Nectandra Institute

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Night and Day at Nectandra

Unlike temperate zone locales, day and night length in the tropics are uniform and almost equal. At Nectandra, winter or summer, they vary only by some 40 minutes during the year. It gets dark early; sunset at the winter solstice is at 5:22 pm, at the summer solstice, it is at 6:01 pm. Twilight does not last long; in little more than half an hour after sunset it is really dark. As we are some distance away from any community, complete darkness sets in quickly, especially on a moonless or cloudy night. Only brilliant halogen head-lamps powered by large rechargeable batteries provide sufficient light to see well beyond our finger tips. Exploration after dark is a startling experience and reveals the unexpected.

During the daytime, the cloud forest is fairly peaceful. Overhead, birds sing and occasionally fly past, troops of monkeys go about their business, and sloths may show themselves, although camouflaged to the point of near-invisibility. During the short sunny minutes, a few butterflies and hummingbirds are seen in the more open areas, insects are scarce, and other fauna, such as frogs, lizards, and small mammals, are generally nowhere in sight. Of course, persistence and luck allow for an occasional encounter with lizards, a snake, a weasel, an armadillo or anteater, an agouti, a large group of noisy howler monkeys, or of silent white face monkeys. One very lucky volunteer came face-to-face early one morning with a mother Baird's tapir and her infant on one of the principal trails. None of the regular staff have been so privileged in the seven years that we have been around. This daytime tranquility, however, is deceptive. On an occasion when we felled a tree, birds, lizards, snakes, giant beetles and other insects exploded from their home as the tree hit the ground. Then, just as suddenly, the displaced fauna dispersed and scrambled to the canopy for their new homes. All was quiet again in a matter of minutes. It appears that a large portion of our fauna resides permanently in the canopy.

Given the relative paucity of our sightings during daylight hours, could the right time be after dark? Early one evening in December, Evelyne and I joined Lisa Gonzalez, an entomologist who was volunteering at Nectandra for a month, for a night walk around our garden paths. We set out from the dining room at the staff building, where many half-inch large black ants were cruising. Barely out of the building, we came upon a large long-horned beetle, Saturniid moths plastered against the windows exposed to the building fluorescent lights, various scarabs, weevils and bugs (photos A & B) on nearby bushes. Walking across the bridge over Quebrada Verde—the largest of six streams at Nectandra, our first stop was at a large patch of *Sobralia* sp., a terrestrial orchid with large, pure white to deep lavender blooms, that last only a few hours during daylight. These Sobralias are mostly uninhabited during the day save for small flies, tiny wasps and occasional caterpillars, That evening, however, a number of very-large grasshoppers (between 3-4 inches, photo C) were foraging on the stalks, as well as a few moderately-large crickets perched atop the foliage. Katydids and crickets are often nocturnal, but grasshoppers are usually diurnal.

We were next to the edge of our garden pond (which is actually a widened side loop of Quebrada Verde), so we cast our lights down into the shallow water; to our surprise, we saw a number of small (two to three inch long) fish that were never seen during daytime, actively preying on tadpoles. These fish (designated "minnows") were in addition to the smaller "guppies" that we routinely see by day. As an indication of a neglected area of study, our main reference on Costa Rican cloud forests, *Monterverde: Ecology and Conservation of a Tropical Cloud Forest* , has no information on aquatic life other than insects. Yet, we have recorded on videotape the activity of large (and now rare) crabs and small otters in Quebrada Verde at night. Long-time residents have told us that large fresh water shrimp were once common in these streams.

Leaving the open garden area, we followed the path under the trees forming the forest boundary. Almost immediately, we saw more arthropods atop low-growing foliage: scattered stick insects, leaf-form katydids (C &

D), green scarab beetles, and numerous harvestmen, which are small-bodied arachnids (spider relatives) with very long, thin legs. On our previous walks, we have seen examples (E through G) of mimicry among these insects that are at once startlingly varied and “non”-revealing. For example, the exoskeleton of the walking stick (E) not only has coloration but also form, including an *apparent asymmetry*, for example, of legs and wings, that make them indistinguishable from a real twig to the naked eye. Imagine a walking fall-colored leaf among the litter, and you would be looking at the katydid in (D), complete with the apparent holes of a decaying leaf. Katydid in (H) revealed itself to the startled photographer only when the moving lichen under her lens foiled her attempts to focus.

Moving along, we saw a striking caterpillar (J) and multiple species of forest cockroaches (not the alien invading domestic pest species). Depending on the species, these forest litter scavengers range from a quarter inch to 3 inches in size. The tropical species are sometimes transported in shipments to the US. Fortunately, they cannot tolerate cold temperature and are not yet found outside Key West, Florida.

