CLIVIA

FIFTEEN

The Clivia Society www.cliviasociety.org

The Clivia Society caters for *Clivia* enthusiasts throughout the world. It is the umbrella body for a number of constituent Clivia Clubs and interest Groups which meet regularly in South Africa and elsewhere around the world. In addition, the Society has individual members in many countries, some of which also have their own Clivia Clubs. An annual Yearbook and quarterly Newsletters are published by the Society. For information on becoming a member and / or for details of Clivia Clubs and Interest Groups contact the Clivia Society secretary or where appropriate, the International Contacts, at the addresses listed in the inside back cover.

The objectives of the Clivia Society

1. To coordinate the interests, activities and objectives of constituent Clivia Clubs and associate members;
2. To participate in activities for the protection and conservation of the genus *Clivia* in its natural habitat, thereby advance the protection of the natural habitats and naturally occurring populations of the genus *Clivia* in accordance with the laws and practices of conservation;
3. To promote the cultivation, conservation and improvement of the genus *Clivia* by:
   - 3.1 The exchange and mutual dissemination of information amongst Constituent Clivia Clubs and associate members;
   - 3.2 Where possible, the mutual exchange of plants, seed and pollen amongst Constituent Clivia Clubs and associate members; and
   - 3.3 The mutual distribution of specialised knowledge and expertise amongst Constituent Clivia Clubs and associate members;
4. To promote the progress of and increase in knowledge of the genus *Clivia* and to advance it by enabling research to be done and by the accumulation of data and dissemination thereof amongst constituent Clivia Clubs and associate members;
5. To promote interest in and knowledge of the genus *Clivia* amongst the general public; and
6. To do all such things as may be necessary and appropriate for the promotion of the abovementioned objectives.

Front cover

Clivia miniata 'Chiba Peach', Grower and photographer Carrie Kruger, Breeder Philip Crous

Back cover

Shige Sasaki's multipetal x (*C. miniata* x *C. caulescens*)

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Yellow ex Umtamvuna 32C

EDITOR
Joubert van Wyk

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Tribute to John Winter

John van der Linde

John Winter passed away on Tuesday 8 April 2014 after a long illness.

Some of you may not know of him, though you may have clivias grown from seed from plants collected by him.

I thought I would give some details of this remarkable man who left his mark in the Clivia world, and in many other fields.

An aloe, an erica and a leucospermum have been named after him.

John was Curator of the Kirstenbosch Botanical gardens, rated one of the top six in the world, from 1978 to 1998. He was then promoted to Deputy Director of the National Botanical Institute, responsible for all the National Botanical Gardens in South Africa.

John retired in 2001 but continued to curate the Kirstenbosch collection, based entirely on plants collected from their habitats, mostly by him, with Mick Dower and John Rourke accompanying him on some expeditions.

PHOTOGRAPHER – CLAUDE FELBERT

John being awarded Honorary Life Membership by Mick Dower 2004

John Winter in a tunnel at Kirstenbosch with *C. mirabilis* seedlings

He collected many plants in the wild, from a wide range of genera besides clivias, and brought them into cultivation. For example, you may know of the well-known 'Mandela's Gold', a yellow flowering form of Strelitzia regina. This was one of his 'babies', now widely grown.

The clivias he collected included new *C. miniata* forms, such as the group forming the 'Appleblossom' complex. Seedlings grown from seed from those and other clivias, including *C. mirabilis*, are now found all over the world.

John attended the first international Clivia conference in 1994 in Pretoria and then led the establishment in 1995 of what grew into the Cape Clivia Club. John was long-time Chairman of the CCC and was the first Chairman of the Clivia Society, which has members from all over the world, many growing seed associated with John Winter.

John reported on the results of his clivia-hunting expeditions in papers presented to international Clivia conferences. He also wrote several important articles for the Clivia Yearbooks and Newsletters.

As if that was not enough, John was a most successful clivia breeder in his own right, with many show-winners to his credit.

John was a plantsman to his fingertips, humble and gentle and always ready to help other enthusiasts at workshops and individually. Thanks to his generosity many of us have grown and bred better clivias.

He will be sadly missed by Meg, his children, grandchildren and by all those who knew him.

He self-pollinated an orange flowering *C. miniata* collected at the Umtamvuma Gorge (Google it if you wish) and was surprised to see that several seedlings had unpigmented stems. When they flowered this beauty was the best of them. The '32C' refers to the orange colour as determined according to the Royal Horticultural Society Colour Chart, which was all that was available in those early days.

John Winter was made an Honorary Life member of the Clivia Society in 2004. You can read a lot more about him in the citation prepared by Sean Chubb. This can be found in the Clivia Society Newsletter Volume 13, No 2.

PHOTOGRAPHER – CLAUDE FELBERT

John with Felicity Weeden 2005

2014 Clivia Society Conference - Breeders and collections in KZN

Barney Viljoen Collection

I first started with ferns and cycads in 1996 and then in 2006 I sold all my ferns and cycads and started with clivias because it would be more challenging to see what the crosses might result in.

My clivia collection consists of mother plants I got from the following growers: Paul Kloeck, Larry Milligan, Giel Adendorff, Wayne Haselau, Andre van Rhyn, Hottie Human, Francois van Rooyen, Sean Chubb, Danie van Vuuren, Liz Boyd and Louis Lötter.

The two top plants in my collection are my Sikwebezi Bicolour and a plant called Lily which was grown from seeds received from Larry Milligan.

I do a lot of crosses with Vico Yellow, Peach green centre, and bronze and inter-specifics in which I have used Yellow Ngome *gardenii*, and I have also used a lot pollen of Sikwebezi Bicolour and Lily on Vico yellow and will be waiting to see what I receive in three years.

Hottie Human and Barney Viljoen

At the Vryheid show in 2008 I won with my Vico Yellow – Best on Show and in 2009, the same plant also won Best on Show. In 2013 I won with a Peach Green centre. I have also won many medals in the different show classes.

Photos of my plants are available on the web at www.ngomieclivias.co.za.
88 Republic Road, Vryheid, Kwa-Zulu-Natal, 3100, South Africa.
My contact details are: +27 738987673.

Karkloof Clivias

Ben Eden Farm – Glen and Liz Boyd

Ben Eden Farm is situated approximately 120 kilometres inland from the coast in Kwa-Zulu Natal. We purchased the farm in 1988. Our farm has a large portion covered in indigenous forest, home to many pockets of *Clivia miniata*.

I attended my first clivia show in 1999 and that sparked my interest in clivia, especially *C. miniata* which is my main focus.

In 2006 I was given the "Naude's Peach" to work with (my sister was great friends with Olive and Stoffel Naude). It has proved to be one of the most interesting plants to work with. I have bought in many plants from far and wide with the sole purpose of crossing with 'Naude's Peach' .

My other star performer is 'Cameo', bought as a chance seedling at a nursery. Her offspring are proving to be beautiful flowers.

Space is fortunately no problem as we reside on a farm. I have eight shadehouses

Cameo

Insect control

Naude's Peach

Gold Cup

Oxblood

Four Seasons Peach

as well as approximately one hectare of pots under trees.

Every year I do certain crosses and grow out all the seed. In this way I can see on a head of seed what percentage are pigmented and what are unpigmented. This also enables me to see if the cross has given the plants vigour, or if generally the seedlings are weaklings.

I plant the seeds in June on heated seed beds so that by September they have germinated and I can see which were good crosses and which not.

Growing clivia is very rewarding – each year brings new surprises!

Carpe Diem Clivia Collection

Owners Piet & Hannetjie van Wyk

My wife and I started growing clivias in 1992. We tried to attend as many clivia shows across South Africa as possible. We started by buying only the best seeds, offsets or plants from the best-known growers all over South Africa and even plants imported from other countries such as Belgium, Australia etc. We tried to buy available show winners or only the best we could find.

We started crossing our plants as they started flowering and needless to say we grew some beautiful plants ourselves. We only kept the best and sold most of the plants to the nurseries or to the public.

At this stage and time our collection of plants has grown to about 50 000 plants.

Hannetjie and Piet van Wyk

From whom did we buy? The list of growers is endless but here are some of the growers: Pat Gore, Tino Ferero, Pikkie Stumpher, James Abel, Sean Chubb, Lionel Bester, Hennie Kock, Rudo Lötter and his father and uncles, the late Fred van Niekerk, the late Ammie Grobler, Pieter van Niekerk, the late Bertie Guillaume, Chris Viljoen, Nick Kruger, the late Dries Olivier, Hottie Human and Liz Boyd. The list just carries on and on. It is clear that with this collection we have a great gene pool in our hands. We have grown show winners and many more plants that took prizes in their show categories.

I live in a rural area called Gluckstadt and am only available after 6 o'clock in the evening at +27 83 6514350. Gluckstadt is about 40km from the Ngome Natural forest.

Email address: tjoepman@gmail.com

Clivia Passion

Val Thurston

I saw my first clivia in 1970 in the garden of Roy's home down the South Coast. Although we had a garden at home when I was a child I had never come across this amazing and addictive plant and living in a town, was not exposed to the countryside where they grew naturally in the indigenous bush. When I saw these beautiful orange blooms I was immediately attracted to them but unable to take a plant home as, at the time, I was not married and lived in a boarding house in Currie Road, Durban. I worked all week and spent the week-ends riding my horse at Hillcrest. Roy was up the north coast and spent most of his 'free week-ends' down at Renishaw with his family on a sugar-farm which was surrounded by sugar-cane and pockets of indigenous bush in which clivia were abundant.

In 1973 Roy and I were married and moved to our own home in the Upper Tongaat. I was then given my first orange plants by Roy's mother and started my long, exciting and passionate hobby of clivia madness. We were hardly settled and on arriving home after spending the Easter week-end down at Renishaw, were informed that we had to move to the coast as Roy had been promoted. We were now about 1km as the crow flies from the sea. The clivias were uprooted and settled in at our new home. Little did I know that they would not flower well in the coastal humidity and warm winter climate and only seemed to flower late in the season around December, if at all some years. I never gave this much thought as I did not know much about the growing requirements of the species.

The craze really hit me with a bang when I attended a garden wedding in Howick and saw a yellow specimen for the first time. I just had to have one! The owner of the plant promised to give me seed and eventually when the plant produced offsets I would get my plant! It turned out that this particular plant had been purchased at the then Natal Witness Garden Club from Cynthia Giddy and was later named 'Natal Yellow'.

Each year I pestered the owner and was

told that it did not have any seeds, the dog had dug it up chasing moles, or it was rescued and planted in a container to recover. In the meantime I had spread the word around the local Tongaat garden club members that I was on the lookout for a yellow clivia. I managed to get one from a chap who lived in a park-home up at Cato Ridge at the exorbitant price of R35-00 – this turned out to be the 'Celtiskloof' yellow which he had obtained from a friend of a friend from that area.

C. miniata Enchanting

Sheer Delight

At the same time I had heard that a nursery up at Merrivale had managed to obtain some yellows from a local farmer and had put one aside for me. Naturally we rushed up and purchased the plant for R50-00! This turned out to be the Howick Yellow. Well, 13 years later the owner of the Natal Yellow arrived at the house with my offset – I was over the moon as I now had 3 yellow clivia. The Celtiskloof Yellow had in the meantime over about 5 years produced offsets. By that time I had met up after of gap of many years, my good horse-riding friend, Jill Chubb, at the Royal Show. She and I had been riding buddies from years ago when we were teenagers but we had drifted apart going our own way through the years. We were both married and she had 3 children. We visited her on her farm at Eston where I met Sean, who was home for the weekend from Cedara Agricultural College. We got chatting and wandered around the garden admiring his plants and soon found that we had a common interest in cycads, bulbs and, of course, clivia.

I mentioned to him that I had managed to get a yellow plant and he immediately told me about the "yellow" one that had been found in the Eston area. We immediately agreed to swop offsets. When flowering time came I made the epic jour-

Fairytale Green Mascot

ney from Tongaat to deliver my "yellow" clone. Sean produced his "yellow" clone and even before he saw mine, I said that his was not yellow but peach. When we put the two plants side-by-side we could immediately see the difference in colour. His plant was named 'Chubb Peach'.

I joined the newly-formed KZN Clivia Club in 1994. The first KZN Club show was held at the Pietermaritzburg Botanical Gardens, where other yellow, pink and peach plants appeared. Emmy Wittig Pink graced the show tables, with eager clivia enthusiasts putting their names down for offsets. Numerous informative meetings were arranged, member numbers swelled and lots was learnt on how to propagate, pollinate and care for clivia. Seeds and plants of various different colours were exchanged and "clivia mania" spread like wildfire.

Forty years on I am still as passionate and obsessed as ever, have a small collection of many different colour variations and clones. I bred my first attractive Fairytale Series and am still hoping for yet more exciting results from the hundreds of seedlings growing in every bit of shade in my garden and hopefully many more years on the clock to continue my love of this amazing and fickle plant.

Val Thurston wrote a 32-page book "The Clivia" in 1998 - *The Editor*.

Co Creative Clivias

My name is Henry Howard and I have been breeding with Clivias for the past 7 years. I was introduced to Clivias by Hottie Human and I have a great appreciation for him. Co Creative Clivias was chosen as a name because we want to honour God who created all living things through Jesus Christ by simply speaking a word.

We as breeders and growers and collectors have the privilege to "co create" with Him through our pollination and breeding, and also to "co create" with each other and work together in breeding new strains.

Green Throat

We Honour: Everything we have learned we have learned from many other breeders and collectors from all over the world. My clivia mentor has been Hottie Human. Therefore we honour all these breeders and growers who have either contributed directly or indirectly to our plants: Sean Chubb, Francois van Rooyen, Hottie Human, Tino Ferrero, Dries Olivier, Chris Viljoen, Lionel Bester, Carrie Kruger, Val Thurston, Mari van der Merwe, Felicity Weeden, John Handman, Rudi Nortje, Ryder Nash, Larry Mulligan and Louis Lötter. Without all these people it would have been impossible to enjoy clivias. Thanks to a wonderful Clivia fraternity!

Our Plants: We have a wide variety of *C. robusta*, *C. miniata* and Interspecifics. My favourite *C. robusta* is a near white and my favourite *C. miniata* are Florid White Lips and Hottie's Hirao. My favourite Interspecifics are Cransley Peach X Peach *C. robusta*, Florid White Lips X *C. mirabilis*, Natal Yellow x Gem's Golden Renaissance and Kevin Walter's Yellow X near white *C. robusta*.

Breeding Programme: We love making new crosses. For example for the past four years we have been making all kinds of crosses with Florid White Lips. Our aim is to breed smaller, more compact plants that are growing quicker, but not compromising on flower quality. Pastels make nice crosses with Florid White Lips and one finds the ghosting dominating in the next generation. A very interesting cross is one between a *C. mirabilis* X Florid White Lips that Sean Chubb made. This cross has a high flower count and the seeds ripen just as quickly as *C. mirabilis*. It takes 4-5 months for the seeds to ripen. If one thinks that this cross flowers twice a year, one is planting seeds twice a year! Even other pollen that is put on this plant sets seed just as quickly! I believe the quest for breeding smaller quicker growing plants without compromising on flower quality is one to be taken seriously. I have put the pollen of many different plants with very nice flower form and count on my Florid White Lips and they grow quite quickly and it is clear that they are smaller in size. By crossing Florid White Lips with our local South African plants and also with Japanese and Chinese plants we are breeding plants that are tougher than the Florid White Lips, yet quicker growing with nice flowers.

Here is just some of the pollen I have put onto Florid White Lips: Nakamura best ghost Multitepal, Roly's Chiffon, Red broad leaf, Luke special, Ndwedwe Orange Globe, Hottie's Hirao, Chinese broad leafs, pastels, yellows, pinks, oranges, interspecifics etc. Another line is where I put Heritage plants' pollen onto Florid White Lips. It has been proven that Hybrids and Heritage plants make beautiful crosses. Currently I have pollinated Florid White Lips with eight different Umtamvuna clones, 2 Mzamba clones, Luke special, Tracker, Ndwedwe Orange Globe, Ndwedwe Jade green throat, Origin of life, 911, Andrew Gibson, Discovery etc.

We are currently making all kinds of crosses with green throats as well. I am using Hottie's Hirao extensively in my breeding. I believe this is one of the best Hirao's around. It is vigorous, has a nice flower form, umbel and a high flower count.

