NATURAL HISTORY RESEARCH REPORTS

Are Rattlesnakes Evolving More Toxic Venom?

Recent reports in the lay press have suggested that bites by rattlesnakes in the last several years have been more severe than those in the past. The explanation, often citing physicians, is that rattlesnakes are evolving more toxic venom, perhaps in response to anthropogenic causes. **Hayes and Mackessy** (2010. *Wilderness & Environmental Medicine* 21:35–45) suggested that other explanations are more parsimonious, including factors dependent on the snake and factors associated with the bite victim's response to envenomation. Although bites could become more severe due to an increased proportion of bites from larger or more provoked snakes (i.e., more venom injected), the venom itself evolves much too slowly to explain the severe symptoms occasionally seen. Increased snakebite severity could also result from a number of demographic changes in the victim profile, including age and body size, behavior toward the snake (provocation), anatomical site of bite, clothing, and general health including asthma prevalence and sensitivity to foreign antigens. Clinical management of bites also changes perpetually, rendering comparisons of snakebite severity over time tenuous. Clearly, careful study taking into consideration many factors will be essential to document temporal changes in snakebite severity or venom toxicity. Presently, no published evidence for these changes exists. The sensationalistic coverage of these atypical bites and accompanying speculation is highly misleading and can produce many detrimental results, such as inappropriate fear of the outdoors and snakes, and distraction from proven snakebite management needs, including a consistent supply of antivenom, adequate health care, and training. The authors urged healthcare providers to avoid propagating misinformation about snakes and snakebites.

SUZANNE L. COLLINS, CNAH

No published evidence supports recent reports suggesting that bites by rattlesnakes, such as this Mojave Rattlesnake (*Crotalus scutulatus*), are more severe than in years past.

TROY HIBBITTS, 2007

Juvenile Leopard Tortoises (*Stimochelys pardalis*) favor colors that correspond to feeding preferences of adults in Namibia for plants with reddish-pink or yellow flowers.

Juvenile Leopard Tortoises Like Red

Juvenile Leopard Tortoises (*Stimochelys pardalis*) from Namibia approached the colors red, light green, and olive more frequently than they approached nine other colors in a behavioral experiment. The 44-day study by **Simang et al.** (2010. *Journal of Herpetology* 44:327–331) sought to determine what visual cues are important in foraging Leopard Tortoises and if they engage in color discrimination. Data suggested that a natural preference exists for certain colors and that these correspond well with foraging observations. Free-ranging adult Leopard Tortoises eat considerable amounts of plants with reddish-pink or yellow flowers and reddish-pink stems. The authors noted that other visual cues such as texture, shape, and height might also influence tortoises when selecting food.

NEWSBRIEFS

Turtles Killed "in Millions" by Fishing Gear

Millions of marine turtles have been killed over the past two decades through entrapment in fishing gear, according to a global survey. Described as the first global synthesis of existing data, the study found especially high rates of "bycatch" in the Mediterranean and eastern Pacific. Six of the seven sea turtle types are on the Red List of Threatened Species.

Writing in the journal *Conservation Letters*, researchers advocate much greater use of gear safe for turtles. These include circular hooks rather than the conventional J-shaped hooks on long fishing lines, and hatches that allow the reptiles to escape from trawls.

Turtles must come to the surface to breathe. When they are caught in a net or on a fishing hook, they cannot surface, and drown. Lead researcher Bryan Wallace said the state of the world's turtles was an indicator of the wider health of the oceans. "Sea turtles are sentinel species of how oceans are functioning," he said. "The impacts that human activities have on them give us an idea as to how those same activities are affecting the oceans on which billions of people around the world depend for their own well-being." Dr. Wallace works in the global marine division of Conservation International and at Duke University in the US.

