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Blending Science, Traditional Knowledge, and Creativity to Support Forest Conservation and Communities in the Peruvian Amazon

By Campbell Plowden

Campbell Plowden, PhD, Executive Director, Center for Amazon Community Ecology

Many indigenous peoples throughout the world face a common set of dilemmas. They want better education, health care, and more and more goods made by other people. These services and products may (or may not) improve their standard of living, but adopting "modern" practices and ways of making money can erode their traditional culture and natural environment. "Development" continues to eradicate hundreds of species of plants and animals in tropical forests while grocery stores are stocked with hundreds of new packages of food made from the same few crops. Traditional peoples need to be able to choose lifestyles that energize their cultural heritage, enhance their well-being, and treat biological diversity as an asset rather than an impediment to their development. Recognizing that both indigenous and non-indigenous knowledge and approaches have their own value, limitations, and the potential to evolve, clash and work together is a good first step toward charting an often elusive path to sustainability for society as a whole.

I began exploring ways to combine indigenous knowledge with scientific methods to promote forest conservation and community development in the late 1990s while studying the ecology, management, and marketing of non-timber forest products (NTFPs) with Tembé Indians in the eastern Brazilian Amazon. Tembé elders and some younger men had fantastic abilities to identify wild plants used for food, fiber, shelter, and medicine and knew the location of many specific trees where they farmed and hunted. They were surprised, however, when our surveys of large patches of forest showed that it was much more difficult to find copaiba and other valuable trees than they had thought. Other studies revealed that the average amount of sellable product they could obtain from a tree was much less than the maximum amounts they had cited as the norm. This tendency for forest people (and optimistic researchers) to overestimate the density and production potential of rare trees can lead to resource depletion when collecting plants for subsistence use shifts to intensive commercial scale harvesting.

The fate of the titica vine (*Heteropsis spp.*) illustrates the risks inherent in this kind of transition. Many Amazon peoples use the strong and flexible aerial roots of this hemiepiphytic vine to lash beams in their houses and weave sturdy baskets. In recent decades, pulling down these roots to sell to wicker furniture makers has generated a substantial income for forest peoples. The high demand for this raw material, however, has virtually eradicated *Heteropsis* populations in parts of Brazil and Peru, and has prompted some state government efforts to regulate its collection and sale.

Studying titica with the Tembé was a vibrant learning experience accented with a cultural conundrum. My field team enthusiastically learned and refined methods to measure the abundance of the vines and the impact of harvesting on the roots. Finding that two-thirds of experimentally cut roots died and regrowth of the survivors was painfully slow was sobering for the Tembé. The need to consider reducing the intensity of root harvest, however, was blunted by their belief that new titica vines readily sprout from the dead bodies of a few fearsome ants.

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The origin and persistence of this Amazon-wide lore is probably due to repeated sightings of thin filaments emanating from some dead ants on tree trunks. These fine structures resemble the anchor roots of *Heteropsis* and other aroid vines, but they are actually hyphae of *Cordyceps* fungi which have attacked the ants. While the Tembé can describe the fruits and fruit eating habits of many game species, they were not familiar with titica's knobby little fruits hiding in the canopy foliage of host trees. I didn't want to adopt the arrogant mantle of a know-it-all biologist by telling them this ant-vine genesis story was wrong, so I stuck to doing what my colleagues seemed to appreciate most – offering basic math classes and creating opportunities for them to learn quantitative techniques they could use to investigate their resources themselves. Traditional knowledge and investigative tools are a powerful combination to focus and interpret keen observations.

Walking back from the forest to the village one day, a Tembé colleague told me that they usually found a "tapuru" (large insect larva) inside the fresh lumps of resin they removed from "breu" trees to caulk their wooden boats. He didn't know why they were in there, but asked, "Would you like to see these?" This casual observation about a plant-insect interaction led to a major field study of copal resin that has become the focus of my research for the past eight years. It pays to ask, and to be open to being asked, lots of questions.

When my work with the Tembé ended in 2000, we had greatly improved our collective understanding about five key NTFPs. Unfortunately, our hope of developing at least one profitable new product was not met. The plants were too rare, too ephemeral, too unpredictable, or just too time consuming to deal with at the low prices offered for them in the local market.

