LETTERS

Narwhals require conservation strategies tailored to the needs of each subpopulation.

*Edited by* **Jennifer Sills**

# Narwhals require targeted conservation

Narwhals are one of three highly specialized whale species that are endemic to the Arctic (*1*). The global narwhal population may number more than 100,000 individuals, but the species persists as a complex, highly divided meta-population, with limited or no exchange between neighboring subpopulations (*1*). Several narwhal populations in Greenland are suffering from low and declining numbers, and unsustainable hunting is putting the species at risk of local extirpation (*1*–*5*). Narwhal conservation requires human activities to be managed at the scale of subpopulations, each of which has its own environmental conditions and exploitation history.

In Melville Bay, the number of narwhals killed by hunters has likely been unsustainable for a decade or more. From 2007 to 2019, the size of the area used by narwhals in Melville Bay has shrunk by 84% from 16,000 to 2600 km$^2$ (*6*). The North Atlantic Marine Mammal Commission (NAMMCO) and the Canada-Greenland Joint Commission on Conservation and Management of Narwhal and Beluga recommended a limit of 280 removals between 2015 and 2019 (*2*), but the estimated accumulated removal during this period was at least 423 narwhals (*7*).

In Southeast Greenland, the Scientific Committee of NAMMCO recommended in 2017—and reiterated in 2018—that annual catches should be reduced to fewer than 20 narwhals and that no narwhal should be taken south of 68°N (*3*, *4*). When improved population modeling outputs became available in 2019, the Scientific Committee changed its recommendation to a moratorium on narwhal hunting throughout Southeast Greenland (*5*). Even so, the catches from 2017 to 2019 totaled 268 animals (*5*). The effects of the ongoing overharvesting can be seen in the population composition: a decreased proportion of females, an overrepresentation of old males, and an absence of calves and juveniles (*5*). The quota for 2020 is set at 58 narwhals (*8*, *9*); this level of harvest could put the long-term existence of the narwhal stocks in Southeast Greenland in jeopardy.

The narwhal is regarded as the most sensitive of all Arctic endemic marine mammals to climate change because of its adaptations to a narrow sea-temperature niche, dependence on sea ice, specialized feeding habits, relatively restricted range, and general sensitivity to ocean noise and other forms of anthropogenic disturbance (*1*). It is vital for authorities in Greenland to accept scientific advice regarding regional narwhal population declines and take the need for responsible management seriously. Given the extreme site fidelity of narwhals (*1*), individuals from other populations are unlikely to recolonize localities where the species has been extirpated. The loss of a local narwhal population from a specific fjord system is likely to be permanent.

**M. P. Heide-Jørgensen[1,2]*, E. Garde[1,2], R.G. Hansen[1,2], O. M. Tervo[1,2], Mikkel-Holger S. Sinding[3], L. Witting[2], M. Marcoux[4], C. Watt[4], K. M. Kovacs[5], R. R. Reeves[6]**
[1]Greenland Institute of Natural Resources, DK-1401 Copenhagen, Denmark. [2]Greenland Institute of Natural Resources, DK-3900 Nuuk, Greenland. [3]Smurfit Institute of Genetics, Trinity College Dublin, D02 DK07 Dublin, Ireland. [4]Fisheries and Oceans Canada, Central and Arctic Region, Winnipeg, MB R3T 2N6, Canada. [5]Norwegian Polar Institute, Fram Centre, 9296 Tromsø, Norway. [6]International Union for Conservation of Nature Species Survival Commission Cetacean Specialist Group, Okapi Wildlife Associates, Hudson, QC JOP 1HO, Canada.
*Corresponding author. Email: mhj@ghsdk.dk

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# Wildfire debate needs science, not politics

The causes of unprecedented wildfires and their impacts on all forested continents are increasingly the subject of discussion. Proper understanding and management of wildfires are crucial to safeguard human lives and to achieve the United Nations' target of "halting and reversing the degradation of ecosystems worldwide" (*1*). However, the insights obtained from scientific research are largely off the public radar compared with the lighthearted, but often biased, opinions of politicians [e.g., (*2*, *3*)]. This is wrongly giving the public the impression

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that we understand little about wildfires and that intensifying wildfire regimes are a surprise. Decades of research, especially after major wildfires such as the 1988 Yellowstone fires (*4*) and 2009 southern Australian wildfires (*5*, *6*), have created a vast body of knowledge that politicians are disregarding in favor of opinions. To address these increasingly destructive wildfires, the public debate and resulting policy response must be based on science.

Historically, neglecting the role of fire in ecosystems and as a positive driver of biodiversity has produced policies that lead to more fire and ecosystem degradation. Widespread fire suppression has produced landscapes with high fuel loads that exacerbate future fires (*4*). Removing burnt trees in the name of restoration has impaired the recovery of ecosystem functions and biodiversity (*7*). Creating even-aged, monospecific conifer plantations for silviculture has increased fire spread and imperiled regeneration potential (*8*).

