

Research seminar: Graduate School for Veterinary Medicine and Animal Sciences, Uppsala Sep. 24, 2018:

Virus infections in reindeer – a comparison between Norway and Iceland





Some key features of reindeer herding in Norway, Sweden and Finland (2014-2015).

	Norway ²	Sweden ³	Finland ⁴	Total
Number of animals¹	211 606	250 332	194 652	656 590
Animals slaughtered/year	75 382	56 333	84 997	216 712
Reindeer meat/year (tons)	1 748	1 459	2 000	5 207
Land area used as reindeer pastures (%)	40	50	36	

¹Reindeer heads in spring 2015 (after slaughter, before calving).

²Ressursregnskap for reindrift 2014-15; Landbruksdirektoratet, Norway (Anonymous, 2016).

³Sametinget, Sweden (https://www.sametinget.se/statistik_rennaring).

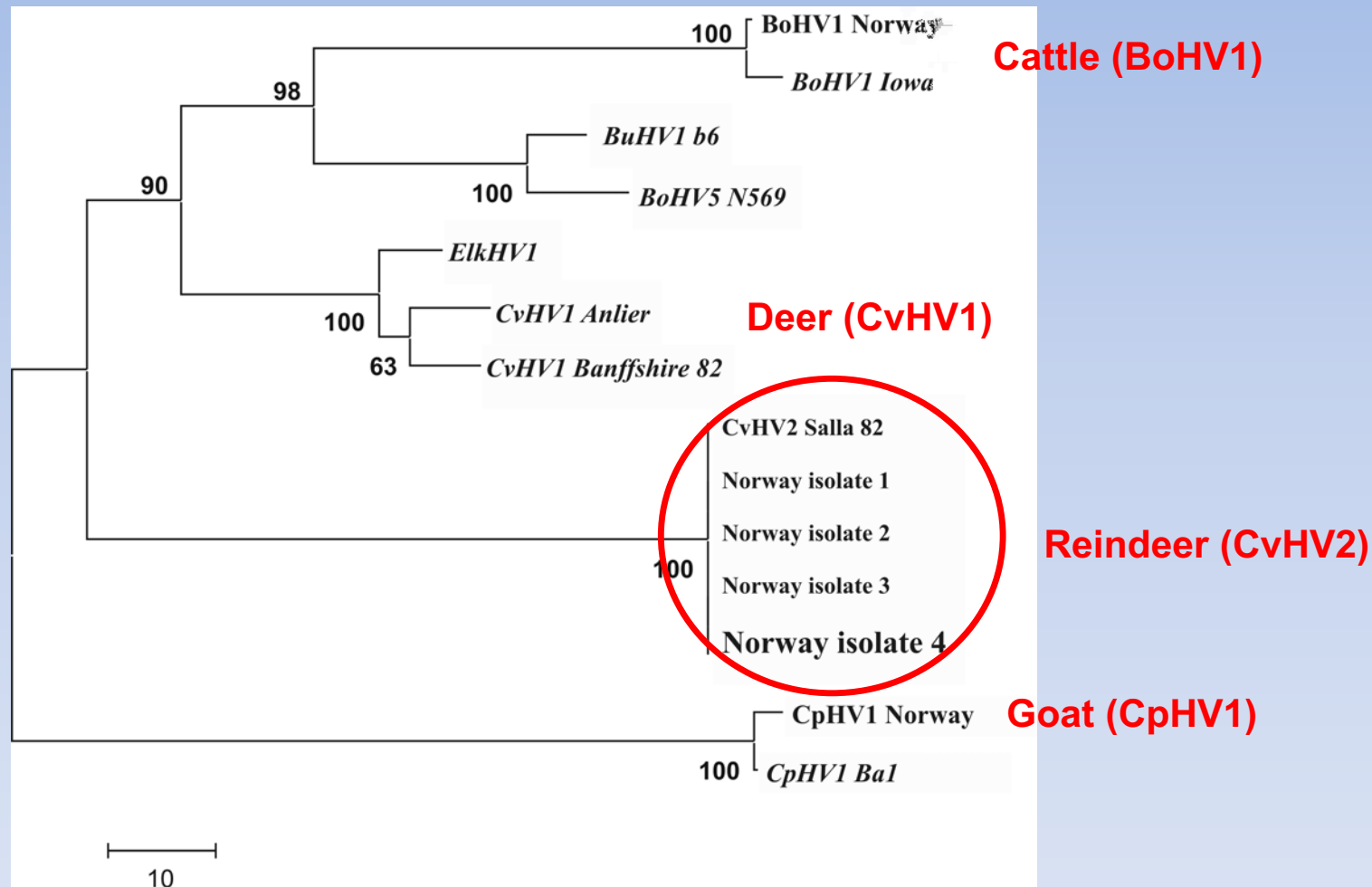
⁴Reindeer Herders' Association (Finland).

