

When Salmon Ate Moose:

Reconstructing the BC Environment, 1793-1913

UNBC Terrace

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The Moose Enigma

- ◎ “Moose swept the province in the past century and a half and yet were unknown in historic times throughout the interior.”
Valerius Geist, 2011.
- ◎ Why have moose increased dramatically in western North America?
 - Why does it matter?
 - The future of caribou might be at stake.
 - Without moose around, there were few wolves.
 - Moose support a large number of wolves who also take caribou, especially during spring.

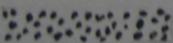
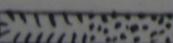
Attempts to answer the question have been unsatisfactory

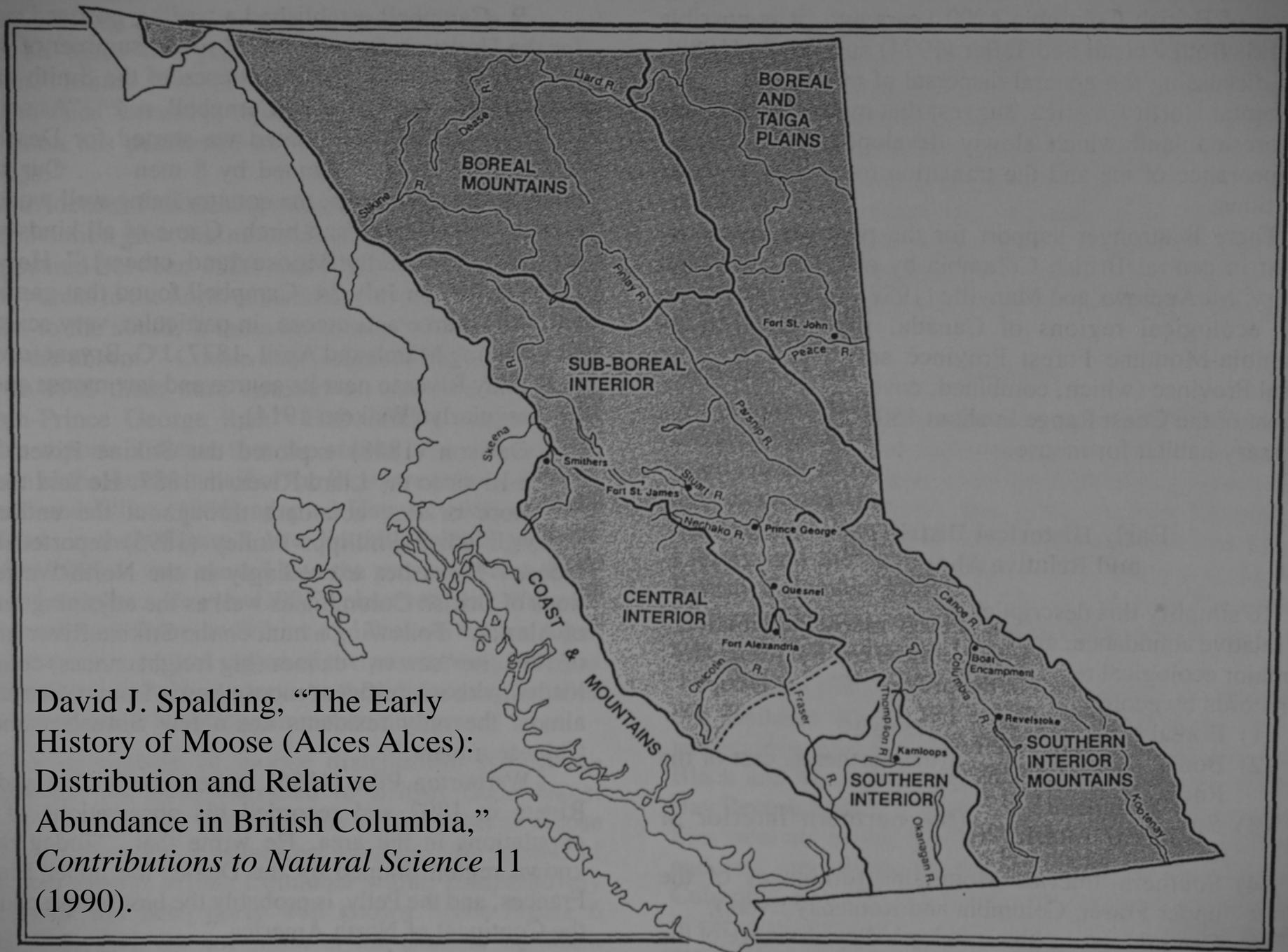
- 1. Because European settlement altered the forest.
 - The proliferation of moose and the expansion of their range do not coincide with the growth of European settlement/forest industry/railways.
- 2. Because the extermination of wolves allowed moose to proliferate.
 - Wolves appear to have proliferated along with the moose.
- 3. Because moose had insufficient time to colonize the region since the last ice age.
 - Moose are able to expand their range quickly. Did expand to Labrador by 1600.
- 4. Because of climate warming.
 - The climate and environment was suitable for moose long before they proliferated. Flourish as far north as Mackenzie delta.
- 5. Diseases once limited moose numbers.
 - There is no evidence to support this theory.



James Hatter,
*Early Ecology and
Management of
the Moose in
Central British
Columbia*

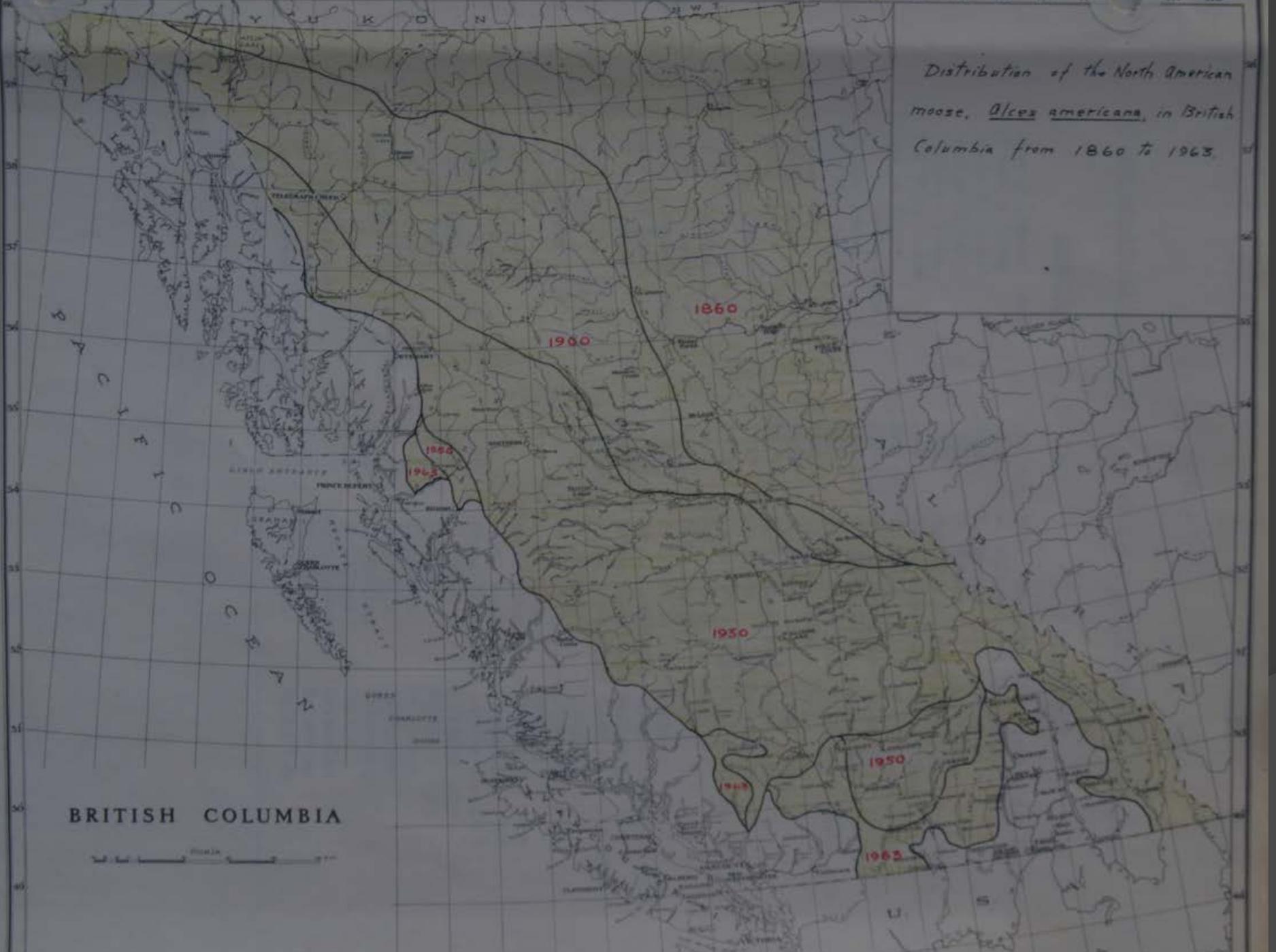
Fig. 4.

