Annual Report

The surveillance programme for Chronic Wasting Disease (CWD) in free ranging and captive cervids in Norway 2017

Veterinærinstituttet
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The surveillance programme for Chronic Wasting Disease (CWD) in free-ranging and captive cervids in Norway 2017

Content

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Summary

In 2017, nine wild reindeer (*Rangifer tarandus*) from the Nordfjella sub-population in South-Norway, one moose (*Alces alces*) from the Lierne municipality and one red deer (*Cervus elaphus*) from the Gjemnes municipality tested positive for CWD. The red deer case being the first natural infection described in free-ranging animals of this species. A total of 25 659 samples of wild, semi-domesticated and captive cervids were analysed in 2017.

Introduction

CWD was detected for the first time in Europe, in 2016, in five wild cervids in Norway (1). This was the first detection of a natural CWD infection in reindeer worldwide. CWD is a transmissible spongiform encephalopathy (TSE) or prion disease of cervids (2-4). It is an invariably fatal neurodegenerative disease with no known treatment. In North America a few species of the family *Cervidae* are known to be naturally susceptible to the disease: mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), Rocky Mountain elk (*Cervus canadensis*) and in lesser extent moose (*Alces alces*) and a captive red deer (*Cervus elaphus*). Chronic wasting disease is a well-known disease in North America that since 1967 has gradually spread to 25 states in US and 3 provinces in Canada, both in captive and free-ranging cervids (5). South Korea has also diagnosed the disease in zoo captive deer imported from Canada (6). Since 2016, with disease emergence in Norway, naturally susceptible species also include reindeer (*Rangifer tarandus*).

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 (7). The wild reindeer is found in fragmented sub-populations in the remote alpine regions of Southern Norway. 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, particularly in the county of Finnmark.

The official numbers of hunted cervids in 2017 were 31 613 moose, 42 541 red deer, 30 380 roe deer, and 5 515 free-ranging reindeer (8). Additionally, the semi-domestic reindeer population counts about 240 000 animals (2012-13). 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. Further details regarding the cervid species in Norway can be found in the report "CWD in Norway" by the Norwegian Scientific Committee for Food safety (8).

Testing wild cervids for CWD was initiated in 2002 through the National Health Surveillance Program for Cervids, operated by the Norwegian Veterinary Institute (NVI). 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 for CWD. Norway performed a survey for CWD in cervids in 2006 and 2007 according to Commission decision 2007/182/EC, in which 700 red deer were examined. The total number of cervids tested for CWD from 2002-2017 is shown in Table 1.

Table 1. The number and species of cervids tested in Norway for chronic wasting disease (CWD) 2002-2017.

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
Total	**10 013**	**7 504**	**13 641**	**3 773**	**2 646**	**33**	**360**	**37 970**

Aim

The aim of the programme is to detect the occurrence of CWD in the Norwegian cervid population.

Materials and methods

The CWD program test wild cervids submitted for necropsy at the NVI. Also, euthanized animals and fallen stock of captive deer and semi-domestic reindeer above 24 months and wild cervids above 12 months are enrolled. Additionally a large sampling effort in wild cervids was put in action, during the 2017 autumn hunt, as a cooperation between the Norwegian Food Safety Authority, the Norwegian Environmental Agency, the Norwegian Institute for Nature Research (NINA) and NVI. In the same manner, also slaughtered semi-domesticated reindeer (aged above 12 months in southern Norway and above 24 months in northern Norway) were included in the program.

Further, after the detection of CWD in 2016, it was decided by the Ministry of Agriculture and Food to cull the remaining population of wild reindeer left from hunting, in the management area Nordfjella zone 1 (10). These were all included in the CWD surveillance.

The routine diagnostics of CWD require brain tissue. Due to early detection of prions in lymphatic tissue of reindeer in Norway, retropharyngeal lymph nodes were included in the analysis of all cervids where such tissues were available (56% of the samples tested).

A rapid test (TeSeE® SAP ELISA from Bio-Rad) was used to screen samples from brain and lymph nodes for detection of the PrP^{CWD}. All the samples were analysed at NVI, being the national reference laboratory for animal TSEs.

The positivity of the samples was confirmed by using the TeSeE® Western-blot from Bio-Rad according to the manufacturer's instructions.

Results

In total, samples from 25 659 individual cervids were analysed in 2017, of which 11 tested positive for CWD. With 10 531 animals, slaughtered semi-domesticated reindeer made up about 40% of the total. Moose samples counted 5 468 and red deer 4 082, being the two larger subgroups beside slaughtered reindeer. The number of tested wild reindeer and roe deer was 2 921 and 1 959, respectively.

There were nine wild reindeer positive for CWD. All originated from Nordfjella zone 1 where CWD was detected in reindeer in 2016. The diagnostic findings are, until now, not distinguishable from findings described in cervids with CWD in North America.

CWD was detected in one moose from Lierne, Nord-Trøndelag County and one red deer harvested in the hunting season in Gjemnes, Møre og Romsdal County. This is the first described case of naturally occurring CWD in wild red deer. Findings in Norwegian moose and red deer differ from typical findings in cervids in North America, and Bio-assay studies are ongoing to characterize the atypical features of the Norwegian moose and red deer CWD (11).

The number, species and geographical distribution of cervids analysed for CWD in 2017 are given in Table 2 and Figures 2-9.

Table 2. The number of cervids tested in the Norwegian surveillance programme for chronic wasting disease (CWD) 2017, distributed on species and reason for submission.