Building on my experiences in Brazil, I founded the Center for Amazon Community Ecology in 2006 to move further down the path of developing NTFPs as economic and sustainable options for native communities. We would still conduct research to ensure that plants were being harvested sustainably. Basic ecological realities and limitations, however, cannot be changed, so our other major goal is to help communities produce value-added products that can command better prices. People needed to spend less time collecting large volumes of low-value raw materials and invest more time exercising their imagination, tapping their cultural assets, and honing their skills to create and sell smaller volumes of higher-value products.

Since 2006, the Center has been studying the ecology of copal trees (known as "breu" in Brazil) and related insects at the Jenaro Herrera field station operated by the Institute for Investigations of the Peruvian Amazon (IIAP). Our work focuses on tracking the recovery and growth of resin lumps after a major harvest. In 2008 we began to expand this work from pure research to practical implementation with native communities along the Ampiyacu River. These communities are reached by a 15-hour boat trip down the Amazon from Peru's Amazon gateway city of Iquitos.

Plowden and Bora leader distilling copal resin (photo by Natalya Stanko/CACE)

One aim of the Ampiyacu project is to help native woodsmen develop a system to sustainably harvest the aromatic copal resin and distill it into an essential oil the communities can sell to fragrance companies. While sustainably harvesting most plants focuses on minimizing damage to the plant itself or plant population, managing the harvest of copal resin lumps focuses on the relationship between copal trees and various insects. The "tapuru" in these lumps that was first pointed out to me by Tembé colleagues turned out to be larvae of unidentified species of weevils. The lumps are formed when the larvae chew through and rupture resin canals while boring into the inner bark to feed. While most insects would be repelled by this sticky substance, these specialized weevils shape a chamber in the resin that becomes malleable and then hardens on the trunk when exposed to air.

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Type 1 weevil larva — Weevil larva that forms resin lumps on copal trees in Peru (photo by Campbell Plowden/CACE)

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This lump then gives weevils protection from predators during their most vulnerable stage of development. Our long-term observation of study trees at Jenaro Herrera have shown that these weevils take one to three years to fully develop. Repeated harvesting of fresh resin lumps containing larvae, therefore, risks reducing the population of the insects responsible for stimulating the production of this resin. The resin can also be obtained by manually wounding the trees several times a week, but it takes much more time to produce a given amount of resin this way than it does to carefully harvest a weevil-stimulated resin every few years.

Adult Pappista weevil that forms resin lumps on copal trees (photo by Campbell Plowden/CACE)

Our pilot study of copal resin harvest near the Bora native village of Brillo Nuevo is being carried out in stages. We initially organized small teams of experienced woodsmen to find and mark trees in a series of forest patches. Conducting these surveys included training villagers to use forestry tools including a diameter tape, compass, and GPS. Most of them could already free climb slender trees and vines, but they all learned to climb larger tall trees with a harness and curved spikes (to minimize bark damage) to gather leaves for tree identification. The woodsmen harvest no more than half of the resin lumps from any single tree. This is our first general rule for keeping the resin weevil population healthy. Data are analyzed to learn which specific types of forest have the highest density of trees with resin lumps. We are now distilling the lumps in a copper alembique pot to determine which copal species produce the most and highest quality oil. This process is more art than science since subtle differences in distilling methods and age of the resin affect the aroma of the final product. Oil samples are being sent to a specialty fragrance company in Los Angeles to evaluate their commercial potential as an ingredient in perfume.

Bora girl mashes mishkipanga fruits to prepare dye for chambira (photo by Campbell Plowden/CACE)

This year, teams from Brillo Nuevo have begun to revisit copal trees where resin lumps were harvested one to two years ago to evaluate how fast the weevils are recolonizing these trees. Information about recovery times will then be used to help the community discuss the best ways to sustainably harvest copal that are compatible with their customs of individual and collective use of forest resources.

The other major goal of the Ampiyacu project is to assist native artisans to make innovative high-quality handicrafts that can be sold within Peru and beyond. This venture requires a dynamic blend of indigenous knowledge, forest management, creative design, social media marketing, and multiple partnerships. Many women in these communities can make beautiful hammocks and bags out of chambira palm fiber dyed with a variety of plant fruits, leaves, bark, and mud. Their challenge in reaping the full benefits of these talents is that artisans from dozens of other communities in the Iquitos area make similar products so it is hard for any of the artisans to be paid a fair price for their labor-intensive efforts. Our approach has been to work with the Bora artisans to apply their traditional weaving techniques and natural materials to make very distinctive products.

