RESEÑA

S.R. Singer and S. Grismaijer
Panic in Paradise: Invasive Species, Hysteria and the Hawaiian Coqui Frog War
Hawaii: ISCD Press, 2005

Francisco Watlington

Departamento de Geografía
Universidad de Puerto Rico, Recinto de Río Piedras

The Hawaiian Islands have been overrun by Puerto Rican coqui tree frogs, provoking righteous indignation among some earlier immigrants who resent their loud foreign screech. Before the coqui, Hawaiian nights were dismally chirpless, and consigned to the creaky chorus of native crickets.[1]

Puerto Rico is well populated by tree frogs of no less than 18 endemic species of the Neotropical genus *Eleutherodactylus* (Leptodactylidae). (Joglar, 1998). Why doesn't Hawaii have at least one endemic representative of this most speciose of all vertebrate genera, almost 600 known species; with 20% of the total, 119 species, on the Greater Antilles? (Hedges, 1993) The historical answer is that before the upsurge of globalization the constraints of unfavorable oceanic currents, winds and sheer distance precluded rafting of pioneer tree frogs from the American tropics.

No longer. The airborne conveyer belt that supplies Puerto Rico with orchids from the Big Island most likely provided the Hawaiian sweepstakes winning ticket to the assertive Common Coqui (*E. coqui*), traveling as a bromeliad stowaway on the return leg. One would think that many Hawaiian biologists are elated over the prospect of observing evolution in action as the coqui expands into its new habitat radiating adaptively in accord with Darwinian natural selection; diversifying to fill specific geographic niches. How long will it

take for the ***malihini*** (newcomer) to become a ***kamaaina*** (oldtimer)? How much longer before the founding species becomes an endemic subspecies, then a full endemic and eventually an array of specialist endemics? Evolutionary biologists are well aware that adaptive radiation can be observed in action well within an average human lifespan. (Weiner, 1994)

If island area and topographic complexity are indicative, Hawaii proper might some day be home to as many as 18 species of coqui-like endemic froglets, the approximate number of species found on Jamaica and Puerto Rico, both islands of similar size. While in their Rican homeland all tree frogs are called 'coqui', each species has its distinctive call, and some do not live in trees. Impatient Hawaiian evolutionists might consider mitigating the dearth of native coqui biodiversity by introducing additional species from Puerto Rico, currently threatened by uncontrolled urban sprawl and less obvious environmental factors.

There is, for example, the ***Guajón*** or 'Demon' Coqui (*E. cooki*) whose banshee call terrifies those who dare approach their cavernous lairs among the Cyclopean boulders of the Sierra Panduras. They should take well to the weathered old lava tube caves of Hawaii. Another promising introduction would be the ***Martillito*** or 'Little Hammer' Coqui (*E. locustus*), which dwells in the bracken and brush around rainforest edges. Be forewarned: their all-night anvil chorus (like scores of small hammers banging on a large rock) could drive some insomniac invasion-crazed biologists over the edge. Perhaps a safer choice would be the ***Pitito***, or 'Little Whistle' Coqui (*E. cochranae*). A widespread resident of suburban gardens in metropolitan San Juan, it is said to be replacing the true Coqui in some areas! Its soft, persistent nocturnal whistle could at times be misconstrued, leading to animosity between formerly close neighbors.

All things considered, the ubiquitous Common Coqui is the darling of the Puerto Rican countryside and cityscape.[2] Most local ecologists do not share the qualms about the species that perturb some of their Hawaiian peers. They are also discovering that the 'just-so' anti-coqui mythology spun by invasion biologists is a ploy to couch condemnation of the beastie in 'scientific' terms. We are indebted to Sydney Ross Singer and Soma Grismaijer for exposing their hidden agenda and brazen conflicts of interest in the valiant book, *Panic in Paradise, Invasive Species Hysteria and the Hawaiian Coqui Frog War* (2005). Hawaii: ISCD Press. It is a chronicle of the media abetted vilification of 'alien' Puerto Rican coquis under pretense of a specious ecological fundamentalism that would do away with immigrant biodiversity to protect endemic species.

A Hawaiian cadre of so called **invasion biologists** (Theodoropolous, 2003) frame their insidious indictment of the coqui as a dire ecological menace in Eltonian epidemiological jargon that maligns bromeliads as 'vectors', pioneer colonies of froglets as 'inoculum', and successfully naturalized populations as 'infestations'. (Kraus *et al.*, 1999).[3] Moreover, purportedly scientific factoids are craftily manipulated for condemnatory effect.

