Annual Report

The surveillance programme for Chronic Wasting Disease (CWD) in free ranging and captive cervids in Norway 2019

Veterinærinstituttet
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The surveillance programme for Chronic Wasting Disease (CWD) in free-ranging and captive cervids in Norway 2019

Content

Authors
Jørn Våge, Petter Hopp, Turid Vikøren, Knut Madslien, Attila Tarpai, Torfinn Moldal, Sylvie Lafond Benestad

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Summary

A total of 30,147 samples of wild, semi-domesticated and captive Norwegian cervids were analysed in 2019. From these, two moose (*Alces alces*) tested positive for CWD, one fallen stock (found dead) from the Sigdal municipality in Southern Norway and one hunter harvested from the Selbu municipality in Mid-Norway. Both of these were old females (12 and 20 years respectively) with characteristics similar to previous CWD cases in Norwegian moose [1], i.e. no detection of PrP^{res} in lymphoid tissue. In addition, four reindeer from Svalbard and 37 wild muskoxen (*Ovibos moschatus*) from the Dovrefjell Mountains were tested and found negative for TSE.

Introduction

Chronic Wasting Disease (CWD) was for the first time detected in Europe in 2016, in Norway [2]. This was also the first detection of a natural CWD infection in reindeer (*Rangifer tarandus*) worldwide. The index case in reindeer was located in Nordfjella mountain-range in Southern Norway and all subsequent positive reindeer have been found in this area (Figure 1). This sub-population was eradicated in 2018 [3].

CWD is a transmissible spongiform encephalopathy (TSE) or prion disease of cervids [4]. It is an invariably fatal neurodegenerative disease with no known treatment. Well-known in North America, CWD has since the 1960's gradually spread to an increasing number of states and provinces (March 2020: 26 states in USA and three provinces in Canada), both in captive and free-ranging cervids [5]. The republic of Korea has also diagnosed the disease after importation of infected elk (*Cervus elaphus nelsoni*) from Canada [6]. With the disease emergence in Norwegian, naturally susceptible species also include reindeer. Norway have by now three affected species; reindeer, moose (*Alces alces*) and red deer (*Cervus elaphus*). From 2018, CWD has also been diagnosed in old moose in Finland and Sweden [7].

Four cervid species are prevalent in natural free-ranging populations in Norway: moose, red deer, roe deer (*Capreolus capreolus*), and reindeer. Red deer predominate along the west coast, whereas moose and roe deer mainly inhabit other areas of the country. The wild reindeer is found in fragmented sub-populations in the remote alpine regions of Southern Norway [8]. In addition, Norway has a population of semi-domesticated reindeer that live in a free-ranging condition, though herded. The majority of semi-domesticated reindeer are found in the northern part of Norway as part of the Sami culture, particularly in the county of Finnmark.

The official numbers (20th March 2020) of hunted cervids in the 2019-2020 season; 30,253 moose, 46,356 red deer, 29,520 roe deer, and 4,738 free-ranging reindeer [9]. Additionally, the semi-domestic reindeer population counts about 250,000 animals [10]. There are approximately 120 deer farms in Norway; most of them keep red deer, but some farms have fallow deer (*Dama dama*) and occasionally both species.

Testing wild cervids for CWD was initiated in 2002 through the National Health Surveillance Program for Cervids and muskox (*Ovibos moschatus*), operated by the Norwegian Veterinary Institute (NVI) on behalf of the Norwegian Environmental Agency. A passive surveillance programme for CWD in Norwegian wild and captive cervids has been running from 2003. In addition, samples from slaughtered semi-domestic reindeer from several regions in the country have been tested. In 2006 and 2007 the European Commission (decision 2007/182/EC) initiated a survey for CWD and Norway performed, like the EU member-states, testing of 700 red deer. Shown in Table 1 is the total number of cervids tested for CWD in Norway from 2002 up to and including 2019.

Table 1. The number and species of cervids tested for chronic wasting disease (CWD) in Norway 2002-2019. Additional six wild reindeer from Svalbard is not included in the table (four in 2019, two in 2018).

Year	Moose (*Alces alces*)	Red deer (*Cervus elaphus*)	Reindeer (*Rangifer tarandus*)		Roe deer (*Capreolus capreolus*)	Fallow deer (*Dama dama*)	Unknown Species	Total
			Semi-domestic	Wild				
2002-15	142	825	966	10	203	13	0	2 159
2016	4 403	2 597	1 738	842	484	0	88	10 152
2017	5 468	4 082	10 937	2 921	1 959	20	272	25 659
2018	6 705	8 428	12 046	3 650	2 124	48	655	33 656
2019	5 932	5 751	12 937	3 335	1 689	37	466	30 147
Total	22 650	21 683	38 624	10 758	6 459	118	1 481	101 773

Aim

The aim of the programme is to detect the occurrence of CWD in the Norwegian cervid populations and TSE in muskoxen.

Materials and methods

The CWD surveillance programme include slaughtered semi-domesticated reindeer (aged above 12 months in southern Norway and above 24 months in northern Norway), euthanized animals and fallen stock of captive deer and semi-domestic reindeer above 24 months and wild cervids above 12 months, and wild cervids submitted for necropsy at the NVI. In addition, since the discovery of CWD in 2016, a large effort has been put in action to harvest and test wild cervids through regular hunting. This effort is a cooperation between the Norwegian Food Safety Authority, the Norwegian Environmental Agency, the Norwegian Institute for Nature Research (NINA) and NVI. Apart from cervids, wild muskoxen are also enrolled in the Norwegian surveillance of animal TSE. These animals live in the Dovre Mountains, as the only free-ranging muskox population in Norway.

The routine diagnostics of CWD require testing of brain tissue (*Medulla oblongata*). Due to early detection of prions in lymphoid tissue of reindeer in Norway, such tissue (retropharyngeal lymph nodes) have, since 2016, been added to the brain samples from cervids when available.

