BULLETIN

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Hedychium longicornutum – a stunning epiphyte from Malaysia

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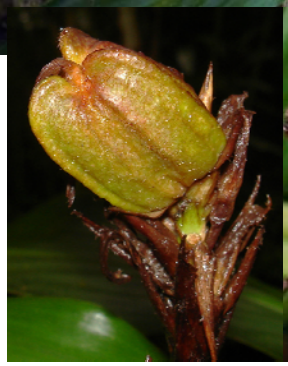
If there was a beauty contest among gingers, *Hedychium longicornutum* would surely qualify to the semi-finals. The inflorescence is both weird and beautiful.

Its orange-red flowers are of an intricate architecture. Long and slender red corolla lobes hang downwards, while the long staminodes and deeply split labellum are curled and usually bright orange. The flowers open for 48 hours, a long duration compared to many other gingers, where flowers typically last just few hours to one day. Flowers emit a slight and pleasant scent wooing butterflies and perhaps also moths with long probosces to have a taste of the sweet nectar deposited deep at the bottom of the long corolla tube. In return, the plant expects the insects to transfer some



Above: Detail of the flowers and inflorescence. Left: *H. longicornutum* perched on rocks in the Ginger Garden. Right: Fully matured fruit (closed and open).

of the pollen from the long exserted anther onto the stigma.

This species flowered regularly for the past few years in the Ginger Garden, but only twice did we see the formation of fruits. As in other *Hedychium* species, the fruit is a septifragal capsule with three leathery valves. These open when the fruit is ripe and are bright orange inside with orange-red seeds embedded in bright red arils – a colour combination highly attractive to birds that ensure seed dispersal. As we have currently only a single plant in Ginger Garden, we can assume that this species is capable of self-pollinating.

This species is native to Peninsular Malaysia and is rather widespread in lowland and midrange forests. It has been recorded and collected many times from various parts of the Malay Peninsula, but unfortunately has never been found in Singapore in the wild. It grows perched on trees or in rock crevices and for that purpose it is well adapted by having swollen roots. These roots not only help to store some extra water, enough to sustain the plant for couple of days without rain, but also provide a firm grip to increase the stability of the plant.

The name *H. longicornutum* was first mentioned by Griffith, an English botanist working for the East India Company, in one of his unpublished manuscripts. It was properly described only in 1892 in J.G. Baker's account of Scitamineae (old name for the plants of the ginger order, Zingiberales) he prepared for the Flora of British India. Interestingly, Baker described in the same work and on the very same page 228 yet another epiphytic *Hedychium* species from the Malay Peninsula - *H. crassifolium*. We know however, that Baker, based at Kew herbarium, worked mainly from dried plant specimens and drawings, and had no chance to see the true variability of gingers in the wild. He himself admitted that it was a great limitation for the study of this family. It was H.N. Ridley, director of the Singapore Botanic Gardens between 1888-1912, who carried out extensive fieldwork in the region and observed this species in the wild in several places. He concluded that both names proposed by Baker represented only one species, and chose the name *H. longicornutum* to be used for this taxon. R.E. Holttum, who also spent over 30 years in this region, further studied gingers in the Malay Peninsula and supported Ridley's treatment. He noted that the difference in leaf shape and size can be considerable and the colour of the labellum and staminodes varies a lot from yellow to orange to reddish.

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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 Zingiberales 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.

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The *Plagiostachys* Experience

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Most photos by the author.

In the great forests of Borneo, where the family *Zingiberaceae* often comprises 10-20% of the herbaceous under-story, the genus *Plagiostachys* is well represented by 14 species (Julius et al. 2007) and several taxa yet to be determined. It often occurs in concert with other ginger genera, although to a lesser extent than *Etlingera, Zingiber,* and *Amomum.*

To the casual forest explorer, most *Plagiostachys* spp. would go unnoticed amongst the mass of green. To the experienced eye, they are actually some of the easiest gingers to find, since the new terminal growth is invariably a bright orange, red or bronze color, standing like sentinels amongst the green. This showy character, along with the unusual flowering method of lateral eruption of the inflorescence from the stem, well below the leafy terminus, sets this genus apart from almost all other gingers, making it easy to recognize. As a caveat, this flowering morphology is not totally restricted to this genus but is also found in a few Bornean *Alpinia* such as *A. haverlandii and A. hansenii.*

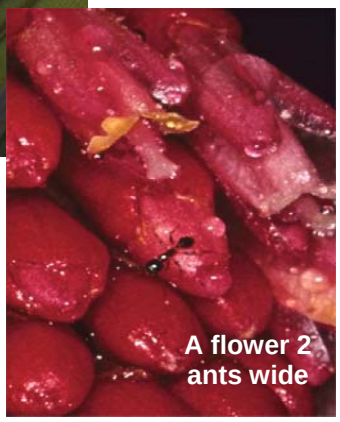

Sentinel in the forest


Emerging inflorescence

Plagiostachys can be found in almost any of the various forest types in Borneo from seasonally flooded *Kerangas* to secondary hill forest and lowland primary forest. From field observations, it appears each species is quite specific in its ecological requirements. They can occur as isolated plants, as populations of one species or sometimes as mixed populations of 2-3 species. Most occur as clumps, but a few are runners with individual stems spaced at regular intervals. They grow from 1500 m down to sea level and on poor ultramafic soils as well as fertile alluviums and a mix of latosols. The diversity of plant size is quite dramatic with diminutive examples such as *P. parva* (see next page) at ca. 30 cm. tall, while others are giants at over three meters, i.e. *P. megacarpa*.


Plagiostachys megacarpa

The majority of species are 1-1.5 m tall, clump and occur as isolated plants. The leaves can be linear, ovate, lanceolate, hairy, glabrous, undulate or smooth and in a large range of size. The flowers are generally very small (ca. 5-15 mm wide), profuse and sometimes imbedded in a slimy, messy mucilage. This character has been a historic deterrent in making good collections as well as drawings and macro photography. The inflores-


A flower 2 ants wide


A mucilaginous inflorescence

cence emerges laterally, one to each stem. Inflorescences can be branched or un-branched. Many are very showy with bright pink flowers such as *P. strobilifera*. Others are hardly worthy of a second glance by a hungry Orang-Utan. The seed capsules look similar to other *Alpinioideae* with a variety of characters, i.e. round, oblong, spherical, ribbed, un-ribbed, smooth, rough, hairy, white, green, red, purple, and black. The aril inside can be soft, firm, hard, sweet, sub-acid, white, edible or not. No matter the exterior or interior characters, one thing has been obvious in our propagation efforts—seed is normally very difficult to germinate. Since the capsules are produced relatively close to the ground, they are fair game for many rodents, barking deer and other mammals. It is difficult as a collector to find mature seed on some species, especially those with delectable arils. In this case, usually the aril is completely eaten out of the capsule as soon as it matures. Consequently, the passage of the hard seed thru the mammal's digestive system most likely benefits natural germination and could be requisite.

