In October of this year I was lucky enough to travel in Ecuador again since my first trip 19 years ago. My travelling companions this time were Carla Black, Angel Rodriguez and Dave Skinner. The last time I was in Ecuador it was my first trip to South America and I was a part of an HSI organised trip including HSI luminaries Fred Berry and Lester Pancoast, amongst others. That trip was mind blowing for me, seeing so many species of heliconias and other tropical plants, all new to me at the time. Fred had the travelling notes of José Abalo and Mark Collins from a trip they had done the previous year. Finding plants we were interested in was very easy: just count the kilometres, get out, and look around. This time we did our own homework, looking at collection data from species publications and we also consulted José, who kindly gave us some very detailed information on some other species that we were keen to find.
Over a 3-month planning period we worked out an itinerary to visit some areas that Carla, Angel, Dave and myself hadn’t been to before. In our 14 days we travelled over 3400 km with Angel at the wheel, driving like a machine with a Zen-like calm I’ve never seen, covering some good roads, some bad roads, and even some roads that required major earthmoving equipment to allow us to pass. Twice we had to alter our planned routes due to landslides, turning around and finding another way to get to habitats we were interested in visiting. Since this was the end of the dry season I’m sure we picked a good time of year to get around – landslides would undoubtedly be worse in the rainy season. Angel had to put up with lots of “ooohhing, aaahhing, look at that!” type of behaviour from inveterate plant fanciers, but the only way to stop the car was to say “Stop!” He also had to put up with passengers trying to get out of the moving car in a rush to get to plants that we spied as we motored around this beautiful country. He also had to deal with cities, towns and rural areas that bore absolutely no similarity to our two road maps. Plus there were the normal Ecuadorian drivers with no interest in going slowly to look at their native plants, so Angel had to relax, move to the right, and allow all manner of traffic to overtake as we trawled our way slowly along very narrow steep dirt and river rock roads.

In all we saw 31 species of Heliconia in bloom. I added 14 species to my list seen in the wild, and perhaps 5 species I had never seen before anywhere. To me this highlights the fantastic job HSI Conservation Centres do around the world, as I have over the past 20 years been able to view so many species in cultivation. With habitat destruction continuing to be a major concern regarding the viability of lots of Heliconia species around the world, these collections are going to be invaluable in the coming years.

The first region we travelled to was Zamora Chinchipe Province. This is in the southeast of Ecuador and it took us the better part of two days driving from Quito to reach our starting point, as a landslide on the Gualaceo - Gualaquiza road meant we had to backtrack and loop around, adding 3-4 extra hours to our journey. The upside for me was seeing flowering Racineae, Guzmania and Pitcairnia as we came down through the cloud forest areas to Limón. My interest in, or some would say serious addiction to, bromeliads over the past 10 years means that we made plenty of extra stops to photograph all manner of these plants, in addition to heliconias and Dave’s passion Costaceae. As we were interested in seeing mid- to higher elevation Heliconia species we managed to keep Dave hostage in these higher elevations where his Costus were thin on the ground. It wasn’t until we went below 900 m that they became more common.

The Rio Nangaritza region was base for our first 3 days in the woods and we saw plenty of H. vellerigera, H. stricta, H. orthotricha, and H. rostrata. After some time in the low elevations we began heading up river drainages to mid- to higher elevations and were rewarded with some different species. H. dielsiana in yellow and orange as well as red colorations. Heliconia pastazae was also seen in many differing forms, quite different from the ones I had seen in Sucumbios Province 20 years ago. We saw red and orange and nearly solid red spiral forms as well as a red distichous form. As enthusiasts we happily defer to others to make decisions on whether these variations are worthy of a ranking other than just polymorphism within species. I certainly had no idea H. pastazae was so variable. It just goes to show it pays to travel more widely to see these amazing variations.

The Purpose of HSI

The purpose of HSI is to increase the enjoyment and understanding of Heliconia (Heliconiaceae) and related plants (members of the Cannaceae, Costaceae, Lowiaceae, Marantaceae, Musaceae, Strelitziaceae, and Zingiberaceae) of the order Zingerberales through education, research and communication. Interest in Zingerberales and information on the cultivation and botany of these plants is rapidly increasing. HSI will centralize this information and distribute it to members.

The HELICONIA SOCIETY INTERNATIONAL, a nonprofit corporation, was formed in 1985 because of rapidly developing interest around the world in these exotic plants and their close relatives. We are composed of dues-paying members. Our officers and all participants are volunteers. Everyone is welcome to join and participate. HSI conducts a Biennial Meeting and International Conference.

