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Colourbox.com - Photograph: Galyna Andrushko.

## Wildlife vehicle collisions , R&D in NPRA



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## Personal injury accidents animal collisions

- The table below shows personal injuries reported by the Police in connection with collision with animals

Periodes of 7 years	Personal injury accidents in the 7-year period	Personal injury accidents Average per year	Number of fatalities in the 7-year period	Fatalities average per year	Number of seriously injured persons in the 7-year period	Severely injured people average per year	Number of slightly injured persons	Slightly injured people on average per year
1998 – 2004	590	84,29	25	3,57	94	13,43	710	101,43
2005 – 2011	436	62,29	14	2	50	7,14	518	74
2013 – 2019	242	34,57	7	1	39	5,57	243	34,71



## Personal injuries wildlife collision

- The number of serious injuries in connection with. Collisions of deer antlers have been declining over time, despite the fact that the number of deer struck has increased and a general increase in traffic volume.
- Moose collisions account for almost 90% of all personal injury accidents. It is primarily motorcyclists who are seriously injured or killed in the collision of the smaller deer animals such as Deer, Roe deer, Fallow deer and Reindeer.
- It is assumed that the main reasons why the number of injuries decreases despite an increase in the number of animals hit can be explained, among other things. with the fact that passenger cars have a safer body and more safety equipment.
- It is also assumed that the relatively many road sections that have had a reduced speed limit due to many traffic accidents have contributed in this context. 80 km/h to 70 km/h.

# Deer collisions in Norway

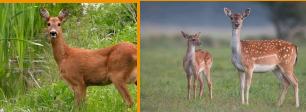
Moose



Deer



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Period 01.04 – 31.03	Collisions All wild deer including Roe and Fallow deer (Rådyr og Dådyr)	Change from previous period All deer including Roe and Fallow deer	Collisions only Roe and Fallow deer 	Change from previous period Only Roe deer
2013 – 2014	7816	- 414 (2012 – 2013 = 8230)	4606	- 181 (2012 – 2013 = 4787)
2014 – 2015	8538	+ 722	5129	+ 523
2015 – 2016	9033	+ 495	5839	+ 710
2016 – 2017	10572	+ 1539	6992	+ 1153
2017 – 2018	13871	+ 3299	8699	+ 1707
2018 – 2019	12700	- 1171	8600	- 99
2019 – 2020	12311	- 389	8277	- 323
2020 – 2021	13158	+847	9264	+ 987

- Increase in all deer including Roe and Fallow deer from 2013/2014 to 2020/2021 = 5342 more collisions, which is an increase of 59.4%.
- Increase only deer from 2013/2014 to 2020/2021 = 4658 more collisions, which constitutes an increase of 49.7%, that means that Roe and Fallow deer alone constitutes most of the total increase for all deer.
- Domesticated Reindeer are not included – not included in the wild deer register

11/18/2021

NVF 18.11.21 Wildlife vehicle collisions – NPRA

<https://www.hjorteviltregisteret.no/FallviltInnsyn/Kart?fromDate=2021-05-18&toDate=2021-11-18&arter=1,2,3,4,7,9,11,12,13,14,16&kjonn=0,1,2&alderskategorier=1,2,3,4&arsaker=1,2,3,4,5,6,7&utfall=1,2,3,4,5,6,7>



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R&D in NPRA

## Interactive wildlife warning system

<https://vimeo.com/202007645>



Henrik Wildenschild, SVV.

Amparo Solutions AS in Trondheim – Norway (former SafeZone AS)

