Experiences of using lasers to scare geese in Denmark

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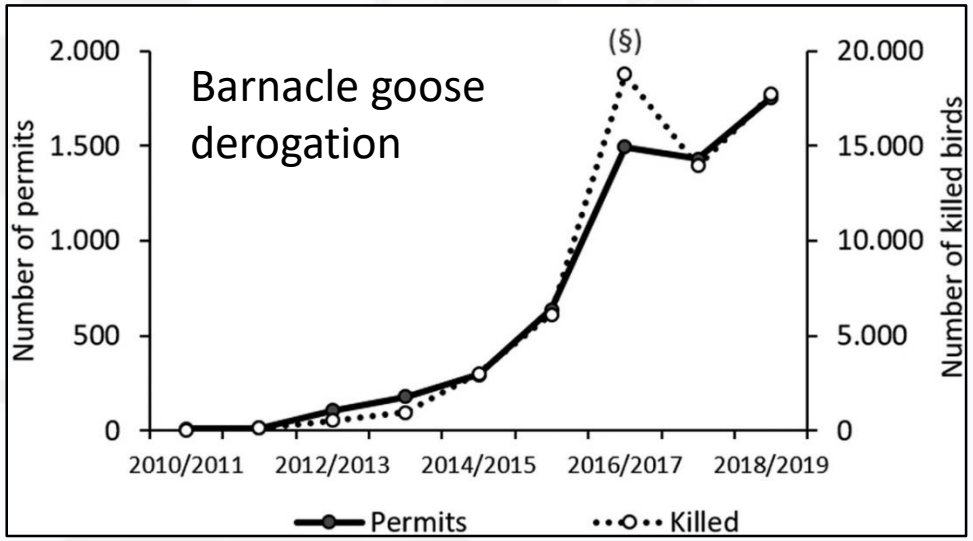
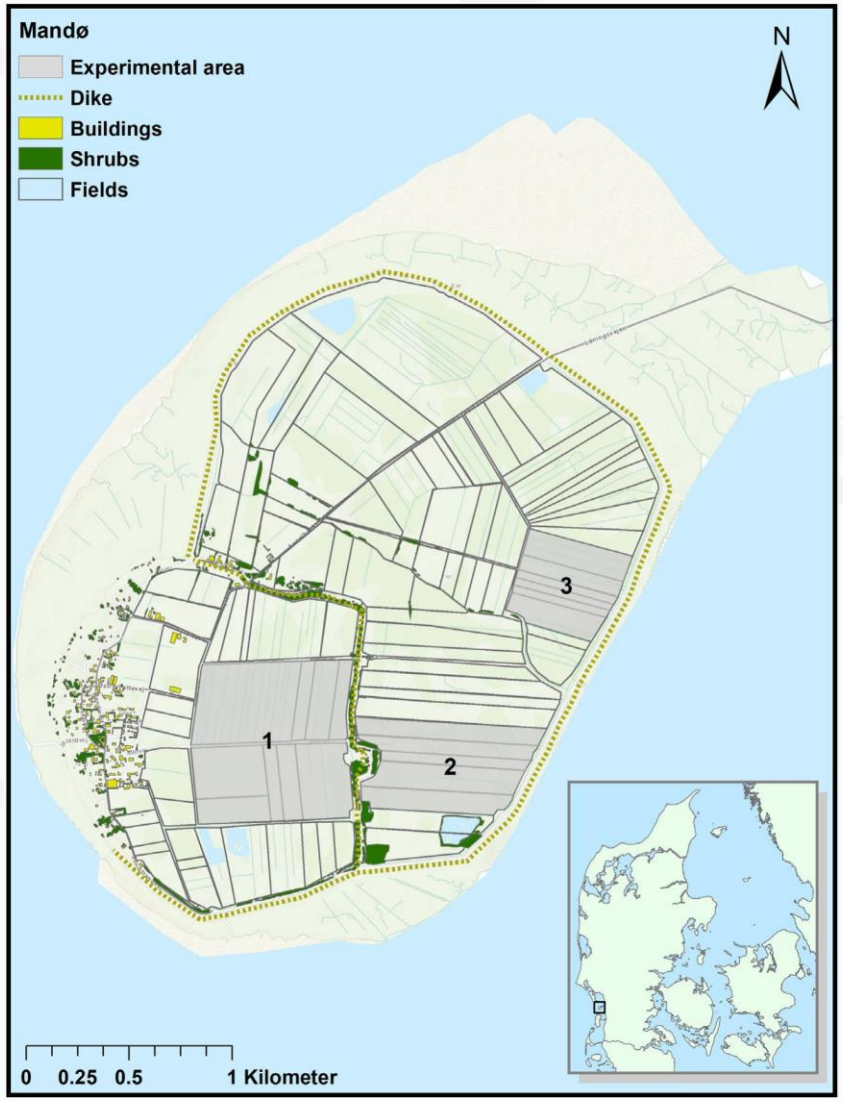
Background

