

continued

frogs and argue that it is unlikely that predation is involved because it is difficult to imagine a predator that would remove the hindlimbs with surgical precision and allow the tadpole to survive. This is where Brandon Ballengée comes in. Brandon (an ecoartist) and I began collaborating some years back on a “SciArt” project to make artistically beautiful and scientifically interesting images of deformed amphibians. Brandon took this one step further and went to England to do graduate work (with me as scientific adviser) focused on limbless deformed amphibians — in this case toads. Imagine my surprise when he told me that he had discovered a predator that surgically removes the developing hindlimbs of tadpoles, thus creating limbless frogs! We spent the next few months analyzing the data and writing it up for publication, knowing that at least one other laboratory had independently discovered the same thing (we offered to collaborate or cooperate in some way, but they weren’t interested).

The culprits, as you know, are dragonfly nymphs, which have mouthparts adapted to grab their prey, almost like a mechanical arm with a claw on the end that they can shoot out. Once they grab a tadpole, they use their front legs to turn it around and around, searching for the tender bits, in this case the hindlimb buds, which they then snip off with their mandibles (<http://blip.tv/file/1418583>). Often the tadpole is released and is able to swim away to live another day. If the tadpole survives, it metamorphoses into a toad with missing or deformed hindlimbs, depending on the developmental stage of the tadpole (at early stages, the tadpoles can completely regenerate their limbs, but this ability diminishes as they grow older). We think the dragonflies select the hindlimbs because toad tadpoles have poison glands in mature skin, and the developing hindlimbs have immature glands. We call this phenomenon “selective predation.” Other selective predators include stickleback fishes and even other tadpoles.

What do these results mean for the role of chemical pollution in amphibian deformities? We have purposefully focused our research over the years on specific kinds of deformities, especially those that involve the limbs (especially the hindlimbs), mainly because these are by far the most frequently

observed deformities in wild-caught amphibians. I think these also have caught people’s attention, because everyone remembers the horrible limb deformities caused by thalidomide, which have come to be seen as the quintessential congenital birth defects in humans. Furthermore, we all are primed for some kind of environmental catastrophe, be it ozone depletion, global warming, or some kind of toxic pollution. Amphibians are seen as “indicator species” for environmental toxins because they have a thin skin that can absorb almost anything from an aquatic (or even a merely moist) environment, and the mysterious “amphibian declines” appear to be happening in many corners of the world. So, I am not surprised at all that so many people suspect chemical pollution as the cause for deformities in frogs — and perhaps these pollutants do play a role, even if indirectly, in some kinds of deformities. Endocrine disruptors, for example, could compromise the immune system of tadpoles, making them more vulnerable to parasites (although no compelling evidence exists for this scenario at the moment). Organic pollutants (nitrogen and phosphorus) could enhance eutrophication, leading to abnormal population densities of aquatic vegetation, snails, parasites, and aquatic insects — but our research over the years has shown that the definitive cause of supernumerary limbs in wild populations of amphibians is a specific species of trematode — and now we have strong evidence that the remaining major type of limb deformity, missing or truncated limbs, is caused by selective predation by aquatic insect larvae.

These results do not completely eliminate the potential role of chemical pollutants, rather we see them as the leading current hypotheses to be excluded when confronted with deformed amphibians, at least those featuring extra limbs or missing limbs. Are parasites (i.e., the specific species of trematode) sufficient to cause extra limbs? Yes. Is selective predation sufficient to cause loss or reduction of limbs? Yes. Are chemical pollutants necessary to understand either of these phenomena? No (in fact, one could argue that the parasites and small predators would be just as, if not more — because they are smaller — vulnerable to chemical pollutants than the frogs!).

NEWS BRIEFS

Europe’s Amphibians and Reptiles Under Threat

One fifth of Europe’s reptiles and nearly a quarter of its amphibians are threatened, according to new studies carried out by the IUCN for the European Commission. The studies, released on International Biodiversity Day, are the first European Red Lists for amphibians and reptiles, and reveal alarming population trends. More than half of all European amphibians (59%) and

42% of reptiles are in decline, which means that amphibians and reptiles are even more at risk than European mammals and birds.