- 
 Approximate range of moose in
British Columbia prior to 1860.
- 
 Present day distribution.



David J. Spalding, "The Early History of Moose (*Alces Alces*): Distribution and Relative Abundance in British Columbia," *Contributions to Natural Science* 11 (1990).

Distribution of the North American moose, *Alces americana*, in British Columbia from 1860 to 1963.



BRITISH COLUMBIA



Alces alces gigas

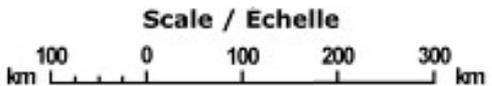


Alces alces andersoni

The Moose (*Alces alces*) Range until about 1860



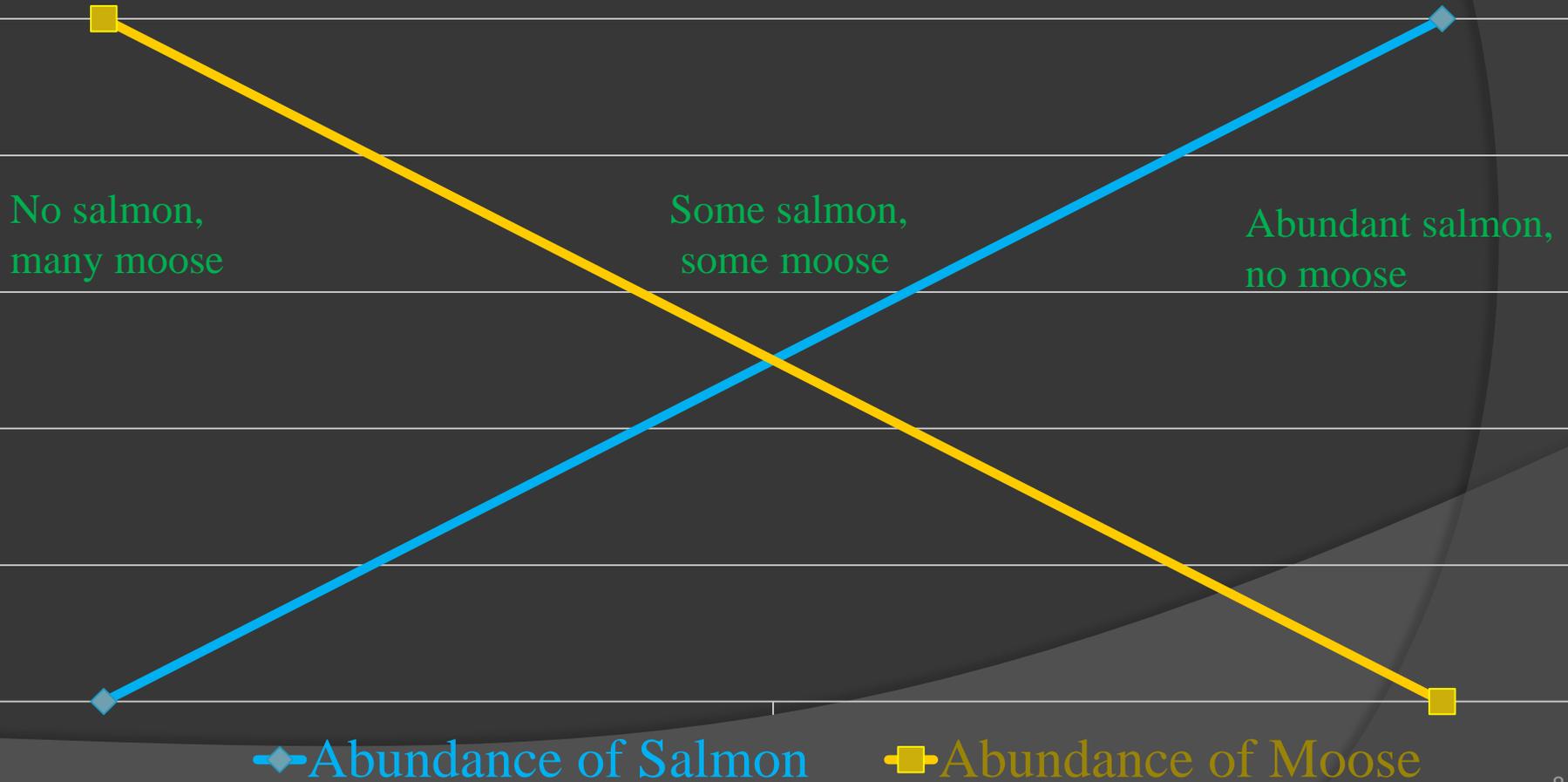
Alces alces shirasi



Salmon Abundance v. Moose Abundance

Absent

Abundant



The Charles Kay Thesis (1997)

- Aboriginal people either kept moose absent or rare in western North America.
 - “Where Native Americans had access to salmon and plentiful vegetal resources, there were few or no moose, but where salmon and other foods were scarce or absent, moose were relatively more abundant.”
(153)

Charles E. Kay, “Aboriginal Overkill and the Biogeography of Moose in Western North America,” *Alces* 33 (1997): 141-64

So, Do Salmon Eat Moose?

Well yes, kind of. Until the late nineteenth century the role of Pacific salmon (*Oncorhynchus* spp.) as keystone species so thoroughly shaped the entire ecosystem of the Pacific slope that their abundance explains the rarity or absence of moose.