Excellent opportunities for pathogens



Reindeer alphaherpesvirus: CvHV2

Phylogeny based on glycoprotein B sequences



Conclusion: CvHV2 is the virus circulating in reindeer herds (not BoHV1)
(Das Neves et al., 2009)

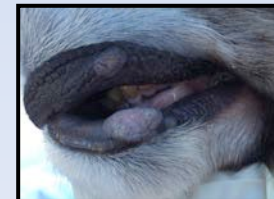
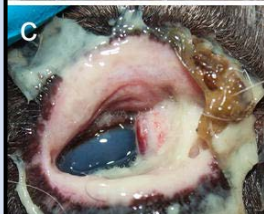


Stress → reactivation (older animals) – primary infection (calves) – secondary bacterial infection



Possible impacts from CvHV2 in reindeer

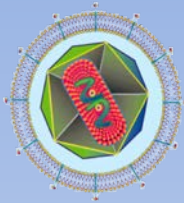
- Endemic: seroprevalence: appr. 50 % in adults, 8 % in calves (< 1 year)
- Reactivation of latent infections upon stress
- Transferred to fetus and newborn calves:
 - Abortion and weak borne calves?
- Transmissible component of IKC:
 - Reactivated in adults, transferred to immunologically naive calves/young
 - Outbreaks occur after herding, corralling, transports etc.
- Primary agent causing mucosal lesions - paving the way:
 - Contagious ecthyma (Parapoxvirus)
 - Oral necrobacillosis (*Fusobacterium necrophorum*)



Gammaherpesvirus in reindeer

Subfamily *Gammaherpesvirinae*, genus *Macavirus*:

- Caprine herpesvirus 2 (CpHV-2)
- Ovine herpesvirus 2 (OvHV-2):
 - Subclinical infections in sheep
 - Causing malignant catarrhal fever (MCF) in cattle, cervids and pigs
- MCF in cattle:
 - Fever, depression, leukopenia, bilateral opthalmia, nasal and ocular discharge, lymphadenopathy, mucosal erosions, CNS-symptoms
- PCR-generated sequences from Norwegian cervids:
 - Moose (*A. alces*), red deer (*C. elaphus*) and roe deer (*C. capreolus*): OvHV-2 and CpHV-2 *
 - Reindeer: sequences different from other gammaherpesviruses (GenBank)
 - A hitherto undescribed gammaherpesvirus in reindeer:
 - Disease in reindeer?
 - Reservoir?



Pestivirus infections

- Serology: 0-55 % in different herds *
- Cattle in Norway: pestivirus not detected since 2006
- Sequencing of PCR-amplicons indicates a reindeer pestivirus closer to BDV (sheep) than BVDV (cattle)
- Uncertain impact of pestivirus infections in reindeer:
 - Fever and diarrhea?
 - Abortion and malformations?
 - Weak offspring?
 - Mucosal lesions and secondary infections?
- The region with highest prevalence also have a high percentage of lost calves during the first year of life
 - Follow up: look for weak individuals

Smittsom munnskurv
Munnvårtsjukan
Contagious ecthyma

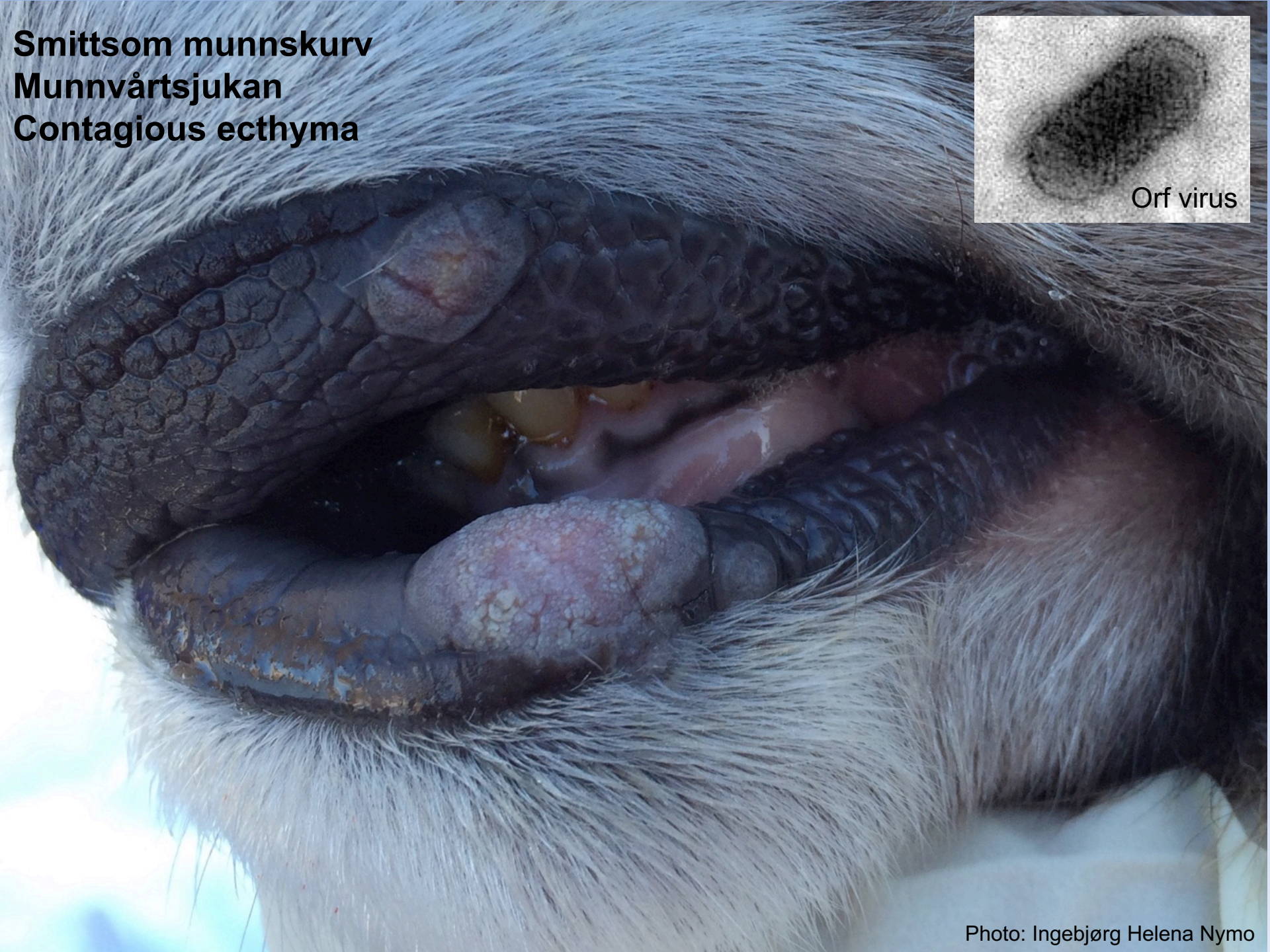
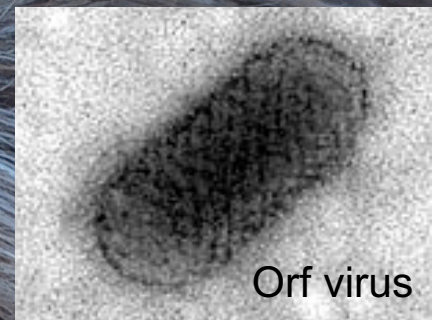