Membership dues are (in $US): Individual, $35; Family, $40; Student, $10; Contributing, $50; Corporate (Company or Institution) $100; Sustaining, $500; Libraries, $25. Membership fees constitute annual dues from 1 July through 30 June. All members receive the BULLETIN (usually published quarterly), the Membership Directory, and special announcements. Please send all inquiries regarding membership or Bulletin purchases to: Ray Baker, Lyon Arboretum, 3860 Manoa Road, Honolulu, HI 96822, Phone (808) 988-0455, Fax (808) 988-0462, raymondb@hawaii.edu. Back issues of the Bulletin are $5.00 per issue.

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The HSI BULLETIN is the quarterly publication of the HELICONIA SOCIETY INTERNATIONAL. Editors: Raymond F. Baker, c/o Lyon Arboretum, 3860 Manoa Road, Honolulu, HI 96822 USA, 808-988-0455, 808-988-0462 (FAX), raymondb@hawaii.edu and Victor Lee, 55 Jalan Kemuning, Singapore 769777, hortvet@singnet.com.sg, 65-67598208, 65-67571231 (FAX).
The next species we were chasing was *H. brenneri*, a higher elevation species. One time, after climbing way up into the mountains on an off-chance, we finally decided we were out of luck and called off the search. Just as we were turning around a strange *Heliconia* leaf fluttered at us, and sure enough: there was *H. brenneri* growing next to a waterfall in rocks and rich leaf humus with perfect drainage. This was on a different road and some distance away from the original, and only, collection made by Gustavo Morales and José Abalo way back in 1982. It is good news that this beautiful plant is still growing, and in a range larger than previously known.

Emboldened with our success we continued heading north, taking side trips up different drainages looking for more plants. The next species we came across was *H. peteriana* growing in the same place it was discovered by Abalo and Morales also back in the early 80’s. The forest around this locality was just about non-existent due to clearing for cultivation and grazing. At a very small remnant patch of woods we wandered in and quickly found ten or so clumps happily flowering. It seemed that all the *Heliconia* we saw on this trip were flowering, getting ready to disperse their seed in the coming wet season due in 4 to 8 weeks. *H. peteriana* along with *H. brenneri* are species I have never come
across in cultivation. I would imagine their higher elevation habitats would be difficult to replicate at our HSI Conservation Centres.

Heading further north along the Oriente Highway we headed towards Tena in Pastaza Province. Species we spotted in the lower elevations included *H. aemygdiana* var. *aemygdiana*, *H. spathocircinata*, *H. subulata*, *H. obscura* ssp. *fuscus*, *H. stricata* with purple leaf undersides, and *H. berryi*. Another landslide would have the road closed for at least a day, so we consulted the map and decided to head back up into the Inter Andean valley via Baños, to try our luck on the Northern Pacific slopes starting with the road heading down from the Inter Andean highway to Santo Domingo de los Colorados.

The second stage of our Ecuadorian adventure started along the Inter Andean Highway at the town of Latacunga - perfect for viewing the snow covered volcano Cotapaxi. We went out for dinner to a very fancy establishment with linen table cloths as our usual haunts are strictly local eating establishments sampling culinary delights such as chicken feet and gizzard soups, fresh caught catfish for breakfast, different local beans, lentils, peas or pigeon peas, all quite tasty and I managed a trip without falling foul of the Inca quickstep, quite an achievement for someone with my delicate constitution. First time on the trip did I don my running shoes, best saved for travelling on planes, as the shoes I wear into the bush are a tastefully earthy hue, once being grey. This brings the argument should rubber boots be worn in the forest. I’m still steadfastly refusing as I can still climb precarious slopes and the occasional tree for bromeliads in my shoes and I can’t imagine I could do so in boots. We also sampled some lovely sticky white clay that completely covered one of my shoes while Carla disappeared to below boot level in the same stuff and had to be extricated by the two Ecuadorian orchid aficionados we were travelling with, who were able to retrieve Carla and her boots intact. Sadly I missed the photo opportunity as I was trying to get the clay off my foot at the time.

Turning off the highway and starting down the hill towards Santo Domingo de los Colorados we were greeted with some very good luck. Major road works were occurring and the expansion of the old two-lane road meant we could pull over and explore wherever we saw plants we liked the look of. Starting at the top we saw *H. impudica* and *H. griggsiana*. As we continued down I noticed a large green plant and duly said “there’s a big green arching one”. Unfortunately I didn’t say “Stop!” and we never saw it again. We consulted our homework and looked at Abalo and Morales descriptions and thought it may have been *H. paludigena*. Carla will make another attempt to see what we noticed on another trip to Ecuador in the future. This plant is another that doesn’t seem to be cultivated currently to my knowledge but is one that appears to be worthy with its long golden inflorescences.