We saw three species of snails that evening. Despite the constant moisture, molluscs are surprisingly scarce day or night. One species of small snail at Nectandra appears almost clonal, with white shell and brown spirals on every individual encountered (we collect empty shells for comparison). Similarly, all individuals of the same species around our house (little more than a mile away) are nearly identical. Yet the two populations are distinguished by the coarseness of the brown spirals. It is clear that they are two variants, isolated from one another by distance over evolutionary time.

Continuing our walk, we soon began to ascend to an upper-level terrace of the garden. We noticed, for the first time, several tiny (less than 0.5 in) rain-frogs on leaves next to the path. Known as tink frogs (genus *Eleutherodactylus*), their calls are reminiscent of metal striking against glass, a dominant sound on rainy or misty nights. They belong to a very diverse family of over 500 species of neotropical frogs that are well adapted to habitats among the humid vegetation and on trees. The particular frogs we were seeing were light tan but can change coloration to tan with darker markings during the day. They did not react to our lights nor were they calling. Unlike most frogs, the larvae of this species develop fully inside the egg sacs and emerge as tiny replicas of the adults away from water pools. Females are quite a bit larger than males; mating take place mostly at night, sometimes with two males, or even three, on the same female.

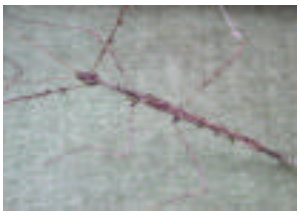
Eventually, we emerged on a garden terrace with a large stone retaining wall. Drainage from the wet hillside above the retaining wall seeps through, and keeps the wall wet. We peered at the numerous crevices in the rock wall, and were promptly rewarded by finding several of the strangely-named “tailless whip-scorpions”. They are small (less than one inch) arthropods that bear only a slight resemblance to true scorpions. They have no tail parts (hence the name—"whip-scorpions" have long thin tails), but have a pair of strong front legs used to grasp their prey. They are black, difficult to see, and hide in rock crevices during the daytime.

Before coming to Costa Rica, we understood the definition of high biodiversity, but gave little thought to the actual manifestation in the wild. It should have been obvious, that a high number of species within a finite space means low density of each. That is, the higher the diversity, the fewer copies of each species. Biodiversity in the cloud forest is subtle, enigmatic, infinitely varied, and of mind-opening beauty when one encounters it. The tiny sample that we witnessed in one night can be multiplied infinitely, in unimaginable varieties. Unfortunately, we humans have not been wise enough to nurture it. To readers who have not been to the cloud forest, go visit it soon—before it is too late.

by David A. and Evelyne T. Lennette


A. Weevils (family Curculionidae), one of 7500 species in CR.

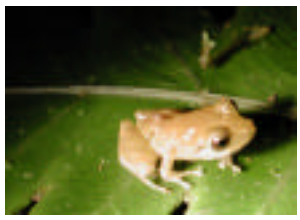
B. Leaf beetles (family Chrysomelidae), one of 12000 species in the Neotropics.

C. Long-winged Katydid (***Coccohotus sp***) (8.0 cm)
D. Walking stick (body length 10cm)


E.& F. Broadwinged katydids ***(Cycloptera sp***), mimicking red and green leaves.


G. Left: Katydid (body length 8.0cm) mimicking a dried leaf.
H. Right: Spike-headed katydid (***Panacanthus sp.***) (body length 6.0cm) mimicking green moss

J. Left: Caterpillar (probably of Saturniid moth) on fern
I. Right:: Tink frog (***Eleutherodactylus diastema***). The caterpillar and the frog are approximately life-size . Frog size = 1.5 cm.

Lose Some, Win Some

Two forces drive me in this project, one negative and one positive. The pessimist in me sees the forest destruction. No sane human would knowingly and wantonly destroy the engine and source of fuel that sustain their home, air, nutrients as Planet Earth flies through space. Yet that is what we are doing. Is insanity part of human's evolutionary heritage? It certainly appears so.

Every day while we work, it is not possible to deny the rapid rate of change. I do not fear change, but the exponential rate of increase sends me into a fit of terror. There are daily reminders everywhere. For example, the cloud bank that bathes the cloud forest has been rising, perhaps as much as 10 meters annually. Six years ago, our rented house at the base of a small valley was submerged in mist at least 12 hours/day, for 10 months a year. Now, for only an estimated 8 months a year. Insects around the house were sometime so dense on moonless nights that I could not avoid breathing them in when going outside. Now, I could count their numbers. This decrease coincided with my neighbor's conversion of his forest, which is contiguous with that of my landlord, to a plantation of Dracaena. This ornamental, exported all over the globe, is ubiquitous in most airports, hotel lobbies and offices. My neighbor is only one of many dracaena growers in the region who are replacing the highly diverse forests for monoculture of ornamental exotics.