<https://amparosolutions.no>



## R&D in NPRA

### Interactive wildlife warning system 01.02.17 – today's date

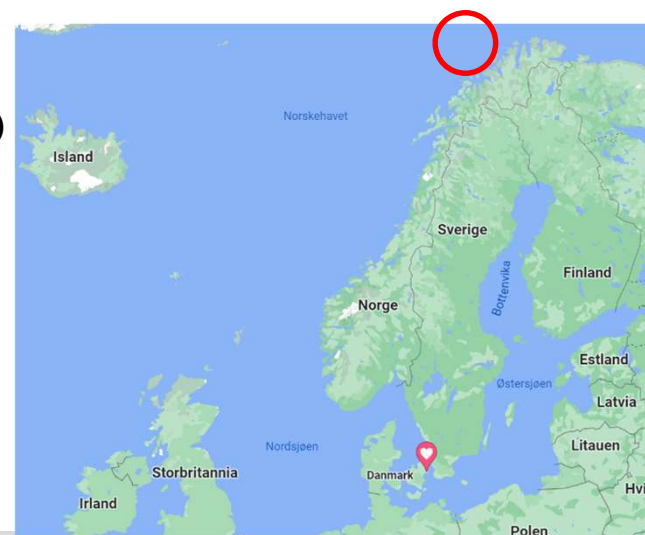
- Experiments in the USA have shown a 51% reduction when using yellow flashes in connection with deer (Traffic safety handbook TøI, previous version, Sullivan et al. 2004)

<https://www.tshandbok.no/del-2/1-vegutforming-og-vegutstyr/doc632/?highlight=vilt>  
The Institute of Transport Economics (TøI)

- Report from TøI 2019 about safety measures for reducing wildlife vehicle collisions

[https://www.toi.no/getfile.php/1350820-1565607036/Publikasjoner/TØI\\_rapporter/2019/1715-2019/1715-2019-sam.pdf](https://www.toi.no/getfile.php/1350820-1565607036/Publikasjoner/TØI_rapporter/2019/1715-2019/1715-2019-sam.pdf)

- E6 Olsborg – Teigen (Målselv) (4 km)
- Fv86 Finnfjordbotn – Sørreisa (Finnsnes) (3,5 km)
- E10 Evenes – Lille Skånland (Tjeldsund) (12 km)
- Rv83 Sørvik – Vollstad (Harstad) (5 km)
- All test sites in Northern Norway





## R&D in NPRA

# Result after 4 years of operation of Interactive wildlife warning system

- Results is with no control sectors or other impacting factors

Change in moose collisions	01.02.2012–01.02.2017 Average per year (total of 5 years without equipment)	02.02.2017– 02.02.2021 Average per year (total of 4 years with equipment)	Percentage change
E6 Målselv (4 km)	3,4 (17)	1 (4)	Down 70,59 %
Fv86 Finnfjord (3,5 km)	1,2 (6)	1,5 (6)	Up 25% * few data
RV83 Sørвика (5 km)	5,6 (28)	2,5 (10)	Down 55,36 %
E10 Evenes (12 km)	10,6 (53)	6,5 (26)	Down 38,68 %
<b>Total (4 test sites above)</b>	<b>20,8 (104)</b>	<b>11,5 (46)</b>	<b>Down 44,71 %</b>