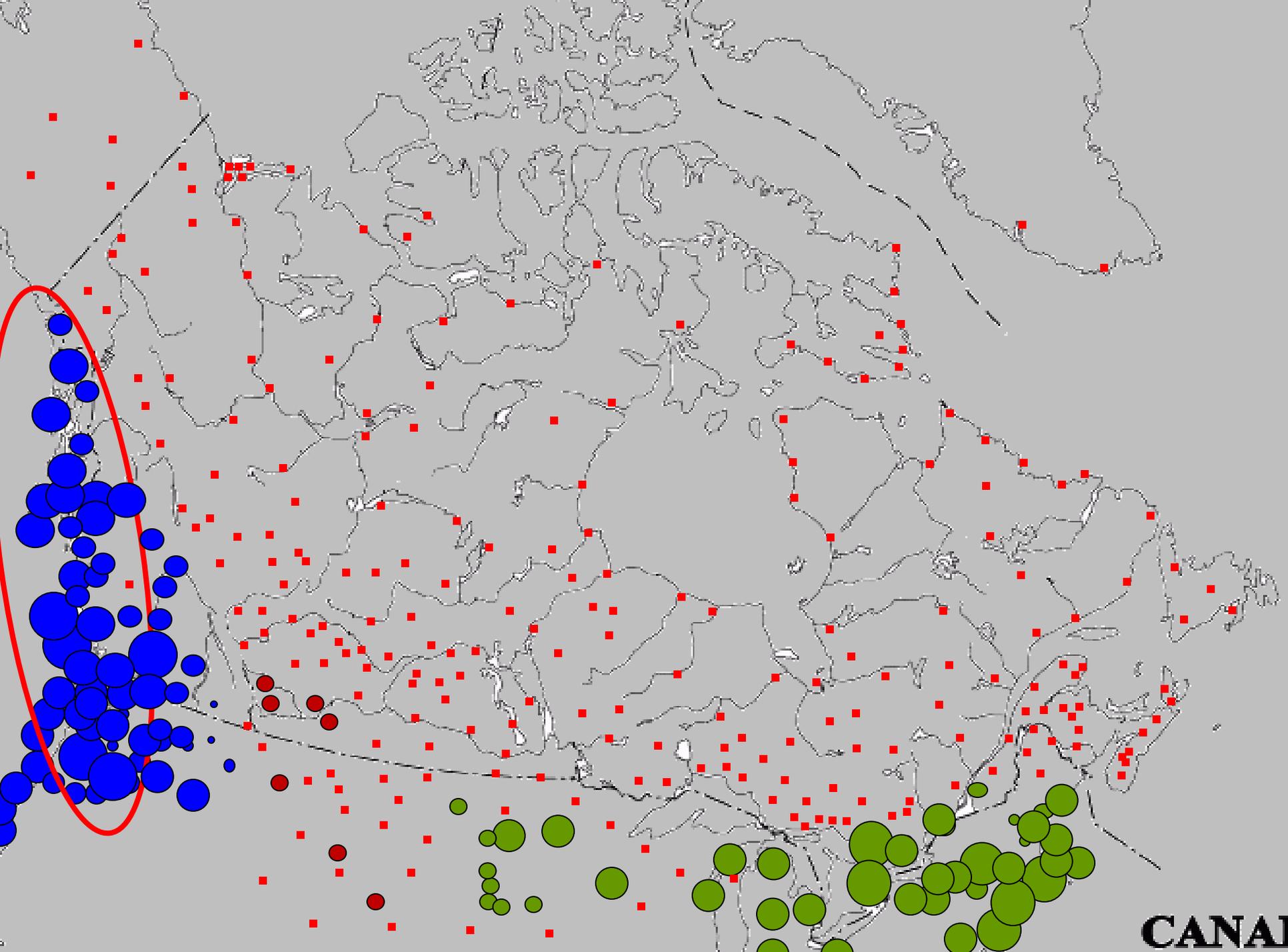
Landscape/Ecosystem Reconstruction

- Focusing on one or two species, or even one or two trophic levels blinds us to the more complex dynamics that must have shaped the entire ecosystem.
- I have relied on historical documents to attempt to reconstruct the entire past ecosystems of the salmon realm.

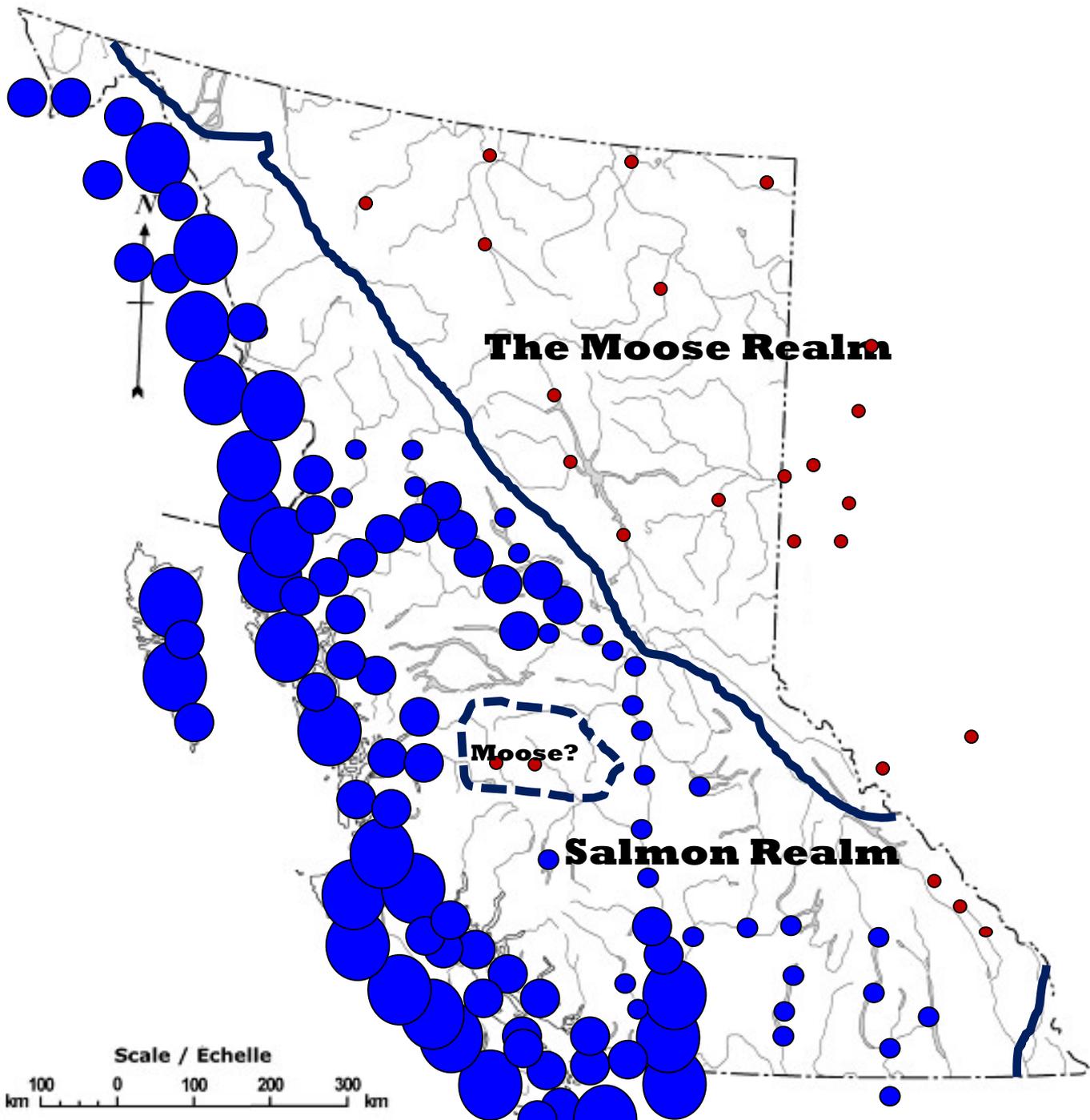
Keystone Species

- A keystone species in any ecosystem is the species (or group of similar species) whose presence, more than any other species, influences the structure of the entire ecosystem.
 - Salmon, during the study period appear to have fit this definition of keystone species in the Pacific Slope during the study period.





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The Moose Realm

Moose?