I have put this plant's pollen on a lot of different top plants, but here are some of them: Belgium Bronze green throat; Daggakoekie (Cross between Pastel Blush X Hottie's Hirao), Variegated Nartjie green throat (ex Dries Olivier plant), Cransley Peach Interspecific GR 2 (bred by Sean Chubb), Natal yellow X Gem's Golden Renaissance (Interspecific bred by Francois van Rooyen), Group 2 Peach, Ndwedwe Jade green throat; Desire, Hesper, Red Green Girl etc. Maybe

the Hirao revolution has not stopped but actually has increased. We can now safely say that Natal yellow and Hirao when crossed with Gem's Golden Renaissance gives Interspecifics with lots of green, and that Cransley Peach when crossed with Peach *C. robusta* gives very green Interspecifics. The green in the Hirao reacts well with green tips of some of the pendulous flowers in *C. robusta* and Ngome types. We can now breed for greener Group 2 plants than Hirao's and Group 2 peaches with green throats and other green throats that have even more green in them. We can breed for picotés with green throats etc. We are in the middle of the green revolution!

We are also breeding for F2 and F3 Interspecifics:

(*C. mirabilis* X Florid White Lips) X Florid white lips. Hoping to get Ghost Interspecifics.

(Kevin Walter's Yellow x near white *C. robusta*) x selfed or X near white *C. robusta*. Hoping to get near white F2 Interspecifics or even better near white *C. robustas* out of 25% of the seedlings.

Cransley Peach (Group 2) Interspecific x Hirao. Hoping to get completely green F2 Interspecifics.

Natal Yellow x Gem's Golden Renaissance x Hirao. Hoping to get a green Interspecific with two other colours.

Valentine (F2 interspecific with Natal Yellow in the breeding and high flower count) x Hirao. Hoping to get nice green throats with pastel tips with a high flower count.

(Florid white lips x C. *mirabilis*) X Hirao. Hoping to get a green throat interspecific with a high flower count.

Kwa-Zulu Natal: A unique province impacting clivia breeding all over the world. I believe that we have a unique opportunity in Kwa-Zulu Natal to preserve the natural heritage of clivia and combine it with endless possibilities for new breeding. The genetic material in clivia in this province is maybe the most diverse in the world. Combining Hybrid and Heritage in breeding will still bring us some of the most amazing results. Some of the crosses that have been made this way are just marvellous: Andrew Gibson x 911 (Hottie Human); Msubo Wow x Andrew Gibson 'Fairytale' (Val Thurston); (Natal Yellow X Naude's Peach 'Pastel Blush') X Hottie's Hirao 'Daggakoekie' (Sean Chubb); Natal yellow x Gem's Golden Renaissance (Francois van Rooyen). I really believe the breeders in this province can contribute in a vast and extensive way to the future of clivia breeding all over the world for many decades to come. Our natural heritage and the way we handle them in KZN can create a wonderful future for clivias in the world.

The Habitat Heritage Collection

The Habitat Heritage collection is a historical collection of rare and unusual clivia originally wild collected from various natural clivia habitats. These specimens have been collected over a long period of time by numerous people. It is both a living museum as well as a captive breeding project. This conservation initiative is housed in a naturally landscaped shade house especially built for the collection. Thurlow Flora, the nursery of Sean Chubb, is the home of the Habitat Heritage collection and is situated at Eston in Kwa-Zulu Natal. The collection is open for any interested parties to visit. The best time to visit this collection is in *C. miniata* flowering season from mid-August until mid-October, although during the *C. gardenii* and *C. robusta* flowering season in late May and early June the display is also spectacular.

Oribi Gorge Yellow

The source of all genetic diversity is to be found in our natural habitat populations of clivia. The outward expression of flower colour and form variation is the best recognisable manifestation of genetic diversity within clivia. The conservation of these natural habitats and the preservation of the diverse gene pool within them are paramount to the future of clivia conservation. The genetic diversity essential for the future cultivation of clivia and the ability of clivia to adapt to changing environmental conditions may be lost. Genetic diversity as represented in the Habitat Heritage Clivia plants must be conserved and protected if clivia cultivation is to have a secure future.

The objectives of the Clivia Habitat Heritage collection are:

- To promote first and foremost the conservation of clivia in their Natural Habitats
- To encourage awareness of the diversity within clivia
- To conserve and document as accurately as possible the history of Habitat Heritage Clivia clones
- To include and represent Habitat Heritage Clivia from all known clivia species
- To preserve the diverse gene pool of Habitat Heritage Clivia
- To provide interested parties access to a gene bank of clivia by providing Living plants in their original clonal form, seed and pollen from Habitat Heritage Clivia

Specimens of clivia within the Habitat Heritage collection do not necessarily have to have been collected very long ago to have Heritage value. However some of the older collected plants have interesting histories and have a particular place in the botanical history of clivia. Each clivia specimen within the Habitat heritage collection is a fragment in history and it is the responsibility of the curator of the collection to preserve it for

Sikwebezi Bicolour

Stanger Natural Hybrid

perpetuity. The intrinsic value of a specimen is in direct proportion to the quality and quantity of the information accompanying it. This information is at least as valuable as the specimen itself. Unfortunately due to many reasons much of the history of some of the Habitat Heritage clones has been lost or distorted and some histories are kept as private secrets, lost to Clivia Heritage.

The Habitat Heritage collection should provide genetic material for breeding purposes and scientific studies. Captive breeding programmes of rare habitat mutations would hopefully decrease the pressure from collectors on the wild populations. This would be done by providing sought after genetic material to potential collectors. The risk of poaching new genetic material hopefully would be too great if the genetic material is made available to collectors. The Habitat Heritage collection gene bank makes the conservation of our unique Habitat Heritage

Lady of Oribi Gorge

Mpumulo yellow

Eshowe clones

Clivia accessible to all interested parties.

The Habitat Heritage Clivia collections primary functions are to collect, conserve, preserve, and study and disseminate information as well as genetic material to clivia breeders, hobbyists and scientists.

Heritage Collection pond

Interested parties wanting to visit the Habitat Heritage Collection can find directions on our website www.cliviasa.co.za or contact Sean Chubb on kzncliviabreeders@cliviasa.co.za or on cell 0843019960.

Eshowe clones

Stanger clones

Entumeni Giant

Natal Yellow

Hilton Clivias

Debbie and Lionel Bester

Both of us have been gardeners all of our lives, me vegetables and fruit and Debbie with flowers.

We bought our property "Leprechauns Leap Nursery" an Orchid Nursery, from Halwyn and Blanche Watkins, of Watkin's Yellow fame, 20 years ago. We were not particularly interested in clivias when we first moved in and viewed them as lovely foliage plants that thrived under trees where little else grew.

The orange flowers were a welcome sight in late winter when little else was flowering in the garden.

I remember our delight at the first flowering season at "Leprechauns Leap" when the first yellow clivias and pastels flowered in the garden. Then the telephone started ringing with enquiries from around the country from clivia enthusiasts wishing to purchase Watkin's yellow clivias.

We sold out the first day and my lifelong business instincts kicked in and the rest is history!

We spent every spare bit of cash we had and more to try to satisfy our growing addiction to clivias, which incidently, is incurable. Today our collection has grown exponentially and we supply seed, seedlings, plants and offsets to our customers locally and worldwide, all year round. We have been working with our clivias full time for the past 4 years and are immensely grateful to be in a position to do so.

Please come and visit this season, as the true joy of growing clivias is in meeting fellow clivia lovers. We are open 7 days a week during August and September and Debbie and I can't wait to meet and enjoy time with you all. To get to our nursery is super easy... Take the Hilton turn off into Hilton Village and follow our Sales signs.

We will organise Phytosanitary Certificates for anyone purchasing material from us and will ship your purchases overseas.

The Gem Wildflowers

Francois van Rooyen

Francois van Rooyen is a fifth generation farmer in Greytown, a small town in the Kwa-Zulu Natal Midlands. His main focus at present is timber cultivation, Nguni cattle and a growing indigenous nursery. The nursery was started 11 years ago in 1998 and has grown and expanded with clivia being at the forefront and where Francois's passion/obsession lies.

Apoline Best

Gem's Hobbit

Gem's Fenell Picoté

Gem's Nathaniel

Francois attended boarding school at Grey College in Bloemfontein and did his military service which kept him away from the farm for some time. Long and much anticipated holidays was the only time he spent on the farm. In 1991 Francois returned to The Gem Farm and joined his father, Pieter, farming.

Following in his father's footsteps, his affinity with Clivia grew to a point where he joined the Kwa-Zulu Natal Clivia Club in 2000. This is when his journey with clivia began. He shared and is supported on this journey by his lovely wife Ginny who is not indigenous to South Africa but a born and bred Texan from Dallas. Francois and Ginny have been blessed by the Lord with triplets, Alexander, Isabella and Pieter, born in 2005.

Gem's Pink Cadillac No. 2

Ngome F2 Interspecific No. 1

Even at their young age they enjoy planting and learning about clivia.

Francois and Pieter strive to breed, preserve and protect the enchanting clivia. The Gem Wildflowers has one of the largest pendulous and habitat heritage collections. They have won numerous awards at clivia shows. Francois has become involved at the provincial and national levels of clubs and the society. He has further had the privilege to be invited to judge many clivia shows over the past few years where he has learned a tremendous amount.

The Gem Wildflowers continue to breed and acquire extraordinary and unusual clivia. Amazing Interspecific breeding has been a fantastic success and much appreciated accomplishment. With each new season brings joy and excitement as to what will flower next.

KZN Clivia Breeders

The Clivia Club in Kwa-Zulu Natal formed in 1994 with a small group of enthusiasts. Realizing that Kwa-Zulu Natal had a huge clivia gene pool with 3 species indigenous to our borders we had a wealth of genetic material which we wanted to share with other clivia enthusiasts. In 2001 the Kwa-Zulu Natal Clivia Club Committee then chaired by Sean Chubb had the initiative to market excess clivia seed produced by the Clivia Club members to other clivia enthusiasts. The Kwa-Zulu Natal seed bank was formed.

The demand for seed both from Habitat and Nursery-grown varieties proved to be almost unsatisfiable. The seed bank flourished each year attracting more and more overseas and local clivia enthusiasts with a wide variety of new and exciting crosses.

The Kwa-Zulu Natal Clivia Breeders was established in 2008 with 3 principal members but also offered seed for sale from other Kwa-Zulu Natal Clivia Club members. Currently Kwa-Zulu Natal Clivia Breeders markets mainly the seed from Val Thurston and Sean Chubb – Thurlow Flora. Both Sean and Val started Clivia breeding programmes in the late 1970s and have a huge genetic base with multiple generation of breeding, thus offering a genetically diverse range of seed including all species of Clivia.

The Kwa-Zulu Natal Clivia Breeders offer top quality genetics in a huge variety of colours and forms, producing many new modern colours, but also maintaining the genetic purity of our habitat Heritage plants. 2014 will be the 14th year we have been offering seed for sale and we pride ourselves in producing seed of the highest quality and true to type. Many seeds offered are line bred and produce an expected outcome. Having in many cases a number of generations of breeding behind an offering, the plants flowered from such seed are highly reliable.

Seed is marketed from the beginning of April until the end of September or until such time as we are out of stock. Two principal methods are used to market our seed and they are via our website and at clivia shows and exhibitions. Our website, www.cliviasa.co.za, hosts our Galleries where customers can view our exciting range of clivia. We also send our seed list to our current and past customers and also any other interested parties. If interested please mail Sean Chubb on kzncliviabreeders@cliviasa.co.za.

Having offered our seed for sale for a long period of time, many of our customers worldwide have had seedlings flower from our seed and we have had numerous comments about our seed and the resulting flowering plants. Below are just a few of the comments we received recently:

"Last year I bought seeds from many breeders. Kwa-Zulu Natal seeds have got

the highest germination rate. 98% of the varieties germinated 100%, like 5 out of 5 seeds. I am very happy with the collection I am growing now. Thank you very much for quality seeds and all these colour variations".

"The quality of the seed is outstanding, and over the years I would have averaged well over 95% germination rates... which is excellent. The seedlings have always been vigorous growers as well. I have also flowered some wonderful plants I otherwise would not have had access to that are now part of my breeding programme. Considering we are being offered the latest crosses, and new-colour breakthroughs, I find the cost of seed, plus the necessary bank charges to be trivial."

"I consider their prices to be a bargain. Fascinating seed and always of good quality. Thanks to all involved. Keep it up!"

"Fact is, those who don't participate in these Kwa-Zulu Natal offerings, are really not keeping up with the cutting edge breeding and are being left behind. Those who already think they have the best of everything are clearly kidding themselves!!"

"Never assume free seed is worthless... Several years ago I received as part of a purchase from Kwa-Zulu Natal some free seed labeled Chubb's 2nd Chance. Judging from the results, it was a pot luck mixture from several parents/breeding efforts. Attached is a photo from one plant out of this group. And yes the other seeds from the Chubb's 2nd Chance packet are just as spectacular, although completely different. For some reason I am developing a preference for surprises."

"Dollar for dollar my greatest satisfaction has come from two seed sources over the years (starting with my first order in 2004 from these two): The Kwa-Zulu Natal seed list and the Cape Clivia Club Seed list".

"I have to say they are the biggest fattest most beautiful seeds I think I've ever seen!"

"I've had excellent germination (germination being to the point of the first green leaf)... certainly above the 95% mark and I have a great crop of healthy seedlings coming along."

"I received the seeds you sent me today. I really appreciate the extra effort you went to. The fact that you also sent me a lot of extra seeds goes way beyond keeping a customer happy! You really didn't have to, but I take note, thanks."

"Seed arrived safely today and it has travelled very well – all seeds look in very good condition. You must have a good reputation with Australian Customs as the package doesn't appear to have been opened for inspection. I expect that also meant I received it a good 4 or 5 days earlier as the inspections can be a bit slow sometimes."

"Sean, these are the biggest fattest seeds I have ever bought, a credit to you and your fellow breeders. Next season I think I will only purchase seed from Kwa-Zulu Natal Clivia Breeders."

Kwa-Zulu Natal Clivia Breeders
WEBSITE: www.cliviasa.co.za
EMAIL: kzncliviabreeders@cliviasa.co.za

Hottie Human & Louis Lötter

Louis Lötter Collection

I first started as a cycad grower and then changed over in 1995 to clivias after visiting the Northern Kwa-Zulu Natal show and seeing Hottie Human clivias.

When I started with clivias, I decided to buy seeds and offsets from the top growers and some of them are eg. Sean Chubb, Hottie Human, the late Dries Olivier, the late Fred van Niekerk, Francois van Rooyen, Tino Ferero, Pikkie Stumpher, Eric Heine, Wayne Haselau, Attie le Roux, Paul Kloeck, Liz Boyd, Ken Smith, Hennie van der Mescht, Rudo Lötter, Charl Coetzee, Lionel Bester, James Abel, Chris Viljoen and Bertie Guillaume just to name some of them.

I started the Vryheid Ngome Interest group in Kwa-Zulu Natal in 2006 and we had our first show display that year. At the show I had the best on show with an Eric Heine yellow. In 2007 the same plant came 1st runner up. In 2009 we had our first big show with judges and I took 6 gold, 2 silver and was the overall winner with most points. At the 2010 show I had the 1st runner up with a seedling of Gunston of Pikkie Stumpher and took 6 gold, 6 silver and 5 bronze and was also the overall winner with the most points. In 2011 I had the 2nd runner up with the Gunston again and took 16 gold, 9 silver and 10 bronze and again also the winner with the most points. At the Kwa-Zulu Natal *C. gardenii* show I won many gold medals for Ngome *C. gardenii* and Sikwebezi Tri colour *C. gardenii*.

Some of my own crosses have already done well at the shows and is proof that the pool I am working with is giving the results that I want. There is a good chance that the seeds you will buy from me could become gold medal plants. I have a good collection of *C. miniata*, *C. gardenii*, Ngome *C. gardenii*, Sikwebezi *C. gardenii*, *C. robusta*, *C. nobilis, C. mirabilis* and *C. caulescens*. I will have seeds, offsets and mature plants for sale from my best crosses.

I stay 20 km out of Vryheid and about 80 km from the Ngome \ Sikwebezi complex. I stay on a game farm and have a lot of space which most clivia growers don't have. Lucky me.

Vryheid, Kwa-Zulu Natal, South Africa
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Saint Charles Grade 3 Clivia Art

During September 2013 Simon Chubb [age 9] presented an oral to his Grade 3

Cherry Tip - Simon Chubb

Golden Glow - Ross Palframan

Golden Fever - Mark Nagel

Maze of Colours - Tom Freese

class at Saint Charles College in Pietermaritzburg. The oral was focused on Clivia colours and the names of many of the Clivia clones.

Night Bloom - Jared Talbot

Perfect Peach - Ross Stanton

Maze of Colours - Tom Freese

Pink Panada - Nathan Buhr

This oral inspired the boys to paint clivia in their art lesson and they had great fun thinking up their own original names for the clones they had painted.