Infructescence with white capsules

Seed propagation aside, *Plagiostachys* is relatively easy (in some species) to propagate via rhizome division, as long as the division is not stressed, is planted in well-drained soil, has medium shade and high humidity. Of the sixty field collections made in Sabah between 1989-2000 by Tony Lamb and myself, a majority survived transplanting to the Tenom Agricultural Park. Divisions of these plants did not survive as well in transfer to Lyon Arboretum, University of Hawai`i.

Currently, Lyon Arboretum has 12 accessions of *Plagiostachys* spp., all collected from Sabah, Malaysia. These include *P. strobilifera, lasiophylla, oblanceolata, parva, megacarpa, subulata* and several unidentified specimens. Surprisingly, once these plants became established in the high rainfall, shaded valley environment, they grew very well. Most of the collections are at least 10 years old and continue to show good vitality, annual flowering and some seed set. In Hawai`i, summer is the primary flowering season with many weeks of flower display.

Taxonomically, there are several new species already collected and awaiting description. Many more are yet to be discovered throughout Borneo and neighboring countries. Considerable work will be required in the coming years in order to accomplish a complete taxonomic treatment and verify the phylogenetic relationships of the genus *Plagiostachys* within the *Alpinioideae*.

From a horticultural perspective, some *Plagiostachys* spp. have excellent potential for tropical landscaping as the genus displays an unusual mix of characters. With the colorful terminal leaves and elevated inflorescences with showy flowers, many of the species could add needed contrast to an often bland, tropical greenery.

A stingless bee and fruit fly doing pollination studies

References

Julius, A., Suleiman, M. and Takano, A. 2007. Five New Species of *Plagiostachys* (Zingiberaceae) from Borneo. Acta Phytotax. Geobot. 58 (1): 1-17.

Another species, probably *P. parva*. Photos: Jana Leong-Škorničková.

Bivouacking on Cerro Pirre

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In June 2009 I went to Cana in Panama's Darien National Park with a group of scientists. My goal was to

look at heliconias and, knowing there were few to see, I also planned to enjoy a vacation seeing the birds, beetles, and moths the others had come to look at. One day I got lost and ended up staying out in the forest overnight at about 1350 m (4500 ft) elevation. When I hear of someone getting lost I'm always curious how it happened and what they were thinking. Here is my story.

Cana is at 500 m elevation in the central part of the Panamanian isthmus near the Colombian border. It is the site of a gold mining operation that lasted over two hundred years, shutting down operations in 1907; mining

rights were finally abandoned in the 1970's when the Darien National Park was established. Ancon Expeditions operates facilities for visitors, including a higher elevation tent camp about 3 hours hike up the ridge at approximately 1250 m.

After a few days in the main camp at Cana, four of us visitors and two staff hiked up to the tent camp.

Above: Tent camp in forest.

Above left: Digger. Above right: locomotive.

Left: Cana mine, now ecotourism base camp.

Below: Smelter near modern base camp. The stack is still in the forest.

The next morning I headed out to look for *H. darienensis*, recorded in elfin forest at the top of Cerro Pirre. I left camp at 7:30 am, hiking fast to get to the often mentioned high point 4 km distant.

One hour of good hiking later I came to the end of the tended trail and looked for the continuation to the summit. That was my first mistake: the "top" everyone spoke of was the end of the good trail – and there was no "top" about it. I continued, following a brushy trail with fallen trees requiring short detours. The second mistake I made was not paying attention to details of the trail, thinking all I had to do was turn around to return to camp. Two or three times I rested my chin on my walking stick, thinking I'd best get help to clear the trail: I'd never make it to the elfin forest at this rate, and I could even get confused on the return trip. But I continued, skirting tree falls and hunting for the foot path.


Forest trail.

About 45 minutes along the rough trail I decided to turn around. It was 9:30 am. Instantly I realized I didn't recognize the way back. I was on a kind of flattish knoll with a variety of routes, all rarely traveled and unconvincing. I went around and around, retracing my route without meaning to, coming across my footprints or passing distinctive plants without knowing how I got there.

After an hour and a half, I got concerned that I wasn't going to stumble across the route home, and the sense of being disoriented was disconcerting. I had to work out a real plan. The sun cooperated, and I could see which way was south, which was certainly the right way back. I built up an image of the trail I was looking for: I thought I had not climbed steeply, that the trail was extremely faint, and that it followed a ridgeline (all three of which turned out to be incorrect). I pulled out my little machete to mark where I had been. I made a point of not straying too far on unpromising routes. At one point I noticed a pair of Coke bottles stashed in a thicket and two arrows carved into tree trunks. Not far away was a brass survey marker. This was a known location, and if I didn't wander too far off, searchers could find me. But not until the next day.

I began to check all possible routes in an orderly fashion. My first early foray down the correct trail didn't seem right, and I came back up at about 1:30 pm. I ate a sandwich and headed down another trail, this time leaving an arrow for searchers to follow, and marking my route with cut leaves and blazes for their benefit, or for mine if I had to return. I wanted to avoid that uncertain feeling I'd had all morning.

For two hours I followed semi-hard ground that implied use as a trail, but I also bushwhacked, always heading downhill and south. I was feeling confident, and if I were on the right track, I could get down by dark.

But just about the time the first rains of the day arrived at 4:00 pm, I could see that my trail wasn't working out. I would have to retrace my route to where I first got lost. But first, I needed a little rest in a dry spot under a leaning tree. Resting with my head in my hands, I realized I was more tired than I thought. I could not get out of the woods by dark, no matter what. If I went back to my "home base" now, I'd not have time to make a shelter, either. It was a relief to make the decision that had been niggling since 11:00 am: I would stay and bivouac, knowing that the other five would be out looking for me at first light in the morning. I felt quite badly for those in camp, and wished I could tell them I was okay.