As we descended we saw *H. harlingii*, *H. longa*, *H. riopalenquensis*, *H. nigriprefixa* and *H. latispatha* as well as *H. wagneriana*. We couldn’t tell if it is a garden escapee or is indeed growing naturally in the lower elevations. It certainly appeared over a fair range as we travelled along the roads in and around Santo Domingo. The old road from Santo Domingo to Quito was a fantastic day trip. This old road is pretty much one lane and has been allowed to regrow in places as all traffic travels on the newer paved highway and the old road carries local traffic these days. Trees dripping with *Guzmania wittmackii*, *Mezobromelia capituligera* and
Guzmania teuscheri kept my attention in between *H. griggsiana* red and blueish wax until we came to a couple of individuals with yellow instead of the mostly dominant red. Harry Luther from Marie Selby Botanical Garden has mentioned recently these xanthic or yellow forms are common in some bromeliads especially *Guzmania*. I guess we are seeing this in *Heliconia* as well. A good example being the yellow *H. dielsiana* we saw in the south. As we climbed in elevation we were able to start spotting different species starting with *H. virginalis, H. pardoi* and finally at the top of the hill we started to see beautiful examples of *H. burleana* some up to 3m tall with large red inflorescences.

The next area we were targeting was around the town of San Miguel del los Bancos. This is the habitat and collecting locality of one of the two patterned leaf heliconias, *H. willisiana*. I was lucky enough to see an individual of this species about 12 years ago at Mark Collins’s Eden Farms Kurtistown farm halfway up the volcano on the big Island of Hawaii. Mark’s farm was generally cloudy with a regular rainfall. The day we were in San Miguel del los Bancos was pretty much the same. It took us a while asking lots of locals where the old road to Santo Domingo was and we found that we needed to be asking people over 60 to be getting the right answers. In the meantime the cloud cover was getting to the point that Angel had between 5 and 10m of visibility as we headed off down the old road. Judging the size of an oncoming vehicle by the distance between its headlights can be fraught with danger as we found huge trucks emerging out of the gloom with just two fog lamps closely spaced on their bumpers. The locality of the original collection was 12km from the town and we had crawled about 2km from town when we had to decide if the danger exceed the value of finding this rare species. Once again we decided we had gone as far as we should and made the call to turn around. We had passed a small forest remnant left standing in a gully next to the road and decided we should drop down into it for a forlorn last look. I hacked my way through the tangled edge and then staggered straight into a single strand of barbed wire lurking in the fog and the foliage at a nice shin height. As I was hopping around swearing, Carla followed me into the foggy forest. The first thing I knew, Carla wacked me on the shoulder and pointed to a patterned leaf *Heliconia* lurking in the fog. Sure enough she had spotted *H. willisiana*. What was almost more amazing growing right next to it was a patterned leaf *Pinanga* I have seen in South East Asian forests. Our luck continued as we had found another spe-
cies pretty much with just sheer luck.

Our next locality was the mythical Lita region close to the Colombian border in Carchi Province. I have fond memories of being a very young heliconia enthusiast with Fred Berry telling me tales of collecting in this region by him and others back in the 80s. To get there from San Miguel de los Bancos meant another huge drive through the back blocks, although there was the tantalising sound of a new road up to Otavalo. We travelled over some very rough roads down steep canyons with no other traffic on the roads. Somewhere along through this area we came across another pendent species that we have no idea as to its identity—red with some black hairs, as well as some on the foliage midribs as well as clasping leaf bases, another FRPH. Images were captured for referral to more informed individuals. Being an enthusiast means you are only as good as the botanical descriptions or books you are carrying with you on the day and Carla had pretty much everything she could lay her hands on. I had downloaded images on my laptop from the Smithsonian Type Specimen Register prior to trip to help.

The new road to Otavalo turned out to be quite a construction which was in progress. Bulldozers carrying beautiful pink sausages of explosives tied up with canary yellow detonation cord, made way to more bulldozers clearing rock falls that could be used as roads. Needless to say our little 4WD with minimal ground clearance just made it through without needing a push from the dozers or all of the passengers to get out as we had to in other sections and some creek crossings.

The next day we arrived in the Lita-Alto Tambo region along a newly laid hot mix asphalt road that looked as if formula-1 race cars could use it as a testing track, so smooth the surface was. This had me thinking how hard the travel was in the old days when there was just the train and hard roads to get into this river valley that starts as an arid wasteland and as it drops down into the Esmeraldas Province where the Chocó region is just across the border in Colombia, reputed to be one of the wettest regions in the world. Rapid clearing is occurring in the surrounding areas as elsewhere in Ecuador as the growing population look to have their own farms for food production and somewhere to bring up their growing families. We travelled as many roads as we could and found the following species of Heliconia: *H. nigripraefixa*, an all red form of *H. harlingii*, *H. latispatha*, *H. regalis*, more pink with yellowish hairs, *H. obscuroides*, and another red pendent with necrotic tips that may be *H. fragilis*.