Red Hot Sunlight - Seth Samuel

Sunset Peach - Caleb van Rensberg

Red Riser - Lahir Sooklal

Vela's Joy - Vela Mnyandu

Thurlow Flora

Sean Chubb

Producing Clivia with pedigree
Specialising in colour breeding
Inspired by diversity

The interest in clivia started at an early age while attending high school at Hilton College. Sean would collect and grow clivia seed found growing wild in the forest. The real passion for clivia colour breeding began in 1987 with a Peach plant subsequently named Chubb Peach.

With a taste for the unusual and uncommon Sean's efforts in breeding clivia has concentrated on breeding and perpetuating rare colours and colour combinations. With a good grounding in Genetics and a practical approach to clivia breeding, Sean's passion for perpetuating rare colour forms has resulted in numerous pure breeding line bred families of rare clivia colours being commercially available.

Sean is also passionate about conserving clivia history and has probably the most complete collection of wild occurring clivia mutations and colour forms. An important part of the clivia collection at Thurlow Flora is "The Clivia Heritage Collection", a Living collection of rare historical plants. This is a conservation effort to preserve rare clivia forms and thus Clivia History.

Sean is a showman and enjoys entering clivia in the various Clivia Shows held in Kwa-Zulu Natal. Since 1994 Sean has entered the annual *Miniata* show and every year Thurlow Flora has won numerous awards with many Best on Shows as well as runner-up Best on Shows. Sean has also won the showman of the year award many

Smoothie

Chubb Super Splash

So Excited

118

Astrix

Chiffon Daughter

Gogo Appleblossom

Gunja

Oribi Gorge Yellow F1 2013

Pastel Blush

Pretty Pink Lady

'Des Andersson' s Val'

Zol

times. Not only has Sean won numerous awards at the *Miniata* shows but also dominates the awards at the annual Interspecific and *Gardenii/Robusta* shows held in KwaZulu-Natal, some shows entering as many as 60 plants.

Thurlow Flora is a specialised clivia nursery growing clivia plants with pedigree and specialising in colour breeding. It is situated in Eston, predominantly a sugar and timber growing farming area. The climate is warm in the summers with night temperatures cooling, rainfall of about 1000mm per annum. Thurlow Flora experiences a high number of cool misty mornings and sometimes whole days. In the winter the night temperatures are generally below 10ºC but seldom experiencing frost. This climate has proved to be ideal for all clivia species. A long flowering period is experienced in all species and seems not only to be due to the climate but also the genetic make-up of the different varieties. The different varieties seem to follow the same sequence of flowering each year. The Chubb Pretty Pinks are always the first to flower from mid-August and normally ending with the Natal Yellows in mid-October, the peak flowering being the middle of September.

Thurlow Flora has a hectare of clivia under 80% shade cloth and is divided into 4 distinct growing areas.

- The most spectacular area is the Mother plant collection where all the breeding and show plants are kept. This area is neatly set out with the different varieties grouped in the colours. It is an awesome sight when the *C. miniata* are in full flower. Areas are also designated for the pendulous species as well as an impressive collection of interspecific hybrids.
- The Habitat Heritage Collection forms part of this same shade house, but in a completely separate area. This area is naturally landscaped and is both a Living Museum and a Captive breeding facility. All the Habitat Heritage plants are planted in pots which are concealed to give the natural forest effect. These pots also make it easy to move plants out of this area into a more controlled environment while plants are being pollinated. Many plants which would naturally grow with clivia in the wild are also planted in this area.
- The largest area is the seedling growing area with an adjoining dispatch shed which also doubles as a show hall and potting shed. In this area all seedlings are grown to flowering. These plants are planted in 4 ½ litre bags at 1 year old and kept in their same bags until flowering. Most plants flower at 4 year or earlier and so very little re-bagging is necessary. All seedlings are grown in the same medium and same size bags which eases management as all are treated in the same manner. Due to an ideal clivia growing climate, no irrigation is necessary in this shade house.
- The last growing area is a germination room with a controlled environment. Seed trays are heated from underneath by heated rubber mats normally used in piggeries to keep piglets warm. The temperature in this room is kept at 22ºC with 18 hours of light per day. Seeds are normally planted in mid-winter [July] and kept in this area for about a year. These ideal growing conditions result in 40% of our seedlings flowering at 3 yrs and up to 90% having flowered by 4 years old.

Nursery management is minimal and 1 full time staff member is employed with another 2 part-time employees in flowering season.

The year time line is as follows:-

- September – Pollination. All pollination is done with breeding for own use in mind. Not all breeding plants are pollinated each year, only certain lines are used every year. All plants to be pollinated are removed from the shade-house to a secure area where there is no wind or insect interference. All plants are hand pollinated in order to guarantee parentage of resulting seed.
- January seed stocktake. As clivia are extremely generous plants as far as seed production is concerned, invariably there are plenty of excess seeds. These are marketed through KZN Clivia Breeders.
- Seed sales begin April with seed being dispatched in July. Excess seed is marketed until end of September.
- July – own seed planted in controlled environment room.
- August – own seedlings are planted out into 4 ½ litre bags into the growing area.
- September, during flowering season seedlings are selected as future breeding plants. A star rating system has proved to be very useful. Plants are rated from 1* to 5* depending on quality, 5* being the best quality normally kept for breeding. Because we are always trying to improve our breeding stock it has become necessary to rate some seedlings as 6* since they are an improvement on the plants rated 5* in previous years. Hopefully as time goes on we will reach 10 and 20* plants. This rating system allows one to have a very good idea of the plant quality even when not in flower. Whilst selecting sales plants there are invariably some which could be keepers or for sale, these are normally selected out of the sales plants by our staff and placed in a '2nd chance' area. Here they are allowed to flower again and checked for quality. This is where the '2nd chance' seed is derived from as most of these plants are self-pollinated.

Seedlings are selected at flowering time using these main selection criteria:

- Vigour
- Colour, pattern and colour intensity
- Individual flower shape and size
- Umbel size and shape at first flowering
- Plant shape and leaf quality

Plants kept for future breeding must have the WOW factor.

Each year the colour groups are evaluated and decisions are made on the quantity of plants required per variety. Of each variety some new seedlings will be selected and the poorest of the older breeding plants will be removed from the breeding group. This way the overall quality of each variety is constantly improving. The older breeding plants are planted under the trees in the garden. Previous year's show winners have been known to be planted in the clivia beds under the forest canopy in Thurlow garden.

A passion for perpetuating rare colour variations in clivia has produced many line bred families of clivia. A full range of colour, form and size can be found in the collection from "Big Mamas" to the "Skinny little Guys". This is a truly diverse collection with probably the biggest gene pool of any collection of clivia. The diversity is truly inspirational.

Sean Chubb has prolifically produced new line bred colours of clivia for some years now and to date cannot be rivalled by any other breeder. The colour varieties of clivia produced by Thurlow Flora can be found in collections across the world. Having bred particular colours for many years now there has been a vast improvement in the quality of plant produced by Thurlow Flora, and some line bred colours are on the 4th and 5th generation of breeding.

Some of the true breeding varieties which have been produced by Sean Chubb

are:

Chubb Peach – originally bred from a habitat plant which was Peach in colour. These Light Peaches can be bred with Group 1 Yellows and produce Peach flowering seedlings. This was a great advantage since a high selection pressure could be placed on the seedlings and thus achieved a fairly rapid genetic improvement.

Chubb Pretty Pink – Originally bred from a habitat plant, Wittig Pink. This variety has been marketed for some years now and has proved to be very popular. This variety flowers early in the season.

Chubb Splash – Originally bred from a habitat plant named Andrew Gibson this variety is basically yellow with red splashes on the back of the petals. The contrasting colours makes this unusual variety very popular.

Chiffon Daughters – Originally bred from a full throated plant named Roly`s Chiffon, this is a colour pattern rather than a mutation making the breeding of this variety fairly easy. These plants improve every year in colour, flower quality and umbel size. A stunning variety, very striking.

Chubb Fantasy Series – Very Feminine dainty Pink and yellow flowers originally bred from a habitat pink named Ndwedwe Pink Fantasy. A fairly variable variety.

Chubb `95 Series dark orange red – Stunning reds with semi-broad dark green leaves. These plants have never failed to win when entered on shows.

Chubb Pastel Blush – Bred from Natal Yellow and Naude Peach, these pastel flowers blush with pink as they age and are most attractive. Often the pastel Blushes display a yellow line on the sepals of the flowers, and are unusual.

Chubb Versicolours and Blushed Yellows – These are Naude Peach F3 generation plants and are proving to be a brilliant line.

Group 3 Yellows – yellow flowering plants which produce red seed pods and are pigmented seedlings. Originally bred from Celtiskloof yellow but now Oribi Gorge Yellow Genetics are helping to improve this variety greatly.

There are numerous other varieties being produced in lower numbers and more recently a super range of interspecifics are being produced.

To Visit Thurlow Flora during August, September and October has left many visitors amazed by the diversity and variation to be found in the *Clivia miniata* collection at the nursery. With the enormous genetic gene pool that makes up the Thurlow flora collection, variation and diversity are the norm. A full range of colour, form and size can be found in the collection.

Diversity at its best.

Club shows

Cape Clivia Club Show 2013

For at least 10 years the Cape Clivia Club Show has been held at the Bellville Civic Centre, but in 2013, a decision was taken to move the Show to the Tygervalley Shopping Centre. Although there was obviously some trepidation about moving from a well-known venue, the move proved to be a successful one.

The actual venue was in the basement of the Food Court of Tygervalley. There was easy access for exhibitors including undercover parking for unloading, which was also relatively wind free, a serious consideration in the Cape.

The Show was very well supported and more than 300 top quality plants were exhibited. The panel of judges and learner judges included Mickey Hoctor, Gerrit van Wyk, Harry Muller, Gerhard Rohlandt and André Swart.

Congratulations to the winners of the various awards who were as follows:

Best On Show	Felicity Weeden
1st Runner Up	Gideon van Zyl
2nd Runner Up	Carrie Kruger (George)
Best Peach	Gerrit van der Merwe (George) (Margarita Blazer Trophy)
Best Own Breeding (Yoshi Nakamura Trophy)	Felicity Weeden
Best Single Floret	Felicity Weeden
People's Choice	Felicity Weeden

Congratulations also to the Novice Entry by Gianpaolo Gilardi that won Gold.

Cape Clivia Club 2013 Show: People's Choice Top 5

Details for the People's Choice for the CCC Show 2013 were as follows:

1st. Felicity Weeden	Large robust orange
2nd. Gideon van Zyl	Multi colour variegated 1st Runner up to Best on Show
3rd. Flip Snyman -	Large bronze green throat
4th. Carrie Kruger -	Bronze - 2nd Runner up to Best on Show
5th. Piet Theron -	Large peach

The stall holders were well supported by the public and sales were good. It was remarkable that there was a big demand for more expensive, unusual and quality plants.

A demo table describing how to prepare and plant clivia seed was a popular feature and a display of photos added colour and interest.

An enormous effort is required to set up the staging and get things in order as well as managing the benching and debenching. A huge vote of thanks is thus due to Clayton Jonkers (Show Manager) and Gideon van Zyl and their teams and a very important couple, Aletta and Pieter van der Merwe, who deal with all the computer and paper work, and Steve Martin for controlling the security.

Photography was efficiently and professionally managed as usual by Claude Felbert. His top quality photos are always a pleasure and inspiration to other would-be photographers.

Thank you Claude.

CCC: Best on Show (BOS)

CCC Class 7: 2nd Runner up to BOS

CCC Class 14: Best Peach

CCC 1st Runner Up to BOS

CCC Best Own Breeding

Eastern Province Clivia Club Show 2013

Eastern Province CC 1st Runner up: Noelia`s Peach - Ricky & Noelia Jardim

Eastern Province CC 2nd Runner up: Bronze Multipetal - Marius Meyer

Eastern Province CC 2013 Show Winners

Eastern Province CC Best on Show 2013: Recurved Orange - Ricky and Noelia Jardim

Eastern Province CC Runner up Best Interspecific on Show 2013 - Gideon Botha

Eastern Province CC Judges' choice Best Potential on Show 2013 (Ghost no 2) - Charl Malan

Eastern Province CC Winner Best Interspecific on Show 2013 - Toll Mostert (owner)

Garden Route Clivia Club - Show 2013

Photographs taken by Marius Meyer

From left to right: Best on Show: Gold - Gerhard Faber's "Orange", Best on Show: Silver - Kobus & Ida Esterhuizen's "Any Other Colour", Best on Show: Bronze - Gerrit & Susarah's "Unusual Flower", Best on Show: "Own Breeding" - Piet Claassen's large Orange Red, Best on Show: Gerhard van Copenhagen's dark maroon "Small Flower"

Best On Show Gold - Gerhard & Karen Faber - Cat4 Orange

Best On Show Silver- Kobus & Ida Esterhuizen Cat44 Any Other Colour

Best On Show Bronze - Gerrit van der Merwe Cat18 Unusual Flower

Winner CAT 2
Bronze - Kobus &
Ida Esterhuizen

Winner CAT 3
Orange Narrow
Petal -
Piet Claassen

Winner CAT 6 Tulip Flowers - Kobus & Helena Kearny

Winner CAT 8 Yellow Broad Petal - Piet & Jeanette Theron

Winner CAT 10 Yellow Green Throat - Piet & Jeanette Theron

Winner CAT 14 Pastel - Ricky & Noelia Jardim

Winner CAT 33 Other Species In Flower - Nelis van Eck

Winner Cat12 Apricot Peach - Kobus & Ida Esterhuizen

Winner CAT 39 Orange First Flower - Ricky & Noelia Jardim

Winner first flower orange class - Carrie Kruger (grower and breeder)

Joburg Clivia Club Show 2013

Best on Show Flowering Clivia - Glynn Middlewick

Best on Show Non-flowering Clivia - Dawie van Heerden

1st Runner Up Best on Show Flowering Clivia – Gerhard van Coppenhagen

2nd Runner Up Best on Show – Dawie van Heerden

Lowveld Clivia Club Show 2013

Greg Jones (Show Organiser)

2013 marked the Lowveld Clivia Club's tenth anniversary that was celebrated with its tenth annual clivia show held at the National Lowveld Botanical Gardens. The show was judged by John Handman and Dawie Strydom. Paul Kloeck was awarded 'Best on Show', 1st and 2nd Runner Up as well as exhibiting the 'Judges' Choice'.

2nd Runner Up – 'Chandelier' – Paul Kloeck

1st Runner Up – 'Yellow Angel' - Paul Kloeck

'Judges' Choice' – Apple Blossom Type - Paul Kloeck

Best on Show – 'Virgin Blush' – Paul Kloeck

Overberg Clivia Show 2013

It is interesting that although the Overberg Group boasts as few as 10 exhibitors, we succeed in staging a reasonable show every year.

Although the number of exhibits was down this year due to two of our more active members being away, we still managed a nice display of good quality plants. The weather was also very negative and some of our members had no plants at all in bloom for the show!

Our Show Manager and Co-ordinator, Caroline Phipps, married Malcolm Pemberton in 2013. The happy occasion took place in a delightful river boat setting. Despite this exciting occurrence in her life, she did her usual excellent job of getting it all together successfully. Her husband, son and stepson helped to fill the many gaps caused by so many members being absent.

Gerrit Rohlandt arranged the benching, Alex Sherriff efficiently dealt with all the

Best on Show - 'Lady Love'

Overberg 2013 Class 7 - Winner & 2nd Runner-up on Show - Felicity Weeden

paperwork and finances. A big "Thank You" is due to all these people.

The judging was ably handled by Henriette Ströh with Gerrit Rohlandt and Felicity Weeden acting as stewards. Many thanks to Henriette who, despite poor health, made the special effort to be with us.

The winning plants were as follows:

Best on Show:	Lady Love – superb quality yellow
1st Runner Up:	Ultra Pink – superb pink of Cameron Peach breeding
2nd Runner Up:	Pure Passion – large perfect pinky pastel
Best on Show Leaves:	Gerrit Rohlandt
1st Runner Up:	Felicity Weeden
2nd Runner Up:	Felicity Weeden
People's Choice:	Felicity Weeden

Winner & 1st Runner-up on Show - Felicity Weeden

Vryheid Clivia Show 2013

Best on Show (Vryheid - 'Peach Green Centre' - Barney Viljoen

Best on Show - Barney Viljoen 'Peach Green Centre'

Runner up yellow - Leon van Rooyen

Leon van Rooyen – Runner Up, Barney Viljoen – Best on Show and Louis Lötter – 'Overall Points' Winner'

Second runner up 'Orange Green Centre' - Louis Lötter

An update on the breeding of multitepals in Japan

Helen Marriott

Given the existence of a firm base of multitepal *Clivia* breeding in Japan, it is not surprising that further developments continue to arise in relation to the quality and types of flowers, including their colours and colouration patterns, as well as variation in the size of plants. While I am sure that exciting breeding with multitepals is also taking place in other locations, this is a short update (prepared in May 2013) on some of the recent advances in Japan[1].