As far as equipment went, I had a small sharp machete, a plastic grocery bag, and a kerchief. I was wearing a Capilene t-shirt that kept my upper body feeling warm, a windbreaker that was not even a little waterproof, mid-weight cotton pants, and rubber boots with wool socks.

I was happy when the rain let up at 5:00 pm to let me build my bed and shelter without getting wetter. The leaning tree was a perfect start, lacking only a pair of sticks on either side to hang the walls on. I cut palm fronds and bent the petioles to hang them over the sticks, then covered the fronds with big cape-shaped leaves of *Asplundia*. Everything stayed together okay without lashing.

For my bed – the space under the trunk was long

enough to lay down in a relaxed fetal position – I cut many slim bamboo sticks and split them by beating them with the back of the machete. They were flexible and comfortable, and kept me off the ground very nicely. To cover myself I cut fern fronds for loft and more *Asplundia* leaves to try to trap the heat.

At 6:00 pm it was getting pretty dark under the forest canopy, and it began to rain again. The front of my thighs were soaked as were my arms, but I didn't feel too wet otherwise. I climbed into my shelter and sat to eat two granola bars, and drank a box of juice and my remaining cup of water. I tied the kerchief under my chin, raised my hood, and settled down with my head on a hard ledge as a pillow. The rain continued until about 8:00 pm, but I was only feeling the occasional, regular drip. I spread the shopping bag under me when I thought I felt a stinging insect, but I had no other trouble with bites or stings. As I lay there I considered other dangers of the night, but was not worried by the chance of a large cat bothering me or of a snake joining me for warmth. The idea of a herd of peccaries kept the camp staff awake overnight, but I didn't know about that danger. Ignorance is bliss.

The blanket was the least satisfactory of my three shelter elements. The ferns were wet and there weren't enough of them. The *Asplundia* kept drifting off, and split into fragments when I handled it. My hips and legs on the canes would dry out a bit and feel quite cozy, but when I had to turn over every two and a half hours or so, the warm side would get wet again and feel cold for lack of good covering. My upper body felt okay, probably thanks to the fabric of the t-shirt. I was too chilly to sleep – the temperature was probably in the low to mid-60's F – but after about 8:00 pm I was happy to notice that I wasn't getting any colder. With regular, energetic shivering, I stayed reasonably warm all night.

I later learned that the camp staff, José and Mario, went out to look for me that night when it stopped raining.

Jose and Mario

They hollered until 11:00 pm, but I was quite far off and had my ears under a few layers of clothes and leaves. I counted on them to look in the morning, but as I laid there I hoped they didn't bother to search at night.

The 12 hours of darkness crept by. I could go a few hours without looking at my watch: one quarter of the way through the night, half way done, just two hours to go. A bivouacker greets the dawn with special joy! With the least light I crawled out, tried unsuccessfully to take photos of my shelter, and headed back along my route. I filled my water bottle from a yellowish stream in case of emergency. Twice I had to stop for 20 minutes to look for my marks; it was a bit unnerving to take so long, but I had patience - no way was I going to wander off my route now!

I began yelling at 6:00 am. A whistle would have been good – it takes a lot of energy to yell in a way that penetrates forest. I sort of imitated howler monkeys, whose calls carry long distances.

Before 8:00 am I was back at home base, and still hadn't heard anything. Maybe the searchers had gone past my point, and wouldn't be back until late afternoon? Maybe I wasn't as close to a traveled route as I thought, and I would be harder to find than I imagined? As the hour crept away, I was beginning to feel a little concerned. I sat on my hard camera case to wait for rescue in my known spot. Five minutes later I was up, needing to do something, to try some route. It was nearly the same hour of the morning that I had gotten lost the day before, and I was noticeably more tired – I really wasn't up for repeating my previous day's activities!

With the sun shining and south clearly apparent, I headed down a barely visible path for the second intentional time. It didn't look right the first time, but by now I had narrowed the options. I stepped over a cute patch of aroids for the umpteenth time, telling myself to have confidence that I had indeed stepped over them upon my first arrival at this spot, and that no, I had not simply become familiar with them in my circling around (which was certainly the case with other small landmarks).

Not more than 15 minutes down the trail, I heard yelling! Or was it just a dove cooing? Back and forth we hollered, them making sure I wasn't a monkey, me hoping they were not doves. "Stay put!" they called. "I'm at the marker!" I hollered. Within 20 minutes the camp staff reached me.

Hugs all around! That's not normal staff-client behavior, believe me! They brought food and water, and a sheet for a hammock to carry me out if it were necessary. I don't know if I felt stronger because of eating and drinking, or just because I knew I had only two hours of downhill walking ahead of me with no chopping and no decisions to make. Probably both.

On the way down we pieced together what I had done. Strangely, I didn't recognize the trail. It fit none

of the three characteristics I had set in my mind. The most misleading was my idea that the trail was faint, so I was willing to go way too far on the wrong route, taking the least sign as encouraging. The real trail was brushy, but the tread was a highway compared to my 2-hour detour route the day before. Though I like to think I would have found my way out of the woods, my head was full of doubts and I don't know if I would have continued far enough to find the well-trod trail on my own. I didn't even recognize the terminus of the groomed trail. I had followed my nose all too happily the morning before.

By 10:30 am we were back at tent camp. My other companions, entomologist Don Windsor from the Smithsonian Tropical Research Institute, his Czech graduate student Lukas Sekerka, and their friend, professor of photography at Princeton, Emmet Gowin, were out in the rain until late afternoon, looking for me (and maybe for beetles, too). The other guests hiked up to tent camp as scheduled, unaware of my adventure. But they were accompanied by all the remaining staff, who were prepared to fan out to find me. Fortunately for all, I was back in camp by the time they arrived, so there was no need to mount a larger search and rescue operation.

Left: Home at last!

Below: Lukas Sekerka (L) and Emmet Gowin (R). (Photo: Don Windsor)

In the final analysis, the unfortunate factors were: 1) I was alone; two people don't get disoriented as easily as one, 2) I didn't pay enough attention to features on the way up, and 3) I didn't have an emergency blanket and whistle. The fortunate factors were: 1) I had a machete, 2) the rain held off until the afternoon, and I was not drenched (as I would have been the day before or after), 3) I found a relatively dry spot to spend the night, 4) I maintained a "home base" where I first realized I was lost, and 5) the night was not too windy, rainy, or cold. It would have been better to not get lost, but the whole experience wasn't too tough, and I never was really scared.

