

MANAGING THE RISK OF REPTILES - A CLOSER LOOK

Scott Hardin, PIJAC Science Advisor

Vincent Russo, Cutting Edge Herpetological, Inc.

Michael Cole, Ballroom Pythons South

FOREWORD

This is the second in a series of PIJAC White Papers addressing the management of risks associated with the pet trade. The first White Paper, “From Bottom to Top,” proposed a framework for the development of regulations for captive wildlife, i.e., non-domesticated species held as pets or for public display. In this paper we focus specifically on reptiles and concerns often voiced regarding reptile ownership.

The reptile industry in the U.S. has grown substantially over the past 25 years. In the most recent survey (2009), nearly 5 million households owned over 13 million reptile pets, and annual industry revenues now surpass \$1 billion¹. This growth has been fueled largely by captive bred animals and improved husbandry practices for all categories of pet reptiles. In particular, the development of a wide variety of color morphs has captured the interest of breeders and pet owners. Many of these popular reptiles have been captive bred for many generations and bear similarities to domesticated species. While domestic captive breeding has surged over the past decade, reptile imports have decreased: as of 2009, U.S. reptile exports outnumbered imports by roughly 10:1².

Although turtles far outnumber other reptiles as pets, snakes often dominate public conversations on regulating ownership of reptiles. No doubt, this apprehension is rooted in a natural fear that many have for snakes, along with the exotic origins of many popular species. Many laws, ordinances and regulations to prohibit or severely restrict the ownership of reptiles reflect a lack of awareness of the diversity of animals in trade and a misunderstanding of the nature of the risk to humans or other animals. Unfortunately, this information deficit is often manifested in all-or-nothing regulatory proposals, such as prohibition on ownership based on length (e.g., snakes longer than 6 feet), origin (non-native), or behavior (constrictors). In some instances, certain reptiles have been included in legislation to restrict ownership of “dangerous animals” despite substantial behavioral and size differences between large snakes and large carnivores.

As we point out in the first White Paper, regulations are one of several elements of risk management. The proper approach is first to assess the nature of risks posed by classes of reptiles, followed by an examination of relevant risk management options, which may include

¹ The Modern Reptile Industry. Report commissioned by the U.S. Association of Reptile Keepers, Ariel H. Collis, M.A. and Robert N. Fenili, PhD., authors. Georgetown Economic Services, LLC, Economic Analysis Group. May 12, 2011. 93 pp.

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outreach, voluntary best practices, education and certification programs. We believe it is critical to involve stakeholders from the reptile community in this process; their knowledge of reptile behavior and husbandry can contribute essential insights to develop balanced programs that manage risk at acceptable levels while allowing the enjoyment of this fascinating class of animals.

WHAT ARE THE RISKS?

Harm to Humans

The most common concern about reptiles is their ability to harm humans. Because of their size or venom, some snakes and a few lizards are capable of causing serious injury or death. The vast majority of reptiles, native and exotic, pose little to no risk of injury. Length is not necessarily an indicator of elevated risk of serious injury, e.g., scrub and amethystine pythons may exceed 12 feet as adults but are relatively light-bodied. Some larger lizards pose little risk of injury due to their mild temperament; several large-bodied monitors (e.g., water monitors, white-throated monitors, Savannah monitors— see the table below) will retreat rather than stand their ground with nearby humans.

In the hands of inexperienced or careless keepers, large exotic constrictors are capable of causing serious injury or death. In the family Pythonidae, reticulated pythons, Burmese pythons, northern and southern African pythons (also known as rock pythons) are heavy-bodied snakes that commonly exceed 12 feet as adults and must be handled and housed with special precautions. Among these species, Burmese and reticulated pythons were more popular than other large constrictors in the pet trade, in part because of the development of attractive color morphs. Green anacondas are far-and-away the heaviest member of the Boa family. Other anacondas (yellow anaconda, Bolivian or Beni anaconda, dark-spotted or Deschauensee's anaconda) do not approach 12 feet in length. Contrary to public perception, most Boa constrictors are not among the largest snake species. True red tail Boas average less than eight feet as adults and rarely exceed 10 feet; common boas are smaller with some Central American types averaging five feet in length. Among the large lizards (Nile, water and Savannah monitors); the primary risk from these species is bacterial infection from an untreated bite or scratch often resulting from careless handling or attempting to capture an uncaged animal³.