A rapid test (TeSeE® SAP ELISA from Bio-Rad until July 2019 and IDEXX HerdChek BSE-Scrapie AG Test, IDEXX Laboratories, Westbrook, USA) was used to screen samples from pooled brain and lymph nodes for detection of PrP^{res}.

Initially positive ELISA results were retested in brain and lymph node separately, before confirmation by the TeSeE® Western-blot from Bio-Rad, according to the manufacturer's instructions. All the samples were analysed at NVI, being the national reference laboratory for animal TSEs and an OIE reference laboratory for CWD.

Results

In total, samples from 30,147 individual cervids were analysed in 2019, of which two wild moose tested positive for PrP^{res}. These two old female moose (12 and 20 years) shared diagnostic characteristics with previously detected positive moose [1].

Semi-domesticated reindeer (12,937) contributed with about 43% of the total. Moose samples counted 5,932 and red deer 5,751, being the two larger subgroups beside slaughtered semi-domesticated reindeer. The number of tested wild reindeer, roe deer and fallow deer was 3,335, 1,689 and 37, respectively.

Amongst the total number were 466 animals of unknown species. In addition, four wild reindeer from Svalbard and 37 muskoxen were tested and found negative.

A total of 79% of the animals were tested by analysing both lymphoid tissue and brain.

Table 2 and Figures 2-9 give the numbers, species and geographical distribution of cervids tested for CWD in 2019.

Table 2. The number of cervids tested in the Norwegian surveillance programme for chronic wasting disease (CWD) 2019, distributed on species and reason for submission. Additional four wild reindeer from Svalbard in 2019 is not included in the table.

	Wild			Captive and semi-domesticated			
Species	**Hunted**	**Diseased, injured or traffic killed**	**Un-known**	**Slaughtered**	**Diseased, injured or traffic killed**	**Un-known**	**Total**
Moose	5 164	524	244	0	0	0	5 932
Red deer	4 748	248	189	537	27	2	5 751
Reindeer	3 023	13	299	12 651	272	14	16 272
Roe deer	208	1 072	409	0	0	0	1 689
Fallow deer	0	0	0	37	0	0	37
Unknown	99	21	317	21	5	3	466
Total	13 242	1 878	1 458	13 246	304	19	30 147

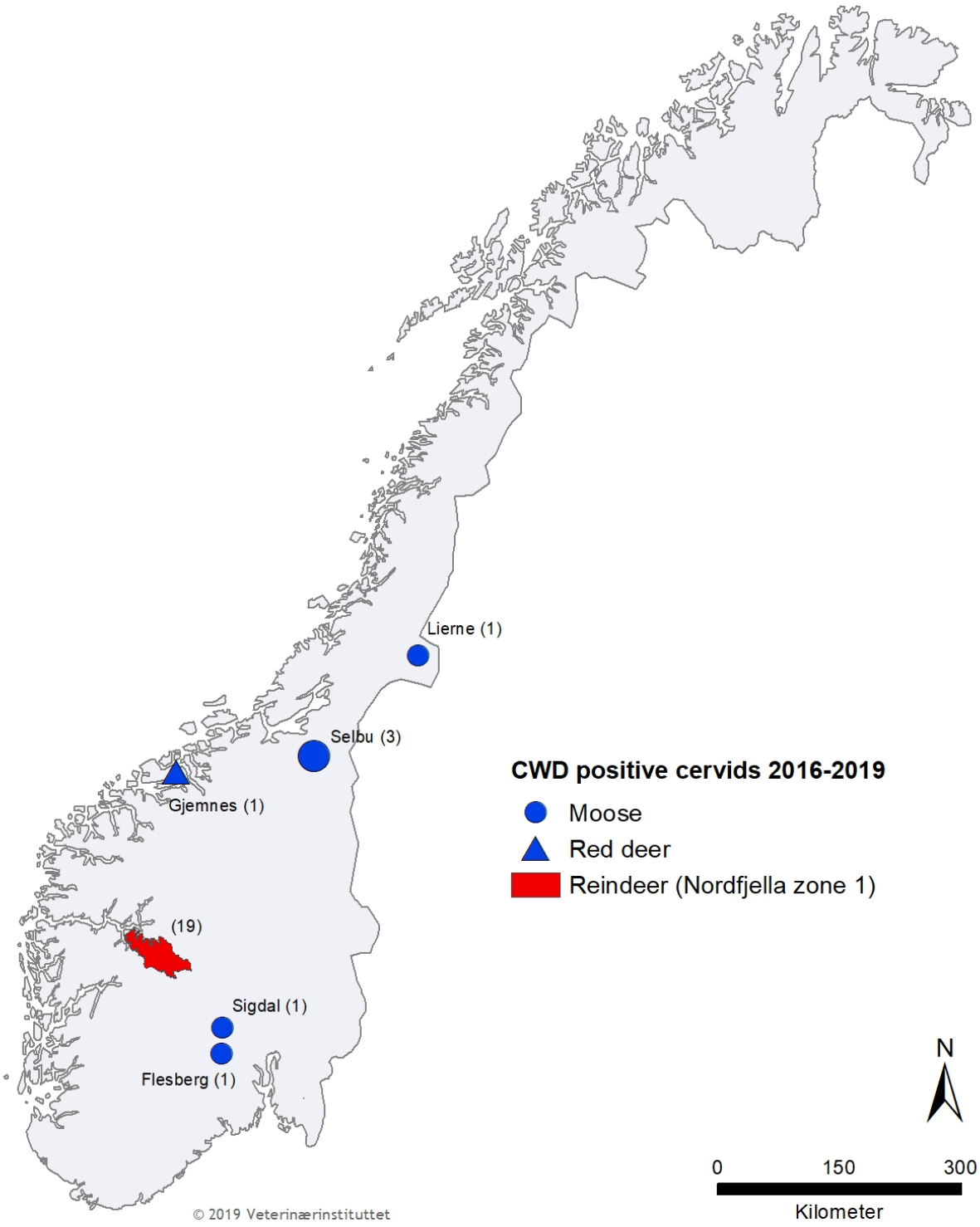

Figure 1. Geographical location of Nordfjella (in red) and the municipalities in which the CWD positive cervids have been detected through the Norwegian surveillance programme for chronic wasting disease (CWD). The number of animals at each location is given in the parenthesis.

