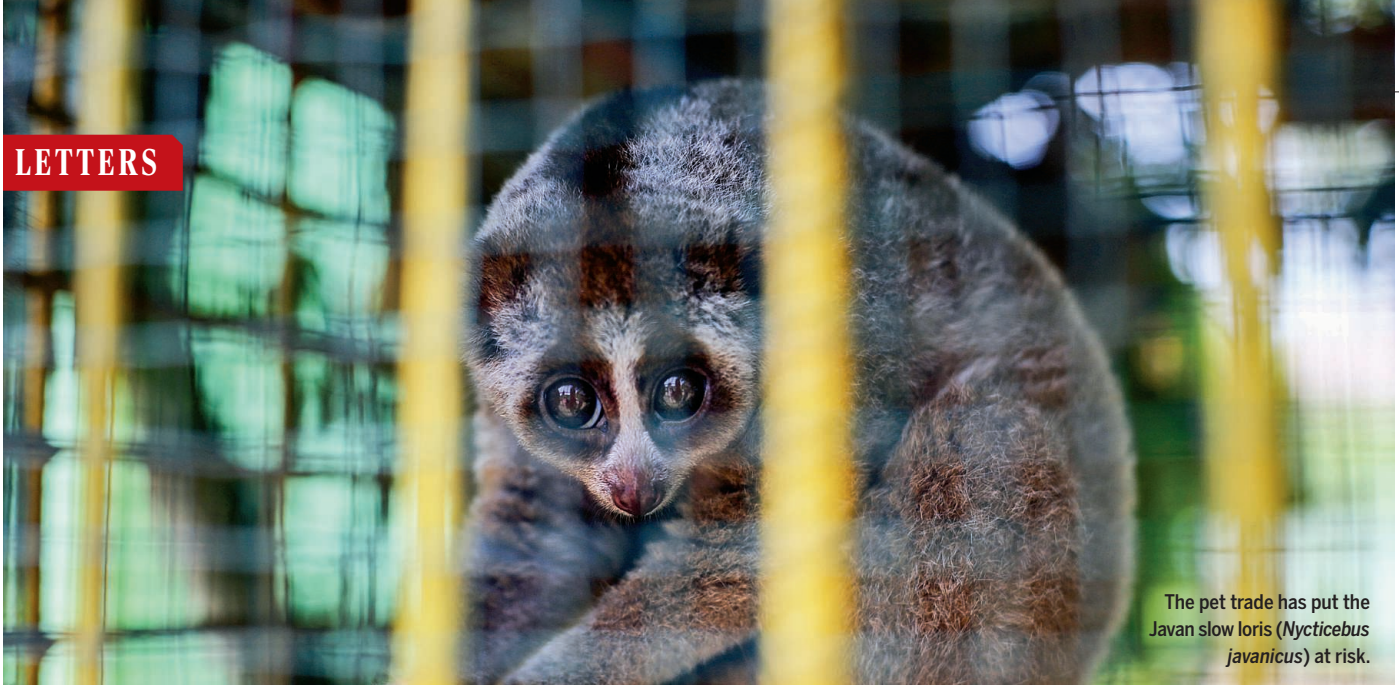

The pet trade has put the Javan slow loris (*Nycticebus javanicus*) at risk.

Edited by **Jennifer Sills**

The pet trade's role in defaunation

In their Report "The impact of hunting on tropical mammal and bird populations" (14 April, p. 180), A. Benítez-López and colleagues quantify the global impact of hunting on defaunation. However, hunting is only one side of the defaunation crisis. Nonlethal take, particularly wild capture for the pet trade, is a frequently overlooked component of defaunation; its victims end up in living rooms, not stomachs. For birds, primates, tropical fish, amphibians, and reptiles in certain areas, such as Asia, Latin America, and Madagascar, capture for the pet trade may result in depletion of a much wider swath of species than hunting (*1*–*3*). One recent study (*3*) found that the pet trade in Indonesia was a major driver of declines in the local bird community, independent of the effect of hunting for consumption. In some cases, species such as the Javan slow loris (*Nycticebus javanicus*) and Spix's macaw (*Cyanopsitta spixii*) have been pushed to the brink of extinction due to the pet trade (*4*).