There are many reptiles (native and non-native) whose venom is considered to be medically significant, i.e., commonly causing serious injury or death⁴. These species pose a legitimate danger if handled improperly. Several snake genera and one lizard genus (beaded lizards and Gila monster) have venom that is potent enough to immobilize their prey but which is medically

³ The Komodo monitor (or Komodo dragon) is the only lizard large enough to seriously injure or kill a human. However, this Indonesian lizard (listed as endangered under the Endangered Species Act) is possessed exclusively by zoos in the U.S. and is not in the pet trade.

⁴ In rare instances, allergic reaction to venom may lead to serious medical consequences; otherwise, envenomation by the species listed would be inconsequential.

inconsequential to humans. A list of these “Technically Venomous Reptiles” is available at PIJAC.org.

Harm to the Environment

A second concern is adverse environmental impact, either from over-collection of native species or from the introduction and establishment of non-native species. Regulations for the collection and possession of native reptiles were uncommon a generation ago, but today most states restrict the harvest and possession of many species whose abundance has apparently declined. In many cases, the primary cause of declining reptile populations is habitat destruction or alteration through human activities, which may exacerbate the impact of collection for personal use or breeding. Because of their typically solitary nature and cryptic markings, it is very difficult to get good estimates of abundance of many reptiles, leading conservation agencies to adopt a cautious approach. This is particularly evident for native turtles, where loss of habitat has led to protection of suites of species.

Among the theoretical consequences of non-native reptiles are the loss or reduction in native species through predation or competition; introduction or spread of parasites or diseases; and genetic “contamination” through interbreeding with native species. For such impacts to be realized, a series of events must take place. Of primary consideration to risk managers, the non-native reptile must be capable of surviving in the local climate. Many non-native reptiles are tropical and sub-tropical species that cannot survive extreme winter temperatures except in a few areas of the U.S. In addition to the temperature barrier, humidity and other habitat requirements are seldom met for tropical animals. In most jurisdictions within the U.S., these limiting factors eliminate concern over impacts to native species.

Natural hybridization is uncommon because of differences in genetic makeup at the genus and species level, along with reproductive behaviors between species. These barriers are more difficult to overcome at higher taxonomic levels, i.e., animals within different genera rarely produce viable offspring and hybrids between species in different families are even more unlikely. Many exotic pets are only distantly related to native species, making hybridization with wild animals very unlikely. However, introduction of subspecies may present a risk of genetic contamination, e.g., red-eared sliders will interbreed with yellow-bellied sliders, and the State of Florida has regulated possession of the former subspecies to address this threat.

Non-native reptiles may host exotic parasites and diseases, which in turn may harm native species if introduced. A noteworthy example are exotic ticks that parasitize certain African and South American reptiles. The ticks are problematic because they may harbor bacteria that cause Heartwater Disease, a significant disease of cattle on other continents that is not found in the U.S. In response to this threat, the pet industry developed best management practices to minimize the risk of introduction of the parasite and the disease (see below).

ASSESSING THE RISKS

It is critical to distinguish the nature of the risks posed by large constrictors and venomous reptiles from those for species typically characterized as dangerous. For example, an uncontained large carnivore or primate is inherently dangerous by virtue of its size and behavior. By contrast, snakes are ambush predators that do not pursue their prey, nor are they capable of inadvertently harming humans as, say, a tiger, rhinoceros or orangutan. Large monitor lizards are not aggressive and will retreat from a potential encounter with humans; water monitors commonly bask in a crowded public park in Asia without incidents⁵. Minimum facility standards to protect the public from the potential danger of many large zoo animals are not necessary for reptiles, even for large constrictors and venomous species. From a risk management perspective, restrictions on possession and exhibition of reptiles merit their own category, rather than under the catch-all title of “dangerous animals.”

