

PanArctic variation in anti-browsing defence in tundra dwarf birches

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The Arctic – a changing system

Warming lead to taller vegetation

(Bjorkman et al. 2018)

Shrubs get higher but also more abundant

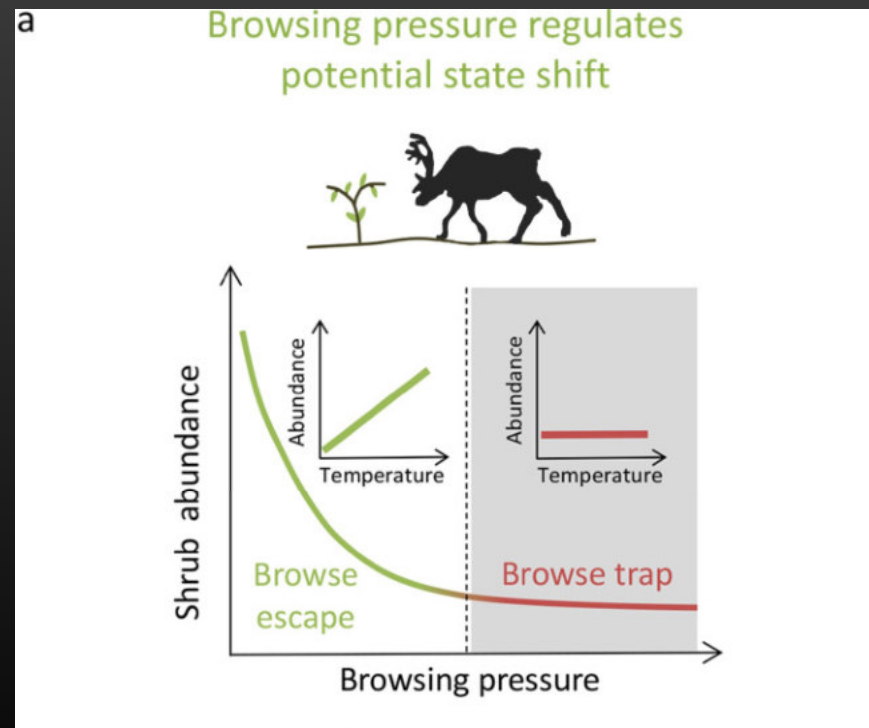
– “Shrubification”

Shrubification patterns are not uniform across the whole Arctic

(Elmendorf 2012, Myers-Smith et al 2015)



Potential of herbivore-control of shrub increase



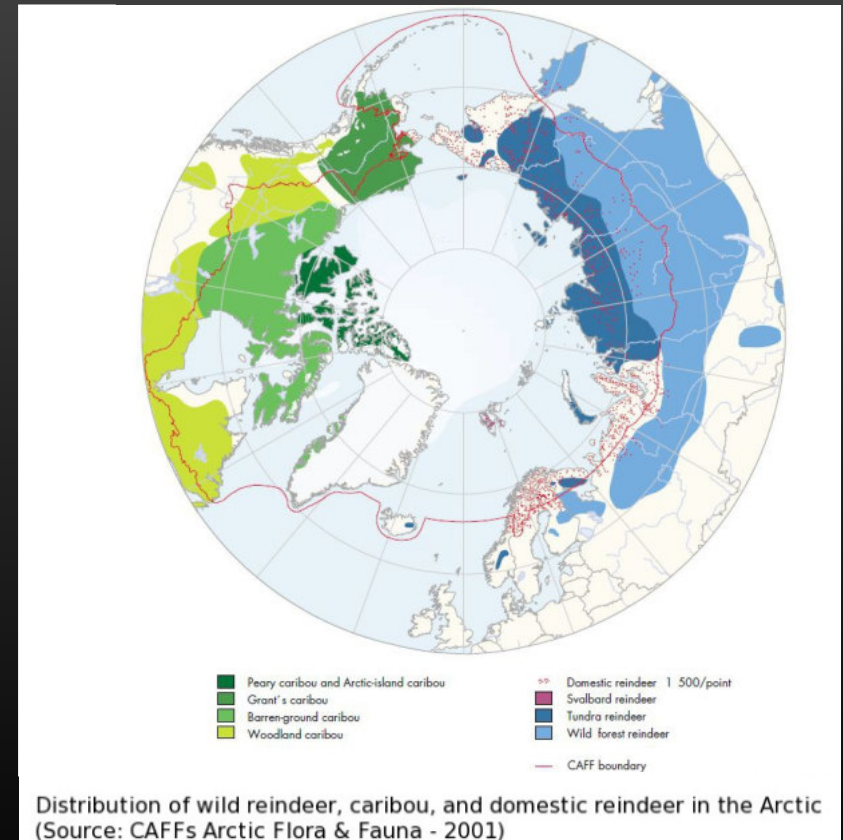
(Modified from Bråthen et al. 2017)

Is the whole Arctic in a Browsing trap?