Amazon Vine Snake (photo by Kris Weinhold, www.guitarfish.org)

Almost on a whim, I took a handful of buckles to Brillo Nuevo in March 2009 and asked a group of women to each weave a belt using their own design. Within a half hour it was obvious that the alternating bands of color on some belts resembled coral and other jungle snakes. We followed up this session with a meeting in a school classroom where the artisans brainstormed the names of all the snakes they knew and then drew the basic color patterns of each snake on the blackboard. One husband brought us the 12-foot skin of a boa constrictor to show the women its pattern. Several days later the group met again to examine their progress. They noted which weaving styles looked best, decided how to attach the belt loop, and complimented one woman for sewing eyes into the end of the belt to make it look more realistic. We added additional belt models in the following year that were inspired by photos of Amazon snakes provided by a Peruvian herpetologist.

Bora artisan and son make snake design belt with chambira fiber (photo by Campbell Plowden/CACE)

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Our initial plan was to market these belts to reptile clubs, but a local musician who bought a belt at a Center presentation in January 2010 inspired the creation of a new product when he asked if the native artisans could make him a chambira guitar strap using the anaconda design of his new belt. Thus was born the Amazon Guitar Strap. This product is now entering its third round of revisions – complete with a traditional Bora pattern of a double labyrinth embroidered above the snake eyes on the end of each strap. The item has sold best to 50+ folkies, but a guitar shop in the east village of New York City has recently expressed interest in buying an assortment of ten designs to show to their younger electric-guitar-playing clients. Our ambitious goal is to develop a premier online store to offer products made by our partners to people throughout the world. This site will be launched in the fall of 2011.

Amazon Guitar Strap samples

The challenges we face in moving this project forward are making parallel investments in building markets for the products, increasing the number of artisans willing and able to make the crafts, and ensuring a long-term supply of chambira palm trees and other plants that yield dyes. Beyond the belts and guitar straps, the women also make net shopping bags and hot pads and will try adapting their flat strap weaving to make dog collars and leashes. To address this opportunity, we are expanding the number of communities involved in the project from one to four. If Jackson Browne, Bono, or Sting buys an Amazon Guitar Strap and talks about it in public, we want the communities to be prepared to absorb an increase in demand without putting undue stress on the forest or on their social harmony.

A key part of our agreement with partner communities is that we return 20 percent of craft sales receipts to them to support their health, education, and conservation needs. While artisans rightfully receive the greatest direct benefits from their labor, the social rebate keeps the whole community and its association fully invested in the ongoing success of the project. We are now urging communities to devote a significant portion of their social rebate to the replanting of chambira palms. This investment may allow the Ampiyacu River communities to avoid the fate of those along the Tahuayo River whose success in selling thousands of their beautiful baskets has forced them to buy raw materials from distant villages who may not follow proper procedures for carefully cutting palm spears.

Each piece of handicraft embodies a story of the person, place and plants that contributed to its creation. The Center is preparing profiles, photos, and video clips of the artisans and communities that make its crafts. This information, along with purchasing information on the products will be displayed on the CACE website where the Amazon Forest Store is currently under construction. We hope these images and extra information will help connect potential customers to Amazon communities and their realities and encourage them to purchase crafts made by local residents. CACE craft marketing is still operating at a very small scale (2010 merchandise sales were just over $5,000), but the program is already having a positive impact on the lives of the most active artisans and their children.

Beyond generating additional income, the craft-making process is having positive social impacts in the communities. In the past, the best artisans tended to work alone because they viewed their neighbors as competitors for a limited market. Now that opportunities to sell crafts are growing, the Brillo Nuevo women regularly teach each other new techniques so they can all benefit. The women have formed their own quality control committee to assume some responsibility for this critical function that had been exclusively performed by the CACE staff. Experienced artisans from this Bora village are now leading workshops to teach their skills to artisans from other villages with Huitoto, Ocaina, and Yagua residents. This summer, we will begin working with artisans to survey and actively manage their chambira trees so they will have enough supplies to continue making crafts for the next decade. This scale-up will require artisans to learn to apply agroforestry techniques. I look forward to this phase of a long-term program that is designed to help these forest communities face the future with optimism.

Bora artisan making Amazon Guitar Strap with chambira (photo by Campbell Plowden/CACE)

Dr. Campbell Plowden expresses his thanks to ICIK for the opportunity to present a recent seminar on the initiatives of the Center for Amazon Ecology. This seminar can be viewed at https://meeting.psu.edu/p46381401/. He also gratefully acknowledges the Rufford Small Grant Foundation and the Marjorie Grant Whiting Center for their financial support of the CACE Ampiyacu Project.

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