Fig. 1 Nakayama's multitepal

Orange multitepals and the emergence of "double-like" flowers

As a specialist in multitepal *Clivia*, Atsushi Nakayama has continued to cross orange multitepals x orange multitepals, with excellent outcomes. Among his many blooms are a group of plants with narrow petals that consistently produce 12 petals (and 12 anthers) when mature. In recent years, green throats have also begun to emerge, as have other very high quality flowers. Figures 1 to 6 show some of his blooms. In 2012, a cross of 'Kiyou no mai' (a strong multitepal parent – see CLIVIA 12, p.88) x 'Hanyae' has produced darker-coloured oranges which are "double-like" in appearance. Here the term "double-like" is used in reference to an inner second layer of petals in addition to an outer layer. This year Nakayama named the best of these new, darkish, double-like hybrids as 'Kokuryuu no mai' (Fig 7).

Fig. 2 Nakayama's multitepal

Fig.3 Nakayama's multitepal

As a breeder with various *Clivia* specializations, Kazumi Hattori has also paid some attention to multitepals. Although on a small scale, he produces compact orange or pastel-coloured multitepals which possess eight or more tepals, but, in addition, in recent years he has another type which he has labelled "Yae Botan" (Fig 8). This new type is double-like in appearance and contains many tepals - often 15-25 - but sometimes 40 appear, also on compact plants (and are thus similar to Nakayama's 'Kokuryuu no mai' type of plants). Shigetaka Sasaki has observed that these plants cannot set seed because they either do not have ovaries or else the ovaries are very narrow. Hattori has reported to him that if Yae Botan is used as the pollen parent on another plant with eight tepals, the Yae Botan type of flower results. As can

Fig. 4 Nakayama's multitepal

be seen from the photos, the flowers sometimes lack anthers or stigmas, and thus breeding with them is only possible if some anthers occur which provide pollen for use on other plants.

Sasaki believes that the Yae Botan group of multitepals is probably a mutation from a plant with six tepals which has occurred as the result of inbreeding. He also suggests that this mutation could be the same mutation as that which occurred in

Fig. 5 Nakayama's multitepal

Fig. 6 Nakayama's multitepal

Nakamura's 'Super Multipetal' (the parent of Ian Brown's multitepal, see CLIVIA 3, front cover and inside page), where the centre flower does not have an ovary.

Other colours and colouration patterns

Hiroshi Mitsuhashi continues to produce yellow multitepals, including some very large plants with splendid, big yellow multitepal flowers as a result of 'Vico Yellow' in their backgrounds (See CLIVIA 12 p.90) (Fig 9 & 10).

In addition, he grows some excellent orange multitepals (Figs 11 & 12). Nakamura has also been working with a yellow multitepal, 'Daybreak Wonder' (Fig 13), using it as the pollen parent on yellow or peach *C. miniata* with six tepals.

Fig. 7 Nakayama's 'Kokuryuu no mai'

Fig. 8 Hattori's "Yae Botan" type

His F1 flowers have begun to emerge and among them are some umbels which have one flower possessing eight petals or else a petaloid, with the remaining F1 flowers consisting of six tepals only.

Toshio Koike has not been breeding Group 2 Yellow or Hirao[2] multitepals, but nevertheless, sometimes a plant emerges with two or three flowers which contain seven or eight petals, such as the Hirao shown in Fig. 14. However, with the aim of producing full Group 2 yel-

Fig. 9 Mitsuhashi's yellow multitepal

Fig. 10 Mitsuhashi's yellow multitepal

Fig. 11 Mitsuhashi's multitepal

low or Hirao multitepals, Sasaki has been crossing these yellow or green flowers which contain the regular six tepals with orange multitepals. For instance, he crossed a Koike green-centred yellow *C. miniata* x 'Hanyae' and in the F1 plant which flowered in 2013, the flowers only had six petals, a result which he expected. On the other hand, an unexpected finding was a cross of a Koike green-centred yellow *C. miniata* x Hirao, where neither parent con-

Fig. 12 Mitsuhashi's multitepal

tained any multitepal flowers, but where the F1 offspring did exhibit some multitepal tendency. Sasaki is uncertain whether this is a recessive feature or not in this particular case.

Ghost multitepals are another important variation found, even though in small numbers to date. Nakamura already had a Ghost multitepal 10 or more years ago, but it tends to have smallish flowers, where not all flowers in the umbel are multitepal and, even if they are, eight tepals seems to be the maximum (Fig 15).

Both Nakamura and

Fig. 13 Nakamura's 'Daybreak Wonder'

Fig. 14 Koike's Hirao

Sasaki have been crossing *C. miniata* Ghost plants with multitepals, and have observed occasional ones which display a multitepal tendency in the F1 flower, with or without the Ghost colouration.

Fig. 15 Nakamura's multitepal Ghost

In recent years Sasaki has also been building up his experience with breeding multitepals, mainly crossing orange multitepals with other *C. miniata* or interspecifics possessing six tepals. One of his most promising hybrids so far is a cross of 'Tadai', a large-sized multitepal flower bred by Nakayama, by 'Chiba Lily', the well-known large yellow 'Vico Yellow' hybrid from Nakamura. In 2013 one F1 plant showed large flowers, with one of these possessing seven tepals, a result which he considers as excellent (Fig 16). In another instance, a cross of a multitepal (which may have also been 'Tadai') x 'Chiba Lily' yielded three flowers each possessing eight tepals in the

umbel of 16 flowers (Fig 17).

Sasaki has also undertaken a cross of another Nakayama green-throated multitepal *C. miniata* x 'Q2' (Fig 18), and although not a single multitepal flower emerged in the F1 generation in early 2013, he is pleased with the shape of the umbel and has selfed the plant, expecting the F2 flowers to display the multitepal trait.

Fig. 16 Sasaki's 'Tadai' x 'Chiba Lily'

Multitepal interspecifics

Nakamura has already bred multitepal interspecfics, as found, for example, in 'Overjoyed', which is an interspecific multitepal hybrid x Nakamura 'Super Multipetal', with the multitepal genes thus present in both parents (Fig 19). On the other hand, it is unclear whether 'Ambitious' (See CLIVIA 12 p.92), another multitepal interspecific which is derived from Nakamura's (*C. miniata* x *C. caulescens*) x (*C. miniata* x *C. nobilis*), spontaneously produced multitepals or whether it was the outcome of a deliberate cross. When it first flowered (Fig 20), most flowers possessed eight tepals but on its second flowering, the flowers were wider, more open and most flowers had 10 tepals (Fig 21).

Fig. 17 Sasaki's multitepal x 'Chiba Lily'

Fig. 18 Sasaki's multitepal x 'Q2'

Fig. 20 First flowering of 'Ambitious'

The breeding of interspecific multitepals also strongly features in Sasaki's current breeding programme and he was able to closely observe some F1 flowering outcomes early this year.

Fig. 19 Nakamura's 'Overjoyed'

A cross of a (*C. miniata* x C. *gardenii*) x 'Kiyou no mai' produced mostly multitepal flowers. In another case, he crossed a Nakayama multitepal *C. miniata* with a green throat x a pinkish (*C. miniata* x C. *gardenii*). Of the three plants to flower in early 2013, two flowers on one of these plants each contained a petaloid (Fig 22).

He also observed that this plant was closer to the *C. miniata* flower shape in comparison to the other two plants which had smaller flowers without any petaloids. Sasaki has undertaken a sibling cross of the petaloid and non-petaloid siblings, and again has high expectations for the F2 cross to display the multitepal traits more strongly.

Another three plants based on Sasaki's hybridization of a multitepal *C. miniata* x 'Crayon' (a picotee-like interspecific thought to be from *C.* x *cyrtanthiflora*) recently flowered for the first time, and of these, the best sibling produced nine flowers, of which four possessed eight tepals and two, seven tepals, where one of the latter also had a petaloid (Fig 23). In another instance, a second flowering of a multitepal *C. miniata* x (*C. miniata* x C. *caulescens*) produced one-

Fig. 21 Second flowering of 'Ambitious'

Fig. 22 Sasaki's multitepal x (*C. miniata* x C. *gardenii*)

third of the flowers with some multitepal tendency (two flowers with eight tepals and three with seven tepals) (Fig 24).

Not unexpectedly, the above limited examples suggest that, as with *C. miniata* intraspecific hybridization, the hybridization of multitepal *C. miniata* with interspecifics may display the trait of additional tepals in the F1 in some instances and that this tendency increases with future generations.

Breeding multitepals

At this stage we do not know which multitepal parents containing which features or degree of multitepal traits are necessary for breeding the "best" multitepals. However, based upon his recent experiences, Sasaki reports that a "strongly" multitepal plant like 'Kiyou no mai', which has a maximum of 24 tepals per flower, will give some multitepal flowers in the F1. This is in contrast to other multitepals, including 'Hanyae' (which has a maximum of 16-20 tepals per flower), which do not seem to produce any multitepal flowers in a first generation cross with a non-multitepal plant.

Sasaki acknowledges that we can occasionally observe a single *C. miniata* flower with eight tepals and suggests that there may be several explanations for this phenomenon. Sometimes, he believes, this may be due to the fertilizer or else because of the plant's hormones, rather than being genetic. Alternatively, he considers it a very good sign if we find two or three flowers with multitepals in conjunction with one of the following characteristics: the stigma has a spiral shape, is bent or has four lobes, or else the lobes on the stigma branch out from lower down rather than at the tip. However, in the case of hybridizing multitepals with interspecifics, he believes that it is a good indicator of strong inheritance even if only one multitepal flower emerges in the F1, given that it is normal for the F1 flowers not to display any multitepal trait. He recommends either selfing or sibling crosses of F1 hybrids, though in general he tends to favour selfing to produce F2 multitepal interspecifics or sibling crosses in the case of *C. miniata* multitepals.

Sasaki himself believes that the best multitepal is a full double flower, with either six tepals in the upper layer and six in the bottom layer, or else a combination like eight by eight. Furthermore, the flowers should have the same number of anthers as tepals. He often recalls his friend's experience of breeding multitepal/double Hippeastrum plants (see CLIVIA 6, pp. 57-59) as an indicator of how to breed good multitepals. In this case, the Hippeastrum breeder crossed a fertile eight-tepal flower with a regular flower containing six tepals (or vice versa) and obtained plants which did not exhibit any multitepal features in the F1 generation, but after undertaking a sibling cross, he obtained multitepals in the F2 generation and further increased the proportion of plants with this trait when he selected the most fertile plants from these for further sibling crosses.

The above examples show that the breeding of multitepals continues in Japan, with increasing variations in flower form and colour, even if on a relatively small scale. Nevertheless, much still remains to be done to increase our knowledge of breeding for improved and consistent multitepal traits such as high tepal/anther count, with or without petaloids, in all (or most) flowers in an umbel, and, importantly, the inheritance of these desirable characteristics. Growing speed and plant vigour may also be priorities, as with any other *Clivia*.

Notes

1. I wish to thank Shigetaka Sasaki for his input of content and photos, and also Kerrie McElroy and Heidi Nerurkar for supplying some of the photos.
2. I have not used single quotation marks for Hirao or Ghost in this text since these names refer to groups of plants, not to single cultivars.

References

Sasaki, S. (2004) Multitepal breeding. CLIVIA 6, pp.57-59.

Fig. 23 Sasaki's multitepal x 'Crayon'

Fig. 24 Sasaki's multitepal x (*C. miniata* x C. *caulescens*)

Genetic variation in Clivia caulescens

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People often think that a species like *Clivia caulescens* is rather uniform with very little variation. A closer investigation will indicate that there exist a lot of differences between plants from different populations and, even in the same population, some differences will be observed. Some "wise" people always ask "why do you split hairs over the little variation present". So let us discuss why we study diversity in populations and how do we quantify the variation.

One of the best measures of determining the health of a species is by looking at its genetic variation. The more variation present in a species the better its chances of survival. Information on the genetic diversity can also be used for breeding purposes. The highest degree of heterosis (hybrid vigour) will be obtained if plants from two genetically total different populations can be crossed.

So with this information as background, how do we measure genetic variation? We study the DNA of different organisms (or in this case different specimens from various

Figure 1 *Clivia caulescens* flowering in nature

populations) and determine to what extent the DNA correspond (or rather to what extent it differs – hence genetic variation).

For the purpose of this study we concentrated on five DNA regions (*atpH-I, matK, rpoB, rpoC1* and *tnL-F* – don't worry about the names; it is just pieces of DNA and the names are only given if somebody wants to repeat this study!) and studied specimens from Soutpansberg, Wolkberg, Magoebaskloof, Mariepskop, Wonderview, God's Window, Bearded Man and Swaziland. All five regions occur in the chloroplast of the plants. The chloroplast is the organelle responsible for the green colour in the leaves and is inherited maternally; therefore the 'podplant' passes it on to its (her?) offspring. So we measure how much difference is present in "mother plants" in a specific geographical area.

Figure 2 *Clivia caulescens* in different habitats

DNA was extracted from a small piece (less than 1 cm) of a young leaf. The extracted DNA is amplified by the PCR (polymerase chain reaction) process[1]. With this process thousands of exact duplicates of a certain piece of DNA is formed. These pieces were send through another apparatus that 'read' the composition of the DNA and give you the DNA sequence; something like ATGCATGAATCGC for example.

The DNA sequences of a specific piece of DNA (for example the trnL-F region) will be compared between different organisms. Statistical analysis of these comparisons will indicate the differences (or correspondence) between different plants. One method of

[1]A mixture containing all the building blocks of DNA is made. A bit of the original DNA from the plant is added, as well as specific primers [short pieces of DNA] that act as starting points for the process to build new DNA. Exact copies of a very specific piece of DNA in the original plant are then formed by alternating different temperatures.

Figure 2 *Clivia caulescens* in different habitats

statistically looking at the data is to determine so-called Genetic Distances. A genetic distance of zero indicates that two organisms are genetically exactly the same. We tried to do at least five different specimens from each locality (preferably 10). In this way you can determine the average genetic distance (or variation) in a specific geographical area, and you can compare different areas to determine how much plants from one area differ from plants in another area (this whole experiment can become useless if people take cultivated plants back to nature – although it may appear to be a noble gesture, it nullifies future research!).

The first part of the study was to determine the efficacy of the different DNA regions. Due to an absence of any variation between different plants, the rpoC1 region was excluded from the study. The other regions showed between 2 and 8.5% variability (atpH-I provided the most variability). The total length of the DNA studied was just over 2 000 base pairs and 85 (3.9%) bases differed between different organisms. These differences are not in genes and are therefore not linked to morphological characters. These figures are higher than in most reported studies. This can be attributed to our long experience working with *Clivia* DNA and knowledge of variable regions in this genus. Sufficient data for a statistical comparison were generated.

Clivia caulescens is distributed along an approximately 400 km stretch along the escarpment, from Soutpansberg in the north to Swaziland in the south, with Mariepskop as an isolated outcrop not currently linked to the escarpment. Instead of giving a lot of numbers we shall summarize the results. Plants in all localities showed a bit of genetic variation. This variation indicates that the plants originated

Figure 3a Stem formation and morphological differences at different localities

from several "mother plants". The variation between different localities is larger than the variation in a locality (as was suspected). The degree of variation is sufficient to indicate that *C. caulescens* is not genetically depleted.

The genetic distances indicate that plants from the northern distribution area (Soutpansberg, Magoebaskloof, Wolkberg) are genetically similar. The same phenomenon was observed for the southern distribution area (God's Window, Wonderview, Bearded Man and Swaziland). The third group consisted of the Marieps-kop specimens. This group differ from the northern and southern groups, with a slightly higher similarity with the northern group.

One plant with a 'Swaziland origin' proved to be very similar, if not identical to the Soutpansberg specimens. These results suggest that the plant was collected near Soutpansberg and either wilfully or mistakenly sold as a specimen from Swaziland.

Somebody may even have collected this plant in the Soutpansberg area, planted it in Swaziland where it was later collected as a specimen from Swaziland. This brings us back to the warning described earlier in this paper, do not try to put cultivated plants back in nature. Not only for scientific purposes but such plants can

Figure 3b Stem formation and morphological differences at different localities

transfer "cultivated diseases" to nature and your attempt to help nature may actually destroy nature!

