



Herpetological Ecotourism and Conservation: Reserva Amazónica, Perú

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Photographs by Robert C. Jadin, except where noted.

The Tambopata region of Perú yields the highest biodiversity of reptiles and amphibians in the world and includes more than 210 amphibian and reptilian species (Doan and Arizabal 2002). Previous surveys of the region's biodiversity have been used to categorize the IUCN and CITES status of species and contributed to future reserve design (von May

et al. 2007). At the epicenter of this diversity lies one of the world's most prominent facilities for ecotourism and conservation, Reserva Amazónica, formerly Cusco Amazónico.

Since 1975, Inkaterra (www.inkaterra.com), the organization that operates Reserva Amazónica and several other Peruvian tourism lodges, has promoted ecological research



Figure 1. The canopy walk at Reserva Amazónica is more than 30 m high and 344 m long and has two towers, eight platforms, and seven bridges. Recently, *National Geographic Adventure* recognized Reserva Amazónica as possessing the “Most Extraordinary Canopy Walkway” (Davis 2009), which even includes a private cabin for adventurous guests. Tourists take early morning hikes in search of the many species of impressive birds that have been recorded — but herpetologists can see other species such as Green Thornytail Iguanas (*Uracentron azureum*, insert).



Figure 2. Typical riverboat on the Madre de Dios River during sunset taken from the boat dock at Reserva Amazónica.

and conservation supported by tourism. The mission statement of Inkaterra is “conserving the environment, preserving the native cultures, and developing sustainable tourism in Perú.” Inkaterra’s strategy for implementing this mission is to conserve the region’s biodiversity while also educating tourists about the natural environment. Reserva Amazónica has received awards from organizations and praise in many international travel magazines for its conservation efforts and ecotourism (Fig. 1). Inkaterra’s mission for conservation remains evident through various collaborations with research scientists. In particular, collaborations with herpetologists at the University of Kansas have resulted in Reserva Amazónica being one of the most well studied areas in South America for amphibians and reptiles. In particular, Duellman’s book *Cusco Amazónico* (2005) extensively documents the region’s biogeography and herpetofaunal diversity.

Within four hours by boat to Bolivia, Reserva Amazónica sits along the Amazon Basin in Tambopata, Perú. The exclusive resort resides within a one-hour boat ride from the nearest city, Puerto Maldonado (Fig. 2). Reserva Amazónica allows each guest personalization of their rainforest excursions regardless of weather conditions and length of stay. Bilingual nature interpreters, specialized in the flora and fauna of the

Tambopata region, facilitate these excursions. Visitors can walk along well established trail systems, including a wetlands boardwalk; they can take canoe excursions around lakes Valencia and Sandoval, as well as Gamitana Creek; or they can take a tour to a river island, a large butterfly house, orchid and medicinal plant gardens, and more. The packages resonate with all levels of biological and travel enthusiasts. Beyond the natural marvels, the resort encompasses full bar services, exquisite three-course cuisine (vegetarian options included), and river front massage therapy.

Our personal expeditions described in this article were focused on amphibians and reptiles (Fig. 3). Not only were we visiting Reserva Amazónica to observe these species, but to study their diversity, abundance, habitat use, and species interactions. Through our monitoring study in collaboration with Reserva Amazónica, we help fill a critical need for long-term population data on tropical species (Fig. 4), while simultaneously equipping the interpreters and tourists with information about these important organisms.

Up Close and Personal

Around the bungalow area during the day, Amazon Racerunners (*Ameiva ameiva*) commonly sprint from beneath



Figure 3. The Black-spotted Skink (*Mabuya nigropunctata*) is the only skink in the region; it is bronze and black with smooth and shiny scales. This species is frequently seen on trails at Reserva Amazónica but, like this individual, can also be found on the walk to Lago Sandoval. The canoe tour around Lago Sandoval is very popular as visitors often encounter monkeys, macaws, river otters, and even Black Caiman (*Melanosuchus niger*).

