LETTERS

*Edited by* **Jennifer Sills**

# *Hunted carnivores at outsized risk*

IN THEIR REPORT "The unique ecology of human predators" (21 August, p. 858), C. T. Darimont *et al.* explain that human predation pressure is considerably higher on large carnivores compared with other faunal groups. Evolutionarily speaking, the high predation pressure exerted by humans is a very recent phenomenon for large carnivores (*1*, *2*). As a result, the impact of human predation is even more severe than the number of removed animals suggests. However, despite increasing evidence, indirect impacts of killing apex predators are still commonly overlooked when managing large carnivores.

Mesocarnivores and herbivores have typically evolved under continuous predation pressure throughout their evolutionary history and have, in response, developed various phenotypical, behavioral, and life-history adaptations to predation (*3*, *4*). On the contrary, because of the apex position of large carnivores in trophic webs (*2*), this group has not faced the same predation evolutionary pressure and is thus expected to be less adapted to high predation. This may explain the extirpation of large carnivores in many regions of the world when compared with mesocarnivores (*2*).

Human killing of large carnivores has been associated with several undesirable side effects for surviving members of the mutual social groups or related individuals. Examples include increased levels of infanticide following shooting of breeding male lions (*5*) and brown bears (*6*), disrupted dispersal patterns in leopards (*7*), and increased hybridization or disrupted social structure in wolves (*8*, *9*), with further consequences in human-predator conflicts (*10*).

If we want to restore healthy, functioning ecosystems and the services they provide, we must implement effective measures such as banning hunting around breeding periods and preventing removal of key members in social groups. Only by integrating such strategies can we mitigate undesirable side effects of hunting.

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OUTSIDE THE TOWER

# Repainting citizen science

How do colors affect attention and learning? Could repainting a classroom improve the learning of the students within? These were the questions asked by students of Molins de Rei High School in Catalunya, Spain. After seeing an online video posted by their class, we—two cognitive neuroscience researchers and one mediator—decided to help them find answers.

Most citizen-science programs are defined by researchers who invite citizens to contribute by collecting data (*1*). Some programs consider questions formulated by citizens, in cases where those questions are relevant for academic research [e.g., (*2*)]. But what if researchers involved citizens in the experimental part of the research? Engaging the public in hypothesis creation and testing can be beneficial for both parties: It anchors the research in an ecological setting, while stimulating citizens' curiosity and providing them with tools for critical thinking.

After helping the students refine their question, we taught them how to build a protocol and perform statistical analyses. We worked with them to replicate published data and then to design and perform original experiments in the school (*3*). Our preliminary results suggest that the influence of colors on learning varies between individuals and depends on baseline distractibility. We are working with the students on follow-up studies, and one of us (L.R.-S.) has initiated similar projects with adults (*4*).

Taking part in this process was empowering for the students, to the point where they became advocates of participatory research (*5*). In turn, they challenged our traditional way of doing research, urging us to think out-of-the-box and thus improve as scientists.

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Outside the Tower *is an occasional feature highlighting science advocacy projects led by scientists and citizen scientists. How do you advocate for science? Tell us at submit2science.org.*

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# *Policies undermine Brazil's GHG goals*

IN A BOLD move, Brazil has submitted to the 21st conference of the parties (COP21) in Paris an intended nationally determined contribution (INDC) to reduce by 2030 its greenhouse gas (GHG) emissions by 43% in relation to 2005. This target goes well beyond other developing countries and is above the pledge of the United States and not far from the proposal from the European Union, despite their greater historical responsibility. However, current policies and actions announced by Brazil are unlikely to be enough to meet the proposed GHG cuts from land-use change.

In order to meet its INDC, Brazil seems to assume that the end of illegal deforestation in the Amazon and the implementation of the market of environmental reserve quotas (CRA) are going to be enough to drastically reduce the country's total emissions from the land sector. But a close analysis of these policies shows otherwise.

Since 2012, farmers who do not have the required amount of Legal Reserve (mandatory private conservation area) can compensate by purchasing CRA offsets—titles to portions of forest located on properties that have more than the required Legal Reserve. In theory, this should limit the total deforestation, but there is a loophole. Depending on pending regulatory choices, the offset market could be flooded with 14 million hectares (Mha) of low-cost titles from private lands inside already protected areas and 38 Mha from Legal Reserves of small properties that are already protected by the Forest Code (*1*), meaning that no additional forests are saved. This allows farmers with forest debt to purchase cheap offsets while others can legally clear their own land.

Increased forest governance in the Amazon led to a substantial reduction in deforestation (*2*, *3*). However, this biome still has 12 Mha of native forests that could be legally deforested (*3*) and 39 Mha of undesignated land (*4*) open for land grabbing and new settlement projects. The situation is particularly worrisome in the Cerrado biome—the most coveted region for agribusiness expansion—where 80% of the private property can be legally deforested. Deforestation in the Cerrado currently contributes to 26% of emissions from land-use change and is expected to increase because the biome contains 40 Mha (of which 11 Mha are highly suitable for soybeans) that could be legally deforested (*3*, *5*). Therefore, enforcement of the Forest Code unaccompanied by additional conservation policies, such as payment for ecosystem services and protected area expansion, is unlikely to curb emissions from deforestation to the levels promised by Brazil's INDC.

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## TECHNICAL COMMENT ABSTRACTS

### Comment on "Crystal structures of translocator protein (TSPO) and mutant mimic of a human polymorphism"

***Jimin Wang***

Li *et al.* (Reports, 30 January, p. 555) reported on a crystal structure for a translocator protein (TSPO) from *Rhodobacter sphaeroides* in which some of the electron density is modeled as a porphyrin. The analysis of the x-ray data discussed here suggests that this assignment is incorrect.

Full text at http://dx.doi.org/10.1126/science.aab1432

### Response to Comment on "Crystal structures of translocator protein (TSPO) and mutant mimic of a human polymorphism"

***Fei Li, Jian Liu, Yi Zheng, R. Michael Garavito, Shelagh Ferguson-Miller***

Wang comments that the diffraction data for the structure of the A139T mutant of translocator protein TSPO from *Rhodobacter sphaeroides* should be used to 1.65 instead of 1.8 angstroms and that the density interpreted as porphyrin and monoolein is better fitted as polyethylene glycol. Although different practices of data processing exist, in this case they do not substantially influence the final map. Additional data are presented supporting the fit of a porphyrin and monooleins.

Full text at http://dx.doi.org/10.1126/science.aab2595