Photo: Ingebjørg Helena Nymo



Munnskurv/munnvårtsjukan forårsakes av Orf virus
Smitte fra sau/geit og storfe, til reinsdyr og til mennesker (zoonose)

Papillomavirus

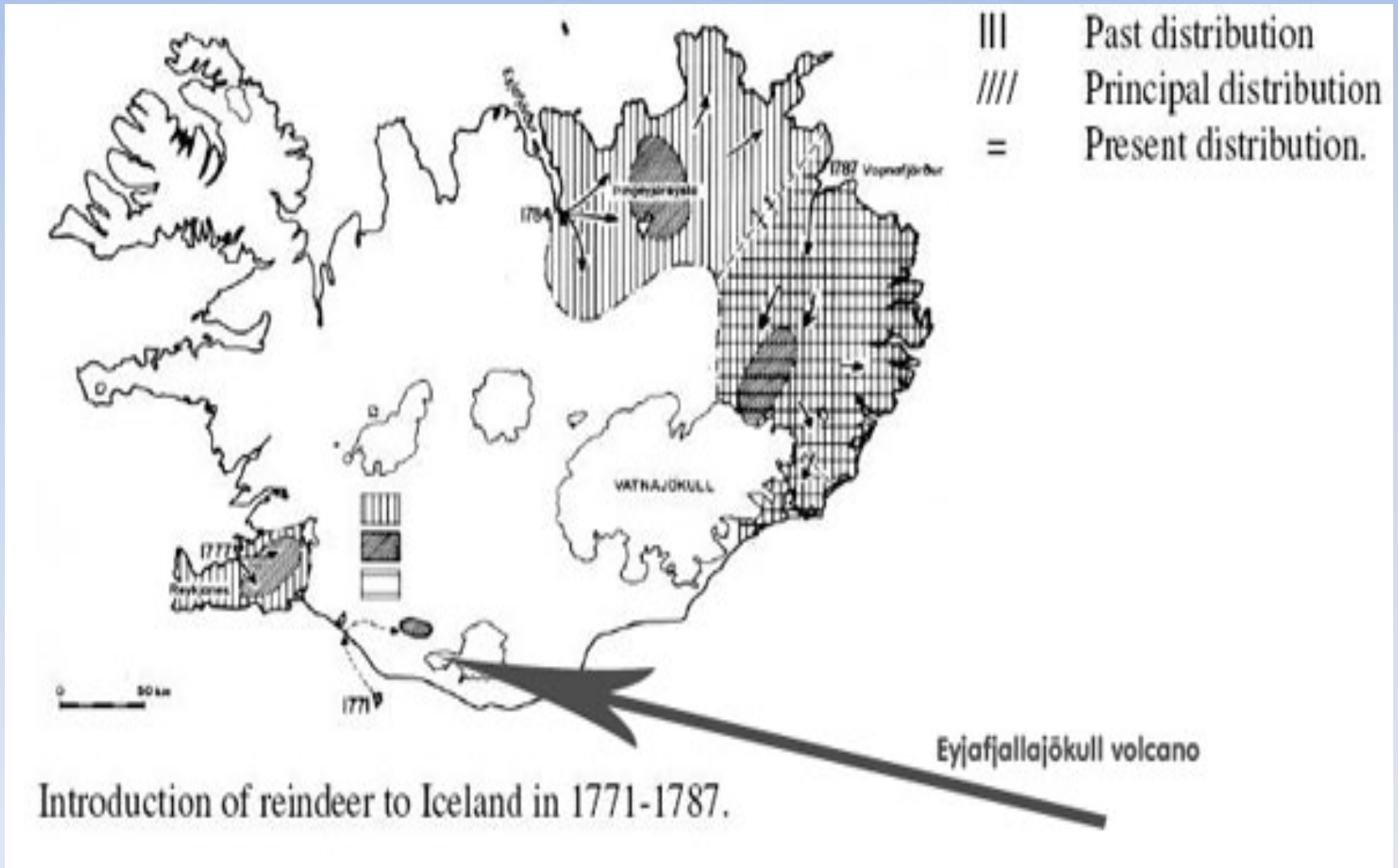


Photo: Sondre Myrvang

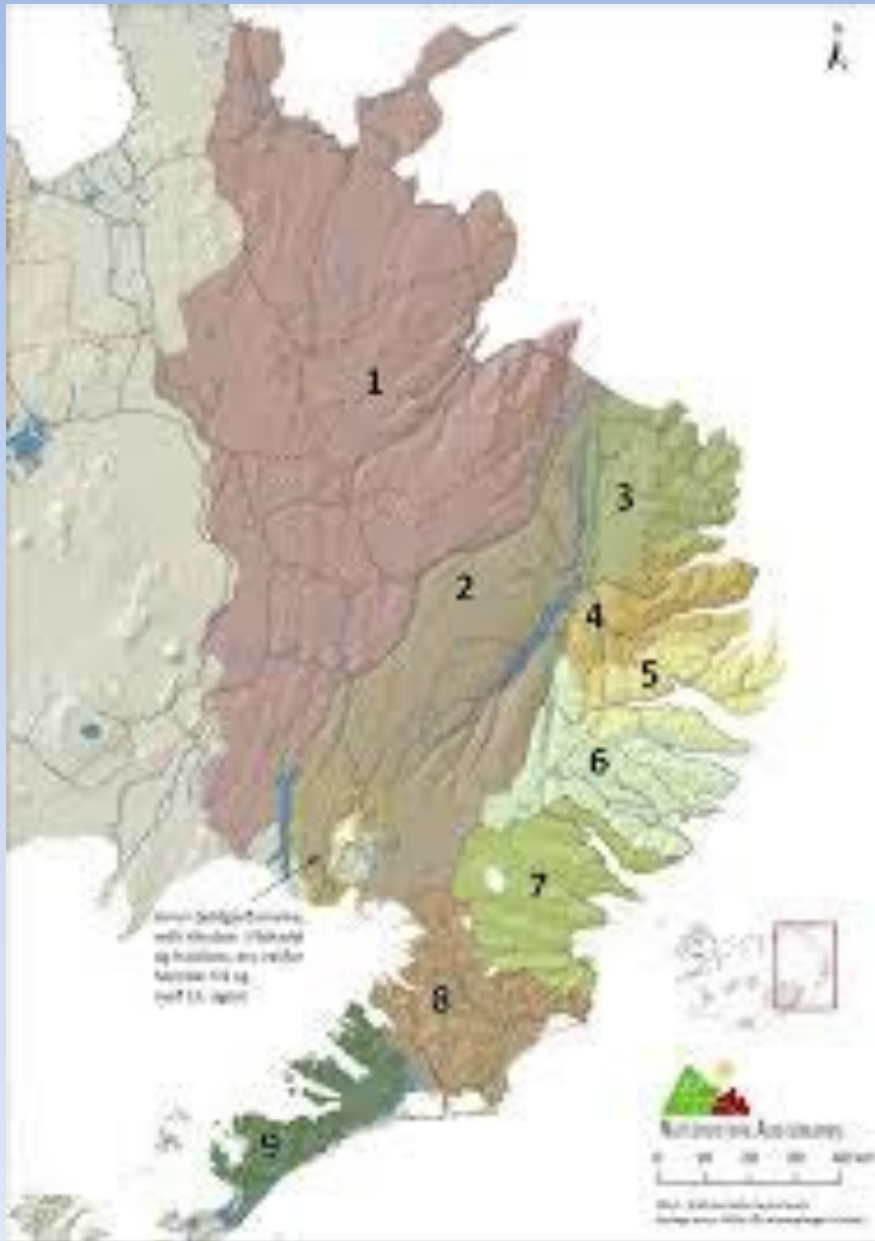
Introduction of reindeer to Iceland:

Four attempts, last one succeeded, 1787:

30 females, 5 males from Avjovarre, Finnmark, Norway



231 years later:



9 management zones on the North-East quarter of Iceland

Population: appr. 6 200

Female/male = 60/40

Guided trophe hunt, merely older animals (no calves)

Hunt 2018:

1450 animals (390 bulls)

+ 15 calves (for research)

In general:

- Arctic fox (*Vulpes lagopus*) the only predator
- No warble flies (*Hypoderma tarandi*) or throat bot flies (*Cephenemyia trompe*).
- No mosquitoes (*Aedes nigripes* etc.).
- A favorable zoosanitary situation due to strict import regulations (livestock etc.).

