

Hunting rifle ammunition –  
a technical, sociological view on benefits,  
performance, availability and monitoring the  
success

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BERLIN, 14-15 MARCH 2024

# Who is Niels Kanstrup?

- ▶ Advisor for Danish hunters 1985-2007.
- ▶ Private consultant 2007-?.
- ▶ Wildlife biologist Aarhus University 2017-?.
- ▶ Advisor for EU/ECHA.
- ▶ A keen hunter 1974-?.
- ▶ Speaking on the background of a phase out of lead ammunition in Denmark since the 1990s.



# Content

- ▶ Some background on lead ammunition regulation in Denmark
- ▶ Transition from lead to non-lead hunting rifle ammunition
  - ▶ Efficacy
  - ▶ Availability and price
  - ▶ Will it materialize in reality?
  - ▶ Control and enforcement.
- ▶ Future perspectives.

# Denmark: A small country with a big hunting tradition

- ▶ 3% of citizens hold a hunting license.
- ▶ 45 huntable species.
- ▶ Inspired from Scandinavia, Germany, France, UK etc.



# The Danish phase-out of lead ammunition in hunting – gunshot:

- ▶ 1970s and 1980s: Increasing awareness of the risks of lead shot to waterbirds
- ▶ 1981: Regulation of lead shot for **clay pigeon shooting** (in wetlands)
- ▶ 1986: Ban on lead shot for **hunting in wetlands**
- ▶ 1993: Ban on lead shot in **upland hunting**
- ▶ 1996: Total **ban on lead shot in hunting AND on trade and possession**

The present situation: Use, trade and possession of lead shot is banned for any purpose apart from training for international sport shooting competition at <5 approved shooting ranges.

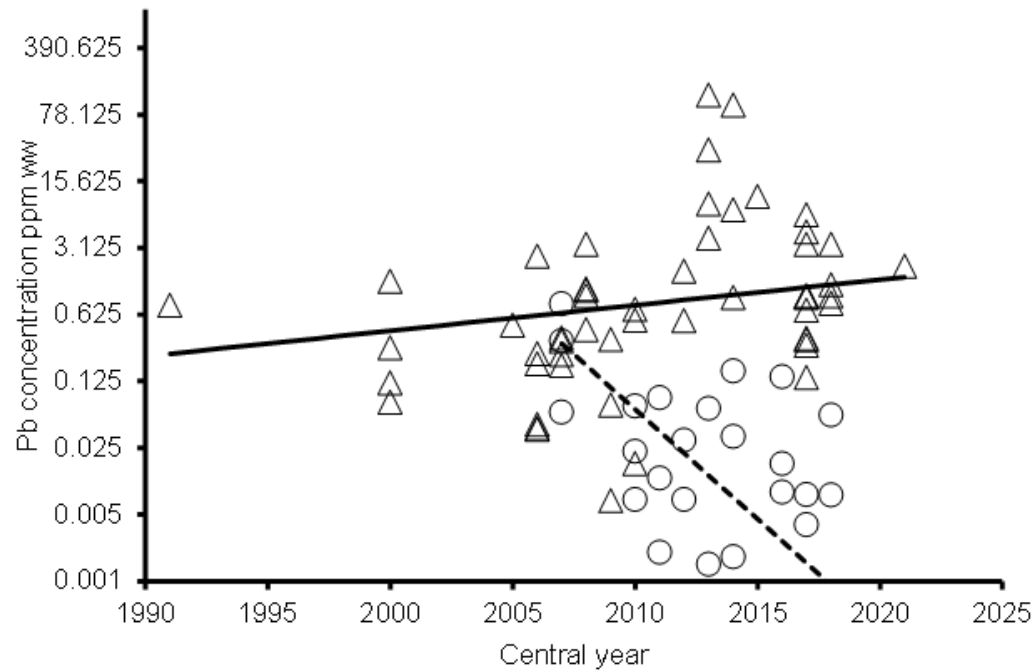


# Did we survive?

- ▶ This has been covered in multiple peer-reviewed studies including all concerns that have been raised
- ▶ The good news is that the industry has provided us with efficient, safe and affordable nonlead alternatives



# Benefit example: Lead out of (small) game meat



Arithmetic mean lead concentrations (ppm w.w.) in tissue from gamebirds from Denmark and small game animals from other European countries.