To summarize: genetic distances indicate that the genetic variation in C. *caulescens* is currently sufficient and there is no need for alarm. Breeders wanting to improve the quality of this species should hybridize plants from either the northern area or Mariepskop with plants form the southern area. These crosses will show the highest degree of hybrid vigour.

The contributions of James & Connie Abel and Fred van Niekerk to this paper are greatly acknowledged.

Virus frustration in Clivia

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Usually the combination of the words virus and frustration will indicate a grower that became frustrated with the number of virus infected plants in his/her collection. In my case it is a totally different type of frustration: the inability to prove beyond any reasonable doubt the presence of a virus in *Clivia*. Let us start this case from the beginning.

The most dreaded words for plant lovers are "virus infection"! A virus infected plant cannot be cured. To save your other plants the infected plant should be burned. Some *Clivia*-lovers will try to forward another view and claim that a virus infection can be cured by certain antibiotics. There is no scientific evidence (or basis) for this theory or a cure for the common cold in humans would have been developed long ago.

A virus is a very interesting thing. It consists of a piece of DNA or RNA, encapsulated with a number of proteins. It is not considered to be a living organism, since it cannot do the majority of functions done by living organisms.

For example, it needs the cells of a living organism to reproduce. It cannot reproduce on its own. Since it is not alive, it cannot be killed by an antibiotic (anti = against & biotic = living). The virus (or the molecule) should be destroyed. If a plant was "cured" with an antibiotic, it had a bacterial infection and not a viral one. Antibiotics can cure pneumonia (bacterial infection) but not influenza (viral infection) in humans.

Through the years people talked about virus infected *Clivia* plants. Usually a spotty leaf was associated with the presence of a virus, although the presence of a virus was not proved. The correspondence on whether the cultivar 'Ella van Zijl' is infected with a virus or not, filled many Newsletters. During the early part of our research on *Clivia* diseases, we received many so-called virus infected specimens. Almost all these specimens reacted positively to fertilizer application. Within six months after applying additional fertilizer all leaves were uniformly green. We used a liquid fertilizer containing all nutrients, including micro-elements. We still do not know which nutrient deficiency caused the light green spots on the leaves.

Another spotty discolouration on *Clivia* leaves is formed by insect infestation. Sometimes the spots will be the first sign of a mealy bug infestation within the inner leaves. Once again the spots may be the result of a nutrient deficiency caused by a decrease in nutrient flow to all parts of the leaf by the bugs.

The 2006 *Clivia* conference was followed by a *C. caulecens* tour. During the tour some specimens at God's Window showed signs of what may be a viral infection. The same symptoms were later observed at Wonder

View and Mariepskop. The symptoms include the appearance of streaky light grey-green areas on some leaves (Fig. 1). Occasionally a bright yellow line appeared on a leaf (Fig. 2). This yellow discoloured part is slightly thicker than the rest of the leaf. A visit to the same site one year later revealed that the number of infected plants almost trebled. Heavily infected leaves (almost the whole leaf turned yellow) were collected and small samples were studied with an electron microscope at the University of the Free State. The remainder of the leaves were send to the Agricultural Research Council facility at Roodeplaat, where they found traces of the virus and positively identified it as the "Tulip Colour Break Virus" (TCBV).

The symptoms of the TCBV start with the slight discolouration of leaves. These parts with discolouration will eventually turn yellow, while larger areas will become grey-green. This process continues till the whole leaf turns yellow. The consequence is that the leaf can no longer act as "food factory" (photosynthetic area) for the plant. The result is slower growth and eventually the plant will die when all leaves are affected. The virus spread very slowly from one leaf to another. It will take almost one year to spread from one leaf to the next one.

However, insects can spread it very fast from one leaf to another and from one plant to another. The problem caused by the slow natural spreading within a plant is that removal of infected parts may appear to result in a "normal" uninfected plant. However, in one year's time symptoms of the disease will reappear, since the disease (virus) is still present throughout the plant. This happens in the *C. caulescens* population where signs of the virus are present in the older leaves. The older leaves of *C. caulescens* die and the plant may appear to be without a virus. However, the next year the signs of the virus reappear!

So a virus has been identified in *Clivia*. We know the effect of this virus on the leaves of a plant. We do not know yet what the effect will be on the flower of the plant. In tulips this TCBV causes the breakdown of

Fig. 1 The symptoms include the appearance of streaky light grey-green areas on some leaves

Fig. 2 Occasionally a bright yellow line appeared on a leaf

anthocyanin formation. This resulted in flowers that start off with a red area, followed by unpredictable white areas where antocyanin could not be formed (*Clivia* flowers should theoretically look like the opposite of a picotee – red centre with white/yellow/green on the outside). These flowers were absolutely beautiful and in high demand, till the virus started killing the plants. The end result was havoc in the tulip trade.

Why am I so frustrated with this virus? To prove scientifically that the plants from God's Window are infected with TCBV, we have to re-infect a plant with an extract containing this virus, and only when this artificially infected plant show signs of the virus you have proven that the virus is responsible for that specific set of symptoms. No attempt to re-infect a plant has yet been successful!

To make matters even worse: I have collected two plants for this study from God's Window with the approval of Nature Conservation. Both plants were heavily affected by the virus. One plant was sacrificed to isolate the virus and the other one was grown under quarantine conditions. Today this plant appears quite healthy and shows no sign of the virus. I experienced the same phenomenon with other *Clivia* diseases; you have to mimic the "correct" ecological conditions otherwise the disease will not develop.

So my frustration is the knowledge that the virus exists and affects *Clivia* but I am unable to prove this scientifically.

However, even without the scientific prove I feel that a warning should be posted: We cannot afford the spread of this virus in *Clivia*. Be aware of plants that may be infected. Be aware of plants with strange colouring patterns. Only buy a plant with a strange colouring pattern when the leaves show absolutely no sign of discoloration. One infected plant in your collection can result in a totally infected collection after something like a mealy bug infestation. Do you really want to destroy your whole collection because you bought one "magnificent" plant with a "unique" colouring pattern?

Acknowledgement: I want to thank Wilmarie Kriel for her input in this paper and her knowledge of *Clivia* diseases in general.

What to do if you think a plant is infected with a virus

1. Isolate the plant (the plant must be kept away from all other plants in such a way that an insect cannot travel from the infected plant to the others).
2. If a virus infection is confirmed, burn the plant (putting it on the compost heap will help to spread the infection).
3. Carefully investigate the plant for signs of insect damage (if there are signs of insect damage, insects must be removed and the plant must get time to recuperate – if "virus type symptoms" disappear, the plant may go back to your collection).
4. Feed the plant well (if "virus type symptoms" disappear, the plant may go back to your collection).
5. Let a heavily infected leaf be tested for a virus (if infection is confirmed: step 2).

Exciting new colour variation in Clivia miniata – *the versicolour flower*

Rudo Lötter

When I first flowered a versicolour Interspecific, Harold Koopowitz described the plant as unbelievable. I named this plant after my daughter Chanel. Since then many versicoloured interspecifics were bred all over the world, proving that this is a feasible colour variation in clivia but yet unknown in *Clivia miniata*.

Interspecific bred by Rudo Lötter Clivia 'Chanel'

In 1995 when I visited the Pietermaritzburg show, there was a plant called Naude's Peach. This plant had several outstanding features: there were two umbels on the same plant, the older blushed to a deep peach and the younger umbel opened yellow; also the older umbel developed red spots on the outside of each petal. Obtaining pollen from Naude's Peach, and not knowing to which group it may belong, using the only pod parent available we pollinated a F1 orange Natal yellow grp2 x group 1 yellow. The seedlings from this cross varied from normal orange to pastel in flower colour. Two of these pastels were selected for quality flowers and labelled F1 Naude's Peach split yellow.

Naude's F1 pastel

I knew that the only way to recover Naude's Peach was to pollinate the two F1 and to wait for the F2 generation. As expected 50% flowered orange 25% yellow and some not yellow or peach but to my surprise versicolour.

Versicolour opening

From these the two best were selected for further line breeding. Seedlings from these flowered and proved that I knew colour variation was made through years of patience and some luck.

Photo submissions

CARRIE KRUGER: Interspecific

Hope - grower and photographer Carrie Kruger

Little Beauty - grower and photographer Carrie Kruger

Marina - grower and photographer Carrie Kruger

CARRIE KRUGER: *Clivia miniata*

Carrie`s Green breeder Nakamura - grower and photographer Carrie Kruger

Carrie`s Peach - grower and photographer Carrie Kruger

Chiba Peach - grower and photographer Carrie Kruger. (Breeder - Philip Crous)

Group two yellow - breeder, grower and photographer Carrie Kruger

Ice Cap - grower and photographer Carrie Kruger (Breeder - Rudo Lötter)

Pink Clouds - grower and photographer Carrie Kruger (Breeder - Charl Malan)

Utopia Vico Pink Two - grower and photographer Carrie Kruger

Utopia Vico Pink - grower and photographer Carrie Kruger

Luke`s Magnificent - grower Luke Kruger, photographer Carrie Kruger

Woodlands Beauty - grower and photographer Carrie Kruger

CARRIE KRUGER: Pendulous

Mini compact dark red *Robusta* - breeder, grower and photographer Carrie Kruger

Robusta Multi petal Lucky Jade, breeder, grower and photographer Carrie Kruger

Robusta Santa Clause, breeder, grower and photographer Carrie Kruger

CARRIE KRUGER: Single flower

Carrie`s Versicolour - grower, breeder and photographer Carrie Kruger

Carrie`s Versicolour - breeder, grower and photographer, Carrie Kruger

Chiffon Beauty - grower and photographer - Carrie Kruger. (Breeder – Sean Chubb)

Giant Multi petal - breeder, grower and photographer Carrie Kruger

Jason`s Bronze - grower and photographer Carrie Kruger

Pink Vogue – grower and photographer - Carrie Kruger (Breeder - Philip Crous)

Carrie`s Green - grower and photographer Carrie Kruger

Dreaming - breeder, grower and photographer Carrie Kruger

TK x Hirao single flower - grower and photographer Carrie Kruger

CARRIE KRUGER: Unusual flowers

Ghost - grower and photographer Carrie Kruger

Zebra - breeder, grower and photographer Carrie Kruger

JOHN HUNTER

Apricot

Bicolour

Euro peach No. 1

Euro peach No. 2

Ghost

Golden White

Green Throat Apricot

Green Throat Salmon

Nakamura red

Watercolour

Interspecific (*Miniata* x *Caulescens*)

Tubular form - *Clivia Nobilis*

Tubular Interspecific - *Cyrtanthiflora*

Tulip Belgian

Watercolour

Wavey pink

WILLIE LE ROUX: Interspecific

Angelique

Cheree

Gigi

Velia

WILLIE LE ROUX: Others

Amore

Aneme

Anya

Charlize

Florencia

Franya

Gina

Girly

Green Angel

Kyra

Le-ne

Liske

Lyla

Maxi

Ruby

Sunel

Tanya

Yutame

Zoe

Kiana

Ohna

Tayla

Vasti

Zetske

SAKKIE NEL

André

Esmé

Griet

Tertia

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CLIVIA

SIXTEEN

Editor
Joubert van Wyk

EDITORIAL

Report to the May 2015 Annual General Meeting of the Clivia Society by the Editor of the Clivia News and Yearbook 16

It has been a reasonably successful year from a publication's perspective, having published a total of 248 pages over the past year, consisting of three editions of the Clivia News and Yearbook 16.

The lack of 2014 Conference presentation contributions for the Yearbook was disappointing. Our publication is entirely dependent on the contributions of Society members. If the number of Yearbook submissions continue to decline, I would suggest that we consider to move to four editions of the Clivia News and periodic publication of the Yearbook. We can then reserve the Yearbook for years when there are a meaningful number of appropriate articles. Show photos and similar contributions can be accommodated in the Clivia News.

2014 Conference Show Prize Winners

For those members who wish to write for our publications, I would strongly suggest having a look at Clivia News Volume 23 Number 3 page 19, in terms of style guidance when preparing contributions. Trying to adhere to such as closely as possible assists greatly, in reducing the rewriting and editing required when compiling the publications.

It has been an honour to serve *Clivia* for the past three years – as editor of the Clivia News and editor of the Yearbook. The greater focus on the visual through more and also larger format pictures continues. For future editions, in addition to the steady flow of other very interesting contributions, submissions on the following broad topics, will be greatly appreciated: the use of less poisonous chemicals; bios on significant contributors to *Clivia*; special breeding techniques; simplified record keeping ideas; and thoughts on the various tensions that at times develop between parties involved with *Clivia*. Such tensions include the commercial interests of members versus the hobby interests others may have in *Clivia*.

I would like to thank all the people who have played a role, however small, in helping produce the two Society publications over the past year. My thanks also goes to the various article contributors, as well as Helen S, Helen M, Sue, Sakkie, Glynn, Fréda, Annatjie and Anita. Thank you for your time and your valuable advice. Without you the publications would not be possible.

I would also like to express my gratitude to Glynn, as Chairperson of the Society, for all his words of encouragement and his guidance during the past year.

Being the Editor continues to be fun!

Joubert van Wyk
2 May 2015

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2014 CLIVIA SOCIETY CONFERENCE - PAPERS

Grouping *Clivia*: Reviewing current information

By Felix Middleton

Many enthusiasts and researchers have contributed to our present understanding of the differences between and therefore the grouping of wild *Clivia*. For example, the No 14 (2011) Yearbook of the Clivia Society which was dedicated to revisit species description and classification greatly enhanced our understanding of groupings as well as the reasoning behind the grouping of *Clivia* populations. The present contribution is aimed at summarising, in laymen's terms, the current knowledge on *Clivia* species classification. Many of the assumptions and conclusions are taken from past Yearbook and newsletter articles and I would therefore like to acknowledge the exceptional research and summaries of past contributors before I begin.

It is in our nature to organise everything that we observe or experience. We set specific parameters for groupings and then classify variation into one or another group. Consider the levels and definitions for grouping *Clivia* growing in the wild as noted in Table 1.

Often we use expressions such as usually,

Fig. 1. "Bulbous" thickening of the base of *C. gardenii* (Ngome form)

commonly and generally to describe the expected type within a grouping. For instance, plants are perceived to consist of leaves, stems and roots. However, several epiphytes such as the Spanish moss plant do not possess roots, many plants such as *Streptocarpus* have no stems and others like some *Euphorbia* do not have leaves. These we regard as exceptions to the rule in order to simplify or facilitate classification. The fewer exceptions to the rule, the better we manage to group and therefore describe the variation we see. *Clivia* belong to the subfamily Amaryllidoideae which is characterised by plants

Table 1. Taxonomic classification of *Clivia*

Group	General features of group
Order: Asparagales	Plants have a rosette of leaves (tight cluster of leaves), either at the base of the plant or at the end of a more-or-less woody stem. The flowers are of a general "lily type", with six tepals.
Family: Amaryllidaceae (Amaryllids)	Herbs with flowers arranged in umbels. Leaves linear, strap-shaped or elliptical in two rows. Flowers usually bisexual and symmetrical. Flower petals and sepals are undifferentiated as tepals.
Subfamily: Amaryllidoideae	Perennial plants, usually with bulbs or rhizomatous bulbs. The fleshy leaves are arranged in two vertical columns and flowers are large.
Genus: *Clivia* (Bush Lily)	Evergreen plants, with strap-like green leaves. Individual bell-shaped flowers occur in umbels on a stalk above the foliage. Flower colours range from yellow through orange to red.

with bulbs or bulbous-looking rhizomes. The only member of the *Clivia* group that might be regarded as a plant with such a structure is the Ngome form of *C. gardenii.* Refer to Fig. 1. Some *C. caulescens* plants from Magoebaskloof also show a slight thickening but this is not typical to all plants in the area.

Why classify

The reasons why we need to group collections of kinds into species varies for different professions. An ecologist needs an accurate method of identifying particular species for stating and testing biological theories and for measuring biodiversity. A conservationist uses classification in decisions when offsetting the advantage of land development to that of species conservation. A nurseryman or landscaper will use the classification to determine which type should be planted in a given environment. Finally, a breeder or enthusiast uses the classification to anticipate the response of a type or even predict the outcome of a cross between types. Although we use taxonomy for different reasons we require a single grouping to facilitate discussions among professions.

How to classify

A species is the most elemental unit of biological classification. It is often defined as the largest group of organisms capable of interbreeding and producing fertile offspring. The benchmark for grouping species into a genus is based on the assumption that they all developed from a single ancestor. Although classification into species can be based on morphological differences and where available molecular fingerprinting, the foundation for classification should still be tested against the principle that a group can or in recent past had the potential to interbreed and therefore develop collectively.

