



HSI Headquarters
Dr. David H. Lorence
National Tropical Botanical Garden
3530 Papalina Road
Kalaheo, Hawaii 96741 USA

HSI Editors
Dr. Ken W. Leonhardt and Dr. Richard A. Criley
Department of Tropical Plant and Soil Sciences
University of Hawaii
Honolulu, Hawaii 96822 USA

A primer on the genus *Boesenbergia* (Zingiberaceae)

John D. Mood

Introduction

In the realm of gingers and *Heliconia*, showy plants with large, colorful inflorescences usually get the most attention, while the smaller species with fleeting flowers and lack-luster foliage go unnoticed. There are exceptions like *Kaempferia* species which often have very colorful and unusual leaf shapes, drawing the eye and pocketbook. For *Boesenbergia* species, few gardeners have ever had the pleasure of growing them, since for the most part, they are unavailable in the general plant marketplace. But as the avid ginger collector knows, there are many *Boesenbergia* gems that warrant horticultural attention. This article gives a brief look into the nomenclatural history, distribution, ecology, taxonomy and horticulture of the genus. A pictorial of *Boesenbergia* species is included.



Fig 1a. *B. pulcherrima*



Fig 1b. *B. pulcherrima*

Nomenclatural history

In 1829 Nathaniel Wallich published two ginger species, *Gastrochilus pulcherrima* (Fig. 1) and *G. longiflora* (Fig. 2), which he

and his collector, William Gomez, discovered in the Rangoon area of Burma three years earlier. Both taxa bore similar, saccate flowers, the former with a terminal inflo-

rescence and the latter with several radical inflorescences emerging from the rhizome. Although Wallich was well aware that David Don (1825) had already used *Gastrochilus* (*gastro* = belly, *cheilos* = lip) to describe a new genus of orchids, Wallich considered Don's genus to be superfluous. Wallich's decision was eventually countered in 1891 when Otto Kuntze recognized Don's orchid genus as valid and proposed *Boesenbergia* as the new name for Wallich's two taxa. This name honored Kuntze's sister and brother-in-law, the Boesenbergs, who incidentally had nothing to do with botany.



Fig 2a. *B. longiflora*

At the time, Kuntze was not very popular among many botanists due to his controversial, revisionist views on botanical nomenclature. Consequently, this generic change was not immediately accepted by the preeminent ginger botanists of the time, such as J.G. Baker and K. Schumann. The latter's treatise on Zingiberaceae (1904) used



Fig 2b. *B. longiflora*

Gastrochilus Wall. to describe thirteen species. In 1913 Rudolph Schlechter re-baptized Kuntze's genus and cited 23 species of *Boesenbergia*. This was not the last of the controversy as Theodor Valetton (1918) adamantly opposed the new name, calling it the result of an orchidologists' conspiracy and proceeded to describe 17 species of *Gastrochilus* Wall. This nomenclatural saw-saw reflects, in part, the growing pains encountered in the evolution of the taxonomy of Zingiberaceae during that

era. Over the next decades little was published concerning *Boesenbergia* until 1950 when R.E. Holttum published Zingiberaceae of the Malay Peninsula where he recognized eight *Boesenbergia* species, one of which, *B. pulcherrima*, was designated as the type for the genus. In the following years up to the present, numerous publications have dealt with *Boesenbergia*.



Fig 3a. *B. ochroleuca*

Distribution and Ecology
Boesenbergia is one of the larger genera of ginger with c. 70 species currently recognized (http://www.catalogueoflife.org/). Their distribution is widespread, ranging from the Western Ghats of India eastward c. 6000 km to the Philippine Islands, as far north as Sagaing, Burma and southward c. 3300 km of latitude to the Indonesian Archipelago. The ancient geographic origin of the genus is most likely Sundaland, as the current centers of diversity are Thailand and Borneo, both of which were part of that ice-age region.