Salmon Realm

Scale / Echelle

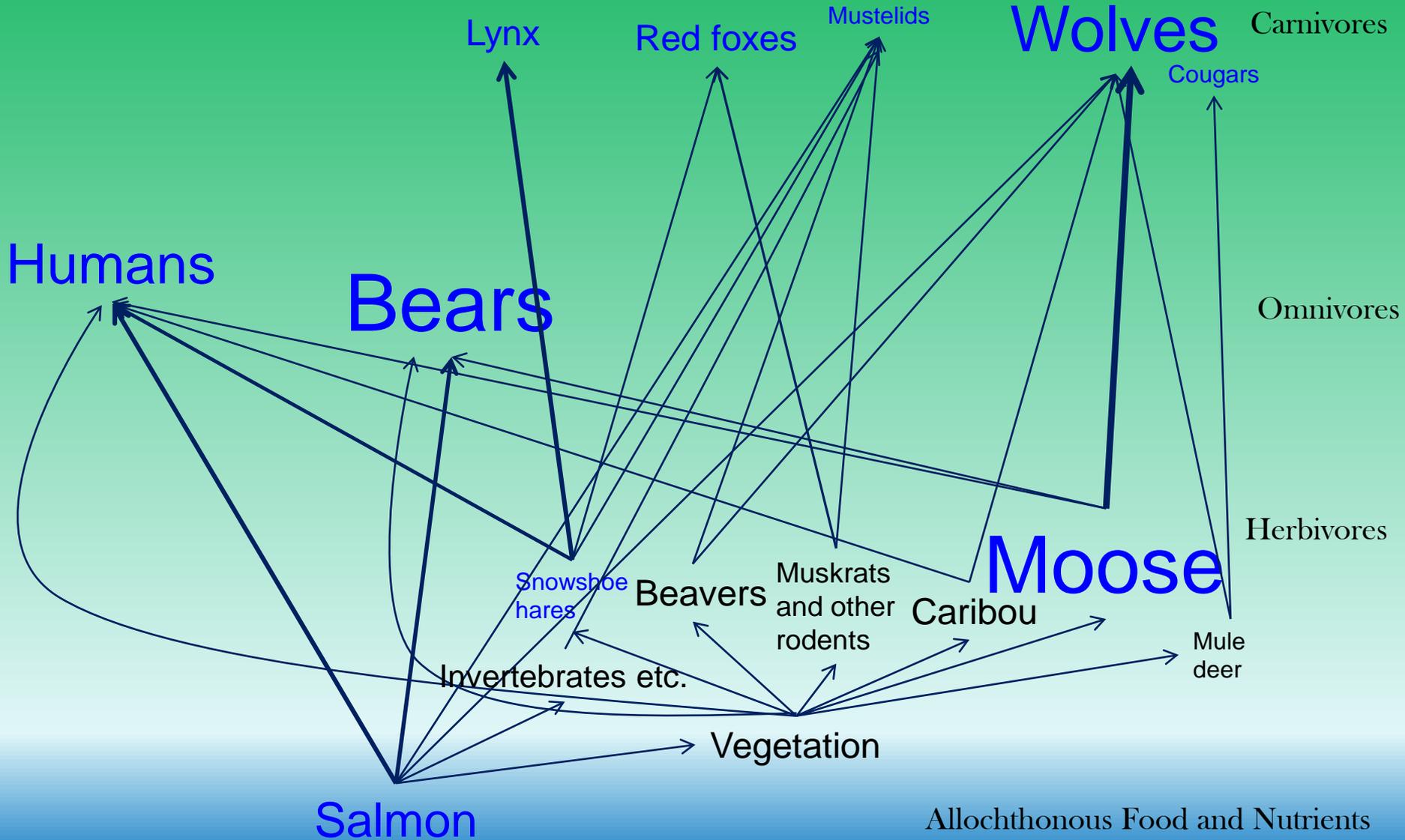
100 0 100 200 300 km

The Transformation of the Salmon Realm, 1860s-1913

- ⦿ Between the 1860s and 1913, the food web of the salmon realm came to resemble that of the moose realm

The Pacific Slope

After 1900



The Moose and Caribou Enigma

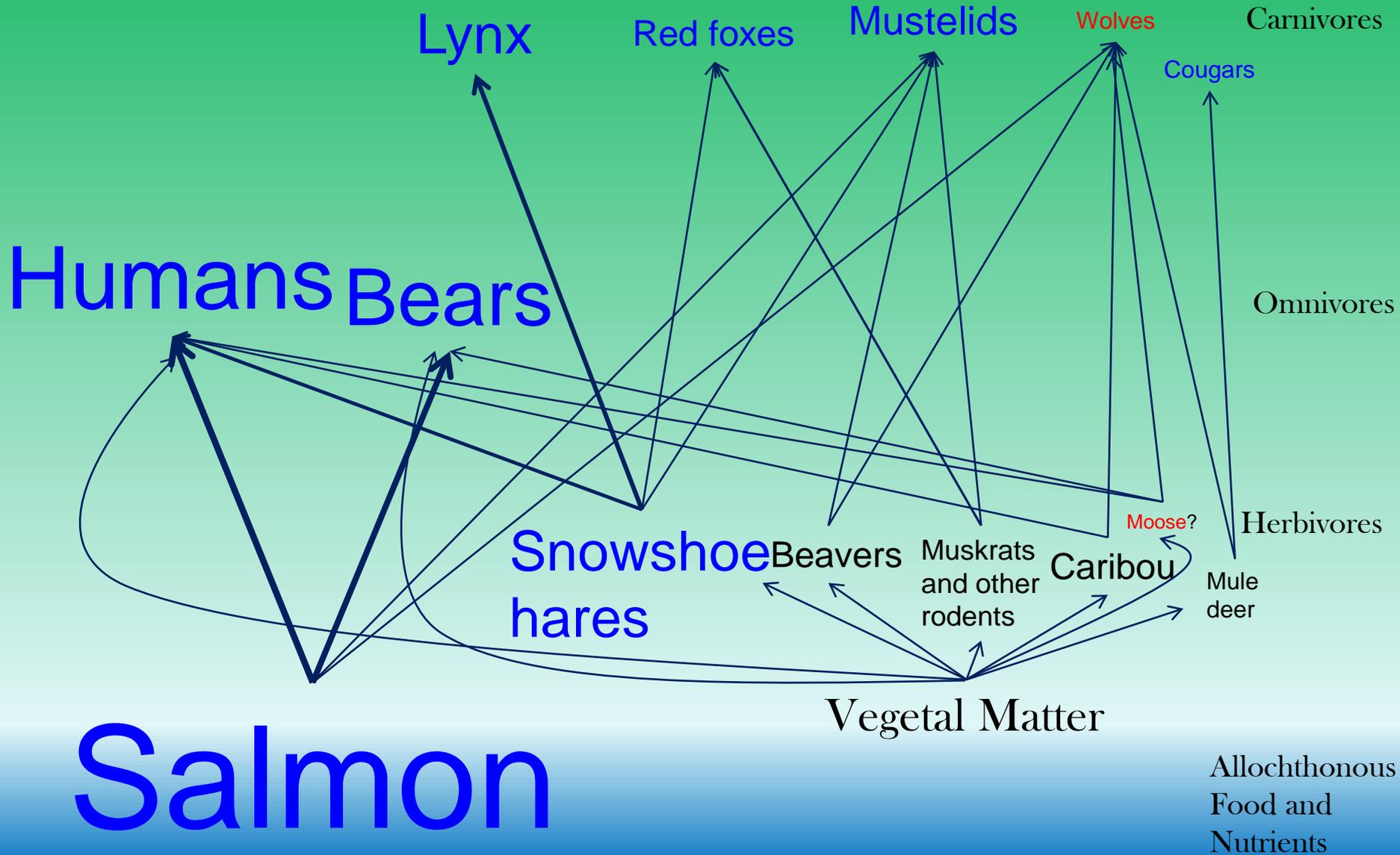
- ◎ Why have moose proliferated (and caribou diminished) in western North America ?
 - Why does it matter?
 - The future of caribou might be at stake.
 - Without moose around, there were few wolves.
 - Moose support a large number of wolves who also take caribou, especially during spring.