- Increasing goose populations give rise to conflicts with human socioeconomic interests.
- Calls for management actions reducing economic impacts on farmers.
- Heavy grazing by geese in grasslands postulated to lead to lower available biomass for hay cutting and grazing by domestic animals.
- A need for investigating ways to displace geese from agricultural areas (e.g. lasers) and for quantifying the actual impact of goose grazing.

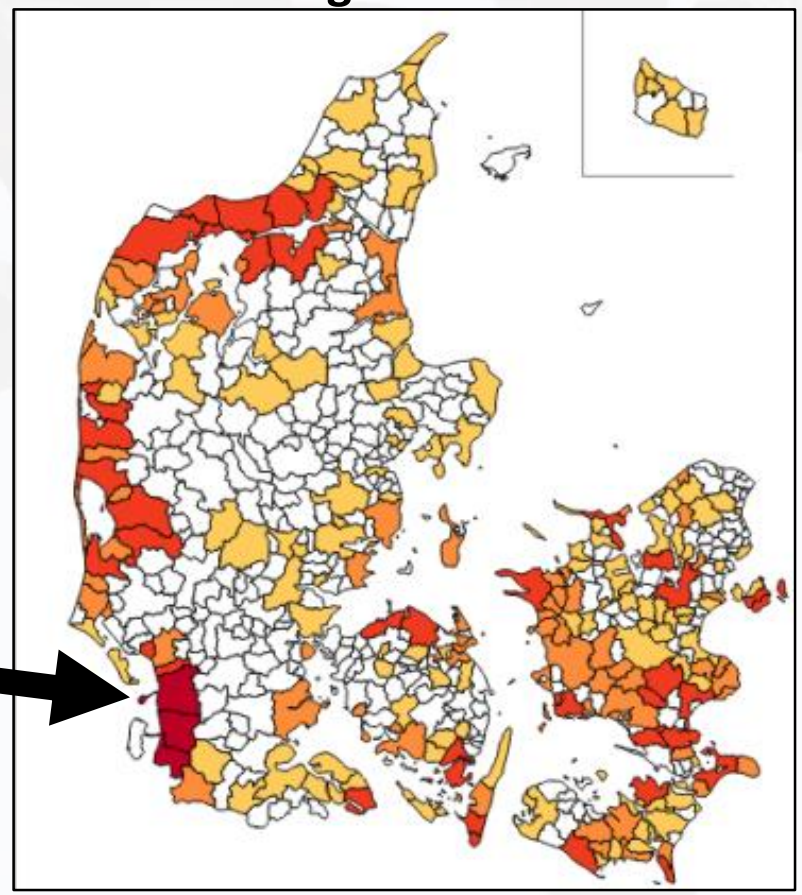


Study site

Spring staging area



Barnacle goose abundance



The laser

Laser specs:

- Handheld laser (Agrilaser 500©)
- Output power < 500 mW (class 3B)
- Wavelength 532 nm (green)
- Diameter at aperture of 40–50 mm
- Represent currently available models

Operated by:

- Using a tripod for accurate aims
- From dikes overlooking the fields

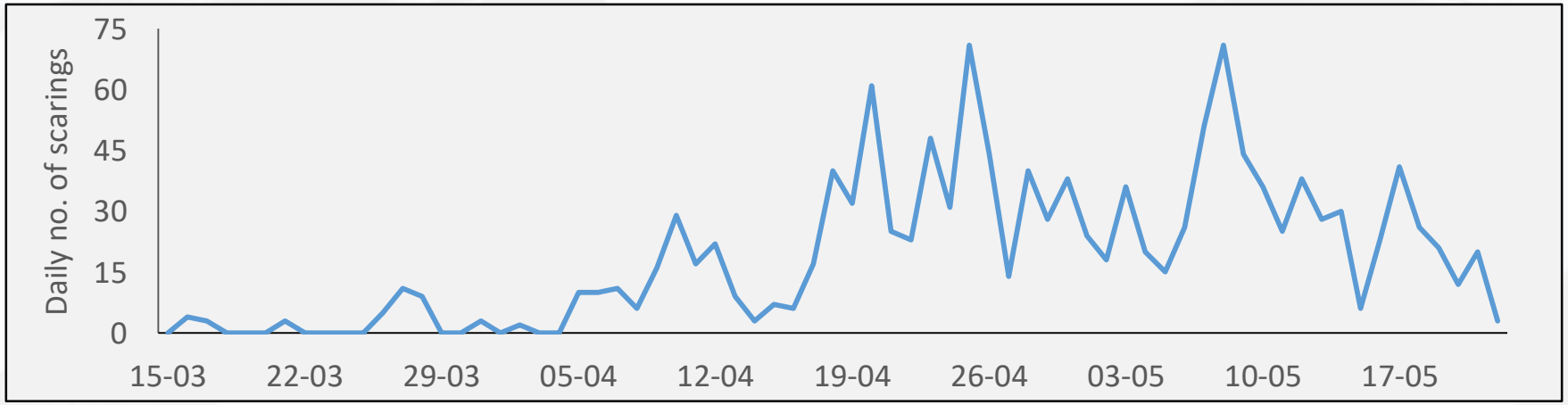
Data collection

Parameters collected during experiments with lasers to displace geese on Mandø:

Parameter	Description
Date	Date of the displacement event
Time of day	Time of day
Cloud cover	A continuous measure of clouds from full sun (0) to overcast (8)
Precipitation	A binomial Yes/No variable for precipitation
Temperature	Temperature (degrees Celsius)
Flock size	Number of individuals in the flock displaced
Distance	Distance from the handheld laser to the displaced flock (km)
Species	The species displaced (Barnacle Geese og Brent Geese)
Duration	Time needed to displace all geese in the flock

The efficiency of laser scaring

- Number of laser scarings per day varied between 0 and 71 with an average of 22.4.
  - Related to day length ($p < 0.001$) and number of geese on the island ($p = 0.032$).
  - Peak in activity early morning and late afternoon