## Measurement of speed E6 Olsborg – Teigen – 2 months. Autumn 2021 (moose season)

3 measuring points – 1 at each end and 1 in the middle

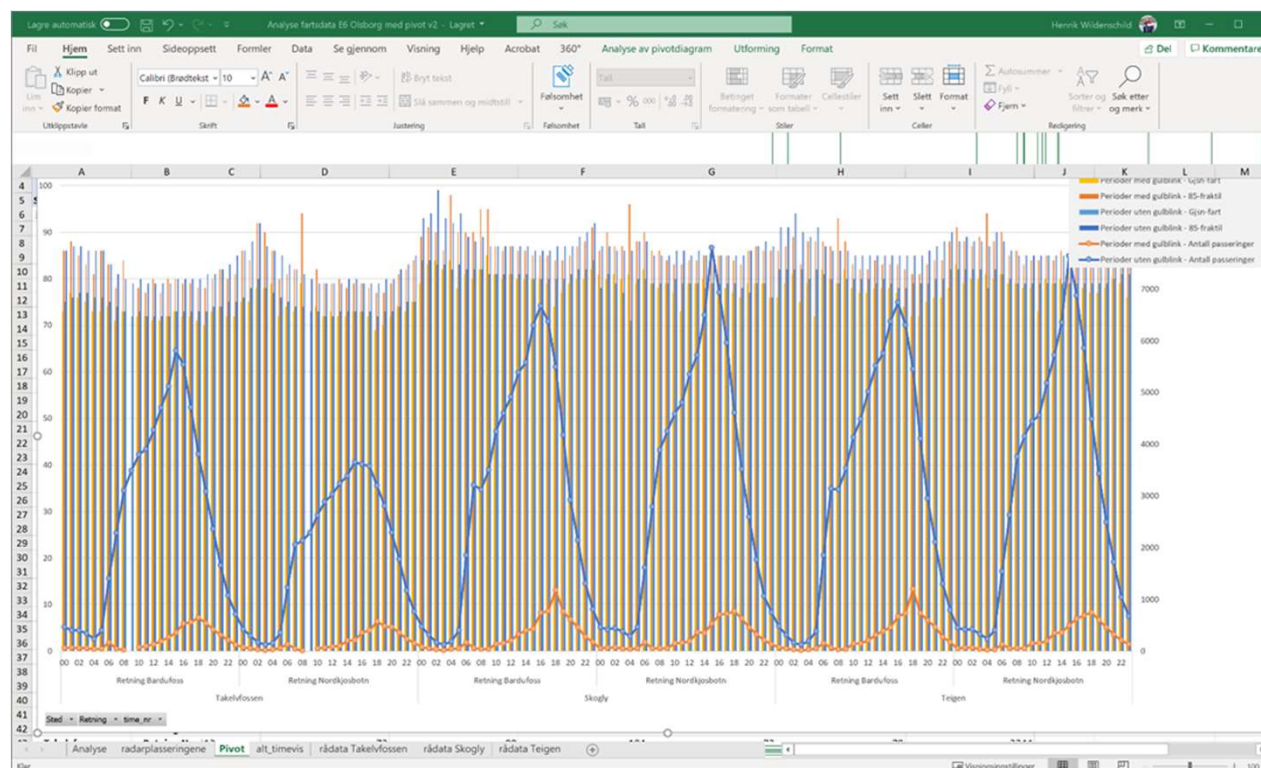
- Speed level – Representative value for speed along a stretch of road or in a section of the road. The current level can be 85% fractional (the speed that 85% of motorists do not exceed).
- The 85–fraction decreases evenly when the yellow flashes is activated. The size of the decline varies, and the fall is greatest around the signs with yellow flashes. In the middle of the stretch, the difference between an 85–fraction with and without a yellow flash is smaller.





## Measurement of speed E6 Olsborg – Teigen

- The speed level only goes down approx. 1 km/h
- The same trend with disappointing results in recent Swedish experiments in a wildlife crossing on the road with fences, detectors and warning drivers with yellow flashes (Mattias Olsson – Enviroplanning)





## Evaluation of the wildlife warning system project

### The Norwegian Institute for Nature Research (NINA)– preliminary report

- NINA will publish the report by 1. th of december 2021 – paid for by NRPA
- Christer M. Rolandsen, Erling J. Solberg og Bram Van Moorter
- Rapport 2043
- <https://www.nina.no/Publikasjoner/Siste-publikasjoner>
- On average, NINA observed a greater reduction in the number of moose hit on the test sections than on the control sections after the measure was implemented, but the difference was not statistically significant.
- This was independent of whether they used one control section per test section or 10 control sections per test stretch



