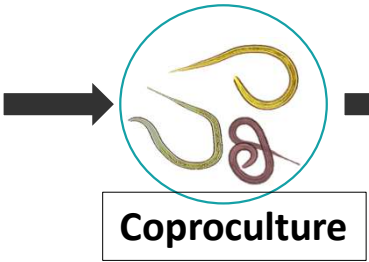
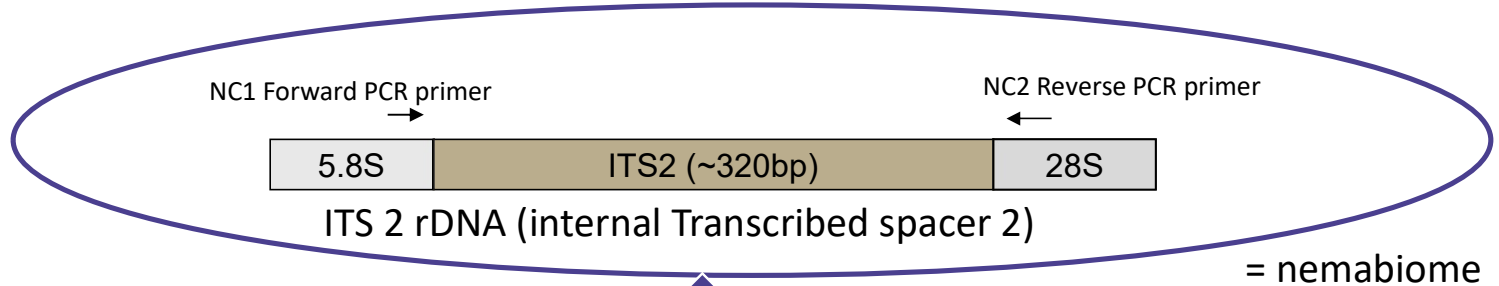


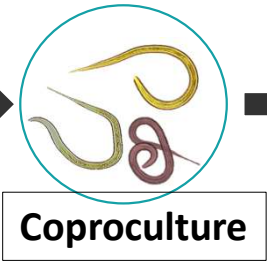
1) Species diversity

PCR



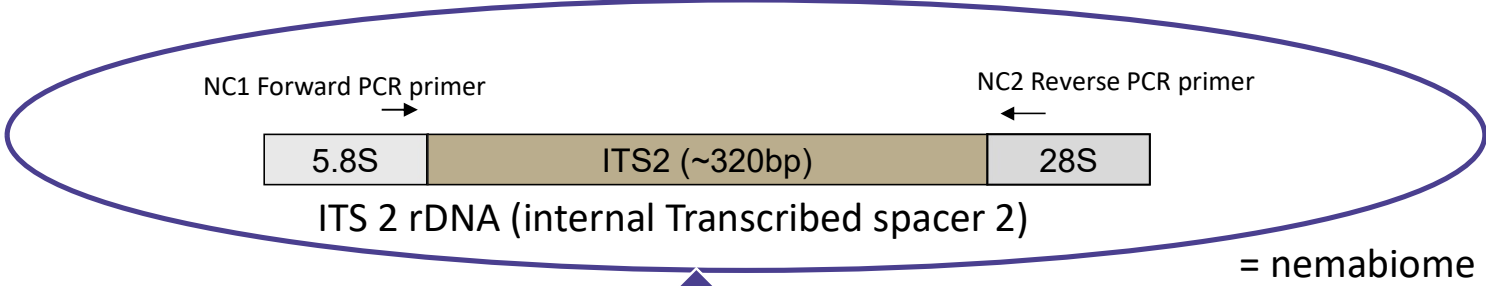
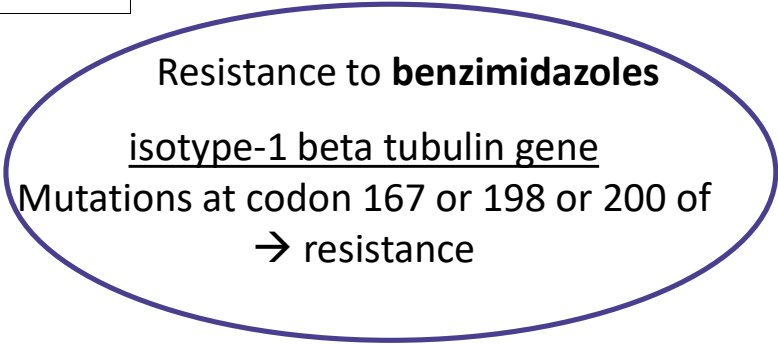
2) Resistance to AH