Over the millennia, this very large area with many, diverse ecosystems has provided a fertile arena



Fig 3b. *B. ochroleuca*

for the evolution of the genus. One of the key elements, which has determined some of the evolutionary direction is the rainfall cycle. A *Boesenbergia* species is either deciduous, going dormant during the dry season, or evergreen throughout the year with periods of growth and rest. Both types occur in Thailand where there is both a monsoonal region



Fig 4a. *B. aurantiaca*

and a wetter area in the southern peninsula. On the island of Borneo all species currently described appear to be evergreen. This same scenario can be seen in other areas. For instance in Indonesia, evergreen taxa are found in wet areas of Sumatra, while deciduous taxa are prevalent in the drier climate of Java.

The ecosystems where evergreen *Boesenbergia* proliferate are primarily closed forests where there is high humidity and accumulated organic matter in the soil. Generally, the deciduous species are more tolerant to harsher conditions and can occur in more open, secondary forest or forest margins. There are a number of species which can tolerate full sun and periods of dryness, such as *B. ochroleuca* (Ridl.) Schltr. (Fig. 3). This particular ginger is a chasmophyte, which grows in the cracks of limestone where organic matter has accumulated.



Fig 4b. *B. aurantiaca*

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 Zingiberales 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.

Membership dues are (in \$US): Individual, \$40; Family, \$45; PDF, \$25; Student, \$10; Contributing, \$50; Corporate (Company or \$100; Sustaining, \$500; Contributing Lifetime

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Taxonomy

Boesenbergia species come in many sizes and forms from c. 10 cm tall as with *B. aurantiaca* R.M. Sm. (Fig. 4) to c. 1 m or more as with *B. longiflora*. Some species are upright, others prostrate with multiple, stolon-like stems. The leaf arrangement can be tufted, rosette-like or distichous.



Fig 5a. *B. rotunda*

The underground architecture can be clumping or running with the added feature of tuberous roots in most deciduous species. Plants can be singular or multiple-stemmed, with some occurring in

large, clonal communities. The arrangement of bracts and flowers in the inflorescence also varies, being either distichous (two ranked) or imbricate (spiral, one-sided)

Comparison of genera

Character/Genus	<i>Boesenbergia</i>	<i>Kaempferia</i>	<i>Scaphochlamys</i>
Bract arrangement	distichous or imbricate	spiral	spiral
Flowers/bract	one	one	several in circinni
Flower sequence	top to bottom	spiral inward	variable
Labellum	saccate	flat, deeply bilobed	revolute margins
Plant cycle	deciduous or evergreen	deciduous	evergreen

(Sakai et al. 2006). The flowers can be very saccate (sac-shaped) as in the type, or flatter and more elongate as in *B. rotunda* (L.) Mansf. (Fig. 5). The flower life cycle is normally about one-day or in the *B. longiflora* clade, two-days (Mood et al., ined.). With this number of physical variables, identification of a *Boesenbergia* species is not an easy task even with a good taxonomic key, original descriptions and type specimens. As with most Zingiberaceae, there are a few easy-to-identify species and those which like to remain anonymous.



Fig 5b. *B. rotunda*

It should be mentioned that if one reviews the early taxonomy of *Boesenbergia*, invariably, some taxa which were once considered as *Kaempferia* L. or *Scaphochlamys* Baker, are now classified as *Boesenbergia* and vice versa. In the late 19th and early 20th century, not all taxonomists

agreed on the physical characters which should be used to circumscribe these genera. The fairly recent advent of phylogenetic analysis has helped clarify this situation. Taxonomists can now integrate the molecular data with traditional methods, thus providing more objective results. The following table shows some of the key characters which differentiate the three genera.

Horticulture

Many *Boesenbergia* species have the potential to be grown successfully almost anywhere in the tropics where rainfall or water availability is not an issue. A few species have been grown with some success in Florida and Louisiana. On the Big Island of Hawaii (author's residence) where rainfall is c.