Reindeer/Caribou are present in most Arctic tundra

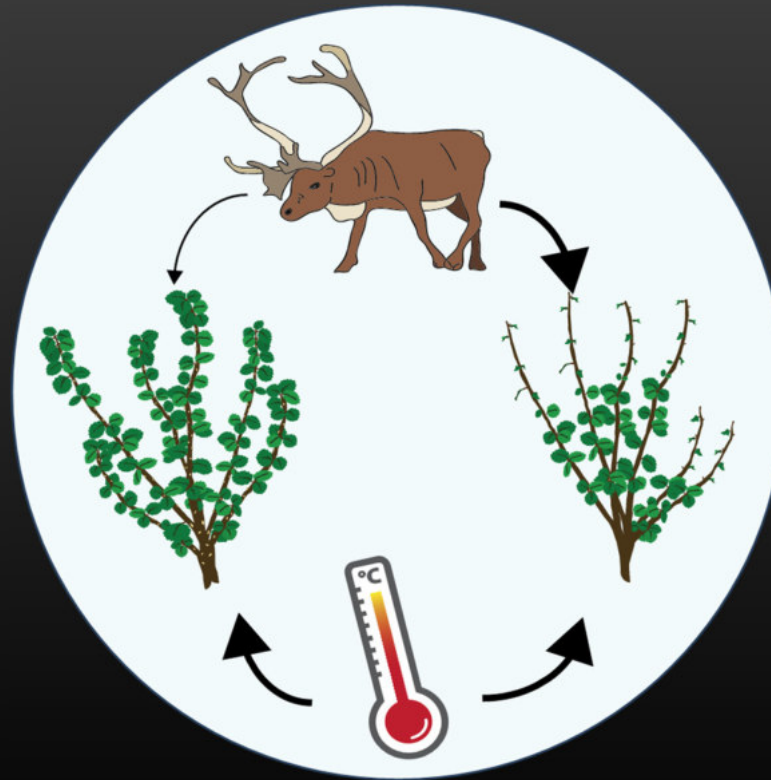
Reindeer can influence shrub abundance (but not always)

(Crête and Dohet 1998, Olofsson et al. 2009, Post and Pederson 2008, Tremblay et al. 2012)



Are shrubs palatable?

Less
palatable



Palatable

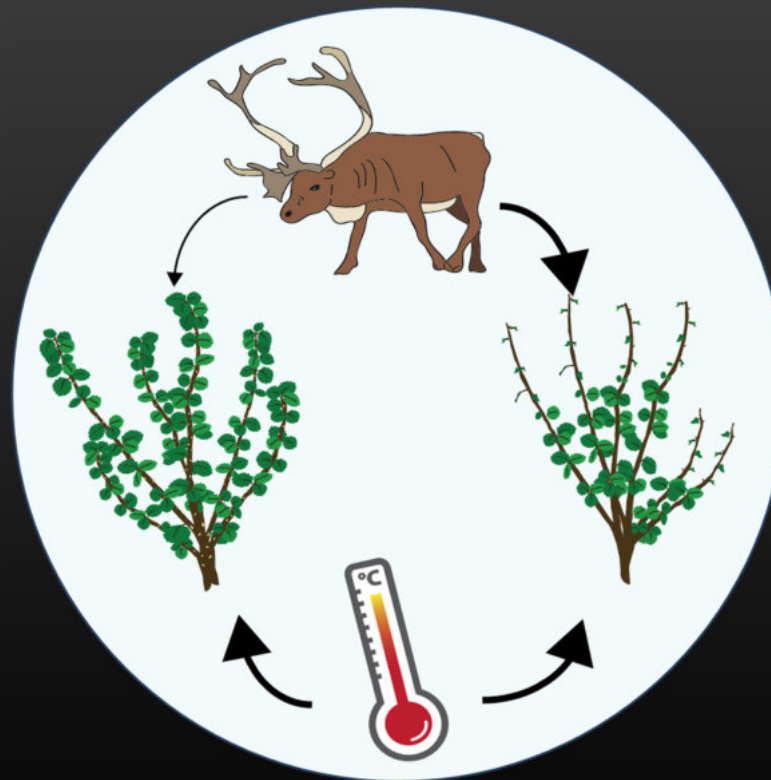
Large differences within species and genera

(Betula dwarf shrubs – a panArctic species complex)

Resin
birch?