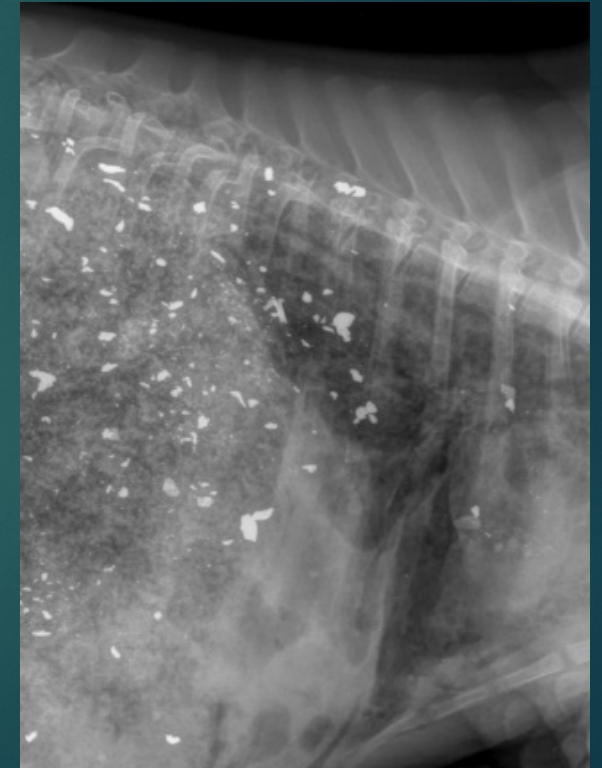
From Pain et al. 2022



# Lead rifle bullets – process:

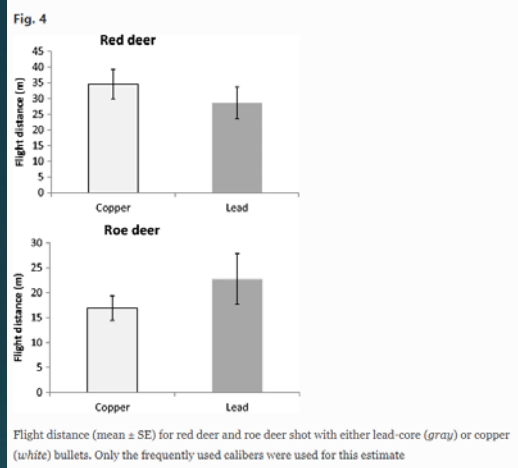


- ▶ 2010s: Increasing awareness on risk to consumers
- ▶ 2015s: Solid research and campaigning + more alternatives
- ▶ 2020: Danish Hunters' Association asks the Ministry of Environment to phase out leaded rifle bullets.
- ▶ 2022: Regulation with the coming into force by 1st April 2024.






# Efficacy – very well studied



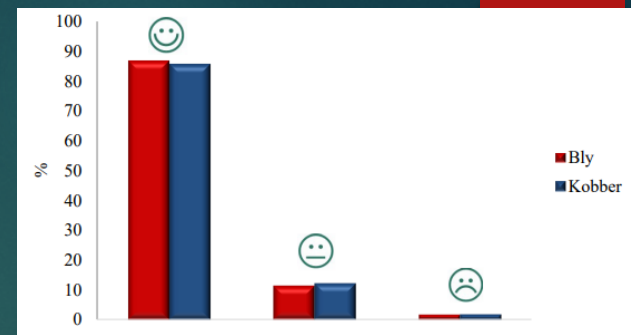
Original Article | Published: 07 April 2016

## Efficacy of non-lead rifle ammunition for hunting in Denmark

Niels Kanstrup , Thorsten J. S. Balsby & Vernon G. Thomas

*European Journal of Wildlife Research* 62, 333–340(2016) | [Cite this article](#)

373 Accesses | 18 Citations | 13 Altmetric | [Metrics](#)




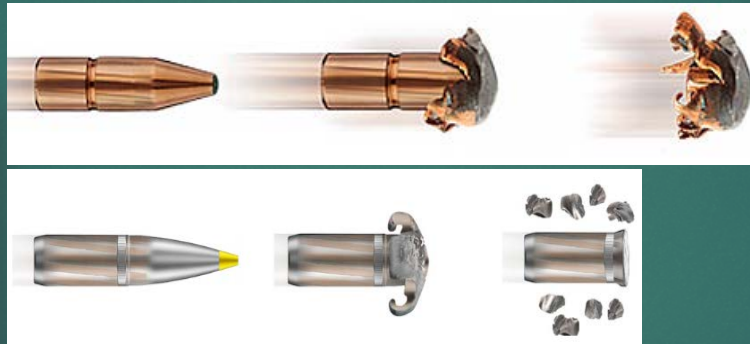
Ambio 2019, 48:1044–1055  
<https://doi.org/10.1007/s13280-019-01171-4>