Fig 6a. *B. siamensis*

3600 mm/year and humidity around 80%, both deciduous and evergreen species grow quite well. In this climate of cool, wet winter and warmer, drier summer, the deciduous species start their growing cycle in late April to May and grow vigorously to October or November when they slowly go dormant. The beginning of the flowering cycle for the deciduous species is variable, with *B. siamensis* (Gagnep.) Sirirugsa (Fig. 6) the earliest, flowering at the end of April before the leaves appear. Others of this type start flowering when the plant reaches a certain maturity, then flower almost continuously until the plant starts to go dormant. Evergreen species in Hawaii can flower several times during the year.



Fig 6b. *B. siamensis*

Propagation of *Boesenbergia* is primarily from rhizome division (Fig. 7). These are best taken during plant dormancy or after flowering for the evergreen species. A few



Fig 7. Rhizome division of *B. basispicata*



Fig 9. Bulb-like rhizomes of *B. longiflora*

deciduous species produce bulblets in the leaf axils of old stems or at the base of the old inflorescence (Fig. 8) similar to some *Globba* L. species. Also, a few have small, bulb-like rhizomes at the base of the stem which are easily separated from the main rhizome (Fig. 9). Both of these vegetative propagules will produce a plant in the next season when potted. Seed can also be used for propagation, but are rarely found in cultivated plants and these tend to be very slow to mature (Fig. 10).



Fig 8. Bulblets at the base of a mature inflorescence of *B. ochroleuca*

Like most gingers, *Boesenbergia* are surface feeders which prefer a well-drained organic media with high moisture holding capacity. Plants in the ground do best when top dressed with organic matter and ma-

nures to promote the surface root system. A continuous feed fertilizer, such as Nutricote© 13-13-13 with minors, has proven to be very effective for potted plants. Both in-ground and nursery plants require about 50% shade. The life expectancy of some species can be two decades or more, based on the long-term data of accessions grown at Waimea Arboretum, Lyon Arboretum and the author's garden.

Conclusions

The diversity among the *Boesenbergia* species makes collecting and growing these plants, a rewarding, albeit, sometimes challenging experience. The following images depict a few of the species beyond those referenced in the text.