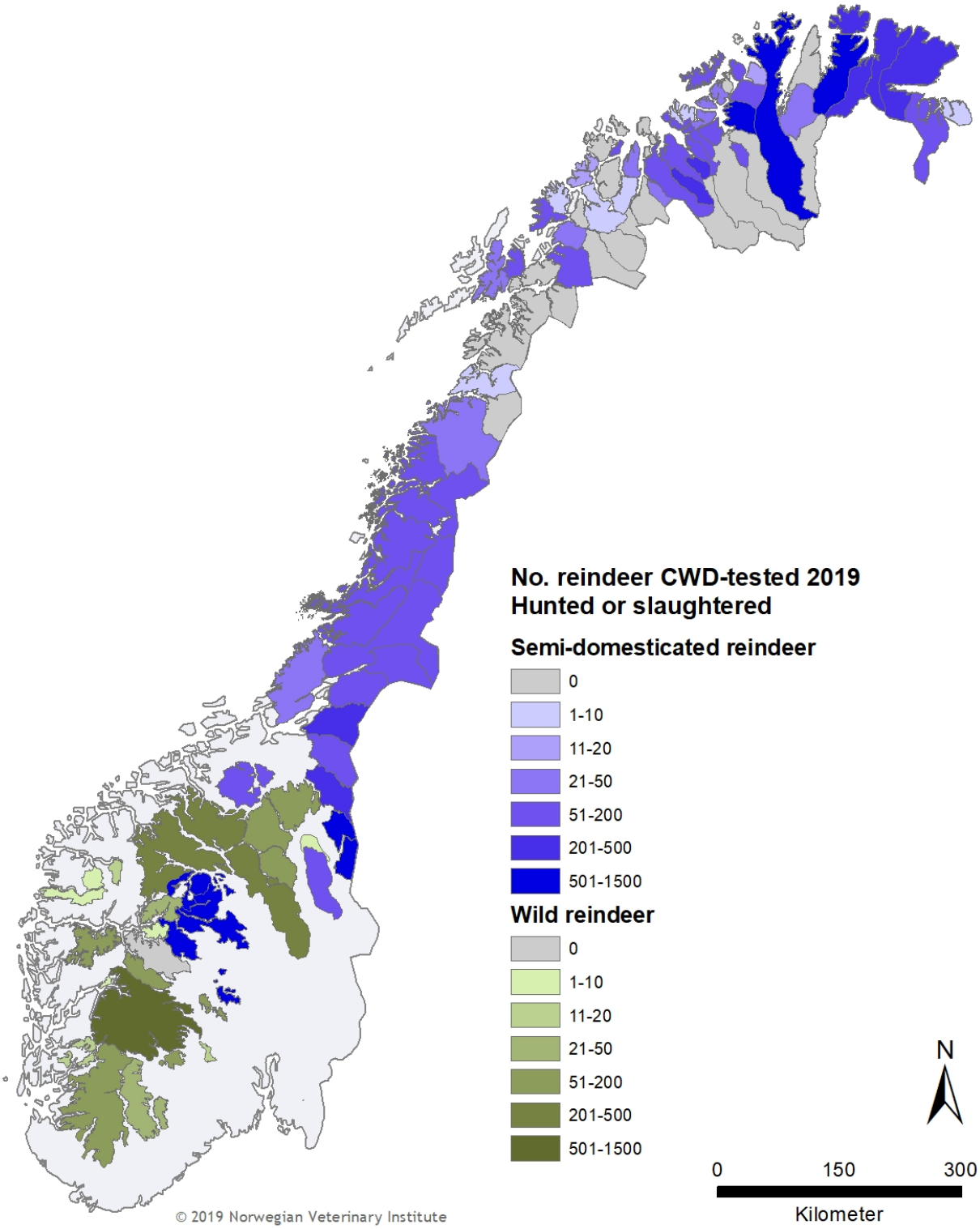

Figure 2. The number and geographical distribution of hunted free-ranging (green) and slaughtered semi-domestic (blue) reindeer (*Rangifer tarandus*) tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2019.

