



Forestomach pH in hunted roe deer (*Capreolus capreolus*) in relation to forestomach region, time of measurement, supplemental feeding, and a comparison among wild ruminant species



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Aims of wildlife feeding

- High survival rate
- Avoid tree damage
- Prime body condition
- (optimal antler development)
- Avoiding feeding deaths



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Sufficient food offer - fibre content as in natural diet

Food more attractive than natural diet - lower fibre content

Intensive feeding with even lower fibre content

Excessive content of easily digestible nutrients - fibre content too low



Tree damage

- Conflicting evidence
- 'Pull effect' - tree damage is shifted into the vicinity of the feeding station
- Food must be a bit more attractive than the tree forage
- If food too low in fibre, deer may additionally ingest natural forage to achieve fibre levels necessary to avoid acidosis



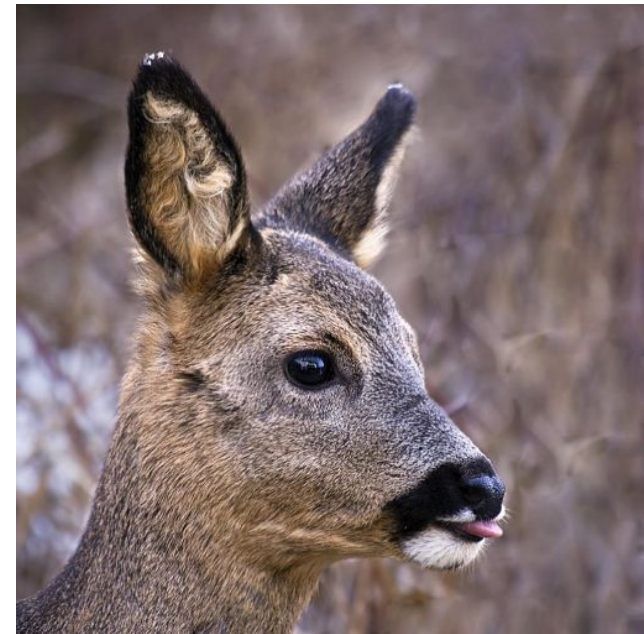
Antler development

- Conflicting evidence
- Genetic potential can be fully used under ideal feeding conditions ...
- ... but the question is whether available forage is the limiting factor in the habitat
- Antlers do not show whether they have been achieved by habitat management, population management, or 'mast feeding'



Differences in acidosis susceptibility?

- Anecdotal reports: rumen acidosis is particularly frequent in roe deer



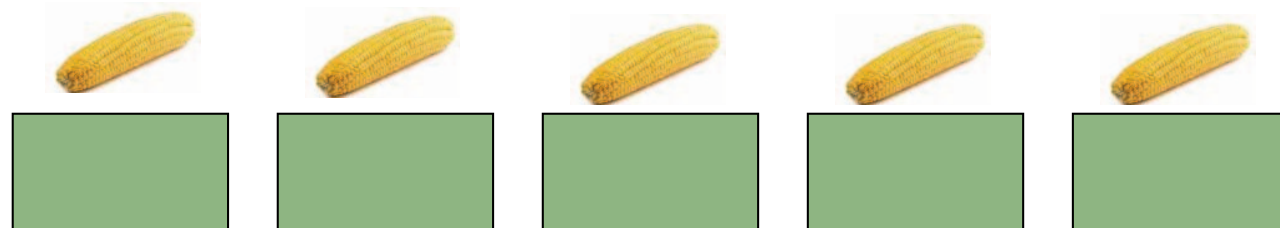


Social aspects of feeding



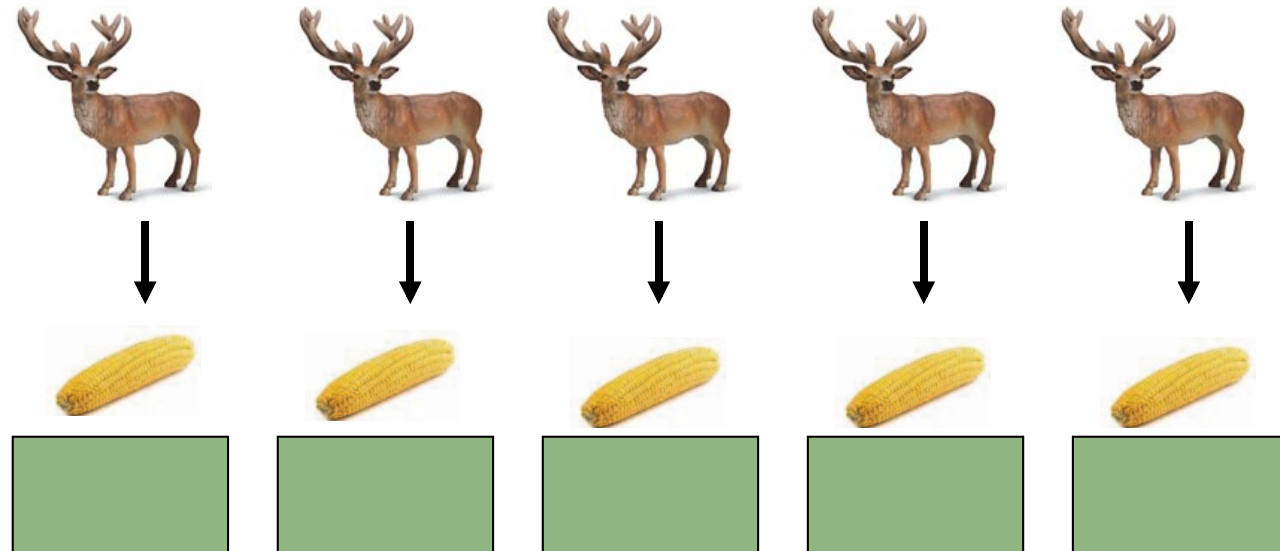


Social aspects of feeding



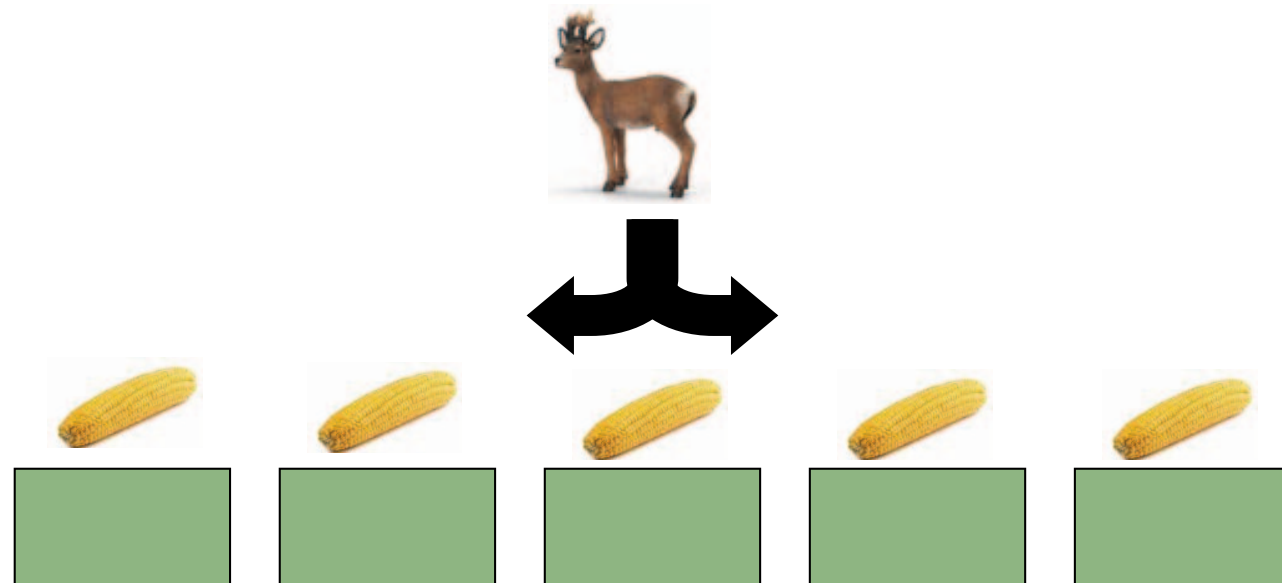


Social aspects of feeding





Social aspects of feeding





Reasonable rations

- **Red deer**
- **Roe deer**



Red deer: overfeeding in winter

- From red deer and wapiti farms, an increase in obstetric problems is reported (accumulation of abdominal fat; large fawns).
- Deer farms: trying to prevent weight loss in winter is not economical because then, the potential for weight accretion during summer is not exploited.



Red deer: winter feeding

“For red deer feeding during winter, an energy density of 7-9 MJ ME/kg dry matter is sufficient. Because such levels are found in hay or silages of medium quality, there is no rational necessity for the addition of concentrates.”