bungalow steps to nearby bushes and pace across the footpaths. At night, the bungalow porches are illuminated with individual kerosene lanterns. The lighting helps avoid stepping on the abundant Cane Toads (*Rhinella marina*) foraging along the paths. Numerous treefrogs (e.g., Gunther's Banded Treefrog, *Hypsiboas fasciatus*, and Milky Treefrog, *Trachycephalus typhonius* [formerly *Phrynohyas venulosa*]; Fig. 5) commonly perch on the vegetation around the cabins. From within the cabins you can typically hear calls of Bolivian Sheepfrogs (*Hamptophryne boliviana*), Amazon

Rainfrogs (*Leptodactylus* [*Adenomera*] spp.), and several species of large Leaf Frogs in the genus *Phyllomedusa*. The calls of the Bolivian Sheepfrogs are unmistakable, sounding remarkably like sheep.

A large bridge elevated above a small swamp connects the bungalow area to the main lodge. This swampy area is home to numerous species of frogs that call in the evening and can easily be observed with a flashlight. On more than one occasion, as we stopped to inspect the colorful leaves of the *Heliconia*, a group of tourists and interpreters would



Figure 4. The endemic Koechlin's Treefrog (*Dendropsophus koechlini*; a. adult male, b. amplexant pair) was described from Reserva Amazónica (Duellman and Trueb 1989). Although considered one of the most abundant species in the area, the activity period of *D. koechlini* is short and correlates strongly with its breeding season that starts with the first heavy showers of the rainy season.



Figure 5. One night at about 2 am, the calls of Milky Treefrogs (*Trachycephalus typhonius*) were so loud that we awoke to find the male calling from our cabin shower! We had to be careful during handling to not alarm the frog into releasing the defensive glue-like milky secretions from glands in its skin, from which it gets its common name. A previous encounter with this species taught us that the secretions are nearly impossible to remove.



Figure 7. Five species of turtles occur in the forests, ponds, and rivers in and around Reserva Amazónica. These include the Yellow-footed Tortoise (*Chelonoidis denticulata*). Adult ticks (*Amblyomma humerale*) parasitized both tortoises observed by the authors during separate trips to Reserva Amazónica. Photograph by Sarah A. Orlofske.

gather around us for a closer look, giving us an opportunity to describe the species and our research in more detail. Everyone leaves the bridge a little reluctantly after such close and unexpected encounters with beautiful Basin Treefrogs (*Hypsiboas lanciformis*; Fig. 6) and other species.

Exploring the Trails — Day and Night

The trail system at Reserva Amazónica is well marked and includes trails as long as several kilometers. Interpreters are available to lead private tours both by day and night. Boots are highly recommended while walking on the trails for both safety



Figure 6. Although recorded for the Tambopata region (von May et al. 2007), this photograph is the first record of the Basin Treefrog (*Hypsiboas lanciformis*) at Reserva Amazónica. This individual, a large female, was found just outside the main lodge, apparently attracted to the calls of males in chorus throughout the month of December.



Figure 8. Females of the Bridled Forest Gecko (*Gonatodes humeralis*) are drab brown or gray and blend well with their environment, whereas males (pictured above) are much more brightly colored.

and support through the muddy terrain. The lodge has rubber boots in all sizes available for guests. Once equipped with boots, you will only have to take a few steps from your cabana to see some interesting reptiles and amphibians (Fig. 7).

Many times during the day and at night we would gather our notebooks and cameras, put on our boots and head out on the trails. On Trail-A we saw plenty of activity in the leaf litter and on the trees. A few minutes into our trail walk we would likely encounter a colorful male Bridled Forest Gecko (*Gonatodes humeralis*; Fig. 8) perched on a tree along the trail. The more cryptic females are slightly less noticeable. Cocha (*Kentropyx altamazonica*) and Forest (*K. pelviceps*) Whiptails are larger, cryptic lizards, but active, so you will most likely notice them shuffling around in areas near recent tree falls when you disturb their basking. The extraordinary diversity of lizards is undoubtedly supported by the diversity of invertebrates. Walking even a short section of trail and not observing ornately colored grasshoppers, walking sticks, beetles, spiders, and butterflies is impossible.