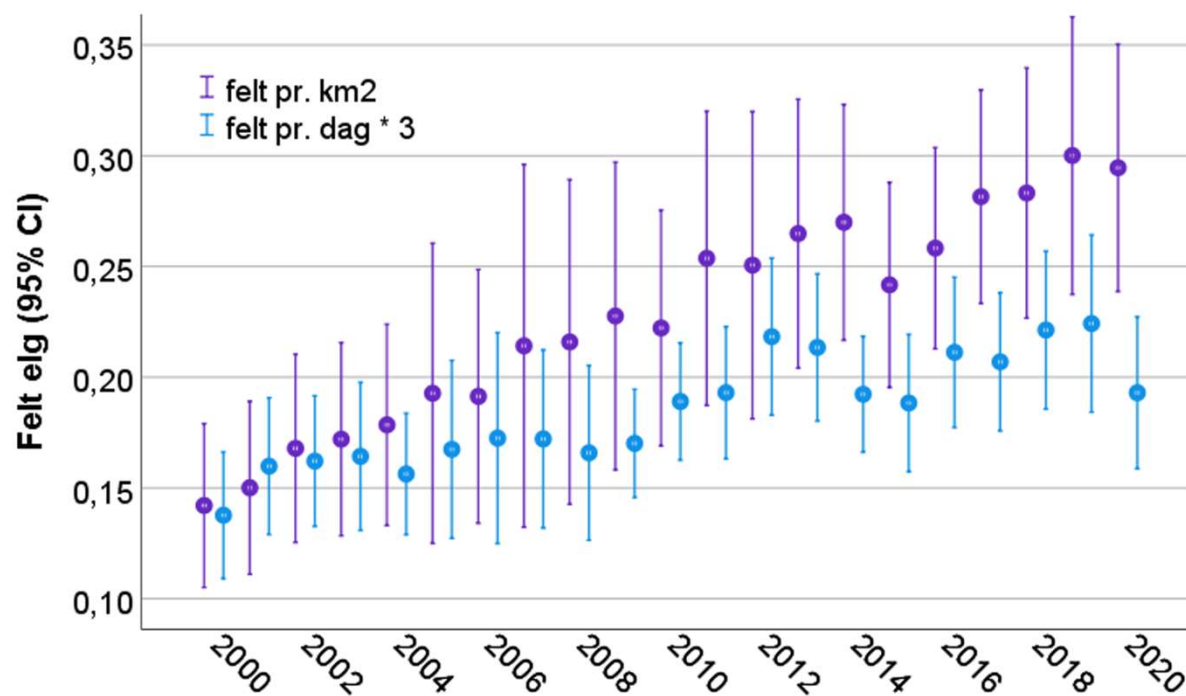
## NINA – preliminary report

- NINA also explored models based on a limited amount of data material but found no significantly different changes on test and control sections after implementation of the measure.
- BACI analysis. BACI is an abbreviation for Before–After–Control–Impact and means that we measure an ecological variable (e.g. the probability of a collision) in an area before and after the introduction of a measure (e.g. warning sign with yellow flashing) and compare the result with the development of the ecological the variable in an area without measures (e.g. section without yellow flashing) (Green, 1979).



## NINA – preliminary report

- Moose population density, snow depth and covid-19 traffic amount were also analyzed.



Figur 2.7. Bestandsutviklingen av elg vist som gjennomsnittlig antall elg felt pr. km<sup>2</sup> skog og myrareal og gjennomsnittlig antall elg felt pr. jegerdag i 18 kommuner i studieområdet (Narvik, Evenes, Tjeldsund, Sortland, Lødingen, Andøy, Harstad, Gratangen, Lavangen, Ibestad, Dyrøy, Bardu, Salangen, Senja, Sørreisa, Målselv, Balsfjord og Storfjord). Antall elg felt pr. jegerdag er multiplisert med 3 for å vises bedre i figuren.



## NINA – preliminary report

Tabell 2.1. Gjennomsnittlig antall elg påkjørt pr. år før (2010-2016) og etter (2017-2020) at tiltaket (gulblink) ble iverksatt på teststrekningene (T1-T4). I parentes vises utstrekning mellom år og totalt antall påkjørsler registrert (N). Endring antyder den prosentvise endringen i årlige påkjørte elg fra perioden før til perioden etter innføringen av tiltaket. I parentes vises utstrekningen av alle mulige endringer fra ett år før til ett år etter tiltak. K1-K4 og XK1-XK4 viser tilsvarende statistikk fra kontrollstrekninger benyttet i analysene. K1-K4 viser til én kontrollstrekning pr. teststrekning, mens XK1-XK4 er gjennomsnittet av 10 kontrollstrekninger pr. teststrekning (se kap. 2.4).

