

Forest clearing bans are seen as a promising tool

From the 1970s to the early 1990s, residents of northern Costa Rica watched as their forested landscape underwent a radical transformation. First cattle ranchers, then banana and pineapple producers arrived to clear land for their operations. Then the Caribbean jungles began to disappear, and habitat teeming with birds, monkeys, frogs and peccaries gave way to homogenous pastures and plantations.

To curb the destruction, the government in 1996 passed the country's Forest Law, which included major new conservation initiatives, and the land clearing began to ease. "There had been so much devastation by chain saw and ax," recalls Olman Araya, a native of Costa Rica's northern region and general manager of Fruver,

a San Carlos-based pineapple producer. "Then a new attitude took hold, encouraged by environmental education and new policies, and the massive clear-cutting stopped."

Indeed, Costa Rica, which once had one of the highest deforestation rates in Latin America, managed to reduce land clearing and emerge as a global environmental leader. Its success, experts say, hinged largely on policy reforms that could be replicated in other tropical rainforest nations. A report published Aug. 5 in the journal *Environmental Research Letters* by researchers at Columbia University, the Earth University of Costa Rica and other institutions explores the impact of a central component of

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Correa taking his Yasuní-protection offer off table

In 2007, Ecuadorian President Rafael Correa pitched what seemed a compelling idea: if the international community would donate US\$3.6 billion to an independently managed trust fund charged with protecting 200,000 hectares (490,000 acres) of Amazon rainforest within Yasuní National Park, Ecuador would drop its plans to drill for oil there.

Some environmentalists cheered; numerous countries in Europe, Latin America, Asia and the Middle East promised donations; and the United Nations Development Program agreed to administer the fund. But on Aug. 15, having received only \$13 million—or less than 1% of the expected money—in contributions, President Correa withdrew the offer. "The world has failed us," Correa said in a televised speech in which he announced plans to begin drilling. "With profound sadness, but absolute responsibility to our people and history, I have taken one of the most difficult decisions of my government."

The plan, devised six years ago, would have left untapped

within the eastern and relatively intact part of Yasuní 850 million barrels of oil in three oil fields known as the Ishpingo-Tambococha-Tiputini (ITT) block. In the process, it would have helped safeguard the future of two isolated, indigenous hunter-gatherer groups and prevented the extraction of oil reserves which, once burned, would produce an estimated 410 million tons of carbon emissions. It also would

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Rafael Correa rescinding his offer to forego oil drilling in ITT block. (AP photo)

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Editor & Publisher

George Hatch

Design

Marina Tubio

Subscriptions Manager

Maria Belesis

Editorial/Subscriptions Office

Fourth Street Press
3 Ellis Square
Beverly, MA 01915

Tel: (978) 232-9251

Fax: (978) 232-9351

E-mail: ecoamericas@fspress.com

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Assessing the environmental record of Nafta, 20 years on

The three-nation Commission for Environmental Cooperation's public-advisory committee is planning to hold a public review next month of the effectiveness of the environmental side accord to the North American Free Trade Agreement (Nafta).

The discussion, scheduled for Oct. 17-18 in Washington, D.C. is intended to mark the 20th anniversary of the implementation of both Nafta and the side accord, officially known as the North American Agreement on Environmental Cooperation (NAAEC). The session is expected to attract participants ranging from academics and environmental advocates to government officials and executives from the three Nafta signatory nations—Canada, Mexico and the United States.

The CEC Joint Public Advisory Committee (JPAC) launched a call in July for information and comments on how well North America is dealing with trade and environment 20 years after Nafta's implementation, setting a deadline of Aug. 30.

Follow-up: For more information, visit the Commission for Environmental Cooperation's website: www.cec.org/20_years.



Class-action asbestos lawsuit is filed in Brazil

Brazilian workplace watchdogs this month filed an R\$1 billion (US\$416 million) class-action lawsuit against Eternit, a producer of building materials made with asbestos.

A group of public labor prosecutors, who are watchdogs for abusive workplace practices, cited evidence that hundreds of former workers at a now-

shuttered Eternit plant suffer from asbestos-related illnesses.

The lawsuit points to a São Paulo state medical research center's finding that 300 of the nearly 1,000 former Eternit plant workers it examined from 2000 to 2013 suffered from illnesses linked to prolonged exposure to asbestos. Among those illnesses is asbestosis, a chronic inflammatory and fibrotic medical condition affecting the lungs that can lead to cancer. Ninety of the 300 who were sick have died. The plant, located in the city of Osasco, was open for 52 years but was closed in 1993.

The lawsuit calls for the requested R\$1 billion in "collective moral damages" from Eternit to be deposited in a fund that supports federal and state medical research centers involved in workers' health. It also asks the court to order Eternit to pay for medical examinations and treatment of all ex-workers at the plant suffering from asbestos-related illnesses.

"We based the R\$1 billion indemnity we seek on the fact that Eternit makes average net profits of R\$100 million (US\$41.6 million) per year multiplied by 10 years, a much shorter period than the 52 years its São Paulo plant was open," says Philippe Gomes Jardim, one of the public labor

prosecutors who filed the lawsuit in a São Paulo federal labor court. "If ex-workers at the closed Eternit plant want to bring another class-action lawsuit against the company for illnesses caused by long-term exposure to asbestos, as some ex-workers have already done on an individual basis, our lawsuit should encourage them to do so."

An Eternit statement said that the company would not comment on the lawsuit because it "does not have access to its contents," adding: "We prioritize the safe use of chrysotile asbestos."

Follow-up: Philippe Gomes Jardim, public labor prosecutor, Brasília, Brazil, +(55 61) 3314-8233, pgt.ascm@mpt.gov.br; Fernando Tabet, environmental lawyer, São Paulo, Brazil, +(55 11) 2985-1070, fernando@tabet.com.br; João Carlos Paes, President, Brazilian Association of Fiber Cement Industries (Abifibro), São Paulo, +(55 11) 4193-2627, abifibro@terra.com.br.



Cloud forest has yielded new, but maybe not last, surprise

A small animal described as a cross between a house cat and a teddy bear is the first new carnivorous mammal to be discovered in more than three decades, but scientists believe it is not the last surprise lurking in the cloud forest.

Called an olinguito, the animal had been misclassified in museum collections as an olingo, the name given to several species of raccoon-like tree dwellers whose range spans the tropical forests of southern Central America and northern South America.

But while studying olingos in museum collections, Kristofer Helgen, mammal curator at the Smithsonian Institution's National Museum of Natural History, noticed that some specimens collected in Ecuador were different. DNA tests con-

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Correction

An article in the July issue of *EcoAméricas* about a meeting of the Council of the Commission for Environmental Cooperation ("CEC focuses on air pollution from cross-border trucking"—*Around the Region*) misattributed a comment made about the harmonization of fuel-efficiency standards. The comment was made by Canadian Climate Change Ambassador Dan McDougall, not Canadian Minister of the Environment Peter Kent.