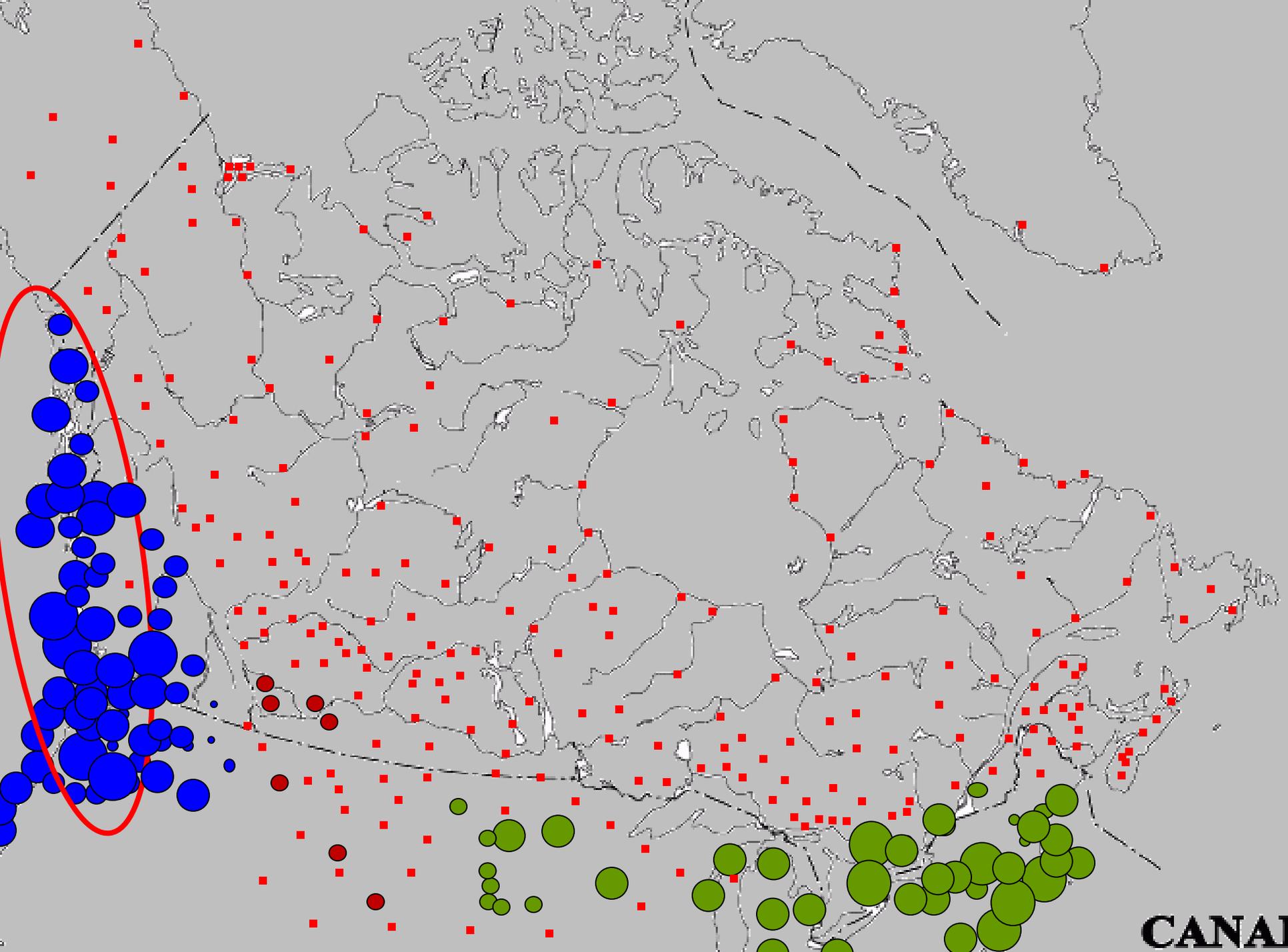
Charles Kay Research

- His research into historical documents is fairly superficial
 - He consulted only a selection of published historical documents.
 - He was focused on
- He makes many other assertions subject to further inquiry
 - Documents could shed more light on the other five hypotheses.
 - Any thorough researcher would have to consult the sources listed in Kay's bibliography, and would have to check to see whether anyone else has published further research on the same question since 1997.

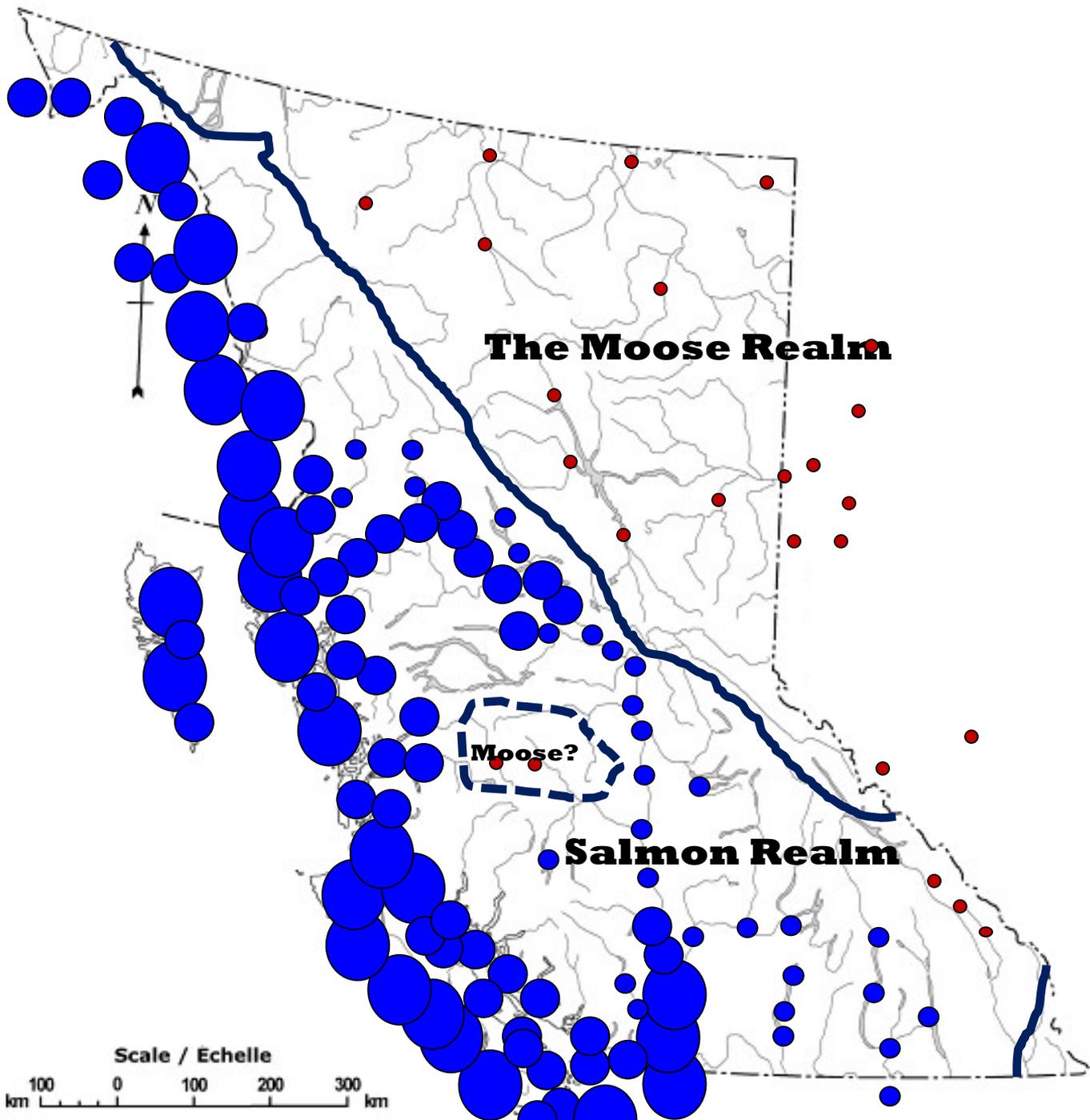
The Salmon Realm

(of New Caledonia before 1860)





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The Moose Realm

Moose?