In similar fashion, assessing environmental risks of captive reptiles is not a “one size fits all” proposition. Adverse impacts from released or escaped reptiles cannot occur without an established, reproducing population. Among the barriers to establishment is a suitable climate, with temperatures and humidity similar to conditions in the species’ native range. Many popular reptile pets are from tropical or sub-tropical regions and will not survive winters over much of the U.S.; in the desert southwest, the temperature range may be conducive but humidity is a limiting factor. Accordingly, “place-based” projection of risk is appropriate; i.e., the risk of establishment in Florida or Puerto Rico is quite different than for Maine or Wyoming.

Another requirement for establishment is an adequate number of sexually mature males and females released within a locality to breed successfully (also referred to as propagule pressure). In many cases, this is a significant hurdle to clear. Pet reptiles are not acclimated to life outside the captive environment and are unlikely to survive following release or escape. Most commercially captive-bred reptiles display some color or pattern anomaly rather than their natural camouflage, decreasing the chance for survival. Many species are held as single pets, and the chance of a “one-off” release finding a mate is very small. Not to be overlooked is the threat of human persecution: pet reptiles introduced to developed areas are likely to be removed or killed by humans, vehicular traffic or other companion animals. A more plausible scenario for survival and establishment is the release or abandonment of a group of animals as a result of an act of Nature, or perhaps by a breeder or wholesaler in personal difficulty and no longer able to care for their facility or broodstock.

There are different schemes and methods to project the likelihood of establishment and adverse impacts. Risk screens are designed to be done quickly and inexpensively, in a matter of hours or a few days. Risk assessments involve a more detailed examination of biology, climate matching and history of introduction and invasiveness, and may take weeks or months. Screens are a good first step in estimating risk, but the trade-off is a broad categorization (high, medium or low risk)

⁵ Hundreds of wild specimens can be observed daily in Lumpini park in downtown Bangkok with thousands of visitors walking nearby.

that may not include information relevant to a management decision. Screening projects have resulted in many species falling into the medium risk category, often necessitating further assessment.

MANAGING THE RISKS

Risk analysis takes the screening and assessment phase a critical step further, adding the dimension of risk mitigation: management actions to reduce the likelihood of adverse impacts to an acceptable level. Mitigation may take the form of regulations, best management practices, third party certifications, industry codes of conduct and education/outreach. Although regulations are the province of government, some mitigation options may be developed and implemented by industry, while others may be joint public-private sector initiatives.

When the subject of reptiles reaches the political sphere, however, restrictive regulations often are perceived as the singular approach to reduce risk. Unfortunately, this attitude ignores the fact that the primary mitigation tool for managing the risk of reptiles is knowledge. Successful breeders have a thorough understanding of appropriate care, including proper habitat, temperature, lighting, diet, health and treatment of illness. Imparting this knowledge to aspiring producers and pet owners will mitigate many of the concerns regarding reptiles. Further, education and outreach programs that effectively communicate the potential consequences of introducing a non-native animal into the wild play a prominent role in reducing the risk of environmental harm.

We advocate including representatives from the reptile community, including members of local herpetological societies, throughout the risk analysis process. Breeders' knowledge of the temperature and humidity requirements, diet, adult size, reproductive habits and general behavior are fundamental to the development of a comprehensive program to promote the welfare of captive animals and to manage the risks of reptile ownership. Their experience can provide guidance for bio-security measures to prevent escape, and their insights into basic biology can facilitate assessment of the risk of a species successfully reproducing and establishing a population in a particular region.

Regulations on possession are appropriate for certain categories of reptiles with greater potential of causing harm to humans or the environment. However, regulations should reflect the importance of appropriate knowledge and experience rather than being cast as simplistic fiat denying ownership to properly qualified individuals and institutions. In more succinct language, the question is *not* whether a reptile should be eligible for personal possession, but what is necessary for a reptile to be reasonably possessed without undue risk to others?