(Kamphues et al. 2004)



Food composition

(%dry matter)

Food	Ash	Protein	Fat	Fibre	Rest
Browse leaves	8	20	3	27	42
Herbs	13	20	3	25	39
Grass	9	15	3	34	39
Grass hay	9	12	2	35	41
Grass silage	9	13	4	30	44
Beet silage	10	11	1	21	57
Corn silage	8	8	3	20	61
Deer pellet 743	5	15	3	11	66
Deer pellet 847	4	11	3	11	71



***There are no secret,
species-specific
ingredients!***



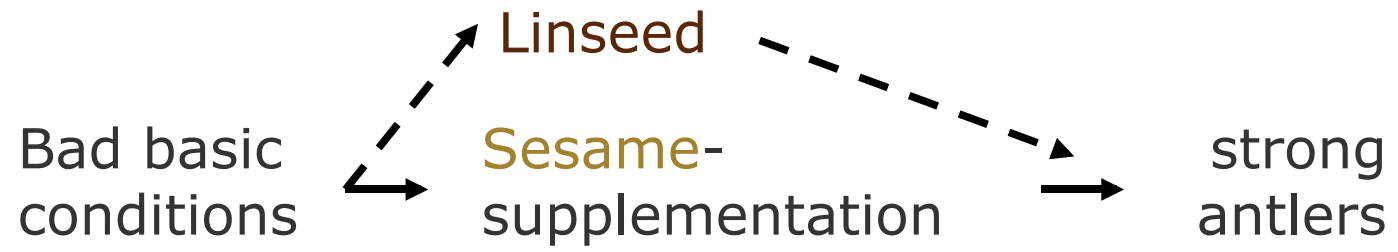
Bad basic
conditions

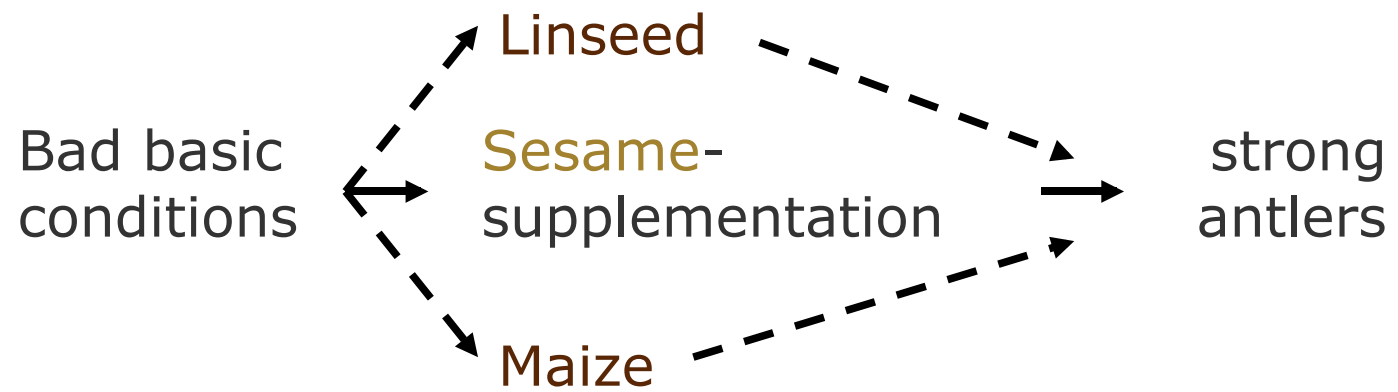


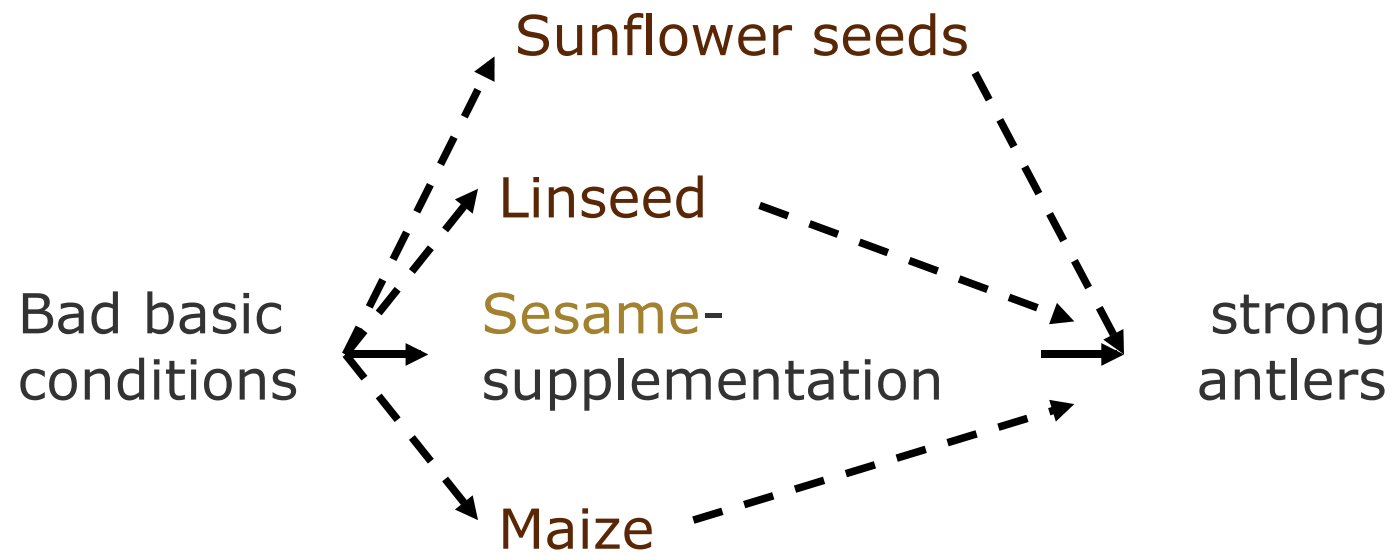
Bad basic
conditions → Sesame-
supplementation

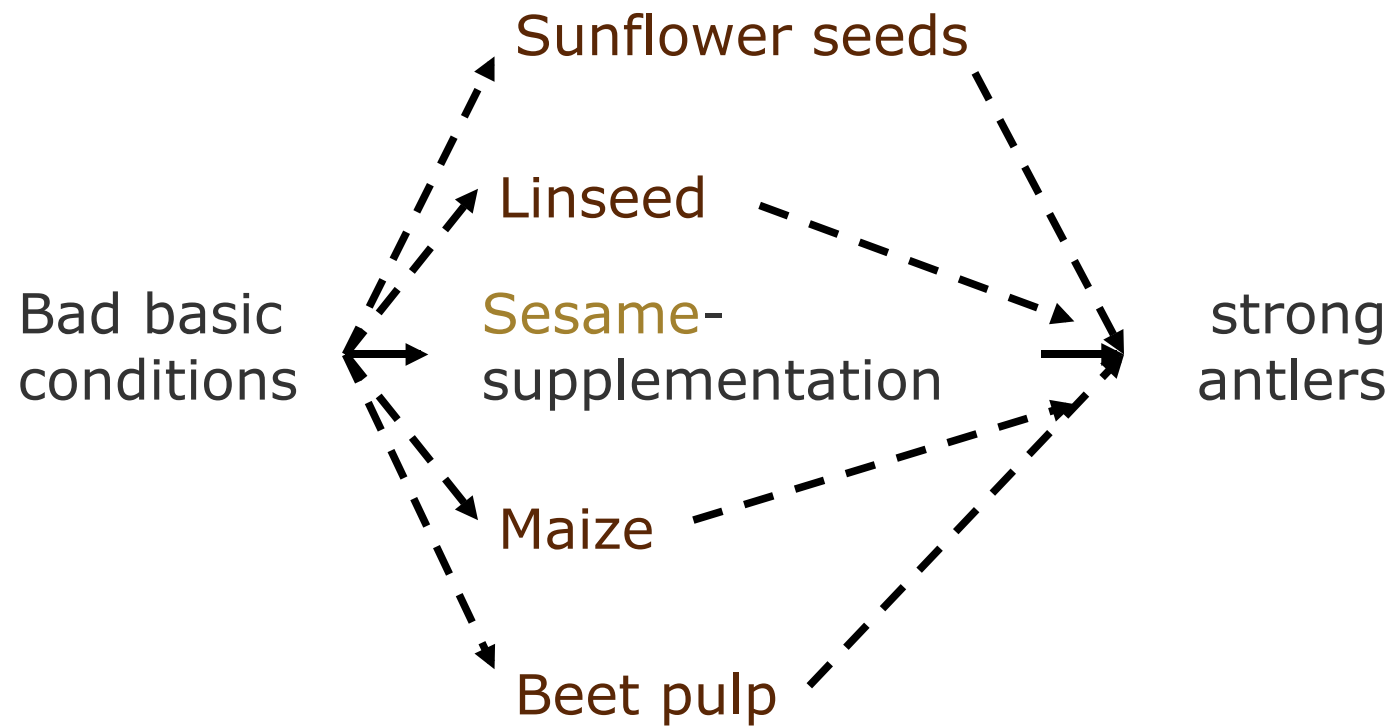


Bad basic
conditions → Sesame-
supplementation → strong
antlers











Reasonable rations

- **Red deer**

Grass hay or grass silage only

Limited amounts of concentrates (feeding stations according to herd size)

- **Roe deer**



Ration design

- Grains (starch) can induce rumen acidosis
- Bread is pure starch
- Maize starch is particularly difficult to digest and can therefore also lead to hindgut acidosis
- Beet pulp contains a lot of easily digestible fibre (pectin) and are thus energy-dense without representing an acidosis risk factor



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Deer pellet 847	4	11	3	11	71
Apple	4	2	1	8	85
Bread	6	15	3	1	75
Maize	2	9	5	2	81



Photo: Jake Veasey



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Photo: Jake Veasey



Apple pomace

Apfeltrestersilage gesackt

33-34 kg im handlichen Kunststoffsack, problemlos zu lagern
(Palette 700kg)



Inhaltsstoffe

TS-Gehalt	12,1 %
Rohprotein	6,9 %
Rohfett	3,2 %
Rohfaser	27,4 %
Rohasche	3,2 %
Zucker	1,5 %
Calcium	0,13 %
Phospor	0,11 %
StE	560 %



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Reasonable rations

- **Red deer**

Grass hay or grass silage only

Limited amounts of concentrates (feeding stations according to herd size)

- **Roe deer**

No grain/bread/maize/fresh fruit

Pellets from beet pulp and min. 18% crude fibre

Browse silage or mixed silages

Apple pomace - lucerne hay mixture



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Grass hay or grass silage only

Limited amounts of concentrates (feeding stations according to herd size)

All feeding regimes for roe deer!