Less
palatable



Non-resin
birch?



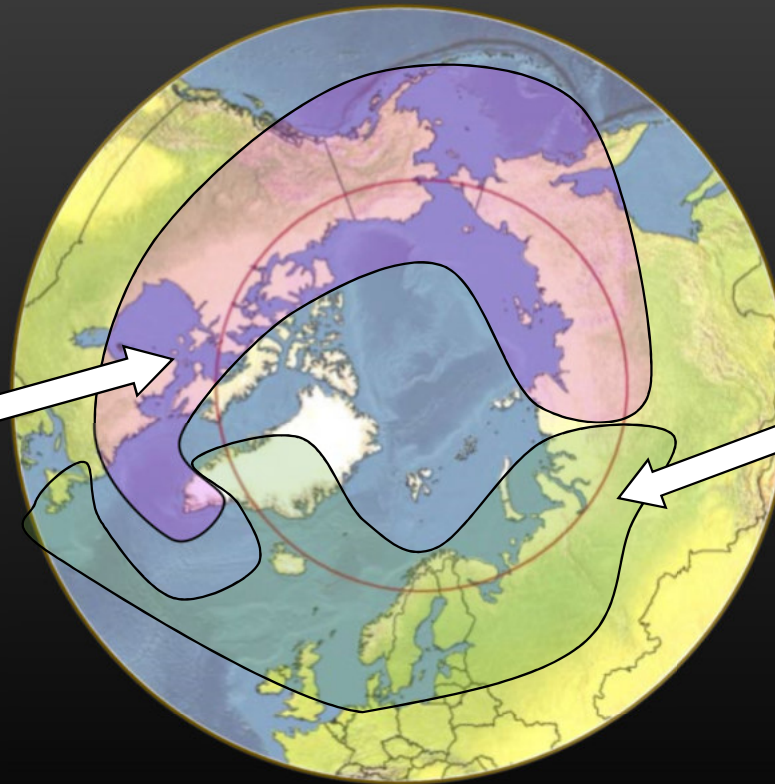
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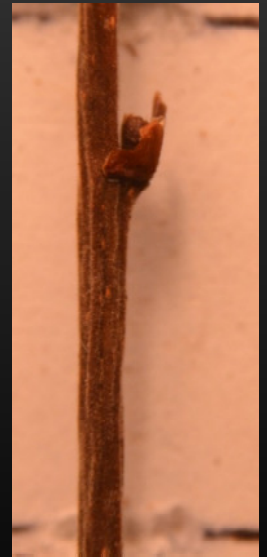


Less
palatable



Palatable

Non-resin
birch?



(Bryant et al. 2014)

Anti-browsing defense in *Betula*

Do resin and non-resin birches represent two different groups of birch chemical defense?

Are non-resin birches more defended by tannins than resinous birches?

Can large-scale shrubification patterns be explained by general patterns in plant palatability?