In the final heliconia analysis, I was really quite far from the top of Cerro Pirre and *H. darienensis*, and there is no cleared trail to the top. There were no heliconias of any kind in the area I wandered, and only *H. spathocircinata*, *H. trichocarpa*, *H. longa* and *H. metallica* on the trail between main camp and tent camp. Around base camp I saw *H. latispatha*, *H. imbricata*, *H. pogonantha* (probably; it was not in bloom), and *H. wagneriana*. This is a surprisingly slim selection for a habitat that seems well-suited to *Heliconia*.

Above: *H. longa*

Above right: *H. spathocircinata*

Right: *H. imbricata*

Having trouble placing the heliconia to the left? Think hard. Think harder!

OK, it's not a heliconia—it's a bromeliad, *Vriesea heliconioides*.

Most photos by the author.

Historic photos thanks to Peter Tristram, bromeliad grower in New South Wales, Australia, whose English great uncle worked at Cana before emigrating to Australia.

A Mystery Ginger

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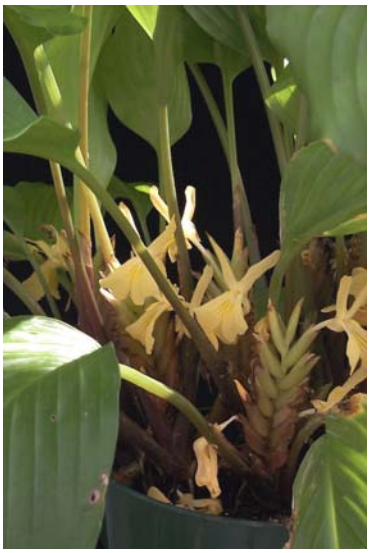
Most photos by the author.

What are the differences between the Zingiberaceae genera, *Scaphochlamys* and *Distichochlamys*? Recently, I had the opportunity to ask this question in trying to identify an unknown ginger.

Over one hundred years ago J.G. Baker established a new Zingiberaceae genus, *Scaphochlamys,* typifying it with the species, *S. malaccana* Baker. (J.D. Hooker 1890) Although Baker did not state his exact interpretation of the Greek-based epithet, *Scapho* from *skaphe* or *skaphos* meaning anything dug or hollowed out such as a scoop, trough or vessel and *chlamys* meaning cloak, mantle or covering, one would assume he was referring to the trough -like, open bracts of the inflorescence of his type.

During Baker's era of ginger taxonomy, the differentiation of genera was an imperfect science. Even after studying many specimens, Baker still did not fully comprehend the true parameters of his new genus, for in the same 1890 publication he named two other new taxa, *Kaempferia concinna* Baker and *Curcuma kunstleri* Baker that today are recognized as *Scaphochlamys.* The mention of this is by no means a criticism of Baker's work. Even today with many more years of accumulated knowledge, unless one is quite attuned to the various nuances separating similar genera, it is not always an easy task to clearly place some of the species. In fact, when the first species of *Distichochlamys, D. citrea* M. F. Newman was proposed in 1995, Dr. Newman took a large leap of faith that the morphological differences, mainly distichous (2-ranked) bracts versus the "spiral" bracts of *Scaphochlamys,* provided enough variance to warrant a new genus. Subsequent DNA analysis confirmed his excellent insight, placing the two genera as distinct sister clades. (Kress et al. 2002)



Distichochlamys citrea
(Photo courtesy Leslie Brothers, Smithsonian Inst.)

In more recent history, this article is the result of some taxonomic flailing, which happened while trying to identify a beautiful, little yellow-flowered ginger. At first glance, pictures sent to me for identification, appeared to be a species of *Scaphochlamys.* After sending these pictures to several other ginger taxonomists, most agreed with my initial guess, but could not recognize the species. The problem seemed to rest with the unusual flower color. Almost all *Scaphochlamys* have white flowers, only a rare few approach yellow. Luckily, before I got too entangled in the identification, Dr. Jana Leong-Škorničková (Singapore Botanic Gardens) came to my rescue. The plant was *Distichochlamys rubrostriata* W. J. Kress & Rehse (2003), a rare ginger indigenous to Cuc Phuong National Park in northern Vietnam. Although the identification mystery was solved, I still was curious as to how such a rare plant ended up in someone's back yard in Hawaii. After a little sleuthing, I discovered the parent plant went from Vietnam to Missouri B.G., to the Uni. of Arizona, to a H.S.I. member and then to Hawaii. Surprisingly, the plant has been on the internet market for quite a few years.

Distichochlamys rubrostriata (Vietnam)

Listed below are a few characters that help differentiate *Scaphochlamys* from *Distichochlamys*.

<u>*Scaphochlamys*</u>
Found in Peninsular Thailand and Malaysia
Bracts spiral on the rachis
Bracteole open
Flowers mostly white
Glandular hairs not always present
Approximately 31 spp. (Searle 2010)

<u>*Distichochlamys*</u>
Found only in Vietnam
Bracts distichous (2 ranked)
Bracteole tubular
Flowers yellow
Glandular hairs present
Three spp.: *D. citrea, D. orlowii, D. rubrostriata*

Addtionally, if anyone would like more information on *Scaphochlamys*, Dr. R. J. Searle recently published an excellent compendium for the field worker. Within this comprehensive text, she provides history, morphology and a key to the species. (Searle 2010)

Cultivation

Taxonomy aside, the horticulture of these two

genera is sparsely documented. The primary reason being their extreme rarity. Thirty-four species might seem like quite a few, but the actual numbers in known botanical garden collections are few. In the wild, numerous species have only been found from one location, one time. Many species are site specific, having evolved over millennia within a narrow, environmental niche. Due to expanding agriculture and forestry in recent decades, these habitats continue to be lost, probably making the 34 documented species purely a historical record. On the other hand, there are numerous new species, yet to be described that will again change this number.