Concern in Argentina about farming impacts

Buenos Aires, Argentina

Argentina's ever-expanding agricultural industry is poised to push onto 9 million hectares (22 million acres) of land currently occupied by small farmers and indigenous peoples, according to a government-funded study here on land problems.

Non-governmental groups have complained for years that Argentina's soybean-driven agricultural juggernaut has been taking a serious environmental and social toll as massive mono-crop operations have displaced forest, small-scale farms and people.

They welcome the study, pointing out that it is the first of its kind to be funded by the government, but they express skepticism that authorities will adopt the policies needed to prevent a continuation of the country's wholesale land-use changes. They cite public plans issued by the government to promote dramatic increases in the production of grains, whose exports rank as the country's top source of foreign-exchange earnings.

The new study, titled "Survey and systematization of land problems of family farmers in Argentina" and presented to Congress last month, gives focus to longstanding concern about the fate of the country's small-scale farmers. These farmers currently represent just 5% of the country's population—a far smaller share than in other countries in the region such as Brazil, Bolivia and Ecuador, writes Argentine Family Agriculture Undersecretary Emilio Pérsico in the introduction to the report.

Soy-market pressure

In the study, researchers from the National University of San Martín describe how a history of unequal land distribution has been aggravated since the 1990s by the rapid expansion of no-till cultivation of soybeans that have been genetically modified to tolerate herbicide. Propelled by lower production costs, greater yields and strong international soy prices, soy operations now occupy more than half of all Argentine land under cultivation. The new practices have allowed large-scale cultivation on lands in areas previously considered unsuitable owing to their climate and soil characteristics.

"Low land prices in northeast Argentina produced an expansion of the agricultural frontier in a process we call 'pampa-ization,'" says Karina Bidaseca, a social scientist who directed the study. "This generated an unprecedented environmental crisis in Argentina, due to the cutting of forests to plant soy; the abandonment of traditional activities such as ranching; and the incorporation of new technologies and transgenic seeds, accompanied by products that were highly toxic and erosive for the soils."

The study, presented in Congress on July

11, focuses on farmers who employ no more than two non-family members. It identifies 857 specific problems related to land, problems that stem mainly from unclear ownership status and the conflicts that result. Such problems, the report says, currently involve 63,843 small-farmer or indigenous families and a total of 9,293,234 hectares (23 million acres).

Bidaseca says normalizing land titles of small-farm owners ought to be the first step toward a policy aimed at encouraging the "return of families to the countryside."

For his part, Pérsico asserts that family agriculture can coexist with industrial-scale farming. "It's about envisioning a strong policy of colonization and a return to the land," he writes in the study's introduction. "No country that defends its sovereignty can abandon its territory. Today we have 250,000 people on small farms, and the challenge is to get to a million."

Policy vacuum seen

To date, however, there is no public policy aimed at accomplishing such a goal, which experts say will require formalizing land titles for small farmers and indigenous groups. At the end of last year, Pérsico and a small group of national legislators from a variety of political parties proposed legislation that would establish a five-year moratorium on evictions of family farmers to give time for such efforts. The bill, however, did not advance in Congress.

Thus far, the government has appeared far more intent on further expanding agriculture than in ameliorating its environmental and social impacts. In September 2011, Argentine President Cristina Kirchner presented an Agroalimentary Strategic Plan (PEA) aimed at boosting grain production to 160 million tons annually by 2020. This year, grain production reached an all-time record of 105.4 million tons.

"Laws such as the one that tries to restrict cutting in woodlands are not followed, and land conflicts are increasing," says Ana Álvarez, executive secretary of the Argentine Chaco Agro-forestry Network (Redaf), a nonprofit that works with rural communities in northern Argentina. "What's more, we're worried to see the PEA because the crop growth it aspires to can't be achieved without a strong expansion of the land area that is sown."

Says José Luis Castillo, a small farmer in Santa Fe province: "We like this study, but now the government must act. The government has to get the big [agricultural] producers to get their foot off of us. All public works, asphalt, bridges or ports go to them, and we're left with the venom of their aerial spraying."

—Daniel Gutman

Contacts

Ana Álvarez

Executive Secretary
Argentine Chaco
Agroforestry Network
Reconquista, Argentina
Tel: + (54 3482) 425511
alvareza@agro.uba.ar

Karina Bidaseca

Researcher
Institute of Advanced Social
Studies (Idaes)
National University of San
Martín
Buenos Aires, Argentina
Tel: +(54 11) 4374-7007
karinabidaseca@yahoo.com.ar

José Luis Castillo

Member
Farmers' and Indigenous
Assembly
of the Argentine North (Acina)
Villa Ocampo, Argentina
Tel: +(54 93842) 539-156
obrerosdelsurco@gmail.com

Documents & Resources

To view the study, Survey and systematization of land problems of family farmers in Argentina (in Spanish), go to: <http://www.proinder.gov.ar/productos/Biblioteca/contenidos/estinv.32.relevamiento%20y%20sistem- atizacion%20de%20problemas%20 de%20tierra%20de%20los%20ag- ricultores%20familiares%20en%20 argentina.pdf>

Petrobras ordered to pay big indemnity award

Rio de Janeiro, Brazil

Contacts

Antônio Caetano de Paula

Acting President
Paraná state Environmental
Secretariat (SEMA)
Tel: +(55 41) 3304-7700
semaimpressapr@gmail.com

Sérgio Luiz Cordoni

Paraná state prosecutor
Curitiba, Paraná state
Tel: +(55 41) 3250-4439
scordoni@mp.pr.gov.br

Malu Ribeiro

Water program coordinator
The SOS Atlantic Rainforest
Foundation
São Paulo, Brazil
Tel: +(55 11) 4022-7095
malubr@terra.com.br

Fernando Tabet

Environment lawyer
Tabet Advogados
São Paulo, Brazil
Tel: +(55 11) 2985-1070
fernando@tabet.com.br

Documents & Resources

The decision about the Paraná state spill is available in Portuguese, at:
www.mp.pr.gov.br/arquivos/File/Sentenca_Petrobras.pdf

A federal prosecutor's office statement about the Rio Grande do Sul state indemnity decision is available, in Portuguese, at:
www.prrs.mpf.mp.br/app/iw/nti/publ.php?IdPub=70078

In one of the largest indemnity awards ever issued for environmental damages in Brazil, a federal judge in the southern state of Paraná has ordered the state oil company Petrobras to pay R\$610.7 million (US\$260 million) for polluting two rivers when it spilled one million gallons (4 million liters) of crude from a refinery pipeline in July 2000.