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No grain/bread/maize/fresh fruit

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Sample

- 213 roe deer from 7 hunting districts
- May-November 2010/11





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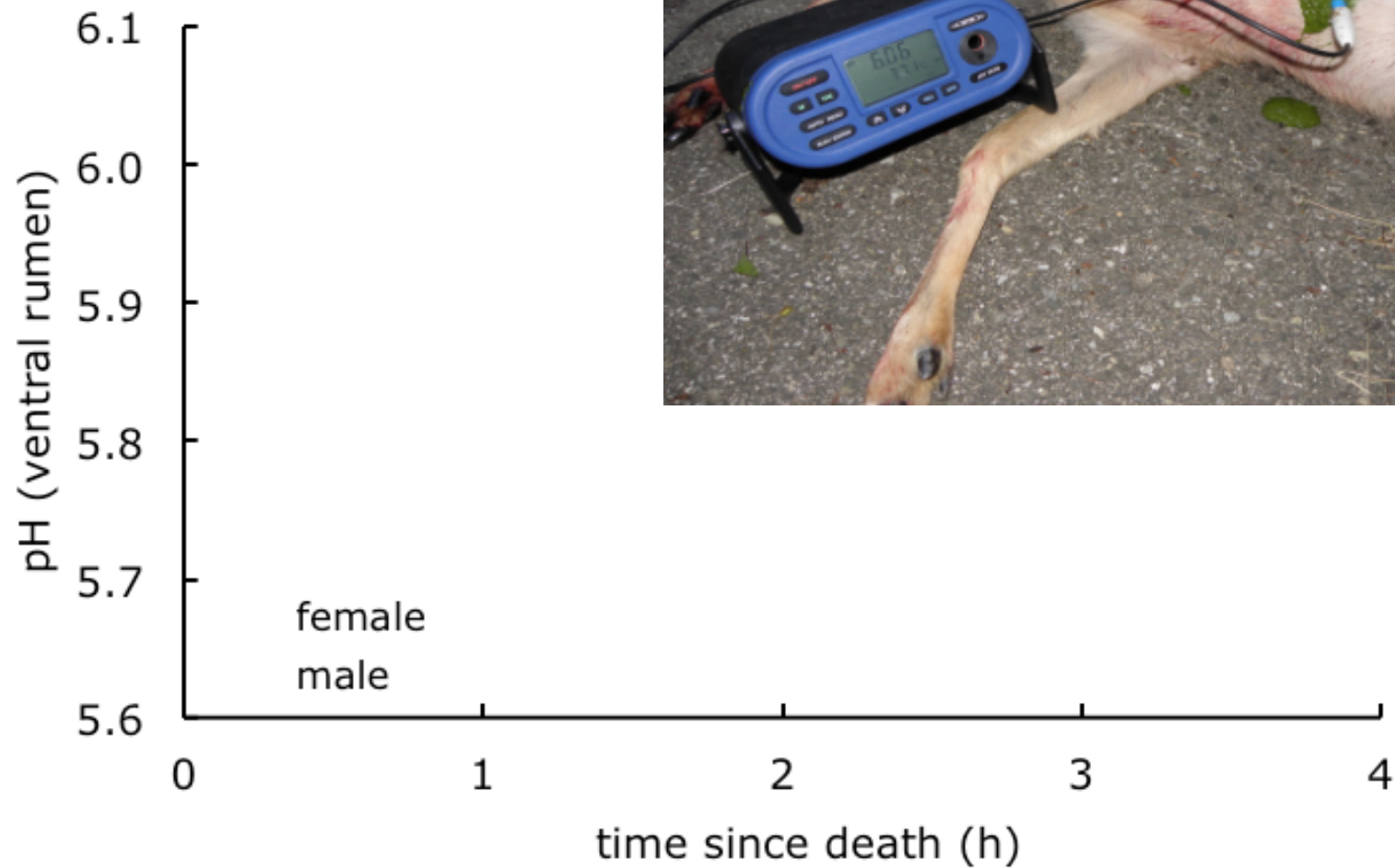


Questions

- Does time between death and measurement influence forestomach pH?