For 23% of amphibians and 21% of reptiles the situation is so severe that they are classified as threatened in the European Red List. Most of the pressure on these declining species comes from mankind’s destruction of their natural habitats, combined with climate change, pollution and the presence of invasive species. “Southern

Europe is particularly rich in amphibians, but climate change and other threats are placing its freshwater habitats under severe stress,” says Dr. Helen Temple, co-author of the study and Program Officer for the IUCN Red List Unit. “Natural habitats across Europe are being squeezed by growing human populations, agricultural intensification, urban sprawl, and pollution. That is not good news for either amphibians or reptiles.”

“On World Biodiversity Day, this is a sobering discovery,” says Stavros Dimas, European Commissioner for the Environment. “Despite strong legislation protecting our habitats and most of the species concerned, almost a quarter of Europe’s amphibians are now under threat. This reflects the enormous pressure we are placing on Europe’s plants and animals, and underlines the need to rethink our relation to the natural world. I therefore call on citizens, politicians, and industrialists to reflect on our recent Message from Athens, and factor a concern for biodiversity into the decisions they make. These trends cannot continue.”

Europe is home to 151 species of reptiles and 85 species of amphibians, many of which are found nowhere else in the world. Six reptilian species, including the Tenerife Speckled Lizard (*Gallotia intermedia*) and the Aeolian Wall Lizard (*Podarcis raffonei*), have been classified as Critically Endangered, meaning that they face an extremely high risk of extinction in the wild. Eleven more are classified as Endangered, meaning they face a very high risk of extinction in the wild, and 10 as Vulnerable, meaning they face a high risk of extinction in the wild.

Among amphibians, a group that includes frogs and toads and salamanders and newts, two species have been classified as Critically Endangered: The Karpathos Frog (*Pelophylax cerigensis*) and the Montseny Brook Newt (*Calotriton arnoldi*), Spain’s only endemic newt. Five more, including the Appenine Yellow-bellied Toad (*Bombina pachypus*) are Endangered, and 11 are classified as Vulnerable.

Amphibians and reptiles are doing even worse than other species groups. Fifteen percent of mammals and 13 percent of birds are under threat. Other groups too are almost certainly in danger, but only

these groups have been comprehensively assessed at the European level according to IUCN regional Red List guidelines.

IUCN
20 May 2009

Wildlife Crisis Worse than Economic Crisis

Life on Earth is under serious threat, despite the commitment by world leaders to reverse the trend, according to a detailed analysis of the IUCN Red List of Threatened Species. The IUCN analysis, which is published every four years, comes just before the deadline governments set themselves to evaluate how successful they were in achieving the 2010 target to reduce biodiversity loss. The IUCN report, *Wildlife in a Changing World*, shows the 2010 target will not be met.

“When governments take action to reduce biodiversity loss, there are some conservation successes, but we are still a long way from reversing the trend,” says Jean-Christophe Vié, Deputy Head of the IUCN’s Species Program and senior editor of the publication. “It’s time to recognize that nature is the largest company on Earth working for the benefit of 100% of humankind — and it’s doing it for free. Governments should put as much effort, if not more, into saving nature as they do into saving economic and financial sectors.”

The report analyses 44,838 species on the IUCN Red List and presents results by groups of species, geographical regions, and different habitats, such as marine, freshwater, and terrestrial. It shows 869 species are Extinct or Extinct in the Wild, and this figure rises to 1,159 if the 290 Critically Endangered species tagged as Possibly Extinct are included. Overall, a minimum of 16,928 species are threatened with extinction. Considering that only 2.7% of the 1.8 million described species have been analyzed, this number is a gross underestimate, but it does provide a useful snapshot of what is happening to all forms of life on Earth.

An increased number of freshwater species have now been assessed, giving a better picture of the dire situation they face. In Europe, for example, 38% of all fishes are threatened and 28% in eastern Africa. The high degree of connectivity in freshwater systems, allowing pollution or invasive species to spread rapidly, and the development of water resources with scant regard for the species that live in them, are behind the high level of threat.

