Comments on the current state of knowledge regarding giant snake risks and proposed rule changes
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Who am I?
It is critical to briefly introduce myself and provide my credentials. I am an Associate Professor in the School of Life Sciences at Arizona State University. I am an environmental physiologist whose research examines how organisms cope with environmental challenges and thus I have considerable knowledge about organism-environment interactions, a relationship that is vital to understanding species distribution patterns. My research focuses on lizards and snakes, and I currently maintain a sizable research colony of pythons, including some of the giant species. Thus, I feel qualified to provide helpful comments on the threat of giant snakes to our native wildlife. What is presented here is strictly my personal comments and does not necessarily reflect the position of my University.

What do we know about the risks posed by giant snakes on native wildlife?
What we do know is simply that multiple species of large boas and pythons have established breeding populations in southern Florida. However, we do not know what risks these populations pose to the local wildlife community or to wildlife communities throughout the United States (U.S.). Proposed rule changes are mainly attempts to prevent additional colonizations of exotic giant snakes, so my comments will focus on that issue rather than the likely impact of these snakes on the wildlife communities in which they are established. This is in no way an effort to discount the importance of the latter issue.

Two recent computer modeling efforts have taken environmental characteristics of the native distribution of one or more giant snake species to predict suitable habitat for these species within the U.S. Unfortunately, the two models make remarkably different conclusions about the vulnerability of the U.S. to colonization. Since the vulnerability to invasive snake colonization is critical in making both political and biological management decision, the discrepancy between the model results must be carefully assessed. The USGS report by Reed and Rodda should be commended for its heroic effort in assembling known information about the species in question. However, the mere size of the report should not in itself dictate the appropriateness of its conclusions.

The report authors acknowledge that, by limiting their model variables to mean monthly temperature and mean monthly precipitation, their habitat suitability model does not include many variables known to influence species distribution, including climatic extremes, vegetative assemblages, and predator and prey abundance to name but a few. For example, while snakes are quite adept at going long periods without eating, the large size of the giant snakes requires a reasonable presence of suitable medium and large prey species. While like available in the climatically friendly environs of southern Florida, such prey resources do not exist in more challenging environments such as the deserts of the American Southwest (this likely explains the maximum sizes of native desert snakes species to be under 1.5 meters, and typically well under one meter). Regardless of this realization, the USGS report predicts these deserts, or at least parts of them, to be suitable habitat for both Burmese pythons and boa constrictors. Furthermore, Boa constrictors are native to Mexico but their northern distribution abruptly ends where the tropical deciduous forest and tropical thornscrub give way to Sonoran Desert. While this distribution is strong evidence that boa constrictors cannot tolerate southwestern deserts, the suitability map for this species includes wide expanses of Chihuahuan Desert and Upland Arizona habitat within the Sonoran Desert. These are but two examples that demonstrate the critical need for species to be well-adapted to their environment. As a result species distributions are often restricted by subtle differences in environmental conditions. In fact, few native U.S. species have a distribution that mimics that proposed as suitable habitat for Burmese pythons, and those few that do have such expansive ranges consist of multiple subspecies across that distribution. No introduced reptile maintains such a wide distribution in the U.S., with the most widely distributed species being the Mediterranean gecko, a species that mostly inhabits human dwellings rather than the natural habitat across its distribution.

The USGS report states that the Burmese python is exceptional among the giant snakes in its ability to tolerate cold weather. The relative nature of this statement has been demonstrated by the recent cold snap that hit the southeastern U.S. While the cold was atypical it was not unheard of for the region, and its impact on Burmese pythons is worthy of mention. After the cold spell, about 50% of the pythons found in southern Florida were dead and all pythons housed in outdoor enclosures at a research facility in northern Florida died. The sensitivity of the species to this extreme weather event in Florida questions the likelihood of persistent python populations in areas of the U.S. included in the report as suitable habitat yet where such weather events are much more frequent.