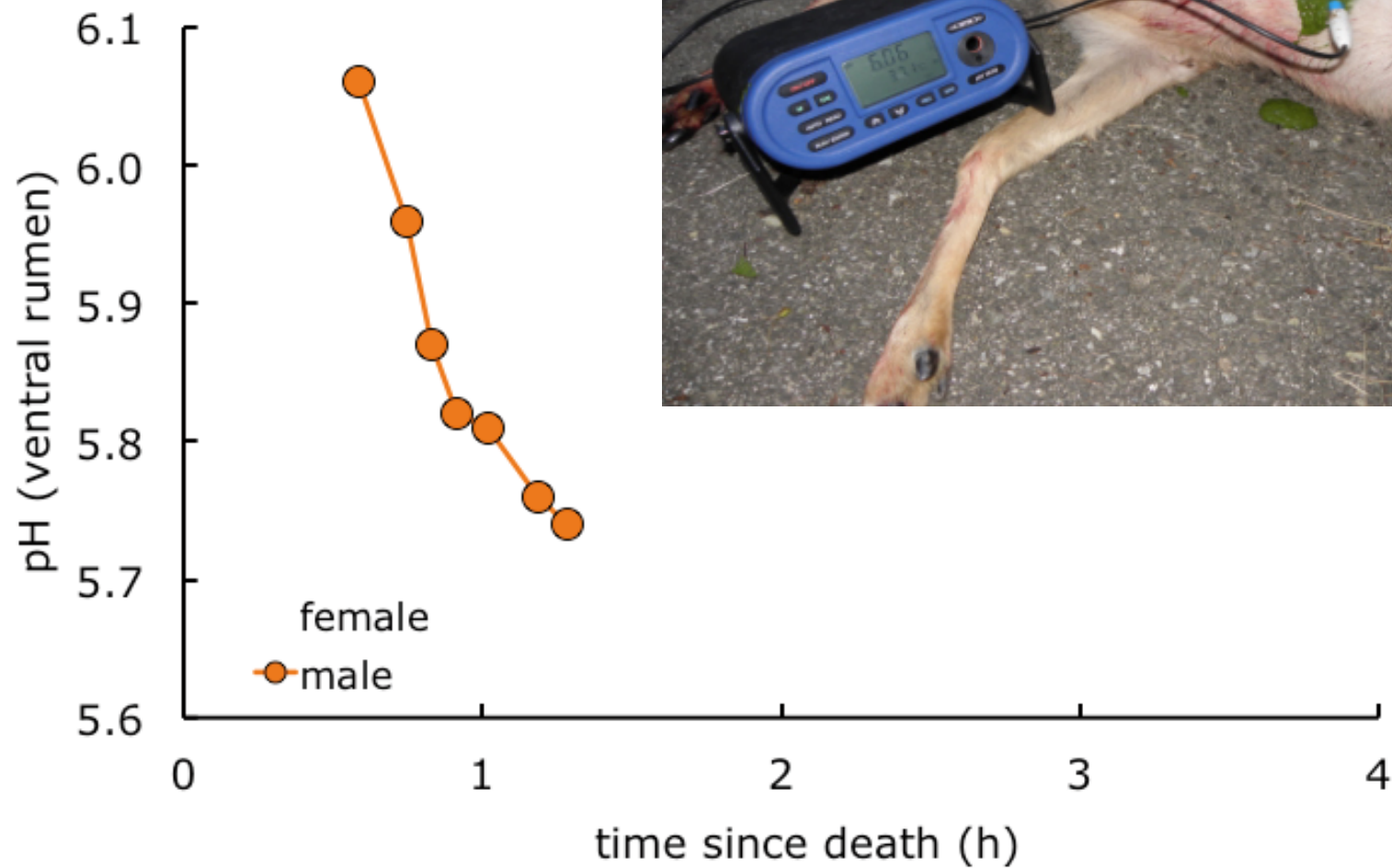


Pilot study



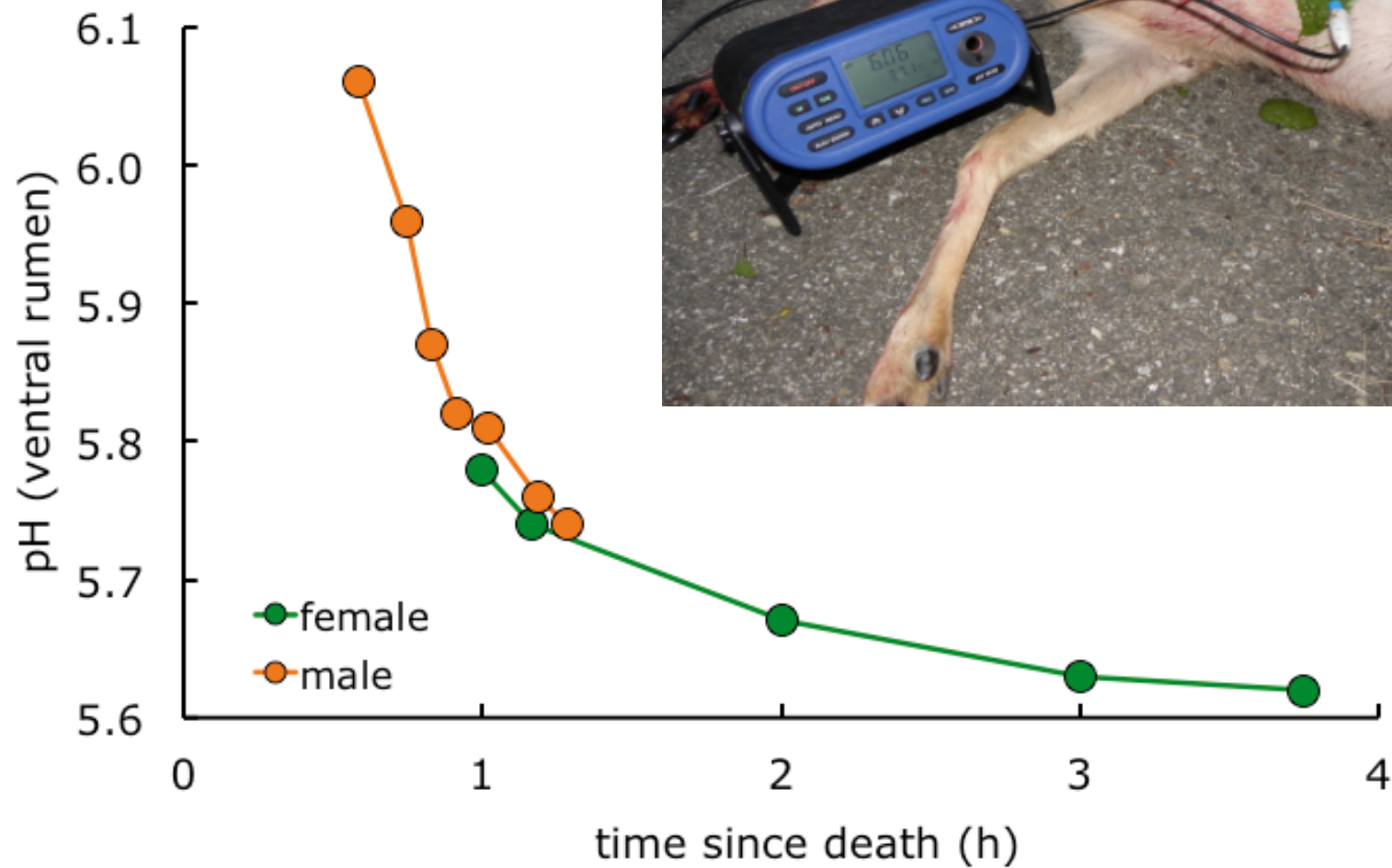


Pilot study





Pilot study





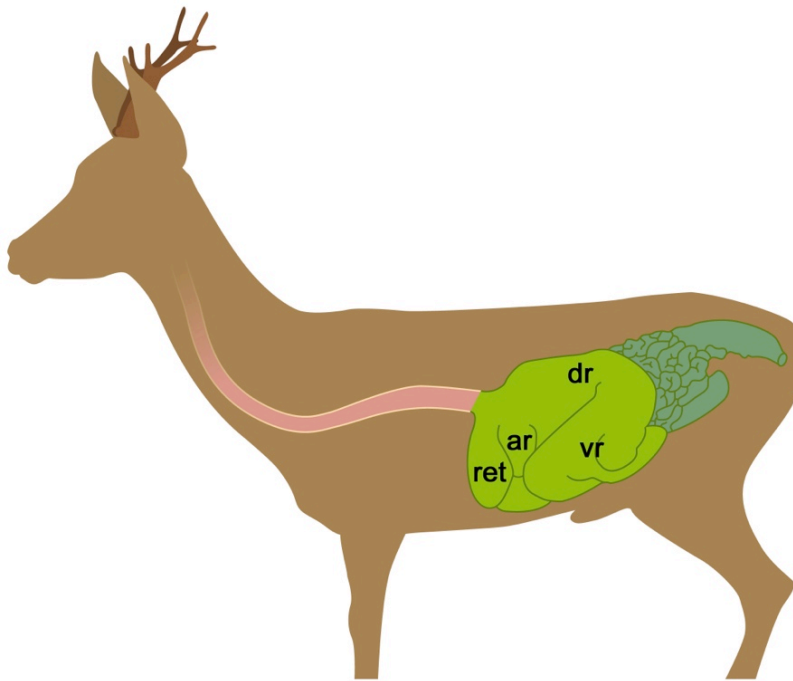
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- Does sampling location influence forestomach pH?



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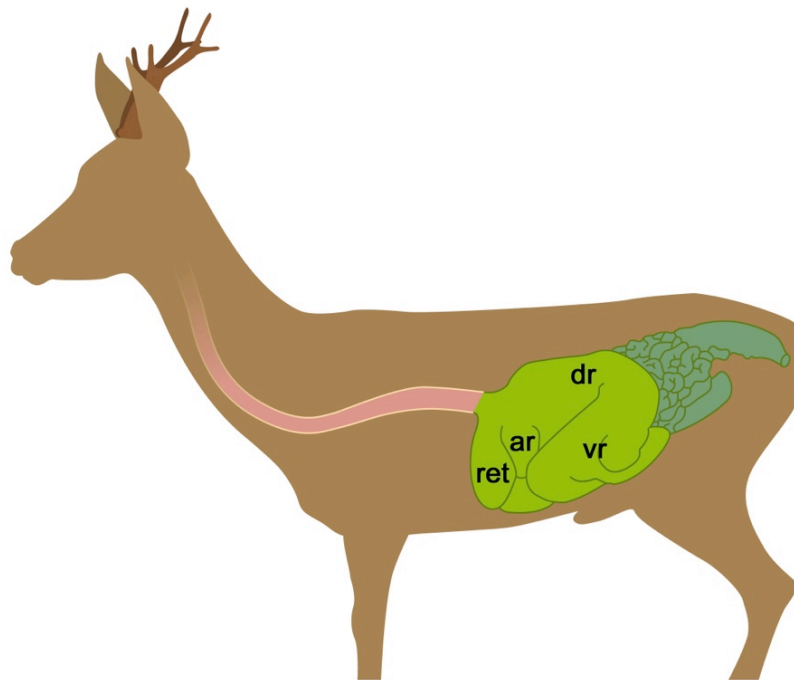
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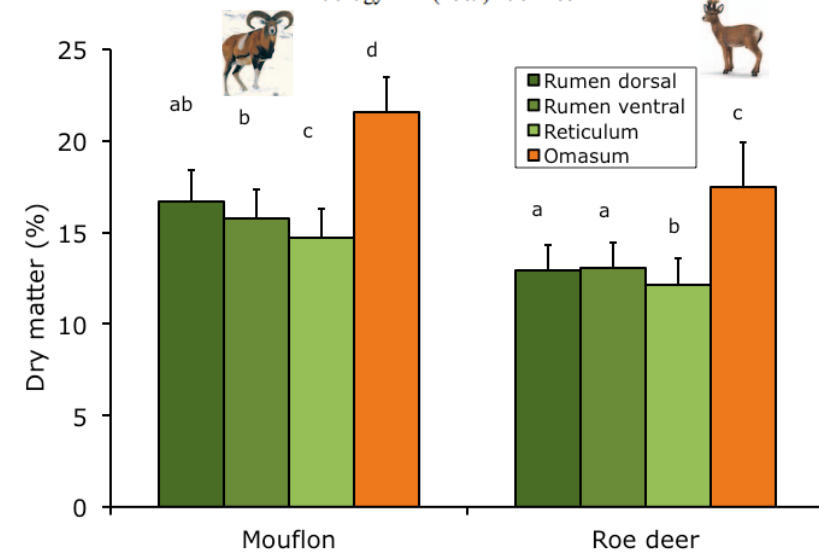
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Physical characteristics of rumen contents in two small ruminants of different feeding type, the mouflon (*Ovis ammon musimon*) and the roe deer (*Capreolus capreolus*)

Marcus Clauss^{a,*}, Julia Fritz^b, Dorothee Bayer^a, Jürgen Hummel^c, W. Jürgen Streich^d, Karl-Heinz Südekum^c, Jean-Michel Hatt^a

