Annual Report

The surveillance programme for Chronic Wasting Disease (CWD) in free ranging and captive cervids in Norway 2016

Veterinærinstituttet
Norwegian Veterinary Institute

The surveillance programme for Chronic Wasting Disease (CWD) in free-ranging and captive cervids in Norway 2016

Content

Authors
Turid Vikøren, Petter Hopp, Knut Madslien,
Ståle Sviland, Attila Tarpai, Kjell Handeland,
Magne Haugum, Torfinn Moldal, Jørn Våge,
Sylvie Lafond Benestad

ISSN 1894-5678

Design Cover: Reine Linjer
Photo front page: Jon Martin Arnemo

Summary

In 2016, CWD was detected for the first time in Europe in five free-ranging cervids in Norway (1). Three free-ranging tundra reindeer (*Rangifer tarandus tarandus*) from the Nordfjella sub-population in South-Norway, and two moose (*Alces alces*) from the Selbu municipality in Mid-Norway tested positive for CWD. This was the first detection of a natural CWD infection in reindeer worldwide. A total of 10,152 samples of free-ranging and captive cervids were analysed in 2016.

Introduction

CWD is a transmissible spongiform encephalopathy (TSE) or prion disease of cervids (2, 3 and 4). 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 candensis*), and in lesser extent moose (*Alces alces*). Chronic wasting disease is a well-known disease in North America that has gradually spread since 1967, both in captive and free-ranging cervids (5). South Korea has also diagnosed the disease in zoo captive deer imported from Canada (6).

Four cervid species are prevalent in natural free-ranging populations in Norway: moose (*Alces alces*), red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), and tundra reindeer (*Rangifer tarandus tarandus*). Red deer predominate along the west coast, whereas moose and roe deer mainly inhabit other areas of the country. The free-ranging reindeer is found in fragmented sub-populations in the remote alpine regions of Southern Norway (Figure 1).

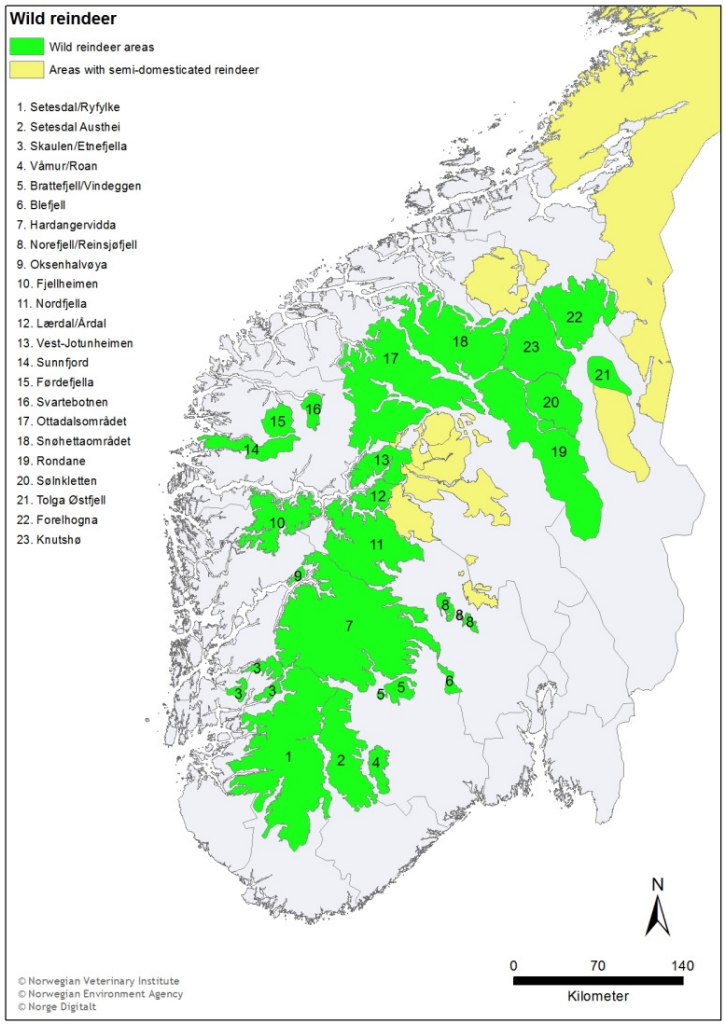


Figure 1. Distribution of the 23 different sup-populations of free-ranging Eurasian tundra reindeer (*R. t. tarandus*) in Norway. (http://www.villrein.no/om-villreinomrdene). (Nordfjella, region 11).

The official number of hunted cervids in 2016 was: 30,829 moose, 37,738 red deer, 30,380 roe deer, and 6,129 free-ranging reindeer (7). Additionally, Norway has a semi-domestic reindeer population, mainly kept in the northern parts of the country, counting about 240,000 animals (2012-13). There are approximately 90 deer farms in Norway; most of them keep red deer, but some farms have fallow deer (*Dama dama*), or more seldom 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 free-ranging cervids for CWD was initiated in 2002 through the National Health Surveillance Program for Cervids (HOP), operated by the Norwegian Veterinary Institute (NVI). A passive surveillance programme for CWD in Norwegian free-ranging 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 2002-2015 is shown in Table 1. In addition, 42 Musk oxen (*Ovibos moschatus*) have been tested for transmissible spongiform encephalopathies since 2002.

Table 1. The number of cervids tested in Norway for chronic wasting disease (CWD) 2002-2015.