	Wild			Captive and semi-domesticated				
Species	**Hunted**	**Diseased, injured or traffic killed**	**Un-known**	**Slaughtered**	**Diseased, injured or traffic killed**	**Un-known**	**Un-known**	**Total**
Moose	4 366	827	272	0	3	0	0	5 468
Red deer	2 839	539	260	415	29	0	0	4 082
Reindeer	2 728	145	48	10 531	405	1	0	13 858
Roe deer	559	1 337	63	0	0	0	0	1 959
Fallow deer	0	0	0	20	0	0	0	20
Unknown	71	106	90	2	2	0	1	272
Total	**10 563**	**2 954**	**733**	**10 968**	**438**	**1**	**2**	**25 659**

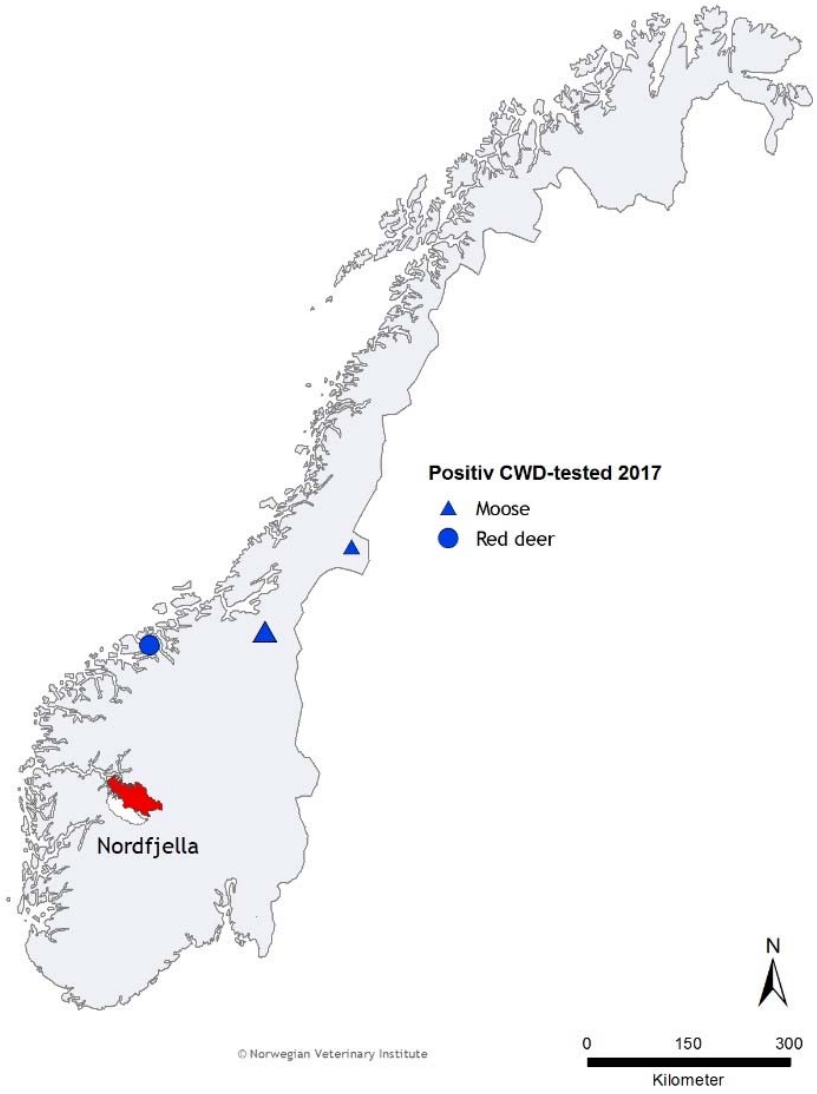

Figure 1. Geographical location of Nordfjella zone 1 (red) and the municipalities of Selbu (blue large triangle), Lierne (blue small triangle) and Gjemnes (blue dot) in which the positive CWD cervids have been detected through the Norwegian surveillance programme for chronic wasting disease (CWD).