Salmon Realm

Scale / Echelle

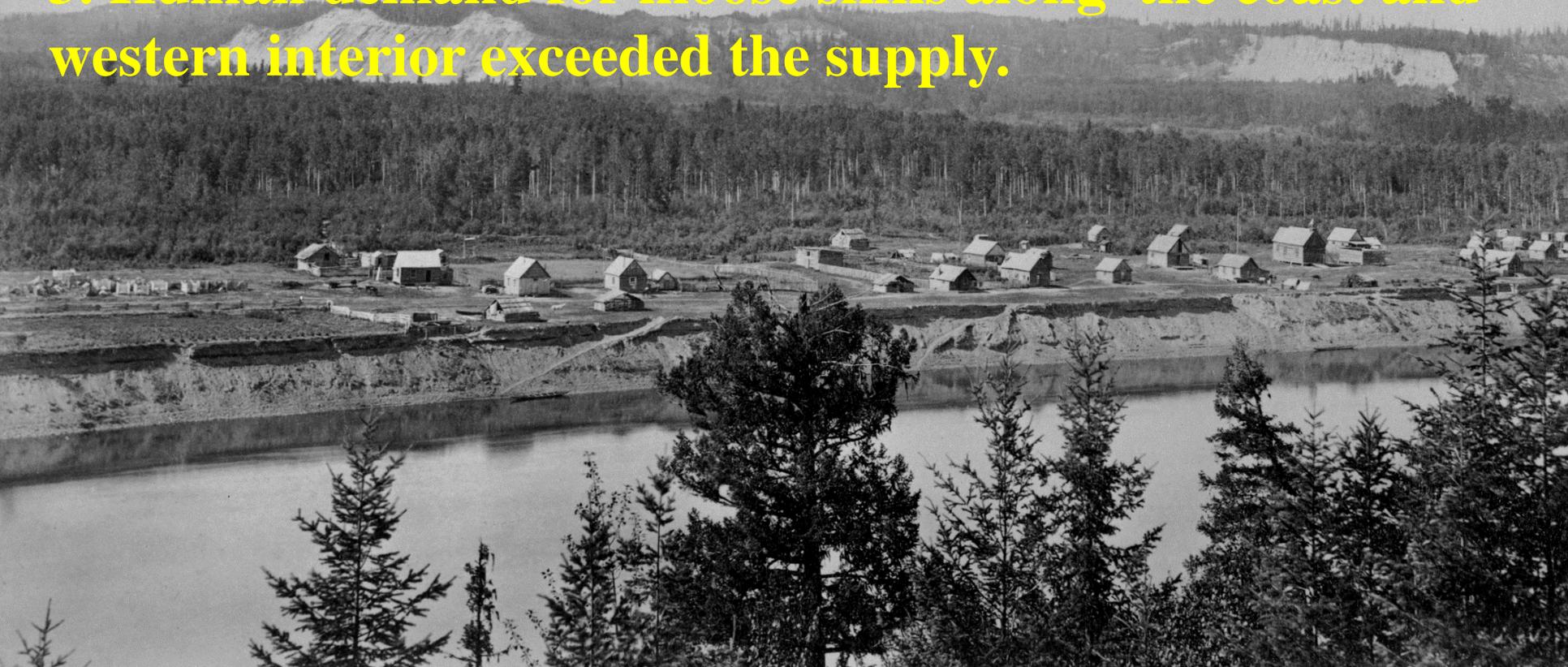
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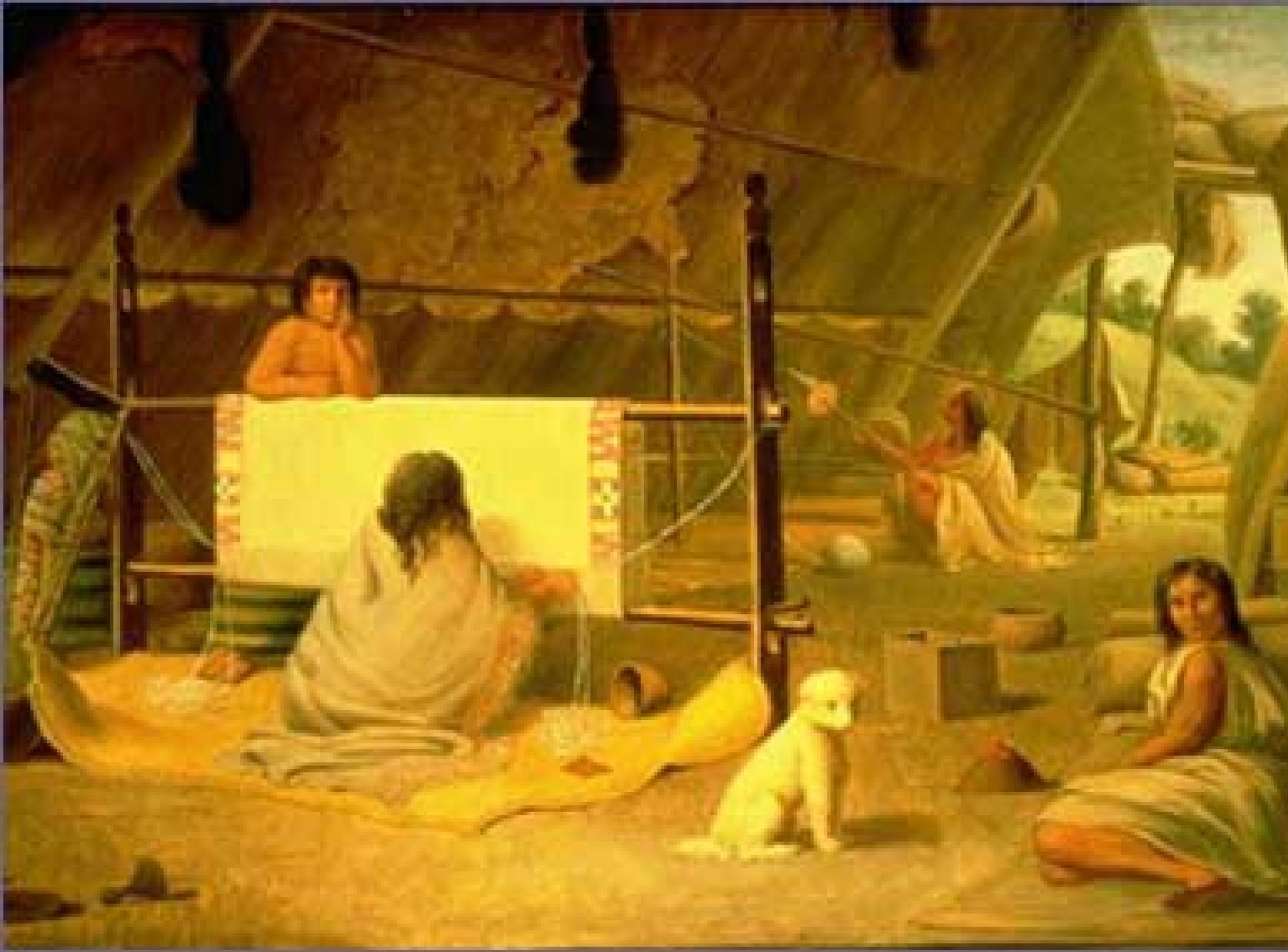
James McDougall, "Indian Village at Fort George, BC" July 7, 1891.
Hudson's Bay Company Archives 1987/13/116 (N16691)

1. Humans were very effective predators of moose.

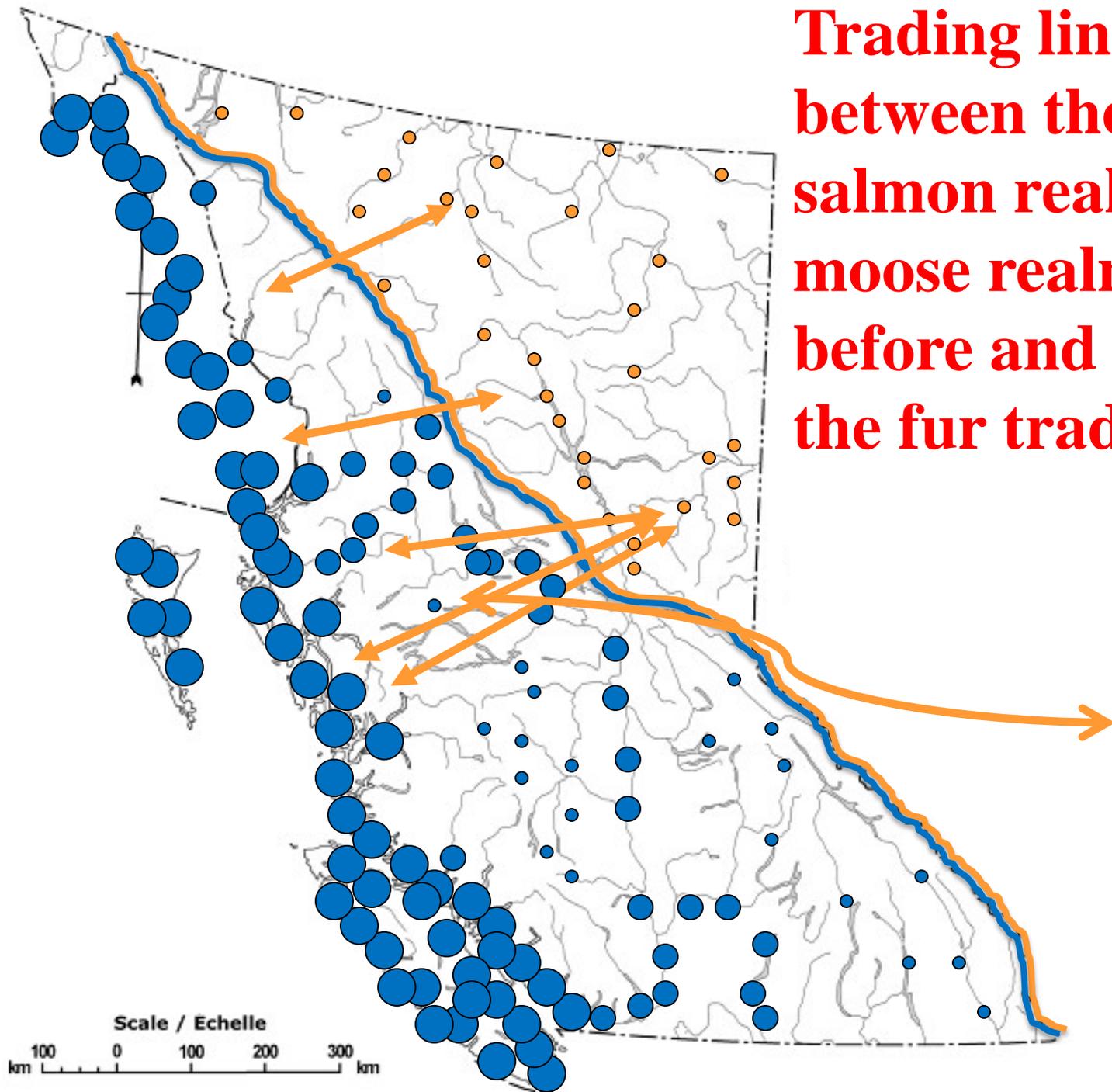
2. Humans were not dependent on moose, and thus human population density was relatively independent of moose population density.