Species	Number of animals tested
Red deer (*Cervus elaphus*)	825
Moose (*Alces alces*)	142
Roe deer (*Capreolus capreolus*)	203
Reindeer (*Rangifer tarandus tarandus*)	
semi-domestic	966
free-ranging	10
Fallow deer (*Dama dama*) – farmed	13
Total	**2 159**

Aim

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

Materials and methods

Free-ranging cervids older than 18 months necropsied at the NVI were examined for CWD. Additionally, captive deer, semi-domestic reindeer and free-ranging cervids older than 18 months that died or were euthanized due to disease or injuries were sampled in the field. A large sample collection of free-ranging cervids during the autumn hunt was put in action in cooperation between the Norwegian Food Safety Authority, the Norwegian Environmental Agency, the Norwegian Institute for Nature Research (NINA) and NVI.

The number, species and geographical distribution of cervids analysed for CWD in 2016 are given in Table 2 and Figures 3-10.

A rapid test (TeSeE ® SAP ELISA from Bio-Rad) was used to screen brain samples for detection of the PrP^{CWD}. All the samples were analysed at NVI, the Norwegian 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.

Table 2. The number of cervids tested in the Norwegian surveillance programme for chronic wasting disease (CWD) 2016, distributed by reason for submission.

Species	Free-ranging			Captive			Unknown	Total
	Hunted	Diseased, injured or traffic killed	Un-known	Slaughtered	Diseased, injured or traffic killed	Un-known		
Moose	3 887	514	2					4 403
Fallow deer								0
Red deer	2 220	233		142		1	1	2 597
Reindeer	514	328		1 682	56			2 580
Roe deer	38	446						484
Unknown	71	16		1				88
Total	**6 730**	**1 537**	**2**	**1 825**	**56**	**1**	**1**	**10 152**

Results

Five of the 10,152 samples analysed in 2016 tested positive for CWD. The first positive case was a free-ranging adult female reindeer from the Nordfjella sub-population in South-Norway (Figure 2) (1). The sick animal was detected by personnel at NINA in the middle of March 2016 in connection with capture for GPS-collaring using helicopter. It died and the carcass was submitted to NVI for necropsy and laboratory examinations including CWD testing.

In the middle of May, CWD was diagnosed in a free-ranging 13 years old female moose from Selbu municipality (Figure 2) that was euthanized due to altered behaviour and emaciation and submitted to NVI for necropsy. Two weeks later, the second CWD positive free-ranging moose from the same municipality was diagnosed. It was a 14 years old female that was found dead in a small river due to trauma.

During the autumn hunting, another two free-ranging reindeer from the Nordfjella sub-population tested positive for CWD. It was a seven years old male and a four years old female in normal condition.

Preliminary molecular analyses show that there are differences between the prion type from the reindeer and the moose, the moose type being seemingly unreported previously in North America. Bio-assay studies are ongoing to characterize the atypical features of the Norwegian moose CWD (9).

Figure 2. Geographical location of Nordfjella (blue/white stripes) and the municipality of Selbu (red) in which the positive CWD cervids were found in the Norwegian surveillance programme for chronic wasting disease (CWD) 2016.