While space limits the numbers of examples, these few provide ample evidence to be concerned that the suitability maps provided within the USGS report are overly generous. The alternate model developed by Pyron and colleagues uses a greater complexity of environmental characteristics and limits the suitable

habitat for the Burmese python within the continental U.S. to the extreme tip of Texas and southern Florida. Noteworthy, despite its extremely limited prediction of suitable habitat, the model does include the Everglades, the lone location of an established population in the U.S.

My intention is not to attack the extraordinary effort put into the USGS report by its authors. The report is an enormous contribution to the assessment process, but it does not provide sufficient justification to implement policy changes. Instead, the report should be considered a critical starting point from which we need to further synthesize what data exist and collect the additional data that are needed.

How might the proposed the rule change impact giant snake colonization in the U.S.?

Even if we assume the unlikely scenario that the suitability maps in the USGS document are reasonably accurate, only two species (Burmese python, boa constrictor) include areas of the continental U.S. other than peninsular Florida and southern Texas. Thus, limiting interstate movement of seven of the species would be of little to no value, since (1) they would be unable to establish populations in the vast majority of the country, and (2) the predominant at risk state for invasion is Florida, where most of these species have already been collected in the wild. The question then becomes whether limiting interstate travel of Burmese pythons and boa constrictors would reduce the risk of their colonization in the U.S. These two species account for 82% of the 1.1 million giant snakes imported over the last 30 years. Furthermore, both of these species are the mostly wildly captive bred of the giant snakes with the USGS report stating that domestic production of the Burmese python likely produces as many or mores snakes than the number imported. Given the considerable number of animals imported over the last 30 years and the high domestic production, is it safe to assume that these two species are already widely distributed in homes across the U.S. Thus, limiting interstate movement would not keep these species out of any areas. U.S.G.S. scientists have publicly claimed that restricting transport of these animals will raise the value of domestically produced snakes and thus reduce the number released into the wild. This contention deserves critical evaluation as the travel restriction will reduce the customer market and thus likely create local overabundances of stock. Considering these points, the proposed ban may actually increase rather than decrease colonization opportunities (i.e., release of unwanted animals into the wild). Such a counter effect must be thoroughly considered and assessed prior to making any rule changes.

Concluding remarks

Sensationalizing the real problem (i.e., the established population of non-native snakes in southern Florida) by expanding its threat from a relatively remote and sparsely populated part of the country and into the backyards of a significant proportion of U.S. resident provides good media headlines, but fails to provide any value to the leadership that is empowered to protect our native lands and wildlife. Considering legislation to prevent the highly unlikely colonization of giant snakes throughout the U.S. only detracts us from focusing on evaluating and implementing management plans for the exotic populations of snakes in southern Florida. While the authors of the USGS report did a commendable job is assembling together what is known about these species, we have insufficient information to create an optimal eradication strategy for southern Florida, let alone make an accurate risk assessment for the country. We are need of much greater information about the physiological ecology of these species, especially those known to have established populations in southern Florida. Such critical information that remains a mystery includes thermal and hydric tolerances, physiological buffering capabilities, and water and energy budgets of these species. With such data we will be better equipped to distinguish the reality from the hype, and thus develop political and biological strategies that will be most effective. I highly suspect that such data will reveal extremely minimal risk to the vast majority of the country, considerable but non-catastrophic impacts of the exotic snake populations in southern Florida, and a Herculean challenge to resolve the Florida problem. However, we need the data to substantiate these predictions. While it is imperative that we not turn our heads and ignore the potential risk of giant snakes to our wildlife, it is equally important that our political and biological management decisions move forward at a rate that does exceed the rate at which necessary data can be collected and synthesized to assure the appropriateness of our decisions. The concern regarding the impact of introduced giant snakes is real and deserving of attention, but, at this time, the attention must be on gathering information rather than on prematurely enacting legislative changes that may hinder rather than benefit our goals.

Sincerely,

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