The raw material from the study came from records of bycatch — incidental catches in fishing gear — from different regions of the world. Over the period 1990–2008, records showed that more than 85,000 turtles were snared. However, those records covered a tiny

DOUG PERRINE, SEAPICS.COM

Numbers of adult Leatherbacks (*Dermochelys coriacea*) — the largest species of sea turtle, which grows to more than 2 m in length and is capable of journeys that span entire oceans — are thought to have declined by more than 75% between 1982 and 1996.

proportion of the world's total fishing fleets. "Because the reports we reviewed typically covered less than 1% of all fleets, with little or no information from small-scale fisheries around the world, we conservatively estimate that the true total is probably not in tens of thousands, but in the millions of turtles taken as bycatch in the past two decades," said Dr. Wallace.

Three types of fishing gear are identified in the survey — long-lines, gillnets, and trawls. Modern long-line boats trail strings of hooks that can be 40 km long, usually in search of high-value species such as tuna and marlin. Gillnets are usually stationary, and use mesh of a set size in an attempt to target certain species of fish. The researchers suggest that several areas of the world account for particularly high levels of bycatch — the Mediterranean Sea and the eastern Pacific Ocean for all types of gear, together with trawling operations off the western coast of Africa.

Modifying fishing gear can have a dramatic impact on the size of bycatch. Shrimp trawls fitted with turtle excluder devices (TEDs) catch markedly fewer of the reptiles. A grid prevents anything large from entering the back portion of the net, and a hole above the grid allows accidentally snared animals such as turtles to escape. A number of countries now require that shrimp boats must use nets fitted with TEDs.

The circular long-line hooks also reduce bycatch of birds such as albatrosses. However, some fleets have resisted adopting selective gear because fishermen believe it will reduce their catch. In many parts of the developing world, the gear is not available.

Marine turtles face other significant threats. Debris in the oceans, such as plastic bags, can also cause drowning, while development in coastal regions can affect nesting and reproduction. Some turtles are still targeted for meat, and their shells used for tourist souvenirs. Numbers of adult Leatherbacks — the largest species, growing to more than 2 m long and capable of journeys that span entire oceans — are thought to have declined by more than 75% between 1982 and 1996.

Richard Black
Environment correspondent, BBC News

The Global Invasive Species Database

The Global Invasive Species Database (GISD: www.issg.org/database/), managed and maintained by the IUCN Invasive Species Specialist Group (ISSG: www.issg.org/), was launched in 2001 to profile invasive species that threaten native biodiversity and covers all taxonomic groups from microorganisms to mammals. The comprehensive, peer-reviewed profiles contain information on the ecology and biological traits of invasive species, their distributions both in native and introduced ranges, how they are being managed globally, their effects on biodiversity and ecosystems, reference lists, and names of expert contacts. The GISD currently features profiles of over 675 invasive species, and plans are to increase the database to 1,000 profiles in the near future.

100 of the World's Worst Invasive Species

The Global Invasive Species Database (GISD) features a list of 100 of the world's "worst" invasive alien species (www.issg.org/database/species/search.asp?st=100ss&fr=1&str=&lang=EN). Species were selected for the list according to two criteria: (1) Their serious impact on biological diversity and/or human activities, and (2) their illustration of important issues surrounding biological invasion. To ensure the inclusion of a wide variety of examples, only one species from any genus was selected. Absence from the list does not imply that a species poses a lesser threat. Three species of amphibians and two species of reptiles are included:

Cane Toad (*Rhinella marina*)

Cane Toads were introduced to many countries as biological control agents for various insect pests of sugarcane and other crops. The Cane Toads have proved to be pests themselves. They will feed on almost any terrestrial animal and compete with native amphibians for food and breeding habitats. Their toxic secretions are known to cause illness and death in domestic animals, such as dogs and cats, with which they come into contact, as well as wildlife, such as snakes and lizards. When threatened, they are able to squirt the toxic secretion over a meter, causing extreme pain if rubbed into the eyes. Human fatalities have been recorded following ingestion of the eggs or adults.

Cane Toads (*Rhinella marina*) have been introduced around the world to control various insect pests, primarily of sugarcane — instead, the toads have become pests, feeding on almost any terrestrial animal and competing with native amphibians for food and breeding habitats.