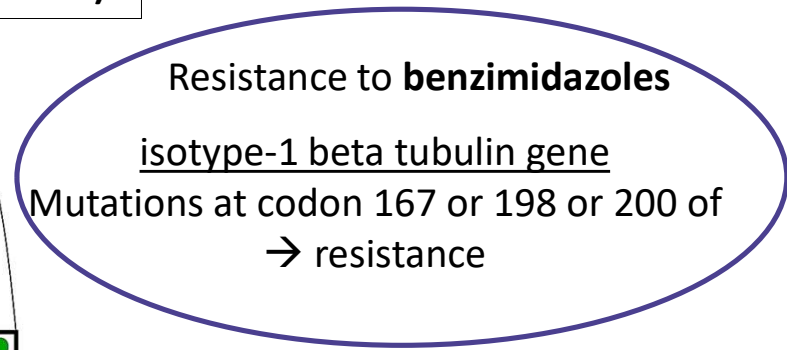
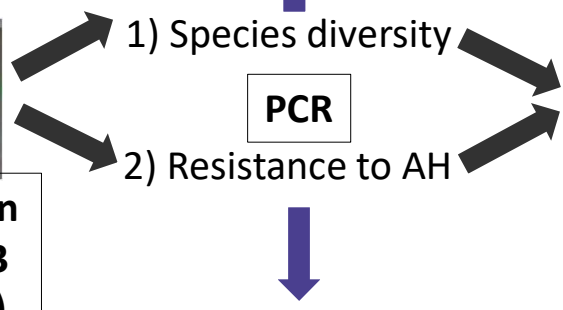
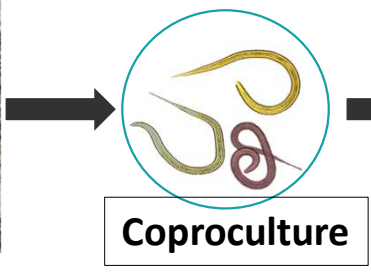
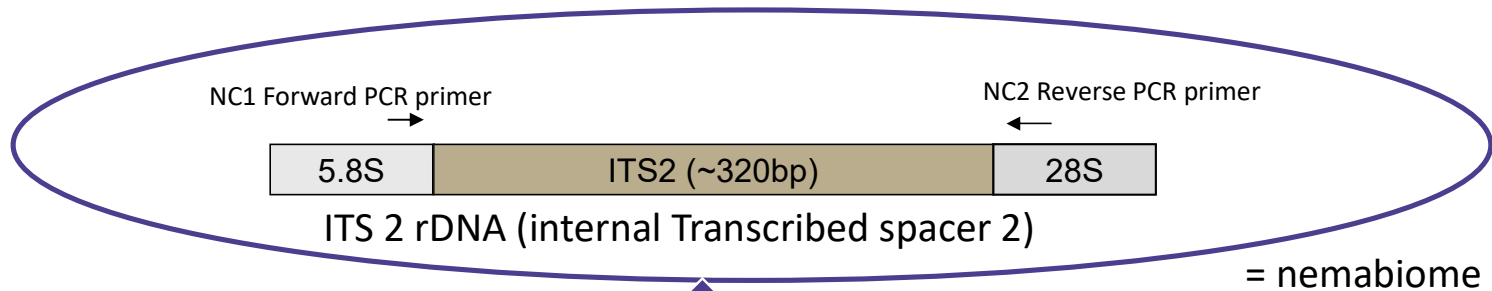




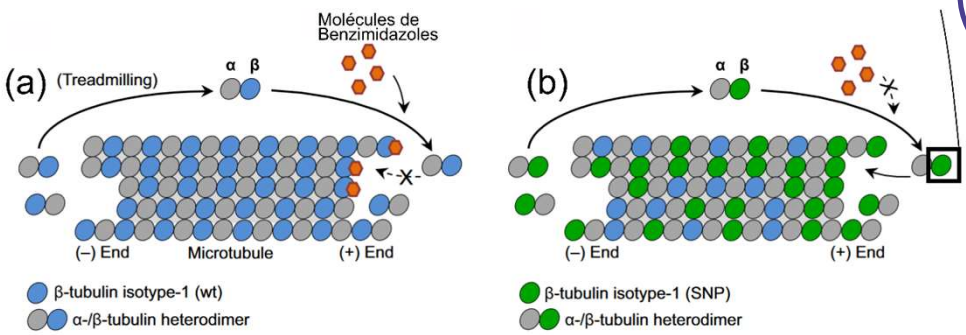
- 1) Species diversity
- 2) Resistance to AH

PCR





G	C	T	T	C	T	G	T	A	T	C	G	T	T	C	T	A	C	T	T	C	G	A	A	
G	C	T	T	C	T	G	T	A	T	C	A	T	T	C	T	A	C	T	T	C	G	A	A	
G	C	T	C	C	T	G	T	A	T	A	A	T	T	C	T	A	C	T	T	C	G	A	A	
G	C	T	T	C	T	G	T	A	T	C	C	T	A	C	T	A	C	T	T	C	G	A	A	
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G	C	T	T	C	T	G	T	A	T	A	C	T	T	C	T	A	C	T	T	C	G	A	A	
G	C	T	T	C	T	G	T	A	T	C	C	T	C	C	T	A	C	T	T	C	G	T	C	
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G	C	T	T	C	T	G	T	A	T	A	G	C	T	T	T	C	T	A	C	G	A	C	G	A
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G	C	T	T	C	T	G	T	A	T	A	G	C	T	T	T	C	T	A	C	G	A	C	G	A
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Results