A combination of human error and equipment problems caused the refinery pipeline to rupture and crude to contaminate the nearby Barigui River as well as the Iguaçu, a major river in southern Brazil. (See "Petrobras speeds safety plans after second spill"—EcoAméricas, Aug. '00.) But the 74.5-mile (120-kilometer) slick was contained before reaching the famed Iguaçu Falls farther downstream. Petrobras paid a R\$40 million (US\$16 million) fine to the Paraná state government for the spill.

In Brazil, a federal or state environmental agency can fine polluters and, in addition, courts can order polluters to pay compensatory penalties sought by public prosecutors, advocacy groups or former workers.

In July 2000, just weeks after the spill, federal and state prosecutors in Paraná state jointly filed a lawsuit seeking an indemnity. The suit revolved around their claim, supported by findings by the prosecutors' in-house forensic experts, that the environmental damage caused by the spill was greater than estimated by the Paraná Environmental Institute (IAP), the enforcement arm of the state's Environmental Secretariat (SEMA), which issued the fine. The IAP, which later joined public prosecutors as a plaintiff in the lawsuit, originally claimed the spill caused a slick only 31 miles (50 kilometers) long.

Indemnity... with interest

Nearly 13 years after the spill, Federal Judge Sílvia Brollo issued a ruling that supported the prosecutors' contention, ordering Petrobras to pay the R\$610.7 million (\$260 million) indemnity, along with interest since the spill. Adding interest, the indemnity payment will exceed R\$1 billion (\$425 million), says Paraná state prosecutor Sérgio Luiz Cordoni.

"This is one of the highest, if not the highest, indemnity ever awarded by a Brazilian court for an environmental accident," says Luiz Cordoni, of the award, which was ordered on June 25 but was not made public until Aug. 13. "The court ruling supported our argument that the spill's environmental damage was far greater and longer-lasting than the IAP originally estimated."

The judge's decision was based on evidence from the court's own forensic experts that 528,000 gallons (2 million liters) of oil,

half the amount spilled, was still polluting rivers and riverbank soil and had greatly diminished the biodiversity of river flora and fauna in the area impacted by the spill. Court forensic experts estimate it will take eight to 10 more years for Petrobras to complete the cleanup, according to the ruling, which requires the company to completely reverse the damage caused by the spill.

Says Antônio Caetano de Paula of SEMA: "The spill's environmental damage exceeded initial estimates because, unlike oil spilled into the ocean from an offshore platform, oil spilled into a river spreads quickly but dissipates slowly because water volumes are much smaller and because river banks contain the slick. Nor did Petrobras have the containment barriers on hand to mitigate the spill's damage."

The court ruling requires Petrobras to put the indemnity payment into a special state environmental fund. The indemnity will be used to replant riverbank vegetation in the six municipalities impacted by the spill; to create protected, forested areas in those municipalities; and to pay state landowners for leaving trees intact on lands that they could legally cut, says Caetano de Paula, who adds that the indemnities could not and would not be used to fund the separate and ongoing Petrobras reservoir-cleanup efforts.

Avenues for appeal

Petrobras refused to comment on the decision until it receives notification of it. The company can appeal the ruling in a regional federal appeals court or, if that fails, in the Superior Court of Justice, Brazil's highest appeals court after the Supreme Court, which only rules on constitutional issues.

Says Brazilian environmental lawyer Fernando Tabet: "I don't know how this case will end, but it is common in an indemnity lawsuit that, during the appeals process, the defendant and plaintiff reach a settlement, especially when the damages awarded are considerable, after which the judge dismisses the case."

On that point, state prosecutor Cordoni says, "We are not interested in a settlement, even though the appeals process could mean a long delay until Petrobras pays the indemnity."

Malu Ribeiro, water program coordinator of the SOS Atlantic Rainforest Foundation, a respected São Paulo green group, agrees that the outcome of the case is not in sight. "The judicial process of seeking and receiving indemnities is way too drawn out, causing Brazilian courts to move far too slowly in penalizing environmental polluters," he says.

—Michael Kepp

Arrests in murder of turtle conservationist

San José, Costa Rica

On the eve of the two-month anniversary of the murder of Costa Rican turtle conservationist Jairo Mora, green groups in eight countries were planning protests to draw attention to the lack of arrests in his case. The same night, agents from Costa Rica's Judicial Investigation Police (OIJ) were gearing up for a 5 a.m. raid on six locations scattered across the country's Caribbean coast.

On July 31, OIJ agents arrested eight suspects allegedly linked to the murder of the 26-year-old, who was found bound, naked and facedown in the sand of Moín Beach, on Costa Rica's northern Caribbean coast. That's where he gathered turtle eggs in order to incubate them out of reach of poachers. Mora and three foreign volunteers were kidnapped while returning from a night beach patrol.

Police say Mora stopped his vehicle to move a log from the road when the group was intercepted by at least five masked men. The volunteers—all women in their 20s—were taken to an abandoned house from which they later escaped. Mora was stripped, beaten and left to suffocate in the sand.

The conservationist's slaying has garnered international attention and spurred an outcry from the environmental community. (See "Killing tarnishes Costa Rica's green image"—EcoAméricas, June '13.) Though officials say the arrests brought a "sigh of relief" for the administration of President Laura Chinchilla, some green advocates are troubled by police statements regarding the alleged killers' motives. Specifically, they object to the way police have downplayed Mora's conservation work, pointing out that he complained to police about poaching and that authorities acknowledge the suspects belong to a band of known poachers.

Complaints from rangers

After Mora's murder, conservationists cited the incident as evidence of a lack of protection for environmentalists across the country. Park rangers came out in force, complaining of numerous violent confrontations with poachers, while those associated with turtle-protection at Moín Beach alleged ties between drug trafficking and poaching.

In their public statements, police have focused on robbery as the motive of Mora's killers. Such was the case in the press conference OIJ Director Francisco Segura held the morning of the arrests. Police recovered cellphones and other items the suspects allegedly took from Mora and the volunteers.

Police also linked Mora's attack with another incident a week earlier in which a couple was robbed in the same area and a woman was raped. In that assault, the attackers also

used a tree branch to block the road. Assaultants escorted the couple to the same abandoned house used in the Mora attack, police said. "When they stopped the car that night they were not out looking for Mora," Segura said the day after the arrests. "They stopped the car to rob them and then took advantage of the situation once they saw Mora was there."

OIJ spokesperson Marisel Rodríguez acknowledges the suspects were part of a criminal gang of known poachers. Rodríguez says they had a deal with Widecast, a nonprofit turtle-protection group for which Mora worked, to bring in turtle eggs in exchange for \$300 a month instead of selling them on the black market. When Widecast no longer had funds for such payments, she says, the poachers and Mora agreed that whoever got to nests first—poachers or conservationists—got the eggs.

OIJ says the poachers took issue with Mora when he decided not to honor this agreement and went to the police for help. But Didiher Chacón, Widecast's Latin America director, rejects the claim. "Widecast has never paid poachers or anyone for turtle eggs," he says.