3. Human demand for moose skins along the coast and western interior exceeded the supply.

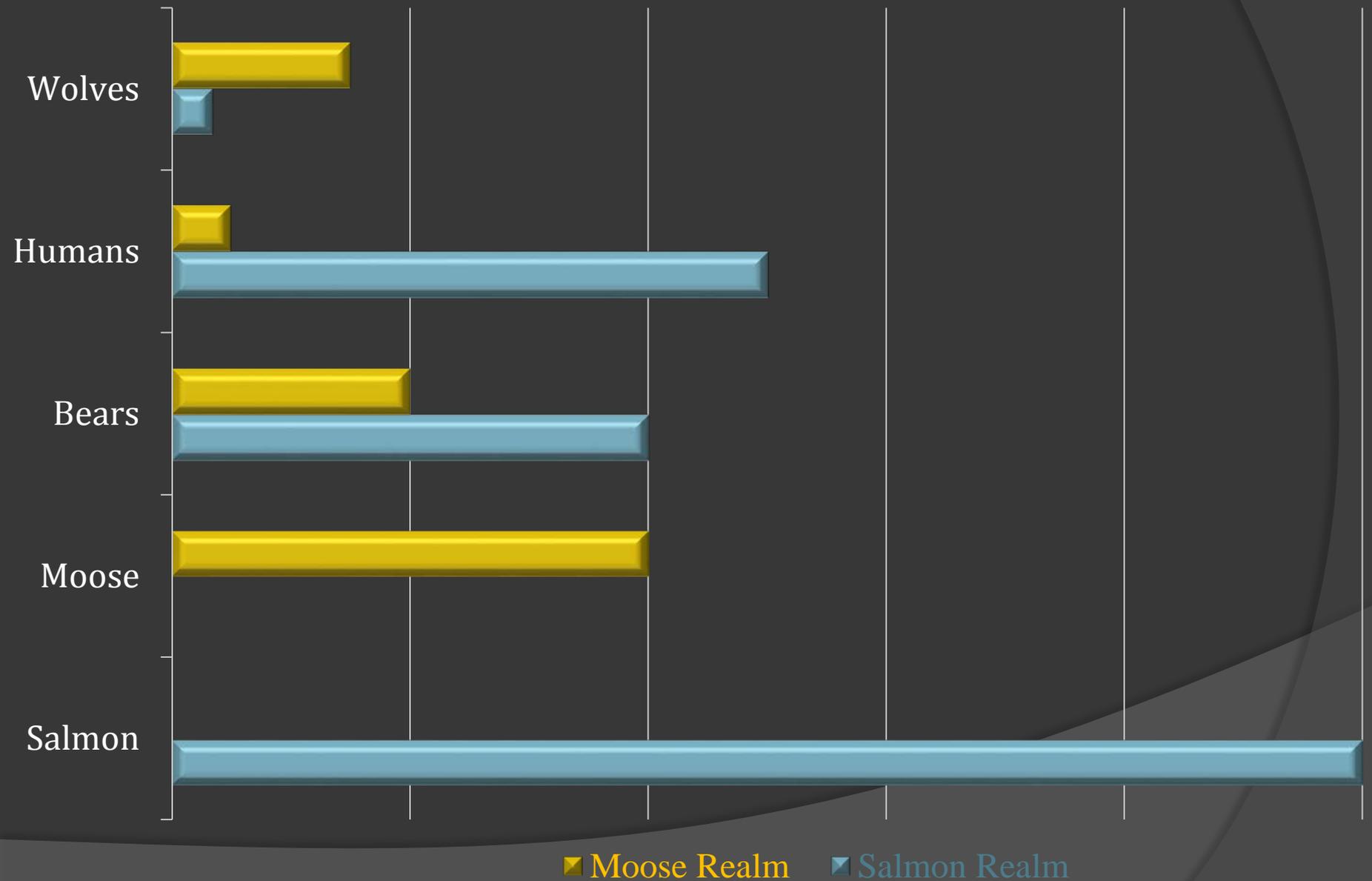




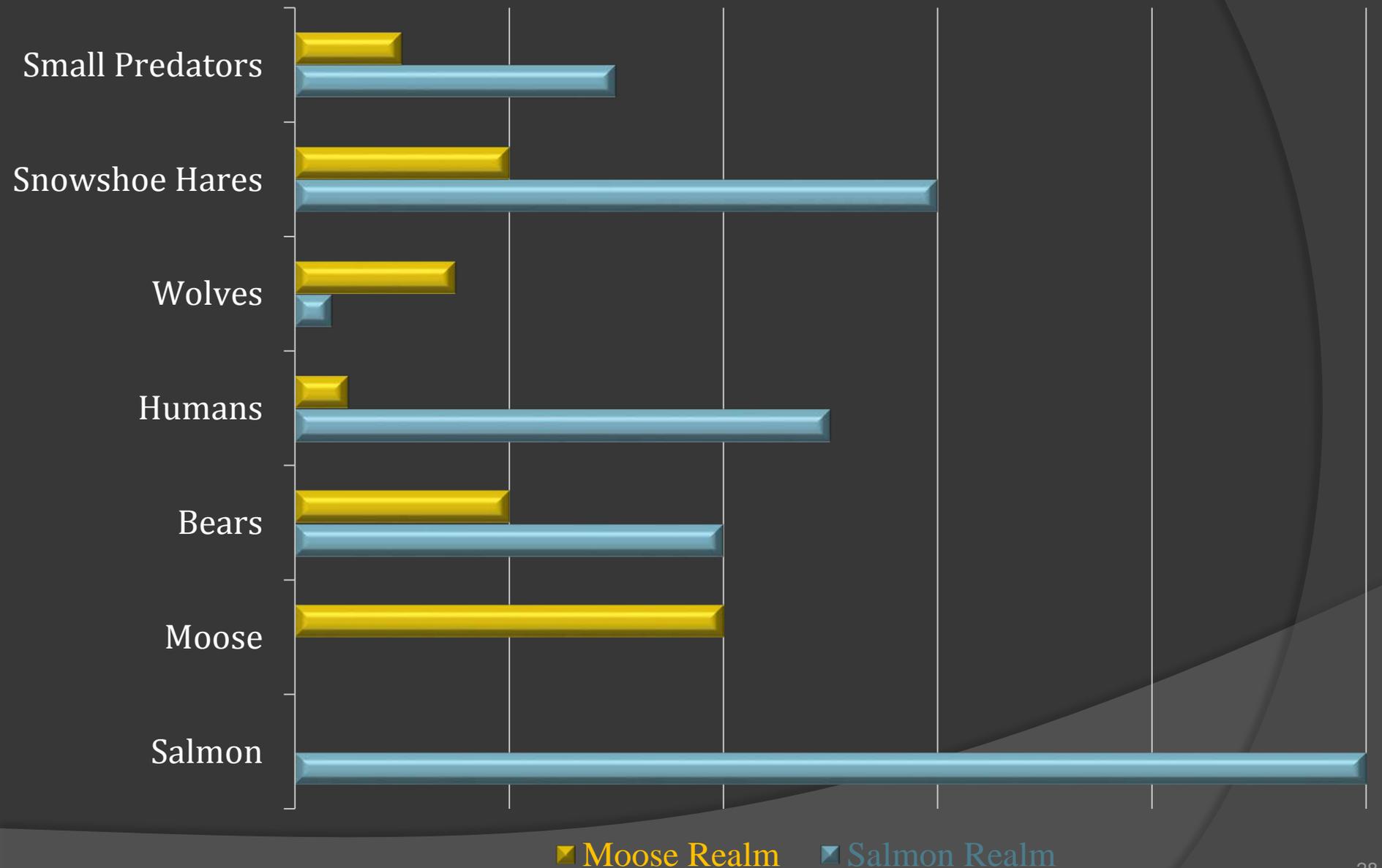
**Trading links
between the
salmon realm and
moose realm
before and during
the fur trade era.**