Fig 10. Seed capsule of *B. siamensis*

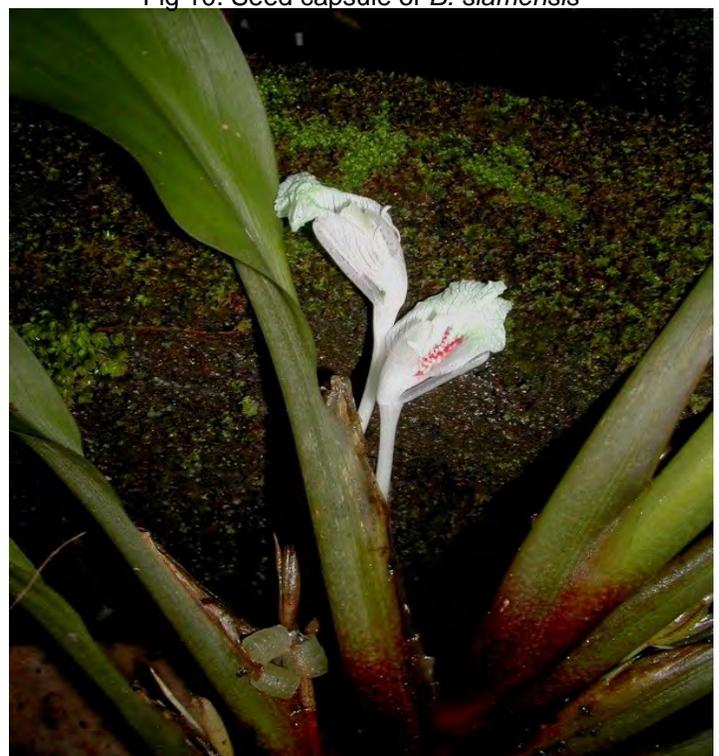


Fig 11a. *B. angustifolia*



Fig 11b. *B. angustifolia*



Fig 12a. *B. armeniaca*



Fig 12b. *B. armeniaca*



Fig 13a. *B. basispicata*



Fig 13b. *B. basispicata*



Fig 14a. *B. curtisii*



Fig 14b. *B. curtisii*



Fig 15a. *B. flava*



Fig 15b. *B. flava*



Fig 16a. *B. longipes*



Fig 16b. *B. longipes*

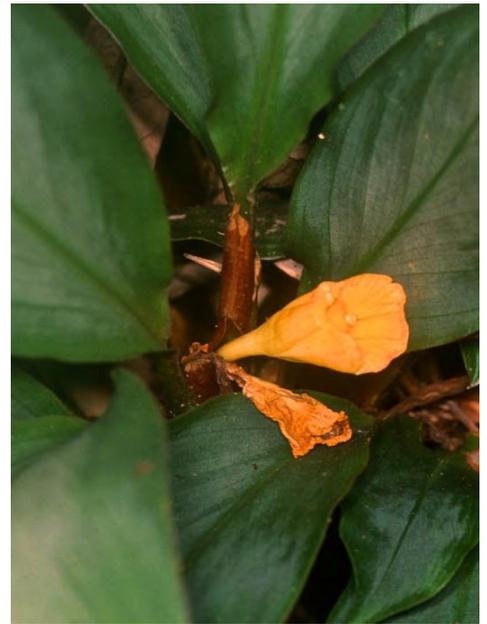


Fig 17. *B. ogliosperma*



Fig 18a. *B. petiolata*



Fig 18b. *B. petiolata*



Fig 19a. *B. plicata* var. *lurida*



Fig 19b. *B. plicata* var. *lurida*



Fig 20a. *B. plicata*

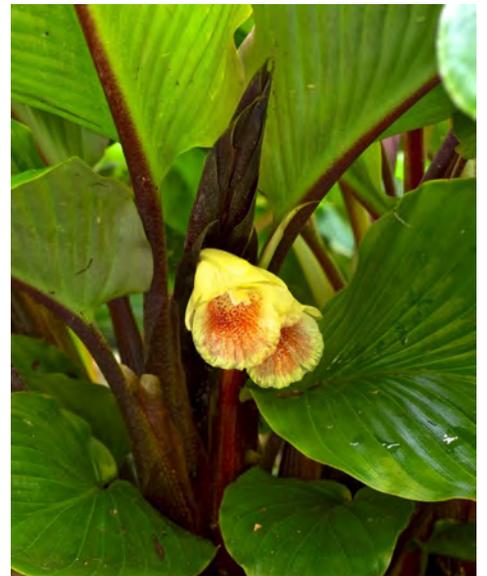


Fig 20b. *B. plicata*



Fig 21a. *B. prainiana*



Fig 21b. *B. prainiana*



Fig 22a. *B. pulchella* var. *attenuata*



Fig 22b. *B. pulchella* var. *attenuata*



Fig 23. *B. siphonantha*



Fig 24a. *B. tenuispicata*



Fig 24b. *B. tenuispicata*



Fig 25a. *B. xiphostachya*



Fig 25b. *B. xiphostachya*

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History of marketing *Heliconia* in Antioquia, Colombia

Carlos Julio Torres, Agricultural Technologist
 President of Asoheliconias, cjtortes@une.net.co

Translated by Carla Black

For the first exhibition of heliconias in the Feria de Flores, in 2004, the botanical garden of Medellín Joaquín Antonio Uribe summoned local heliconia producers to help. They responded immediately, providing flowers and foliage, and donating the money to pay for the designers and deco-

rotors for the exhibition. That year 26,000 people visited the exhibition.