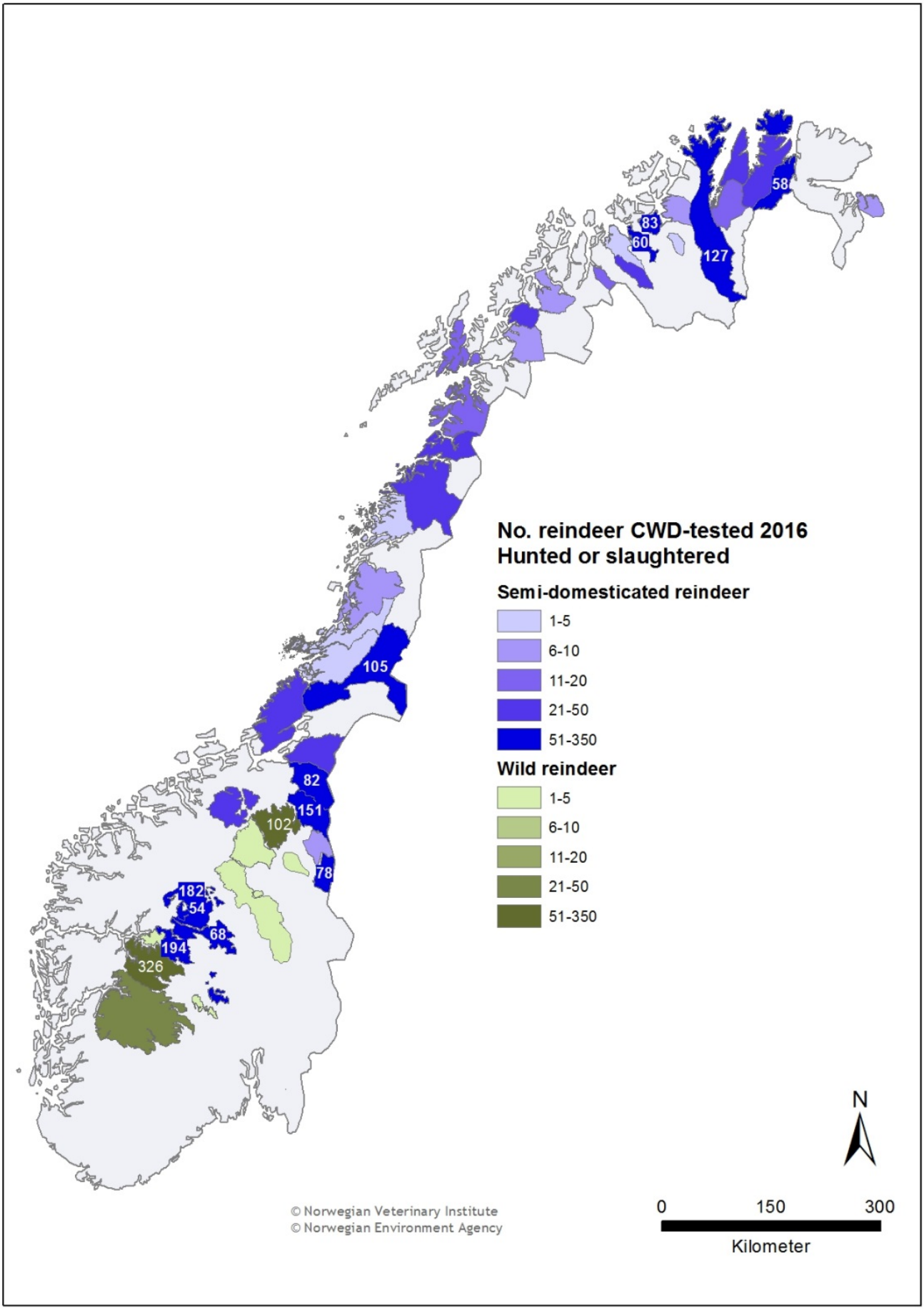


Figure 3. The number and geographical distribution of hunted free-ranging (green) and slaughtered semi-domestic (blue) reindeer tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2016.

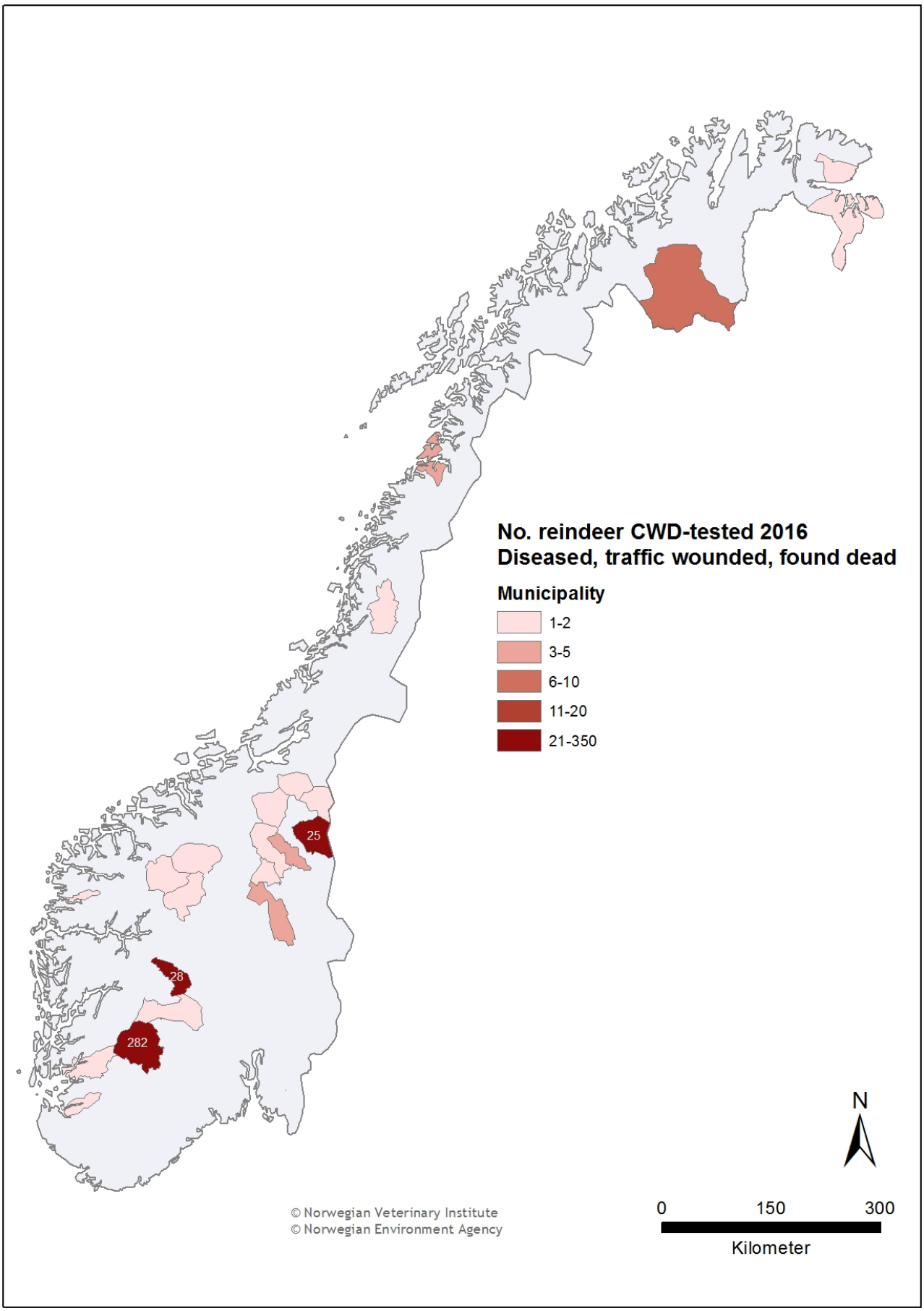


Figure 4. The number and geographical distribution of reindeer (both free-ranging and semi-domestic) found diseased, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2016.