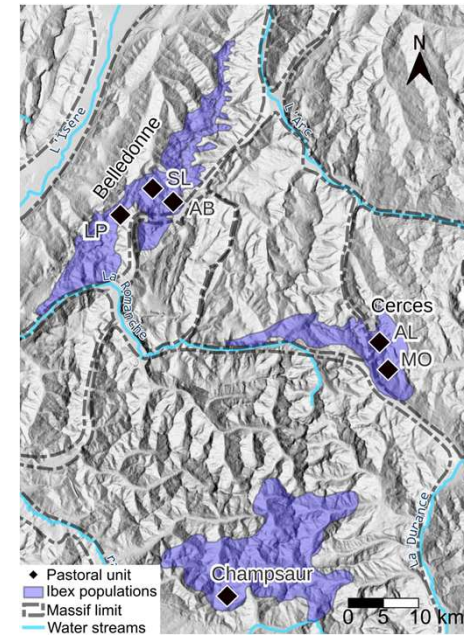
Shared species? Nemabiome ibex \neq nemabiome sheep?



n=144

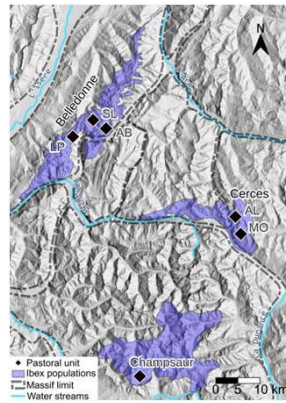
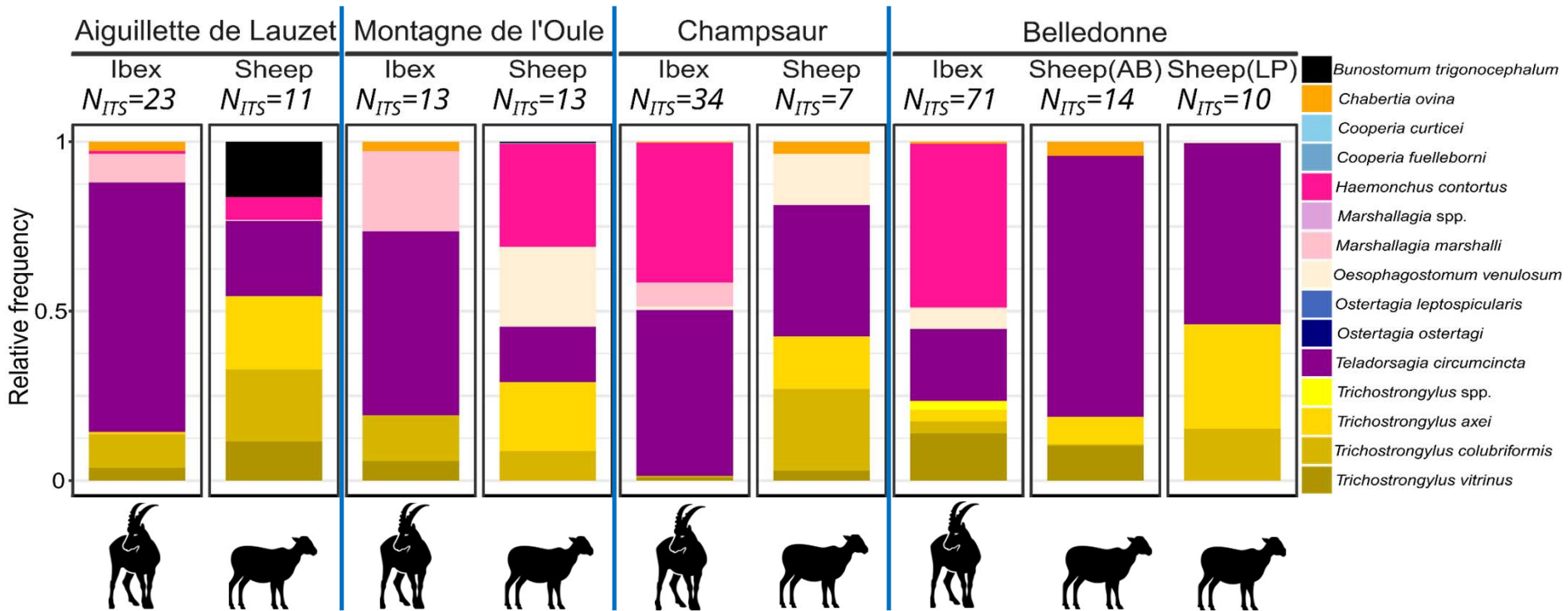


n= 55 (5)