As to the ex-situ growing of these very small gingers, *difficult* is the key word. Over many years of experimental propagation in Hawaii at Lyon Arboretum, Waimea Arboretum and the author's facility, there have been more failures than success. Certain species grow unabated with good vigor, e.g. *S. kunstleri.* [See following article by Jana Leong-Škorničková.] Others never seem to acclimate, decline and die. Even in Malaysia, where temperatures, humidity, rainfall and soils might best duplicate a similar environment, the same problem exists, albeit, to a lesser extent. For many species, creating conditions even remotely close to their unique forest microcosm is pure guesswork. Even when we have personally collected the plant and have a 'feel' for the conditions, invariably, it is the soil, soil microbes, micro-climatic nuances and other unknowns, that often stymie success. To me it is a miracle that some species can apparently adapt and prosper in alien climates and conditions, such as our mystery ginger, while others die. But not to be completely pessimistic, for an experienced grower, there are some variables that can be considered. In the forest, both genera primarily occur in areas where highly organic, well-drained soils, high humidity, shade, and good rainfall prevail. Some, like *S. reticosa* from Sarawak, have been found in limestone areas that can have a different micro-environment and soil. Thus, when it comes to preparing soil mixes for pot culture and placement within a nursery or garden, it helps to have a general idea of the normal habitat of the species. In lieu of those details, use of a highly organic, well-drained, acidic mix placed in a high humidity area with at least 50% shade, would be a good starting point. Good luck in your pursuit with these beautiful gingers.

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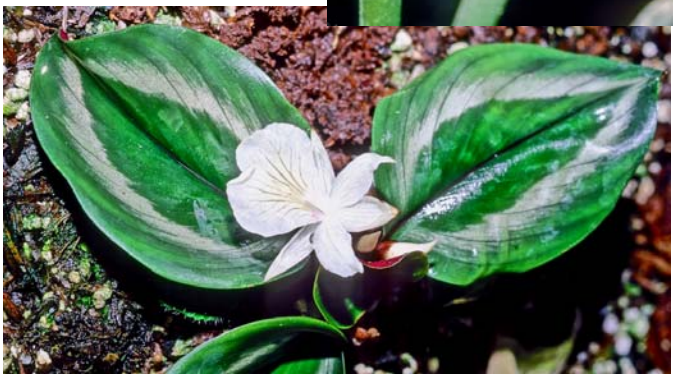
Left: *S. oculata* (Ridl.) Holttum; (notice how similar the flower is to *S. kunstleri* var. *speciosa* in the following article).

Below: *S.* sp. (from Thailand)

Above: *S. reticosa* (Ridl.) R.M. Smith.

Right: *S. minutiflora* Jennitt. & K. Larsen.

Below: *S. biloba* (Ridl.) Holttum.



Scaphochlamys kunstleri – colours in the shade

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***S. kunstleri* var. *kunstleri* (green-bract form)**


***S. kunstleri* var. *kunstleri* (red-bract form)**


S. kunstleri* var. *speciosa


S. kunstleri* var. *rubra

Scaphochlamys kunstleri was first described by J. G. Baker in Hooker's Flora of *British India*. Baker based his description on a drawing made in 1882 from plant cultivated in Calcutta Botanic Gardens. Unfortunately the original locality in the Flora of British India appears as Pegu (Burma) by mistake, but in fact this species was originally discovered by H. Kunstler in Perak, which is the locality mentioned on the drawing Baker worked with and which is now deposited at Royal Botanic Gardens Kew. So far it is known to occur naturally in the Malay Peninsula and has also been reported from Thailand. Its bracts can be light green in colour or flushed with red, reaching in some cases deep crimson maroon-red. They form pouches resembling those in the genus *Curcuma*, and hence the species was named as *Curcuma kunstleri* when first described in 1890. The plant subsequently 'suffered' another two name changes, as it appeared in genera *Hitcheniopsis* and *Gastrochilus*, of which none is currently recognized. In 1950, a director of Singapore Botanic Gardens R. E. Holttum, who worked extensively on Malayan gingers, finally placed this species in the genus *Scaphochlamys*. The leaves are widest at the upper third and have long, soft and silky hairs underneath; this and the very open flowers and unilocular ovary easily distinguish it from the genus *Curcuma*.

This is one of the few gingers which occur naturally in several flower colour forms. The original description referred to a plant with light green bracts and yellow flowers, but a beautiful bright red coloured variety was discovered in 1894 in Malaysia and described by H. N. Ridley in 1907 as *S. kunstleri* var. *rubra*, while the white-flowered variety, *S. kunstleri* var. *speciosa*, was named as recently as 2001.

Scaphochlamys kunstleri is an increasingly popular ornamental plant, commonly available in Singapore and Malaysian nurseries. It is suitable for the shady damp corners of your garden, where it gives nice ground covering foliage and also beautiful flowers for several months of the year. The form with a dark red flush on the lower side of leaves is particularly pretty. It happily grows and flowers in several parts of the Ginger Garden - so look out for it!

Conservation Centers of the Heliconia Society International

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The Heliconia Society International (HSI) Conservation Centers are repositories that maintain accurately identified, documented, and labeled living collections of the eight families comprising the Zingiberales order. Currently there are 11 official conservation centers. These are most often botanical gardens, either privately owned or associated with a university or learning center, or governmental. However, smaller privately owned gardens may also function as Conservation Centers. For example, Puerto Rico is unique in having a network of eight smaller privately owned gardens. All the Centers are voluntary participants and receive no direct funding from HSI.

Destruction of the world's tropical vegetation continues at alarming rates. Species are being lost before we even have a chance to name and catalog them. These Conservation Centers can play a critical role in saving species *ex situ*, as collectively they safeguard a large number of Zingiberales taxa.

Each Conservation Center should strive to maintain accurately labeled and documented collections. These should be mapped and prevented from growing together. Each Center is unique in the growing conditions and habitat types it offers and the species it conserves. All except Wilson Botanic Garden in Costa Rica are low elevation sites, however, and it is important to have additional cooler, mid-elevation sites for montane and cloud forest species. The eleven HSI Conservation Centers are listed in alphabetical order below.