Strekning	Påkjørt før (2010-2016)	Påkjørt etter (2017-2020)	Endring (%)
<b>T1 (Olsborg-Teigen)</b>	3,0 [0-8; N=21]	1,2 [0-2; N=5]	-58 [-100-65]
<b>T2 (Finnfjordbotn-Sørreisa)</b>	0,71 [0-3; N=5]	1,2 [0-2; N=5]	75 [-88-0]
<b>T3 (Evenes-Lille Skånland)</b>	4,3 [0-10; N=30]	2,5 [0-5; N=10]	-42 [-100-25]
<b>T4 (Vollstad-Sørvika)</b>	8,9 [5-15; N=62]	6,2 [2-13; N=25]	-29 [-81-134]
<b>K1</b>	6,4 [1-12; N=45]	6,0 [3-9; N=24]	-7 [-72-577]
<b>K2</b>	5,9 [1-11; N=41]	8,8 [3-14; N=35]	49 [-65-800]
<b>K3</b>	2,6 [0-6; N=18]	1,8 [0-3; N=7]	-32 [-100-147]
<b>K4</b>	0,14 [0-1; N=1]	0,0 [0-0; N=0]	-100 [-100-0]
<b>XK1 (snitt av 10 strekninger)</b>	2,0 [0-12; N=137]	2,3 [0-9; N=93]	19 [-100-300]
<b>XK2 (snitt av 10 strekninger)</b>	2,3 [0-11; N=159]	2,3 [0-14; N=92]	1 [-100-200]
<b>XK3 (snitt av 10 strekninger)</b>	1,2 [0-8; N=87]	1,2 [0-4; N=48]	-3 [-100-200]
<b>XK4 (snitt av 10 strekninger)</b>	1,4 [0-8; N=98]	1,1 [0-11; N=45]	-20 [-100-100]



## NINA – preliminary report

Tabell 3.1. Parameterestimater og teststatistikk for modeller som inkluderte bestandstetthet og snødybde i kommuner med test- og kontrollstrekninger. Modellene er basert på kontrollstrekninger med og uten flyttbare skilt.

Modell	Faktor	Estimat	SE	P-verdi
<b>BACI:</b> En kontrollstrekning	Intercept	1,19	0,80	0,14
	Test-kontroll	0,29	0,65	0,65
	Etter-før	-0,11	0,31	0,70
	Snødybde (/100)	-0,28	0,22	0,20
	Bestandstetthet (*10)	0,79	0,57	0,17
	Test-kontroll x etter-før	-0,23	0,30	0,85
<b>BACI:</b> Ti kontrollstrekninger	Intercept	0,32	0,31	0,30
	Test-kontroll	0,58	0,33	0,08
	Etter-før	-0,13	0,12	0,26
	Snødybde	0,08	0,36	0,81
	Bestandstetthet	0,45	0,28	0,10
	Test-kontroll x etter-før	-0,16	0,35	0,65
<b>BACI:</b> En kontrollstrekning Uten flyttbare skilt	Intercept	-1,08	0,90	0,23
	Test-kontroll	0,87	0,49	0,08
	Etter-før	-0,33	0,36	0,36
	Snødybde	0,73	0,63	0,25
	Bestandstetthet	1,65	1,06	0,12
	Test-kontroll x etter-før	-0,05	0,44	0,90
<b>BACI:</b> Ti kontrollstrekninger Uten flyttbare skilt	Intercept	-0,15	0,34	0,66
	Test-kontroll	0,80	0,32	<0,05
	Etter-før	-0,05	0,14	0,70
	Snødybde	0,31	0,29	0,30
	Bestandstetthet	0,64	0,40	0,11
	Test-kontroll x etter-før	-0,25	0,39	0,51

95% confidence interval, if it is to be significant, the P-value must be less than 0.05



## NINA – preliminary report

- **Does the measure affect the outcome of the accident:**  
On the test sections, the mortality of the moose collisions was around 60% on average, with some variation between years and sections. However, there was no significant increase or decrease in mortality after the measure was implemented. In other words, there is little reason to believe that moose that were hit after the introduction of the measure were more likely to survive an encounter with a car.
- Design, sample size and test strength (power analysis) and quality of data in the wildlife deer register
- NINA can also not conclude that the measure has no effect, but according to Christer M. Rolandsen it is probably below 10 %, and at most 15 %, if there is an effect.



## Moose collisions and speed

- Several studies have been done on how speed affects the number and degree of damage from wildlife accidents. A study conducted in Sweden found that 2 km/h lower speed leads to a 15% reduction in moose collisions, while 10 km/h lower speed leads to a 56% reduction in the number of accidents (Andreas Seiler 2005)
- Another study done in Main (USA) showed that an 8 km / h increase in the sign speed limit increases the probability of a moose accident by 35% (Danks et al. 2010).
- Gunther et al. (1993) found that there are 50% fewer wildlife collisions on road sections where the speed limit is below 70 km / h compared to those with a speed limit above 70 km / h.
- In Sweden, 90% of moose collisions that result in serious injuries or fatalities occur on roads with 80 km/h or higher speed limits (Krafft et al. 2011).