Anti-browsing defense in *Betula*

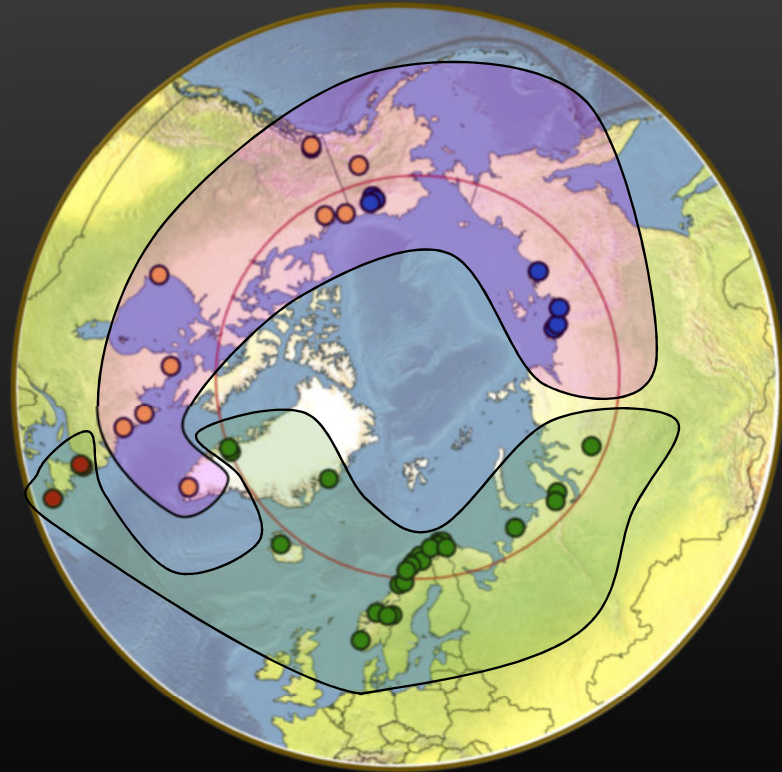
Circumpolar sampling of dwarf birch

128 samples, 41 locations

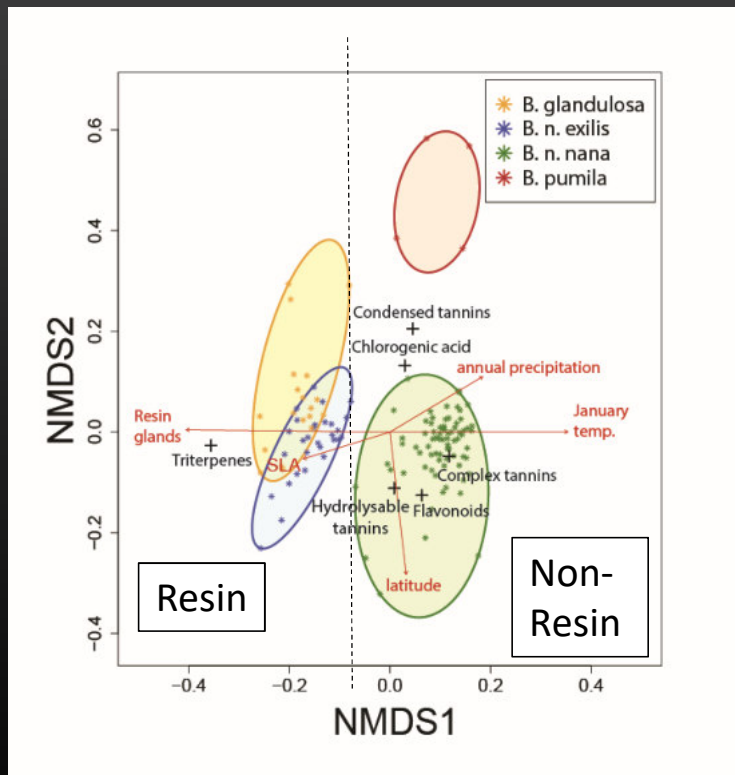
- *Betula glandulosa*
 - *Betula nana* ssp. *exilis*
 - *Betula nana* ssp. *nana*
 - *Betula pumila*
- } Resin birch
- } Non-resin birch

Targeted Metabolite Profiling (LC/MS)