The plant we were hoping to see was *H. lutheri* - a hairy pendent from the Barbatae group with white waxy undersides to its leaves. We spent two days looking high and low but came up empty. We saw lots of white backed *Calathea lutea* but not the elusive *H. lutheri*.

This trip was a fantastic adventure and we certainly saw lots of Ecuador and its natural beauty in two weeks. Without Carla Black and Angel Rodriguez there is no way someone like myself who can really only order a cerveza and ask for the bill in Spanish would be able to get around with the absolute freedom we enjoyed and I am eternally grateful for their generous company.
Challenges Ahead for the Banana

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Abstract Even though the banana is the fourth most important food crop in the world it is largely ignored by most funding agencies (Grimm, 2008). There are a number of diseases that attack bananas. Some of these include Black Sigatoka Disease or Black Leaf Streak Disease (BLSD) and Banana Bunchy Top Disease. The most destructive of these diseases is a new form of an old enemy, Panama disease, which had caused the banana many problems in the past (Grimm, 2008). This review offers a brief history of the banana, describes its current state and the problems it faces. It also offers a glimpse of the possible routes to solutions for these problems.

The History of Bananas

Bananas were first referenced in Sanskrit writings from around 500 BC and are thought to have originated in an area that includes India, Papua New Guinea, Southern China, Malaysia and Indonesia (Reynolds, 1940). Some of the bananas in this region over a period of time, developed more pulp and became seedless. Exactly where seedless bananas developed is unknown but it is believed to have occurred around 10,000 years ago (Denham et al., 2003).

The edible bananas we know today developed from two wild seeded species, Musa acuminata Colla (Figs. 1, 2 & 3) and Musa balbisiana Colla (Figs. 4 & 5) and are very different from their ancestors (Colla, 1820; Simmonds, 1962). The fruit from Musa acuminata and Musa balbisiana weigh around 30 grams each, contain a very small amount of edible pulp and are very difficult to eat due to the numerous hard seeds (Simmonds, 1962). There are three groupings of banana cultivars that are recognized today. One of these groups displays the characteristics of Musa acuminata, one displays the characteristics of Musa balbisiana, and the third group are hybrids of Musa acuminata and Musa balbisiana scientifically called Musa \( \times \) paradisiaca (Fig. 6). The first edible seedless bananas were Musa acuminata diploids that became parthenocarpic (producing fruit without pollination) and were therefore sterile (Simmonds, 1960, 1962).

The edible bananas of today come in a variety of
sizes but commonly weigh around 200 grams. Inside there is only edible pulp with the remnants of seeds (present as brown specks in the pulp). Seeds are rarely, if ever found in the pulp. Even if the female flowers are pollinated, the production of seeds is very low and some cultivars are completely sterile and never form seeds (Simmonds, 1960; Champion, 1967). There are some cultivars that will set a few seeds if pollinated but the seed production is very low. More than 10 seeds per fruit are unusual with the average number being much lower (Simmonds, 1960). The cultivars that have retained a small degree of female viability are very important in banana breeding programs around the world. The use of these cultivars in improving the edible banana is described below (Champion, 1967; Fawcett, 1913; Kervégant, 1935; Jacob, 1952; Valmayor et al., 2002; Shanmugavelu et al., 1992; Bakry, et al., 2009).

Bananas are an important food crop and rank fourth worldwide behind rice, wheat, and corn. Less than 15% of the bananas produced around the world enter the export market. The remainder of the fruit are consumed locally. The members of the Cavendish group are the most commonly grown bananas for export purposes (Bakry et al., 2009). In the United States the average person consumes around 25 pounds of bananas per year, but in some parts of Africa the average consumption approaches 550 pounds per year (Bioversity International, 2000). In addition to being consumed in the ripe state, bananas are also used in the green cooked stage, to brew beer and in a variety of other foods (Bakry et al., 2009; Bioversity International, 2000; Karamura, 1998).

**The Problem with Diseases**

Banana pests and pathogens that cause diseases have co-evolved with their host plants within the purported centres of origin where the greatest diversity exists today. The wild seeded banana species typically possess resistance to a variety of diseases that attack banana plants being grown for fruit production. The balance tipped in favor of these diseases when people started selecting for parthenocarpic plants. (These plants do not need to be pollinated to produce fruits and as a result give seedless fruits). As the banana was dispersed throughout the wet tropics, inevitably most of the disease pathogens accompanied the vegetative suckers. As human populations began to grow large numbers of the same cultivar in a location, pathogens began to attack these bananas (Pearse, 2003). Although the fruit from parthenocarpic banana plants are better suited for eating, the lack of genetic diversity and mixing causes the plants to become more susceptible to disease (Koeppel, 2005; Canine, 2005). Over time, different cultivars appealing to a variety of tastes and uses were generated, but at the expense of resistance to diseases and pests. This susceptibility to disease has caused problems for the banana in the past and present.