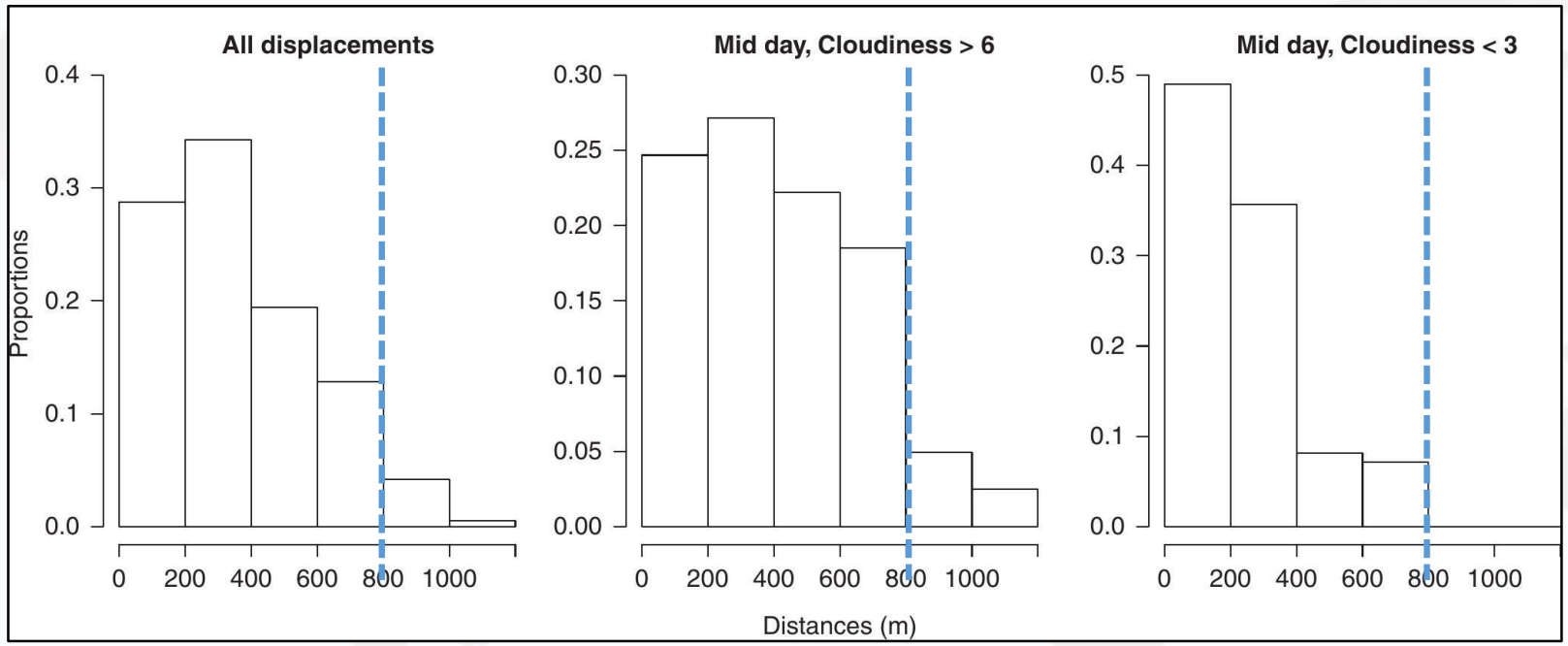


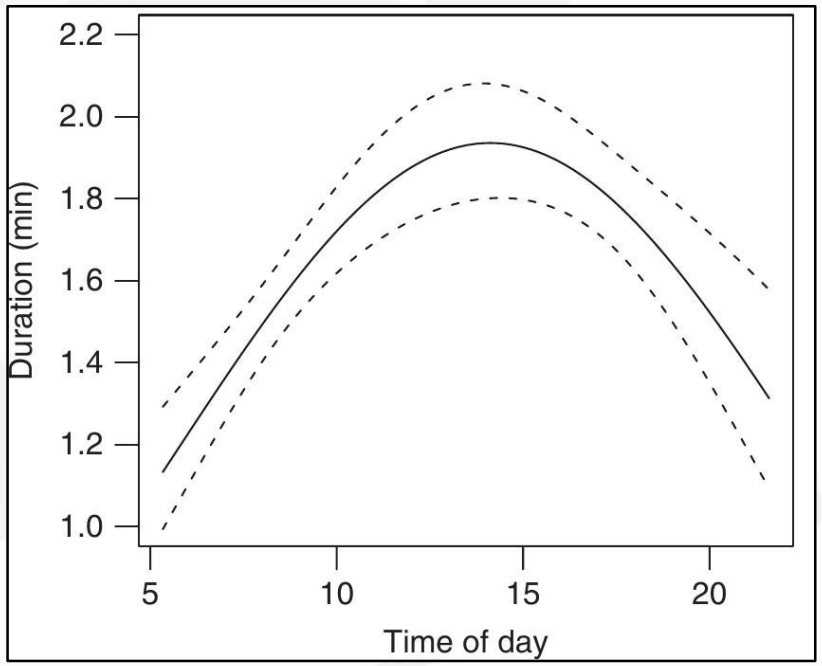
- The laser displaced 70 % of all flocks within one minute and 98 % within five minutes.
- Displaced flocks generally moved away from the occupied field but stayed on the island.

The efficiency of laser scaring

Effect	df	F	P value
Time of day	**1,1139**	**24.68**	**<.001**
Time of day^2	**1,1139**	**23.58**	**<.001**
Cloud cover	**1,1139**	**6.99**	**0.008**
Precipitation	1,1139	1.47	0.225
Temperature	1,1139	0.22	0.639
Flock size	**1,1139**	**17.92**	**<.001**
Distance	**1,1139**	**8.12**	**0.004**
Species	1,1139	1.49	0.223
Day of year	1,1139	0.26	0.608

