Kia'i Nā Moku O Maui Nui

"Guarding the Islands of Maui County"

Newsletter of the Maui Invasive Species Committee

Spring 2007

Whistler of the Night

"Residents tell us . . . that for once they had a really quiet night sleeping."

By Darrell Aquino
MISC Crew Leader

"Ko-kee! Ko-kee! Ko-kee!" What is that sound? Is that a bird? No, it's a little noisy frog whose native home is Puerto Rico. Wow. As a hunter, I never imagined I'd be hunting *frogs*. When asked if I was interested in joining the MISC vertebrate crew, doing night surveys and controlling small frogs, I thought it was just another species to work with. Man, was I in for a challenge.

First I learned why, how, and where these little creatures operate. Coqui frogs may have hitched a ride or laid eggs in the leaves or soil of nursery plants brought to Hawai'i. On Maui, they now live in junkyards, valleys, residential neighborhoods—even on the grounds of first class hotels!

Monday through Thursday our six-person crew gets its assignments: what's going on for the evening and who's going to Lahaina, Kīhei, Ha'ikū, Honopou, or certain nurseries where frogs are heard on Maui. We split up in pairs or work a large site all together. We follow the ricocheting calls to a patch of wet leaves, where frogs the size of a quarter can hide. A whistling frog takes only a minute or so to locate—*if* it is making noise. But the only ones making the noise are the male frogs. Then comes the challenge of actually catching the fast-moving frog bare-handed, before it jumps away. Now there's a big problem: there are lots of frogs on one particular property. This is where the heavy machinery comes in handy.

We use a 100-gallon sprayer filled with granular citric acid dissolved in water to spray the entire area where frogs are heard. There are several reasons why we spray the entire area. One is to get tiny, hidden egg clusters. Second, we can control all the frogs, not only the ones that are calling. Last but not least, we can control a huge area in minutes. With 127 acres to deal with, finding the quickest and most effective method helps.

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In this issue:

Message from the Manager

Enough Already!

By Teya Penniman
MISC Manager

"MISC adopted a policy of 'No New Vertebrates' to prevent the establishment of new animal species on Maui."

Many people on Maui, whether they are *kamaʻāina* or recent arrivals, do not know that Maui has very few native animals. For instance, the *ʻōpeʻapeʻa* (Hawaiian hoary bat) and *ʻīlio-holo-i-ka-uaua* (monk seal) are the only native land mammals to grace our islands. In contrast, the numerous vertebrates on the island – among them the ubiquitous gecko, anolis lizard, and common myna – are all transplants. We seem to co-exist just fine with the geckos and the big toads that stand like a pillar-of-salt in the night path, don't we? So, what's the big deal?

The problem with this philosophy is that changes caused by new species often can't be observed for many years, by which time the intruder is so well-established that eradication or containment is not only absurdly expensive, but practically impossible. And the problems caused by many alien vertebrates are irrefutable. Consider the rat, recently implicated in the defoliation of our native forests, or the mongoose, which preys upon ground nesting birds and sea turtle eggs. Hawaiʻi Island has spent millions of dollars trying to control the night-calling coqui frog, with real estate agents now required to disclose the presence of this tiny vertebrate to prospective buyers.

The effects of vertebrate introductions are often complex. Introduced parrots disperse seeds of the aggressive miconia plant far into the native forests. Feral pigs uproot the native *hāpuʻu* (tree fern), creating pools of stagnant water – ideal habitat for the mosquitoes which carry avian malaria to our threatened forest birds. Maui's native plants and animals had millions of years to adapt and morph into spectacular examples of nature's diversity. The tidal wave of new species—thousands over a mere several hundred years, many without local predators to keep their numbers in check—has decimated much of that original splendor. The remnant species are exceedingly vulnerable to changes in their world.

MISC adopted a policy of "No New Vertebrates" to prevent the establishment of new animal species on Maui. This doesn't mean that MISC is trying to eliminate all non-native species. Limited resources and a practical management approach dictate that we focus only on species that pose the most serious threat to our environment, economy, and quality of life. Additionally, control must be feasible and economically reasonable.

In practice, controlling invasive animals is not an easy mandate. Invasive plants pose their own challenges, but at least the original "mother" plant tends to stay put. Animals are, by their nature, mobile. Plus, many of our targets are cryptic. Try finding a snake curled up in a dark corner of a shipping container or near the 14th hole of a local golf course! Our trained searchers had a hard time locating two veiled chameleons that we knew were perched in one of two trees. The coqui frog's loud call helps to locate the quarter-sized male squawkers, but the females, juveniles, and brooding males remain silent and difficult to detect. Logistics can be complex, with most searches taking place on private property. Operations typically involve multiple agencies such as the Hawaiʻi Departments of Agriculture and Land and Natural Resources, which have legal jurisdiction over the animals. The work is often frustrating, especially when reports of an animal are several days old.