The population doubled in 2000 to 2008 although 20–25% of the estimated total summer population was hunted annually (Figure 32).

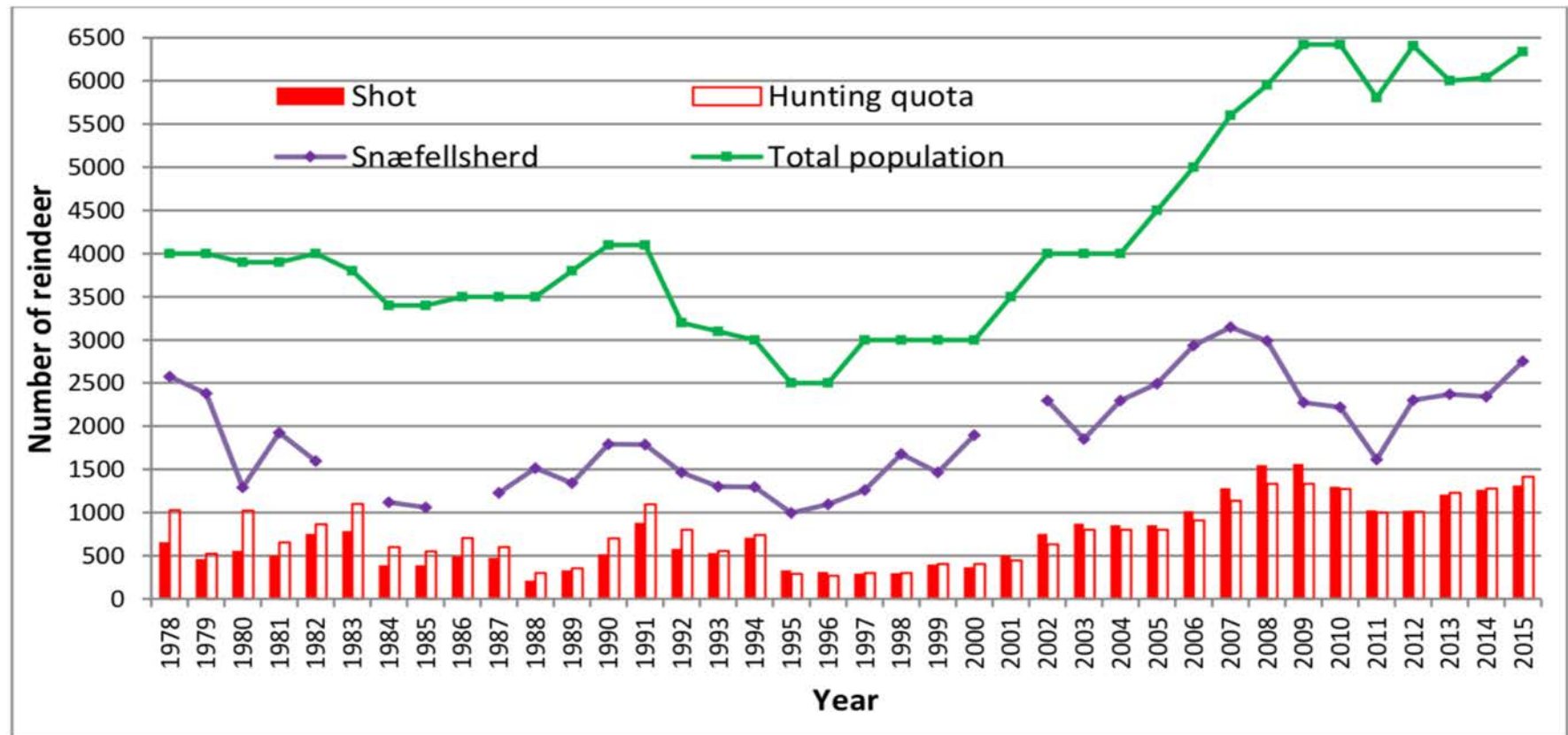


Figure 32. Population size of Snæfellsherd in summer, hunting quotas and total number of reindeer shot between 1978–2015 (Þórisson, 1978–1999; Þórarinsdóttir, 2005; Þórisson, 2000, 2003, 2007, 2008 and Þórarinsdóttir & Þórisson, 2004, 2006, 2008–2015).