Andromeda Gardens, Barbados
The Botanical Ark, Cairns, Australia
Fairchild Tropical Botanic Garden, Coral Gables, Florida, USA
Heliconia Society of Puerto Rico, Puerto Rico [8 different localities]
Jurong Bird Park, Singapore
Lyon Arboretum, Honolulu, Oahu, Hawaii, USA
National Tropical Botanical Garden, Kalaheo, Kauai, Hawaii, USA
Nong Nooch Tropical Garden, Pattaya, Thailand
Waimea Arboretum & Botanical Gardens, Haleiwa, Oahu, Hawaii, USA
Wilson Botanic Garden, Costa Rica
Zingiberales Gardens, San Juan, Puerto Rico

The following summaries will give the reader an idea about the Centers and their collections.

1. Andromeda Gardens, Barbados: Size: 2.4 ha. (6 acres)
Elevation: near sea level
Climate: humid tropical lowland, driest months December to May.
Became a Collection Center: 1986
Contact: Jeff Chandler, jchandler@uwichill.edu.bb
Number of Zingiberales collections: Caribbean *Heliconia* species and hybrids, *H. psittacorum* cultivars, assorted other *Heliconia* and Zingiberales species (recent records are not available).

Andromeda comprises a total of about 600 tropical plant species including many species of flowering plants and tropical trees. This botanical garden started in 1954 as a private plant collection around the home of the late Ms. Iris Bannochie, a leading expert in tropical horticulture in the island. It is currently owned by the Barbados National Trust but leased to Perseus Inc. The University of the West Indies (UWI) has responsibility for Research and Educational activities at Andromeda. The University's activities there are funded by the Peter Moores Foundation (UK). There is an admission fee.

2. The Botanical Ark, Mossman, Queensland, Australia
Size: 12 ha. (30 acres)
Elevation: 35-110 m (16-363 ft)
Climate: lowland wet tropical
Became Collection Center: 2000
Contact: Alan and Susan Carl, info@botanicalark.com
Number of Zingiberales collections (2008): Cannaceae 2 species; Costaceae 7 genera, 73 species, 107 taxa including. cultivars; Heliconiaceae 71 species, 141 taxa including cultivars; Lowiaceae 1 genus, 6 species; Marantaceae 20 genera, 99 species, 107 taxa including cultivars; Musaceae 2 genera, 27 taxa; Strelitziaceae 3 genera, 3 species; Zingiberaceae 24 genera, 147 species, 185 taxa including cultivars.

Dedicated to saving tropical plants, The Botanical Ark has over 3,000 species of tropical fruits, flowers, and ethnobotanical species.

3. Fairchild Tropical Botanic Garden, Coral Gables, Florida, USA
Size: 33 ha (83 acres)
Elevation: 0.6-4.5 m (2-15 ft.)
Climate: humid subtropical lowland
Became Collection Center: 1995
Contact: Mary Collins, Senior Horticulturist, Horticulture@fairchildgarden.org
Number of Zingiberales collections (2010): Cannaceae 3 accessions; Costaceae 6 genera, 46 accessions; Heliconiaceae 91 accessions; Lowiaceae 3 accessions;

Marantaceae 9 genera, 63 accessions; Musaceae 2 genera, 50 accessions; Strelitziaceae 3 genera, 9 accessions; Zingiberaceae 19 genera, 147 accessions.

Note: Flamingo Gardens (Fort Lauderdale, Florida) was the former HSI headquarters and a conservation center from 1986 until 1995. When horticulturist David Bar-Zvi left to work at Fairchild Tropical Botanical Garden a duplicate set of the collections went to Fairchild.

4. Heliconia Society of Puerto Rico (HSPR)
Co-operative HSI Conservation Center of Puerto Rico.
Number of gardens: 8
Location of gardens: Scattered throughout the entire island of Puerto Rico
Size: Farms range from 0.8 to 24 ha. (2-60 acres)
Elevation: From about 60 m (200 ft.) to about 1140 m (3,800 ft.) above sea level
Climate: Tropical lowlands and highlands
Rainfall: Varies between 110 cm (50 inches) on the eastern part of the islands per year to 220 cm (100 inches) per year in the western highlands.
Became Collection Center: 2007
Contacts: Raymond Jerome, raymondjerome@prtc.net; Bryan Brunner, brbrunner@yahoo.com
Number of Zingiberales collections (2009): Number of *Heliconia* species & cultivars in collections: 391 reported for the conservation center inventory, but the actual collections on these farms are much more extensive. Costaceae 25 accessions. This conservation center is unique in being the only cooperative unit in the HSI. Their main focus is on heliconias, but future plans include developing other quite extensive Zingiberales collections.

5. Jurong Bird Park, Singapore
Size: 20 ha (50 acres)
Elevation: near sea level
Climate: wet tropical lowland
Became Collection Center: 1989
Contact: Melvin Tan, MelvinTan@zoo.com.sg; Xiao Yi, xiaoyi@birdpark.com.sg
Number of Zingiberales collections (2010): 111 taxa and 111 accessions of *Heliconia* species and cultivars; Cannaceae 1 accession; Costaceae 14 taxa, 15 accessions; Marantaceae 18 taxa, 19 accessions; Strelitziaceae 2 taxa, 2 accessions; Zingiberaceae 10 taxa, 15 accessions.

The hot, humid climate makes it challenging to grow certain species. Now under the management of the Singapore Zoo. Focuses on the conservation and breeding of rare and endangered birds. Jurong was the first HSI repository in Asia.

6. Lyon Arboretum, Honolulu, Hawaii, USA
Size: 77 ha (193.5 acres), 36 ha (90 acres) actively gardened
Elevation: 450—1850 ft.
Climate: wet tropical/subtropical lowland
Became Collection Center: 1986
Contact: Raymond F. Baker raymondb@hawaii.edu
Number of Zingiberales collections (2008): Cannaceae 4 taxa, 14 accessions; Costaceae 4 genera, 95 taxa comprising 66 species, 188 accessions; Heliconiaceae 300 taxa comprising 115 species, 425 accessions; Lowiaceae 4 species, 5 accessions; Marantaceae 21 genera, 340 taxa comprising 200 species, 510 accessions; Musaceae 1 genus, 19 taxa, 25 accessions; Strelitziaceae 3 genera, 4 species, 10 accessions; Zingiberaceae 36 genera, 950 taxa comprising 323 species, 1220 accessions.

The Harold L. Lyon Arboretum forms part of the University of Hawaii system.