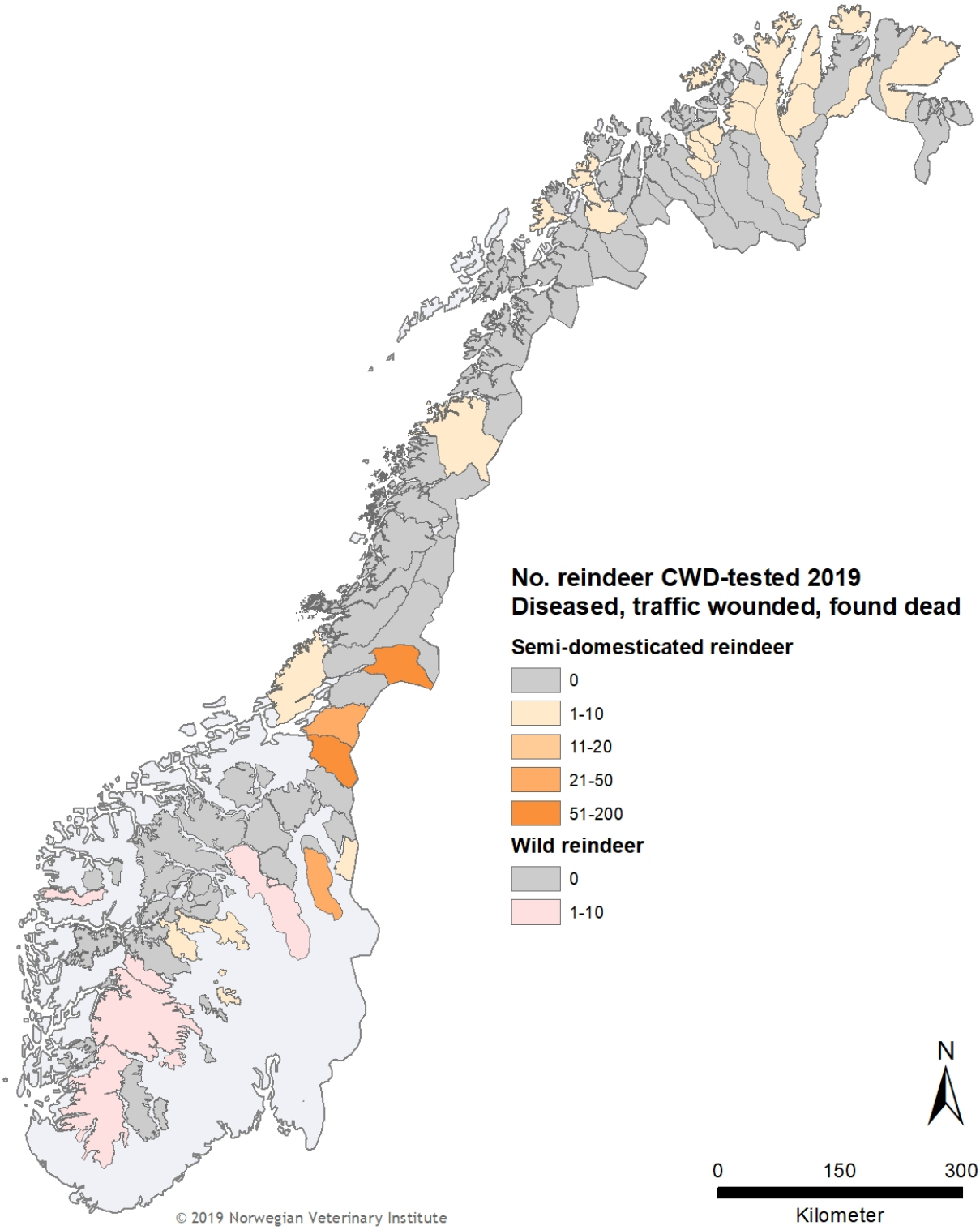

Figure 3. The number and geographical distribution of reindeer (*Rangifer tarandus*), both free-ranging and semi-domestic, found diseased and euthanised, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2019.

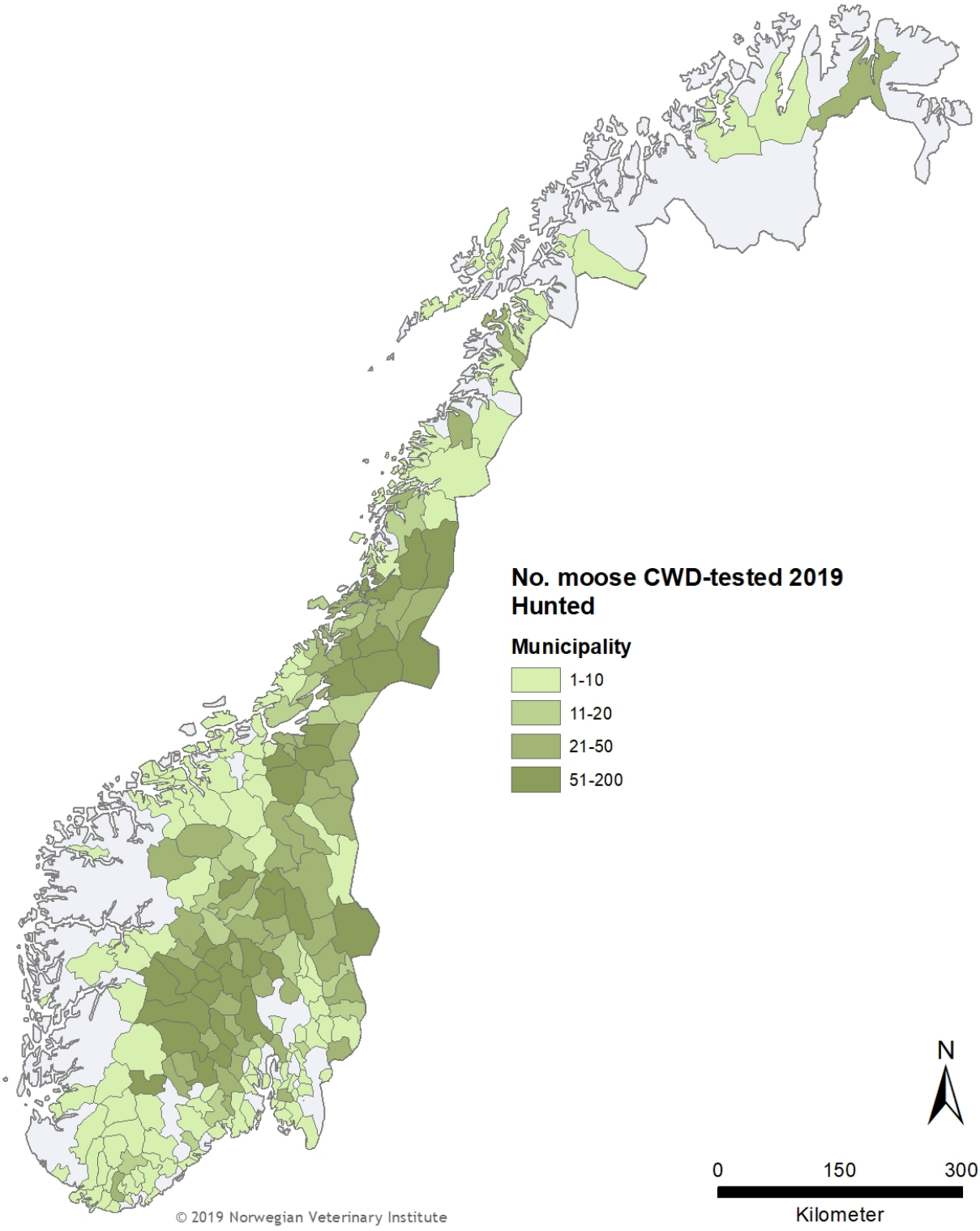

Figure 4. The number and geographical distribution of hunted free-ranging moose (*Alces alces*) tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2019.