Too often, regulatory proposals attempt to classify certain reptiles as "off limits" for personal possession, without regard for the qualifications and facilities of many keepers that mitigate concerns over human safety and environmental damage. Secure containment (permanent enclosures and during transport), safe handling and disaster contingency plans can be tailored to the species held, effectively minimizing risks for the larger constrictors and venomous reptiles.

In some cases, regulations for the possession of captive animals are entirely prescriptive, detailing enclosure dimensions, configurations, and densities. Although this approach may be intuitively satisfying to the public, overly detailed regulations may result in the keeper focusing on the regulatory specifics and not paying adequate attention to the bigger picture, i.e., are the animals and the facility secure? Considering the incredible diversity of reptiles and their habitat requirements, less prescriptive measures may be a more effective risk management tool.

Best management practices that identify broader objectives (e.g., adequate space, appropriate environment, interior and exterior biosecurity) provide the keeper with more flexibility without increasing risk. When best management practices are incorporated into a regulatory framework, it is essential that government enforcement and administrative staff have an understanding of reptile care and husbandry. A working relationship between regulatory agency personnel and the reptile community is essential for exchanging knowledge and managing risk.

CONSIDERATIONS FOR RISK MANAGERS

As is the case with other captive wildlife species, reptiles can be grouped into risk categories, (generally high, medium or low), preferably following a risk assessment. Management options should reflect the risk of the reptile category, e.g., public safety measures are unnecessary for smaller species that pose no threat to humans. Many popular species have been in the pet trade for decades without evidence of established populations, in part because of climate barriers in most of the U.S.; here again, regulatory intervention is unnecessary for such species in most jurisdictions.

Medium-risk reptiles pose a moderate danger to humans or have an elevated likelihood of establishing a population that may adversely impact native wildlife. Managers should consider a variety of mitigation options, including moderate biosecurity requirements, documentation of knowledge and experience, voluntary best management practices and education/outreach.

A small group of large constrictors and venomous species merit additional risk management due to the possibility of serious human injury or, in some regions, environmental impacts (such as preying on native wildlife). For this group, regulations may be the principal risk mitigation tool, although non-regulatory approaches may be used to further decrease risk. The primary considerations are secure containment (for permanent enclosures and during transport) and safe handling, which reduces the chance of injury and environmental harm.

A risk mitigation option for all classes of reptiles (and other non-native species) is a pet surrender program, which provides an alternative to release for owners who no longer wish to care for their animals. Surrender programs may be event-oriented, such as Florida's Pet Amnesty Program, or established as a continuous network of qualified (or permitted) individuals available to receive and care for unwanted exotic pets.

The following tables illustrates risk management options for three different categories of reptiles based on risk assessment results. The vast majority of reptile pets will be low risk, and the species listed are selected examples of some of the more popular species. The list of medium risk reptiles is not exhaustive but contains examples of species for which additional risk management is appropriate. There are few reptiles that pose a high risk of harm to humans or the environment; the list covers virtually all the species that merit significant restrictions on possession and documentation of the requirements for ownership.

It is important to note that the risk of certain species depends on location. Species that pose a risk of environmental harm in regions with mild climate may be of less concern in areas with harsh winters. For example, Nile monitors are known to eat the eggs of crocodilian species that are limited to a few areas of the U.S.; consequently, Nile monitors are a high risk species in Florida and similar areas but would not be a similar threat in most states. A risk screen or risk assessment is an essential tool to properly categorize reptiles based on geography.