In the oceans, the picture is similarly bleak. The report shows that a broad range of marine species are experiencing potentially irreversible losses due to over-fishing, climate change, invasive species, coastal development, and pollution. At least 17% of the 1,045 shark and ray species, 12.4% of groupers, and six of the seven marine turtle species are threatened with extinction. Most noticeably, 27% of the 845 species of reef-building corals are threatened, 20% are Near Threatened, and data are insufficient for 17% to be assessed. Marine birds are much more threatened than terrestrial species, with 27.5% in danger of extinction, compared with 11.8% of terrestrial birds.

“Think of fisheries without fishes, logging without trees, tourism without coral reefs or other wildlife, crops without pollinators,” says Vié. “Imagine the damage to our economies and societies if they were lost. All the plants and animals that make up Earth’s amazing wildlife have a specific role and contribute to essentials like food, medicine, oxygen, pure water, crop pollination, carbon storage, and soil fertilization. Economies are utterly dependent on species diversity. We need them all, in large numbers. We quite literally cannot afford to lose them.”

The report shows nearly one third of amphibians, more than one in eight birds, and nearly a quarter of mammals are threatened with extinction. For some plant groups, such as conifers and cycads, the situation is even more serious, with 28% and 52% threatened, respectively. For all these groups, habitat destruction, through agriculture, logging, and development, is the main threat and occurs worldwide.

In the case of amphibians, the fungal disease chytridiomycosis is seriously affecting an increasing number of species, complicating conservation efforts. For birds, the highest number of threatened species is found in Brazil and Indonesia, but the highest proportion of threatened or extinct birds is found on oceanic islands. Invasive species and hunting are the main threats. For mammals, unsustainable hunting is the greatest threat after habitat loss. This is having a major impact in Asia, where deforestation is occurring at a very rapid rate.

“The report makes for depressing reading,” says Craig Hilton Taylor, manager of the IUCN Red List Unit and co-editor. “It tells us that the extinction crisis is as bad or even worse than we believed. But it also shows the trends these species are follow-



The Montseny Brook Newt (*Calotriton arnoldi*), Spain’s only endemic newt, is critically endangered.



Nearly a third of all amphibians are threatened with extinction, and data are deficient for about 45% of those not listed in threatened categories. Populations of Mountain Chickens (*Leptodactylus fallax*) on Dominica crashed after the chytrid fungus (*Batrachochytrium dendrobatidis*) became established on the island.

ing, and is therefore an essential part of decision-making processes. In the run-up to 2010, the global community should use this report wisely to address the situation.”

Climate change is not currently the main threat to wildlife, but this may soon change. After examining the biological characteristics of 17,000 species of birds, amphibians, and reef-building corals, the report found that a significant proportion of species that are currently not threatened with extinction are susceptible to climate change. This includes 30% of non-threatened birds, 51% of non-threatened corals and 41% of non-threatened amphibians, which all have traits that make them susceptible to climate change.

Red List Indices make it possible to track trends of extinction risk in groups of species. New indices have been calculated and provide some interesting results. Birds, mammals, amphibians, and corals all show a continuing deterioration, with a particularly rapid decline for corals. Red List Indices also have been calculated for amphibian, mammalian, and avian species used for food and medicine. The results show that birds and mammals used for food and medicine are much more threatened. The diminishing availability of these resources has an impact on the health and well-being of the people who depend on them directly.

“The IUCN Red List provides a window on many of the major global issues of our day, including climate change, loss of freshwater ecosystems, and over-fishing,” says Simon Stuart, chair of the IUCN Species Survival Commission and co-editor. “Unless we address the fundamental causes of unsustainability on our planet, the

lofty goals of governments to reduce extinction rates will count for nothing.”

To read the full report, *Wildlife in a Changing World — An Analysis of the 2008 IUCN Red List of Threatened Species*, please go to: <http://data.iucn.org/dbtw-wpd/edocs/RL-2009-001.pdf>.