For example, there is the spurious claim that coquis are depriving endangered Hawaiian honeycreeper-finches (Drepanidinae) of the insects they feed on. However, very few extant drepanids are strictly insectivorous. Most feed on nectar, fruits and seeds, as well. Only certain species with highly specialized bills grub or peck into rotted wood for morsels hidden from coquis. There is no lack of bugs to go around. The Hawaiian Islands are home to no less than 10,000 endemic species of insects, including a notorious 'killer caterpillar', and 43% of the world's known species of crickets (Wilson, 1999). But there were no ants in the original native fauna! There are plenty of ants now, a favorite coqui food, among the 3,000 introduced and naturalized arthropods. Some of the 40 or so introduced species of ants are quite aggresive and may drive some hapless island insects to extinction (Reimer, 1994) unless kept in check by the coquis which also relish alien mosquitoes, vectors of avian malaria, lethal to endemic birds.

Even the much maligned naturalized 'Small Indian Mongoose' (*Herpestes javanicus*) has been invoked. Coquis will feed, fatten and multiply the dreaded mongooses! Nonsense! Serious surveys of mongoose stomach contents in wet and dry forests in Puerto Rico and elsewhere have consistently evinced that coquis are insignificant sporadic items in the largely insectivorous and frugivorous small-time predator's diet (Vilella, 1998; Vilella and Zwank, 1993).

Singer and Grismaijer's incisive monograph unravels the trophic flowchart that links opportunistic bioscientists with the expedient largess of the political establishment. Would-be exterminators vie for public and corporate funding to further their pogrom by 'experimenting' with everything from scalding water through caffeine to quicklime. As experts in the diagnosis of culturogenic malaise, the authors recognize the "coqui problem" as an issue of human sociobiology rather than of wildlife ecology.

However, their treatment has shortcomings that might be remedied in later editions. The evolutionary relationships between naturalized, native and endemic species, indeed the controversial concept of 'species' itself, needs to be clarified. Also needed is a complete bibliography of documentary and other references, an indispensable adjunct for credence among educated readers.

Sadly, all is not well with coqui biodiversity back home and elsewhere. Many species are declining alarmingly along with other anurans and sundry amphibians worldwide (Hedges, 1993; Joglar, 1998). Amazingly, urban development on the coastal plains and interior lowlands seem not directly to blame. For it is the coquis that live in near pristine rainforests on the highermountains that are in trouble. Two or three such kinds have not been seen in recent years and are presumed extinct. Others are diminishing also and though global environmental change has been implicated, scientists have yet to unequivocally qualify the causes.

A pandemic fungus may be symptomatic of such biochemical changes in the atmosphere as the increase in acid rain and global warming. But possibly the most portentious threat–to coquis and humans alike, is the amount and composition of dust that is being blown into the air and transported across oceans to far-off islands remote from the continental sources.

Each year Saharan storms carry aloft millions of tons of dust that blow westward all the way to the Caribbean, Central and South America (Wright, 2005). Air quality advisories on the Saharan plume are regularly issued in Puerto Rico warning asthmatics and others with challenged repiratory function to stay indoors. The amount of dust from Africa has been climbing steadily as desertification from deforestation, overgrazing and lake beds dried out from water diversion advances inexorably.

The dust carries mineral nutrients, including iron, nitrate and phosphate that can overfertilize coastal waters, smothering corals with algal blooms. Clouds of particulates are also laden with more insidious frequent fliers. Mercury and radioactive isotopes from open-pit mines and testing grounds, pesticides and herbicides that have been banned in the United States but are still used in Africa, and over one hundred species of bacteria, viruses and fungus maladies are proven intruders in the dust.

An estimated third of the traveling bacteria are pathogens such as the pseudomonads which cause ear and skin infections in humans–and on the delicate moist epidermis of tree frogs. Others are responsible for infestations of banana leaf spot, sugar cane rust, meningitis, and a host of allergies. Dust transports up to a billion microbes per quarter teaspoon.