The banana industry is important to the economy of a number of countries because it provides both jobs and food for the people but banana production in Asia is currently fighting a battle with a new form of an old enemy, Panama disease. Panama disease, also known as Fusarium wilt, is a banana disease caused by a soil-borne fungus, *Fusarium oxysporum* f. sp. *cubense*, that has caused significant problems for banana production in the past (Stover, 1990). Prior to the 1950’s, the banana export market in Latin America and the Caribbean region was dominated by a cultivar known as ‘Gros Michel’ or “Big Mike”. Panama disease Race 1 was responsible for the devastation of these banana plantations and forced the conversion to cultivars of the Cavendish group which possessed resistance to Panama disease Race 1 (Ploetz, 2005a, 2005b). The fungus currently attacking banana plantations in Asia, Australia and the Canary Islands is another form of *F. oxysporum* f. sp. *cubense* known as Tropical Race 4 (Fig. 7). Three of the four races of *F. oxysporum* f. sp. *cubense* have been reported to attack bananas. The other (Race 3) only attacks heliconias (Ploetz, 2005b). Panama disease Tropical Race 4 is especially damaging since it attacks all varieties of bananas that Races 1 and 2 attacks. In addition it also attacks the Cavendish cultivars which are not affected by Races 1 and 2 (Ploetz, 2005b), (Fig. 8). This is especially important since the Cavendish cultivars are very widely grown for local consumption in a variety of countries. Members of the Cavendish group are also grown widely in the banana exporting regions of the world.

The fungus infection begins by penetration into
the roots of the plant, colonizes and grows within the vascular system and eventually chokes off the flow of water and nutrients to the plant. The growing fungus produces a mycotoxin, fusaric acid, which is then carried in the transpiration stream and causes the yellowing of the older leaves initially which then spreads to the younger leaves. Eventually the leaves collapse near the stem and the plant dies usually before producing fruit (Ploetz, 2000). The fungus that causes Panama disease can live for many years in the soil and is easily spread by the use of rhizomes or “suckers” which are commonly used as planting material for starting new plantations. The pathogen can also be spread by irrigation water and infected soil on the tools and shoes of workers (Ploetz, 2000).

In addition to Panama disease, the banana is also involved in a fight against several other diseases. Two of the most damaging are Black Sigatoka Disease or Black Leaf Streak Disease (BLSD) and Banana Bunchy Top Disease caused by the Banana Bunchy Top Virus (BBTV). BLSD is caused by the fungus Mycosphaerella fijiensis Morelet and attacks the leaves of the banana plant (Bakry et al., 2009; Heslop-Harrison & Schwarzacher, 2007). The disease can cause significant reductions in yield and is only partially controlled by the regular aerial application of fungicides. It is estimated that 15-20% of the production costs associated with bananas is due to the need to apply fungicides to treat BLSD. Hybrid bananas that possess resistance to BLSD have been produced in banana breeding programs. Banana Bunchy Top Disease caused by the virus BBTV is another serious disease of bananas that is transmitted by aphids (Heslop-Harrison & Schwarzacher, 2007). However, this has a more restricted world-wide distribution.

Fears about Panama Disease and Market Impact

Panama disease was responsible for causing a number of problems for the banana industry in China in recent months. Due to reports that were published in the media in China during the spring of 2007, the general population became afraid to eat bananas. The reports of the disease in the banana plantations led to rumors that Panama disease was dangerous to people. This resulted in reduced purchasing of the fruit by the general population. As a result of the reduced demand, there was heavy overproduction of fruit, which resulted in much lower prices and a huge economic loss for the banana industry in China (Koeppel, 2008).

Author Dan Koeppel described the situation in his book “Banana: The Fate of the Fruit That Changed the World”, published in early 2008. “The blight became big news in China during the middle of the year, when a newspaper article described the malady as 'banana cancer'. Within days, scores of consumers and farmers were avoiding the fruit, fearing it would make them sick. Within a month, banana sales across China had plummeted” (Koeppel, 2008). When asked about the potential danger of eating fruit from plants grown in soils infested with the Panama disease pathogen, Dr. Alice C.L. Churchill, from Cornell University and Chair of the ProMusa Crop Protection Working Group, made the following statement for this article: "Fortunately, consumer fears of contracting a disease from bananas harvested from F. oxysporum f. sp. cubense-contaminated areas are unfounded since the fungus is not a human pathogen. Like most plant pathogens, the fungus that causes Panama disease is specific for its plant host, in this case susceptible banana and some alternative plant hosts, primarily infecting the roots of plants grown in contaminated soil. Although the roots, pseudostem, and leaves of infected banana plants will eventually show disease symptoms caused by fungal damage to the plant vascular system, the fungus is not known to infect or contaminate the fruits of the plant but, instead, significantly weakens and eventually kills the plant, reducing fruit yield during disease progression. Therefore, consumption of fruit from Panama disease-affected plants poses no direct risk to consumers."