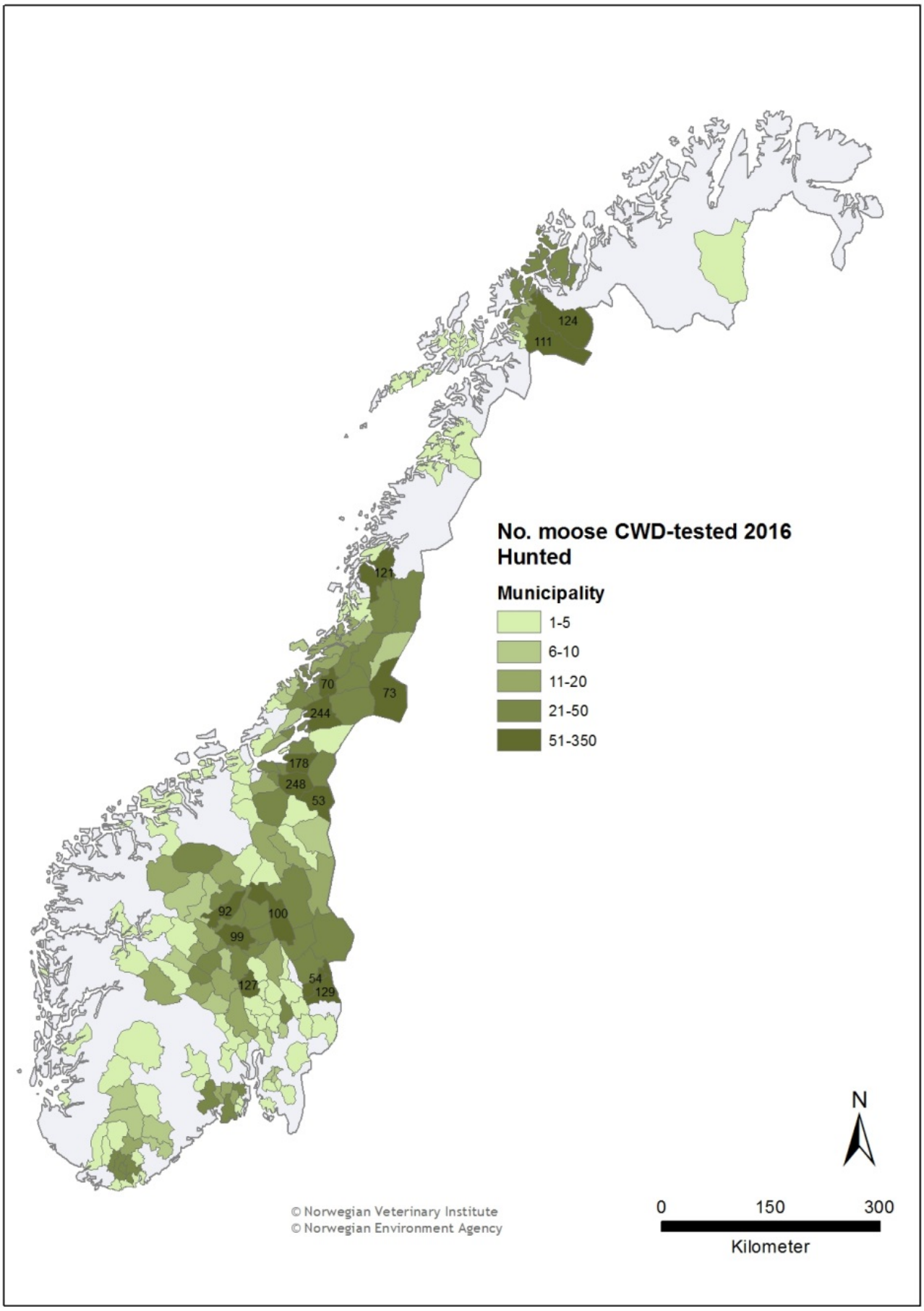


Figure 5. The number and geographical distribution of hunted free-ranging moose tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2016.