## What do we do next where we can not use a game fence?

- Most have been tried without good results, I think in the future there will be a discussion in society and the sector whether we should use a reduced speed limit e.g. from 80 km/h to 60 km/h in some places, during periods of the year when there is a lot of deer near the roads.
- Game fencing works, is very expensive and does not work everywhere, disadvantages for the animals, major encroachments on area and nature.
- Clearing of vegetation off the side terrain, we calculate in SVV that it has an effect of 2% reduction on all degrees of damage to personal injuries, including fatalities (TS effect ver. 4.2)
- The results differ for the measure clearing vegetation off the side terrain. One Swedish study (experimental study) found a reduction in the number of wildlife collisions of 20%. Meisingset et al. (2014) found a reduction in the number of deer collisions of 53% in winter and no effect in summer. Voß (2007) and Lindstrøm (2016) found no effect. (ref: TS handbook TØI)



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Thank you for your  
attention  
Questions?

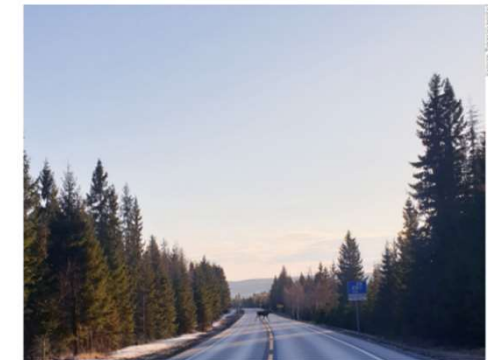




## Use of speed limit reduction

# Report – socio-economic analysis 2019

- The result of the cost-benefit analysis showed that a temporarily reduced speed limit was not socio-economically profitable, neither by 10 km/h nor a 20 km/h reduced speed limit on any of the sections.
- Reduced speed leads to significant benefits through reduced claims costs, but not enough to offset the time costs associated with longer travel time.



<https://vegvesen.brage.unit.no/vegvesen-xmlui/handle/11250/2612977>



## Is travel time of too high value?

- Chronicle by Rune Elvik at The Institute of Transport Economics (TØI) 12.08.2020  
*Better to be dead than sitting in a traffic jam?*  
<https://samferdsel.toi.no/meninger/bedre-a-vare-dod-enn-a-sitte-i-bilko-article34614-677.html>
- Personal injuries are valued in NOK, but what about deer antlers, we should have put a value in NOK on them, what about NOK 500,000 for the life of a moose?
- TØI report 2010 – NOTE! figures are in 2009 kr

<https://www.toi.no/forsiden/et-spart-liv-i-trafikken-verdsatt-til-30-millioner-kroner-article29908-4.html>

Ulykkestype og kostnadsart	Drept	Meget alvorlig skade	Hard skade	Alvorlig skade	Lettere skade	Kun materiell skade
Realøkonomiske kostnader	4 095 962	9 570 090	5 361 365	4 124 127	146 345	29 564
Velferdseffekt	26 126 880	13 362 853	5 225 376	4 019 520	467 342	0
Total ulykkeskostnad	30 222 842	22 932 943	10 586 741	8 143 647	613 687	29 564
Total ulykkeskostnad (avrundet)	30 220 000	22 930 000	10 590 000	8 140 000	614 000	30 000