There is considerable scientific consensus on the importance of fire for ecosystems, species evolution, and society (*9*), as well as on the feedbacks between human land use, changes in wildfire regimes, ecosystem responses, and impacts on human society (*4*, *5*, *10*). We have also learned that climate change interacts with wildfires in multiple ways, for instance by extending the fire season and increasing the frequency of dry years (*11*). Recent wildfires in Australia, California, and South America exemplify how protracted drought magnifies fire propagation and intensity, leads to fire spreading to nonflammable ecosystems, increases smoke that impairs human health, and undermines the capacity of ecosystems to recover (*10*, *12*). Scientific research has promoted policies for a healthier coexistence with fire [e.g., (*4*, *5*, *10*)], including the use of prescribed fire to simulate natural processes and the creation of heterogeneous landscapes in restoration programs to enhance regeneration in case of fire.

Wildfires and droughts will likely transform landscapes and our relationships with them. Whereas research generates knowledge and helps identify new policies to deal with wildfires, recent public debates politicize their causes and consequences by blaming political opponents. These distracting arguments risk setting back the policy advances that have already been made. We advocate a stronger scientific platform to inform public debates about wildfires. Greater promotion of science can improve understanding and management of the ecosystems that face intensifying fire regimes globally.

**Alexandro B. Leverkus[1,2]*, Simon Thorn[3], David B. Lindenmayer[4], Juli G. Pausas[5]**
[1]Departamento de Ecología, Facultad de Ciencias, Universidad de Granada, 18071, Granada. [2]Laboratorio de Ecología, Instituto Interuniversitario de Investigación del Sistema Tierra en Andalucía (IISTA), Universidad de Granada, 18006, Granada, Spain. [3]Field Station Fabrikschleichach, Department of Animal Ecology and Tropical Biology, Biocenter, Universität Würzburg, 97070 Würzburg, Germany. [4]Fenner School of Environment and Society, Australian National University, Canberra, ACT 2601, Australia. [5]Centro de Investigaciones sobre Desertificación (CIDE-CSIC), 46113 Montcada, Valencia, Spain.
*Corresponding author. Email: leverkus@ugr.es

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# "Forest mismanagement" misleads

Politicians (*1*) and journalists (*2*) have attributed the increased size and intensity of U.S. western wildfires to "forest mismanagement," an ambiguous term that implicates resource managers. To reduce the risk of damage from wildfires, we must understand the constraints on responsible forest management and work to overcome them.

Resource managers face a range of obstacles to science-based solutions to extreme wildfire. Harvesting trees remains both ecologically problematic and socially unpopular (*3*). Removing dense, small, low-value trees requires economic subsidies (*4*). Biomass production struggles to become economically viable (*5*). Let-burn wildfire policies carry risks (*6*). Intentionally set, prescribed fires face regulatory hurdles from smoke-generated pollution (*6*). Increasing any active management option faces economic, social, and regulatory barriers.

In addition, wildfire is not just a conifer forest issue. Most of California's largest and most damaging wildfires have been in regions dominated by non-forested habitats (*7*) and lacking in commercial timber operations (*5*, *8*). Attributing recent wildfires to "forest mismanagement" fails to acknowledge the limits of forest resource managers in addressing the full range of fires.

Meanwhile, U.S. public land management agencies are budget starved. Appropriated Forest Service budgets over the past 25 years have shifted from proactive forest management to reactive fire operations (*9*). To empower resource managers to implement evidence-based policies, legislators must provide agencies with funds to support management actions at sufficient scales.

The state of California and the U.S. Forest Service recently made progress by signing a memorandum of understanding that would expand forest treatments to 1,000,000 acres/year (*10*). However, successfully addressing wildfires will require rethinking our social responses to forest management. We may have to embrace increased timber operations, accept more smoke, and modify built communities to tolerate fire as a natural ecosystem process. Labeling a complicated decision-making process as "forest mismanagement" oversimplifies, obfuscates, and politicizes an issue that we cannot afford to misunderstand.

**Mark W. Schwartz[1]*, James H. Thorne[1], Brandon M Collins[2], Peter A. Stine[3]**
[1]Department of Environmental Science & Policy, University of California, Davis, Davis, CA 95616, USA. [2]Center for Fire Research and Outreach, University of California, Berkeley, Berkeley, CA 94720, USA. [3]Retired, Pacific Southwest Research Station, U.S. Department of Agriculture Forest Service, Richmond, CA 94804, USA.
*Corresponding author.
Email: mwschwartz@ucdavis.edu

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**COMPETING INTERESTS**

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