Results

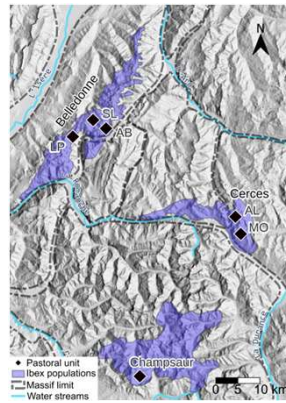
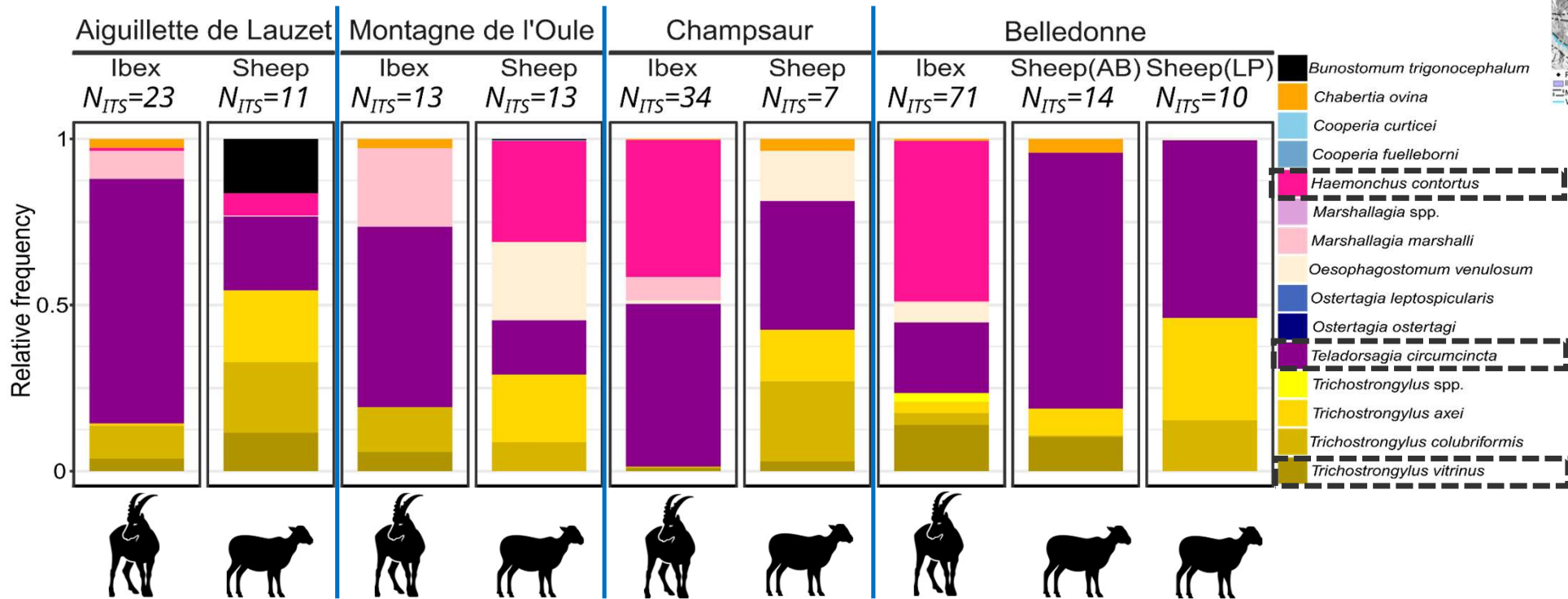
Shared species? Nemabiome ibex ≠ nemabiome sheep?



→ 13 species
→ 2 genus

Results

Shared species? Nemabiome ibex ≠ nemabiome sheep?

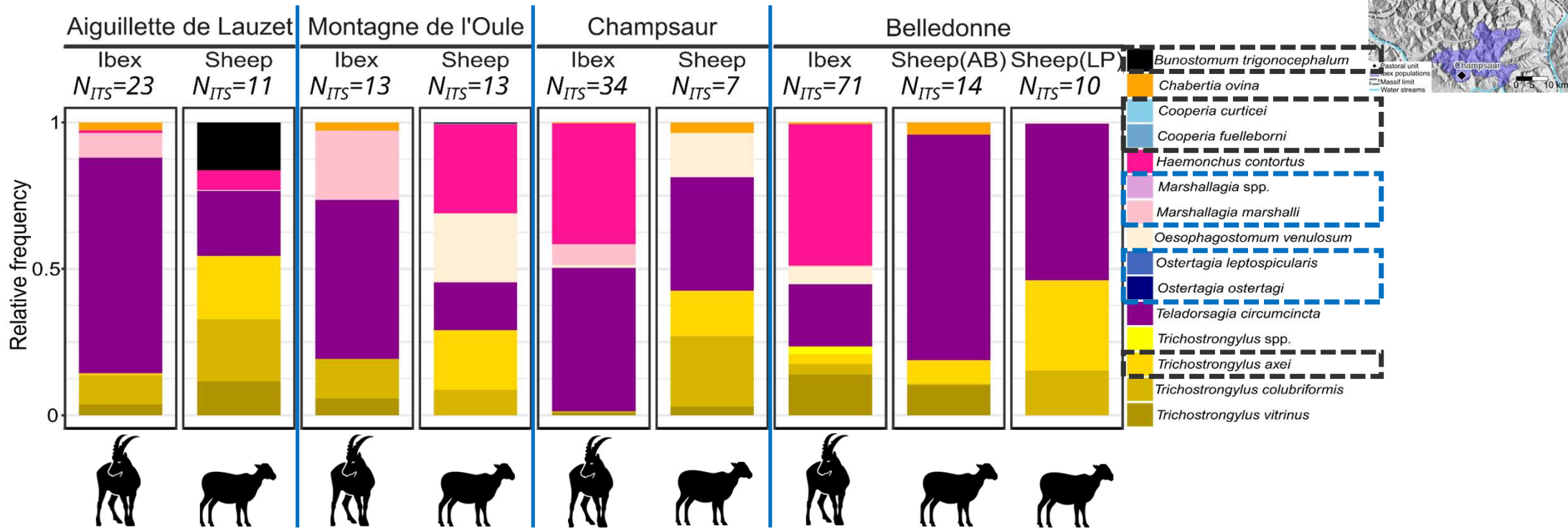


Most prevalent and in both sheep and ibex:

- *Teladorsagia circumcincta*: 85% of the samples
- *Trichostrongylus vitrinus*: 63%
- *Haemonchus contortus*: 56%

Results

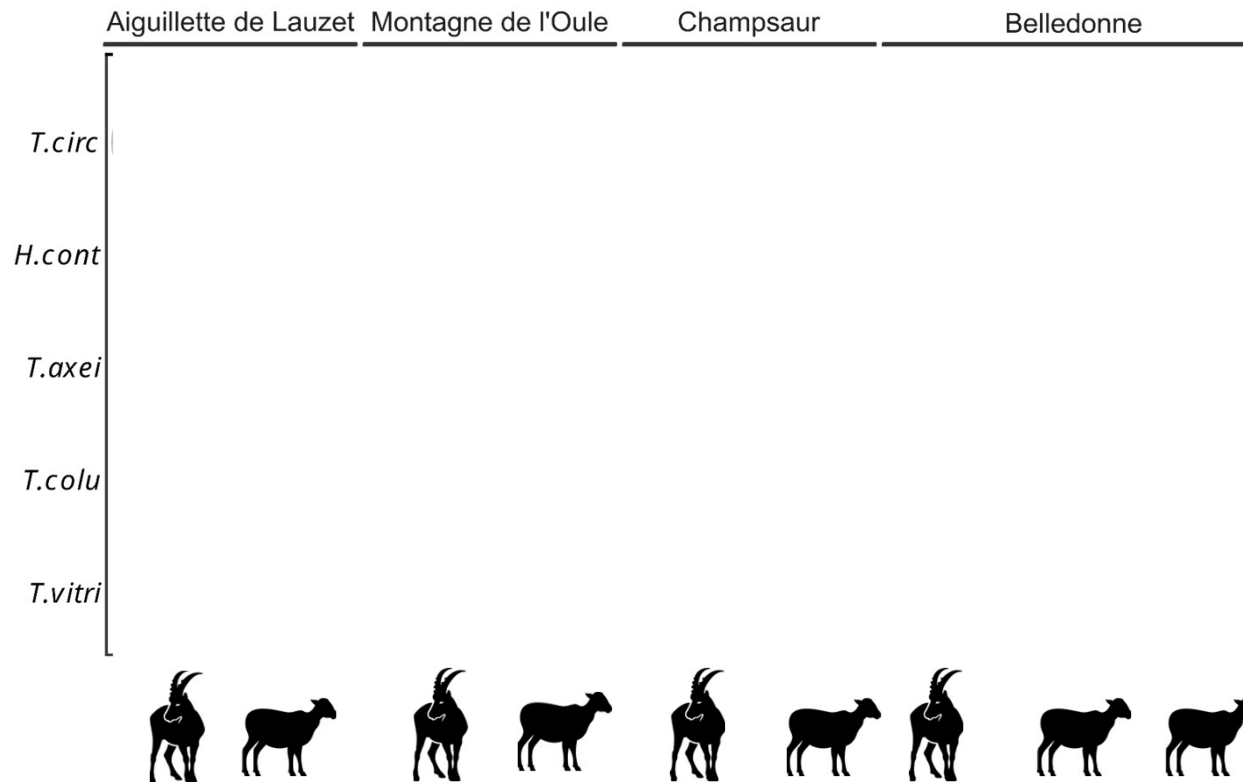
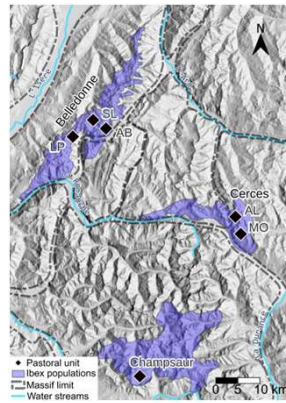
Shared species? Nemabiome ibex ≠ nemabiome sheep?



- Higher species diversity in ibex vs sheep
- Mostly or only in sheep: *Trichostrongylus axei*, *Bunostomum trigonocephalum*, *Cooperia* spp.
- Only in ibex: *Marshallagia* spp., *Ostertagia* spp.