Daunting though it may be, the goal of "No New Vertebrates" is a worthy one. We invite you to join in our efforts - get to know which animals are already here and promptly report unusual sightings. We hope you enjoy reading about MISC's efforts to stop the spread of invasive vertebrate species within Maui Nui.

Acting Locally

Not Your Typical Garden Variety

Angela Kepler and Frank Rust offer expertise in the field of rare Hawaiian bananas

Angela Kepler reaches past a myriad of wet leaves to find a stalk of striped green and yellow bananas. She points out the details that distinguish this uniquely Hawaiian variety. "There, do you see how these fruits are shaped a little different from the others? They are well-rounded at the tips, not bottle-nosed or square-ended, and of course, the variegation makes this Hawai'i's most easily recognizable variety." The Maui Invasive Species Committee (MISC) field crew nods, mesmerized. Angela and her husband, Frank Rust, are treating the MISC crew to a two-hour crash course on Hawaiian bananas. If anyone knows bananas, it's these two plant enthusiasts who have risen to the challenge of uncovering the cultural significance of Hawaiian varieties and defending such treasures against threats and possible extinction.

Frank and Angela have created a sanctuary for some of Hawai'i's rarest bananas on their three-acre property in Huelo. They grow more than 20 varieties - primarily to study and photograph their development. They also enjoy eating them! Weaving through the garden, Angela describes how early Hawaiians cultivated numerous banana varieties, each suited to a different culinary, cultural, or religious purpose. The striped banana, *mai'a (maoli) manini*, is reportedly delicious when cooked. Its orange-tinted flesh has a lingering flavor that's especially good sautéed with garlic and fresh coconut cream. The male flowers of *iholena* produce a jelly-like, sweet nectar called *pīlali* that Hawaiians once used for baby vitamins. *Mai'a (maoli) 'ele'ele* has a dark, glossy trunk tissue that is still used for weaving black patterns into *hala* (pandanus) hats and bracelets. Then there's *mai'a hāpai* (pregnant), whose sweet fruits sometimes develop within the center of the trunk when the "birth canal" becomes closed.

Angela points out intricate details of a banana leaf to MISC field workers, Russell Suzuki and Brooke Mahnken.

Angela Kepler and husband, Frank Rust, are preserving some of the rarest banana varieties in the world.

While 75 traditional banana cultivars are reported in the popular literature, Angela and Frank's fastidious studies have determined, after taking duplicates from different islands into account, that only 44 cultivars existed, including five undescribed varieties that they and others have discovered in the last five years. As of March 2007, only 22 remain. Of these, 17 are critically endangered, with estimated populations of 1 to 100 plants.

Frank and Angela spent countless hours researching, documenting and photographing bananas throughout the Pacific. Their interest went beyond recording. Says Angela, "We decided that there was no use just describing and photographing bananas without further helping them survive." To that end, they helped bring people together to protect the precious and unique diversity of bananas from Banana Bunchy Top Virus (BBTV). Along with the Maui Banana Working Group,

See Hawaiian Bananas on page 11

Committee Member Spotlight

Pythons, Parrots, Dart Frogs, and "Big Cats"

By Teya Penniman, MISC Manager

When bizarre animals land on Maui, there's a good chance Dr. Fern Duvall II will see them or help mastermind the effort to capture them. As the Vice Chair of the Maui Invasive Species Committee (MISC), Fern is on the front lines – helping to protect Maui Nui's natural resources from the onslaught of unwanted and often illegal invasive vertebrates.

> *"Fern sees the patterns, shadows, and tracks, where others see only a tree or dark spots in a maze of color."*

Work on invasive species is not technically part of Fern's job description. His regular duties as a wildlife biologist with the DLNR's Division of Forestry and Wildlife (DOFAW) keep him plenty busy. On any given day, you might find him clambering onto the rocks of Molokini to band *ua'u kani* (wedge-tailed shearwaters), descending a lush and treacherous path down the north flanks of Haleakalā to census native forest birds, or crouched in the dark on Lāna'i's Munro Trail, listening for the eerie calls of the nocturnal *ua'u* (Hawaiian petrel). He may be called to respond at odd hours to a disoriented deer on the Hāna Highway or pick up an errant seabird from one of the cruise ships. Fern's no slouch in the plant department either. Active on several local boards, including the Hawai'i Native Plant Society, he helps protect rare and endangered plant species, such as *ma'o hau hele* (*Hibiscus brighamii*), by pulling weeds in exclosures created to keep out feral cattle, goats, and deer. He has personally co-discovered two new plant species and his home garden in Makawao is a riot of orchids and unusual native plants.