Beach patrols

Vanessa Lizano, former volunteer coordinator for Moín Beach turtle conservation efforts and head of a nearby wildlife sanctuary, says her volunteer initiative did have a paid program for former poachers, but in 2012. "In our program they were not poachers, they were patrolling the beach with us and we paid them," Lizano says. "We gave them a second chance, and I still trust them. I don't think they would be involved in this kind of activity."

Lizano says the money used to fund the poacher program came from Moín beach turtle volunteers, but the program lost volunteers and was discontinued after a group of volunteers was tied up and robbed at a hatchery in 2012.

As for a deal with poachers who got to the nests first, Lizano said such an agreement dates from the 1950s, and is not a special deal Mora made. "We are not police, we can't make anyone give us the eggs, so we just try to negotiate," she says.

Though pleased arrests have been made, environmental and human rights organizations remain skeptical of authorities' commitment to ensuring the safety of conservationists. "It's not the task of social organizations, civil society or citizens to put their own lives at risk to protect the environment," says John Knox, an independent human rights expert. "These are police functions that have to be adequately carried out by the government."

—Lindsay Fendt

Contacts

Randall Arauz

President
Marine Turtle Restoration
Program (Pretoma)
San José, Costa Rica
Tel: +(506) 8344-3711
rarauez@pretoma.org

Didiher Chacón

Director
Latin America Programs
Wider Caribbean Sea
Turtle Conservation
Network (Widecast)
San José, Costa Rica
Tel: +(506) 8838-9840
dchacon@widecast.org

John Knox

Independent human
rights expert
Winston Salem, North Carolina
Tel: (336) 758-7439
knoxjh@wfu.edu

Francisco Segura

Director
Judicial Investigation Police
San José, Costa Rica
Tel: +(506) 2295-4121

Centerpiece

In the cause of conservation, a new entrée



Lionfish have encountered no natural predators since making their way into Atlantic waters, where they've multiplied prodigiously. (Photo by Walter Hackerott)

removing lionfish and marketing them for consumption is widely acknowledged now," says Lad Akins, director of special projects at REEF, a marine conservation organization headquartered in Key Largo, Florida.

REEF encourages citizens to take lionfish by participating in fishing derbies that award cash prizes. Says Akins: "Many restaurants now have it on the menu, but there is still no large scale demand. ... It may take a while."

While the market is developing slowly, restaurants and fishmongers that sell lionfish report sales are up markedly from just a few years ago, when consumers were skeptical. Local fishermen and consumers have recognized the fish as a threat.

"Spear them," says Carlos Sarubbi, a member of The Bar-

For more than 50 years, Vesuvio, a white-tablecloth seaside restaurant here, has done a brisk business serving up local specialties caught from the Caribbean. But lately, along with menu mainstays like snapper, grouper and mahi-mahi, diners are inquiring about a new item: lionfish.

"People aren't sure what it is," says maître d' José Esteves, who has been explaining the fish to would-be consumers for the past year. "But if we can sell them, it helps preserve the Caribbean and our native fish."

Invaders from the Pacific, lionfish were first spotted in the Atlantic in the early 1980s and subsequently spread to the Caribbean. They are now found in coastal waters ranging from New York to Venezuela. Divers spot lionfish all over the Caribbean eating up small fish, many of which are key cogs to commercial fisheries and to maintaining healthy reefs.

"It's a huge threat because they have no natural predators in the Atlantic or Caribbean and the numbers are just exploding," says Carl Safina, co-founder of the New York-based Blue Ocean Initiative. "They are extremely voracious, eating the juveniles of just about every fish that lives on a reef."

But the mere fact that lionfish appears on restaurant menus reflects an important, albeit gradual, shift in the Caribbean. Lionfish are becoming the hunted.

After decades of multiplying with little to no resistance, lionfish finally have a predator: humans. Across the region, fishermen, tour operators, divers and conservationists are teaming to spear lionfish, and restaurants and markets are selling them to a public that fish sellers say is gradually developing an appetite for the white, flaky filets.

"Most of the region has come quite a ways ... The need for

racudas, a group of seven Santo Domingo bank employees who heeded the call to do something about the lionfish incursion. The Barracudas perform monthly dives in La Caleta, a Dominican marine park that was overrun with lionfish two years ago, when the group began its control efforts. "We, humans, are the only things that can control them ... In La Caleta, we've seen a substantial drop in the population since we started."

Humans can only dive so deep, however, and researchers believe that large lionfish more than a foot long in size lurk at depths of more than 150 feet. A submersible vessel spotted lionfish off the coast of the Bahamas 1,000 feet down.

Work is being done to develop traps and other devices that could capture lionfish at those depths.

Lionfish are ravenous, gobbling up the small reef fish that are key to keeping reefs healthy, such as parrotfish, which feed on the algae that can choke coral.

To learn just how destructive lionfish are, researchers compared the population of lionfish against that of 16 native predators on nine reefs off the coast of New Providence Island in the Bahamas between 2008 and 2010.

At the start of the period, lionfish made up 23% of the predator biomass; by the end, they represented 40%. Meanwhile, the population of small reef fish that lionfish fed on fell by 65%, according to the study, "Invasive Lionfish Drive Atlantic Coral Reef Fish Declines."

The Atlantic and Caribbean are a virtual smorgasbord for lionfish. Some 70 different species of native fish have been found among their stomach contents. Among the fish they consume are the young of species that help support commercial fishing worth \$2.6 billion a year to U.S. Atlantic and Gulf Coast states, accord-

ing to National Oceanic and Atmospheric Administration (NOAA) data from 2011, the most recent available.

"We're trying to understand just what is the impact on some of our native fish stocks and how it will influence fisheries," says James Morris, an ecologist at NOAA's Center for Coastal Fisheries and Habitat Research in North Carolina. Morris says lionfish consumption of young snapper and grouper is of particular concern.

Although they can go weeks between feedings, lionfish are eating so much and so frequently that Morris has found signs of obesity in captured specimens.

"We're finding very high levels of fat content in lionfish in North Carolina," Morris says, adding that studies are underway to compare lionfish fat levels to those of native species. "I've caught, studied and processed a lot of fish. It definitely stands out."

Along with eating everything they can—their stomachs can

in open spaces around the reefs."

While scientists hoped that native predators would start eating lionfish, new research suggests that's unlikely.

Hackerott was the lead author of a 2013 study published in the journal *PLOS One* that examined whether a mass of large native predators correlated to fewer lionfish on reefs. "We found no relationship at all," she says. "There are less lionfish in protected marine parks in general, but that is likely due to reef managers removing them."

Researchers have tried feeding speared lionfish to large groupers and sharks in hopes that this might make them appealing as prey. But those efforts have accomplished little, with only a handful of reports of live lionfish being eaten by native species.