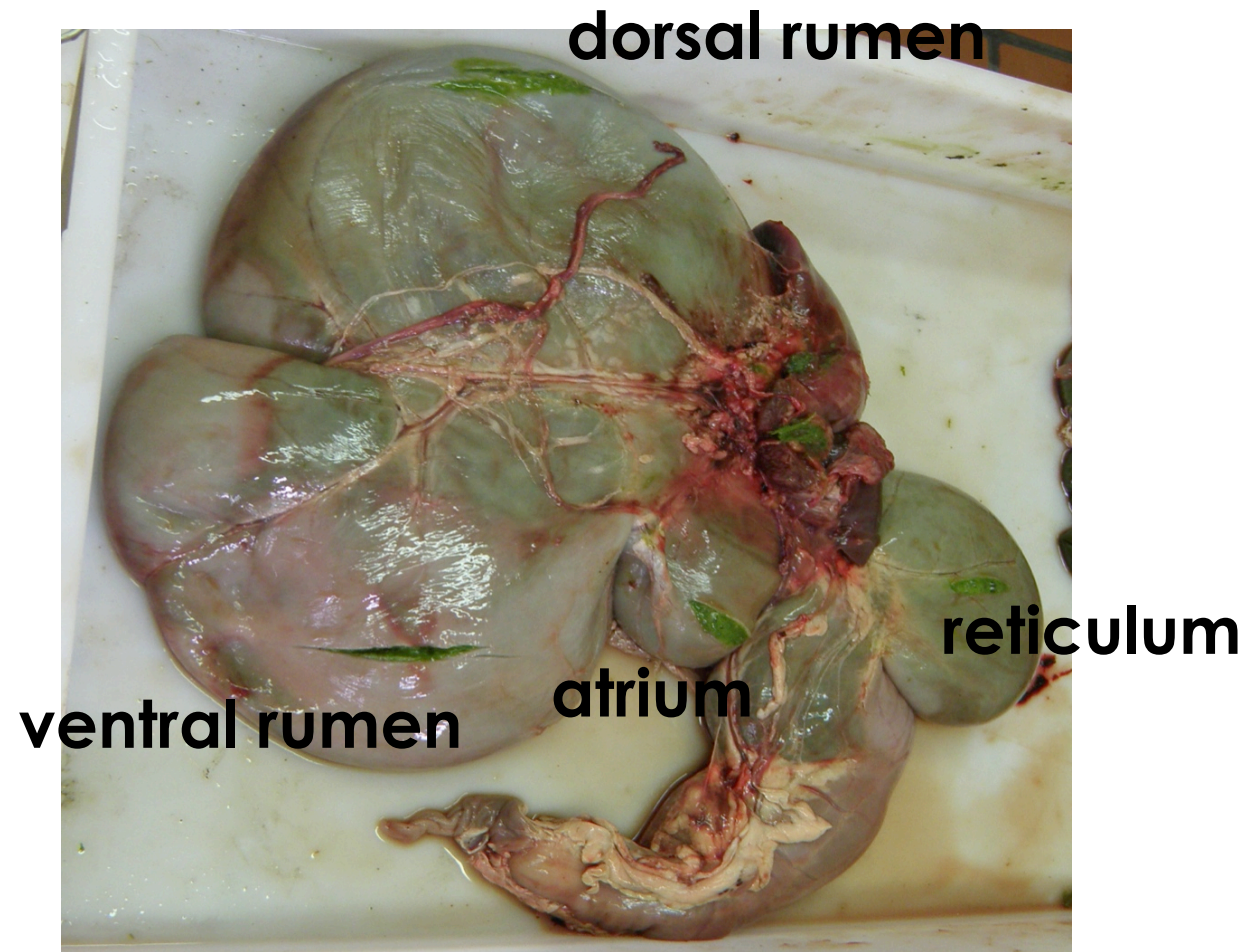
Zoology 112 (2009) 195–205





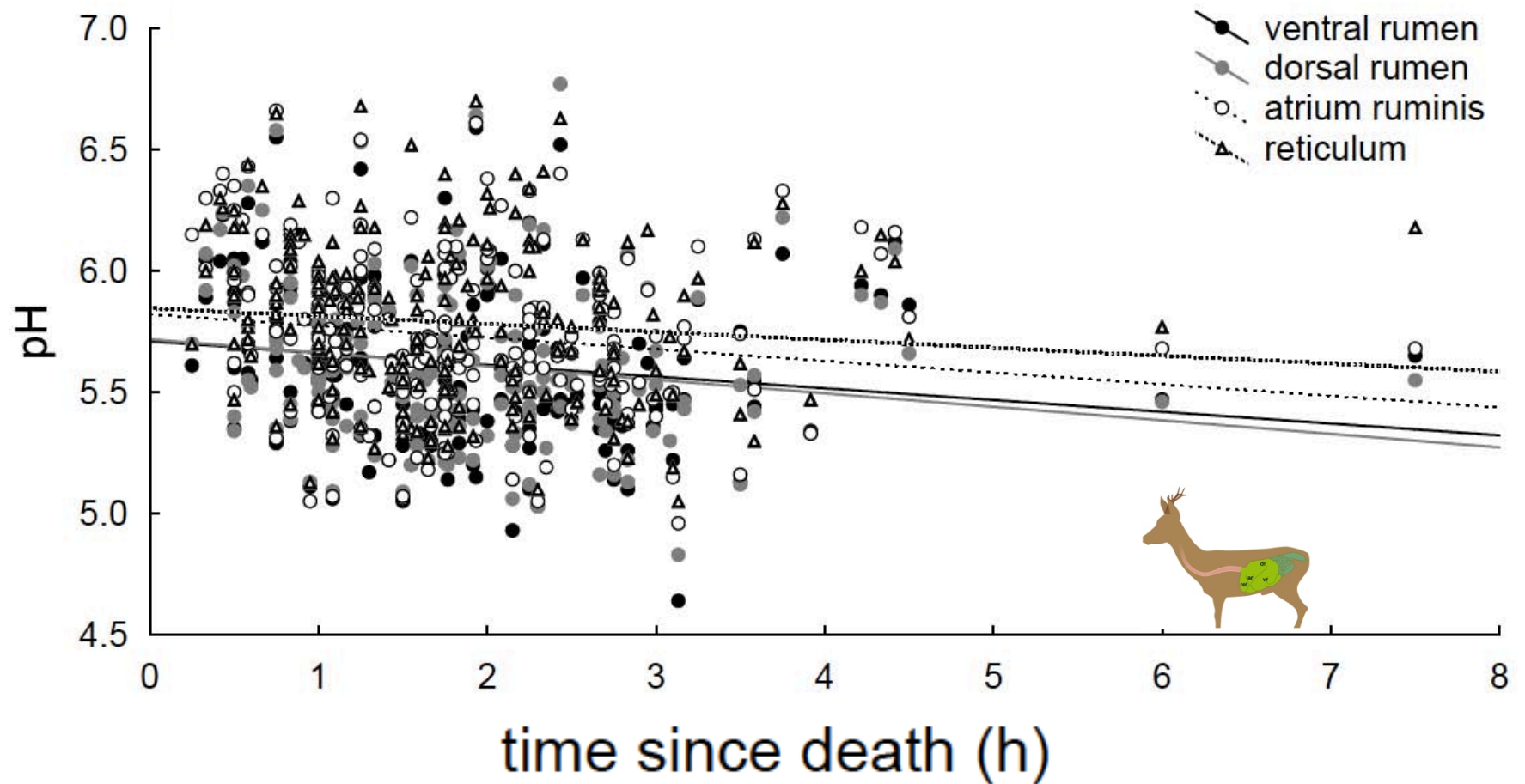


Sampling locations





Results



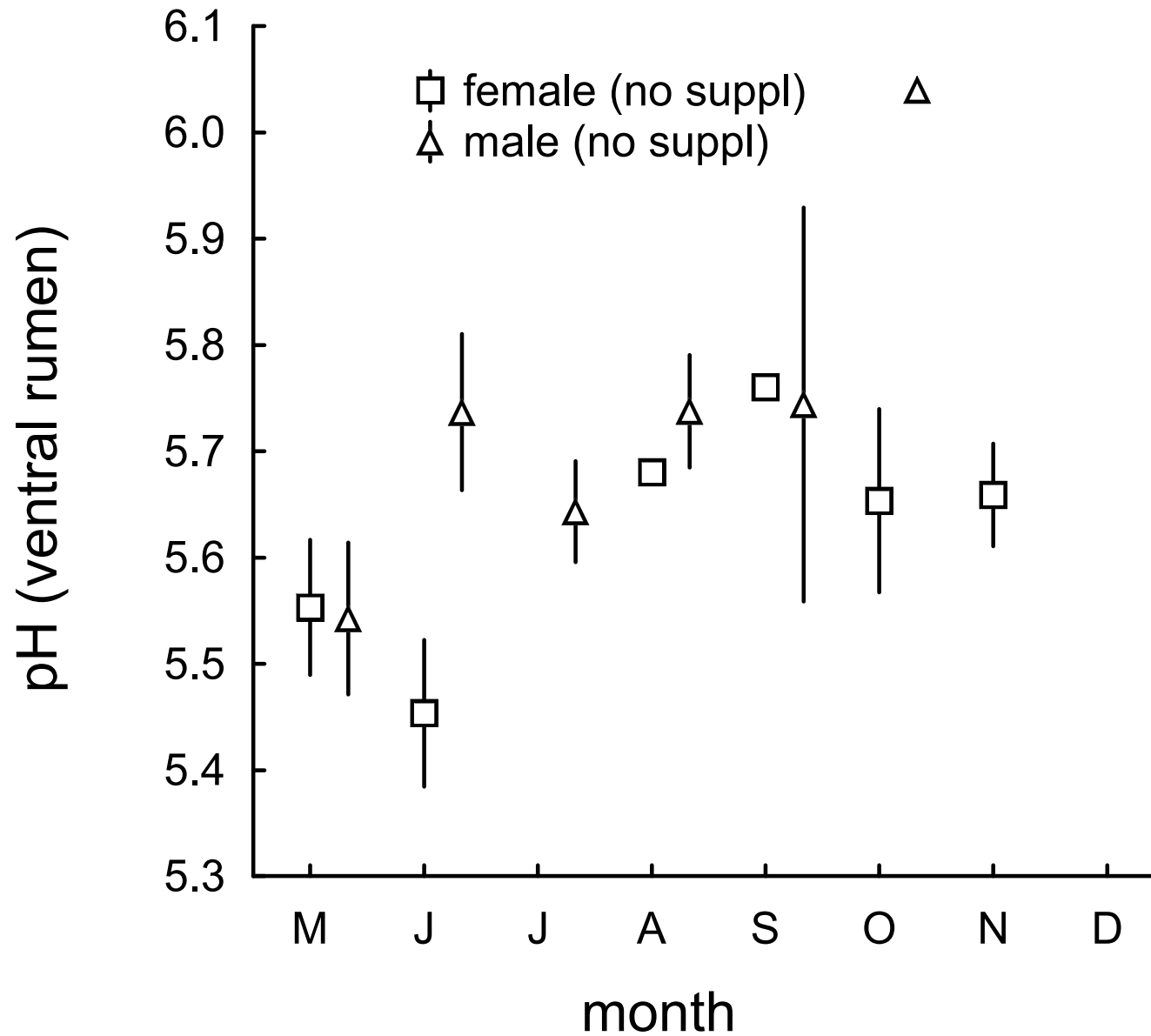


Questions

- **Is there a seasonal fluctuation of forestomach pH?**



Results





Questions

- **Is there a difference in forestomach pH between areas with and without supplemental winter feeding?**



Questions

- **Is there a difference in forestomach pH between areas with and without supplemental winter feeding?**

	(% as fed)
ensiled apple pomace	20.7%
sugar beets	20.7%
oats	20.3%
sesame expeller	10.0%
triticale	8.3%
peas	8.3%
maize	8.3%
rye	3.4%

(app. 120 tons distributed from the end of September to the end of March at 105 feeding stations)