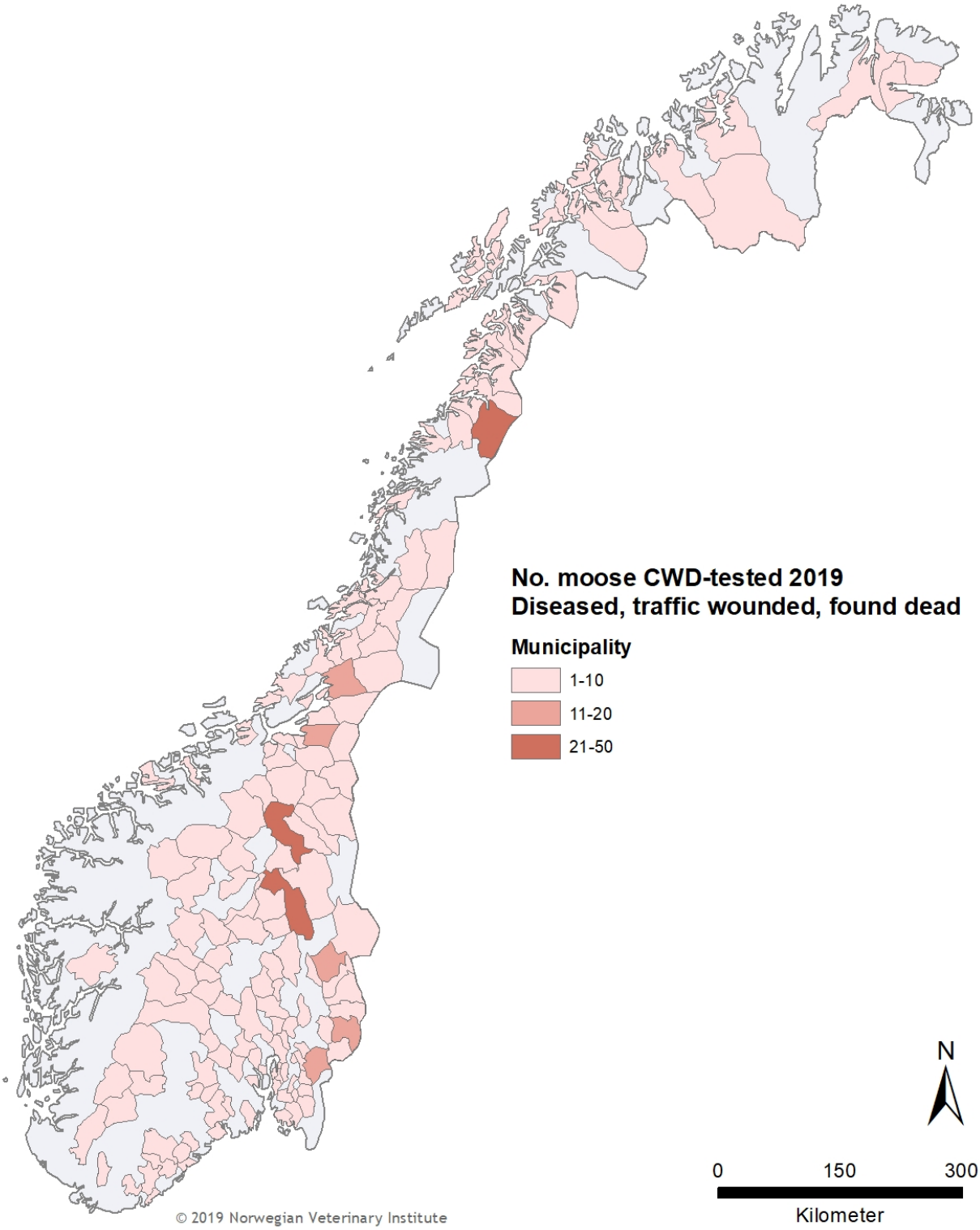

Figure 5. The number and geographical distribution of free-ranging moose (*Alces alces*) found diseased and euthanised, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2019.