"I see it as a no-win situation, and I think the most reasonable possibility is that in a few places lionfish can be controlled so that their numbers are not entirely plague-like," says Safina, who dedicated a 2013 episode of his PBS television series, "Saving the Ocean with Carl Safina," to the scourge.



Conservationists hope humans will keep lionfish in check. Initiatives range from a spear-fishing competition in Veracruz, Mexico (right, courtesy of Conanp) to promotion of lionfish dishes in restaurants such as La Boheme Bistro in Santo Domingo, Dominican Republic (above and left, courtesy of Reef Check).

expand dramatically during a large feeding—lionfish are also prolific reproducers.

Capable of spawning around the year, females can lay roughly 2 million eggs annually, with the lar-

vae sometimes floating hundreds of miles.

While other native fish are capable of producing more eggs, lionfish have no predators in the region and their population has multiplied. Once localized to the coast of Florida, lionfish are now found from Rhode Island south to the coast of Venezuela.

With merlot and white striations and deceptively harmless looking fins that fan out around their bodies like manes, lionfish are visually striking.

"When I started diving in the Pacific 10 years ago, it was a really rare and exciting thing to see them," says Serena Hackerott, a graduate student at the University of North Carolina-Chapel Hill, who is studying the lionfish invasion. "They were deep within caves on the reefs and the dive master had to find them. But in the past few years in the Caribbean, I've seen them on almost every reef, during the day, and boldly hovering above the coral or



Conservationists believe that the only way to make a dent in the population is to work with local groups to regularly remove the fish from reefs.

"Control efforts can absolutely be successful," says Ricardo Gómez, director of Mexico's Cozumel Reefs National Park.

In late 2009, before divers and tour operators began spearing lionfish, the Cozumel park counted between 60 and 70 lionfish per hectare. Today, after regularly removing the fish, the number has fallen to 17 per hectare. Elsewhere, such as in the Bahamas, the number can climb as high as 400 lionfish per hectare.

"One of the things that we're promoting is to include local groups in control efforts," Gómez says. "As soon as coastal communities realize that it's a threat to their ways of life, they will support any effort."

Gómez worked with Cozumel fishermen to teach them how to catch lionfish—most efficiently by spear because they are difficult to catch on a line—and process the meat.

Lionfish carry a painful dose of venom in their fins, which is completely harmless to humans after they are out of the water for roughly 15 minutes. They also can carry the ciguatera toxin, which can cause food-borne illness, the U.S. Food and Drug Administration recently warned, but that is a risk associated with other reef fish as well.

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Contacts

Lad Akins

Director of Special Projects
REEF

Key Largo, Florida
Tel: (305) 852-0030
lad@reef.org

Hilcia Ferrúa

Executive Director
Reef Check Dominican
Republic
Santo Domingo, Dominican
Republic
Tel: +(809) 227-4409
hilcia@reefcheckdr.org

Ricardo Gómez

Director
Cozumel Reefs
National Park
Cozumel, Mexico
Tel: +(52 987) 872-4275,
ext. 7
rglozano@conanp.gob.mx

Serena Hackerott

Graduate Student
University of North Carolina –
Chapel Hill
Chapel Hill, North Carolina
snhackerott@gmail.com

James Morris

Ecologist
NOAA Center for Coastal
Fisheries and Habitat Research
Beaufort, NC
Tel: (252) 728-8782
james.morris@noaa.gov

Carl Safina

Co-Founder
Blue Ocean Institute
Stony Brook, New York
Tel: (631) 632-3763
admin@blueocean.org

More formidable than food-safety concerns is the challenge of establishing a market where fishermen can sell their catch. To do so, conservation groups are working side-by-side with restaurants and grocers to promote lionfish for consumption.

Reef Check Dominican Republic, for example, last year launched its campaign, “Eat a Lion,” in which conservationists work with chefs and well-known restaurants, such as Vesuvio, to develop recipes.

Reef Check also persuaded the country’s largest supermarket chain, Nacional, to sell lionfish alongside the calamari, conch, shrimp and Caribbean fish that have long been popular with Dominicans.

Lionfish sells for less than grouper or snap-



per, due to the fact that it’s less well known, but the chain is promoting the fish with in-store signs and on its social media channels.

Such is the concern about lionfish intrusion in the Caribbean that governments in the region are preparing launch a joint strategy aimed at combating the fish. (Photo by Abel Valdivia)

“We also include information about how the fish is damaging the marine ecosystem,” says Hilcia Ferrúa, the organization’s executive director. “The best way to combat [the spread of the species] is to eat them, we say.”

Similar efforts have been occurring across the region, resulting in lionfish popping up on restaurant menus from Cozumel to the Florida Keys and beyond. In Turks and Caicos, the Department of the Environment pushed for sales of the fish in restaurants across the small islands, whose human population is just 39,000. The result has been a range of innovative menu items, including a lionfish pizza.

Elsewhere, chefs are experimenting with dishes involving traditional sauces or using the fish in ethnic dishes. Lionfish sushi has appeared at several restaurants. In the Honduran island Roatán in the western Caribbean, the fish even inspired a restaurant’s name, Lionfish Louie’s. Several U.S. restaurants also serve the fish.

“Our [Cozumel] fishermen are selling one ton of the fish per month, exporting small quantities to restaurants in New York and Washington,” Gómez says.

In 2011, for the first time, the lionfish catch in the United States registered on NOAA’s count of commercial landings. While the catch was small, only 1.1 tons worth a paltry \$11,237, it signaled an increase in consumption.

Still, researchers say a great deal needs to be done to develop the market necessary to spur more fishermen to undertake the laborious practice of spearing the needed numbers of lionfish.

A January 2011 study published in the journal *Biological Invasions* concluded that roughly one-fourth of the adult lionfish population would need to be removed each month in order to cause any significant reduction in the regional population.

“What’s been lacking is a unified effort across the Caribbean,” Gómez says. But that would require broad collaboration.

Gómez says that an effort of that sort is exactly what’s about to happen. Conservation groups, NOAA, Caribbean governments and other stakeholders are set to launch a regional strategy targeting lionfish.

The group’s members are finalizing a strategy that they hope will, for the first time, result in the standardization and sharing of research, the promotion of education across the region and action by governments to adopt specific legislation to address the lionfish invasion.

“The focus here is to triage the problem,” says Morris, who represents NOAA on the committee. “We know we can’t eradicate [lionfish] or even control them on a regional basis. But we can do things like create protected areas to control them in places.”

Such protected and managed areas, where lionfish would be regularly removed, would give native species a lionfish-free environment in which to reproduce.

A regional approach is also needed to prepare for other invasive species, Morris says. “We have little experience with invasive marine species in the region,” he says.

Yet the Atlantic and Caribbean are already starting to feel the effects of yet another intruder, the Asian tiger shrimp, which can spread viruses that are fatal to the region’s native shrimp populations.