It is important to consider only wild or ex-habitat plants when describing species; domesticated *Clivia* should be noted as hybrid *Clivia* as their genetic makeup and therefore distinctive attributes have been contaminated by interbreeding and artificial selection.

The following is a systematic partitioning of the *Clivia* group based on information currently available:

1) Morphology or mode of pollination

It is generally accepted that there are two basic types of *Clivia*: those with open flowers and those with pendulous flowers. A recent study on *Clivia* ecology conducted at the University of Kwazulu-Natal has implicated a pendulous ancestor for the *Clivia* group. The open flower type developed out of this ancestor as a result of adaptation towards a butterfly and moth mediated mode of pollination whereas the pendulous species is generally pollinated by hummingbirds. Inheritance of the open flower characteristic is not as complicated as most think. An interspecific hybrid between any pendulous species and a *miniata* type produces semi-pendulous progeny. The first generation backcross to the pendulous parent produces progeny with flowers that closely resemble the pendulous species. Similarly, backcrossing the F1 to the *miniata* type produces progeny showing the open flower trait. Self-pollination of the F1 produces a whole range of flower types, however many are of the *miniata* type or pendulous in appearance.

It is therefore easy to imagine the rapid development of an open flower *miniata* type from a pendulous population, especially as this open flower type is preferred by a pollinating agent that in most environments are more abundant than hummingbirds.

2) Distribution

The majority of *Clivia* are found in forests along the Eastern side of South Africa. The distribution spans from just North of Port Elizabeth in the Eastern Cape all the way up through Swaziland and into the Northern parts of the Limpopo province. Although there are small sections of this environmental strip that do not contain forests and therefore *Clivia*, especially in the Northern Natal section, we can still regard it as a historically continuous ecological environment where *Clivia* could until recently interbreed and develop. In addition to

Fig. 2. Interspecies hybrid between *C. miniata* and *C. gardenii*

Fig. 3. Backcross of a *C. miniata* x *C. gardenii* F1 to the *C. miniata* parent

Fig. 4. Backcross of a *C. miniata* x *C. gardenii* F1 to the *C. gardenii* parent

these Eastern populations, there are a few small pockets of *Clivia* that grow in forests more to the West of the country. These *Clivia*, which were only recently described as *C. mirabilis*, are ecologically separated from the *Clivia* in the East. This separation and isolation cannot be described as recent. Variation between these few populations of *C. mirabilis* is high due to their relatively recent ecological isolation from each other. However, the small number of plants in the total population, similarity among plants in this harsh environment and the differences compared to other *Clivia* in the East precludes any further differentiation within the species.

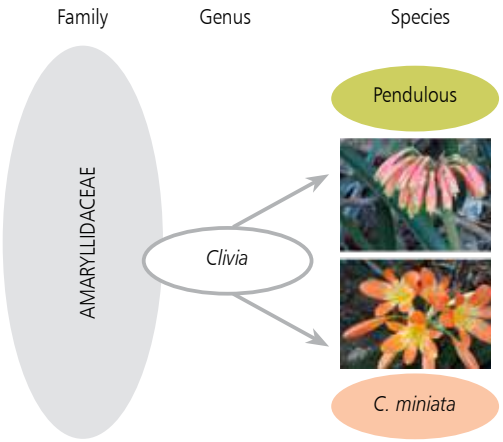


Fig. 5. Classifying *Clivia* based on pollinating agent

3) Flowering time

Let us consider for now only the pendulous groups growing in the strip along the east of South Africa. The populations growing to the south and those growing to the far north of this strip flower in spring, from October to December. These are separated by a group that flowers in autumn. The separation is distinct with no overlap in spring or autumn flowering populations. To the south we find *C. nobilis* which is adapted to harsher environments, thrive in bright light and generally grow in sandy soils. The leaves of these plants are tough and often V-shaped when drought stressed, an adaptation to possibly funnel water to the roots. Furthermore, leaves are serrated along the edges and typically notched at the tip. To the north we find *C. caulescens* which grow in shade and prefer leaf litter and humus rich substrates in order to thrive. Although leaf morphology of this group is variable, the leaf tip has a slight bulge, in contrast with the notch of *C. nobilis*. The group growing in the Natal area is variable in morphology but flowers in autumn to early winter. The distribution of *C. miniata* overlaps with all of the pendulous populations in the East. Very few natural hybrids have been recorded most likely due to the flowering time that seldom overlaps as well as the mode of pollination which differs. In contrast to the

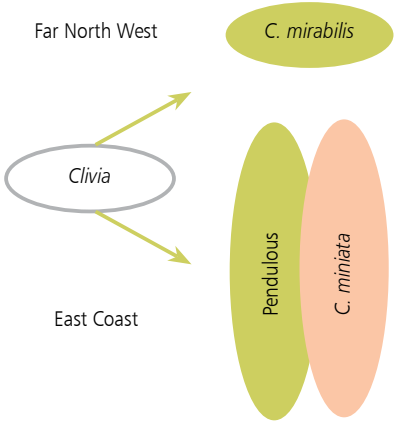


Fig. 6. Classifying *Clivia* based on distance

Fig. 7. Leaf tip morphology of *C. nobilis* (left), *C. caulescens* (right)

pendulous *Clivia* in the East, *C. mirabilis* flowers in summer.

4) Adaptation

C. robusta is regarded as a robust form of *C. gardenii.* Many ecologists believe that the motivation and decision to class it as a different species is not warranted. This seems to be a valid point if we only consider the three criteria for limiting interbreeding, namely pollinating agent, isolation and flowering time. In nature most mature *C. robusta* plants are large as vigour is a requirement for survival in the marshy environments where they occur. We often find that many habitat collected *C. robusta* plants do not set seed when self-pollinated. Furthermore, those that do set seed after selfing produce offspring that do not exhibit the rapid growth or large plant size of the parent plant but have the typical appearance of *C. gardenii.* A cross pollination between two different *C. robusta* clones yields many seedlings which quickly grow into outsized specimens. The assumption is therefore that this species is surviving by maintaining hybrid vigour gained from outcrossing. Outcrossing is assisted by pollination self-incompatibility.

Fig. 9. A *miniata* type, but would it survive in *C. miniata* habitat?

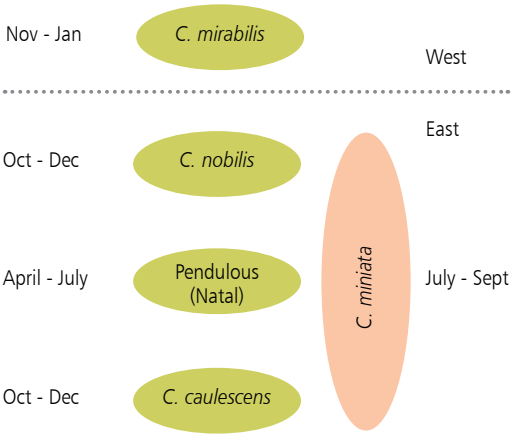


Fig. 8. Classifying *Clivia* on flowering time

Plants in the wild are regarded as species

Mature plants in nature have survived natural selection and can truly be called representative of the species. If we

Table 2. Summary of Clivia classification based on potential to interbreed

Species	Mode of pollination	Spatial separation	Flowering time	Adaptation
C. miniata	Moths & Butterflies	East	July-Sep	Self-compatible
C. nobilis	Hummingbirds	East	Oct-Dec	Self-compatible
C. robusta	Hummingbirds	East	Apr-June	Self-incompatible
C. gardenii	Hummingbirds	East	Apr-June	Self-compatible
C. gardenii (Ngome)	Hummingbirds	East	June-July	Self-compatible
C. caulescens	Hummingbirds	East	Oct-Dec	Self-compatible
C. mirabilis	Hummingbirds	West	Nov-Jan	Self-compatible

take seed from these plants and grow them in a garden or greenhouse environment most survive to adulthood but many do not possess the attributes that would have allowed them to survive in their natural habitat. The preceding discussion on *C. robusta* presents a good example of this. Most seedlings from a selfing and even cross between *C. robusta* clones would not have survived in the natural marshy environment where the species occurs. We can even go so far and assume that a "wilding" or seedling collected from nature may not be a true representative of the species as the plant still has to survive to adulthood.

Only mature habitat collected plants and offsets taken from these can be regarded as species. Most of our *miniata* type *Clivia* are separated from the *C. miniata* species by several generations of open pollination or directed breeding. Many even have the odd pendulous parent concealed somewhere in their seemingly noble lineage. Plants that originate from seedlings grown out of habitat are to be regarded as domesticated *Clivia* and be called hybrid *Clivia* as is the norm in many other ornamental plants and crops in cultivation to discern them from their habitat-collected counterparts.

Supporting molecular evidence for *Clivia* species classification

Molecular phylogeny studies have shown that the *C. mirabilis, C. nobilis* and *C. caulescens* groups can easily be distinguished from each other. *C. gardenii, C. robusta* and *C. miniata* form a super-group with very little DNA evidence that supports differentiation into separate species. Furthermore, DNA analysis shows that *C. miniata* more than likely developed out of the *C. gardenii* super-group. The natural interspecific hybrid (*C.* x *nimbicola*) plants that we find at the Bearded Man site in Limpopo are the advanced generation progeny of hybridisation between *C. caulescens* and *C. miniata* and not a new open flower *miniata* type forming out of the *C. caulescens* species. Past gene exchanges from *C. nobilis* and *C. caulescens* into *C. miniata* has also been revealed by DNA analysis. This supports the observed variation that we see at numerous *C. miniata* locations. For instance the leathery leaves of Pondoland *miniata* are likely the result of a historic hybridisation event with *C. nobilis*. Similarly, the thick rhizome-like stems of *C. miniata* from Northern Limpopo is the result of a past hybridising event with *C. caulescens.*

Further grouping

Clivia in the wild grow mostly as isolated patches in certain indigenous forests of Southern Africa. Even within a forest, *Clivia* form groups in ravines and on river banks. These patches are becoming smaller, fewer and far between due to deforestation, development and habitat destruction. Many of these populations have become so isolated that they have started to divert into different types with characteristics that distinguish them from the norm for the species. This differentiation from the standard originates from either mutation or gene contamination from natural hybridisation with another *Clivia* species. The divergence into

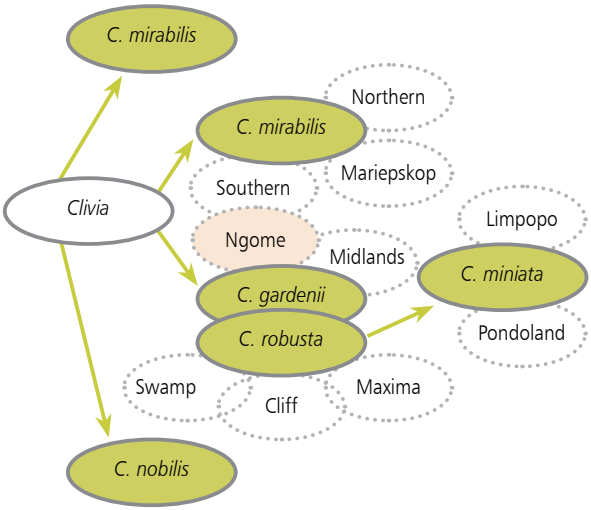


Fig. 10. Recognisable groups within species

C. gardenii

F1: *C. miniata* x *C. gardenii*

Ngome *C. gardenii*

F1: *C. miniata* x Ngome *C. gardenii*

Fig. 11. Characteristics of typical *C. gardenii* and Ngome *C. gardenii*

a different group is driven by natural selection pressure or genetic bottle-necking. Natural selection is based on the concept of survival of the fittest; bottlenecking describes the process where atypical characteristics become more prevalent due to chance selection in small populations. Examples of these discernible groups within a species are depicted in Fig. 10. Many of these groups have been recognized by molecular phylogeny studies. The variation in some of these groups can be explained by gene movement from historic interspecies hybridisation events. For example, *C. miniata* plants from the Northern parts of Limpopo exhibit the elongated stem and bulge on the leaf tip which is characteristic of *C. caulescens.* Other types are due to natural selection within the habitat. For instance, *C. robusta* can be grouped as cliff, swamp or maxima types based on growth habit, positioning or form.

In the taxonomy profession we find those who want to have as few groups as possible and those who believe that diversity needs to be documented by making as many distinct groups as possible. The "lumpers" base species classification on breeding isolation alone. The

"splitters" also base classification on isolation but take dissimilarities for observable traits between populations into consideration.

I personally am partial to the idea of the grouping into species based on breeding isolation only. The current groups that we see may at some point in time become so far separated from the norm that they can then be regarded as populations with distinctive breeding strategies. A subspecies refers to a group within a species that has become reproductively isolated and is developing adaptation strategies that differ from the parent species. In my view, the group that currently has this potential to be classed as a subspecies is the Ngome *C. gardenii* group.

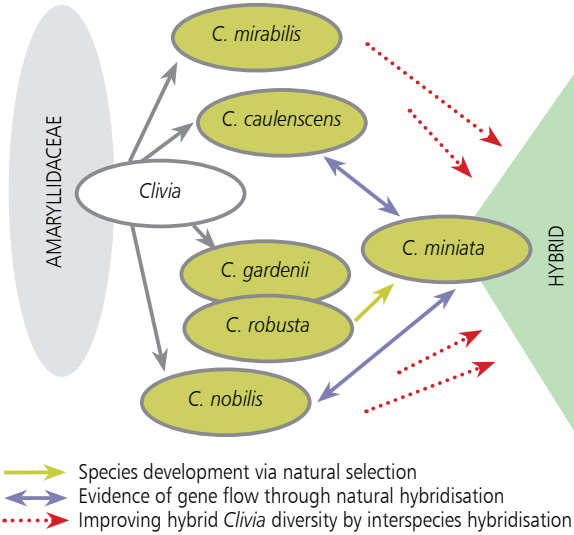


Fig.12. Species classification in *Clivia* and subsequent domestication

Ngome *C. gardenii* are distinguishable from typical *C. gardenii* in that they have a higher flower count, have flowers that are generally lighter in colour and have a characteristic flared tip on the tepals. These characteristics are even present in the interspecific progeny with *C. miniata.* More importantly, Ngome *C. gardenii* flower in July, where most *C. gardenii* flower in April to June. Ngome *C. gardenii* do not form a discernible group in molecular phylogenetic studies; some samples group with the *C. gardenii* cluster, whereas others form a separate grouping with certain *C. caulescens* samples. Ngome *C. gardenii* is therefore either a subspecies from the *C. gardenii* group which has pilfered characteristics from *C. caulescens* through a historic hybridisation event or is an intermediate pendulous form that shares the same ancestor of both the *C. caulescens* and *C. gardenii* group.

Concluding remarks

Refer to Fig. 12 where the development of *Clivia* species is illustrated and gene flow exchanges are depicted.

There is merit in the present classification of the *Clivia* genus into six species as this partitioning adheres to the guidelines of using breeding isolation for grouping into species. Further grouping into types is valuable to the *Clivia* enthusiast and breeder as it facilitates the planning of propagation, husbandry and breeding.

The development of new species is not always a simple linear progression from a single ancestor as many scholars believe. We find that gene flow has and still is occurring between *Clivia* species. This gene exchange is helping *Clivia* adapt by increasing the pool of genetic variation for natural selection to work. However, some traits are being accumulated as a result of chance segregation due to small population sizes.

Clivia in cultivation should be regarded as domesticated *Clivia* and therefore be noted as hybrid *Clivia.* Although the domesticated *Clivia* originated from habitat collected *C. miniata* plants, gene introgression from the pendulous species has played an important role in improving aesthetic value and increasing genetic variation in our plants.

Taking plants from nature - reflections and a warning

By Felix Middleton

The South African Biodiversity Act (BIODIVERSITY ACT 10 OF 2004) forbids picking parts of, cutting, chopping, uprooting, damaging or destroying any specimen of a listed threatened or protected species. This precludes therefore the taking of any *Clivia* plants or parts of plants from the wild as this genus is listed as either threatened or protected (refer to Table 1). Furthermore and more importantly, the Clivia Society does not condone any activities that contravene this legislation!

A species is classed as Vulnerable when the best available evidence indicates that it is facing a high risk of extinction. A species is classed as Near Threatened when available evidence indicates that it is likely to become at risk of extinction in the near future. Species of conservation concern are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity.

We generally motivate our transgressions of this Act by redirecting attention to the decimation of whole populations by unscrupulous muti collectors or by the ever encroaching urban development. There are different reasons for a *Clivia* enthusiast to step over the line; we may want to rescue plants, collect for study, try to improve the germ pool in our collection, retain a keep-sake or worst of all, plunder to sell to others. Let us evaluate these offenses individually:

Fig. 13. Zululand April 2011: Yellow form of *C. gardenii.* This population has been fragmented and is now isolated due to deforestation.