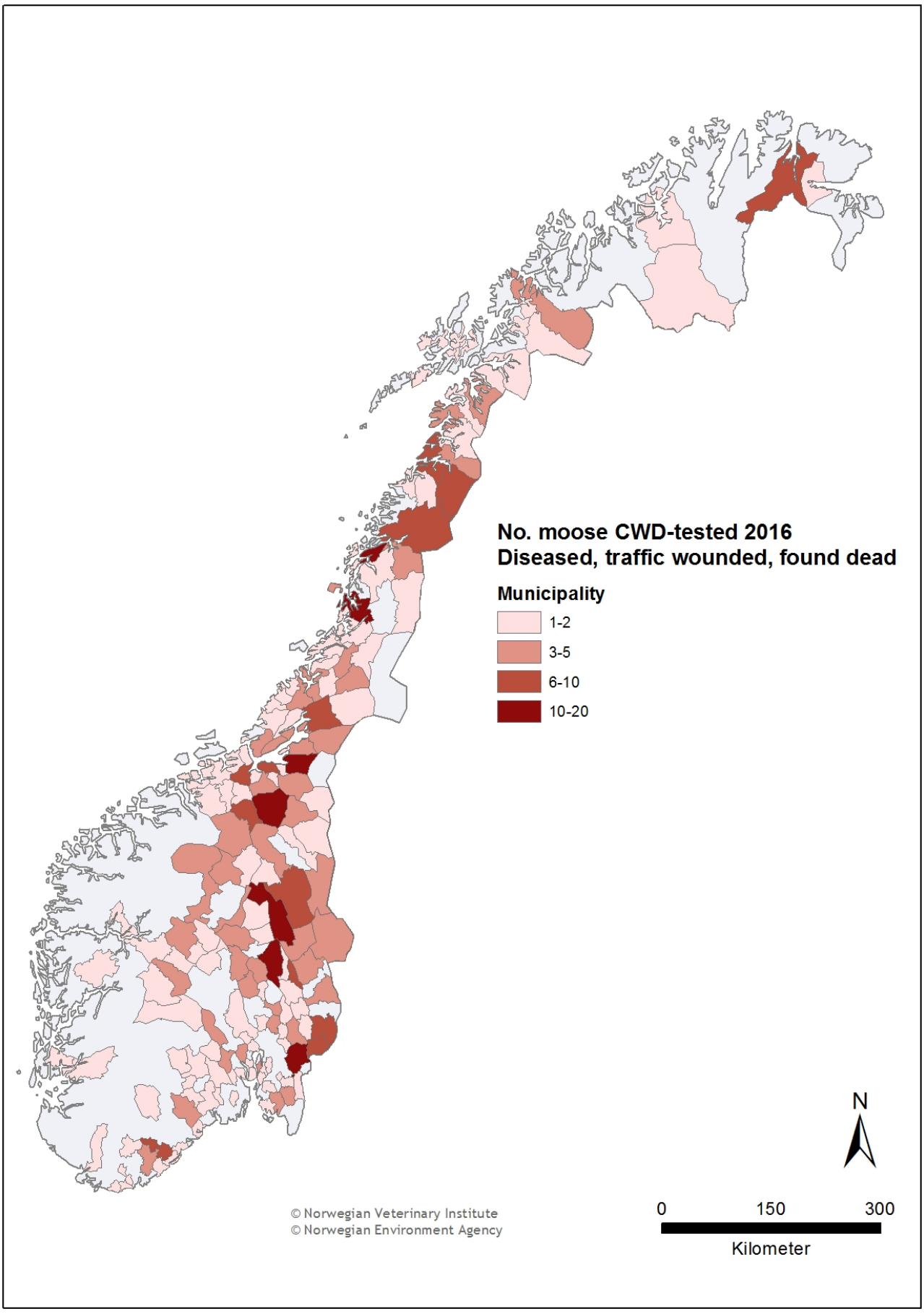


Figure 6. The number and geographical distribution of free-ranging moose found diseased, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2016.

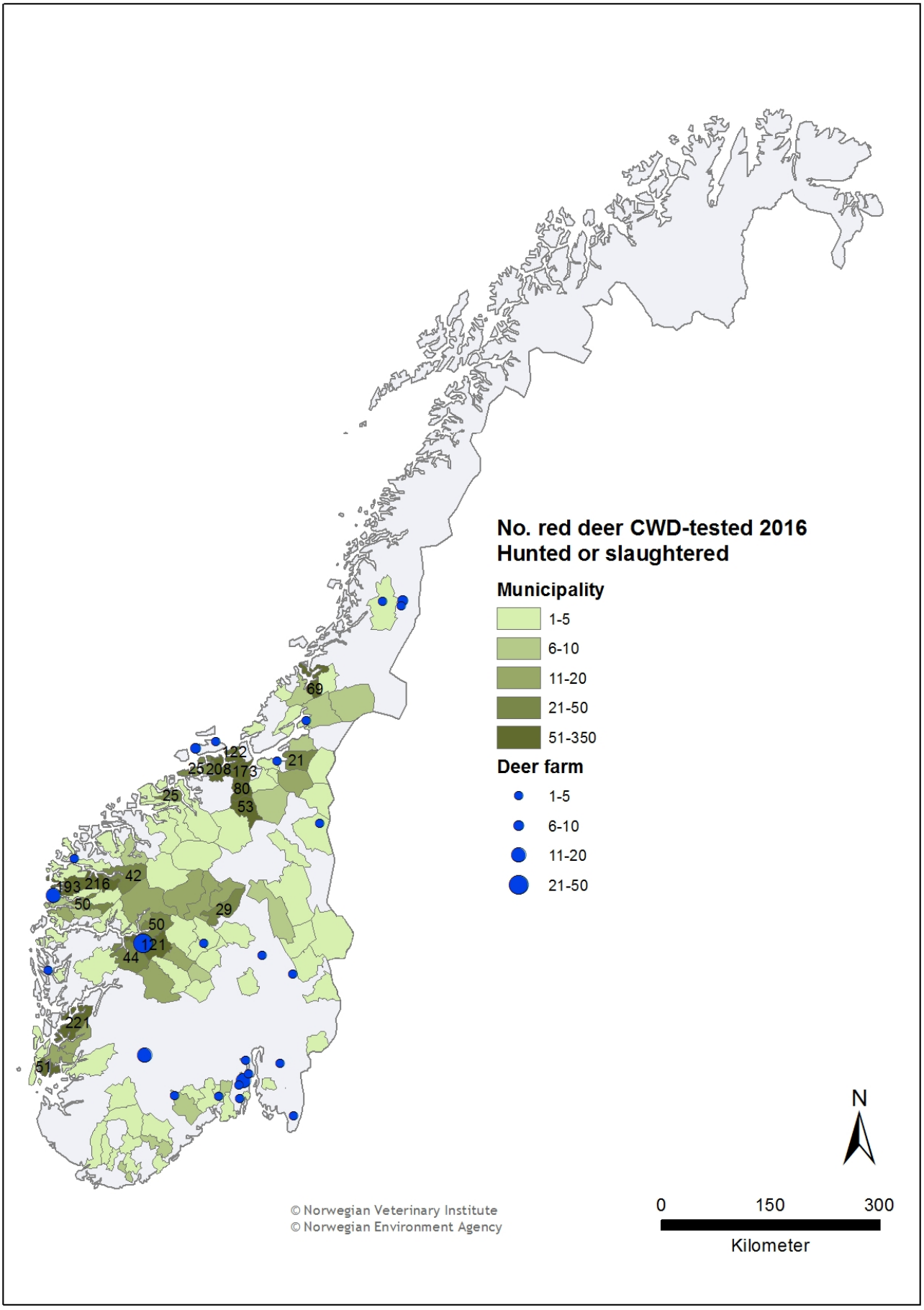


Figure 7. The number and geographical distribution of hunted free-ranging (green) and slaughtered captive (blue dots) red deer tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2016.