But a half-empty glass is always also half-full. So is the changing climate at Nectandra. For example, the Resplendent Quetzals previously stopped here on their migration from the Pacific highland to their breeding ground in the Nicaraguan lowlands. They were mostly female, solitary and stayed only briefly. This year for the first time, we had three sightings in November, one a group of two females and a juvenile male. They were seen parked on trees digesting after feeding. The other surprise came in the form of a troop of more than a dozen keel-billed toucans, when an occasional toucan has been the norm. Both birds are strikingly beautiful. No observer can be indifferent to the metallic sheen of the Quetzal, nor the outlandish but colorful bill of the toucans. We are happy to host them and feel graced to be able to provide a respite on their journeys. To see them well fed is what brought us here.

Unfortunately, their presence bodes ill: it can only mean that their "normal" food supply is no longer there.

— The editor

2005 Events

Increased Visitation — Some 300 visitors came to see our cloud forest garden. Many were visibly moved by the serene forest as soon as they arrived. The undefinable beauty of a sharply outlined wet trail snaking through a grove of tree ferns in the heavy mist has a way of touching one's soul. Their reactions, in turn, gave us (the staff) hope that we were on the right track. During their guided walks, we shared company and talked about many things, among them our mutual appreciation for Mother Nature's gifts to mankind and the Institute's goals in caring for them.

Tapirs — Since the beginning, six years ago, Baird's tapir footprints and scat were visible. Once plentiful throughout the country, they are now on the endangered list from over-hunting and loss of habitats. These large vegetarians (150-300 kg) require a large home-range. Our preserve of 100 hectares, too small for their home, does provide several "services" to them. First, we provide water and food. The main stream runs all year long, even in the "dry" season. Their favorite foods are among trees planted in our reforestation parcels. Manuel Solis, our forest ranger who does the actual hard work of planting, is delighted every time he sees his young seedlings consumed, even at the expense of his effort to grow the trees. Lastly, we provide a respite from hunters who pursue them, from both northern and southern borders which are 2 km in length. On one occasion, Manuel witnessed two hunting dogs in pursuit of an adult tapir, crossing into our southern fence line. Manuel managed to catch both dogs! What we did with those dogs is another story. Stay tuned.

Jaguar Confirmed — There have been anecdotal report of a jaguar some 30 km north west of us; we never imagined this exceedingly rare cat to visit. One did in a recent month and left an immense footprint in the soft mud near the northern boundary. Manuel, who had hunted them in his previous (now abandoned) career as a professional hunter, carefully lifted the print with plaster of Paris and compared it with that of a puma. To our guarded excitement, it was strikingly larger. Dr. Eduardo Carillo, the foremost mammologist in the country, personally confirmed the print to be that of a jaguar. To put this finding in perspective, the Osa National Park, 50 thousand hectares large, has a jaguar population of about 50 from Dr. Carillo's census in 2005, reduced from 200 in the 1995 census. The estimated effective population in Costa Rica is about 200 individuals.

Herpetofauna Survey — Andres Vega initiated his survey November 2004 and is continuing this year. Reptiles and amphibians require highly humid habitats with constant temperature, They are very vulnerable to climate changes. Their populations went through a crash countrywide in 1987. A general survey at Nectandra is urgently needed to determine their present status.

Volunteers — Three volunteers came to help this year. **David Leeder**, newly graduated in environmental science from Laurentian University in Canada, did 2.5 weeks of field work in the Reforestation Project, tagging and inventorying trees. **David Muth**, a professional herpetologist from the consulting firm LSA Associates, spent one intense week evaluating the prospect of a long term herpetofauna survey. **Lisa Gonzalez**, a freshly minted entomologist from the University of California at Riverside, spent one month evaluating Nectandra insects as live subjects for public displays. Our small volunteer (1-2 maximum at any one time) program has one primary objective—to provide young professionals a short tour in the tropics, to explore and experience field work first hand, or to further their career interest. It goes without saying, we appreciate their generous motivation to help and hope the benefits were mutually received.

Construction — Our staff building was completed in June and signaled the end of the construction phase. It is a U-shaped building. One arm is a large workshop/storage area. It houses all of the shop and garden tools and future investigational gear (live animal traps, various containers and large items needed for field work, including boots for the investigators, etc.). The other arm has a large staff lunch/meeting room and also a modest sized general laboratory for microscopy and future plant tissue-culture work.

Our reforestation work, over a total of ten hectares divided into eight study plots, is progressing well. Data collection continues at a steady pace. The oldest study plot had its fourth annual data point taken this year. Benchmark time point will be at year five, when no additional intervention (transplanting and cleaning) will take place, and when preliminary analysis of the growth patterns of study plots will be compared to the control plots.