Fern prepares to release a cruise ship visitor.

It was the critically endangered *alalā* (Hawaiian crow) that brought Fern to Hawai'i. He headed up the captive propagation program in Olinda—a natural fit, given his doctoral work at the University of Berlin on the social behavior of crows. Around the time that Fern left the *alalā* project to become a DOFAW wildlife biologist, MISC adopted a policy of "No New Vertebrates" for Maui County. Fern was asked to be DOFAW's point person for MISC and the rest, as they say, is history.

Fern Duvall conducts surveys on Lāna'i.

It's hard to imagine a person better suited to the challenge of identifying and tracking mystery animals than Fern. Growing up near Lake Huron in Michigan, Fern displayed an early interest in wildlife. The Duvall property became a second home for turtles, birds, lizards and a host of other creatures, with his mother drawing the line at snakes. As a teen, Fern could be seen pedaling the rural roads, followed closely by two low-flying Canada geese he had reared as goslings.

Besides an enduring interest in wild animals, Fern's photographic memory comes in handy when dealing with the unexpected. When asked, "What was the most unusual animal you've ever encountered on Maui?" he didn't hesitate to describe, in detail, the thorny tailed lizard that a Ha'ikū resident captured. Upon seeing the animal trapped in a plastic bucket, Fern immediately visualized the book and page (in German!) where he had seen this animal and properly identified it. His ability to remember identifying characteristics and his encyclopedic knowledge of animal morphology and behavior help immeasurably when answering phone calls that begin with, "I saw this weird animal…."

His keen observation skills are evident to anyone who has worked in the field with him. Fern sees the patterns, shadows, and tracks that mean there is a creature attached to the branch, where others see only a tree or dark spots in a maze of color. Fern's attention to detail no doubt spills over into one of his less-well-known talents: capturing the essence of Hawai'i's plant and animal life in wonderful pencil and ink or watercolor portraits.

MISC regularly draws on Fern's expertise to train staff and help craft our management strategy. He holds the title for MISC partner who has spent the most time in the field with the crew, earned mostly on veiled chameleon and snake hunts. It's a practice that is consistent with his philosophy of "hands-on management," which keeps him in touch with what's happening in Maui's backyards and native landscapes. In the process, MISC and all of Maui Nui are the beneficiaries. We are lucky to claim Dr. Fern Duvall II as one of our key supporters and partners.

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Filling a 100-gallon tank can take awhile because of the low water pressure found at our various water sources. The higher the pressure, the faster we're on our way spraying. Water supply is one of our biggest challenges. We pull our sprayer hose through trees and past bushes. This takes a few lengths of hose and a good water pump. We encounter numerous obstacles such as old rusty junk cars, rocks, trees, old fencing wire, and steep terrain. Working in rubber boots, rain gear, long sleeve shirts and high humidity (especially during summer months) can really wear a person down. Breaks aren't possible until the tank empties, which takes 45 minutes to an hour, depending on how many spray guns are in use.

All of this work is done at night, when the frogs are most likely vocalizing. Our biggest concern is that we work when people need to sleep. While we try to be quiet, we can't avoid causing a disturbance, talking to our spray man or whoever is handling the hose, with the sprayer running, flashlights shining, and, of course, homeowners' dogs barking. Spraying 600 gallons is a hard nights' work. Our night is complete when our data is entered into the computer back at the baseyard, our sprayers are washed thoroughly, gear is put away, trucks are washed, and all wet gear is hung to dry for the next night's challenge.

Dense grass: good coqui habitat but a rough place to work.

The most rewarding aspect of controlling coqui frogs is when residents tell us that what we did last night, the night before, or last week really made a big difference and for once they had a really quiet night sleeping. It is awesome when we go back and notice how much quieter a neighborhood is and what we have accomplished. We hope we can control all known coqui frog locations in Maui County. It's going to take a lot of late nights, money, time, and cooperation from landowners, businesses and the people of the island to keep Maui nō ka ʻoi.

The crew uses Global Positioning System (GPS) units to track and map coqui frog infestations.

New Science

Coqui frogs as predators and prey in Hawai'i

By Karen H. Beard
Utah State University, Assistant Professor

I began researching the effects of coqui frogs (*Eleutherodactylus coqui*) on invertebrates and ecosystem processes in Puerto Rico in 1997 and in Hawai'i in 2003. Here I summarize some of the published results from the research conducted in Hawai'i. My graduate students and I have initiated several other studies that we hope to share with the scientific and Hawaiian community soon.