Collecting for herbarium specimens and study

This practise should not be attempted by the novice enthusiast. SANBI has projects in play where plant specimens from different locations

Table 3. SANBI Red list classification of *Clivia* species (http://redlist.sanbi.org)

Species	Category	Ranking	Standing
Clivia caulescens	Near Threatened		
Clivia gardenii	Vulnerable		
Clivia miniata	Vulnerable		
Clivia mirabilis	Vulnerable	Threatened	Conservational concern
Clivia nobilis	Vulnerable		
Clivia robusta	Vulnerable		

Table 4. Clarification of genotype descriptions

Habitat specimen	Plant taken from the wild
Habitat clone	Sucker of, or stem cutting from a wild plant.
Wilding	Often seedlings that are growing close to an exceptional plant in the wild are taken as they may mature to have the attributes of the parent. Ultimately also classed as habitat specimens.
Domesticated *Clivia*	*Clivia* in the wild have undergone cycles of natural selection and are adapted to grow and multiply in a specific environment. We as enthusiasts do not apply natural selection during breeding as we are only interested in enhancing aesthetic attributes. The domesticated *Clivia* can be regarded as superior for these attributes but inferior for ecological adaptability.
Hybrid *Clivia*	A domesticated *Clivia* originating from interbreeding *Clivia* in the garden or greenhouse. Refers to the *miniata* type (open flower) forms of the species.
Clivia hybrid (Interspec)	Generally denotes the outcome from a first generation interspecies cross. Progeny from these interspecies crosses are often classified as *Clivia* hybrids if the flower form permits it. Pendulous and semi-pendulous forms are classed as advanced generation interspecies crosses.

are collected for study. They are meticulous in their data-gathering and will not collect specimens if they are not needed. The general public may help by submitting pictures and details to the official website (http://www.ispot.org.za). To those who submit pictures to I-SPOT, be aware that pictures taken by the newer generation cell-phones are imbedded with GPS coordinates. Although this feature can assist SANBI with pin-pointing populations, this opens up a backdoor for unscrupulous collectors to locate that special plant that you observed in nature. Several universities also collect specimens for study. The red tape to gain permission for collecting is often a problem, even though sampling for DNA or biochemical analysis is seldom destructive.

Fig. 14. Midlands September 2014: Pink *C. miniata* in a remote, seldom visited kloof. This habitat, although surrounded by Eucalyptus forests, is safe due to its seclusion.

Rescuing plants

Many *Clivia* populations are being ruined by development, deforestation for agricultural, forestry and mining interests as well as harvesting for the muthi and landscaping markets. We often hear of and see images of charred trees due to deforestation for agricultural development in far-off locations like Brazil. Many of us are not aware of what is happening in our own neck of the woods. Here in Natal I have seen two small *C. gardenii* populations being destroyed by fires due to deforestation for grazing purposes. In the Transkei, populations of *C. nobilis* are being displaced by mining projects. In view of this we often want to take plants out of these situations and either move them to other sites

Fig. 15. Transkei October 2014: *C. nobilis* in habitat. This population is being visited by collectors; very few mature plants are left.

or just simply keep them. There are formal channels whereby you can obtain permits for such translocations. These permits are not easily obtainable by the general public and the process of approval is slow. An example of this dilemma is here in Greytown where a population of *Aloe boylei* was being bulldozed during the process of widening a road out of town. Concerned residents wanted to remove the plants and move them further away from the roadside only to be told it was illegal without proper permits or environmental assessments. Needless to say, many of these stunning plants were destroyed. Miraculously, a few of the larger specimens did relocate themselves further away from the road shoulder one misty morning.

Fig. 16. Sabi October 2014: *C. caulescens* in habitat. This site is part of a seldom visited walking trail. *Clivia* here are thriving.

Fig. 17. Ngome forest July 2012: *C. gardenii* population pilfered by poachers. Although this site is known to be visited by muthi collectors, they generally take whole plants when pursuing *Clivia*. This is therefore the work of an enthusiast or collector. The insert is that of a picture taken near the site in June 2012.

Improving our *Clivia* germ pool

It is a well-known fact that the progeny from a cross between a hybrid *Clivia* and a wild habitat specimen is often superior in appearance. This phenomenon can be attributed to the potential hybrid vigour of crossing unrelated materials but also due to adding new traits to the germ pool. The term "hybrid *Clivia*" is used here to distinguish the domesticated *Clivia* from its wild habitat counterpart.

There is absolutely no reason to take plants from nature when trying to broaden a specific collection's germ pool. We have many breeders and nurseryman out there who possess legally gained heritage collections of superior habitat specimens. There are very few novel traits still out there in nature, most are either already segregating in our comprehensive germ pool or are locked up in rarely used heritage collections. An enthusiast has many sources of legal germ plasm to draw from as breeders and nurserymen are more than willing to share their knowledge and plant-material.

Collecting just for the sake of having or to retain a souvenir from a visit:

Offsets and even seed-grown plants from all species are currently available at affordable prices. I have seen mature garden variety *C. caulescens, C. gardenii, C. nobilis* and even *C. robusta* at prices similar to those of average yellow *C. miniata*. Contact any breeder and they will be very helpful in supplying or directing you to a retailer that will be able to supply you with such plants. There is therefore no reason for taking a plant from nature just to be able to say that you have a wild specimen. If the urge to keep a souvenir becomes unbearable, take one seed but know that you are accountable if caught. Never take a plant, be it mature or a wilding. A mature plant has survived natural selection and has a right to be there.

Collecting for selling

As explained, we possess a near-exhaustive range of variation already in cultivation. If you are collecting just to sell a specific type (such as Transkei broad leaf orange *C. miniata*), please re-think your actions as these variations are already in cultivation and your actions are highly illegal. I specifically refer to this type and hope those "skoffelaars" disturbing the population along the Qora River will heed this warning. This is one of the few easy accessible *Clivia* populations that many enthusiasts as well as general hikers visit and admire. We cannot

Fig. 18. Hermannsburg August 2014: *C. miniata* in habitat. No two plants in this small secluded population are the same. The plants are protected on a privately owned, well managed farm.

allow it to be pilfered.

I acknowledge that there is a well-established muthi trade and reluctantly accept that we will need to make peace with this practise. But taking plants to sell either to breeders or to landscapers is unacceptable.

For those of you buying plants, make sure you purchase from a reputable nurseryman or breeder. If you are knowingly buying a habitat collected specimen, you are promoting poaching. Remember that if caught, you, as the buyer, are also liable to fines.

Confessions of an overzealous enthusiast

As many enthusiasts, I do have in my collection "one or two" less than legal specimens. These are mainly from the fanatical first years of the hobby when I collected seeds from any spectacular looking wild plant. Most of the seeds germinated and many seedlings made it to adulthood. Unfortunately I am now burdened with numerous inferior looking *Clivia* that are only taking up space or have been translocated to the garden. I still visit natural populations but instead of collecting seeds I only take pictures.

In conclusion, the consequences of our deeds are not always as insignificant as what we assume. By ignoring legislation and laws, we as *Clivia* custodians not only kill plants, we also lower our own ethical standards and more worryingly indicate to those who look up to us that we do not respect authority.

CONFERENCE 2014

Best On Show Gem Wild Flowers

2nd Best on Show Liz Boyd

Best on Show 3rd Sean Chubb Thurlow Farm

Best Akebono Flower Sean Chubb

Best Akebono No Flower Brian Tarr

Best Any Other Colour Sean Chubb

Best Apricot Salmon John Handman

Best Broad Leaf Flower Gem Wild Flowers

Best Broad Leaf No Flower Val Thurston

Best Green Throat Hirao Sean Chubb

Best Green Throat Orange Liz Boyd

Best Green Throat Other Colour Sean Chubb

Best in Fruit Val Thurston

Best Interspecific Brian Tarr

Best Miniature Flower Liz Boyd

Best Miniture No Flower Gem Wild Flowers

Best Most Unusual Flower Sean Chubb

Best Orange Gem Wild Flowers

Best Orange Red Sean Chubb

Best Pastel Sean Chubb

Best Peach European Gem Wild Flowers

Best Peach SA Liz Boyd

Best Picotee Sean Chubb

Best Pink Gem Wild Flowers

Best Plant Member Bred Liz Boyd

Best Pot Plant Sean Chubb

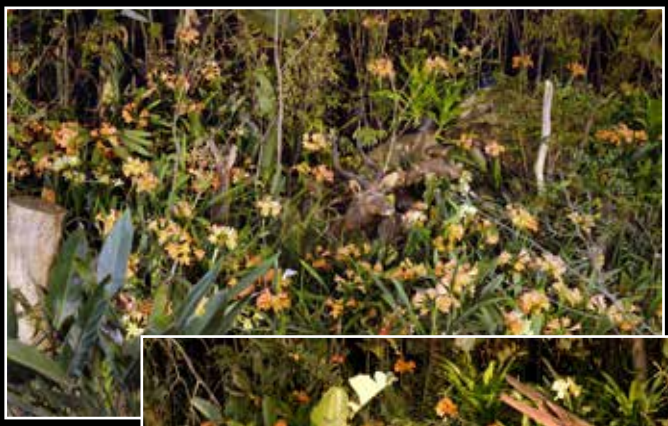
Best Spider Sean Chubb

Best Variegated in Flower Sean Chubb

Best Variegated No Flower Gem
Wild Flowers

Best Versi Colour
Louis Lotter

Best Yellow 2 umbels Sean Chubb



Display 1

Display 2

Prize Winners

Display 5

Display 3

Display 4

Variegated Leaf With Flower Class

CLUB SHOWS

Border Clivia Club Show 2014

By Peter Miles

Glenn Miles won more prizes than anyone else. Our flowering was very late last year and as a consequence, we had less entries than usual and the quality of blooms was also negatively affected.

Glenn Miles (CLASS PINK)

Glenn Miles (CLASS PINK)

Glenn Miles Green (RUNNER UP)

Glenn Miles Appleblossom (Judge's Choice)

Glenn Miles, wife Barbara & grandson, Miles Sansom behind

Wayne Haselau on left

Lovely orange - owner unknown

Rodney Ellis - Best Multipetal

Cape Clivia Club Show 2014

By Felicity Weeden and photos by Claude Felbert

The Cape Show was again successfully staged in the very attractive venue in Tygervalley Shopping Center. Two hundred and eighty five plants were benched by 24 exhibitors. It was encouraging to note that there were new names among the exhibitors and also among the winners.

The judging was interesting as there were three new judges, namely Carrie Kruger from George, Andre Swart and Leon Blom from the Cape, two experienced judges, and Micky Hoctor who ran the whole procedure, providing guidance where necessary. The Cape no longer allows a member to bench plants and also to be a judge, as has been the norm in the past.

People's Choice again proved interesting and popular, and the top five plants, while including two from the Best on Show table, did not include the Best on Show. People's Choice Winners were:

Winners: Dave and Colleen Garriock (also 1st Runner Up), and Clayton Jonkers (Appleblossom), Felicity Weeden (Peach also 2nd Runner up), Tony Trew (Orange), Felicity Weeden (Yellow).

Appleblossom Q5 x Q6 Ian Brown

This year, for the first time in the Cape, a trophy was awarded for Best Leaves on Show and was won by Pieter Kok. Plant sales were brisk and as usual we had some of the George members with us who benched some interesting plants and also had attractive plants for sale.

Andrew Gibson Habitat Dave Garriock

Selection Kirstenbosch 2014 Tony Trew

Selection Kirstenbosch 2014 Ken Smith from Nakamura

Selection Kirstenbosch 2014 Tony Trew

Selection Kirstenbosch 2014 Piet's Bronze Clayton Jonkers

Selection Kirstenbosch 2014 Luke's Special Eric Clur

Many fine plants were on display and the winners were:
Best on Show – Gideon and Lorraine van Zyl
1st Runner Up – Dave and Colleen Garriock
2nd Runner Up – Felicity Weeden
Best Leaves – Gideon and Lorraine van Zyl
Best Own Breeding – Felicity Weeden
Blazer Trophy for Best Peach – Felicity Weeden

Selection Kirstenbosch 2014 Chiffon's Daughter Eric Clur

Selection Kirstenbosch 2014 John van der Linde x G v Wyk Multipetal green throat Ian Brown

'Cameron Peach' x 'Victorian Peach' Ian Brown

Selection Kirstenbosch 2014 'Mbashe River Habitat Pink' John Winter

Selection Kirstenbosch 2014 'Roly Strechan White Throat' x 'Tienies Treasure Green Star' Simon Walker

Selection Kirstenbosch 2014 'Molly' Gideon van Zyl

Selection Kirstenbosch 2014 'Tienies Treasure' Alleta van der Merwe, Clayton Jonkers

Red Gideon and Loraine van Zyl

Red Orange Broad Tepal 35mm+ Gideon and Lorraine van Zyl

Right: Light Yellow Tony & Rhoda Trew

Bronze Green Throat Frans & Elise Mouski

Red Orange Broad Tepal 35mm+ Gideon and Lorraine van Zyl

Multipetal Koos Bredenhand

Peach and 2nd Runner up to Best on Show
Felicity Weeden

Broad Leaf Gideon & Lorraine van Zyl Best on Show Leaves

Compact Variegated Gideon & Lorraine van Zyl

Broad Leaf Variegated Felicity Weeden

Novice Sydney &
Marlene Cywes

Bicolour
Felicity Weeden

Interspecific flared Clayton & Natalie Jonkers

Own Breeding Felicity Weeden with green center stripe

Interspecific *miniata* type Dave & olleen Gariock

Plants displayed at the show

Set-up of the 2014 Cape Clivia Club Show

Winners' Table

Eastern Province Clivia Club Show 2014

By Dawid Botha (Show Chairman)
Photographs taken by Marius Meyer

Our show was held at Sherwood Garden Centre on 27 and 28 September 2014. Pre-show jitters and whispers that most of the *Clivia* were done flowering in Port Elizabeth made us all very nervous on the up-coming show but nerves started to relax as soon as the entries flowed in. I must thank the committee and volunteers who battled to transform chaos into something to be proud of. Although the weather did not play along, no one minded since we needed the rain. The show was well supported by all *Clivia* enthusiasts.

The panel of judges was Peter Miles, Mark Joubert and Dawid Botha. The learner judge attending was Marius Meyer. Congratulations to our winners and great thanks to one and all who entered their plants for the show. Without you there will be no show. We also want to thank all the visitors and friends from other clubs who also showed some of their plants.

Best Beginner - Tienie Williams

2014 Show Winners' Table

A total of 155 plants were entered and the winners table was made up as follows:

Best on Show:	*Miniata* orange broad tepals	Lester De Beer
Runner up to Best on Show:	*Miniata* dark peach	Marius Meyer
Second Runner up to Best on Show	Seedling flowering first time	Johan Mostert
Best Beginner:	*Miniata* orange	Tienie Williams
Runner up to Best Beginner:	*Miniata* orange	Bennie Butler
Judge's Choice:	*Miniata* green (Maud)	Charl Malan
People's Choice:	*Miniata* light peach 2 umbels	Marius Meyer

Judge's choice (Maud) - Charl Malan

A special thanks to all our sponsors and for the donations (plants and seeds) received in aid of the club.

Thanks to Willie Le Roux, our Chairman, who captivated the public with his informative display and talk on "'The germination and cultivation of *Clivia*" and for answering questions from the public that kept him occupied far longer than anticipated. We trust that he will be available for next year's show.

The sales stalls were also brimming with flowering *Clivia* and well supported by the public. As usual the quality and unusual plants were spotted first by the discerning eye and quickly sold at bargain prices. We had 15 exhibitors and the wide variety of quality plants challenged the judge's decisions on who will ultimately walk

People's Choice - Marius Meyer

away with Best on Show. I must take this opportunity to thank all the willing souls who helped before, during and after the show. It is your help that made it a success. We also want to thank the judges for their effort and time invested in our club and in the learner judge.

Runner up Best Beginner Bennie Butler

Runner up to Best on Show - Marius Meyer

As usual we had a lovely function at the Koi-san on the 27th, the Saturday night, that was well attended. The show and the results were discussed over a glass of wine and a display of delicious food, where after the trophy award ceremony followed. The auction was well supported and the highest bidders were announced.

The show ended on Sunday and all plants were safely removed by the owners, without incident. The show was a wonderful event and apart from the array of stunning plants on show to the public, we had a chance to catch up with old friends, made new friends and we are looking forward to the next show with great anticipation.

Finally, we would like to thank Sherwood Garden Centre for making this facility available to us and the caterers for the excellent snacks provided.