IUCN

Galápagos Islands World Heritage Site Stays on Danger List

The decision of the World Heritage Committee to retain the Galápagos Islands on the danger list comes two years after they were recognized as being under severe threat because of growing tourism, invasive species, and immigration. “The decision to retain the Galápagos on the List of World Heritage Sites in danger shows the clear commitment of the government of Ecuador to continue with its conservation efforts and work together with the international community to maintain the outstanding universal value of this unique place on Earth,” says Pedro Rosabal, Senior Program Officer of the IUCN. “Ecuador has a history of working in line with the World Heritage Convention, which led to the removal of Sangay National Park from the danger list. The IUCN considers this as ‘best practice’ of using the danger list as a mechanism for enhancing the conservation and management of endangered sites. The IUCN, through its Regional Office



The Galápagos Islands World Heritage Site, home to this Blue-footed Booby (*Sula nebouxi*), remains on the danger list two years after the islands were recognized as being under severe threat because of growing tourism, invasive species, and immigration.

for South America, will further support the efforts of Ecuador toward the removal of the Galapagos Islands from the Danger List.”

The Galapagos Islands were among the first sites to be inscribed on the World Heritage List in 1978 and further extended in 2001. The wide variety of flora and fauna on the 19 islands contributed to Charles Darwin’s theory of evolution. Due to increased tourism, immigration, and threats from invasive species brought by plane and boat by the visitors, the islands have been inscribed on the danger list, following the IUCN’s recommendation in 2007.

The Galapagos Islands of Ecuador and the Manas Wildlife Sanctuary in India are the two natural sites on the danger list outside Africa. Another 11 sites in danger are all located on the African continent.

IUCN

“Python Patrol” Targets Giant Snakes of South Florida

Juan Lopez reads meters with one eye and looks for snakes with the other. Lopez is a member of the “Python Patrol,” a team of utility workers, wildlife officials, park rangers, and police trying to keep Burmese Pythons (*Python molurus bivittatus*) from gaining a foothold in the Florida Keys.

Officials say the pythons — which can grow to 20 feet long and eat large animals whole — are being ditched by pet owners in the Florida Everglades, threatening the region’s endangered species and its ecosystem. “Right now, we have our fingers crossed that they haven’t come this far yet, but if they do, we are prepared,” Lopez said.

Burmese Pythons are rarely seen in the middle Florida Keys, where Lopez works. The Nature Conservancy wants to keep it that way. The Python Patrol program was started by Alison Higgins, the Nature Conservancy’s Florida Keys conservation manager. She describes it as an “early detection, rapid response” program made up of professionals who work outside.

Eight Burmese Pythons have been found in the Keys. “If we can keep them from spreading and breeding, then we’re that much more ahead of the problem,” Higgins said. Utility workers, wildlife officials, and police officers recently attended a three-hour class about capturing the enormously large snakes. Lt. Jeffrey L. Fobb of the Miami-Dade Fire Rescue Venom Response Unit taught the participants how to capture pythons.

“There’s no immutable laws of snake catching. It’s what works,” Fobb said as he demonstrated catching a snake with hooks, bags, blankets, and his hands. “We’re doing it in the Florida Keys because we have a lot to protect,” Higgins said. “The Burmese Pythons that are coming out of the Everglades are eating a lot of our endangered species and other creatures, and we want to make sure they don’t breed here.”

Where the snakes are breeding is just north of the Keys in Everglades National Park. An estimated 30,000 Burmese Pythons live in the park. The Everglades, known as the “River of Grass,” is a vast area with a climate perfect for these pythons to hide and breed — and breed they do: The largest clutches of eggs found in the Everglades have numbered up to 83.

The snakes grow like they’re on steroids. With a life span of 30 years, these pythons can weigh as much as 200 pounds — and the larger the snake, the bigger the prey. Biologists have found endangered wood rats, birds, bobcats, and other animals in their stomachs. Two 5-foot-long alligators were found in the stomachs of Burmese Pythons that were caught and necropsied, officials say.

Officials also say Burmese Pythons can travel 1.6 miles a day by land, and they can swim to reach areas outside the Everglades.

This nonvenomous species was brought into the United States from southeastern Asia. Everglades National Park spokeswoman Linda Friar says biologists believe that well-intentioned pet owners are to blame for their introduction into the Everglades. “These pets were released by owners that do not understand the threat to the ecosystem,” she said. Higgins says 99,000 of the popular pets were brought into the United States from 1996 to 2006, the most recent data available. She says they are an easy species to breed, and you can buy a hatchling for as little as \$20.