Winter feeding





Winter feeding





Winter feeding



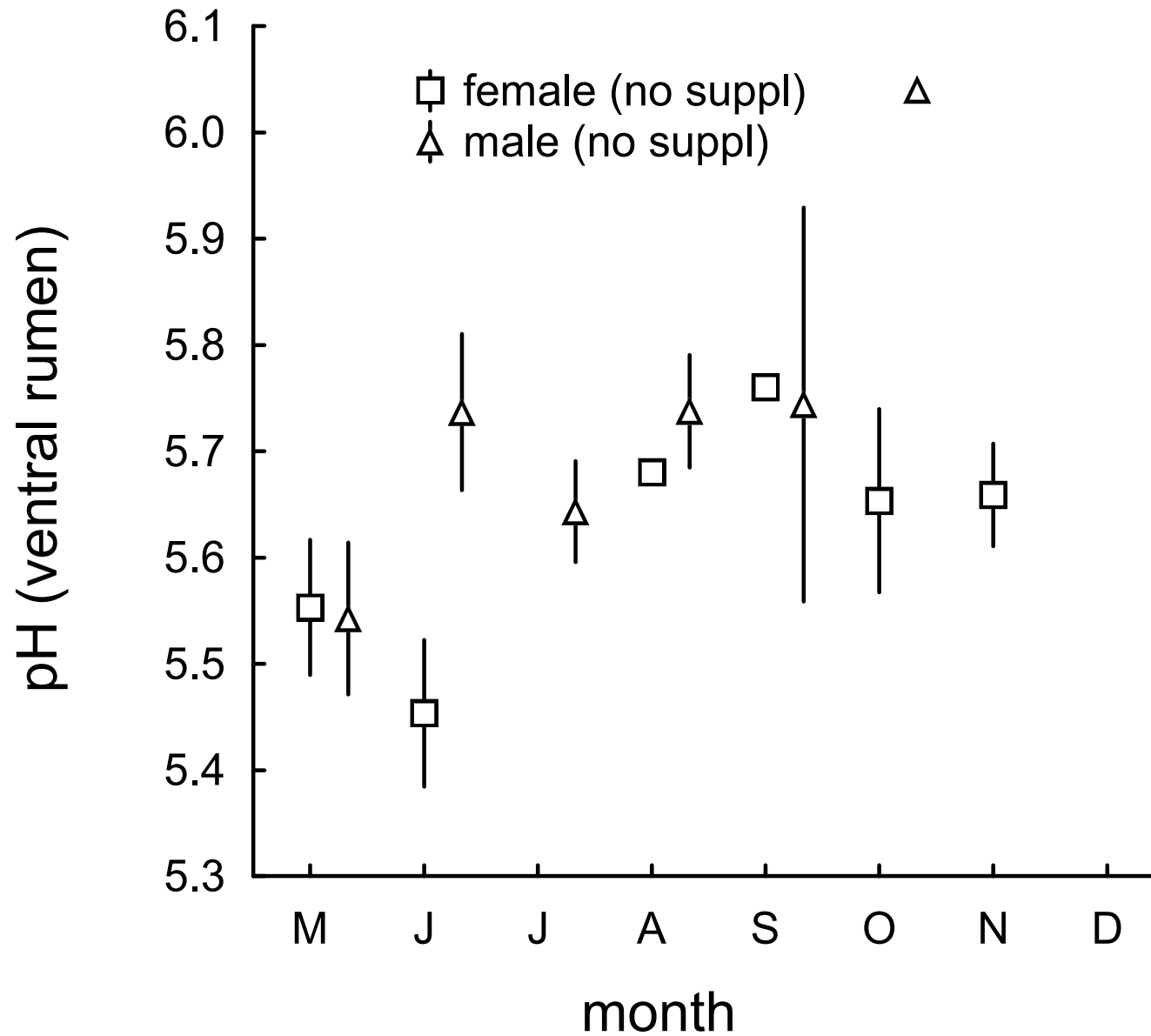


Winter feeding



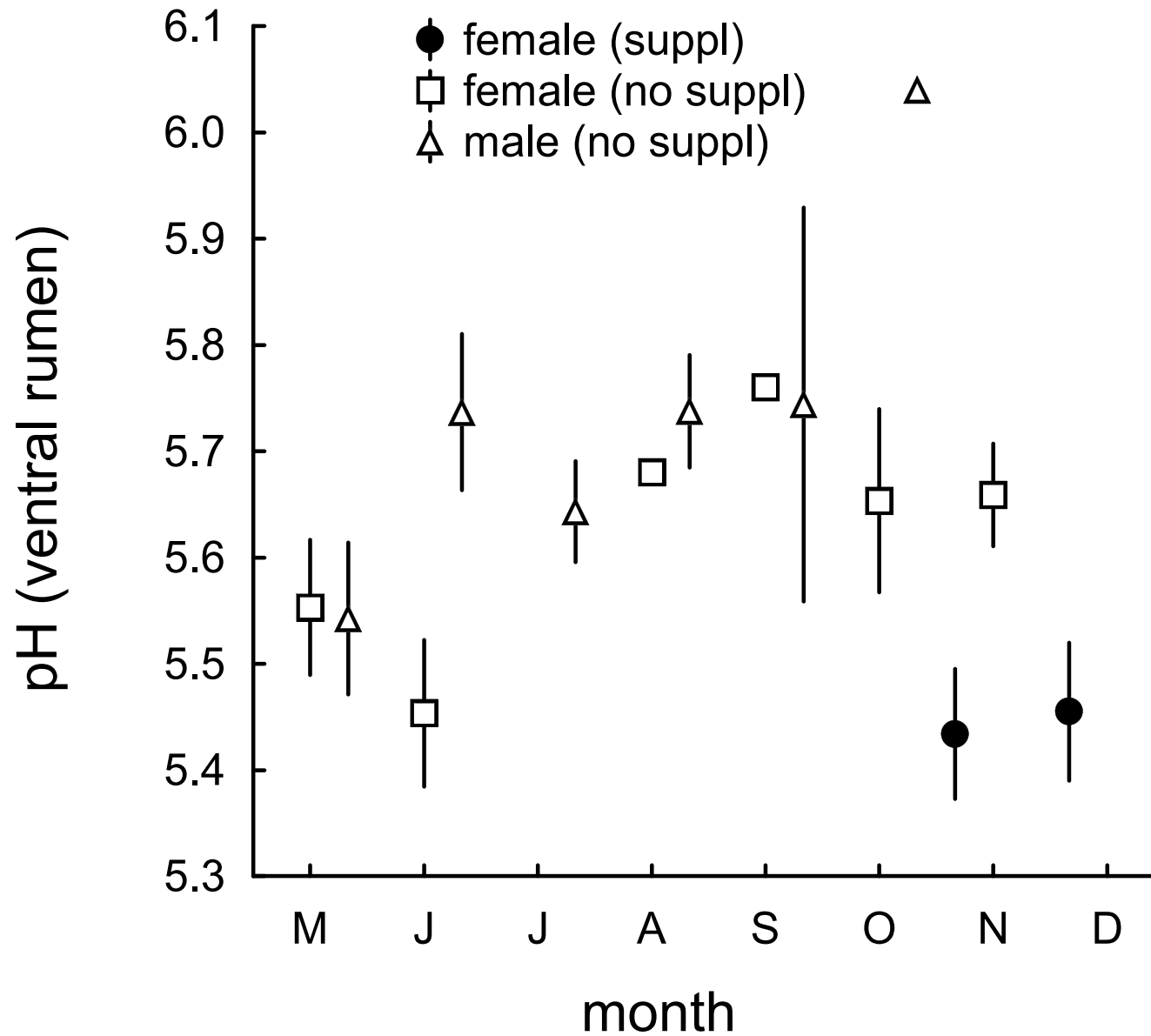


Results