Arrangement at an exhibition

The project to mount the displays was the first time we had met and worked together, and from this was born the idea to partner rather than compete among ourselves in selling flowers. Asoheliconias was created to confront the difficulties in

marketing cut heliconia flowers. The department of Antioquia had over 125 hectares in cultivation, and many farms



Display at an exposition

were far from Medellín. Profitability was poor, with high transport costs and low prices aggravated by delayed payments by wholesale florists.

As a growers' association for tropical flowers and foliage, Asoheliconia's goal is to present the best product through controlling the quality during production, harvest and postharvest, and delivering 25 fresh varieties to decorators, florists and homes. The governor of Antioquia has supported our project by helping to purchase a building, training producers, buying supplies for new small producers, and contributing to the development of 10.5 hectares of diversified plantings of new commercial varieties.



Flowers in the Asoheliconias distribution center

Medellín has a culture of flower consumption. The flower marketing center in the city, called Placita de Flórez, where Asoheliconias has its headquarters, was founded more than 120 years ago for the cut flower producers from a town called Santa Elena. The colorful loads of flowers carried from Santa Elena to market in the city inspired the tradition of the *silleteiros* parade celebrated during the Feria de las Flores each August. Asoheliconias



Flower delivery

was the first active marketer of heliconias in Medellín, delivering flowers door-to-door while addressing the most common concerns about using the large flowers: they were too big and expensive. We showed that one heliconia

might artistically and economically replace a number of smaller flowers, and sponsored flower-arranging workshops to familiarize florists with the varieties and methods available for heliconia. With this intensive promotion, heliconias gained popularity in hotel and event arrangements. In addition to their beauty, heliconias have a competitive advantage over other flowers because of their long vase life, and the fact that vase water does not take on odors.



Display at an exhibition

At first we sold flowers one by one; now the minimum is a bundle of six, either of a single variety or mixed. Flower quality is foremost, this means no scratches, abuse, bent bracts, nor fungal or insect damage. We are dedicated to quality, variety and service. The final consumer appreciates our flowers because of this attention to detail. Our clients, the florists, are attracted to the low prices of the informal vendors who do not take the same care in production and transportation. With pressure from the final



Asoheliconias members

consumer, florists ask for our product, and in this way we influence the quality and fair price throughout the market. Were it not for the united group of producers, we would not be able to survive in Medellín's highly competitive heliconia market.



Ikebana arrangement

Meanwhile, on the production side we promoted careful crop management with appropriate cultural practices to ensure very good quality flowers. Amongst our growers we insisted on excellent harvest and post-harvest handling, including washing to remove dust, leaves, and vestiges of the true

flowers. Working with florists, we provided a stem length of 105 to 120 cm to accommodate the height of the vases available to them.

The association's partners in Antioquia range from small producers with up to 1000 clumps and between 5 and 12 varieties, to medium producers with three hectares in cultivation



Formal arrangement

and many varieties. Some have been growing heliconias for 25 years, others for just four.



Tropical arrangement in a restaurant

Plant spacing is usually 2 to 2.5 m between clumps and 3 m between rows. A few farms have taken the risk of planting 1.5 m between plants and 2 m between rows (3,333 plants per hectare), demanding a higher level of management and technical practices. The partners are mostly coffee farmers, and heliconias provide diversification to generate other income and thus sup-

port the family and their farm. Coffee harvest is in the months of September, October and November with a small secondary crop in March and April. On these farms heliconias are planted in the ravines, roadsides and entrances to the farms, taking advantage of heliconia's native habitat.



Informal arrangement

Today in Colombia heliconias are key players. They occupy a privileged place in hotel lobbies, guest rooms and banquet halls. They're appreciated across the social class spectrum, filling living rooms and offices with their bright colors, beautifully accompanied by verdant tropical foliage. Heliconias are here to stay amongst us, their admirers.