It is not surprising that many studies of defaunation exclude nonlethal take from their analyses. The pet trade in wild animals is ubiquitous, notoriously difficult to monitor, and therefore understudied (*3*). Benítez-López and colleagues quantify sobering worldwide impacts from hunting. If they included nonlethal consumption as well, these numbers would almost certainly be even more grim, and they would encompass a much wider range of species. Unless we study the collective impacts of defaunation, we will not know what we are losing until it's gone.

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Sex matters: Report experimenter gender

There is a replication crisis spreading through the annals of scientific inquiry. Some research groups report that attempts to replicate published data in biomedical science fail more often than they succeed (*1*), and a recent paper in *Science* revealed that of 100 articles published in high-ranking psychology journals in 2008, less than half of the original findings were successfully replicated (*2*). Many factors can alter participants' responses (*3*); however, a frequently overlooked variable that likely perpetuates this ubiquitous problem is the role of experimenter gender.

Research involving human subjects often includes interactions between the participants and an experimenter who conducts interviews, provides instructions, or administers drugs. Many researchers fail to record the experimenter's gender when they report the results of the study. Yet a

substantial body of evidence shows that the experimenter's gender influences a wide variety of study end points, including physical performance, mental acuity, hormone levels, social behavior, and pain sensitivity (*4*–*8*). Results skewed by the experimenter's gender may lead the scientific community to conclude that therapeutics or other interventions are either over- or undertreating a variety of conditions. Worse still, this lack of bookkeeping on such a simple factor may degrade the reproducibility of study results.

It would be a step in the right direction for scientists to take it upon themselves to record and report experimenter gender. However, relying only on the researchers to self-impose this standard is misguided. Instead, researchers could be required to report the planned experimenter gender to an open-access database before running the experiment. Alternatively, scientific journals could impose the requirement, which should provide a healthy incentive structure. Whichever approach is chosen, enforcing these standards will not only help to address the current replication crisis, but also ensure increased scientific integrity in the future.

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Chemical safety must extend to ecosystems

In their Policy Forum "Policy reforms to update chemical safety testing" (10 March, p. 1016), A. E. Nel and T. F. Malloy highlight the value to human health of recent reforms to the Toxic Substances Control Act, which is administered by the U.S. Environmental Protection Agency (EPA). The Act regulates the introduction of new or already existing chemicals to prevent "unreasonable risk to health or to the environment." Traditionally, toxicity tests are based on whole-organism studies that determine end points such as the lethal concentration that kills 50% of test animals (LC_{50}). The reforms encourage alternative testing strategies such as the adverse outcome pathway paradigm, which seeks to link in vitro quantification of molecular initiating events at the cellular level to an adverse outcome, such as disease.

We agree with Nel and Malloy that because of the thousands of chemicals in use, the EPA should embrace alternative testing strategies to increase the rate that chemicals are screened for safety to humans. However, the mission of both the EPA and the Toxic Substances Control Act is to protect not only human health but also the environment, which includes nonhuman organisms and the habitats in which they reside. Adverse outcome pathways predominantly describe suborganismal processes, and thus they alone are unlikely to accurately predict the impacts of chemicals on ecosystems (*1*, *2*). We emphasize the ongoing importance of toxicological research focused on understanding effects at higher levels of biological organization, such as whole-organism studies (*1*).

In addition to protecting ecosystems for their inherent value, humans must preserve the environment for the sake of human health. Functioning ecosystems provide humans with clean water, food, resources for shelter, natural medicines, and protection against pests and human pathogens (*3*, *4*). Despite increasing evidence for the codependence of human and environmental health (*3*, *4*), EPA funding for research on the ecological effects of chemicals has declined precipitously in the past few decades (*5*). The current political environment poses an even greater threat to continued funding. As Toxic Substances Control Act reforms are implemented, researchers must determine the extent to which alternative testing strategies, such as adverse outcome pathways, can reliably identify risks to populations, communities, and ecosystems. If they fall short at these higher levels of biological organization, then researchers should use strategies that do produce such data to ensure that policies meet the goal of protecting both health and the environment (*1*).

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Editor's Summary

The pet trade's role in defaunation

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