In addition to attacking bananas, different forms of F. oxysporum attack a number of important plants grown for food production around the world including tomatoes, potatoes, peppers, eggplants, asparagus, ginger and melons (Nelson, 1990).

Possible Solutions

There are few effective methods for the management and control of Panama disease. Chemical treatments are of little use for the effective, long term removal of F. oxysporum f. sp. cubense from the soil (Bakry et al., 2009). Varieties of bananas susceptible to Panama disease Tropical Race 4 can be grown in non-infected soil if disease-free plants from tissue culture are used as planting material and the pathogen is not introduced into the area by some other means. Even though disease-free plants can be provided for establishing banana plantations, it is very difficult to prevent the plants from contracting Panama disease after they are placed in the fields (Ploetz, 2000).

Employing banana cultivars that possess resistance to the fungus is at present the best method available for the production of bananas in soils infested with the pathogen. Several Fusarium-resistant cultivars of the Cavendish group have been developed by the Taiwan Banana Research Institute as a result of intensive selection for disease-resistant somaclonal variants (Hwang & Ko, 2004). When plants are produced using tissue culture, differences are sometimes observed in the plants. These differences are referred to as somaclonal variation. These somaclonal variations can be a negative
when the plants being produced need to be clones of each other but can be of great use in the search for improved varieties of plants.

There are also resistant hybrids that have been developed in banana breeding programs around the world. Even though Panama disease-resistant hybrids have been produced in breeding programs, these new hybrids are not very well received in all regions because their flavor is different from that of the Cavendish group (Figs. 9-12). Several Panama disease Tropical Race 4-resistant tetraploid hybrid bananas have been produced by FHIA (Fundación Hondureña de Investigación Agrícola) a banana breeding program located in Honduras (Bakry et al., 2009; Rowe, 1990).

The production of new banana hybrids through traditional breeding can be a time consuming and difficult process. As mentioned previously, edible banana varieties do not produce many seeds when pollinated and some never produce any seeds. The few seeds that are obtained through the application of pollen to the female flowers of an edible banana do not germinate with great success when planted normally in the soil. To facilitate increased survival rates, matured seeds are subjected to “embryo rescue”, whereby the embryo in the seed is aseptically extracted and grown on a nutrient rich media in the laboratory (Bakry et al., 2009), (Figs. 13, 14 & 15). This allows the embryos to germinate in much larger numbers than would occur if the seeds were planted in soil. After the embryo has germinated, the seedling must be grown for several weeks in sterile conditions in the laboratory until it is strong enough to make the transition into soil (Fig. 15). After the plant has been transitioned into growing in soil, it can take several years to fully evaluate the disease resistance and fruit production of the new hybrid banana. In addition to traditional breeding techniques, Fusarium resistant plants are also being developed through the use of mutation breeding and other methods (Bakry et al., 2009).

Although much progress has been made, the search for new bananas with Fusarium wilt and other disease/pest resistance will continue to occupy the time of those involved in banana breeding for years to come.
References


Hamilton Manley, 1945-2009

We are sad to announce that one of our early HSI members, Hamilton Manley of Kurtistown on the Big Island of Hawai‘i, passed away on 1 July, 2009 while snorkeling at the Wai Opae tide pools near Kapoho, something he and his family loved to do. Hamilton was 64, born in Greensboro, North Carolina. Hamilton was HSI Vice-President for Executive Affairs from 1987-1991, and would lead panel discussions on cut flowers at our early conferences. He was conference chairman for the 1990 meeting in Hilo, Hawai‘i. An active sportsman, Hamilton coached various youth basketball teams, and for 5 years was assistant coach for the men’s basketball team at the University of Hawai‘i - Hilo. He was formerly co-owner of Sunshine Farms, which specialized in cut tropical flowers, particularly anthuriums. The business closed and he retired in 2004. He is survived by his wife Marisa; sons Harlan, Stewart and Isaac; daughters Harlina and Suliana; and two grandchildren. Above all, Hamilton was a great guy and a pleasure to know.
The Genus *Plagiostachys*

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This genus was first established in 1899 by the former director of the Gardens, H.N. Ridley. Since then, almost 30 species have been described from Indochina to Malesia, with its centre of diversity in Borneo. These stately gingers usually have rather small flowers. These are tightly arranged in dense slanting spikes, which break out from the leafy shoot usually somewhere in the middle or lower half of the pseudostem, and rarely close to the ground. Their inflorescences are often covered in a slimy mass. The peculiar position of inflorescence inspired Ridley to choose its botanical name based on the Greek words *Plagio* meaning oblique and *stachys* referring to the spike-like inflorescence.