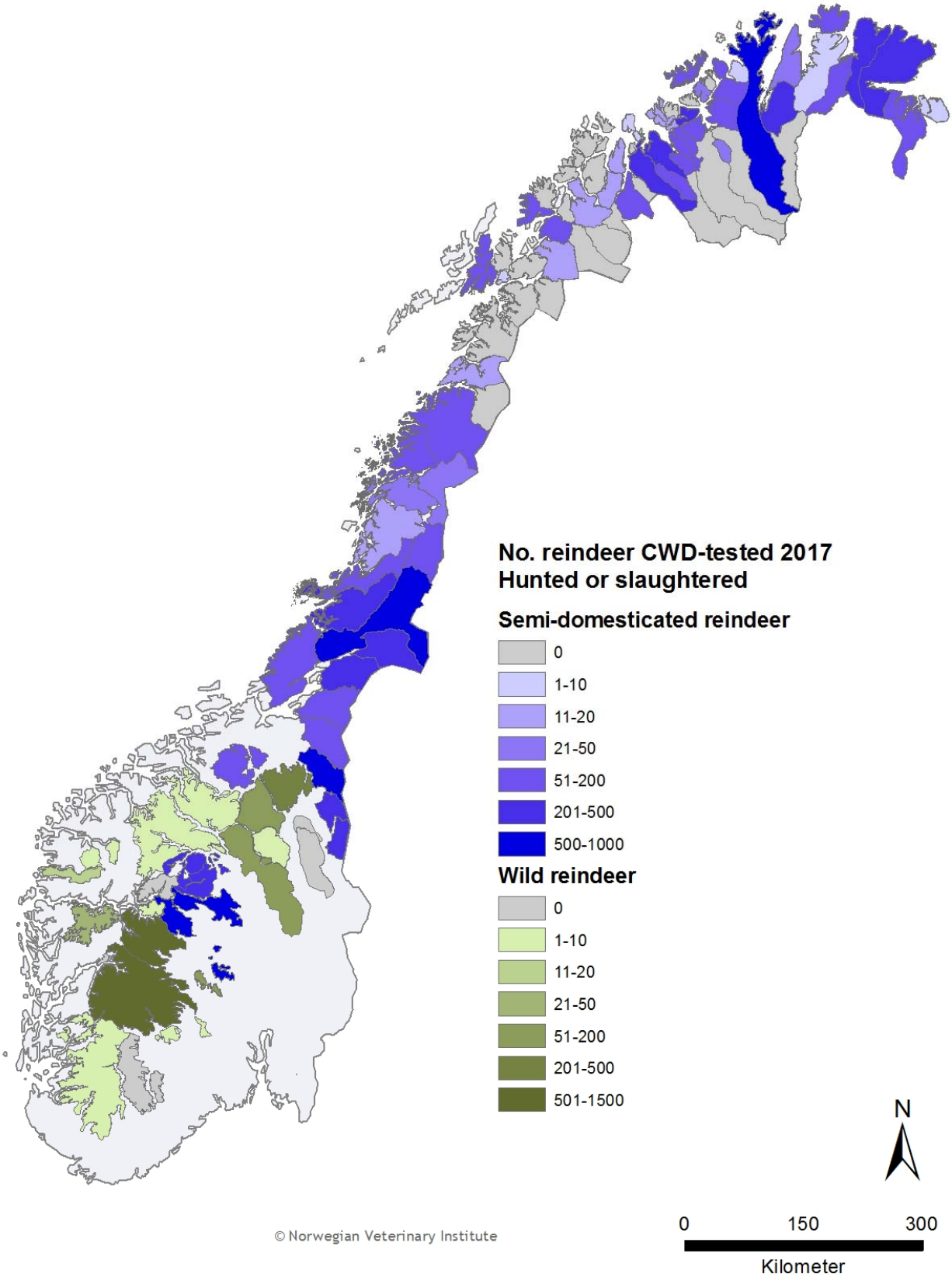

Figure 2. The number and geographical distribution of hunted free-ranging (green) and slaughtered semi-domestic (blue) reindeer tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2017.