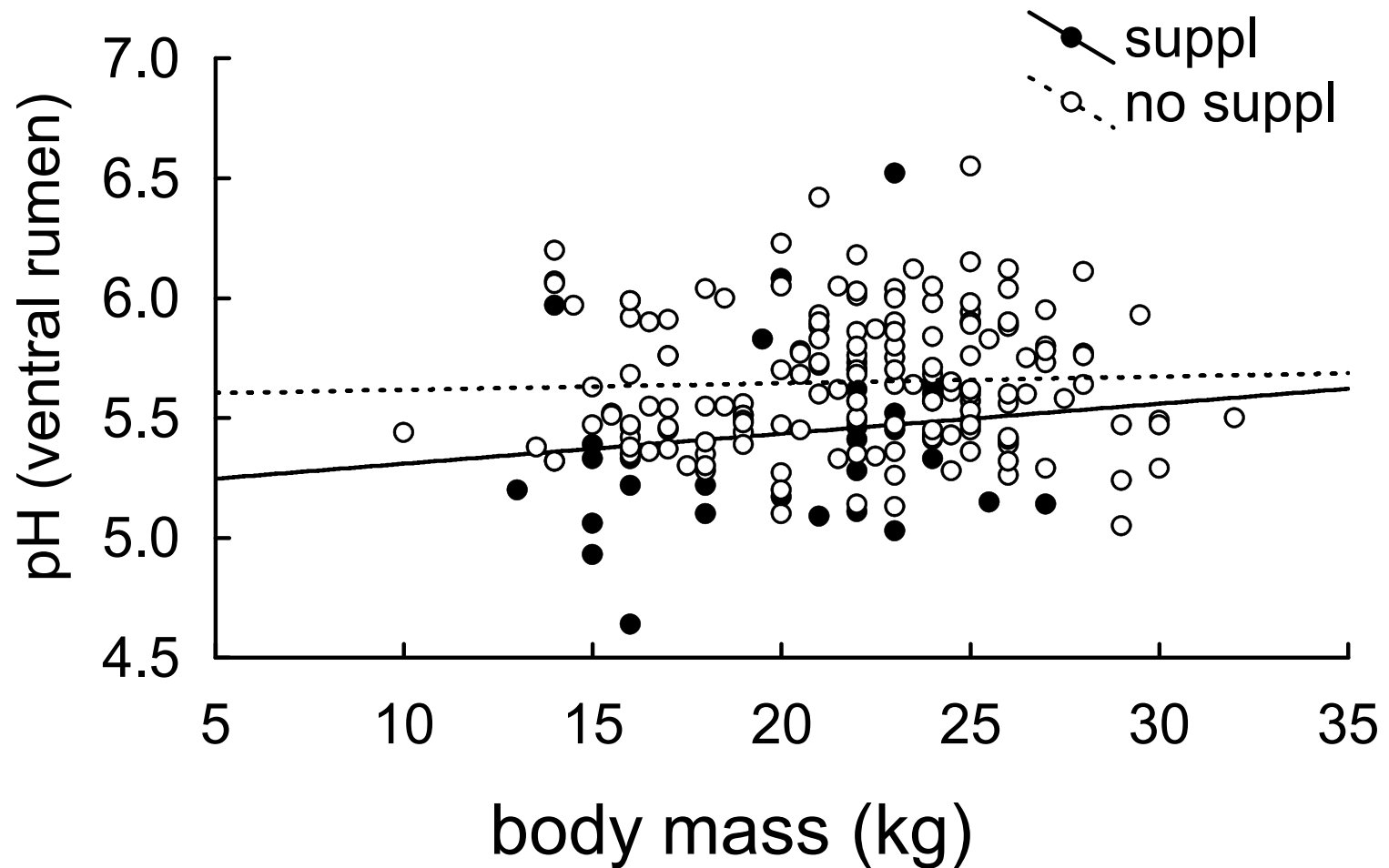


Results





Results





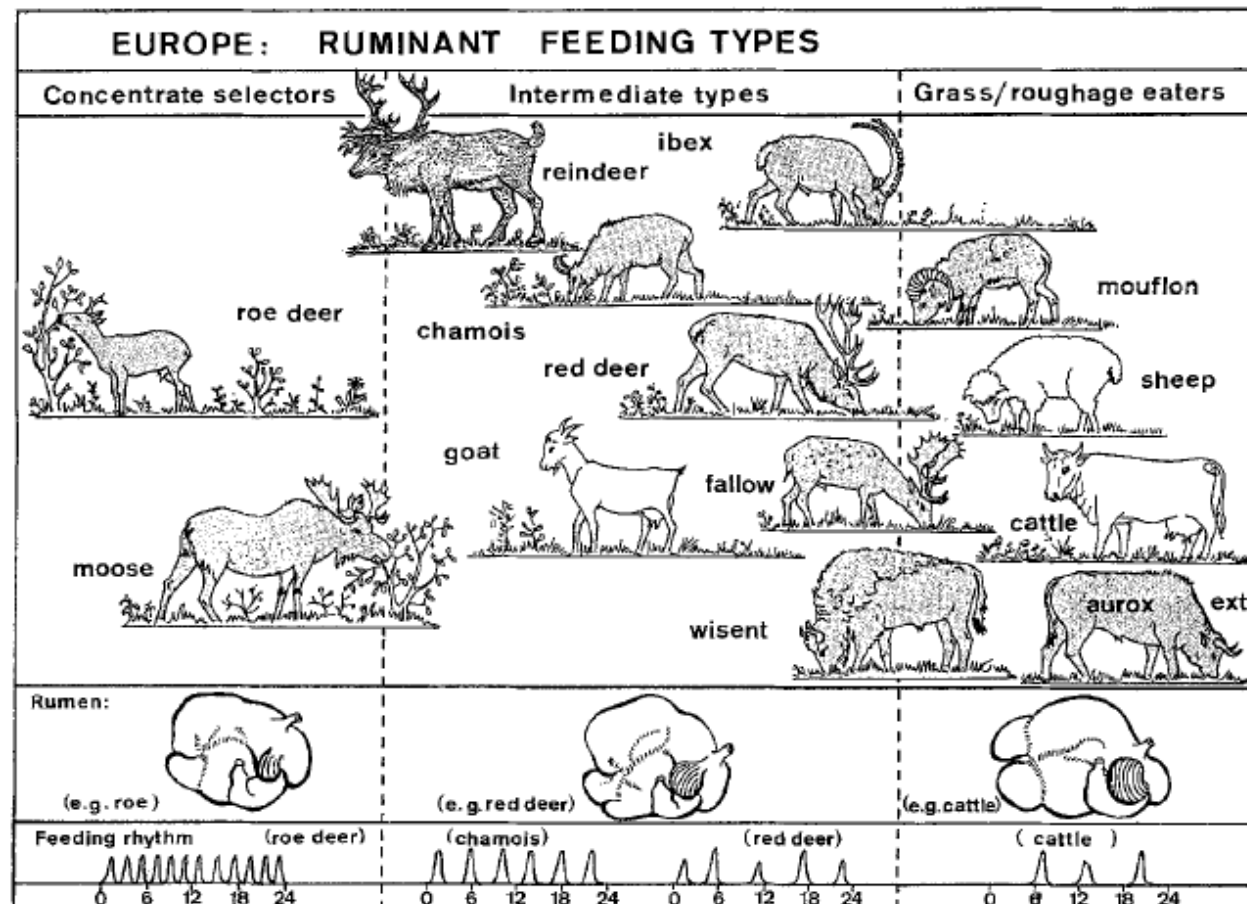
Questions

- Do roe deer (and other browsers) have lower forestomach pH than grazing ruminants?