“Marine invasive species will be a major threat in the future,” Gómez says. Working together on lionfish, he adds, “will help us prepare a process that allows us to work in a coordinated way to confront the threat.”

—Ezra Fieser

Forest-clearing bans continued from page 1

the 1996 reforms: the ban on the clearing of mature forests. It looks at an area of northeastern Costa Rica that is drained by the San Juan River, covers roughly one-tenth of the country and has experienced intensive cattle ranching as well as banana and pineapple cultivation.

The report finds that between the implementation of the ban in 1996 and 2011, the rate of mature forest loss in the area dropped 40%, to just 1.2% a year. Indeed, despite a tripling of the land area dedicated to pineapple cultivation—the region's principal agricultural activity—pineapple growers generally did not expand at the cost of virgin jungle. Instead, they moved into pasture or young secondary forest, sparing in the process the woodlands with the highest levels of biodiversity.

The reasons are not entirely clear. Violators face prison terms of between three months and three years and the confiscation of equipment, but the report's authors suggest another possible explanation. "Companies are aware of the publicity angle of working in Costa Rica, the potential loss to their reputation and the possibility of boycotts for violating the law," says Matthew Fagan, a tropical-deforestation expert at Columbia and the report's lead author.

Model for others?

Whatever the case, the ban's effectiveness has implications for tropical nations, the authors say. Logging bans, which call for intercepting illegally cut timber on roads and ports, have been tried in many nations with varied success. But forest-clearing bans, which combat the problem at its source, are relatively new, attempted until now only in Brazil, China, Indonesia and Costa Rica. Says Fagan: "That a poor country like Costa Rica could deliver such positive results is truly impressive."

Experts caution that the report must be understood in a broad context. Costa Rica began to eliminate soft credits, tax breaks and other incentives for cattle ranchers and farmers long before the Forest Law of 1996, thus helping to curb the appetite for more land. It also began an intense environmental-education effort in schools and communities and pushed the creation of nature sanctuaries. Today 24% of the country lies in national protected areas, with more land in private reserves.

Most importantly, the country created a program of payment for environmental services for the maintenance of standing forests. That program, also part of the 1996 Forest Law, currently pays up to US\$78 a hectare to landowners who mitigate greenhouse gas emissions or preserve water resources and biodiversity by avoiding clear cutting. While those payments cannot compete with the \$7,000 per hectare

that a pineapple operation might bring in, they are instrumental in conserving marginal areas on mountain slopes or with poorer soils where cattle ranching or small-scale subsistence agriculture might occur.

"The payment-for-environmental-services program provides a positive incentive for forest conservation," says Carlos Manuel Rodríguez, a former Costa Rican environment minister. "It is essential in preserving areas outside the 20% of the country apt for intensive agriculture."

While the forest-clearing ban has had tremendous success, he adds, "it must be seen in the context of numerous other policies, including the elimination of subsidies and the payment for environmental services program."

In 2006, the Amazonian state of Mato Grosso in Brazil attempted its own form of a forest-clearing ban. Responding to pressure from international environmental organizations and environmentally conscious consumers, major soybean companies agreed not to export soybeans produced in deforested areas.

Effective in Brazil

According to a report published last year in the Proceedings of the National Academy of Sciences by researchers at Columbia and other institutions in the United States and Brazil, that innovation appeared to have an impact similar to the one in Costa Rica. From 2006-2010, with the prohibition in place and the government stepping up enforcement, forest clearing in the state decreased to 30% of its historical average just as soy production was reaching an all-time high. In October 2012, the so-called "soy moratorium" was extended until Jan. 31, 2014.

The successes in both Brazil and Costa Rica indicate that "it is possible for mandated forest protection outside parks to maintain forest cover without negatively affecting agricultural production," write the authors of the Costa Rican report. Some experts say this means that with the right balance of policies, tropical nations can engage in large-scale farming, make big profits on agricultural exports and preserve rainforests at the same time.

The key, these experts argue, is careful, scientifically rooted regulation. For instance, Fagan says industrial farms must establish buffer zones around their fields and ensure preservation of secondary forests connecting patches of rainforest, allow for the movement of animals and maintain water quality around rivers and streams. He adds: "It must be remembered that secondary forests and swamps, as well as rainforests, play critical roles in these landscapes and should be preserved."

—Steven Ambrus

Contacts

Olman Araya

General Manager
Fruver
La Legua, Costa Rica
Tel: + (506) 2404-1190
fruversa@racsa.co.cr

Matthew Fagan

Tropical Deforestation Expert
Columbia University
New York, New York
Tel: + (512) 569-1417
mef2153@columbia.edu

Carlos Manuel Rodríguez

Vice President for
Conservation Policy
Conservation International
San José, Costa Rica
Tel: +(506) 2253-0500
cm.rodriguez@conservation.org

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Contacts

Matt Finer

Amazon conservation expert
Center for International
Environmental Law
Washington, D.C.
Tel: (202) 785-8700
mfiner@ciel.org

Glenn Hurowitz

Senior Fellow on Forest Policy
Center for International Policy
Washington, D.C.
Tel: (202) 552-1828
hurowitz@catapult-campaigns.com

Steve Schwartzman

Senior Scientist
Environmental Defense Fund
Washington D.C.
Tel: (202) 387-3500
sschwartzman@edf.org

Kelly Swing

Director of the Tiputini
Biodiversity Station
Yasuní, Ecuador
Tel: (59 32) 297-1961
tbs@usfq.edu.ec

have helped preserve a highly prized park that researchers describe as among the most biodiverse places on earth.

To many observers, an ingenious approach to benefit sharing had been hatched. Wealthy nations, expected to be the principal donors, would profit through biodiversity protection and the effort to combat climate change. Ecuador, in receiving \$3.6 billion, would be compensated for half the revenue that it expected to earn from tapping the oil and earmark those funds for renewable energy, forest conservation and social programs.

Just as the program known as REDD (Reducing Emissions from Deforestation and Forest Degradation) shifts money from the developed to the developing world to help keep tropical forests intact, President Correa's scheme would allow Ecuador to receive badly needed financial support while providing ecosystem and carbon-storage services of value to all nations.

Yet critics from the environmental community began to point out what they said was a disturbing tendency of President Correa to badger the international community to pay up, alienating potential donors in the process.

Move not popular

Ecuadorians, who had consistently rejected developing the ITT block—a poll in June showed 93% opposition to drilling—reacted with fury when the conservation initiative was cancelled. Oil production already occurs within large parts of Yasuní. The ITT block, which is pristine and overlaps a territory reserved for the hunter-gatherer groups, seemed to many Ecuadorians to be a line in the sand.