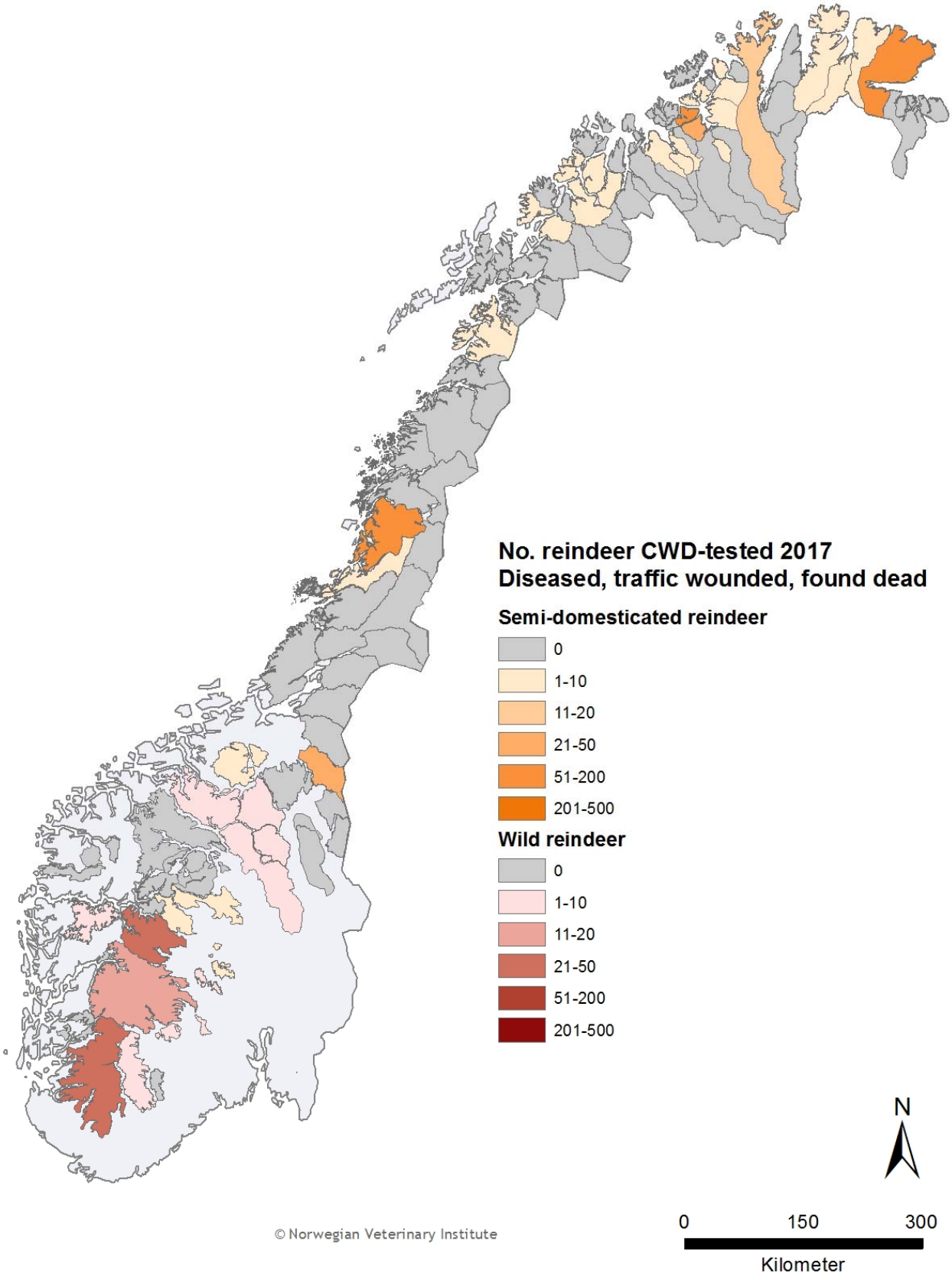

Figure 3. The number and geographical distribution of reindeer (both free-ranging and semi-domestic) found diseased, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2017.

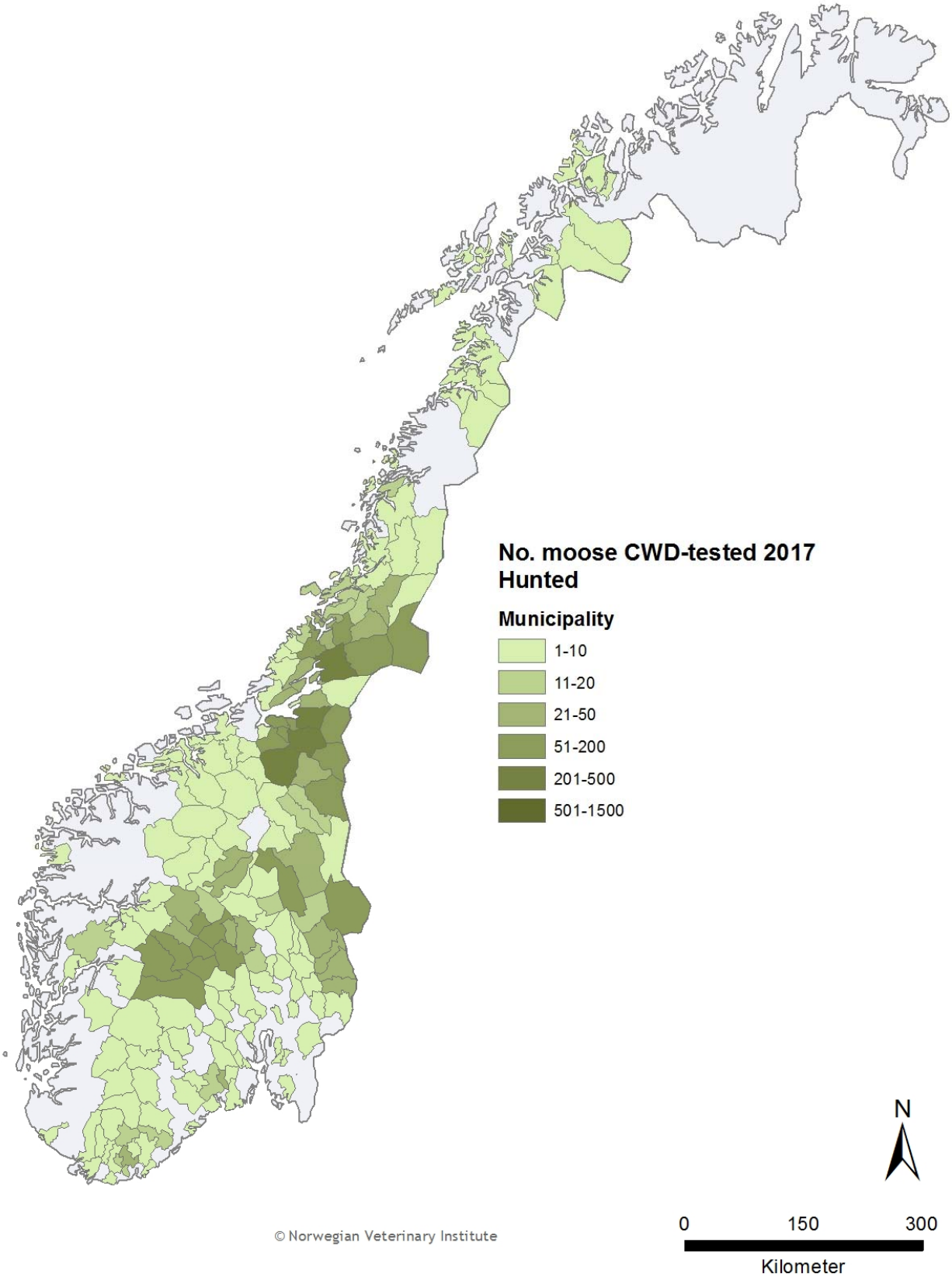

Figure 4. The number and geographical distribution of hunted free-ranging moose tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2017.