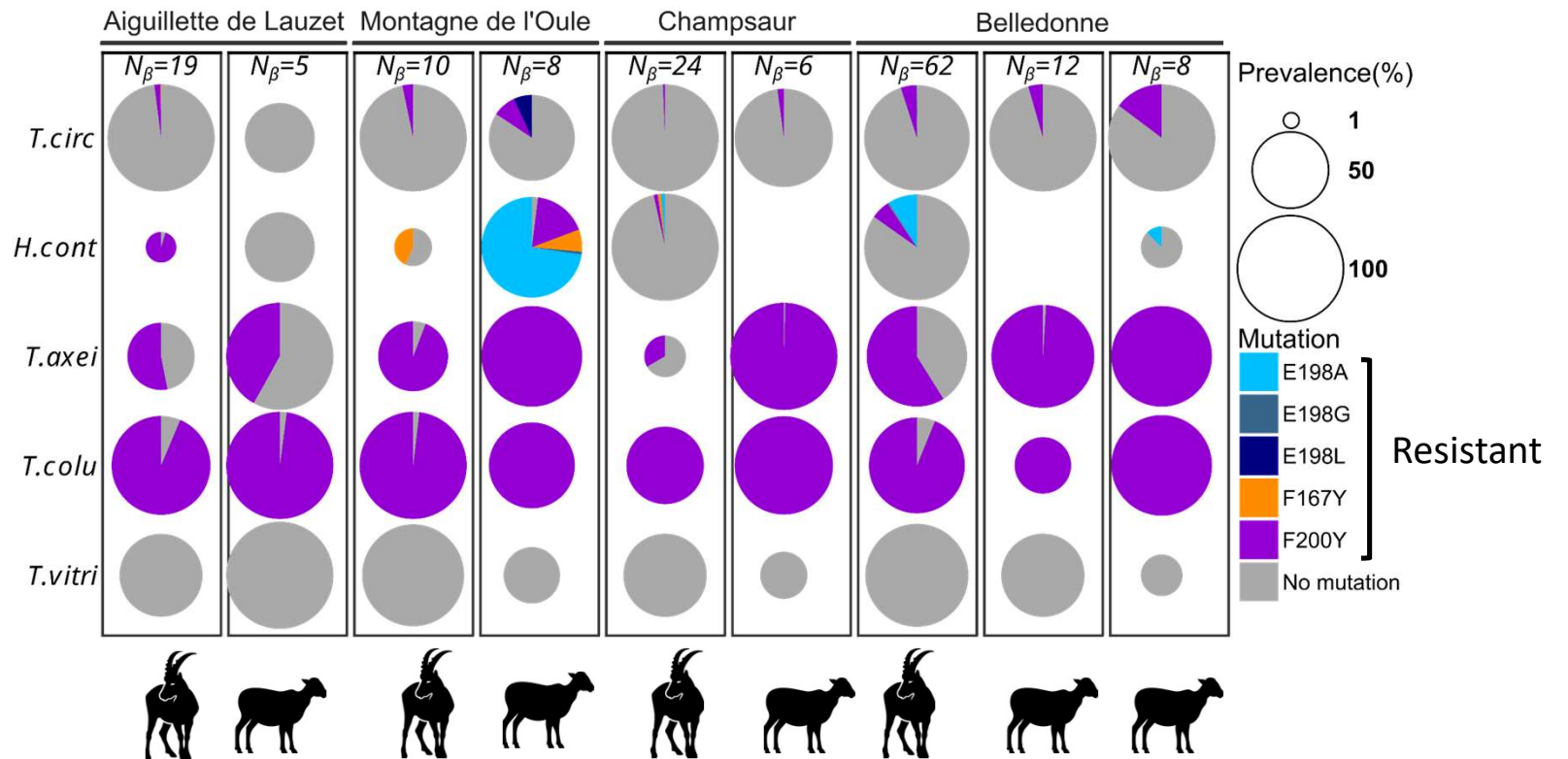
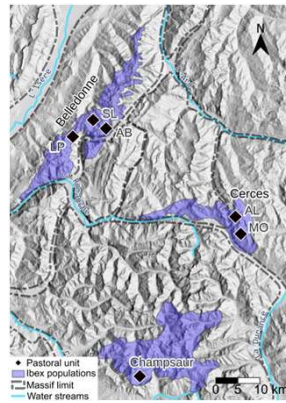
Results

Parasites resistant to benzimidazoles in sheep and wild ibex?
(sheep > ibex)