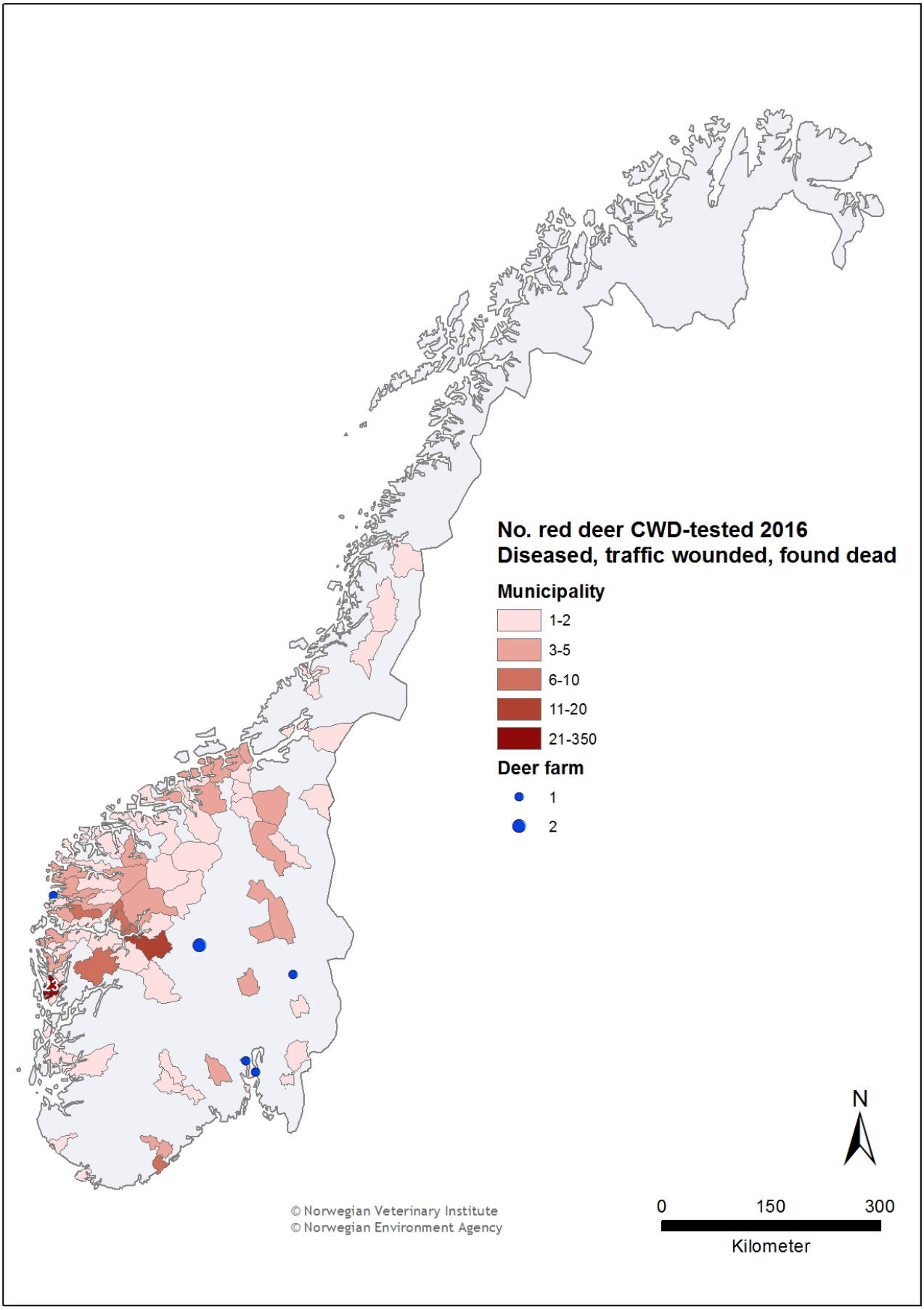


Figure 8. The number and geographical distribution of free-ranging (red) and captive (blue dots) red deer found diseased, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2016.