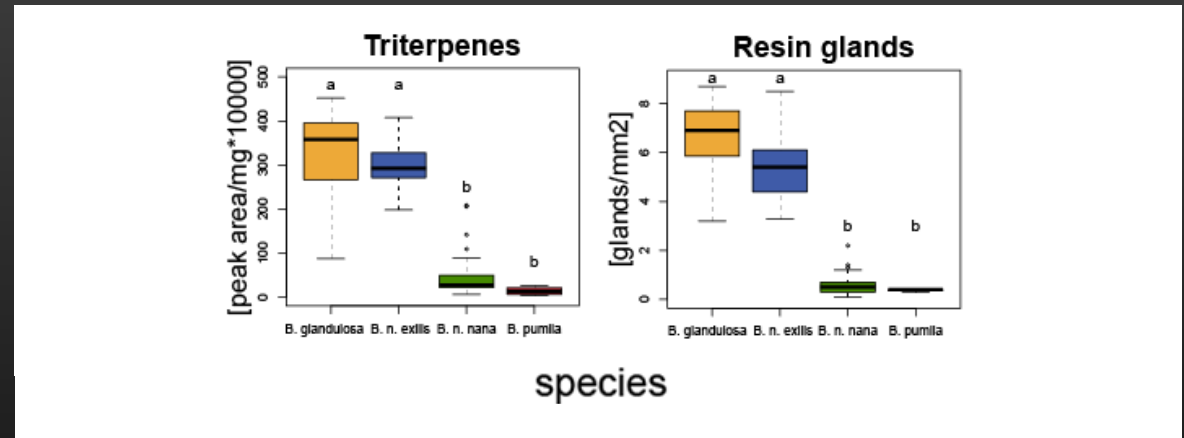
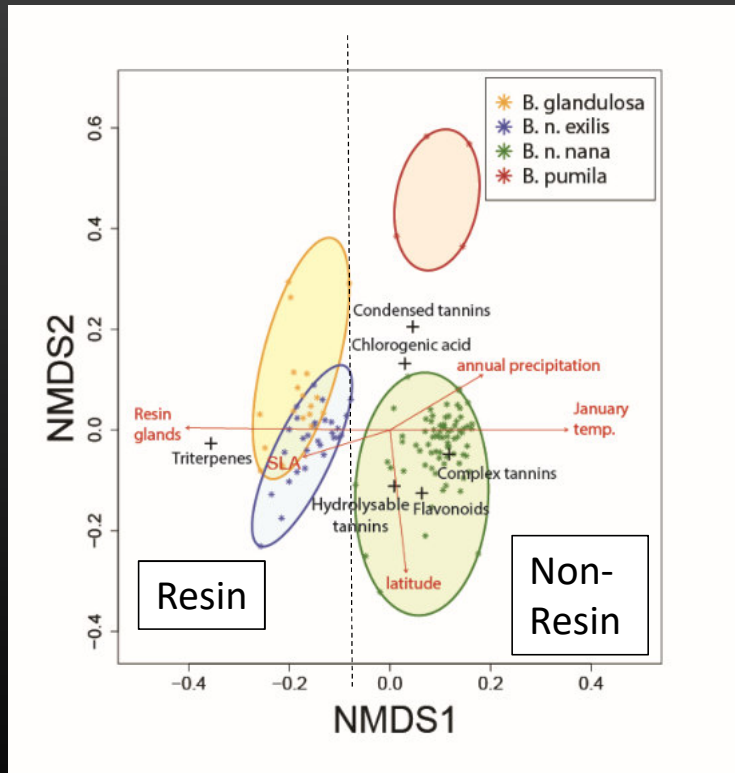
112 compounds