Because the coqui is an abundant insectivore (up to ~20,000 frogs/acre in Hawai'i) that has been found to control invertebrate populations in Puerto Rico, one of the most likely consequences of the invasion is a reduction of invertebrates. To begin to address this hypothesis in Hawai'i, I determined the stomach contents of 696 frogs from 9 sites on the Island of Hawai'i and two sites on Maui in 2004. Stomach contents were compared to invertebrate abundances in the environment at each site.

Stomach contents varied among sites and appeared to reflect both prey availability an prey preferences. I found that coquis were mostly foraging in the leaf litter, and that non-native amphipods and ants comprised > 50% of the total prey items consumed. I found little evidence to suggest that coquis were reducing important invertebrate pests. No mosquitoes (order Diptera family Culicidae) were found in stomachs, despite the presence of crane flies (order Diptera family Tipulidae), which are morphologically similar. Termites (Isoptera) comprised < 1% of the total prey items. Scientific orders containing endemic species that appear most vulnerable to coqui predation included Collembola (springtails), Acarina (mites), Coleoptera (beetles), and Diptera (flies), which each made up between 3 and 12% of coqui diets. Based on this research, I would suggest that areas with endemic invertebrates, especially in the above mentioned orders, should be the focus of coqui management.

Another question that I have explored in my research is whether coquis serve as a food source for

See New Science on next page

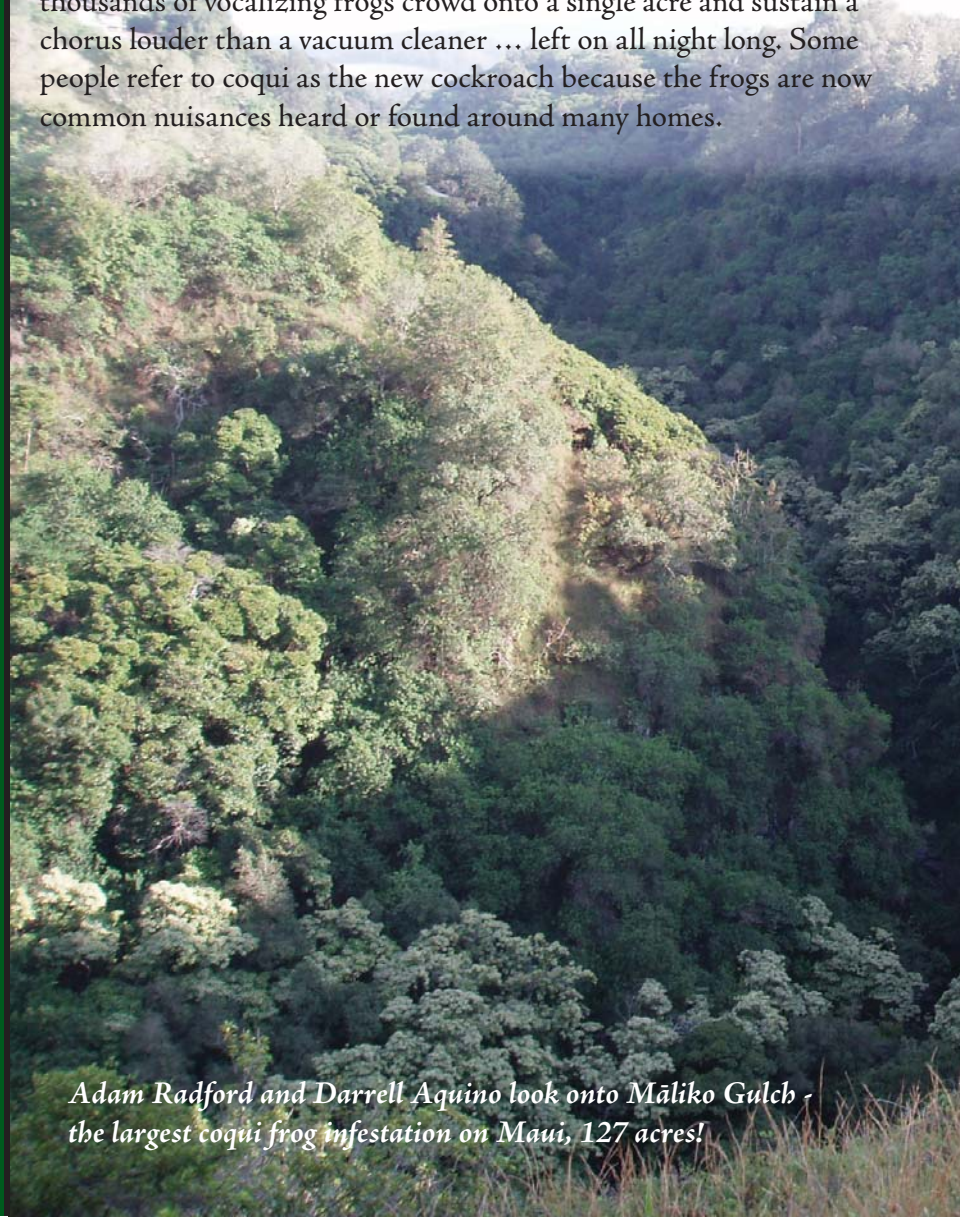
Can you find the coqui frog?