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from Hofmann (1989)



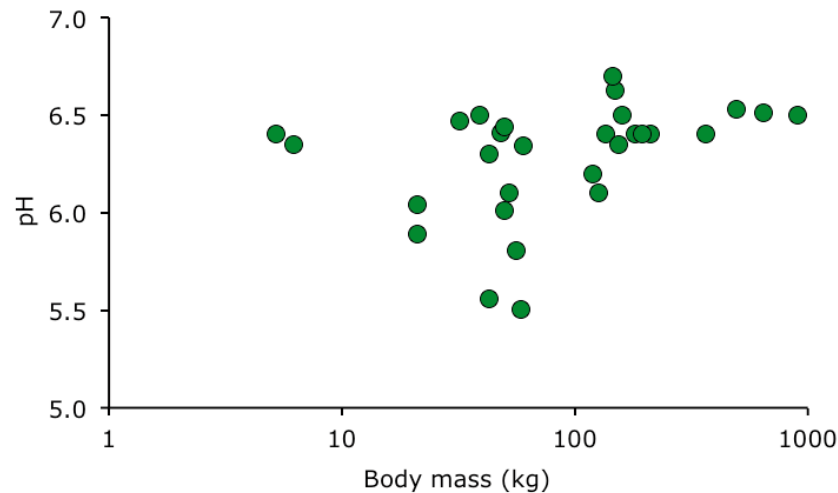
Results

- Data on 24 wild ruminant species of different body mass and feeding type



Results

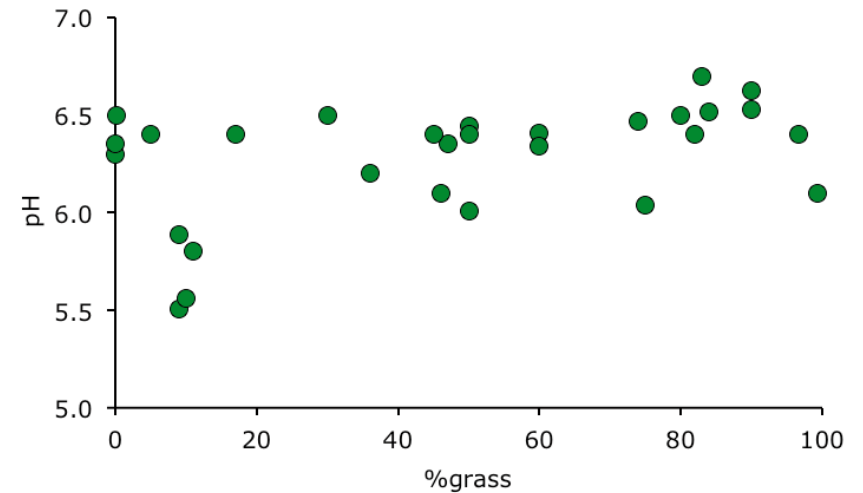
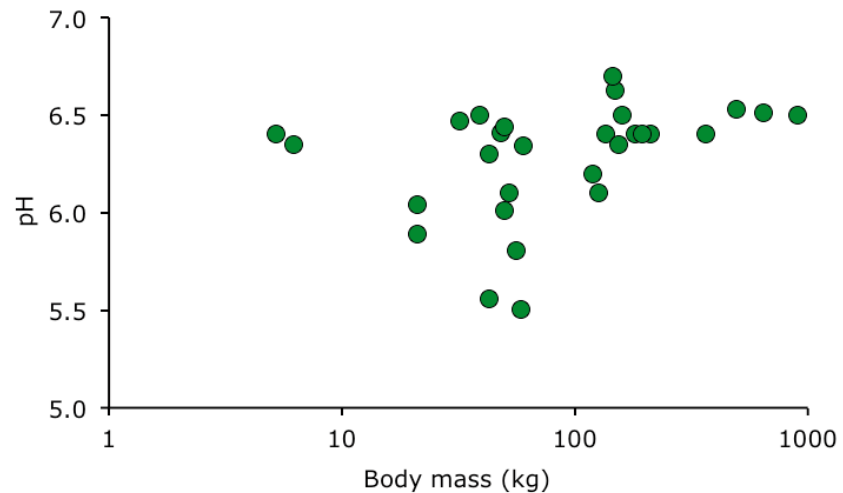
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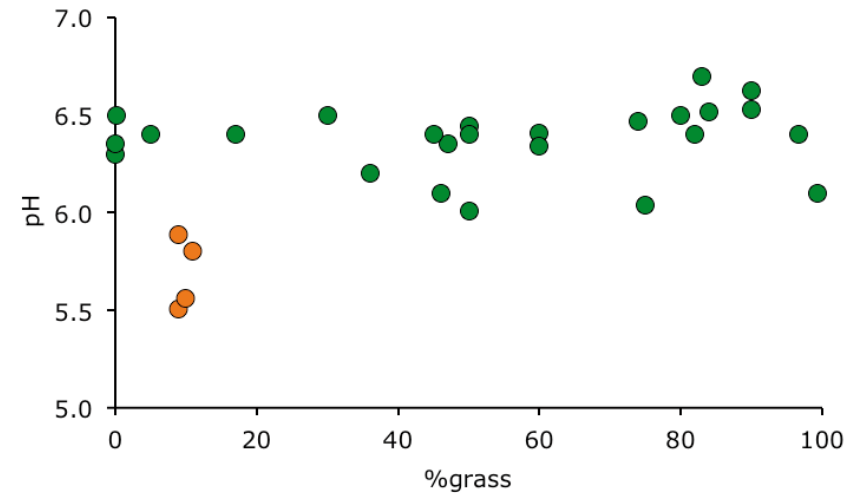
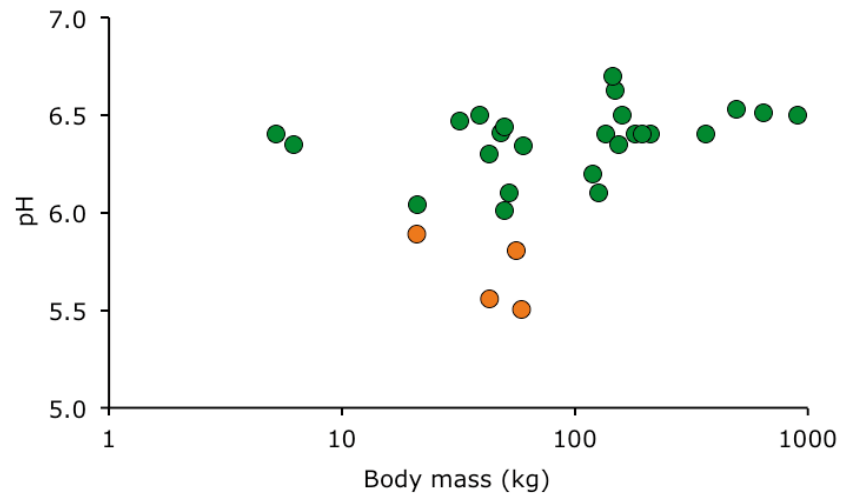
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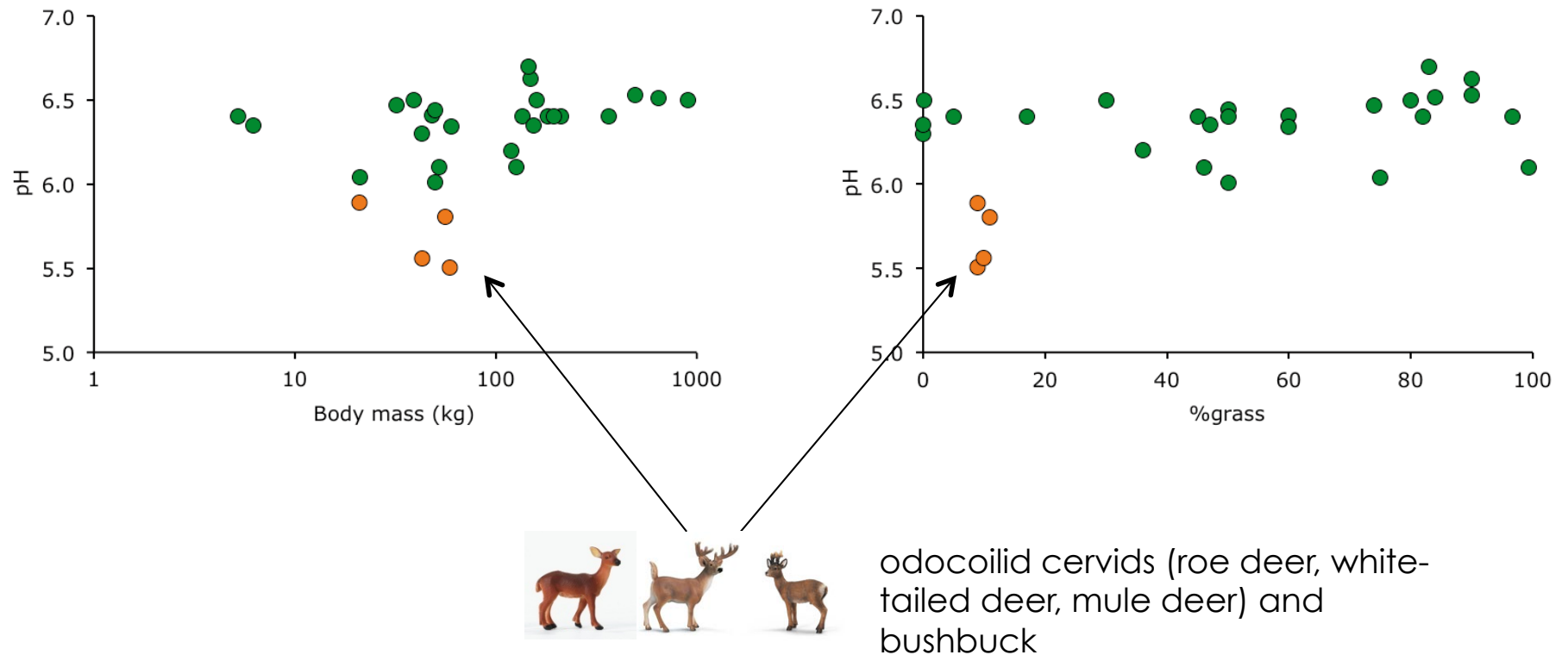
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Results

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Conclusions

Forestomach pH measurements depend on

- Time since death
- Forestomach location
- Season
- Supplemental feeding
 - Feeding regime could be changed to exlude grains, sugar beets (rather: beet pulp), and include fibre like lucerne*
- Species (mechanism unclear)



thank you for your attention