The study of this genus is particularly challenging as most flowers of *Plagiostachys* tend to quickly disintegrate into slimy thick mass. However, modern molecular approaches may clarify the position of this genus especially in relation to the genus *Alpinia*, which seems closely related. Recent DNA-based studies of the tribe *Alpinieae* (where genera *Alpinia*, *Plagiostachys*, *Amomum* and several others belong) have shown that some members of the genus *Plagiostachys* may actually be closer to others in the genus *Alpinia*. Unfortunately, gardeners may have to put up with likely name changes in the near future.

*Plagiostachys albiflora* is one of the first species described. Found on Mt. Kukub in Johor State, Peninsular Malaysia in 1908 by Ridley, this species seems to be widely distributed. In Borneo, it is reported to grow abundantly in wet places on the edges of lowland forests. It displays a certain level of variability requiring detailed studies of living materials and molecular studies to elucidate this species complex. Under the magnifying lens, the tiny flower of *P. albiflora* (less than 1 cm long) reveals its beauty with its single stamen placed above the petal-like labellum. The specific name *albiflora*, means ‘white flower’. Interestingly enough, with the yellow centre of the labellum and red lines at its edges, the flowers are not really white, as one would expect. Fortunately, Ridley’s original description published for this species mentioned this colour pattern, removing doubts of the identity of this species.

*Plagiostachys breviramosa*, a new species recently described in 1999 by Jill Cowley, has small and delicate yellow flowers. It occurs in many parts of Borneo. Unusual for its branched inflorescence, it is one of the *Plagiostachys* species which does not exude a slimy mass. The inflorescence is rather dry after the flowering finishes and its dark red fruits are ovoid and smooth.

*Plagiostachys crocydocalyx* is one of the stateliest species widely distributed in Borneo. German botanist K. Schumann originally described it as a member of the genus *Alpinia* in 1899, but the species was transferred to the genus *Plagiostachys* in 1972. Its round fruits are full of aromatic seeds with sour-sweet arils. Local people often chew them.
More *Plagiostachys* at Lyon Arboretum

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Following the lead of Jana Leong-Škorničková, now that she has brought this unusual and little known genus to our awareness, we would like to take this opportunity to show a few more species growing at the Lyon Arboretum on Oahu in Hawai`i. These are only a few of the ginger species given to us over the years by John Mood, many of which resulted from his collecting trips in Sabah (Borneo), and other parts of southeast Asia. *Plagiostachys* are not always easy to grow, and the three pictured here are the ones that have done the best under our conditions. We have also tried *P. lasiophylla*, *P. parva*, and several without species names, some of which are undescribed. Ms. Avelinah Julius, of the Forest Research Institute of Malaysia, is currently working on the genus.

Join the up-coming HSI 16th Conference in July 2010 for an opportunity to see *Plagiostachys* in the wild during the post-conference trip to Sarawak!
The Rediscovery of *Globba arracanensis* (Zingiberaceae) in Myanmar

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In October of 1869 north of Akyab (now called Sittwe) in the Kolodyne River Valley of Arracan (now called Rakhine) State in Myanmar, Wilhelm Silpuz Kurz collected a plant that he would later name *Globba arracanensis* in the family Zingiberaceae. The plant was reported by Kurz to be widely distributed in the mixed deciduous forests of the low hills of the region. The month of October marks the start of the dry season in the western hills of Myanmar and the plant must have been in the early stages of starting to go dormant when collected by Kurz. Seed was present when he found it.

Only three known voucher specimens of *Globba arracanensis* were made by Kurz. The holotype is at the Royal Botanic Gardens Kew; two isotypes are at RBG Kew and the herbarium at the Botanic Garden in Calcutta (Williams, 2003). Kurz published this new species the year after he found it in 1870 in the Journal of the Asiatic Society of Bengal (vol. 39, page 83-84). *Globba arracanensis*, in subgenus *Mantisia* section *Haplanthera* (Williams et al., 2004), is the least studied and least understood species in the entire genus and is closely related to *G. andersonii* from the Darjeeling region of India.

This species was not collected again in Myanmar or any other country for 135 years and was presumed to be extinct. However, we discovered it again during a collecting expedition to Myanmar in mid-November 2004, 32 miles north of Sittwe along the road to Mrauk U, just north of Ponnagyun in Rakhine State. At that time the plant was completely dormant and the foliage was dry and unrecognizable. The rhizome was attached to a large boulder in a dry stream bed in the understory of a bamboo forest. We were collecting any gingers that we found, even if dormant. Until this collection *Globba arracanensis* was only known from the type specimen. We knew at the time we collected it that we were in the area visited by Kurz in 1869, but we did not know we had re-found this species until our plants flowered sixth months later in our greenhouses.