Results

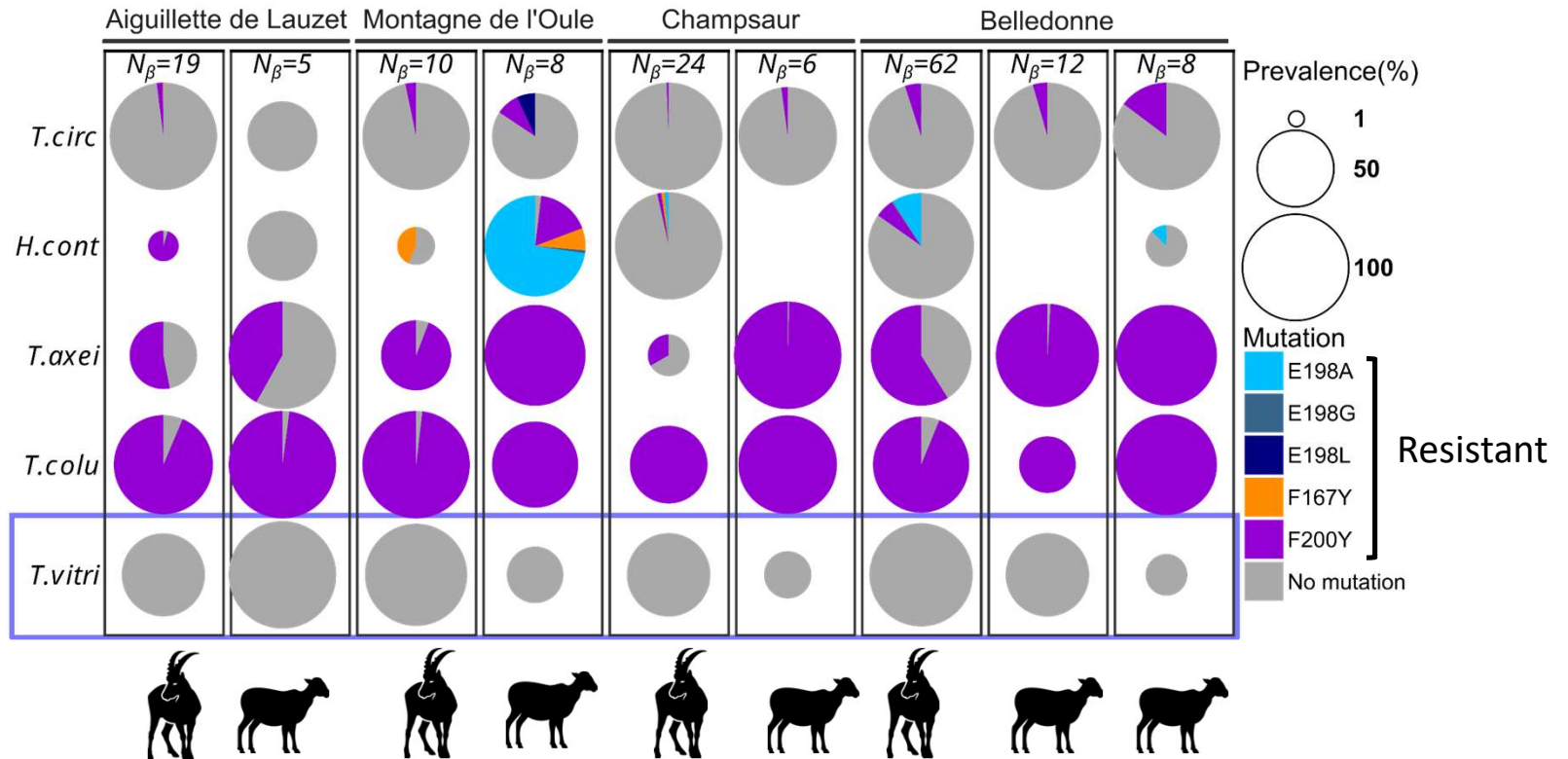
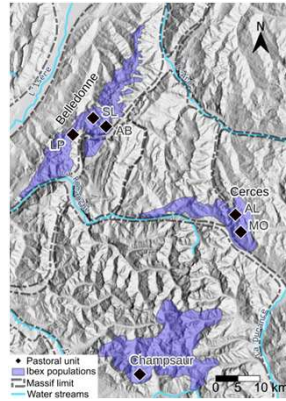
Parasites resistant to benzimidazoles in sheep and wild ibex?
(sheep > ibex)



Results

Parasites resistant to benzimidazoles in sheep and wild ibex?
(sheep > ibex)

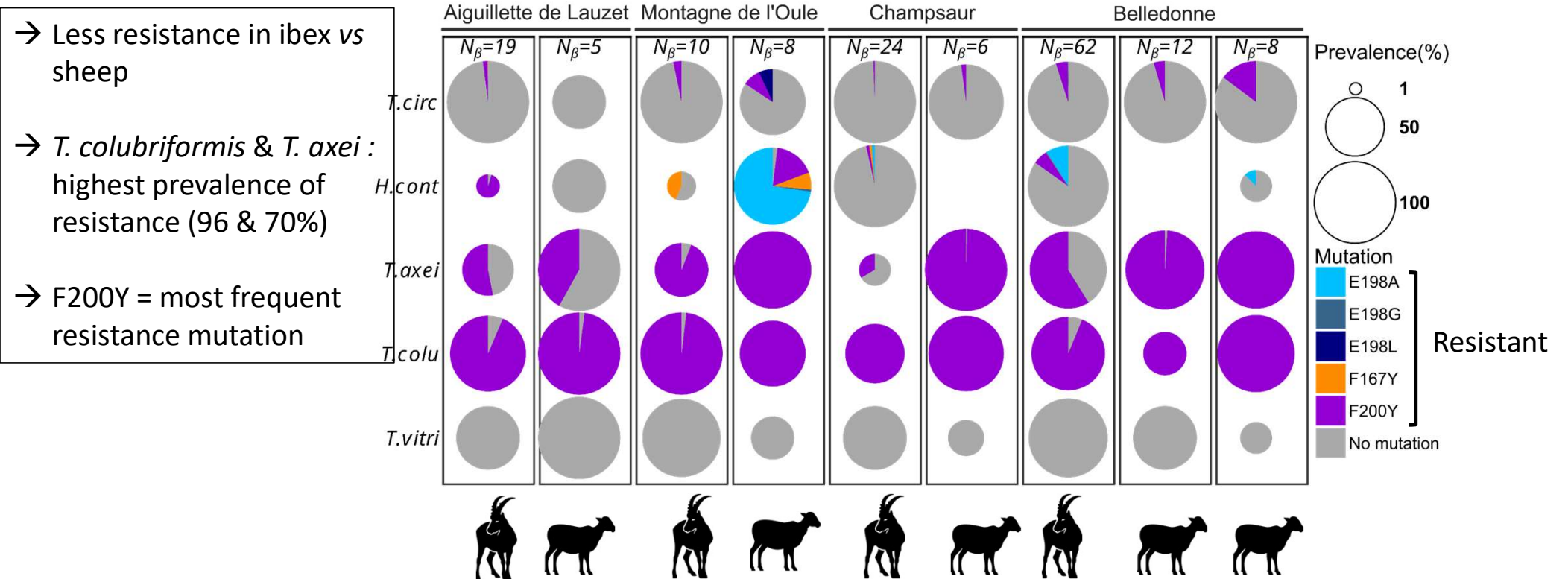
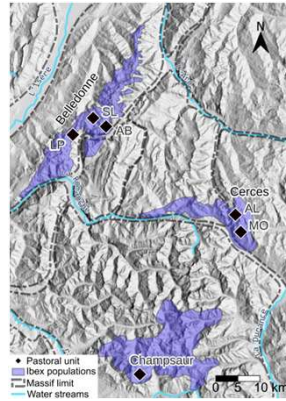
Resistance mutations were highly frequent (93.5% of the samples; n=144/154)