In: Skarphéðinn G. Þórisson: Population dynamics and demography of reindeer (*Rangifer tarandus* L.) on the East Iceland highland plateau 1940–2015 - A comparative study of two herds. Master thesis, Agricultural University of Iceland, Faculty of Environmental Sciences (2018)

In general:









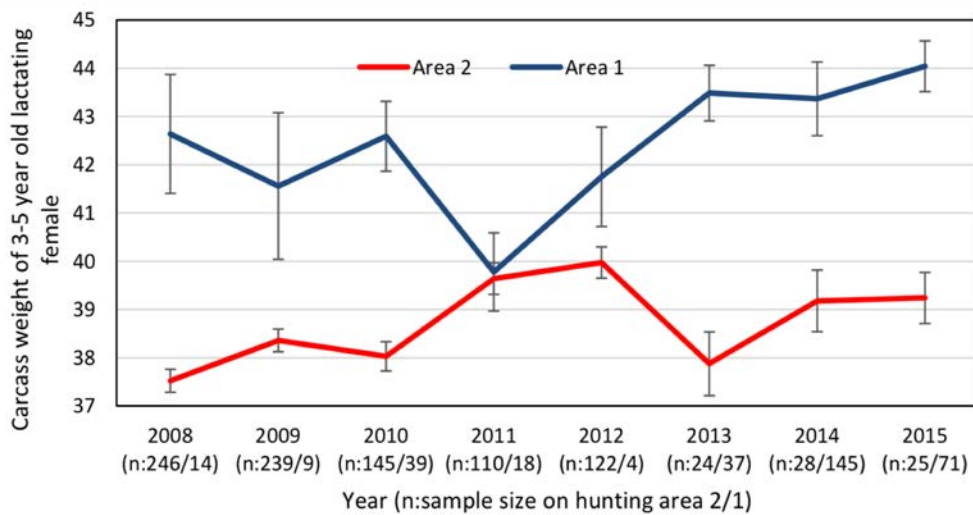


Figure 42. Mean carcass weight (kg) (with standard error) of 3–5-year-old lactating females at the hunting time in area 1, 2 and 3–8 (Eastern fjords) in 2008 to 2015.

Mean carcass weight females
3-5 years old

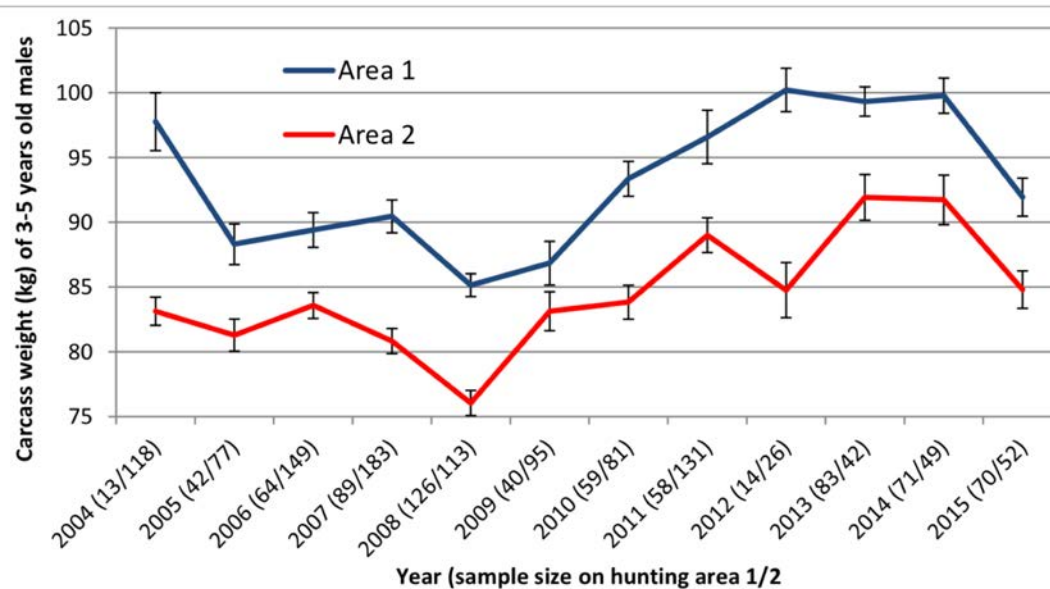


Figure 43. Comparison of carcass weight (kg) (with standard error) of 3–5 years old males in area 1 and area 2 in the 2004–2015 hunt.

Mean carcass weight males
3-5 years old

The main cause of death of reindeer in Iceland is believed to be hunting. From 252 recorded carcasses during the period 1991–2013, car accidents seem to be the most common reason for premature death. The police inform EINCR of most of these instances, which occurred at a similar rate between area 1 and area 2. For one fourth of the carcass analyses the cause of death was unknown (Figure 39).