The efficiency of laser scaring

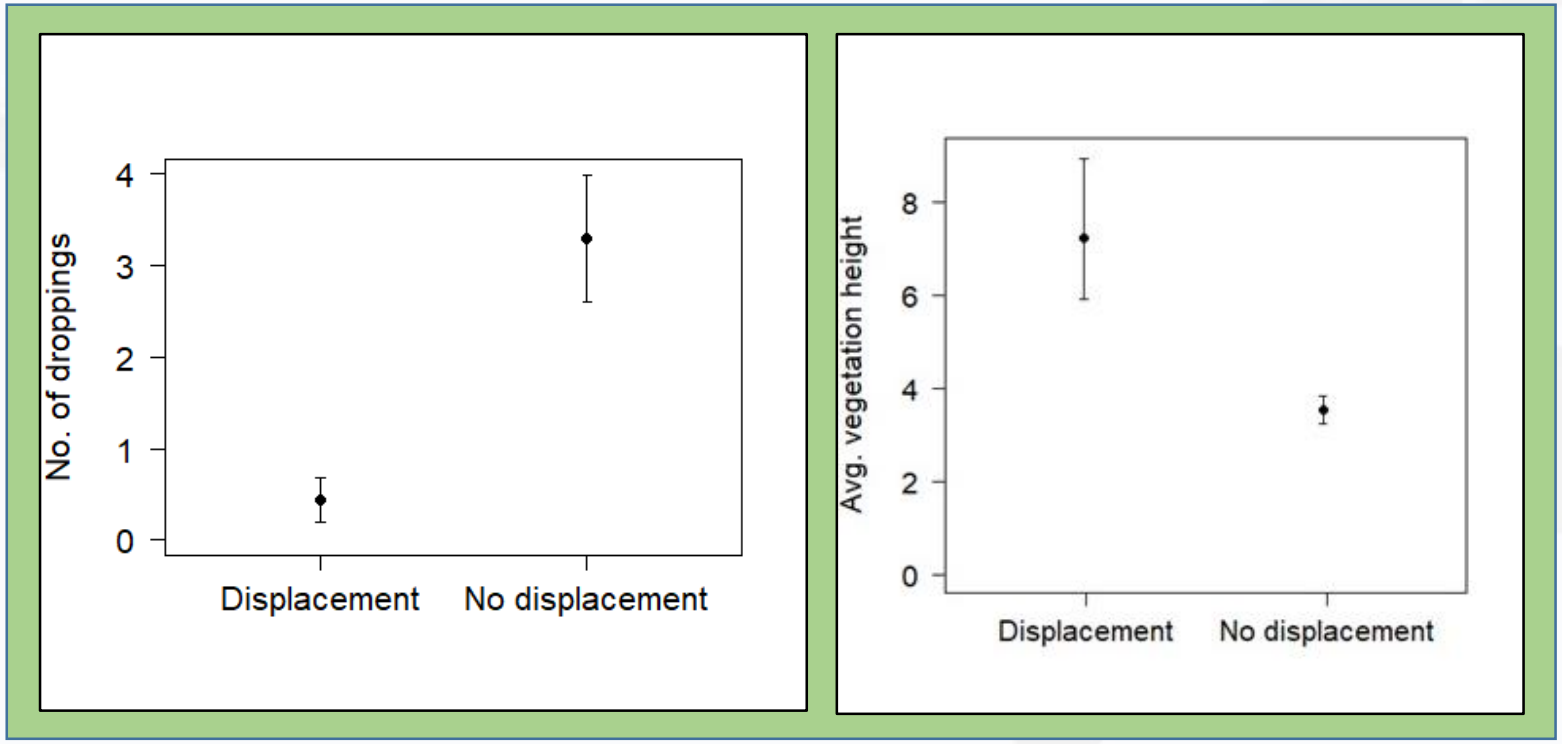




Return times:

- Geese were generally back on a field relatively quickly (but large variation).
- Laser scaring did not significantly differ from other types of active visual scaring (approaching geese by foot/car).
- On the long term, continuous scaring often led to a higher crop that was eventually avoided by geese.

The effect of laser scaring



Fields subject to laser scaring had seven times lower dropping densities and a mean vegetation height that was 3.3 cm taller than control fields.

The difference in sward height between experimental and control fields of 3.3 cm translated into a difference in biomass of ≈ 1750 kg per hectare.

Worth the effort?

Costs	Units	Note
Average man-hours per day	10	Rough estimate
Hourly pay (€ per h)	18.7	Standard worker
Days of effort	69	
Total pay, €	12,903	
Average transport per day (km)	42	Rough estimate
Transport expenses (€ per km)	0.26	
Total transport expenses (€)	753	
Price of laser (3 year depreciation, €)	784	Total price: 2351 € ex VAT
Total cost (€)	**14,440**	
Benefits	**Units**	**Note**
Yield gain (SFU per ha)	288	
Area of experimental fields (ha)	111	
Price of organic pasture grass (€, per SFU)	0.243	Local Danish 2018 price
Benefit per ha (€)	70	
Total benefit (€)	**7,770**	
Balance (benefit – cost, €)	**-6,670**	

Conclusions

- Handheld lasers could quickly and easily scare geese from fields in most situations < 800 m.
- Efficiency especially dependent on distance and light conditions.
- Often the effect on field occupancy was short, and geese readily returned to a previoulsy used field after scaring.
    - Few birds perceiving the actual disturbance?
    - Large turnover?
- A lasting effect relied on continous scaring as long as the crop was attractive.
    - Very time consuming / expensive
- Automated systems may be apllicable in some areas (with purely agricultural interests), but not in our study area with tourism, breeding meadow birds etc.
- Goose grazing on pastures resulted in lower biomass yield, but the cost of operating the laser outweighed the economic loss from foraging geese.
    - May vary a lot (goose densities, crop value etc.)

Thank you for your attention

AEWA European Goose Management Platform

AARHUS UNIVERSITY

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