7. National Tropical Botanical Garden, Kauai, Hawaii, USA

The NTBG was established in 1964 as a privately supported organization for research, education, and conservation of tropical plants. Formerly known as the Pacific Tropical Botanical Garden prior to 1989, it is the only botanical garden in the United States chartered by the U.S. Congress. It is a non-profit, non-governmental organization with no direct state or federal funding. NTBG consists of four gardens and three preserves in Hawaii, and one in Florida. The "Garden Island" of Kauai is home to three of NTBG's gardens.

McBryde Garden--comprising 75 ha (186 acres) in Lawai Valley, on the south shore of Kauai is home to the Kalaheo headquarters complex including administration and the education, horticulture and living collections, conservation, and science departments. The newly constructed Botanical Research Center (BRC) is located here and houses the library (20,000 volumes) and herbarium PTBG (64,000 specimens).

Allerton Garden--40 ha (100 acres), located on the oceanfront and streamside in lower Lawai Valley; comprised of gardens of beauty and landscape design, and collections of palms, *Pandanus*, and Pacific Island plants.

Limahuli Garden and Preserve--7 ha (17 acres) located in Haena, on the north shore of Kauai, holds many native Hawaiian and Polynesian introduced taxa. The largest portion of Limahuli Valley comprises a preserve with over 960 acres (384 ha.) of wet forest habitat and is the site of extensive ecological restoration projects.

Kahanu Garden--50 ha (123 acres) near Hana, in east Maui. The collections here consist of Pacific islands economic and ethnobotanical plants, native plants of Maui, the world's largest collection of breadfruit (*Artocarpus altilis*) cultivars, and a diverse collection of banana cultivars including many Hawaiian types.

The Kampong-- David Fairchild's former residence comprises 3.6 ha (9 acres) in Coconut Grove, near

Miami, Florida. The collections include rare fruit tree species and cultivars, flowering trees, palms, ornamentals, and a Kampung-style garden. Few Zingiberales are cultivated here.
Elevation: Ranges from 0 to 120 m (0-396 ft.)
Climate: moist to wet tropical (Hawaii gardens) and subtropical (The Kampong) lowland
Became Collection Center: 1986
Contact: David H. Lorence, lorence@ntbg.org
Number of Zingiberales collections (through 2009): Cannaceae 15 taxa, 18 accessions; Costaceae 27 taxa, 107 accessions; Heliconiaceae 135 taxa, 359 accessions; Lowiaceae 3 species, 8 accessions; Marantaceae 51 taxa, 58 accessions; Musaceae 38 taxa, 145 accessions; Strelitziaceae 5 taxa, 10 accessions; Zingiberaceae 59 taxa, 263 accessions.

8. Nong Nooch Tropical Garden, Pattaya, Thailand
Size: 200 hectares (600 acres)
Elevation: 14 m (46 ft.)
Climate: moist tropical lowland
Became Collection Center: 2002
Contact: Anders Lindstrom, ajlindstrom@yahoo.com
Number of Zingiberales collections: (2002) Heliconiaceae 45 species, 581 accessions; Zingiberaceae 27 genera, 475 accessions; Marantaceae 12 genera, 243 accessions; Musaceae 200 species and cultivars.

This the private garden of Mr. Kampon Tansacha, comprising formal display gardens landscaped with palms cycads, and much more. The *Hortus Botanicus* houses the research and conservation collections of Zingiberales and other families, often in shade houses. Each is grown in a concrete container or bed with drip irrigation.

9. Waimea Valley, north shore of Oahu, Hawaii.
Size: 60 ha. (150 acres)
Elevation: lowland, 12-42 m (40-140 ft.)
Climate: mesic tropical/subtropical lowland (rainfall 50-70 inches per year).
Became Collection Center: 2002
Contact: David Orr, DOrr@waimeavalley.net
Number of Zingiberales collections (2010): Cannaceae 15 taxa, 31 accessions; Costaceae 4 genera, 41 taxa, 64 accessions; Heliconiaceae 98 taxa, 182 accessions; Marantaceae 11 genera, 43 taxa, 47 accessions; Lowiaceae 1 accession; Musaceae 2 genera, 31 taxa, 45 accessions; Strelitziaceae 3 genera, 6 taxa, 7 accessions; Zingiberaceae 22 genera, 198 taxa, 315 accessions.

10. Wilson Botanical Garden, southern Costa Rica
Size: 12 ha. (36 acres)
Elevation: 1150-1200 m (3775-3940 ft)
Climate: Tropical premontane wet forest
Became Collection Center: 1988
Contact: R. A. (Zak) Zahawi, zahawi@ots.ac.cr, http://www.ots.ac.cr/en/lascruces/
Number of Zingiberales collections: (2010). Cannaceae 8 acc.; Costaceae 113 acc.; Heliconiaceae 107 acc.; Marantaceae 191 acc.; Musaceae 13 acc.; Strelitziaceae:10 acc.; Zingiberaceae 104 acc.

Wilson is situated in tropical premontane wet forest at the Las Cruces Biological Station. Former home of Robert and Catherine Wilson, the Garden was founded in 1963. Las Cruces Biological Station has been run by the Organization for Tropical Studies (OTS) since 1973. The total area of the station is approximately 297 ha. (742 acres). The remainder of the property is primary forest (c.200 ha or 500 acres) and secondary forest of varying age.

11. Zingiberales Gardens, Puerto Rico
Size: 8 ha. (20 acres)
Elevation: 150 m (500 ft.)
Climate: moist tropical lowland
Became Collection Center: 2003
Contact: Endre Guttman, tciendre@coqui.net
Number of Zingiberales collections (2008): Cannaceae, 5 accessions; Costaceae, 5 accessions; Heliconiaceae, 180 accessions; Marantaceae, 2 accessions; Musaceae 11 accessions; Strelitziaceae, 3 accessions; Zingiberaceae, 40 accessions.
This is a privately owned garden.

Taking a closer look at NTBG's collections

As mentioned above, the purpose of HSI's Collection Centers is to provide a number of geographically separated repositories for the maintenance of documented living collections of species, varieties, and cultivars of *Heliconia* and relatives in the botanical order Zingiberales. As the old saying goes, "Don't put all your eggs in one basket." Each Center serves as a conservation gene bank to protect endangered and other valuable species as well as a research collection for scientific and horticultural investigations.