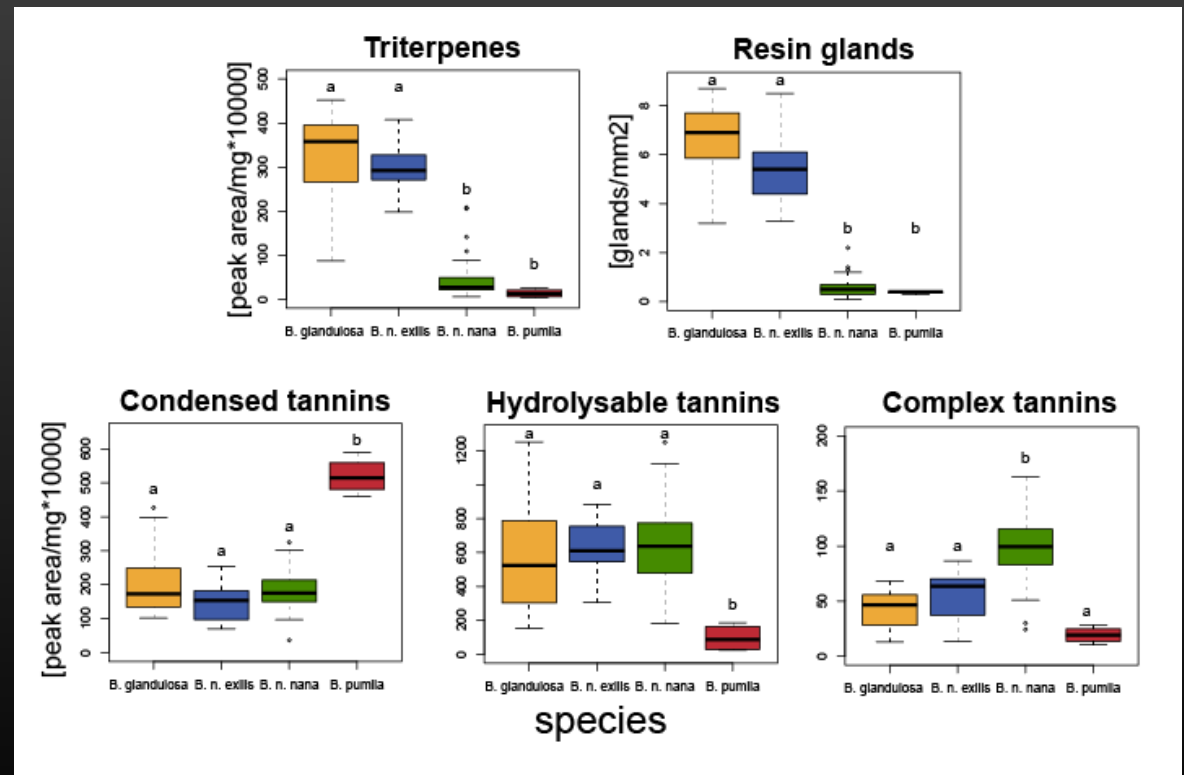
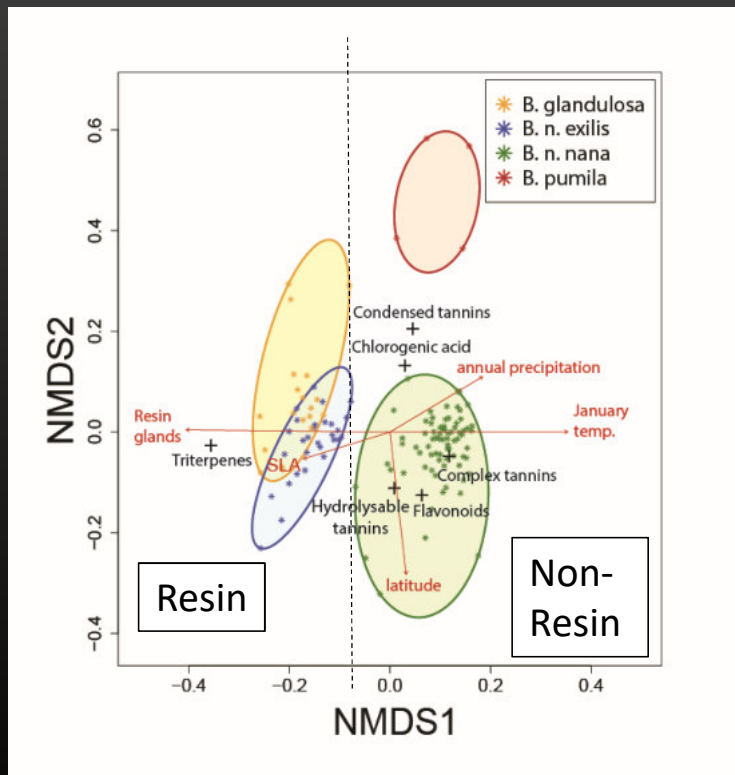
Resin & non-resin birches do form two groups but with large variation within



Resin birches do have more triterpenes but the ranges of variation within the groups overlap



PanArctic variation in chemical anti-browsing defence in tundra dwarf birches



Conclusions

Resin
birch



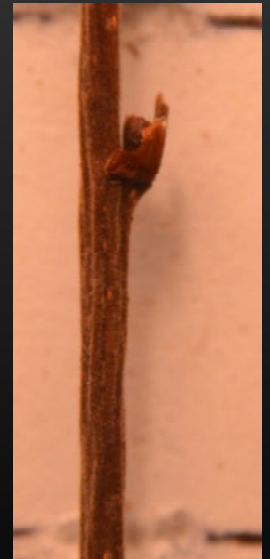
Can we detect two functional groups?

Yes two groups – but a lot of variation within

Does non-resin birches have more tannins?

Yes the non-resin have more of either condensed or complex tannins – but remain uncertain what the latter mean for palatability.

Non-resin
birch



Conclusions

Resin
birch



Can we detect two functional groups?

Yes two groups – but a lot of variation within

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Shrubification patterns vs. Plant palatability patterns

Not really. Large variation in herbivory defense. This should be considered/measured in local studies.

Other factors must also be important.

Non-resin
birch



ArcRein

PanArctic study of the effect of reindeer on tundra vegetation

Semmeldalen - Svalbard



Toolik - Alaska



Pöyrisjärvi - Finland



Toolik - Alaska



Thanks to

Johan Olofsson

Mariska te Beest, Maja Sundqvist



UMEÅ UNIVERSITY

Ilka Abreu

Tomas Moritz



All of those contributing by sampling