Salmon Realm vs. Moose Realm



Salmon Realm vs. Moose Realm



John McLean on New Caledonia, 1849

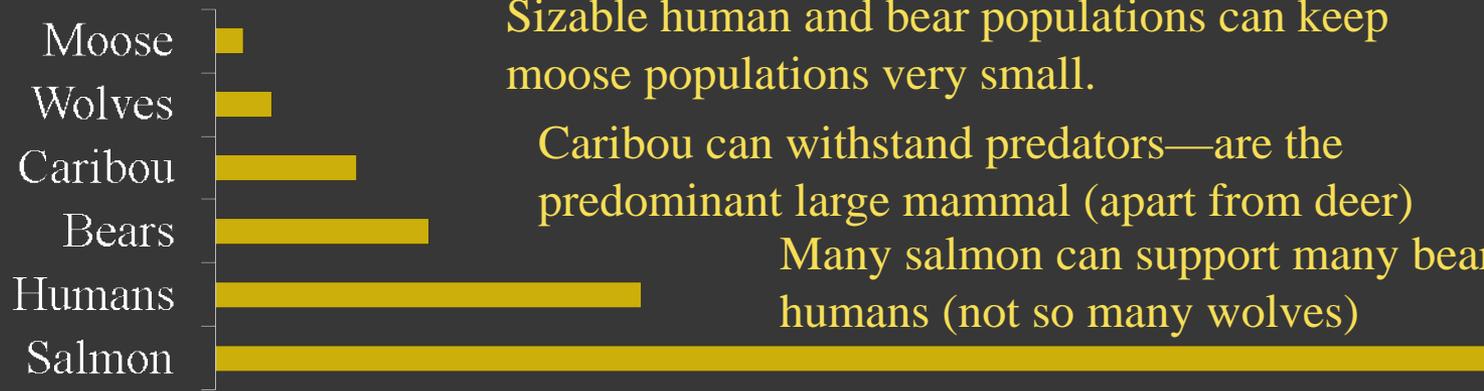
“Rabbits [snowshoe hares] are sent to supply the place of the salmon; and, singular as it may appear, these animals increase in number as the salmon decrease, until they swarm all over the country. When the salmon return, they gradually disappear, being destroyed or driven away by their greatest enemy, the lynx, which first appear in smaller, then in greater numbers;—both they and their prey disappearing together. As to the cause that induces those animals to appear and disappear in this manner, I cannot take upon myself to explain.”

Salmon Realm vs. Moose Realm



Salmon Realm

Before European Contact



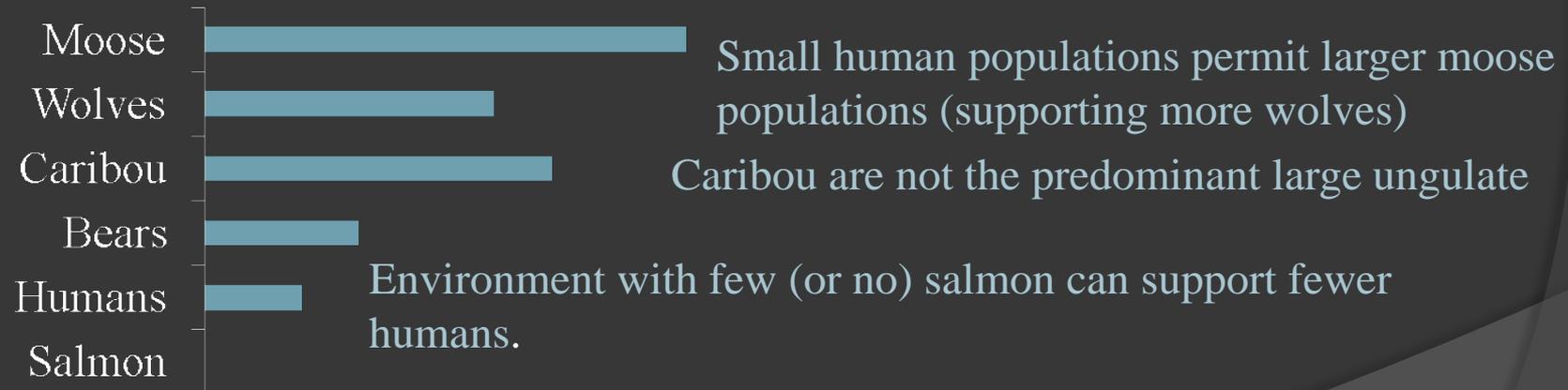
Sizable human and bear populations can keep moose populations very small.

Caribou can withstand predators—are the predominant large mammal (apart from deer)

Many salmon can support many bears and humans (not so many wolves)

Active trade of moose skins from the subarctic to the salmon realm may suppress the moose population in portions of the subarctic near the salmon realm

The Subarctic



Small human populations permit larger moose populations (supporting more wolves)

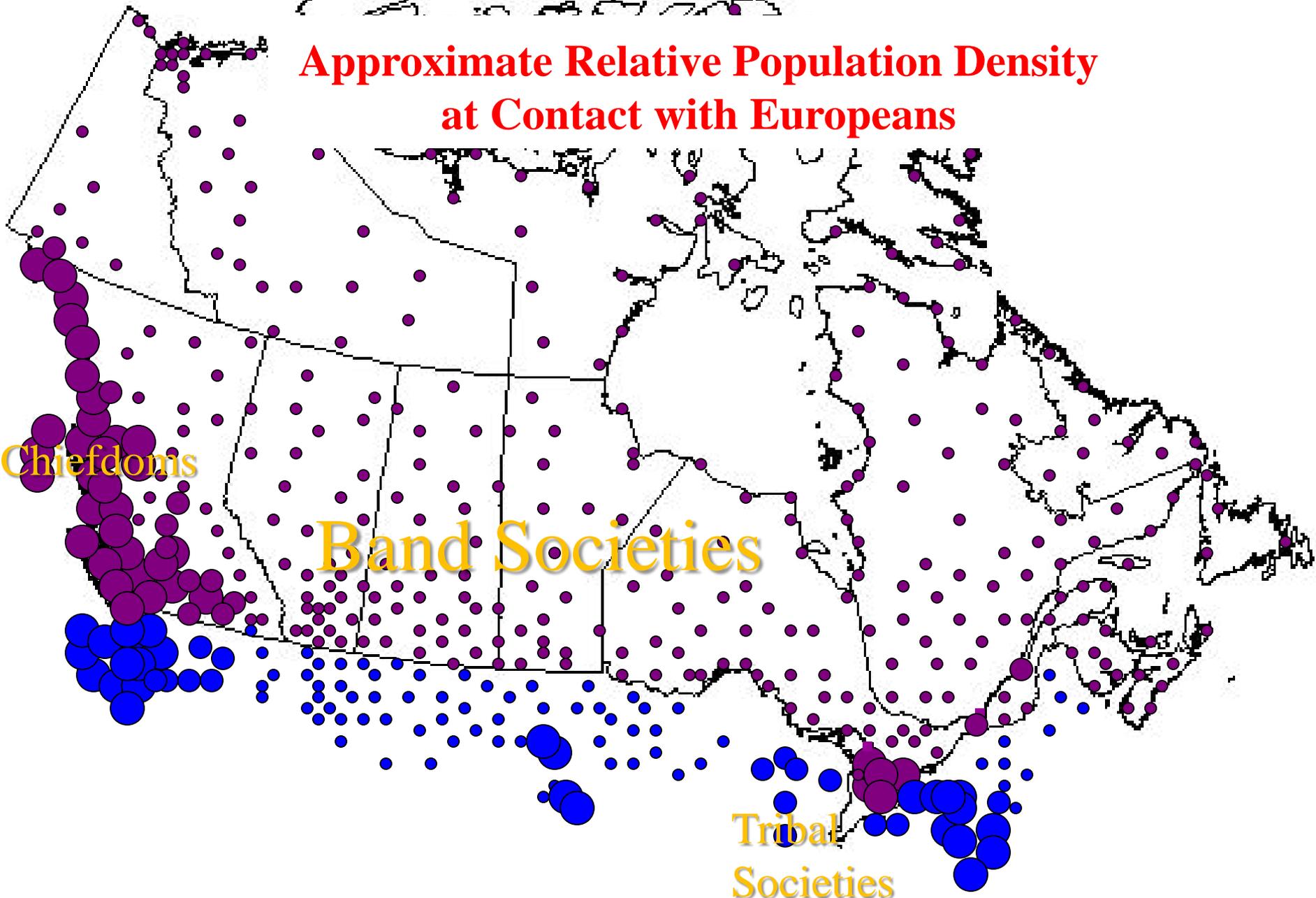
Caribou are not the predominant large ungulate

Environment with few (or no) salmon can support fewer humans.

Reducing human predation (depopulation caused by disease, limiting aboriginal populations to reserves, introduction of wildlife conservation, end of subsistence hunting) can cause moose (and wolf) populations to grow in both Salmon realm and subarctic. Large wolf populations put pressure on caribou populations.

Aboriginal America before Europeans Arrived

**Approximate Relative Population Density
at Contact with Europeans**



Chiefdoms

Band Societies

Tribal Societies