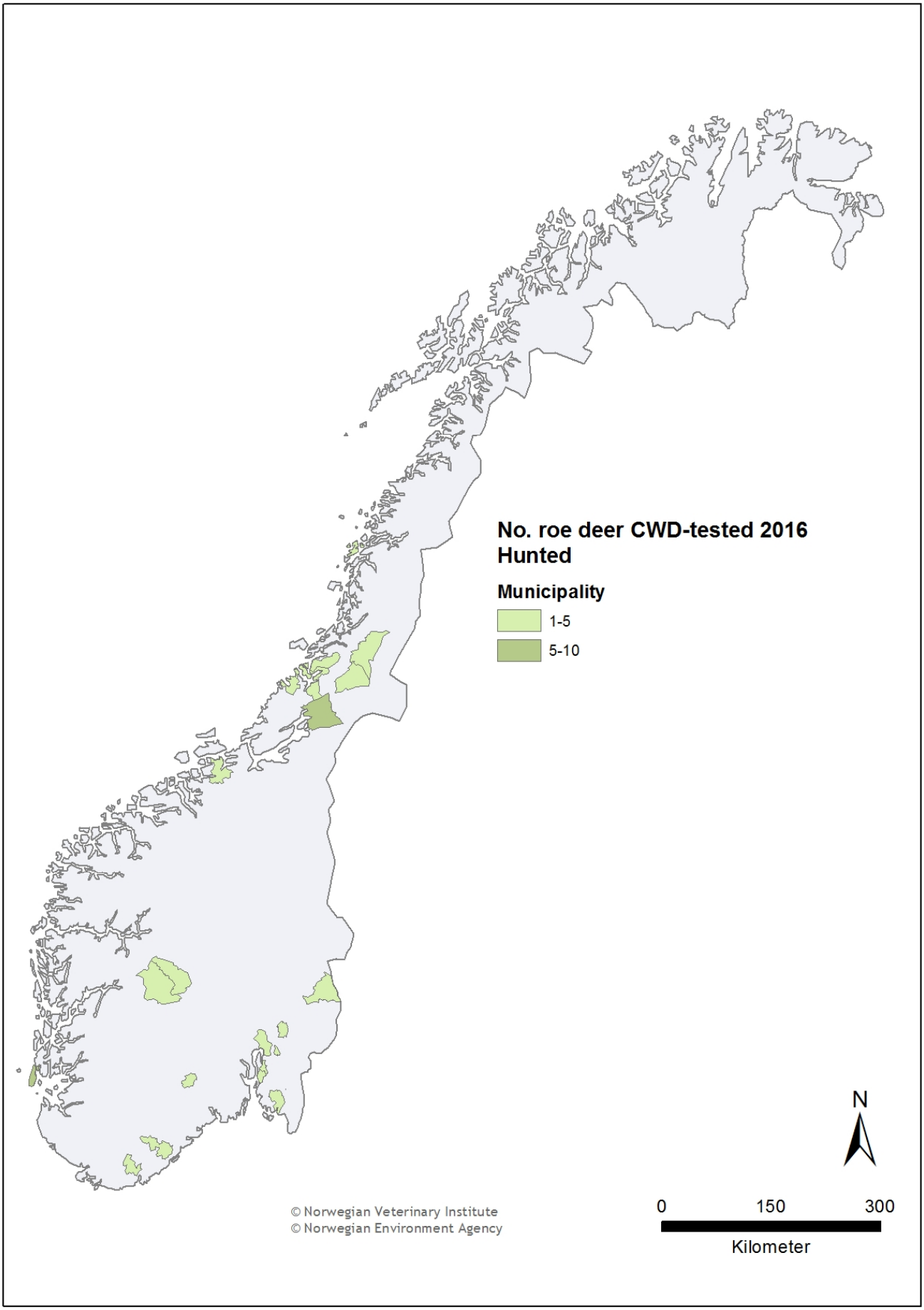


Figure 9. The number and geographical distribution of hunted free-ranging roe deer tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2016.