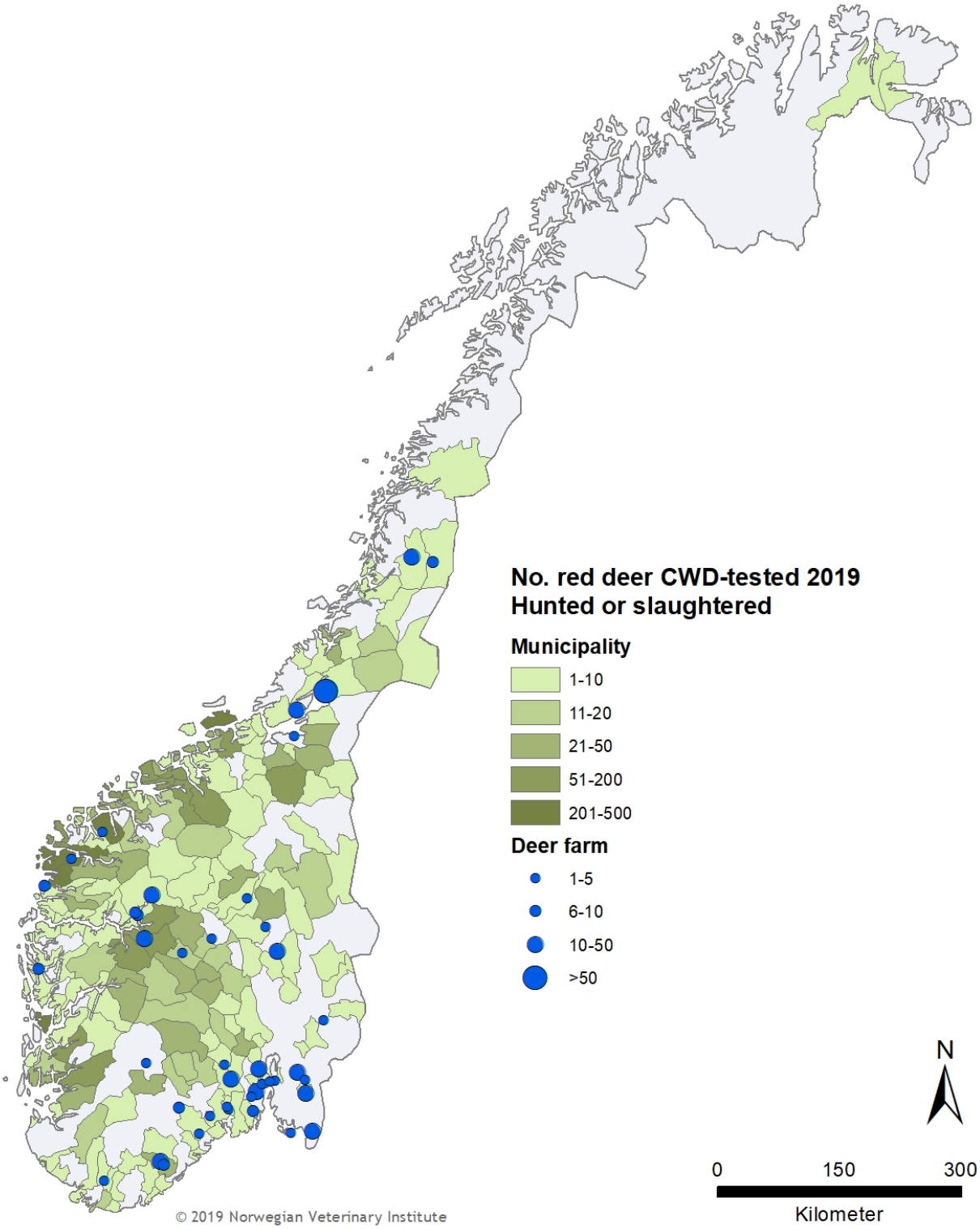

Figure 6. The number and geographical distribution of hunted free-ranging (green) and slaughtered captive (blue dots) red deer (*Cervus elaphus*) tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2019.