The rhizomes that we collected in Myanmar were brought back to the Smithsonian Institution’s Department of Botany Research Greenhouses in Washington, DC. The rhizomes were potted up and allowed to complete their dormancy cycle. In May of the next year (and each year after that) the plants broke dormancy and flowered (Figures 1, 2). In 2008, they finally set seed (Figure 3), either due to natural visitation by bumble bees in the greenhouses or as a result of hand-pollination by one of us.

The plants of *Globba arracanensis* are deciduous with stems to 60 cm, arching and curving upward. Leaves are green up to 8 cm wide and 28 cm long, ovate-elliptic tapering to a thread-like tip. The inflorescence is terminal on the leafy shoots (Figure 1). Inflorescence bracts are persistent, starting green then maturing to a pale white, while the bracteoles are persistent and light lilac. The flared, almost petal-like lateral staminodes of the flowers are white to light lilac while the labelium is bifid, yellow and lilac with yellow tips, one crossing over the other (Figure 2). The petals are white to light lilac, the floral tube is white, the filament white, and the anther light lilac with a darker almost purple tip. The pollen is white. The fruits are pale green and the seeds are tan and pubescent with an aril (Figure 3). The plants do not produce bulbils in the axils of the inflorescence bracts. According to Kurz’s description the bracteoles, petals, lateral staminodes and filament were lilac in the plants he found. However, natural variation in color is quite common in globbas (especially in species with white and purple flowers) and we suspect that our plants represent such natural variability from the type collection.

Although *Globba arracanensis* is now known not to be extinct in its native habitat, the rapid degradation of the forests and natural habitats of Rakhine State suggest that measures should be sought to insure the conservation of this and other species under threat in the region.

**Literature Cited:**


Inflorescence of *Globba arracanensis*, with close-up of flower and fruit, cut open, showing arillate seeds inside.

In the great tradition of Darwin’s *Voyage of the Beagle*, this book is a first-person narrative of daunting travel and scientific discovery in the little-known country of Myanmar. Dr. Kress explored many areas in this enigmatic country, surveying its teak forests, bamboo thickets, timber plantations, rivers, and mangroves to document its incredible botanical diversity. Myanmar is one of the great biodiversity “hot spots” in Asia, but because of its social isolation and reputation for political repression it has been closed to—or avoided by—many scientists. Nevertheless, Dr. Kress was determined to search for and record plants that had not been studied since they were first discovered by Western botanists over a century ago. Among the rarities he came upon was a new species of plant called “the weeping goldsmith,” a ginger flower whose Burmese name was derived from the legend that the local goldsmiths were reduced to tears because none of their own creations could rival its exquisite-ness.

Dr. Kress also relates how he came to appreciate the people and culture of Myanmar through an understanding of their flora, natural habitats, and human-dominated environments. Included are fascinating excerpts from his field journals that serve as counterpoints to the accounts of earlier plant explorers. Illustrating the text are some 200 of Dr. Kress’s own color photographs of the incredible plants, people, landscapes, and temples he witnessed in his travels as well as 40 archival images of Burma taken by past explorers. The back matter features an illustrated portfolio of representative native plants.

This lively armchair exploration should appeal to a general readership as well as to botanists, conservationists, and environmentalists.

**About the author:** W. John Kress is a Curator of Botany and Research Scientist at the National Museum of Natural History at the Smithsonian Institution. He is the co-author of *A checklist of the trees, shrubs, herbs, and climbers of Myanmar* and *Plant Conservation – A Natural History Approach*, and has written many botanical articles.
HSI XVI INTERNATIONAL CONFERENCE SINGAPORE
15TH – 18TH JULY 2010
CALL FOR PAPERS

Persons wishing to present papers or posters at the 16th Heliconia Society International Conference in Singapore, 15th – 18th July 2010, should submit their topic to the Selection Committee at admin@heliconia.org as soon as possible.

Your submission should include an abstract (at least 100 words) of your talk by 15 January 2010.

Topics to be covered should relate to any of the eight families of the order Zingiberales and can include systematics, floriculture, propagation, plant pathology, travel/exploration, art, ethnobotany, ecology or any other pertinent area of research.

Presentations are to be in English and should be 30 minutes long.

Visual aids at the conference venue will be PowerPoint projectors.

35mm slide projectors will be provided if required.

Printed handouts will be the responsibility of the speaker.

Following the conference, a manuscript suitable for publication in the HSI bulletin will be greatly appreciated.

Notice of membership dues increase: Owing to the general increase in costs, particularly printing and postage, HSI reluctantly is obliged to increase membership fees. This increase will come into force for renewals and new members from 1 July 2010.

The new schedule will be: Regular members - $40; Family members - $45; Library members - $35; Students - $10 (unchanged). A new category will be introduced for members who are prepared to forego their printed Bulletin, and download it from the HSI Website: PDF members - $25.