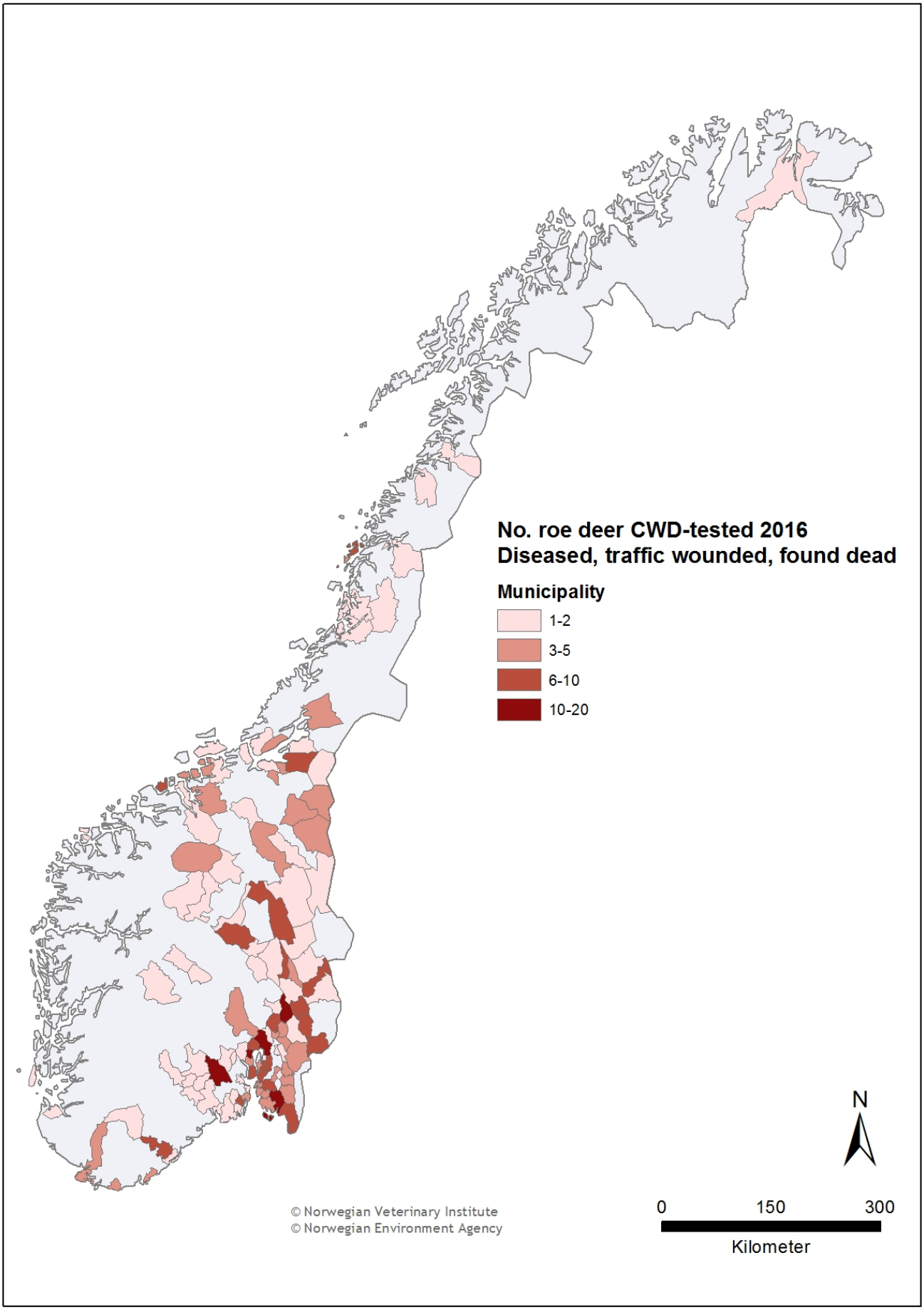


Figure 10. The number and geographical distribution of free-ranging roe deer found diseased, traffic wounded or dead and tested in the Norwegian surveillance programme for chronic wasting disease (CWD) in 2016.

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 (10). 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 (11). In Norway, approximately 2,200 cervids were tested for CWD in the period 2002-2015, of which only ten were free-ranging reindeer, but none were from the Nordfjella area (Table 1). Because of the limitation of the surveillance program in cervids, it is not possible to exclude that CWD has been present in Norway or Europe for decades without being detected until now.

Intensified surveillance in Norway will continue in 2017 and further surveillance of cervid populations in Europe is warranted.

References

1. Benestad SL, Mitchell G, Simmons M, Ytrehus B, Vikøren T. First case of chronic wasting disease in Europe in a Norwegian free-ranging reindeer. 2016; Vet Res 47:88. DOI 10.1186/s13567-016-0375-4.
2. Williams ES, Young S. Spongiform encephalopathies in Cervidae. Rev Sci Tech Off Int Epiz 1992; 11: 551-567.
3. Williams ES. Chronic Wasting Disease. Vet Pathol 2005; 42: 530-49.
4. Baeten LA, Powers BE, Jewell JE, Spraker TR, Miller MW. A natural case of Chronic Wasting Disease in a free-ranging moose (Alces alces shirasi). J Wildl Dis 2007; 43: 309-314.
5. USGS National Wildlife Health Center. Map of chronic wasting disease in North America. http://www.nwhc.usgs.gov/disease_information/chronic_wasting_disease/.
6. Lee YH, Sohn HJ, Kim MJ, Kim HJ, Lee WY, Yun EI, Tark DS, Cho IS, Balachandran A. Strain characterization of the Korean CWD cases in 2001 and 2004. 2013; J Vet Med Sci 75:95–98.
7. Statistics Norway. Hunting Statistics. https://www.ssb.no/jord-skog-jakt-og-fiskeri?de=Jakt
8. Norwegian Scientific Committee for Food safety. CWD in Norway. http://www.english.vkm.no/dav/be5ebca1a5.pdf
9. Benestad SL. One year with Chronic Wasting Disease in Norway. Oral presentation. Prion 2017, 23-26th May 2017, Edinburgh, UK.
10. Mitchell GB, Sigurdson CJ, O'Rourke KI, Algire J, Harrington NP, Walther I, Spraker TR, Balachandran A. Experimental oral transmission of chronic wasting disease to reindeer (Rangifer tarandus tarandus). 2012; PLoS One 7(6): e39055.
11. EFSA Panel on Biological Hazards (BIOHAZ); Scientific Opinion on the results of the EU survey for Chronic Wasting Disease (CWD) in cervids. EFSA Journal 2010;8(10):1861. [29 pp.] doi:10.2903/j.efsa.2010.1861. Available online: www.efsa.europa.eu/efsajournal.htm

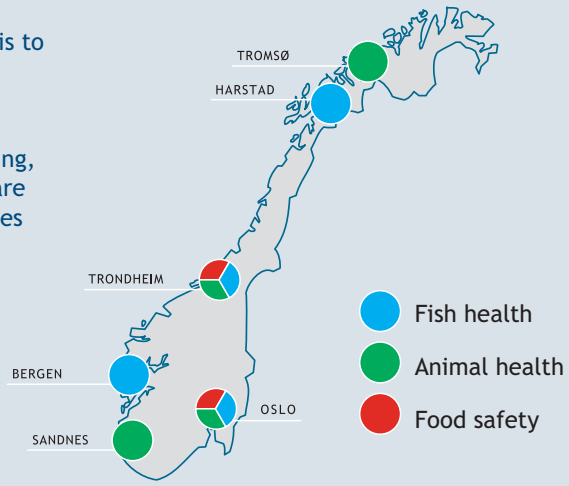
Scientifically ambitious, forward-looking and cooperatively oriented – for integrated health

The Norwegian Veterinary Institute is a national research institute that operates in the fields of animal and fish health, food safety and feed hygiene; its primary task is to provide the authorities with independently generated knowledge.

Emergency preparedness, diagnostic services, monitoring, reference functions, consulting, and risk assessments are all important areas of activity. Our products and services include research results and reports, analyses and diagnoses, studies and advice.

The Norwegian Veterinary Institute's central laboratory and administration lie in Oslo, and we operate regional laboratories in Sandnes, Bergen, Trondheim, Harstad and Tromsø.

The Norwegian Veterinary Institute collaborates with a large number of national and international institutions.



Fish health

Animal health

Food safety

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

www.vetinst.no

Veterinærinstituttet
Norwegian Veterinary Institute