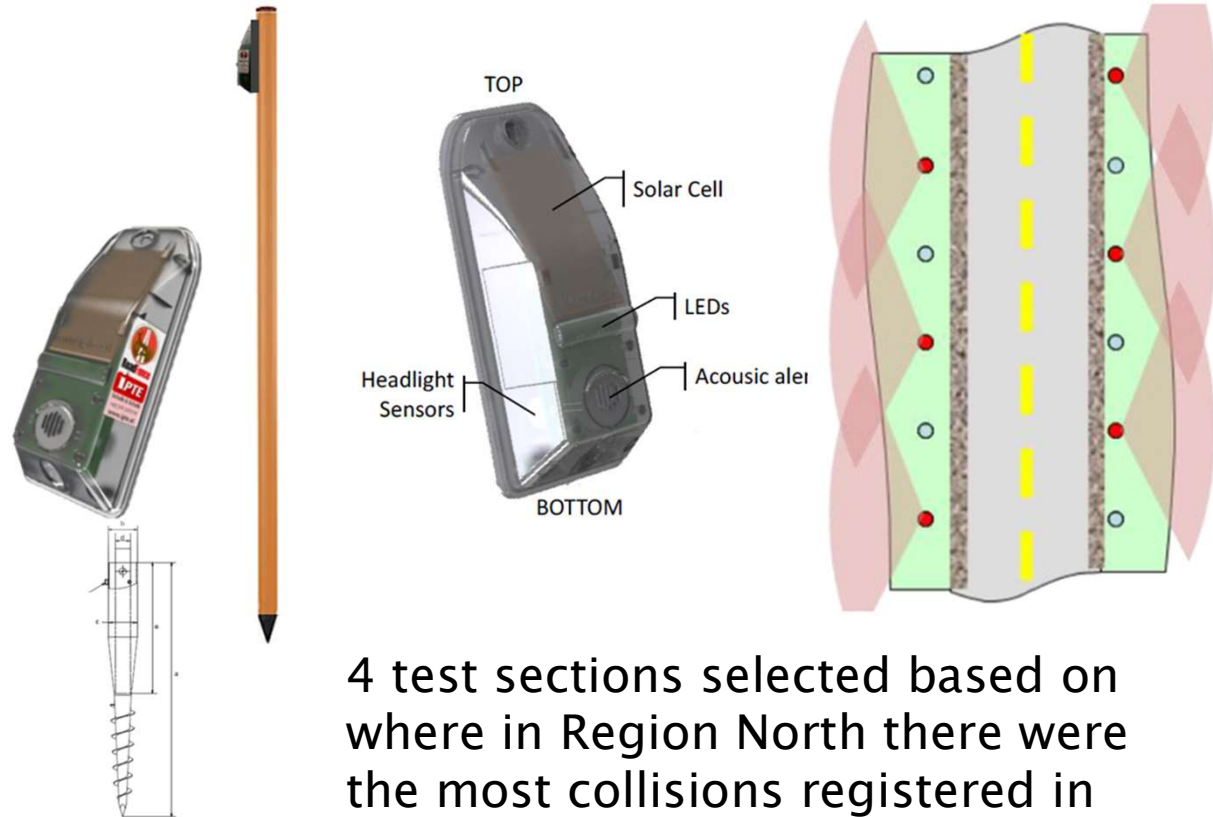
TØI rapport 1053C/2010

# Discontinued R&D activities in NRPA



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Electronic moose scarers with high-frequency sound and light. DeerDeter DD450 from Austria.



4 test sections selected based on where in Region North there were the most collisions registered in HVR. Mounted 2014, Discontinued 2017



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## Discontinued R&D activities in NRPA Blue reflectors



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## Discontinued R&D activities in NRPA

### Blue reflectors

- New research from Sweden regarding blue reflectors dec. 2017, is all or part of the effect with the driver?

[https://www.trafikverket.se/contentassets/9cdbc8c357054d9e8ae74062d56a46a3/bla\\_reflektorer\\_slutrapport\\_trv2017\\_230.pdf](https://www.trafikverket.se/contentassets/9cdbc8c357054d9e8ae74062d56a46a3/bla_reflektorer_slutrapport_trv2017_230.pdf)

- German research 2018
- An analysis of 43 studies regarding wildlife warning reflectors published in the last 40–years showed that reflectors did not significantly reduce wildlife casualties.

In enclosures under controlled conditions roe deer exhibited the same behavioural patterns compared to deer close to roads. These results confirmed those of the field experiment. In addition, feeding experiments did show that blue is not a "warning color" for deer.

**In summary, this extensive behavioral study demonstrates that wildlife warning reflectors are not a suitable preventive measure for reducing vehicle–wildlife accidents.**

<https://www.waldwissen.net/en/forest-ecology/forest-and-game/game-management/wildlife-warning-reflectors>



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