More secretive than the lizards, snakes are diverse but more difficult to observe in the rainforest. At least 50 species of snakes have been documented at Reserva Amazónica. Walking the trail system you may find frog-eating specialists like Black-headed Calico Snakes (*Oxyrhopus melanogenys*; Fig. 9) or Wucherer's Ground Snakes (*Xenopholis scalaris*), snail-eaters including several species in the genus *Dipsas*, or lizard-eating specialists such as Blunt-headed Treesnakes (*Imantodes cenchoa*; Fig. 10A). Additionally, several boids occasionally can be found on the trails. The Rainbow Boa (*Epicrates cenchria*) is most frequently encountered. Several venomous species of snakes, including the South American Bushmaster

Temporary Wetlands – Enduring Interactions

Although observing numerous species is possible at any time of year, by far the best time to observe amphibians is during the wet season (November–March). The evening after the first heavy rain erupts in frog calls. Following the same trail that was dry the day before leads now to a temporary wetland flooding the trail. When closely inspecting leaves and branches, silhouettes of tree-frogs on the other sides of leaves become visible. These are males we have intercepted during their migrations to the choruses around the newly formed pond. Several species are present at one location and all are calling. These typically include Tarauaca Snouted Treefrogs (*Scarthyla goinorum*), San Carlos Treefrogs (*Dendropsophus leali*), Amazon Snouted Frogs (*Scinax ictericus*), and the most abundant of all, Koechlin's Treefrogs (*Dendropsophus koechlini*). The sound is deafening, so loud that hearing another person talking to you from even a few feet away is difficult. To our dismay, getting a clear recording of just a single species at a time was almost impossible. By the next evening, the water level in the pond has risen even higher and females have arrived. The males look like backpacks clinging to females as they seek a location to lay their eggs. By the following day, egg masses begin to appear under leaves and floating on the surface along the pond edges. Within a few days, tiny tadpoles will hatch and begin the journey to metamorphosis, which they will complete a few weeks later. Almost as rapidly as the frogs arrived so has a thriving aquatic invertebrate community that includes snails, water scorpions, predaceous diving beetles, and dragonflies. Here, Sarah is conducting one component of our research, assessing the diversity of aquatic invertebrates in temporary wetlands, particularly those that prey on tadpoles and may play a role in structuring the amphibian community.





Figure 9. A juvenile Black-headed Calico Snake (*Oxyrhopus melanogenys*) is one of several coral-snake mimics in the rainforest.



Figure 10. Species in the genus *Imantodes* probably have the best cantilevering abilities among Neotropical snakes (Ray 2012). This is a very important adaptation given that many of these species are lizard-eating specialists. A. A Bluntheaded Treesnake (*Imantodes cenchoa*) searches the trees at night for its prey. B. Slender Anoles (*Anolis fuscoauratus*) sleep at night on the edge of leaves. This defense serves them well as these lizards will fall to the forest floor if they detect vibrations of their perches. Consequently, the snake must cantilever to the lizard without disturbing the branch on which the lizard is sleeping in order to obtain a meal.

(*Lachesis muta*), are native to the region; however, encounters with venomous species are rare at Reserva Amazónica.

The Anaconda Board Walk, a 200-meter boardwalk elevated 1 m above the Aguajales swamps is named for an anaconda sighting during its construction and lies approximately 1.5 km into the trail system. During the evening, the vegetation surrounding the boardwalk resonates with cacophonous calls of various anurans including Beireis' Treefrogs (*Dendropsophus leucophyllatus*, Fig. 11), Paradoxical Frogs (*Pseudis paradoxa*), Henle's Snouted Treefrogs (*Scinax pedromedinae*, Fig. 12), and Orinoco Lime Treefrogs (*Sphaenorhynchus lacteus*). While searching for frogs in the leaves and branches overhanging the boardwalk, we occasionally startled a sleeping Slender Anole (*Anolis fuscoauratus*), perched precariously at the very edge of the leaf, prepared at the first movement caused by a predator to leap to safety on another branch (Figure 10B). In or near the water, we have observed Scorpion Mud Turtles (*Kinosternon scorpioides*) and Royal Ground Snakes (*Liophis reginae*), and noticed the eye glare of Spectacled Caiman (*Caiman crocodilus*).