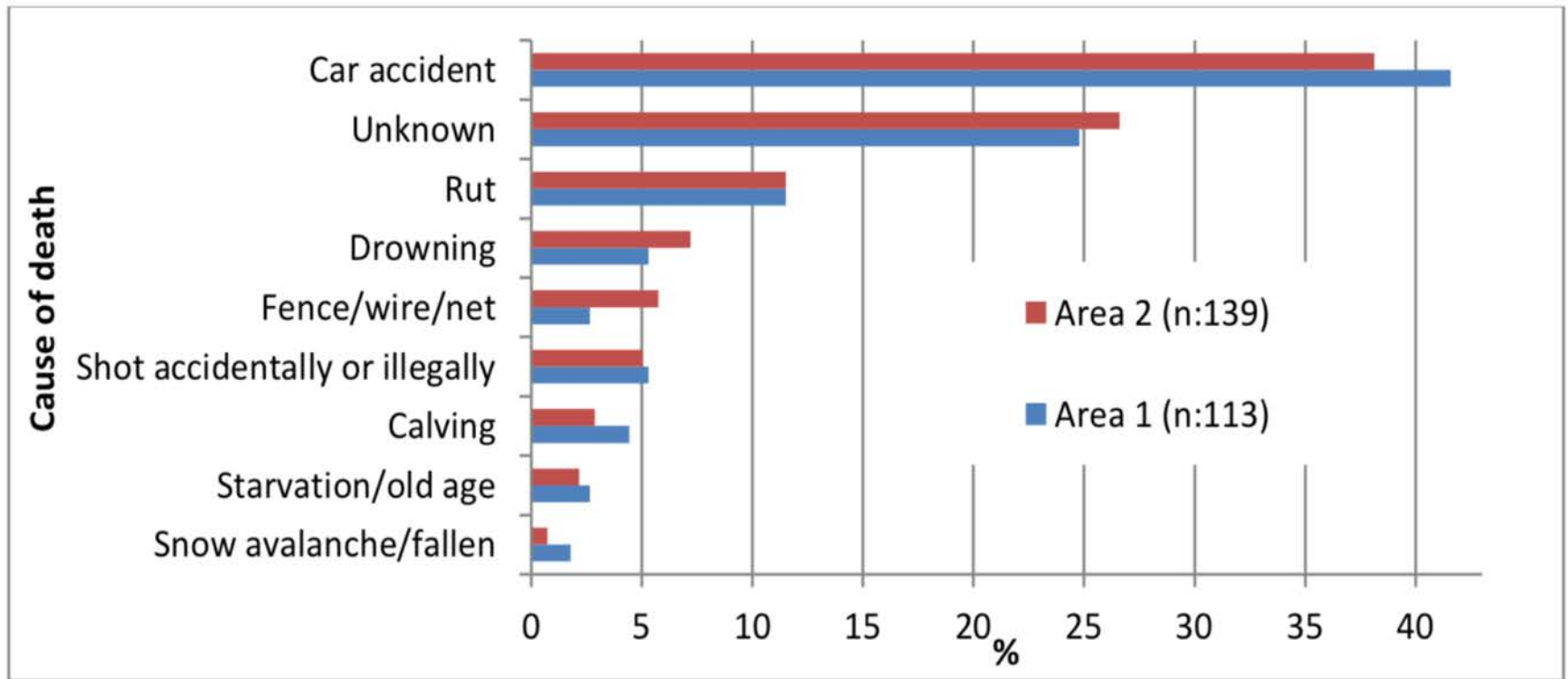
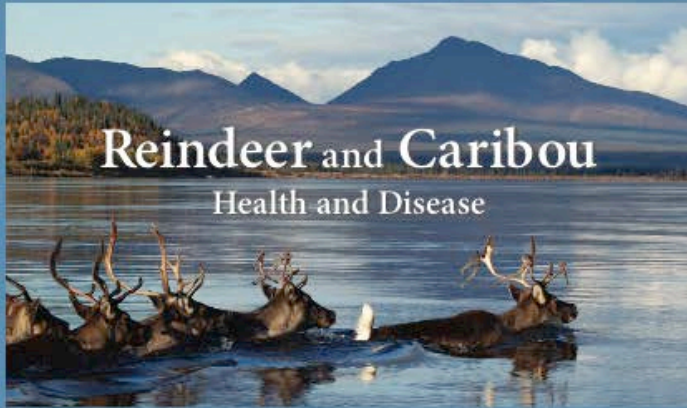


Figure 39. Cause of death of reindeer (except hunting) based on carcass analysis 1991–2013 (Þórisson & Ágústs dóttir, 2014).



Results from 2017:
3-4 pestivirus seropositive animals (n=35)