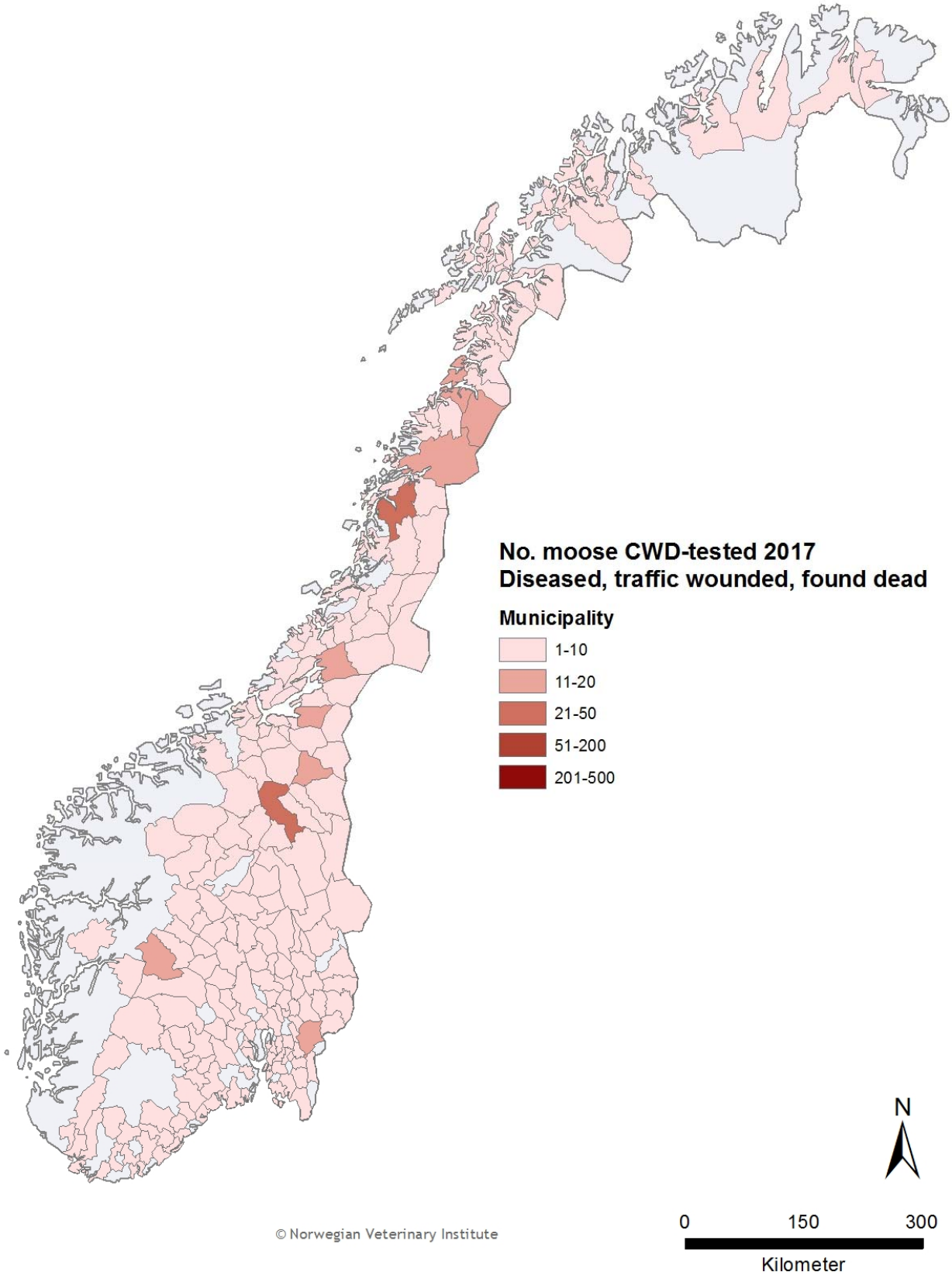

Figure 5. The number and geographical distribution of free-ranging moose found diseased, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2017.