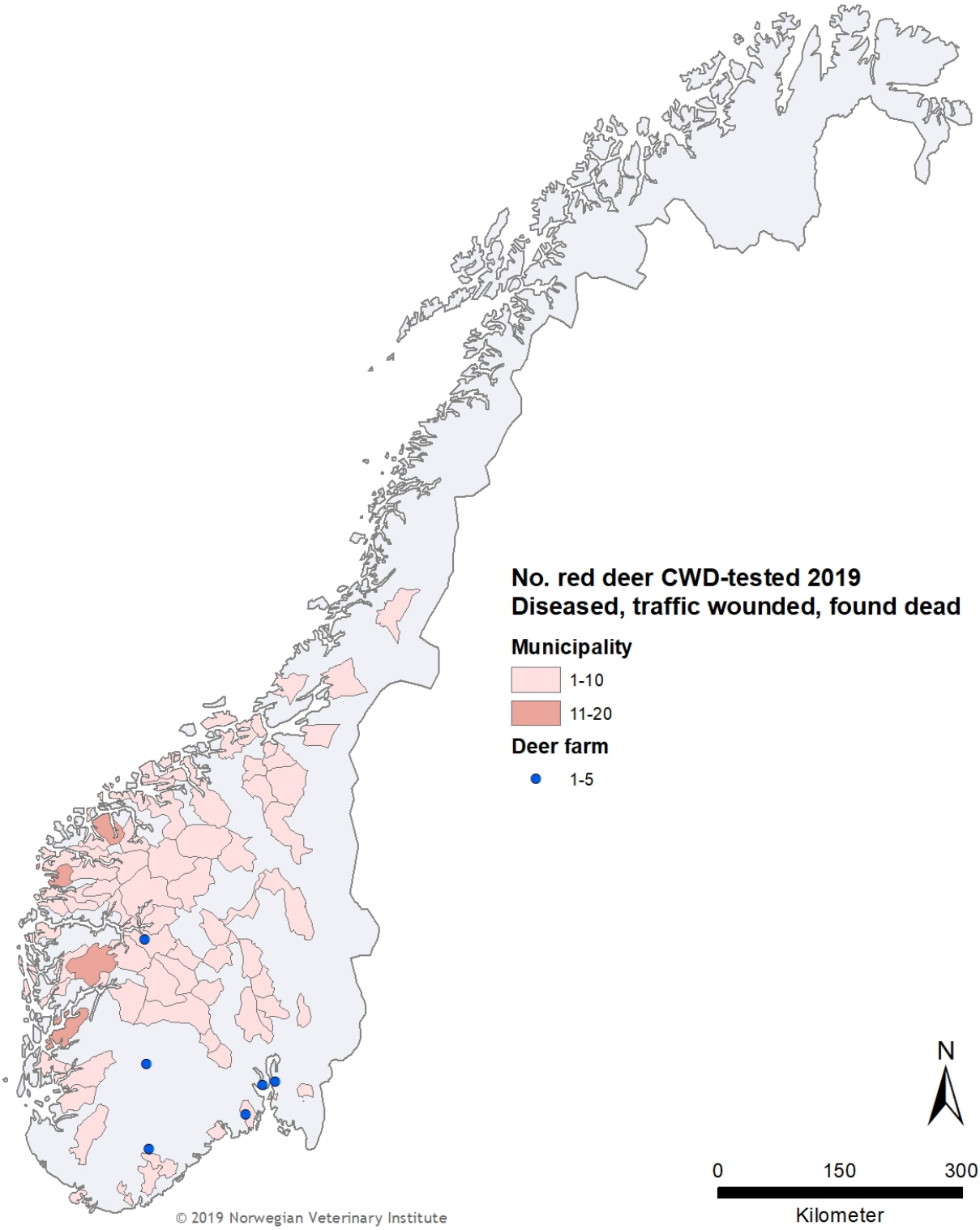

Figure 7. The number and geographical distribution of free-ranging (red) and captive (blue dots) red deer (*Cervus elaphus*) found diseased and euthanised, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2019.

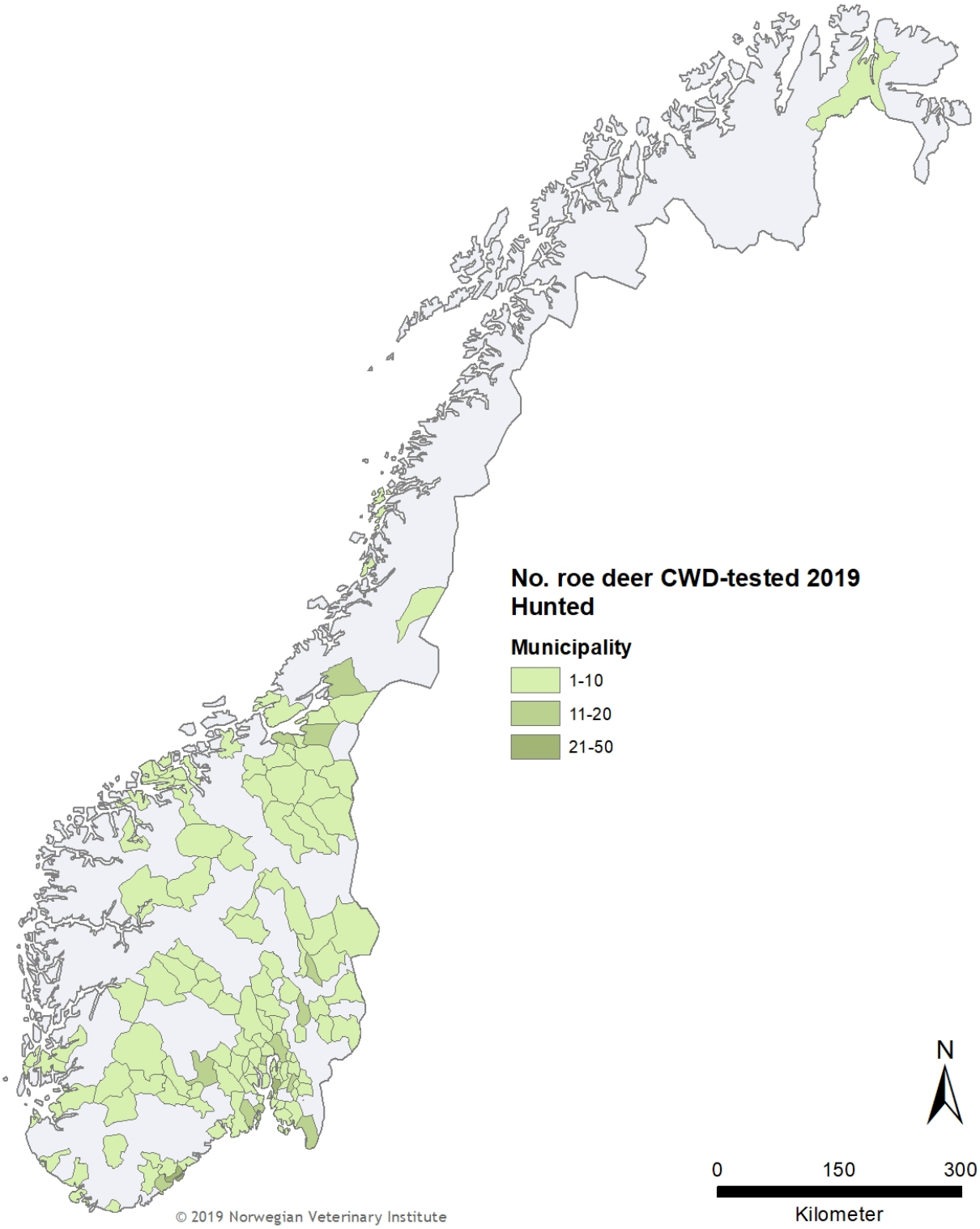

Figure 8. The number and geographical distribution of hunted free-ranging roe deer (*Capreolus capreolus*) tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2019.