The War c

By Adam Radford
MISC Vertebrate
Operations Field Supervisor

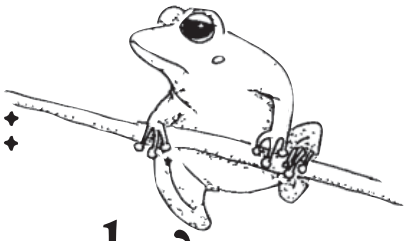
When coqui frogs were first detected on Maui in 1997, few people realized that a full scale environmental, political, and community war was about to erupt. Ten years later, coqui frog control has become one of Hawai'i's most recognizable invasive species battles.

The coqui frog likely hitchhiked to Hawai'i on plant material from Florida or Puerto Rico. In its native home of Puerto Rico the coqui is a beloved mascot, singing residents to sleep. In a place where population densities typically are much lower than Hawai'i, the "ko-kee" chorus seems like a musical backdrop some could love. In Hawai'i it's an altogether different song. Without natural predators, frog populations can explode far beyond those of Puerto Rico. In areas on the Big Island thousands of vocalizing frogs crowd onto a single acre and sustain a chorus louder than a vacuum cleaner … left on all night long. Some people refer to coqui as the new cockroach because the frogs are now common nuisances heard or found around many homes.



Adam Radford and Darrell Aquino look onto Māliko Gulch - the largest coqui frog infestation on Maui, 127 acres!

on Coqui Frogs: A Winnable Battle?



As a rule, non-native animals that reach unnaturally high population densities are responsible for significant environmental change. The coqui frog is no exception. Concerns over quality of life, displacement of other animals, soil change due to coqui biomass, and reduction or eradication of native arthropods drive the efforts of organizations such as MISC.

Concerted control work involving MISC, partner agencies, community groups, and concerned citizens got underway by the spring of 2005. MISC ramped up its control efforts by hiring a dedicated coqui crew and delimiting the perimeter of each infestation on the island. Following up on hundreds of coqui frog reports, MISC determined that twelve population centers existed on Maui. (Population centers are locations with five or more vocalizing males and/or locations where coqui frogs are present on multiple properties.) Many reports turn out to be crickets, other frogs or toads, or instances of a single vocalizing male that typically can be hand captured.

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New Science continued from page 6

endemic-bird predators. This could be important if coquis bolster populations of endemic-bird predators and indirectly reduce endemic bird populations. I studied predation on coquis by four potential endemic-bird predators in Lava Tree State Park from 2004-05. Stomach analyses were conducted on 44 rats (*Rattus rattus* and *R. exulans*), 22 mongooses (*Herpestes javanicus*), and 27 cane toads (*Bufo marinus*). Of the rats and cane toads studied, none had consumed coquis. Of the mongooses trapped, three contained a total of 16 frogs, which represented 7% of their prey items by weight. These results are very similar to results from studies conducted in Puerto Rico, where the same rat, mongoose, and toad species have been introduced.

More research is needed to determine how coqui frogs will affect Hawai'i's endemic species. One area of research, in particular, that needs further exploration is whether coquis are, or are capable of, competing with endemic birds and the endemic bat.

If anyone desires more detailed information on the research that my graduate students and I have been conducting, I recommend reading the following published material:

Beard, K.H. 2007. Diet of the invasive frog, Eleutherodactylus coqui, in Hawaii. Copeia 2007(1): 281-291.

Beard, K.H. and W.C. Pitt. 2006. Potential predators of an invasive frog (*Eleutherodactylus coqui*) in Hawaiian forests. Journal of Tropical Ecology **22:**345-347.

Beard, K. H., and O'Neill, E. M. 2005. Infection of an invasive frog *Eleutherodactylus coqui* by the chytrid fungus *Batrachochytrium dendrobatidis* in Hawaii. Biological Conservation **126**:591-595.