No resistance detected

Results

Parasites resistant to benzimidazoles in sheep and wild ibex?
(sheep > ibex)



Discussion

Do domestic sheep and wild ibex have similar communities of nematode (= nemabiome)?



Includes pathogenic parasites (e.g. *H. contortus*)
→ Consequences on population dynamic of ibex?



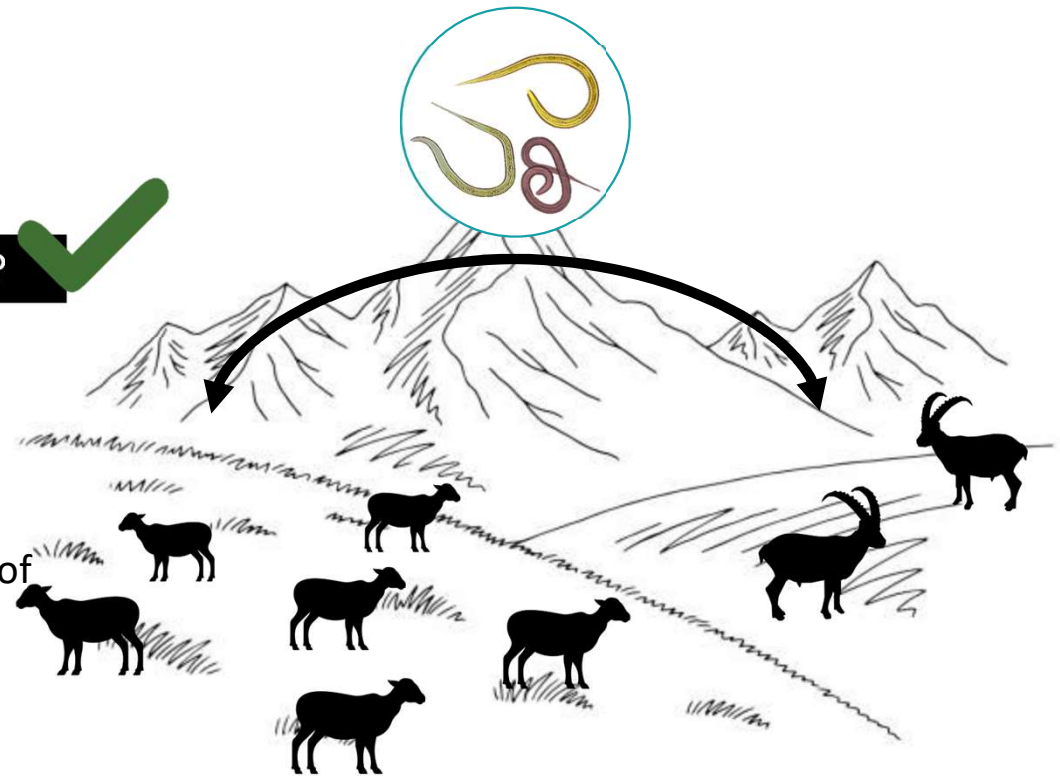
Discussion

Do domestic sheep and wild ibex have similar communities of nematode (= nemabiome)?

Includes pathogenic parasites (e.g. *H. contortus*)
→ Consequences on population dynamic of ibex?

Are ibex contaminated by parasites resistant to anthelmintic?

- Ibex never treated → contaminated by sheep
- Ibex shed eggs of resistant nematodes despite no sheep >8-10 months
- Relative contribution of each species in the dynamic of resistant parasites?
- Ibex = refugia of sensitive parasites or reservoir of resistant parasites for sheep?





Thanks !