As if betrayed, hundreds of protesters from environmental and indigenous groups rallied at the presidential palace after the speech, and the powerful Confederation of Indigenous Nationalities of Ecuador vowed to halt drilling. The group said it might gather signatures to trigger a plebiscite on the project. "If there's an idea Ecuadorians all agree on, it's [their objection to drilling in] Yasuní," Esperanza Martínez, president of the Quito-based environmental group Acción Ecológica, told the Spanish daily *El País*.

But some critics allege a basic flaw in the Yasuní initiative from the beginning. It was one thing, they say, to ask potential donors to give money for REDD and other tropical forest conservation programs; many wealthy nations have responded to such appeals. But it was another thing, they argue, to threaten Yasuní, a nationally protected area and United Nations biosphere reserve, with potentially damaging oil extraction if donors refused to pony up.

"I've spoken to many representatives of foreign governments and multilateral funding institutions who told me they found repugnant the idea of holding a national park hostage and who said that giving in by providing funds would set a bad precedent," says Glenn Hurowitz, a forestry expert at the nonprofit Center for International Policy in Washington, D.C. "It's a perversion of the concept of REDD financing, which is supposed to provide positive incentives for forest conservation through things like improved law enforcement, governance and related efforts..."

Suspicious that Correa had been scheming to attract money without truly caring about the environment only made matters worse, critics say. Those concerns deepened in early 2012 when workers from Petroamazonas, the state-owned oil company, revived plans to drill for oil within Block 31, a deposit in Yasuní that is adjacent to ITT and shares the ITT land's biodiversity and carbon characteristics.

Sequestration gains questioned

Matt Finer, an Amazon conservation expert at the nonprofit Center for International Environmental Law in Washington, D.C., says that while he didn't question the motivations behind the ITT conservation initiative, the development of Block 31 and the increasing oil exploration around Yasuní over the last couple of years "put into question its supposed climate change benefits." Adds Finer: "If you don't drill in the ITT, but then open everywhere else to development, it doesn't seem like you are actually making much progress on reducing [greenhouse-gas] emissions at the national level."

The future of the park is now anyone's guess. Oswaldo Madrid, manager of Petroamazonas, has told the press that he expects \$2.8 billion in investment in the ITT and peak production of 200,000 barrels per day. But he says no new roads would be built for the block's exploitation and that pipelines would be used to transport the oil from drilling platforms to reduce harm to the surrounding ecology. He also says all work would be subject to approval from the Ministry of the Environment.

"I thought the ITT initiative represented a legitimate ideal and I'm sorry it didn't work out," says Kelly Swing, founding director of the Tiputini Biodiversity Station, a scientific research center within Yasuní. "With modern strategies and technology, impact can be minimized. But if the government doesn't set aside some area [for protection], more and more of Yasuní will be nibbled away at until there's nothing left."

—Steven Ambrus

Around the Region
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firmed that they were a separate species, and he wondered if it still existed or was extinct.

Although the olinguito (*Basaricyon neblina*) is a new species for science, “people had seen it before,” according to Ecuadorian biologist Miguel Pinto, a PhD student at the City University of New York.

“But because it is a nocturnal animal that lives in the tops of trees, people got confused,” mistaking it for a monkey or a kinkajou, he says. “When you see it with a flashlight from the ground, you see only two bright spots—the eyes.”

Using a powerful spotlight and a camera, Pinto was the first member of the scientific team to make out the shape of the animal high in a tree in a forest just a few hours from Quito, Ecuador’s capital.

Several weeks later, a field expedition was launched to study the animal. Says Pinto: “We were looking for more evidence of olinguitos. We were trying to establish their habits.”

But the animal proved elusive, evading laser-triggered camera traps that take photos remotely and nail-studded carpets that scientists hoped would snag some hairs for DNA tests. Further efforts are planned, though, using techniques that have worked for other olingo species, he says.

Unlike other species, the olinguito inhabits high cloud forest, around 2,000 meters above sea level. That means habitat suitable for the animal extends from Colombia through Ecuador into northern Peru.

The researchers have already received photos and reports of sightings from Colombia and are encouraging biologists in Peru to look for the animal in that country’s northern cloud forests.

New species of birds, insects and other fauna have been discovered in the cloud forest in recent years, and scientists suspect that more await. Although

researchers do not believe the olinguito is endangered, Pinto says its habitat has been disappearing, with no more than 40% of the original cloud forest remaining. “The cloud forest in Ecuador has been heavily influenced by humans,” he says. “There has been a lot of agriculture, and towns have been built in the cloud forest.”

Follow-up: Scientific paper published in journal ZooKeys: <http://www.pensoft.net/journals/zookeys/article/5827/abstract/>. Miguel Pinto, American Museum of Natural History, New York, New York, mpinto@amnh.org. Pinto’s number in Ecuador, where he does his fieldwork: +(593 99) 512-9238.



Project targets pollution of São Paulo reservoirs

Brazil’s government plans to invest R\$3.3 billion (US\$1.36 billion) in a project to further reduce the amount of raw sewage being dumped into two sprawling reservoirs that supply the city of São Paulo, South America’s largest metropolis, with 40% of its drinking water.

The project, which President Dilma Rousseff announced at a July 31 City Hall ceremony, targets settler communities on the banks of the Billings and Guarapiranga reservoirs, which lie just a few miles apart. The reservoirs were created by damming several large rivers and now occupy 154 square miles (400 square kilometers) on the southern periphery of the city. Some 450,000 slum-dwelling families (1.8 million people) have illegally settled in the area since the 1980s.

The R\$3.3 billion third phase of the Programa Mananciais (Reservoirs Program) is expected to result in the relocation of 10% of 46,500 slum dwellers living near the shores of the reservoirs to nearby housing that is to be built with program funds. It also is slated to provide families with potable water; sewer systems

to connect to existing waste-treatment plants; organic and inorganic garbage collection; storm drainage; paved streets; and sidewalks and street lights. And it calls for a 164-foot (50-meter) exclusion zone on the shores of the reservoirs that will be turned into parkland around which further illegal occupation will be banned.

“Continued upgrading of the settlements around the two reservoirs, mainly by installing more sewer systems, will reduce the amount of raw sewage and garbage entering the water bodies,” says Ricardo Sampaio, director of the Programa Mananciais.

Follow-up: Carlos Bocuhy, President, Brazilian Environmental Institute (Proam), São Paulo, Brazil, +(55 11) 3814-8715, proam.org@uol.com.br; Ricardo Sampaio, Director, Programa Mananciais, São Paulo Municipal Habitation Secretariat, +(55 11) 3397-3477, ncarboni@prefeitura.sp.gov.



Course targets parks issues in U.S. and Latin America

Latin Americans whose work focuses on natural areas recently spent a month in the Rocky Mountain west of the United States learning about parks and recreation management in a challenging environmental context.

Sponsored by Colorado State University’s Center for Protected Area Management and Training and the U.S. Forest Service, the Spanish-language course involved 23 employees of non-governmental groups and public agencies active in parks issues in a dozen Latin nations.