Sin, H. 2006. *Eleutherodactylus coqui* influences lowland forest invertebrate communities and ecological processes in Hawaii. MS Thesis, Department of Wildland Resources, Utah State University, Logan, pp. 116.

You can email me (karen.beard@usu.edu) for copies of these manuscripts or thesis.

Partners Pulling Together

Tri-Isle RC&D Council – Lending a Hand

By Elizabeth Anderson
MISC Program Specialist

Program Manager, Stuart Funke-d'Egnuff visits Tri-Isle RC&D projects throughout Maui County.

Tri-Isle Resource Conservation and Development Council (RC&D), Inc. is the rather daunting name for a down to earth, grassroots organization committed to empowering Maui County's rural communities. RC&Ds are unique programs affiliated with the U.S. Department of Agriculture's Natural Resource Conservation Service (USDA - NRCS). They provide a mechanism for local residents to work together to protect their natural resources and actively solve economic, environmental and agricultural problems. Nationwide there are 375 RC&Ds, with four in Hawai'i covering all of the major islands. Established in 1970, Tri-Isle RC&D Council sponsors projects on Maui, Moloka'i, and Lāna'i - assisting communities with projects that make our islands better places in which to live.

"Tri-Isle's support frees up MISC staff members so that they can concentrate on their primary mission."

Tri-Isle RC&D has been with the Maui Invasive Species Committee since the beginning. In the early 1990's, Tri-Isle was one of the founding sponsors of the Melastome Action Committee (MAC), which brought a broad base of experts together to develop and implement control strategies for miconia. The group took on other species, as well as the beginnings of a public information campaign, and MAC became MISC—a fully-staffed operation tackling a diverse suite of invasive targets on multiple islands.

"Tri-Isle just happened to be the right player in the right place," says Tri-Isle Coordinator, Nathan Varns. "It worked out well. It was a modest project in the beginning. Now it's much more integrated; now we're the model for the state."

For the past 12 years, Tri-Isle has served as a fiscal sponsor for MISC, providing grant and contract management, financial oversight, acceptance of donations, and help with purchasing supplies and equipment. With the advantage of both its on-going partnership with USDA and its status as a 501(c)(3) non-profit organization, Tri-Isle is able to leverage many resources, obtaining funding from federal, state, and private grants, and maximizing individual contributions. Tri-Isle's support frees up MISC staff members so that they can concentrate on their primary mission – controlling invasive species and educating the public. The relationship has had benefits for both organizations.

"MISC was the biggest project that Tri-Isle was dealing with at the time," says Nathan. "We were able to get more recognition from the County because we were doing well with MISC. It opened the doors for us to get other grants and helped us grow."

Much of Tri-Isle's growth in recent years can be attributed to the breadth of projects they support and their proactive flexibility in meeting the needs of their clients. In addition to providing significant support for MISC and Maui County's Watershed Partnerships, Tri-Isle lends a hand to projects as diverse as the Moloka'i and Maui Ag Development Projects, the Lāna'i Beverage Container Recycling Center, and the South Maui Coastal Heritage Corridor. The Tri-Isle team is willing to do what it takes—whether the need is as small as an emergency purchase of a sprayer part for coqui control, or as far ranging as brainstorming new funding sources for East Maui miconia operations.

Despite Tri-Isle's full roster of responsibilities, the organization maintains a soft spot for one of its oldest clients. "Because of the professionalism and the long-term relationship, I would say MISC is my favorite," says Nathan. "The people are team players, very committed. Working with them is a real pleasure." As far as MISC is concerned, the feeling is mutual.

MISCellaneous Files

Dear Dr. MISCellaneous,

My property is full of weeds, but your crew marches past them to kill one little miconia plant. Why? Why don't you control African tulip, wattle, and that vine that's covering all of Kula?

Sincerely,
Mr. Wants More Weeds Whacked!

Aloha Mr. Wants More Weeds Whacked,

Good question! A lot of people on Maui wonder why the Maui Invasive Species Committee (MISC) controls certain species and not others.

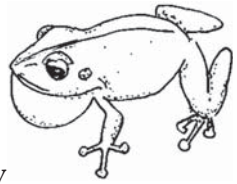
Unfortunately, we are not able to rid Maui County of all pest species. Some have spread too far to be stopped; wattle, African tulip and glycine (that fast-moving vine) are good examples. They are certainly problematic weeds, but they are now too widely established to control. Instead of chasing our tails, we choose to focus our time and money on targets where we can really have an impact. These targets are either "incipient," (meaning new to the island or present in small enough numbers to be considered containable) or species we can't afford to ignore because of their potentially severe impact on the health and stability of our watershed.