The problem with these pets, Friar says, is that they get too big for their owners to handle. Making the owner aware of what to expect when the animal becomes full-grown is a priority. “The pet trade is pretty supportive in educating people,” Friar said. She hopes a “Don’t let it loose” message campaign makes an impact on pet owners.

Florida Sen. Bill Nelson, a supporter of restoring the Everglades, has introduced a bill that would ban importing the python

species into the United States. The senator saw the need after learning about the effect these snakes were having on the park. “Finding out many endangered species are being found in the stomach of the python,” Nelson spokeswoman Susie Quinn said, “we need to do a better job at protecting the resources.”

In the meantime, Lopez and the Python Patrol will continue to protect the Florida Keys by capturing the snakes and turning them over to biologists to perform necropsies. The Nature Conservancy plans to expand the program to all the areas that surround the Everglades, making these predators their prey. “I would like to find them and get rid of them,” Lopez said.

Predatory Snakes Become Prey in the Florida Everglades

Joe Wasilewski drives along a narrow stretch of road through Florida’s Everglades. The sun is setting, night is coming on quickly, and Wasilewski is on the prowl for snakes — and one snake in particular. “The next 10 miles seem to be the hot spot for Burmese Pythons,” he said.

Wasilewski is a state-sanctioned snake-hunter who regularly scours this area for the reptiles. The Everglades has the perfect space and climate for pythons to hide and breed.

They are also speedy travelers, able to move across 1.6 miles of land every day, experts say. The travel lets people like Wasilewski hunt the snakes from the driver’s seat of his truck. However, it also means that the problems created in the local ecosystem by the non-venomous snakes are spreading. “It’s a large predator, and they’re eating basically everything in sight. That’s the problem,” Wasilewski said.

Volunteers like Wasilewski, happy to grasp the problem and the snakes with both hands, are not the only troops in Florida’s war on the invading pythons. A “Python Patrol” was launched in the Florida Keys, south of the Everglades, by Alison Higgins of the Nature Conservancy. Her program uses utility workers, wildlife officials, park rangers, and police to keep an eye out for snakes and trains them to capture any they find. “The Burmese Pythons that are coming out of the Everglades are eating a lot of our endangered species and other creatures, and we want to make sure they don’t breed here,” said Higgins, the conservation manager for the Keys.

The problem probably originated when reptile-breeding facilities near the Everglades were destroyed during Hurricane Andrew. Compounding the problem is the release of these snakes by pet owners.

Twenty years ago, no Burmese Pythons were found in the Everglades, park statistics say. Now, there could be 100,000 snakes in the River of Grass, but no one knows for sure. What Wasilewski is sure of is that night is the best time for his hunting, as that is when the snakes tend to be on the move. When he finds his prey, he puts the snake in a bag, deposits it in a crate, and delivers it to biologists for the Everglades National Park, where the snake can be studied and/or destroyed.

On one recent evening, the pickings were slim, and after two hours of driving back and forth along the two-lane Tamiami Trail, Wasilewski’s crate was empty. He saw a python on the road, but it was dead, and the other small snakes and a baby alligator in the area did not interest him. Finally, Wasilewski, an environmental and wildlife consultant, spotted something. “Yeah, baby! Hee ha! Look at the size of this one,” he exclaimed from the front seat of his truck. He got out and picked up the brownish-green snake, which immediately coiled around his arm. “This isn’t a big one,” he said, but as he got a closer look, he did not deny that it was a good one: “At least 12 [feet].”

Wasilewski has a soft spot for these species, and one of the reasons he volunteers for the snake hunt is to learn more about them. He says it is not the snakes’ fault that they ended up in the Everglades, but he acknowledges the problems they are causing on the Florida ecosystem and the need to do something. “One down, 100,000 to go,” he said.

Kim Segal and John Zarrella
CNN



Florida wildlife officer holding the tail of a large Burmese Python (*Python molurus bivittatus*).