| Risk Assessment Category | Risk Management Options | General Description | Example Species |
|--------------------------|---|---|--|
| LOW | <p>Outreach/messaging at point of sale on proper care, not releasing into the wild</p> <p>Care sheet provided at sale</p> | <p>Non-venomous native species</p> <p>Small-bodied lizards</p> <p>Slender-bodied monitor lizards</p> <p>Slender-bodied snakes</p> <p>Mild tempered snakes</p> <p>Freshwater turtles</p> <p>Captive bred tortoises</p> | <p>Leopard gecko, Bearded dragon</p> <p>Chameleons, e.g., Jackson's, Veiled, Panther, Skinks</p> <p>Tree monitors</p> <p>Australian, Asian and African monitors not listed in MEDIUM or HIGH risk</p> <p>Corn snakes, Milk snakes, King snakes</p> <p>Ball python</p> <p>Boas, e.g., Boa constrictor, Rainbow boa, Dumeril's boa,</p> <p>Freshwater turtles, e.g., painted, river cooter, mud, musk</p> <p>Tortoises, e.g., red-footed, yellow-footed, Russian, Hermann's, Greek</p> |

NOTES FOR LOW RISK SPECIES

- Education and outreach programs primarily target the hobby community; content, material and media should be a joint venture between reptile enthusiasts and regulatory or management agencies.
- Wild-caught native species subject to state harvest regulations; captive bred specimens available for most popular species (e.g., corn snakes, king snakes)

| | | | |
|---------------|--|--|---|
| MEDIUM | Best Management Practices for containment, handling, habitat, diet | Medium-bodied snakes | Yellow anaconda |
| | Knowledge & experience documentation | Longer, small-bodied snakes | Amethystine python Scrub python |
| | Enclosure security | Mild temperament, large-bodied lizards | Savannah monitor Water monitor White-throated monitor Black-throated monitor |
| | Education/outreach at point of sale | Medium-bodied lizards | |
| | No-cost Permit | Venomous lizards | Gila monster, Beaded lizard |
| | Care sheets provided at sale/transfer | | Dwarf caiman |

NOTES FOR MEDIUM RISK SPECIES

- Voluntary Best Management Practices should reflect the experience and wisdom of reptile breeders, hobbyists and the zoo community.
- Standards for security should be developed cooperatively by regulators and reptile experts.
- Certification programs administered by recognized authorities are options for documenting that a breeder or keeper has the requisite knowledge and experience to possess medium and high risk species without endangering the public or the environment.

| | | | |
|-------------------------------|--|-----------------------------------|--|
| HIGH | Fee permit | Venomous snakes | Families Elapidae and Viperidae Some rear-fanged members of the family Colubridae (e.g., twig snakes, vine snakes, keelbacks, Boomslang, <i>Boiga</i>) |
| | Stringent knowledge & experience documentation | | |
| | Enclosure security requirements | | |
| | Secondary barriers to escape | | |
| | Facility signs identifying potentially dangerous animals | Large-bodied constrictors | Burmese python Reticulated python Northern African python Southern African python Green anaconda |
| | Transport requirements | | |
| | Restrictions/conditions for public display | | |
| | Regular inspection by regulatory agency | | |
| | Identification of individual animals | Crocodilians | American alligator, Caiman (except dwarf caiman) |
| | Emergency contingency plan | | |
| Handling protocol | Aggressive, large-bodied lizards | Nile monitor Crocodile monitor | |
| Mandatory inventory reporting | | | |

NOTES FOR HIGH RISK SPECIES

- Enclosures must be of sturdy, non-degradable materials with locking mechanisms.
- Secondary barriers to prevent unauthorized access, e.g., locked out-buildings, security fences.
- Prominent signs should be posted in the facility identifying potentially dangerous specimens for first responders.
- There should be redundant security during transport, e.g., reptiles secured in cloth bags inside a secure transport box.
- Documentation via examination or certification programs (see above) that a breeder or keeper has the requisite knowledge and experience for each high risk species in possession.
- Conditions for public display should ensure no contact with venomous species.
- Annual or semi-annual reporting on the disposition of high risk specimens (e.g., births, deaths, sales)
- An emergency plan must be developed for natural disasters (securing the facility and animals, notifying local emergency management personnel)
- Safety protocol for handling and feeding should be reviewed with anyone with access to high risk species and should cover procedures in the event of injury or envenomation.
- Certification programs administered by recognized authorities are options for documenting that a breeder or keeper has the requisite knowledge and experience to possess medium and high risk species without endangering the public or the environment.