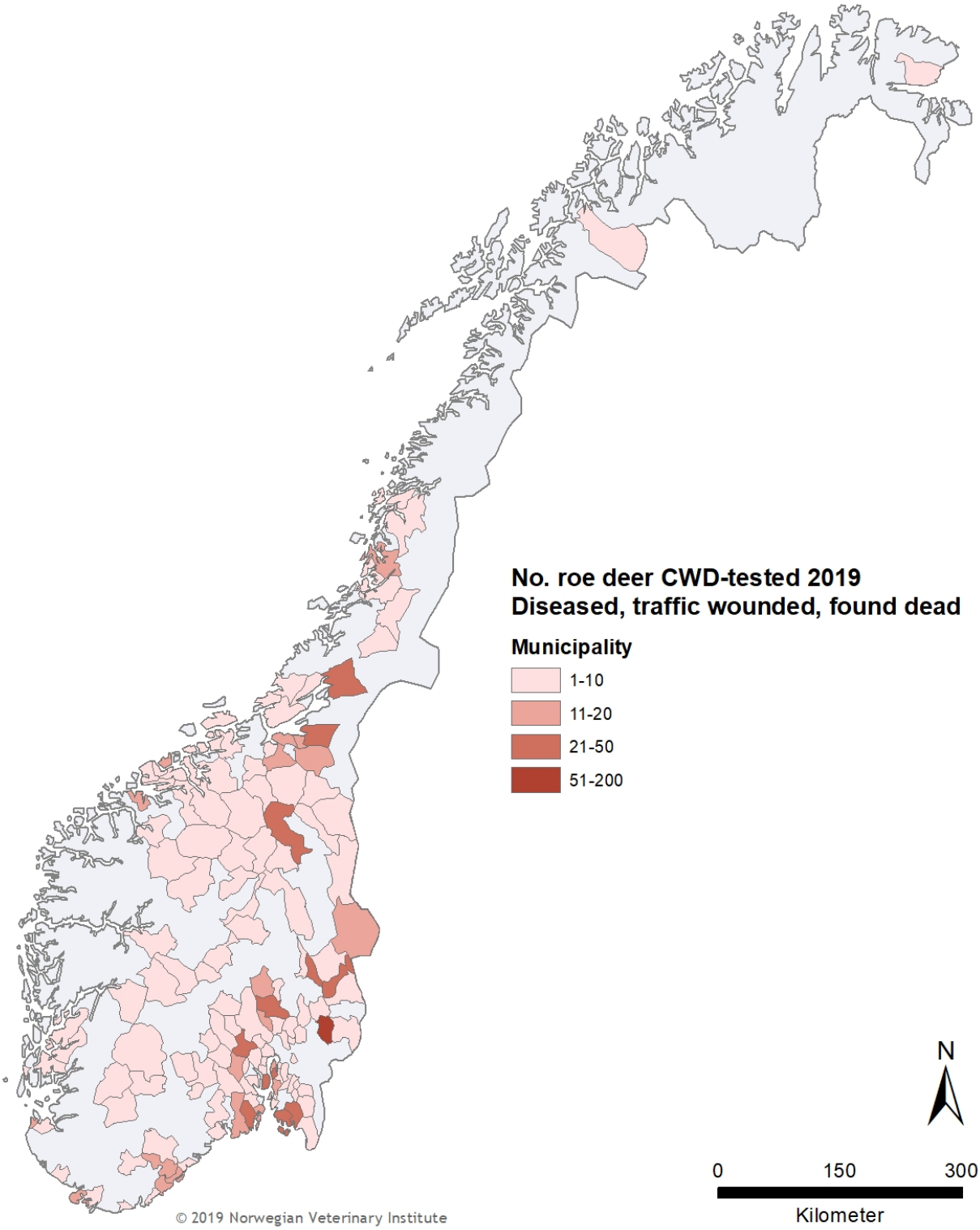

Figure 9. The number and geographical distribution of free-ranging roe deer (*Capreolus capreolus*) found diseased and euthanised, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2019.

Discussion

In 2016, CWD was for the first time detected in Europe, in six free-ranging cervids in Norway. In total the CWD testing has revealed 19 reindeer (all in the Nordfjella zone 1 region), six moose and one red deer positive for the disease in the period 2016-2019. No reindeer-cases detected outside Nordfjella give some indications of the infection in this species being limited. Characterization has shown prion strain differences between reindeer and the two other cervid species. The reindeer cases were indistinguishable, in results of diagnostic test methods, from cases of CWD from North America, whereas the positive European moose and red deer have shown atypical characteristics [1,7,11], importantly with no PrP^{res} detection in the lymphoid tissues.

The detected numbers in moose and a red deer, 6/22,650 and 1/21,683 respectively, indicate low levels, if any, of horizontal spreading between live animals in these species. TSE in domestic animals, with scrapie in sheep and BSE in cattle, have prion strains showing similar sporadic nature. Atypical scrapie/Nor98 and atypical BSE have prevalence of about 6-8/10,000 and 1/3,000,000, respectively.

The number of tested cervids in Norway is not yet at a level to assure knowledge of prevalence nor to give complete understanding of CWD epidemiology. For other European countries there is even much more uncertainty as the surveillance levels are still very moderate [7]. Thus continued surveillance in all susceptible species is warranted and planned in 2020.

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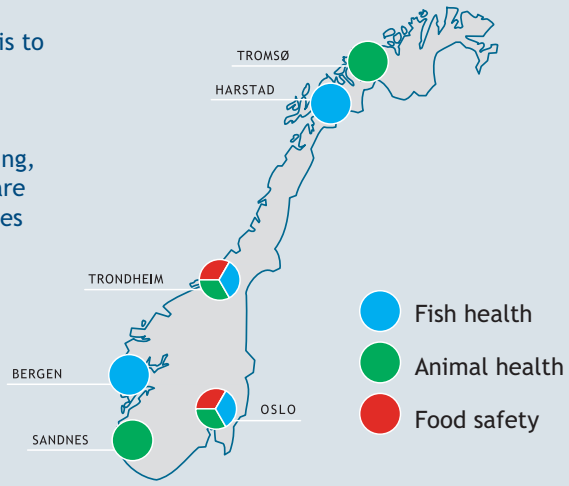

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Oslo	Trondheim	Sandnes	Bergen	Harstad	Tromsø
postmottak@vetinst.no	vit@vetinst.no	vis@vetinst.no	post.vib@vetinst.no	vih@vetinst.no	vitr@vetinst.no

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Veterinærinstituttet
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