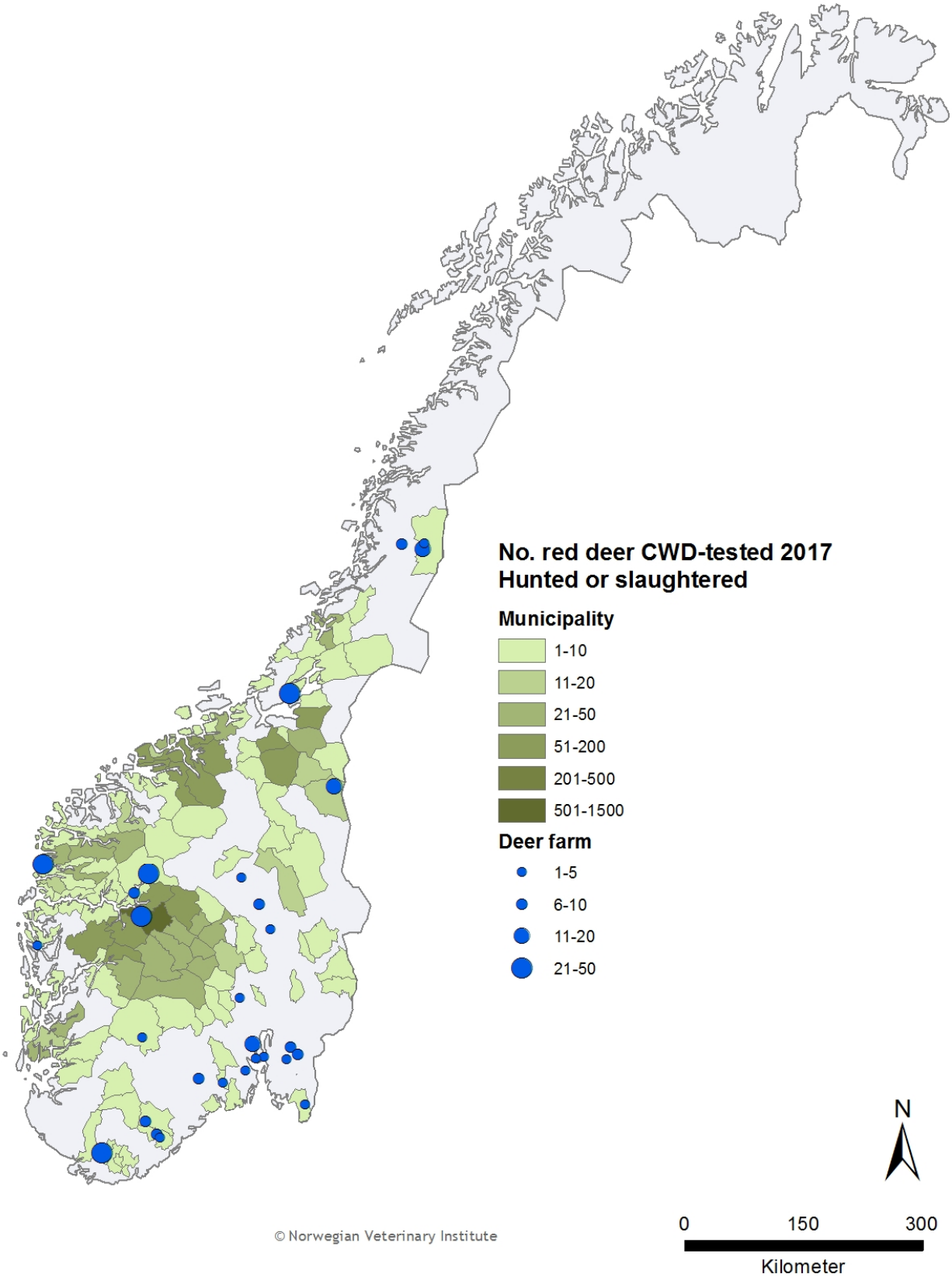

Figure 6. The number and geographical distribution of hunted free-ranging (green) and slaughtered captive (blue dots) red deer tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2017.

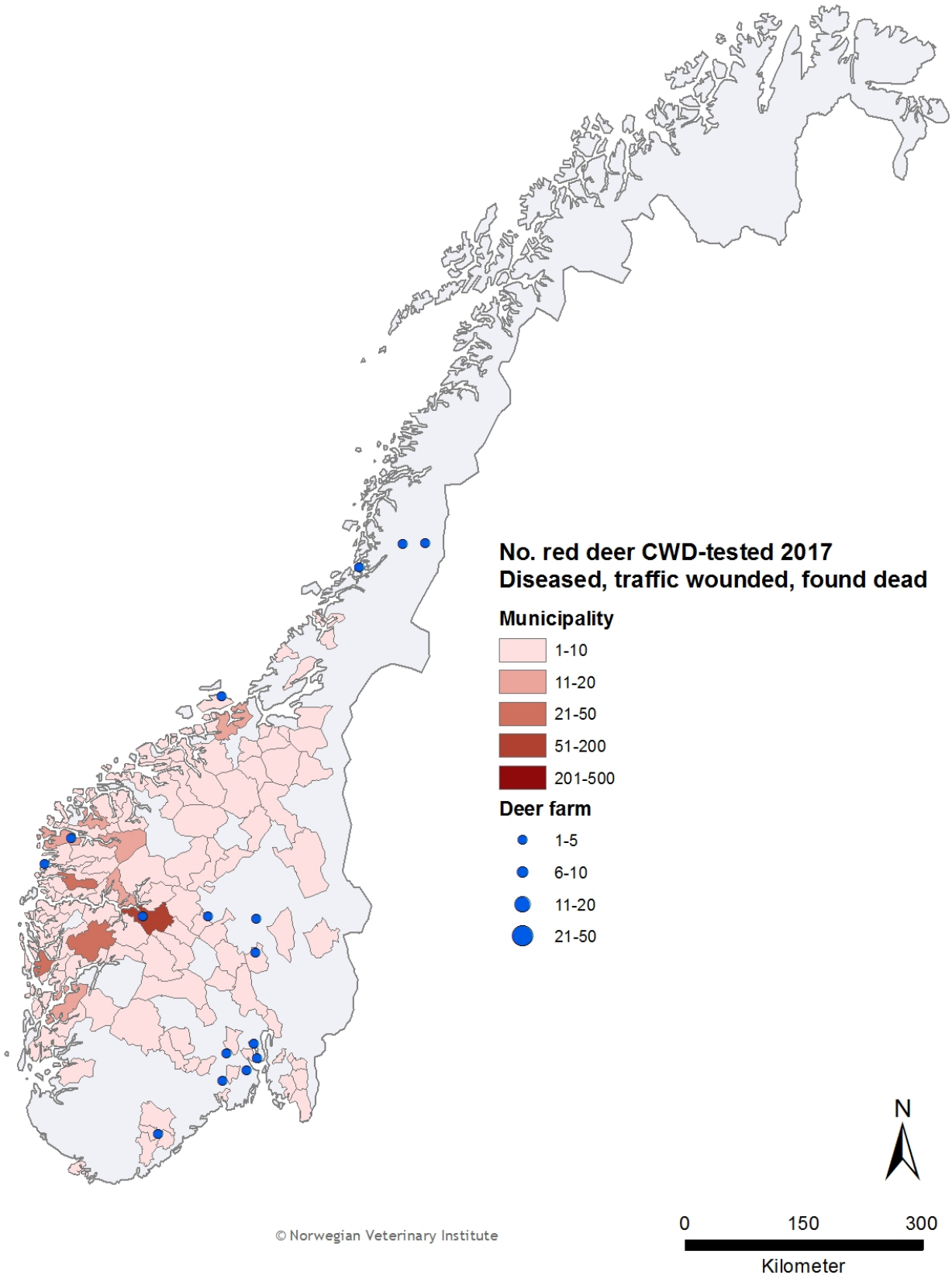

Figure 7. The number and geographical distribution of free-ranging (red) and captive (blue dots) red deer found diseased, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2017.