Coqui (*Eleutherodactylus coqui*)

The Coqui is a relatively small tree frog native to Puerto Rico. The frogs are quite adaptable to different ecological zones and elevations. Their loud call is the main reason they are considered a pest. The mating call is the species' namesake, a high-pitched, two-note "co-qui" (ko-kee') that


LORI OBERHOFER, NWRC HAWAII FIELD STATION

Coquis (*Eleutherodactylus coqui*), which are native to Puerto Rico, have a voracious appetite and the concern in Hawai'i, where they have been introduced, is that they might put Hawai'i's endemic insect and spider species at risk and compete with endemic birds and other native fauna that rely on insects for food.

attains nearly 100 decibels at 0.5 m. These frogs have a voracious appetite and the concern in Hawai'i, where they have been introduced, is that *E. coqui* may put Hawai'i's endemic insect and spider species at risk and compete with endemic birds and other native fauna that rely on insects for food.

American Bullfrog (*Lithobates catesbeianus*)
The American Bullfrog is native to North America, but has been introduced to over 40 countries on four continents. Many introductions have been intentional with the purpose of establishing new food sources for human consumption. Other populations have been estab-


S. PRICE, BCFROGWATCH@VICTORIA1.GOV.BC.CA

Introduced American Bullfrogs (*Lithobates catesbeianus*) have displaced native amphibians from large areas of southeastern Vancouver Island in Canada — and might be carriers of the chytrid fungus that is decimating amphibian populations around the world.

lished from unintentional escapes from Bullfrog farms. Consequences of the introduction of non-native amphibians to native herpetofauna can be severe. The American Bullfrog has been held responsible for outbreaks of the chytrid fungus found to be responsible for declining amphibian populations in Central America and elsewhere. They are also important predators and competitors of endangered native amphibians and fish. The control of this invasive in Europe partly relies upon increasing awareness, monitoring, and education about the dangers of releasing pets into the wild. Strict laws are also in place to prevent further introductions. Eradication is achieved largely by physical means that include shooting, spears/gigs, bow and arrow, nets, and traps.

Red-eared Slider (*Trachemys scripta elegans*)
The Red-eared Slider has been the most popular turtle in the pet trade. More than 52 million individuals were exported from the United States to foreign markets between 1989 and 1997. Despite the vast worldwide occurrence of these turtles, little is known of their impact on indigenous ecosystems. Clearly, research and education on the dangers of releasing pet turtles into the wild are needed. Their omnivorous diet and ability to adapt to various habitats give them great potential for impacting indigenous species.


KEVIN ENGE

Red-eared Sliders (*Trachemys scripta elegans*) are the most popular turtles in the pet trade, and more than 52 million individuals were exported from the United States to foreign markets between 1989 and 1997. They can be especially damaging when they hybridize with endemic sliders (such as in the Greater Antilles) or compete with native turtles (such as in peninsular Florida, where this individual was photographed).

Brown Tree Snake (*Boiga irregularis*)
Native island species are predisposed and vulnerable to local extinction by invaders. When the Brown Tree Snake was accidentally introduced to Guam, it caused the local extinction of most of the island's native species of birds and lizards, causing "cascading" ecological effects by removing native pollinators, resulting in the subsequent decline of native plant species. The ecosystem fragility of other Pacific islands to which cargo flows from Guam has made the potential spread of the Brown Tree Snake from Guam a major concern.


GAD PERRY

When Brown Tree Snakes (*Boiga irregularis*) were accidentally introduced to Guam, they caused the local extinction of most of the island's native species of birds and lizards, causing "cascading" ecological effects by removing native pollinators, resulting in the subsequent decline of native plant species.