Is fortress Hawaii safe from the onslaught of dust-borne environmental disaster by virtue of its isolation? Hardly. Over the millennia Hawaiian soil has been enriched by quartzite fallout from Gobi Desert dust storms blown seaward by the Siberian High. The mustard-yellow plume has in recent years transported

soot, acidic gases and heavy metals such as mercury across the Pacific to the United States west coast, reaching critical aerosol levels.

Among the countless pesticides hoisted aloft is the popular weed-killer Atrazine, currently used in some 80 countries. Recent research suggests the chemical may be contributing to amphibian declines (Harder, 2002). At environmental levels of 0.1 parts per billion, once thought insignificant, male frogs are feminized, developing ovaries and smaller larynxes. Testosterone level in the blood of adult males exposed to Atrazine is one-tenth that of unexposed males. Is the Hawaiian Coqui foredoomed to extinction as its assertive call diminishes from shriek to squeak?

Invasion biologists rejoice! Might this be the eventual solution to the coqui "problem"? Caveat emptor! Atrazine and other potent androgen blockers that, even as this is written, are raining down upon the Hawaiian Islands are known to have similar effects on humans. Would it not be wiser to recruit the Hawaiian Coqui as a *sentinel* to monitor the environmental impact of pervasive estrogenic atmospheric pollutants? A similar role has been proposed for naturalized caimans in Puerto Rico's freshwater wetlands where critical groundwater resources are in jeopardy from industrial, agricultural and domestic pollution (Watlington, 2002).

NOTAS

1. At least two other species of tree frogs have also reached Hawaii, the soft spoken Cuban *E. planirostris* or 'greenhouse frog' and *E. martinicensis* from the Lesser Antilles (Kraus *et al.*, 1999).

2. Fueling the suspicion that nostalgic Hawaiians of Puerto Rican descent are implicated in the spread of the coqui, at least on the island of Maui where a large ethnic Rican community concurs with a widespread coqui presence.

3. Refers to Charles S. Elton, putative father of invasion biology (Davis, Thompson and Grime 2001), an early British ecologist and wartime pest exterminator whose bioxenophobic postwar radio series was published as: *The Ecology of invasions by Animals and Plants* (1958).

REFERENCIAS

Davis, M. A., K. Thompson y J. P. Grime. (2001). Charles S. Elton and the dissociation of invasion ecology from the rest of ecology. Diversity and Distributions 7: 97-102.

Elton, C. S. (1958). The Ecology of Invasions by Animals and Plants. London: Methuen.

Harder, B. (2002). Feminized frogs: Herbicide disrupts sexual growth. Science News, April 20 (161): 243.

Hedges, S. B. (1993). Global amphibian declines: A perspective from the Caribbean. Biodiversity and Conservation 2: 290-303.

Joglar, R. L. (1998). Los coquies de Puerto Rico, su historia natural y conservación. San Juan: Editorial de la Universidad de Puerto Rico.

Kraus, F., F. W. Campbell, A. Allison, y T. Pratt. (1999). Eleutherodactylus frog introductions to Hawaii. Herpetological Review 30 (1): 21-25.

Reimer, N. J. (1994). Distribution and impact of alien ants in vulnerable Hawaiian ecosystems. pp. 11-22 in D. F. Williams (ed.), Exotic Ants: Biology, Impact and Control of Introduced Species.

Singer, S. R. and S. Grismaijer. (2005). Panic in Paradise: Invasive Species Hysteria and the Hawaiian Coqui Frog War. Hawaii: ISCD Press.

Theodoropoulos, D. I. (2003). Invasion Biology: Critique of a Pseudoscience.Blythe, CA: Avvar Books.

Vilella, F. J. (1998). Biology of the mongoose (Herpestes javanicus) in a rainforest of Puerto Rico. Biotropica 30 (1): 120-125.

_____ y P. J. Zwank. (1993). Ecology of the small Indian mongoose in a coastal dry forest where sympatric with the Puerto Rican Nightjar. Carib. Jour. Sci 29 (1-2): 24-29.

Watlington, F. (2002). Stranger in a lost paradise: Caiman crocodilus, Puerto Rico's own aliengator, pp. 239-243 in: Crocodiles: Proceedings of the 16th Working Meeting of the Crocodile Specialist Group. Gainesville, FL: IUCN.

Weiner, J. (1994). The Beak of the Finch. Westport, CT: AVI.

Wilson, E. O. (1999). The Diversity of Life. New York: W.W. Norton & Co.

Wright, K. (2005). Blown away. *Discover* 26 (3).