### LEAD USE IN HUNTING

## Unleaded hunting: Are copper bullets and lead-based bullets equally effective for killing big game?

Sigbjørn Stokke , Jon M. Arnemo, Scott Brainerd



Figur 4. Rester af projektiler, som er stoppet i vildtkroppen. 6,5x57 RWS EVO 0 gram (0557blyfri). Ræsevægten på disse to var hhv. 3,24 og 3,23 gram, svarende til et vægttab på hhv. 2,76 og 2,77 g. Foto: Niels Kanstrup



EFFEKTIVITETEN AF BLYFRI RIFFEL-AMMUNITION – ERFARINGER FRA JÆGERSBORG DYREHAVE OG KALVEBOD FÆLLED

Videnskabeligt support fra DCE – National Center for Miljø og Sundhed | 457 | 2021



	Alle					Træfpunkt blad, abdomen og bringe				
	N	Middel	Median	Min	Max	N	Middel	Median	Min	Maks
6557blyfri	285	17	10	0	400	252	18	10	0	400
6557bly	115	29	15	0	500	100	34	25	0	500

# Availability: Non-lead bullets on the Danish retail market

Materials: Copper, Brass, Tin, Iron, Tungsten

Production: E.g. Denmark, USA, Gernamy, Sweden, Finland, Czech Rep.

Price: Ex.

Norma 30.06 Tip Strike  
11g/170gr (17434)  
Riffelpatron  
Norma  
7393923318486  
✓ PÅ LAGER  
659,00 DKK

Norma 30.06 9.7g/150gr  
Ecostrike (17424)  
Norma  
7393923319513  
✓ PÅ LAGER  
729,00 DKK

88 Euros

97 Euros



# Will this work?

- ▶ "Road show 2023": 30 local lectures, 1,000 attendants.
- ▶ A large proportion already changed.



15. Juni Fonden



Yes, it will work!

Denmark got rid of lead gunshot 25 years ago and new generations of hunters and shooters now hunt and shoot without any thought of lead.

The phase out of lead bullets from next year will also materialize.

Many hunters regard the use of lead as unsustainable and a basic threat to the future of hunting.

Kanstrup et al. *Environ Sci Eur* (2021) 33:41  
<https://doi.org/10.1186/s12302-021-00485-z>


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## Non-lead rifle ammunition: Danish hunters' attitudes



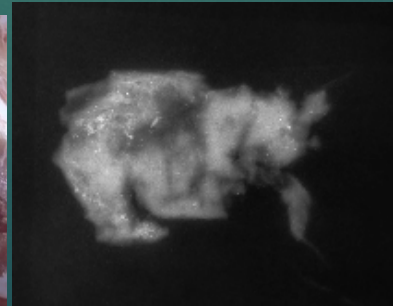
Niels Kanstrup<sup>\*</sup> , Thorsten Johannes Skovbjerg Balsby, Kavi Askholm Møllerup and Hans Peter Hansen

# Enforcement

- ▶ Government (EPA) has the formal responsibility of transition.
- ▶ Enforcement and control of hunting laws is the responsibility of the police.
- ▶ Aarhus University (Dept. of Ecoscience) provides research and monitoring systems.
- ▶ Field check of what hunters bring to the hunt is difficult of two reasons:
  - ▶ Reluctance of private outfitters to check (conduite).
  - ▶ Some non-lead and lead cartridges look very much alike.
- ▶ At present we develop a system based on testing of metal deposits in tissues from the wound channel (next slide).

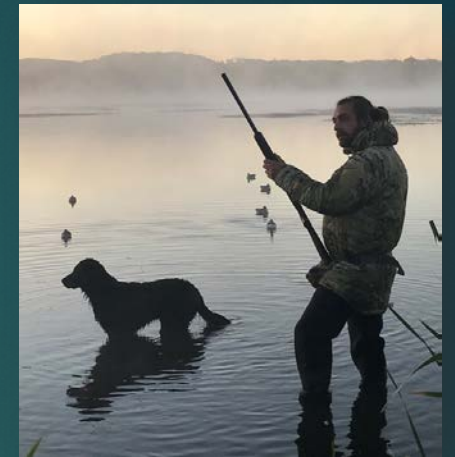
# A system to monitor compliance

- ▶ Tissue (muscle, fat, blood, skin etc.) sampled from wound channel. This may be done on the hunting spot or later in processing institution (slaughter house).
- ▶ X-ray check for fragments.
- ▶ Dissection and XRF check of fragments (metal identification and concentration).
- ▶ ICP-MS for accuracy.
- .....
- ▶ Strengths:
  - ▶ Simple.
  - ▶ Strong factor of prevention (hunters realize that their prey is checked).
- ▶ Weaknesses:
  - ▶ Non-fragmenting lead bullets will not be identified.
  - ▶ Fragmenting non-lead bullets will be included and needs further check.
  - ▶ Expensive (unless the ICP-MS element can be excluded)



# Concluding remarks – on the technicalities

- ▶ Ammunition is not just ammunition but covers a wide variation in terms of:
  - ▶ Applications
  - ▶ Construction
  - ▶ Performance
  - ▶ Quality
  - ▶ Price
- ▶ This applies to non-lead ammunition as well.
- ▶ Therefore, there are large overlaps and often hunters can't tell the difference.
- ▶ In general the ammunition material is of secondary importance.