‘IAC Cacheffo’: A new cultivar of torch ginger (*Etilingera elatior* (Jack) R.M. Sm. x *E. haemespherica* (Bl.) R.M Sm.) selected by the Instituto Agronômico (IAC), Brazil.⁵

Carlos Eduardo Ferreira de Castro¹, Silvia Rocha Moreira², Charleston Gonçalves³, and Lucas Lafratta Calandrelli⁴

¹Instituto Agronômico (IAC), Caixa Postal 28, CEP 13012-970, Campinas (SP), Brasil, e-mail: ccastro@iac.sp.gov.br; scholarship CNPq DTI 2; ^{2,3}Pólo Regional do Vale do Paraíba-UPD de Ubatuba/APTA, Ubatuba (SP), e-mails: charleston@apta.sp.gov.br and silviamoreira@apta.sp.gov.br; ⁴Graduate in Agronomy UNESP Ilha Solteira, Ilha Solteira (SP), scholarship CNPq ATP-B; ⁵Project sponsored by CNPq.

An *Etilingera* research and breeding program at the Instituto Agronômico (IAC) aims to introduce some species of this genus, produce intra-and interspecific crosses, and develop new varieties. For the selection of new cultivars the following aspects are considered: Plant productivity, total weight of stem/inflorescence, low incidence of pests and diseases and postharvest longevity of the inflorescence.



Etilingera elatior ‘IAC Cacheffo’

In 2000, seeds resulting from the crossing of *E. elatior* and *E. haemespherica* from a commercial area in Manaus, Brazil, were collected and sown. Nine genotypes with different attributes were selected after the bloom onset, in 2002. After morphological, phenological, and agronomic monitoring, carried out in UPD Ubatuba/APTA, three cultivars were selected showing a high market potential.

Among those, the ‘IAC Cacheffo’ was selected, showing the following features: Cup-shaped inflorescence, wine colored with white stripe on the edge of the bracts, flower diameter of 5.2 cm, inflorescence length of 11 cm, stem length of 76 cm, wine-greenish/pink-greenish zonal colored, inflorescence weight of 180 g and average of 70 inflorescences plant/cycle. Flowers harvested with the basal bracts fully expanded, presented a postharvest longevity of 12 days.



High productivity was a selection criterion

The acclimatization of this selection is excellent at temperatures from 25 to 32 °C and rainfall from 1600 to 2400 mm/year, with flowering onset in September and flowering period lasting until April in Southeastern Brazil, whereas in Northern Brazil the flowering period lasts longer.

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KAEMPFERIA CANDIDA: CURCUMA IN BRILLIANT DISGUISE

A small bee trying hard to get to the nectar, which seems to be way too deep to reach. The small bees did not seem to carry any pollen on their back when leaving the flowers.

Jana Leong-Škorničková, Herbarium of Singapore Botanic Gardens

All photos by Jana Leong-Škorničková

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“Oh, my candida!” The catchy line from Tony Orlando of 70s' fame, which I am fortunately too young to know firsthand, slipped out of my mouth when I first saw *Kaempferia candida* in the bamboo forest of Kanchanaburi. So, what was so exciting about finding this ginger with huge white flowers? Well, once we found it, I knew that together with my colleague Jiranan Techaprasan from the National Center for Genetic Engineering and Biotechnology (BIOTEC) in Bangkok, we would be able to crack the puzzle: whether this species is — or is not — a *Kaempferia*.