Miconia is one we can't ignore. This monster weed first got a foothold in the Hāna rainforest in the early 1970s. Dispersed throughout East Maui, miconia presents such a grave threat to Maui's watershed that we're committed to controlling it indefinitely, if necessary. We feel that miconia is similar to a forest fire; if we stopped working on it, it would devour the mountainside—taking with it many of the plants and birds that make Maui special. This is the unfortunate fate of Tahiti, where miconia has invaded 60-75% of the native forest, forming unstable monotypic stands of miconia trees.

We have to be selective about how we spend our resources. We divide them between target species where we can make a big difference, such as the coqui frog and pampas grass, for the benefit of the natural environment and people of Maui. Thanks for asking!

Sincerely,
Dr. MISCellaneous

Coqui Battle continued from page 7



MISC crews work closely with residents to control coqui frogs and remove frog friendly habitat. Working late into the night, crews systematically apply citric acid (a food additive) to infested areas. Application of hundreds of gallons of diluted citric acid would not have been possible without MISC's 100-gallon spray tank, two additional spray tanks on loan from the Hawai'i Department of Agriculture, and the willingness of stakeholders to donate both water and patience.

After a year and a half of dedicated control work, one of the original twelve population centers is coqui free. Four more are in a monitor phase. Monitoring takes place every four to six weeks for at least a year from the date the last calling male is heard. The remaining seven population centers are showing promising results with decreases in numbers of vocalizing males and infested acreage. These gains are encouraging given that coqui control began in earnest just two years ago, while the frogs have had at least a decade to populate Maui. Community support has increased as positive results have become evident. Lāna'i and Moloka'i continue to remain frog-free, with only a few instances of individual frogs being heard and hand captured.

The story of coqui frog control on Maui appears to foretell a winnable battle. But two major hurdles remain. The first is that only a portion of our largest infestation is being actively controlled. This is largely due to the challenging terrain—76 acres of steep cliff faces overgrown with dense vegetation in Māliko Gulch— and the lack of money for citric acid and staff.

The second hurdle is the ongoing threat of new infestations via the plant trade. Recently a thirteenth population center was added to our list. This site, a nursery, was infested via plant material from Hawai'i Island. Apparently, measures had not been taken to treat the material and we are now dealing with the results. This fairly common scenario highlights the need for improved inter-island shipping standards. Although prospects for addressing the two issues look bright, the war on coqui frogs will only be winnable once these last few obstacles are overcome.

The coquí is hiding here!

Volunteer Spotlight

MISC's Secret Agent: Shanoa Miller

By Shannon Wianecki
Writer/Editor

Last year, you might have noticed a young woman traipsing through Maui's empty lots, gardens, and harbors leaving a trail of chopsticks behind her. Shanoa Miller was laying traps for the little fire ant, a 2 mm long stinging pest that's currently crawling across Hawai'i Island. This year, she's set her sights on another target: Banana Bunchy Top Virus (BBTV). She's helping the Maui Invasive Species Committee test new techniques for finding this devastating banana disease. When her research wraps up in June, Shanoa will have contributed important data to MISC's early detection efforts—just in time to accept her high school diploma.

How did this King Kekaulike senior get tangled up in hunting for some of Maui's most wanted invasive species?

"I didn't get into the honors track I wanted to in my sophomore year," says Shanoa. "So I asked Sadie Mossman (King Kekaulike teacher) for extra projects to keep me up to date."

Shanoa Miller

Like many great scientists, when Shanoa didn't at first succeed, she kept trying. She took her teacher's suggestion—the Hō'ike o Haleakalā curriculum's little fire ant survey—and ran with it. She baited for ants using chopsticks smeared in peanut butter, honey, or chicken. She painstakingly identified, labeled, and preserved 16 species of ants. Fire ants, luckily, were not among them. Family support for the project was essential. Shanoa's mom wanted to know, "What are these ants doing in my freezer?"

Shanoa's microscopic work paid off sizably. First her ant project won the 2005 Maui Schools Science Fair. She then took it to the Hawai'i State Science and Engineering Fair, where she won two 1st place awards, from the Conservation Council of Hawai'i and the Hawai'i Entomological Society. She continued the project for another round of awards the following year, using a GPS unit to map the ant collection data. After winning a Certificate of Honor from the State Legislature, she was invited to speak at the State Capitol for the 2006 Hawai'i Science and Technology Day. "I was so nervous. I had

Shanoa volunteered with MISC studying banana bunchy top virus.

butterflies in my stomach," she says. "But the project helped me gain self confidence. I learned about how to write a scientific paper and collaborate with other people. I learned about the science community here."