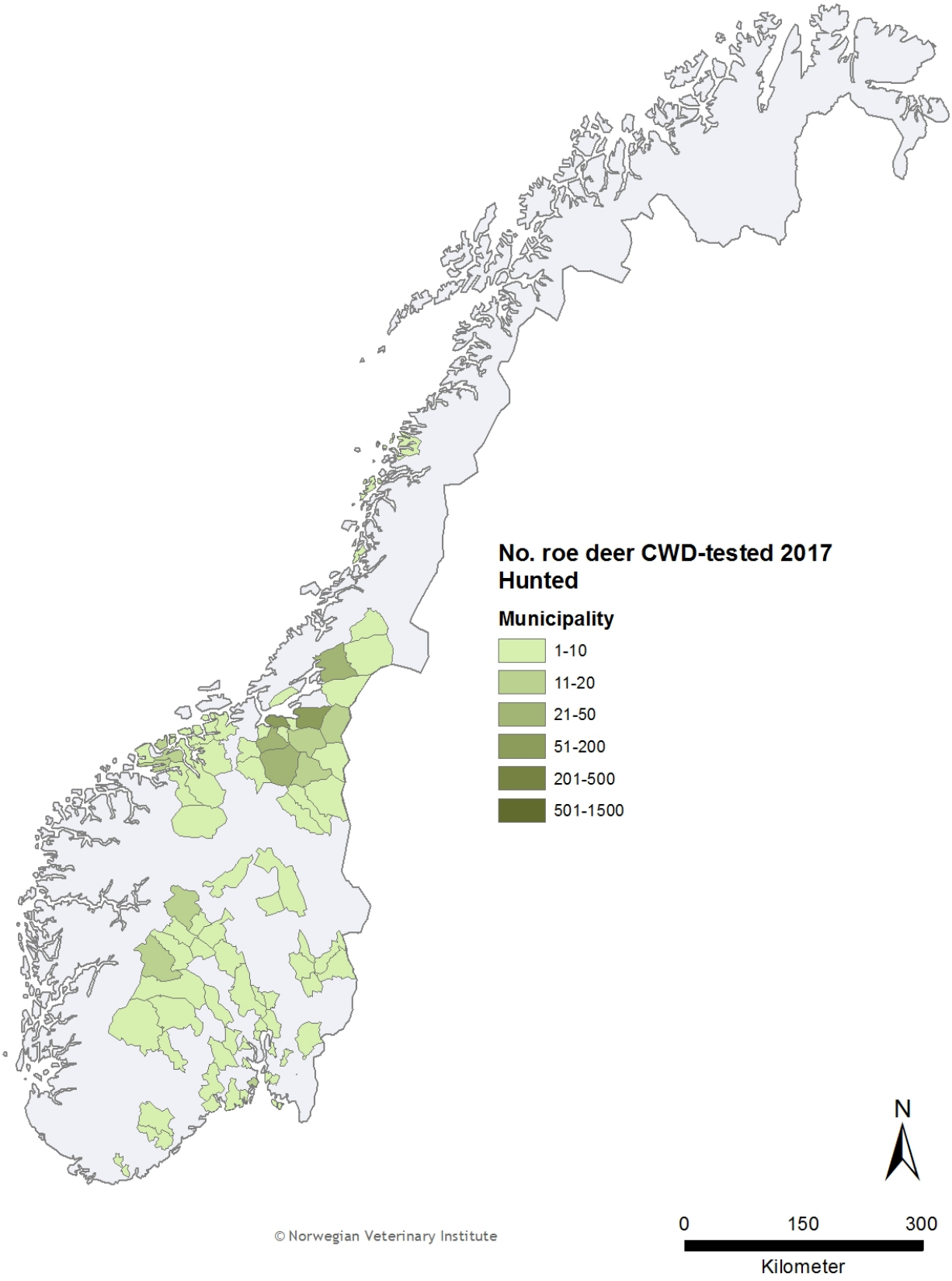

Figure 8. The number and geographical distribution of hunted free-ranging roe deer tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2017.