In the next part of this article I would like to focus more closely on the NTBG as a Conservation Center. All eight families of Zingiberales are represented in NTBG's Living Collections as they comprise one of our basic or core collections. They are very useful horticultural plants for landscaping and add color, diversity and beauty to any garden. The great majority of our Zingiberales holding are planted at the McBryde and Allerton Gardens (0-120 m elev., annual rainfall 75-150 cm). A number of *Musa* cultivars are grown at Limahuli and Kahanu Gardens (both near sea level but wetter than McBryde and Allerton) because they represent Polynesian-introduced cultivars or economic plants of the Pacific. Because of the problem with banana bunchy top disease (BBT) there is a ban on importing *Musa* into the state and on shipping them between islands in Hawaii.

NTBG receives living materials mostly through collaboration and exchange. For example, we receive collections from the Harold L. Lyon Arboretum, Waimea Arboretum, the University of Hawaii Experimental Station on Kauai, and occasionally from local growers or nurseries and international botanical gardens. In addition, accessions are obtained during collecting trips by Garden staff that conduct field work in the Pacific or other tropical regions.

The value of a botanical garden's living collections depends to a large degree on the accuracy of its documentation and records and permanency of tagging. Incoming collections are given unique accession numbers and entered into our computerized database using data fields compatible with the International Transfer Format (ITF). Plant labeling or tagging is always a challenge in gardens. Plant labels are printed out from the database using thermal transfer printer onto plastic tags, which are used in the nursery to tag flats of seedlings or individual pots. The printer has a bar-coding capability, but we have not yet bar -coded our nursery collections.

Plants designated for planting in the gardens get permanent metal tags consisting of an adhesive printed label attached to a stainless steel tag with a clear plastic overlay. The tags are then attached to metal or fiberglass stakes driven into the ground. For trees and shrubs the tag is attached to a coiled, plastic-coated wire spring around the trunk or major branch. The life span of a tag is about five years, or less if the printed side is exposed to direct sunlight and weather conditions, after which the tag must be replaced. For identification purposes, most of our living accessions are vouchered and the specimens deposited in our herbarium consisting of almost 65,000 collections. Name verification of the plant is done by staff, and specimens or digital photos are often sent for determination by specialists. For example, Marantaceae are identified by Helen Kennedy, Costaceae by David Skinner, and *Heliconia* by John Kress.

Many Zingiberales are integrated with other plantings and are used as ornamentals or for landscaping purposes. NTBG has developed two areas featuring Zingiberales for display and educational purposes. These areas include representatives of all eight families in the order and are designed to accommodate a variety of Garden visitors including classes, visiting school children, and tour groups. Several representatives of each family are planted to give an idea of the diversity each family has to offer, highlight the economically and horticulturally useful members, and to show how the families relate to each other. They may include economic plants like ginger and turmeric, brightly colored ornamentals like shell or torch gingers, costus, and heliconias, bananas, and the tall traveler's tree *Ravenala madagascariensis*.

One area was developed planting the families in groups separated by paths, enabling visitors to wander through and see similarities and differences. Plantings were installed over a period of several years with the help of our student interns. Circular plastic rhizome barriers were placed around each collection to reduce the chance of the clones spreading and intermingling, although this is not foolproof because many Zingiberales have deep-growing rhizomes. As the tag is located within the circle, it is usually easy to locate each plant. Still, gardeners must keep an eye on the plants and prevent them from spreading and intermingling.

What are some problems facing Conservation Centers?

Serving as an HSI Conservation Center is a voluntary commitment on the part of the institution. However, maintaining carefully documented living collections requires a long-term commitment of staff time and resources, and consequently there are a number of potential problems:

1. Mission creep or institutional change of direction or emphasis.
2. Loss of funding to maintain the collections, especially in these difficult economic times.
3. Loss of key staff and interest in maintaining the collections, perhaps due to a difficult financial situation or new management.
4. Weediness. Although some Zingiberales are clearly endangered by habitat destruction, others have become serious pests in some parts of the world. This is especially true on certain tropical oceanic islands like Hawaii with fragile floras that have evolved in isolation. There is a serious risk that certain Zingiberales may naturalize and become noxious weeds, often due to birds spreading the seeds. In Hawaii there are already nine documented naturalized Zingiberales, including some very noxious forest weeds including *Hedychium gardnerianum*.
5. As a result, conservation centers must constantly monitor their collections and be conscientious and vigilant about introducing new weeds that may negatively impact native ecosystems. Spontaneous seedlings should be removed and plants destroyed if they show signs of becoming weedy.

Diseases and pests of Zingiberales include fungi, bacteria, and viruses. Certain microbial disease organisms may be carried by plants for long periods of time without visible symptoms. These microbes may remain viable on clothing and equipment for up to one month, and sources of infestation may persist in debris and leaf letter for up to two years. Some diseases are transmitted by insects such as leaf hoppers. Sanitary practices should be adopted to prevent disease spread, and infected plants should be destroyed by burning.

In spite of these problems, the HSI Conservation Center network has been working effectively since 1986. Through the dedication and support of members like you

it will continue to preserve these useful and beautiful plants for future generations to enjoy.

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In Memorium — Boyo Ramsaroop (May 17, 1938-March 20, 2010)

Boyo Ramsaroop, former Board Member of the Heliconia Society International, died in March in Guyana of advanced diabetes and other medical complications. He was 72.

Boyo was among the first batch of scholarship holders to communist Eastern Europe during the Premiership of Dr. Cheddi Jagan, the son of indentured Indian immigrants who founded the People's Progressive Party (PPP) and helped lead Guyana to independence from British colonial rule in 1966. Boyo studied electrical engineering in East Germany, and on his return to Guyana became a loyal and hard working member of Jagan's PPP party. However in the final four years of his life, he switched his support to the Alliance for Change, claiming that the present PPP leadership had departed from the tradition of Cheddi Jagan.

He will be remembered for his exceptional attributes of frankness, integrity and honesty, who genuinely desired the good of his country, and one of Guyana's leading horticulturists who was instrumental in promoting Guyanese flowers locally and abroad.

HSI extends sincere condolences to his family.

- Sandra Barnes

Some of Boyo's heliconias (most photos: R. Baker)

***H. stricta* `Iris'** (image from ronvandongen.com/image)

***H. stricta* `Bucky'**

***H. psittacorum* `Kathy'**

***H. psittacorum* `Petra'**

***H. psittacorum* `Lizette'**

H. `Nickeriensis'

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