

Where Science Gets Social.

AAAS.ORG/ COMMUNITY

AAAS' Member

Community is a one-stop destination for scientists and STEM enthusiasts alike. It's "Where Science Gets Social": a community where facts matter, ideas are big and there's always a reason to come hang out, share, discuss and explore.

Member
COMMUNITY
AAAS

shot for hunting in 1991 (10). By 2017, a federal ban on all lead ammunition use on federal land was declared; however, the Trump administration revoked the ban shortly afterward (11). Encouragingly, a total ban on all lead hunting ammunition took effect on 1 July 2019 in California (12).

We urge national hunter's organizations across Europe, the United States, and worldwide to collaborate and persuade members and industry to phase out the use and production of lead hunting ammunition. This approach would promote the interests of hunters through the survival of more quarry animals and through the stimulation of a more positive public perception of hunting. Moreover, it would protect the environment and prevent further harm to wildlife.

Christian Sonne^{1,2*} Aage K. O. Alstrup³,
Yong Sik Ok^{2,4}, Rune Dietz¹, Niels Kanstrup⁵

¹Aarhus University, Roskilde, Denmark. ²School of Forestry, Henan Agricultural University, Zhengzhou, China. ³Aarhus University, Aarhus, Denmark. ⁴Korea University, Seoul, Korea. ⁵Aarhus University, Kalø, Denmark.

*Corresponding author. Email: cs@bios.au.dk

REFERENCES AND NOTES

- World Health Organization, "Preventing disease through healthy environments." (2010); www.who.int/ipcs/features/lead.pdf.
- European Chemicals Agency, "Registry of restriction intentions until outcome" (2019); <https://echa.europa.eu/registry-of-restriction-intentions/-/dislist/details/0b0236e1840159e6>.
- European Chemicals Agency, "ECHA identifies risks to terrestrial environment from lead ammunition" (2018); <https://echa.europa.eu/-/echa-identifies-risks-to-terrestrial-environment-from-lead-ammunition>.
- R. J. Williams *et al.*, *Rev. Environ. Contam. Toxicol.* **245**, 157 (2018).
- A. H. Boesen *et al.* *Front. Vet. Sci.* **6**, 285 (2019).
- D. J. Pain *et al.*, *Ambio* **48**, 969 (2019).
- R. Mateo *et al.*, *Ambio* **48**, 989 (2019).
- M. Friend, J. C. Franson, W. L. Anderson, in *Ingestion of Lead from Spent Ammunition: Implications for Wildlife and Humans*, R. T. Watson, M. Fuller, M. Pokras, W. G. Hunt, Eds. (The Peregrine Fund, Boise, ID, 2009), pp. 34–60.
- C. F. Bellrose, *Illinois Natural Hist. Survey Bull.* **27**, 235 (1959).
- D. Avery, R. T. Watson, in *Ingestion of Lead from Spent Ammunition: Implications for Wildlife and Humans*, R. T. Watson, M. Fuller, M. Pokras, W. G. Hunt, Eds. (The Peregrine Fund, Boise, ID, 2009), pp. 161–168.
- V. Volcovici, "New Interior head lifts lead ammunition ban in nod to hunters," *Reuters* (2017); www.reuters.com/article/us-usa-interior-zinke/new-interior-head-lifts-lead-ammunition-ban-in-nod-to-hunters-idUSKBN16930Z.
- California Department of Fish and Wildlife (2019); www.wildlife.ca.gov/Hunting/Nonlead-Ammunition.

10.1126/science.aaz8150

Beyond meat: Ecological functions of livestock

Livestock production and meat consumption are major drivers of biodiversity

loss and carbon emissions globally (1, 2). Governments and civil society will have to prioritize the reduction of livestock numbers and meat consumption [e.g., (2, 3)] to mitigate impacts and achieve international sustainability goals. However, traditional livestock systems also play a role in biodiversity conservation, climate adaptation, and socioecological resilience at regional and local scales.

In Europe, traditional breeds of free-range livestock are fulfilling conservation goals by securing the ecological role of wild large herbivores that are long absent or in low abundance (4). These livestock breeds may include traditional breeds of cattle, often grazing unattended, and small herds of domestic goats or sheep that contribute to the maintenance of high-nature-value habitats and diverse landscape mosaics, the regulation of vegetation growth and structure (also linked to fire prevention, especially in southern Europe), and the maintenance of genetic diversity, local identity, and knowledge (5, 6).

As the 2021–2030 UN Decade on Ecosystem Restoration approaches (7), agri-environmental schemes and labeling and certification schemes (8) should adopt proactive measures that go beyond impact mitigation. Sustainable use of traditional livestock systems can help restore and manage biodiversity and ecosystem services where their maintenance contributes to local, regional, and ultimately global conservation goals.

Vânia Proença* and Carlos M. G. L. Teixeira
MARETEC, Instituto Superior Técnico, Universidade de Lisboa, 1049-001 Lisboa, Portugal.

*Corresponding author.

Email: vania.proenca@tecnico.ulisboa.pt

REFERENCES AND NOTES

- A. Marques *et al.*, *Nat. Ecol. Evol.* **3**, 628 (2019).
- H. C. J. Godfray *et al.*, *Science* **361**, eaam5324 (2018).
- R. Harrabin, "Plant-based diet can fight climate change—UN," *BBC* (2019); www.bbc.com/news/science-environment-49238749.
- S. J. G. Hall, R. G. H. Bunce, *Ecol. Evol.* **9**, 5859 (2019).
- S. J. G. Hall, *People Nat.* **1**, 284 (2019).
- R. Lovreglio, O. Meddour-Sahar, V. Leone, *iForest* **7**, 260 (2014).
- UNEP, "New UN Decade on Ecosystem Restoration offers unparalleled opportunity for job creation, food security and addressing climate change," UNEP (2019); www.unenvironment.org/news-and-stories/press-release/new-un-decade-ecosystem-restoration-offers-unparalleled-opportunity.
- Global Nature Fund, Lake Constance Foundation, "Baseline Report: Biodiversity in Standards and Labels for the Food Sector," *LIFE* (2017); www.business-biodiversity.eu/en/baseline-report.

COMPETING INTERESTS

V.P. is the scientific coordinator of a project conducted by Terraprima as part of her research activity at MARETEC. V.P. and C.M.G.L.T. have been financially supported in the past through short-term contracts by Terraprima.

10.1126/science.aaz7084

sciencemag.org **SCIENCE**

Beyond meat: Ecological functions of livestock

Vânia Proença and Carlos M. G. L. Teixeira

Science **366** (6468), 962.
DOI: 10.1126/science.aaz7084

ARTICLE TOOLS	http://science.sciencemag.org/content/366/6468/962
REFERENCES	This article cites 5 articles, 1 of which you can access for free http://science.sciencemag.org/content/366/6468/962#BIBL
PERMISSIONS	http://www.sciencemag.org/help/reprints-and-permissions

Use of this article is subject to the [Terms of Service](#)

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. The title *Science* is a registered trademark of AAAS.

Copyright © 2019 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works