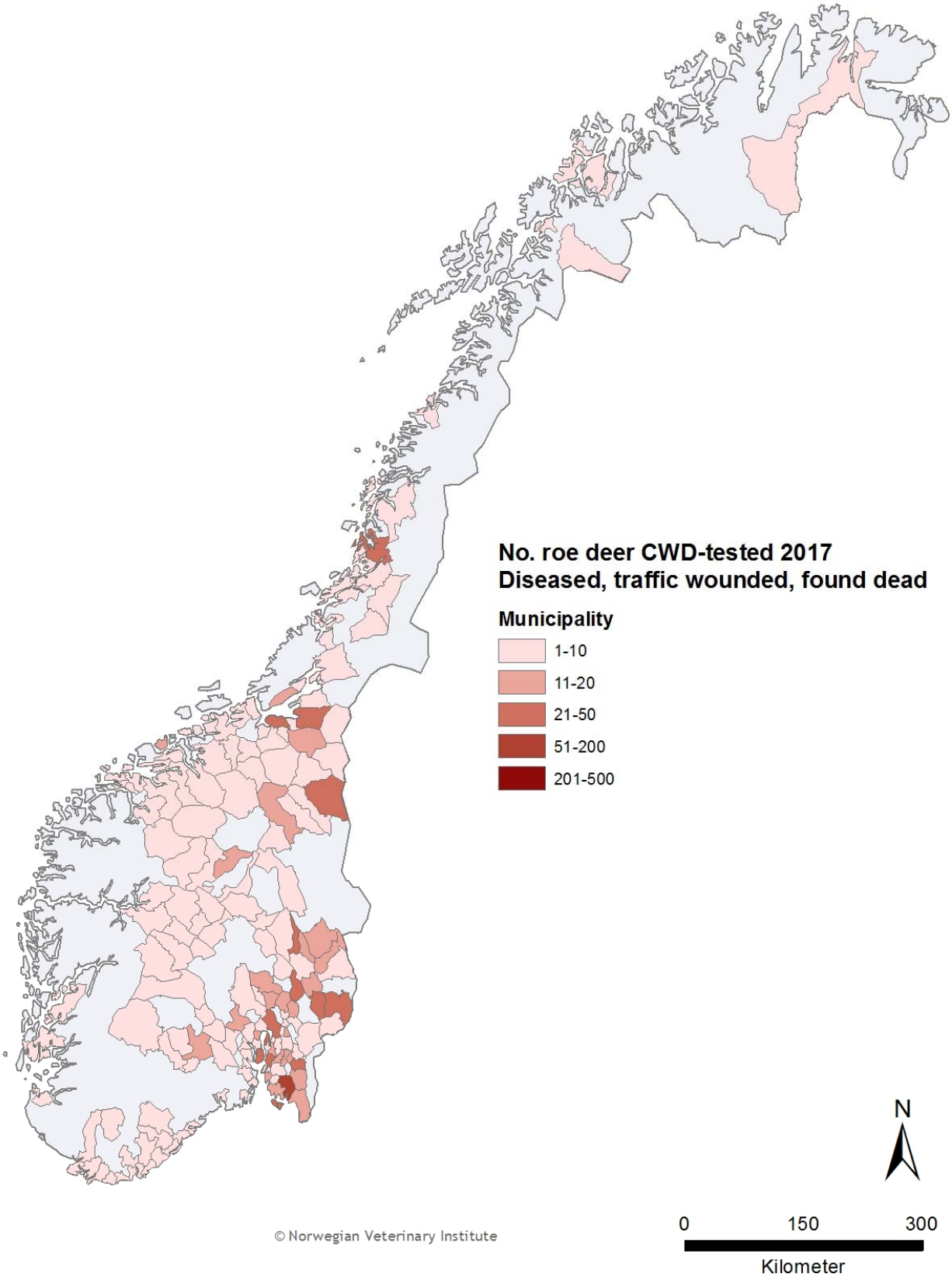

Figure 9. The number and geographical distribution of free-ranging roe deer found diseased, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2017.

Discussion

CWD was detected for the first time in Europe in five free-ranging cervids in Norway 2016. In moose, CWD has previously been reported in a few cases in North America (4). On the contrary, the Norwegian CWD reindeer represent the first detection of a natural CWD infection in reindeer worldwide, despite the fact that experimental studies have shown that reindeer are susceptible to the disease (11). The origin of the occurrence of CWD in the Norwegian cervid population is unknown (1).

The surveillance for CWD in Europe has been limited, and the European Food Safety Authority stated in 2010 that the occurrence of CWD could not be excluded in cervids in Europe, especially in remote and presently unsampled areas (13). In Norway, approximately 2 200 cervids were tested for CWD in the period 2002-2015, of which only ten were wild reindeer (Table 1), but none was from the Nordfjella area. Because of the limitation of the surveillance program in cervids, it is difficult to infer about historical CWD prevalence in Norway or Europe.

The 2017 surveillance effort detected new cases of CWD and in a new species, red deer. Molecular analyses so far indicate different types of CWD in Norwegian cervids, showing atypical findings in both moose and red deer as compared to classical findings in reindeer. Thus, in November 2017, the Norwegian Veterinary Institute described the possibilities that we have detected different types of CWD in our cervids (14). Further knowledge about variation in prion diseases in cervids is expected from already initiated bioassays.

Intensified surveillance in Norway will continue in 2018, aiming both at detection of possible new cases of atypical CWD and documentation of freedom from classical CWD in other areas apart from Nordfjella. Surveillance of cervid populations in Europe is initiated for EU member states with populations of moose and/or reindeer. Early results from this increased surveillance detected a moose in Finland in February 2018 also showing atypical diagnostic findings (15).

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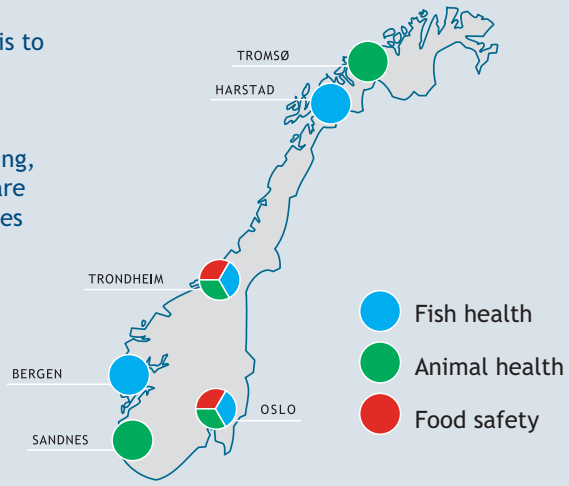

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