California Upholds Ban on Non-native Frogs and Turtles

In an effort to reduce the number of invasive species and infectious diseases harming native wildlife, the California Fish & Game Commission voted 3–2 to uphold their recently instated ban on the importation of non-native frogs and turtles for use as food. The ban, intended to reduce the influx of harmful invasive species into the state, drew significant criticism from the San Francisco Chinese community, one of the largest US consumers of frog legs and turtles. This, in turn, prompted a re-consideration hearing in a Sacramento room that was filled to capacity with legislators, businessmen, nonprofit representatives, and other members of the public eager to express their views.

Frog populations worldwide have been declining at unprecedented rates, and nearly one-third of the world's amphibian species are threatened with extinction. Up to 200 amphibian species have completely disappeared in recent years, and California is home to 16 threatened amphibians. The frog-leg trade is responsible for the spread of infectious diseases and invasive species that damage California ecosystems, according to Santa Cruz-based public charity SAVE THE FROGS! (www.savethefrogs.com), which led the campaign to maintain the California


GARY M. FELLERS, USGS

If cultures did not adapt, humans would have long since eaten the California Red-legged Frog (*Rana draytonii*) to extinction.

Fish & Game Commission's April 8th ban. The group's supporters sent nearly 1,200 letters to the California Department of Fish & Game.

SAVE THE FROGS! founder Kerry Kriger testified at the Commission hearing, highlighting the spread of infectious diseases and invasive species that inevitably accompany the frog-leg trade. "Several million Bullfrogs from North America are farmed overseas and imported into California for food each year. A recent study showed that over 60% of these frogs are infected with a deadly chytrid fungus that has decimated frog populations in the Sierra Nevada range." The fungus, which causes a potentially lethal skin disease called chytridiomycosis, has caused the extinction of up to 100 amphibian species worldwide. Furthermore, says Dr. Kriger, "Bullfrogs and turtles regularly escape or are purposely set free into the wild. They establish

populations and damage local ecosystems by eating native frogs and other wildlife."

San Francisco-based legislators Leland Yee, Fiona Ma, and Ted Lieu testified in opposition to the ban, stating that it would damage the economy and that it discriminated against the Chinese community and their 5,000-year-old history of eating frogs and turtles. However, the vast majority of frogs the Chinese-American community is eating are Bullfrogs from North America, which have only a very recent history in Chinese cuisine.

"Cultures necessarily evolve: If they did not, we would have long since eaten the Buffalo and the California Red-Legged Frog to complete extinction, as we did the Passenger Pigeons," said Dr. Kriger. "As Americans, we are fortunate to have many choices of food, and thus it is our responsibility to act wisely and ensure that our culinary decisions are not unduly impacting our natural heritage and the future of our planet."

Americans consume 20% of the world's frog legs, and scientists estimate that over a hundred million frogs are taken out of the wild each year for food. SAVE THE FROGS! recently convinced San Francisco's upscale Restaurant Gary Danko to remove the frog legs from the restaurant's menu. The group, which organizes the annual Save The Frogs Day events, recently held the world's first protests in defense of frog populations — at four east-coast restaurants that refuse to stop serving frog legs.

More information on the frog-leg trade and on the ban can be found at: http://savethefrogs.com/frog-legs and http://bit.ly/ca-frog-legs-ban.

Vipers: New IUCN Specialist Group

Vipers are found on all continents except Australia and Antarctica, including extreme environments such as the Arctic Circle and high elevations in the Andes. The Viperidae have a high proportion of endangered species (~14%) relative to other families of snakes. Although people are fascinated by vipers, they are one of the world's most heavily persecuted groups of wildlife. In addition, vipers are facing a variety of threats including the loss and fragmentation of habitats, global climate change, and collection for the pet trade. The initial objectives of the Viper Specialist Group are to develop a conservation assessment/action plan for vipers and to develop a series of focal initiatives aimed at particular species or regions.

JEFF ETTLING

Darevsky's Viper (*Vipera darevskii*) might be the rarest viper in the world. It has a very small distribution in the Dzhavakhet Mountains in northern Armenia and may possibly occur in adjacent Georgia and Turkey.