Research and Conservation

Inkaterra encourages ecological research of the region and the Inkaterra Association, an affiliated NGO, runs an adjacent research station available for numerous biological studies of plants and animals. That the region is a hotspot for amphibian and reptilian diversity allows extensive tropical field experiments and natural history research. As a partnership, Inkaterra often facilitates the education of its interpreters on

Ants, More Ants, and Frogs that Eat Ants

Ants patrol the trails by day and night. Care is needed to avoid unintentionally intercepting their trails, particularly for the Leaf Cutter Ants. The abundance of ants in the Tambopata region is greater than that of any other type of insect and includes diversity numbers upward of 43 species in a single tree (Wilson 1987). This diversity and abundance of ants provides a significant prey resource for amphibians, and has resulted in the evolution of a large number of ant-eating specialists.

During the day two cryptically colored frogs can be heard calling from the leaf litter. Although both species have varied diets, both include a majority of ants. The first is the Three-striped Rocket Frog (*Allobates trilineatus*), which frequently calls from root buttresses, signaling his superior mating qualities or defending his territory from intruders. Although not as colorful as some of its relatives, the more toxic species of Poison Frogs, its hues of gold and copper make it a striking sight before it retreats into the leaf litter. The second species, the Pale-striped Poison Frog (*Ameerega hahneli*), is slightly more colorful, with pale yellow stripes on a brownish-black body, and likewise bolder in its choice of calling locations.

At night, one can observe up to five microhylid species that follow ant trails for easy meals. When following an ant trail for even a short distance, one is likely to encounter Amazon Sheepfrogs (*Hamptophryne boliviana*) or Two-colored Oval Frogs (*Elachistocleis bicolor*, pictured) partaking of a “buffet.” The ant mounds themselves represent a highly diverse microhabitat. Approaching an ant mound at night offered us a glimpse of other unique species rarely seen elsewhere in the forest, including another microhylid, the Brown Egg Frog (*Ctenophryne geayi*), and the poison-frog mimic Gold-striped Frog (*Leptodactylus lineatus*). Tarantula burrows are another unique microhabitat, perhaps one where you would not expect to find an amphibian. However, the Dotted Humming Frog (*Chiasmocleis ventrimaculata*), the smallest microhylid in the area, can occasionally be found inside these burrows, where it feeds on the ants that prey on juvenile tarantulas. This mutualistic relationship keeps the small frogs safe from the adult female tarantulas, who often feed on other frogs, as the female apparently “knows” that these frogs help protect her spiderlings from ants.





Figure 11. More than 40 species of treefrogs occur at Reserva Amazónica. One of the flagship species, Beireis' Treefrog (*Dendropsophus leucophyllatus*), breeds in several places but is easily seen from the Anaconda Boardwalk during the rainy season. a. “clown” phase, b. “giraffe” phase.



Figure 12. Henle's Snouted Treefrog (*Scinax pedromedinae*) demonstrating crypsis on a lichen-covered tree.

regional plant and animal diversity by collaborating with visiting biologists. The interpreters and staff are eager to learn, as well as to teach us, about the local biodiversity. Even after long hours already in the forest, they would join us on our evening excursions looking for frogs, snakes, and many other organisms. They would help us take photographs, record calls, and collect data. For several years now, Inkaterra and Reserva Amazónica have supported the fieldwork of SAO and RCJ making it possible for us to continue our research as well as mentor the next generation of tropical herpetologists. Many students of herpetology have begun their tropical research at this very site, a trend that is likely to continue well into the future. However, the excellent accommodations and natural atmosphere are just as inviting for those just longing to witness amazing biodiversity and learn about its conservation.

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