# What matters is

- ▶ Chose the right combination of gun and ammunition for the actual quarry animal and hunting type.
- ▶ Ensure proper zeroing – in particular small rifle calibers with non-lead.
- ▶ Regardless of ammunition material:
  - ▶ BE AWARE OF SAFETY!
  - ▶ BE AWARE OF THE IMPORTANCE OF SHOOTING DISTANCE!
  - ▶ TRAIN REGULARLY!





# Hunting sustainability

There is a new generation of hunters that was not even born when lead shot was banned.

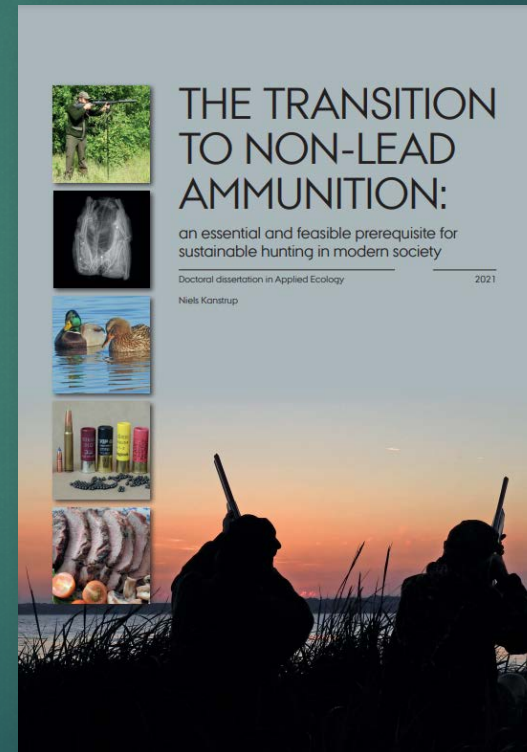
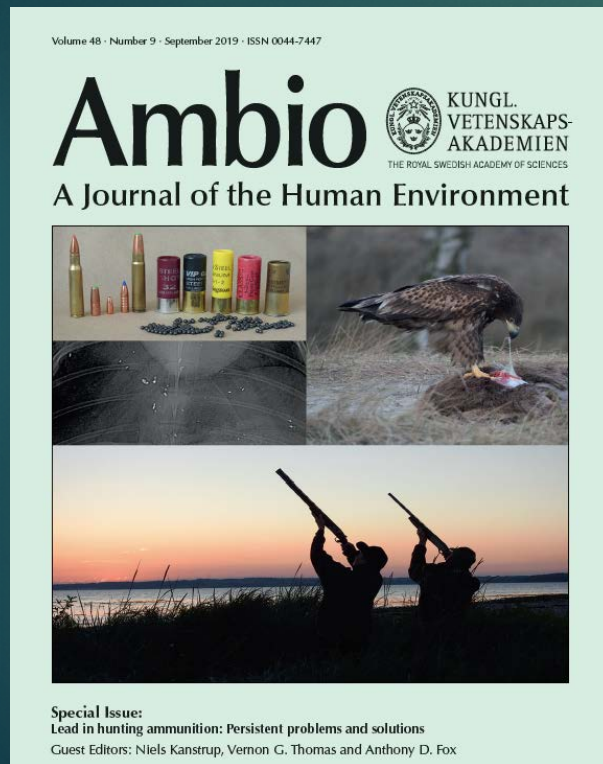
They hunt just as efficiently and successfully as previous generations.

Their needs are not to sustain lead ammunition but to enhance sustainability and public perception of hunting.



# More information

► <https://link.springer.com/journal/13280/volumes-and-issues/48-9>



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[https://pure.au.dk/portal/files/284678093/210528\\_Niels\\_Kanstrup\\_Transition\\_non\\_lead\\_ammunition\\_Dissertation.pdf](https://pure.au.dk/portal/files/284678093/210528_Niels_Kanstrup_Transition_non_lead_ammunition_Dissertation.pdf)