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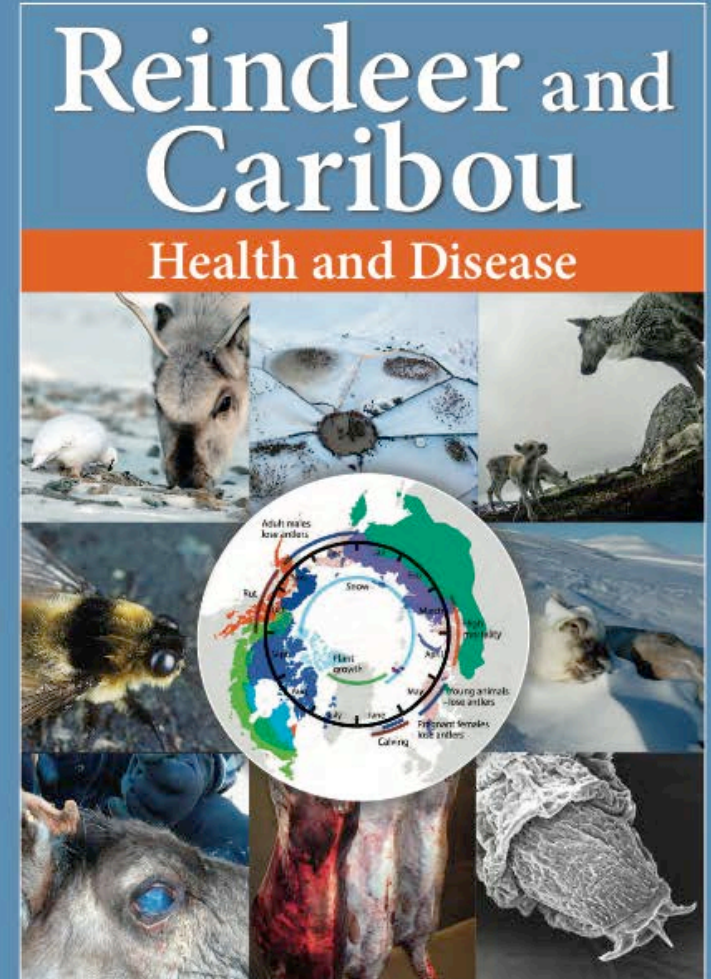
Reindeer and Caribou

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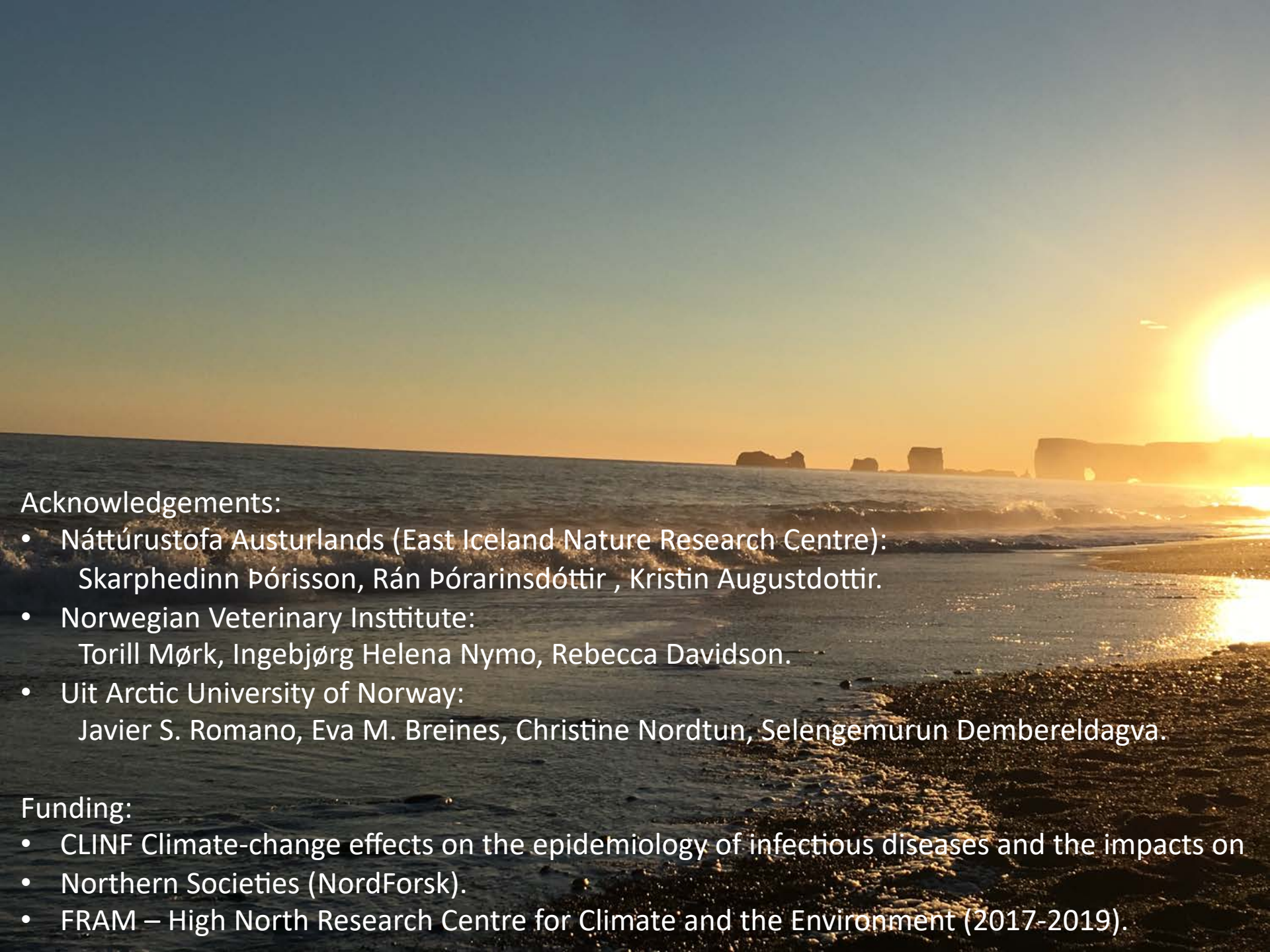
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