The course exposed the students to a century’s worth of U.S. parks management and conservation experiences, both positive and negative, says James Barborak, the center’s co-director.

As part of their studies, participants learned about a broad

range of U.S. parks and conservation initiatives on public and private lands. “What we stress is that a lot of conservation takes place on private lands, so it’s important to work with neighbors,” Barborak says. “The idea is to show them different types of protected areas.”

Barborak, also an instructor in the program, says the Colorado State-based training course attracts students from both the government and non-governmental sectors and enrolls individuals with professional backgrounds.

Barborak says the class does not avoid thorny issues, noting many students must cope at home with problems such as overfishing and illegal logging. While in the United States, students examine biodiversity conservation, ecotourism, conflict management, building user constituencies and integrating wildland protection with social and rural development.

The Center’s curriculum has regularly been expanded to address such issues as climate change, invasive species, energy and mineral development.

Training takes an experiential approach, says Barborak. He compares the educational model to rural extension work done by U.S. land grant universities, only on an international level with a focus “beyond farming and ranching.”

Now in its 23rd year, the course has graduated nearly 500 students. Colorado State and the U.S. Forest Service also conduct year-round trainings and educational exchanges in Latin America on parks management and conservation experiences in the region.

Funders of the program include the U.S. Park Service, World Wildlife Fund and Conservation International. **Follow-up:** James Barborak, Co-director, Center for Protected Area Management and Training, Fort Collins, Colorado, (970) 491-2117, 970-631-0228, jim.barborak@colostate.edu.

Q&A:

Champion of 'citizen science' weighs in on hydro debate

Bill McLarney is cofounder of Asociación ANAI, a nonprofit promoting conservation and sustainable development in Costa Rica's Talamanca region and nearby areas of Panama. McLarney directs ANAI stream biomonitoring in the watersheds of La Amistad International Park, which straddles the two nations' border. The biomonitoring has spotlighted diadromous fish and shrimp that migrate between the park's high mountain streams and the sea. Conducted with indigenous residents of the region who are trained by ANAI as parataxonomists, the work has contributed to questioning of plans for dams in watersheds draining La Amistad Park. McLarney, who holds a Ph.D. in fisheries from the University of Michigan, also runs community biomonitoring in the United States in the upper Little Tennessee River watershed. He has held posts with the U.S. Bureau of Commercial Fisheries, Woods Hole Oceanographic Institution, the U.S. National Aquarium and Appalachian State University. He spoke recently with EcoAméricas Editor George Hatch.



Bill McLarney

Describe where your ANAI biomonitoring occurs.

La Amistad International Park runs along the spine of the continental divide, which tops out at over 13,000 feet. We're concentrating on the Atlantic slope. As you come down those drainages, the first thing you encounter exiting the park is territory of one of four indigenous ethnias: the Bribri, Cabécar, Naso and Ngöbe. From there, you come down to territory inhabited by Hispanic and mestizo people with agro-industrial banana plantations. Then, on the coast, you have Afro-Caribbean communities strongly affected by tourism development. National parkland covers the entire high elevation without exception, and at every point is bordered by indigenous land. Almost all of the dams proposed are in territories of indigenous people. They are the people who would be displaced.

Connect diadromes to the dam debate.

We sometimes overlook the fact that every free-flowing stream functions as an altitudinal biological corridor. Recognition of that sleeper issue is extremely important to conservation, especially with respect to hydropower, which is often pushed as clean energy. We had Naso parataxonomists look at all the undammed Atlantic watersheds flowing out of the Panamanian sector of La Amistad in 2011. These rivers never had been surveyed for aquatics. In every case, we found that if you took away the diadromous fish and shrimp, you'd lose the majority of the upstream aquatic species and biomass. By damming a river downstream of La Amistad, you block the movement of animals up and down, effectively extirpating them from the park and removing them from the Indian diet. Results are suggested by research above dams in Puerto Rico. For example, the digging by diadromous shrimp in the stream substrate reduces the accumulation of organic matter and flushes sediment downstream. Absent that, you get more algal growth, which reduces aquatic insect communities and creates erosive processes you didn't have before. This affects non-aquatic animals that depend on fish and insects. Think herons and kingfishers and other birds. Think raccoons and otters. Unless rivers and streams are unfragmented from the headwaters to the sea, we cannot achieve the

biological-diversity conservation we all want. It has been argued that dams won't hurt La Amistad because they aren't being built in the park. That's fallacious. If I were to stand on a hill outside La Amistad and shoot a jaguar in the park, wouldn't I be doing damage to the park?

What dams are built or planned in your focus area?

When we got involved in 2004, there were no dams in our focus area. Since then, of several dams proposed for Panama, one is now completed: the Chan 75 dam on the Changuinola River. There, diadromous species have been eliminated in their entirety from a main-stem watershed leading out of the park. The Ngöbe, who live in the area, are screwed. They have lost the battle. Then there's the Teribe River, a major tributary of the Changuinola, where a dam project has been on and off the books. And a smaller dam, called Bonyic, is nearing completion on a Teribe tributary. Other dams proposed

for Panama are farther up the Changuinola, but the damage [to that watershed] is already done. In Costa Rica, the main watershed of concern is [that of] the Sixaola River, which forms the international boundary. If you take all the proposals that have been made, there's a total of 16 dams planned for that watershed. Of those, ten were withdrawn, supposedly because they would be partially or totally within the national park, and Costa Rica prohibits that, though there's discussion of amending the law to allow energy development in parks. That leaves six proposed dams, one of which, the Talamanca, would do what Chan 75 did to the Changuinola, eliminating diadromes from almost all of the Sixaola watershed. It would also inundate an extremely important agricultural area, the Talamanca Valley, which is home to 60% of the Bribri population. There's at least one more dam proposed, on the Estrella River in territory of the Cabécar.

How has ANAI brought its biomonitoring findings to bear?

First, we have made the natural resource agencies of the two countries aware. And there has been interaction with Unesco [La Amistad is a Unesco World Heritage site], which has made two mission visits. But the greatest impact comes from sharing information with indigenous communities. It has informed their concern about dams. We are not just about collecting information and leaving it in a computer. The goals for citizen science are to do conservation and involve people to the greatest degree possible. These people take the information to their communities, to their kids and their elders. We complement this with environmental education. Our staff and parataxonomists are doing programs in nearly 50 communities. Now you have people who are citizens, and who the government tends to try to keep happy, going to meetings. Instead of saying, "I don't want a dam on this river" and making vague objections, they say, "I don't want a dam because the passage of diadromous fish and shrimp benefits our ecosystem and the park." In much of the world, indigenous groups feel a hostility toward parks because their use of them is restricted. We've aided the realization in indigenous communities that they derive a benefit from the national park, their upstream watershed. It results in indigenous communities becoming friends of protected areas.