Shanoa traveled next to the nation's capitol. At the National Academy of Science Conference in Washington D.C., she says, "Everyone was high *makamaka* in suits and ties." In comparison, at Hawai'i's Conservation Conference, "Everyone was in aloha shirts and slippers," she says. "I liked it."

"I like doing projects that people can relate to," says Shanoa. "I really wanted something that would give back to the community. That's what differentiated my project at the Science Fair. It targeted Maui specifically."

Shanoa and another student are the first to complete the natural resources career pathway, a new three-year high school program designed to encourage students considering future careers in natural resource management. Shanoa chose BBTV as the focus of her required biotechnology research project. She teamed up with MISC's Vertebrate Operations Field Supervisor, Adam Radford, to determine the potential distribution of BBTV in Kīhei.

Shanoa and the MISC crew used two survey methods to look for BBTV—surveying each property within two small buffer zones and surveying a random sampling of properties within a third, larger buffer zone. Shanoa collected tissue samples of each banana plant found within the survey areas. She used equipment at the University of Hawai'i - Mānoa to conduct Polymerase Chain Reaction (PCR) tests with the tissue samples. (PCR testing replicates genetic material for the purpose

By Brooke Mahnken

of diagnosing diseases such as BBTV.) The test results could confirm the field crew's visual identification of the disease in the field and indicate the level of efficacy of the surveys.

Meanwhile, Shanoa's still logging a full day's work at King Kekaulike High School. Aside from heavy-duty science, she lends her time to water polo, the swim team, Key Club, and the Chrysanthemum Ball. Like many soon-to-be Maui grads, she says she "has to get off this rock." But if her description of "high *makamaka*" D.C. is any indication, she's still a local girl at heart—good news for Maui's conservation community, since we can certainly find work for her here!

Hawaiian Bananas continued from page 3

the Maui Nui Botanical Garden, and Kahanu Gardens, they aim to preserve as many varieties as possible in cultivation and in the wild.

The couple's banana fascination started when Angela was asked to write a book about growing fruits and nuts in Hawai'i. The amount of information to compile was overwhelming. She and Frank were persuaded to extract a section specific to bananas for a separate book. Seeing this as a more manageable subject, they took on the challenge.

This husband and wife team works well together, complementing one another's work. Angela is a noted Pacific field ecologist, researcher and widely recognized author known for portraying botanical information in a lively, colorful manner. Among her numerous published works are scientific articles, newspaper columns, and 17 books covering a range of topics, including the highly popular plant guide, "Maui's Floral Splendor," and "Proteas in Hawai'i." Frank is equally industrious; he works closely with various botanical gardens to study and photograph the many thousands of identifying banana characteristics for inclusion in the upcoming book. Frank's avid interest in Global Positioning Systems helps the couple to follow up on and locate specific sites of bananas.

"Just finding varieties in the forest and in gardens and photographing them at every stage takes enormous amounts of time," says Angela. "But we love it!"

Bananas aren't the only thing these two are bent on protecting. They also work cooperatively with MISC to defend the forest beyond their backyard from invasive parrots. The fruit-eating parrots are capable of spreading invasive miconia seeds far and wide into pristine native areas of East Maui. The couple has opened their property to MISC field crew and researchers and has provided personal observations of the parrots' daily flight patterns—important information that will help MISC to devise a control strategy.

Angela and Frank have called Maui their home for over twenty years and have explored just about every corner imaginable. From hiking the steep valleys of East and West Maui to visiting the offshore islets, these two have seen more of Maui than most residents in their quest to locate rare banana varieties. In addition to enjoying their island home, they've stepped up to the responsibility of preserving its unique natural resources.

MISC Partners

Haleakalā National Park

Hawai'i Department of Agriculture

Hawai'i Dept. of Land and Natural Resources

Maui County Department of Water Supply

Maui County Office of Economic Development

Maui Land & Pineapple Co.

Pacific Islands Exotic Plant Management Team

The Nature Conservancy of Hawai'i

University of Hawai'i -
Pacific Cooperative Studies Unit

US Fish and Wildlife Service

USDA Forest Service

US Geological Survey - Biological Resources Div.

USDA Tri-Isle Resource Conservation
and Development Council, Inc.

The Maui Invasive Species Committee is a partnership of government, non-profit, and private organizations working to protect Maui County from the most harmful invasive plants and animals.

MISC works to prevent invasive species from becoming established, controls invasive species on private and public property free of charge, and educates people about how to protect Maui County.

Maui Invasive Species Committee

573-MISC (6472)

www.mauiisc.org.

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MAUI INVASIVE SPECIES COMMITTEE

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Working to protect Maui Nui from invasive plants and animals that threaten our environment, livelihoods, and quality of life.