This enigmatic ginger was first found by the Danish botanist Nathaniel Wallich in Myanmar. The large white flowers, which appear at ground level before the leafy shoots, indeed remind of other *Kaempferia* species, e.g., *Kaempferia rotunda*, and Wallich seemed to have no

doubt that this is where this species belongs. He described and depicted the inflorescence and flowers in his monumental work *Plantae Asiaticae Rariores* and deposited the original specimens of this species in several herbaria, including the Royal Botanic Gardens, Kew. Other botanists since, not having access to additional material, seemed to have accepted Wallich's identification without question. During the early years of my ginger studies in India, Wallich's drawing of this species attracted my attention. The superficial similarity as observed by Wallich aside, the rather closed shape of the flowers and well exposed anther, the bright yellow centre of the otherwise white flowers did not really fit any *Kaempferia* I have ever seen and actually resembled some of the *Curcuma* species in South India and Sri Lanka. But to re-collect the species in Myanmar was not something convenient then and therefore put on hold. Meanwhile, legendary Danish ginger specialist Professor Kai Larsen and Dr. Thaya Jenjittikul, his colleague from Mahidol University in Bangkok, discovered this species in Thailand very close to the Burmese border, not far from the place of Wallich's collections. This find represented a new record for Thailand and was published in 2000 in the Thai Forest Bulletin with a detailed description, line drawing and several photographs. But after a long, hard look at the shape of the anther, which did not match any *Kaempferia*, but is reminiscent of that in *Curcuma*, and its well-developed leafy shoot, which is rare in *Kaempferia*, my suspicion and curiosity about this ginger deepened.



Jiranan Techaprasan dissecting a flower of *Curcuma candida*.

When I met Dr. Thaya at an international symposium, I shared my suspicions with her and her student Jiranan, who was working on the molecular phylogeny of the genus *Kaempferia*. Even though they were not overly excited by the prospect of this beautiful plant (their favourite *Kaempferia* as they said) falling out of the genus *Kaempferia*, they agreed, for the sake of science, to embark on a collaborative project to uncover the truth.

one. We spent the next two hours photographing and dissecting the flowers, taking notes and looking for more plants, before rewarding ourselves with lunch and local *durian*.

Soon after Jiranan started work on molecular analyses, she reported that *Kaempferia candida* did not seem to belong to the genus *Kaempferia*. We then decided to add more



Dr. Thaya (far right) and the team are all smiles after finding about 15 plants of *Curcuma candida* in flower.

We located all specimens of this species from various herbaria to confirm that this species was rather rare and restricted in its distribution. Dr. Thaya then led us on a field trip to find flowering material, so that all aspects of morphology could be examined. The timing of such a trip is always tricky as these plants flower just before the monsoonal rains for only a short period sometime between late March and early May. We placed our bet on the second week of April. On our way to the forest, we were assured that our timing was spot on, as we learned from locals that young inflorescences, cherished as a seasonal vegetable, had already appeared in the village markets for sale during the previous week. Yet, when we stepped into the completely dry bamboo forest, there was no sight of the pale flowers on the forest floor, which was covered by silvery beige dried bamboo leaves. We spread out and went on all fours so as not to miss the precious flowers and before long, the first find was accompanied by cheers from every

samples from various ginger genera into new analyses including several *Curcuma* species and as we suspected, ‘our dear candida’ nestled comfortably among other *Curcuma* species. The last step was to write this exciting little story for the *Nordic Journal of Botany* in order to establish the new, correct name, *Curcuma candida*, for this species. The paper was published in the December 2011 issue and there is now one *Curcuma* more and one less ginger puzzle. What remains a mystery is what pollinators tend to these very large flowers. Although we have seen several visitors to the flowers, including small bees and ants, they all seemed too small to effectively transfer the pollens. Moreover, some of the plants we have brought back in pots for more observation opened their flowers during the late evening, which brings in the possibility of a nocturnal pollinator. So that would be a beginning of yet another exciting story to be told.

Illustrations of two genera featured in this issue of the Bulletin

Reproduced from Singapore Botanic Garden 2007 calendar
 Paintings by James and Charles de Alwis, between 1890 and 1908



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HSI Headquarters
Dr. David H. Lorence
National Tropical Botanical Garden
3530 Papalina Road
Kalaheo, Hawaii 96741 USA