Seedling Flowering first time - Johan Mosterd

Show flowers on display and banner

Garden Route Clivia Club Interspecific Show 2014

By Carrie Kruger

The Garden Route Clivia Club Interspecific show took place on Saturday, 26 July 2014. There were some beautiful plants on display and it was a big success. Thank you to all the members who attended and to all who displayed their lovely flowers. We see more exceptionally beautiful hybrids that are emerging from the enthusiastic breeders every year and look forward to the 2015 show.

Interspecific Show Display

Interspecific show winners, from Left, 1st runner up, Silver, Kerneels Buitendag, Best on Show, Gold, Dr. Piet Theron, 2nd runner up, Bronze, Carrie Kruger

2nd Best on Show Kerneels Buitendag

Best on Show 2014
Dr. Piet Theron

Our judges were Koos Geldenhuys and Rita van Vuuren. The 2014 winners were as follows:

1st place – Dr. Piet Theron, with a beautiful versicolour.

2nd place – Kerneels Buitendag with a very unusual green interspecific.

3rd place – Carrie Kruger with a lovely bi-colour.

The show was well attended with more than 50 members present. Dr. Piet Theron gave the club an interesting talk about his aims in breeding *Clivia*. The winners were announced and trophies handed over after the talk. Refreshments were served and everybody admired the beautiful flowers on display.

Members' Favourite and 3rd best on show - Carrie Kruger

Garden Route Clivia Club Show 2014

By Gordon Fraser

Karl Rost

Rickie & Noelia

Best on Show Bronze
Piet Theron

Best on Show Own Breeding Ricky & Noelia Jardim

Piet & Jeannette Theron

Best on Show Gold Gerhard Faber

Best on Show Silver Piet Theron

Gerrit van der Merwe

Show hall

Winners' podium

Joburg Clivia Club Show 2014

By Glynn Middlewick, photographs by Danie Pretorius

The annual show is the highlight of the Joburg Clivia Club calendar. We all look forward to what the members will bring along to the display tables.

Our Show was again held at the Garden World Nursery. The display of various blooms on the show tables was appreciated by the visitors to the show. The judging took place on the Friday evening. The top five plants in the flowering category were of exceptional quality and thus the decision for the winning places was not easy for the judges to decide on.

Best on Show

Flower 3rd best

The Best on Show winner was given to Neil Rossouw. Neil is a relatively new member and this is his second year as an exhibitor. His bloom, Hirao, is the first occasion that the Joburg Clivia Club has awarded the top prize to a green flowering *Clivia*.

A close runner up to the Best on Show was an impressive orange *miniata* bloom of Pikkie and Elize Strumpher.

Second runner up to the Best on Show was awarded to Corra and Dawie van Heerden for an exceptional yellow *miniata* bloom.

Runner up flower

The awards for the non-flowering *Clivia* were to Corra and Dawie van Heerden for both the Best on Show and the runner up to the Best on Show. The second runner up to the Best on Show for non-flowering *Clivia* was to Gerda Gers. The Joburg Clivia Club congratulates all show entrants and thanks them for their participation.

Winner 'Hirao' – Neil Rossouw.

Runner up Orange – Pikkie and Elize Strumpher.

Third best on show Yellow – Corra and Dawie van Heerden.

Lowveld Clivia Club Show 2014

By Greg Jones

2014 was an extraordinarily successful year for *Clivia* Kingdom, having taken all the honours in the Interspecific, pendulous and *Clivia* without flowers sections. Best on Show, 1st and 2nd Runner up in both categories were awarded to Paul and Sue Kloeck.

The annual *Clivia miniata* Show was held at the Lowveld Show Grounds in the Poultry Hall. Head Judge, Henrietta Stroh, heard about the change in venue from the Botanical Gardens to the Poultry Hall and arrived appropriately dressed in a top depicting a guinea fowl! A green-throated pastel with large flowers and a perfectly spherical umbel bred by Paul Kloeck was awarded Best on Show. This plant stood head and shoulders above the rest, not just in beauty, but also in stature. The 1st Runner

Clivia Show 2014

Up was also bred by Kloeck and this was a lime green-throated watermelon-coloured pastel *Clivia*. The 2nd Runner Up was Willem Froneman's 'Bronze Green Boy' offset.

Clivia Show 2014

Clivia Show 2014

Paul & Sue Kloeck

Show winners

New Zealand Clivia Club Shows

By Tony Barnes

The main events of the year for the club, naturally, are the three shows, Auckland, Tauranga, and Lower North Island, which alternates between Palmerston North and New Plymouth. There are usually about 100 – 150 plants on exhibit depending on the season. The club does not have competitive shows, but has a People's Choice Award, which is the bloom that receives the most votes from the public attending the show. The 2014 winners from Auckland (a lovely green throated bronze) and Tauranga (an Hirao Green) were both grown by Jude Coenan of Tauranga, and Kevin Luff of Wanganui took the Lower North Island award with a beautiful

'Green Envy', Jude Coenan People's Choice Tauranga Show

Kevin Luff Red, People's Choice 2014 Lower Nth Island Show

Jude Coenan, People's Choice 2014 Auckland Show

Overberg Clivia Show 2014

By Felicity Weeden

Despite the fact that the show was very late in the season, and that sleepless nights were experienced worrying that there would not be enough plants to put an acceptable display together for the public, we succeeded again. There were also one or two very unusual and interesting plants which added interest for the regular Clivia Club members. We also had an attractive display of single *Clivia* florets arranged in a flat vase (Figs. 19 - 21).

Bearing in mind that we have very few exhibitors, a satisfactory 118 plants were benched. We are grateful to Pieter Kok from the Cape who benched a good number of plants and won 2nd Runner up to Best on Show and also 1st Runner Up – Leaves.

We decided to run a judging school instead of having formal judges. Unfortunately all those who expressed interest in the idea didn't turn up and we were left with a difficult situation of one judge (who had many plants on show). The dilemma was solved when two Overberg members and one member from the Cape, supervised by the resident judge, took turns nominating and all decisions had to be unanimous. Basically, it was consensus judging by experienced *Clivia* growers/enthusiasts. It was an interesting experiment and went very well and quite quickly. The only area of concern was the choice of 2nd Runner Up, but after some discussion, this was also cleared up.

In order to try and encourage members to exhibit, we offered a prize of an embossed glass to each exhibitor. Although the idea was enthusiastically received, it didn't serve the purpose of getting more members to exhibit!

This year, due to the suggestion of a visitor at last year's show, a new poster was produced describing the travels of the *Clivia* around the globe, and also the specialities that the various countries have developed. This proved to be

Fig. 19. Something unusual Overberg 2014

an interesting addition to our collection of informative posters.

The winners at the Overberg Show held at Hermanus were as follows:

Best on Show – Felicity Weeden
1st Runner Up – Felicity Weeden
2nd Runner Up – Pieter Kok
Best on Show – Leaves – Gerrit Rohlandt
1st Runner Up – Pieter Kok
2nd Runner Up – Felicity Weeden
(Fig. 22 and 23)

Peoples Choice:

1st – Felicity Weeden – Yellow
2nd – Pieter Kok – Orange
3rd – Felicity Weeden – Pastel (Fig. 24)

The Overberg members pulled together as a team, but special thanks must go to Alex Sherriff, once again, for his enormous input during the show and Gerrit Rohlandt for getting the staging set up, among other onerous tasks.

Fig. 21. Single Floret Display Overberg 2014

Fig. 23. Winners Overberg Show 2014, Pieter Kok

Fig. 20. Very unusual Overberg 2014

Fig. 22. Winners Overberg Show 2014

Fig. 24. People's Choice Back 1st, Pastel 2nd, Orange 3rd

Free State Clivia Club Show 2014

From left to right: Stef de Swardt, Stefan Ferreira, Kobus Botha

Kobus Botha Runner up

Stefan Ferreira
Best on Show
Pink Pastel

Kobus Botha
Runner up

North American Clivia Society Clivia Show 2014

By Alan Petrovich and Malcolm Shrimplin

Longwood Gardens introductions (from left) *Clivia miniata* 'Longwood Debutante', *Clivia miniata* 'Longwood Sunrise', and *Clivia miniata* 'Longwood Fireworks'

The Huntington and Botanical Gardens: Large Throated Watercolour, entered by Manuel Morales - Plant Horizons

The Huntington: Variegated Yellow, entered by Manuel Morales - Plant Horizons

The Huntington: Non-variegated Yellow, entered by Manuel Morales - Plant Horizons

Best in Division III, Interspecific hybrids, Class 12, Any interspecific hybrid, Entered by Mike Riska *C. miniata* X 'Day Dream'

Longwood Gardens: Best in Division VI Longitudinal Variegation, Class 17, Striped Leaf-Shima-Fu, entered by Damon Smith, *Clivia miniata*

The Huntington: People's Choice Second Runner-up

The Huntington: People's Choice Winner Manuel Morales - Plant Horizons

The Huntington: Best Flower arrangement

The Huntington: Best in Foliage Category, Donald Todd

NACS show at Longwood Gardens

Northern Clivia Club Clivia Show 2014

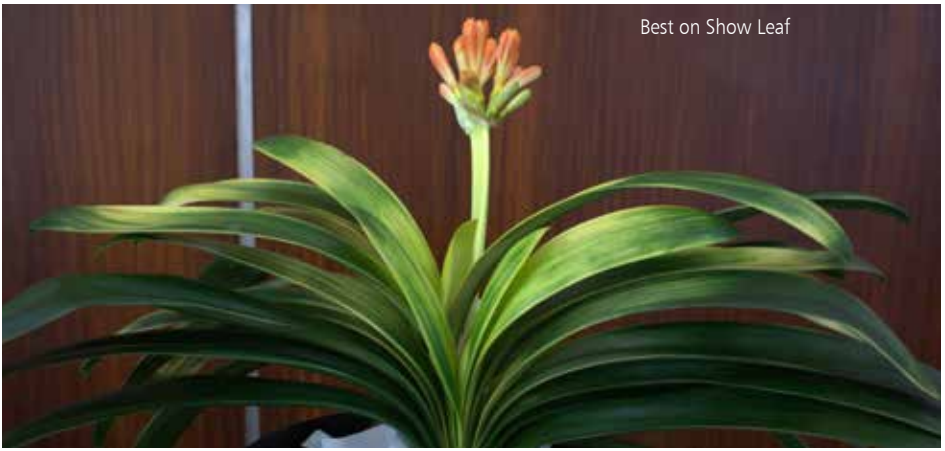
By Rudie Koekemoer

NCC Show winner 2014, 'Frenchy' – breeder R Lotter, grower Pieter Saayman & Michael Holt

2nd Runner up, Leaf

Runner up, Flowering plants

2nd Runner up, Flowering plants



Best on Show Leaf

ARTICLES

Return to the wild – September 2104

By Felicity Weeden (Photos by Felicity Weeden and Hein Grebe)

With the advent of the 2014 Clivia Conference in Pietermaritzburg, KwaZulu Natal, the opportunity presented itself to travel by road to Pietermaritzburg and visit some *Clivia* habitat locations along the way.

The first excursion into the wild was Lalapanzi near Morgans Bay. After a long walk through waist high grass, we entered the forest and a *Clivia* habitat location.

This proved to be a wonderful start to the trip as we came upon an absolutely incredible sight. Here was literally a vast forest glade of *Clivia* in full pristine bloom, a sight of absolutely awe inspiring beauty. Here were *Clivia* growing in full bloom on the huge granite boulders, *Clivia* growing on ancient twisted trees, in dead trees, *Clivia* everywhere, interspersed with enormous clumps of agapanthus unfortunately not in bloom. On the rocks grew all manner of ferns and on the tree branches, orchids. Despite the drought, the little blue and white streptocarpus found only on the rocks, were in full bloom (Figs. 25 - 32).

Along the banks of the river, with palm trees, kiepersol, yellow woods and many others providing shade and cool, grew *C. nobilis* in full bloom. In the rocky river bed tucked between the big blacks rocks grew dainty green maidenhair ferns. It was an absolutely magical setting with the musical tinkling of trickling water. The soft susurration of the trees, birdsong and the occasional harsh cry of a hunting raptor provided peaceful and varied

Fig. 25. Famous Karkloof

Fig. 26. *Clivia* growing on a tree stem

music for us and the *Clivia* (Fig. 33).

Further along we returned to old haunts and were able to recognize plants we had viewed before, flourishing and blooming despite the obvious presence of bush pigs. In this area many excellent clumps of *C. nobilis* in full bloom grew

Fig. 27. Growing on rock

Fig. 28. Wild *Clivia*

Fig. 29. Forest glade - A sight to see

among the countless *C. miniata*, interspersed by dracaena, ferns and various other indigenous shrubs. Because the area had received rain, the *Clivia* were in very good condition and although the river was not in full spate, there were quiet pools of water and a steady stream in the shade of the trees, creating magical spots to sit and enjoy the beauty of the bush (Fig. 34).

The next stop was the *C. nobilis* colony at Kei Mouth. Literally thousands of *C. nobilis* grow in the dune forest right on the seashore. It was interesting to note that the plants grow and

Fig. 31. Beautiful habitat peach pastel. Lalapanzi

Fig. 30. Nature's garden. Lalapanzi

Fig. 32. Nature's landscaping. Lalapanzi

Fig. 33. *C. nobilis*. Lalapanzi

flourish by the sea, enjoying the fresh breeze, while on the more protected river bank, very few plants are to be found. There was a good range of colours evident and there were also full umbels of berries proving that pollination is successfully taking place. This was a quick stop requiring minimal effort to reach and was enjoyable as we were able to cool off in the breeze and walk on the beach (Figs. 35 - 36).

The following stop, after a long hot drive, found us at Port St. Johns where they were suffering a particularly severe drought. Expecting a long hard hike up the mountain,

Fig. 34. Wild landscape. Lalapanzi

Fig. 35. Kei Mouth

Fig. 36. *C. nobilis*. Kei Mouth

Fig. 37. Hein taking photos. Port St. Johns

Fig. 38. Wayne at Port St. Johns

Fig. 39. (From left) Hein, Mfundisi and Andy

Fig. 40. Really tough going. Port St. Johns

Fig. 42. Really steep at Mazmba

Fig. 41. (From left) Hein, Lucky, me and Andy at Mzamba

we were fortunately given a lift on the back of a bakkie (ute) to the top of the mountain. Starting down into the bush, it was not long before the first *C. miniata* appeared. The plants were spread out in drifts down the mountain and the further down we went, the more blooms and plants there were. In this location there were nice pastels and of course oranges. The flower form varied greatly as usual, but tended towards being spidery. The plants were reasonably compact with fairly broad leaves. It was amazing to see these plants with their dark green leaves and fresh flowers looking crisp and lovely in the driest conditions.

As we descended to the lower regions of the

Fig. 43. Giant habitat spider. Mzamba

mountain, we came upon an old storage dam full of water. Directly next to this was a small ravine and on the rocky edge sat a beautiful *Clivia* in full bloom with wild ferns draping down over the ledge, creating a beautiful natural picture (Figs. 33 - 39).

Fig. 44. Umtamvuna Gorge

Fig. 45. Photographer at work again. Umtamvuna

Fig. 46. Natural planter. Umtamvuna

After a really rough climb back up the mountain we connected with the old gravel road and were able to enjoy the beautiful old forest trees on the way down (Fig. 40).

Starting early the next morning, we made our way towards Port Edward and the really glorious habitat location called Mzamba, where we were met by Andy Forbes-Hardinge and Lucky, who would be our guide down the mountain. Our guide on the previous trip was Mfundisi, but the years have taken their toll and his son, Lucky, kindly stood in for him (Fig. 41). To me this location has mystical

Fig. 47. Tree stump planter. Umtamvuna

qualities and the *Clivia* are truly exceptional. I was led to believe that this spot was devastated and all the trees dead, but this was not the case to my huge relief.

It is certainly a very inaccessible spot and dangerous as it is necessary to climb over and around very large boulders and some of the stepping stones are anything but stable. However the diversity of the flowers is such that one is driven to clamber and battle your way through and over the mountain rubble, thorn bushes and thorny lianas in order to get to the next beautiful bloom or colony. Here there are very lovely pastel pinks and dark orange reds, small oranges, spiders and even variegated plants. The climb back up the mountain is very steep, but because it was so dry, not so hazardous. This is the spot where, as you inch your way around a rocky overhang, were you to lose your balance, you would fly into infinity (Figs. 42 - 44).

In the afternoon, after booking into Clearwater Cottages, we climbed down into the Umtamvuna Gorge in the Umtamvuna Nature Reserve. This is a long fairly steep climb on a well-marked rock path. It was worth the effort as there were masses of plants in full bloom. It was interesting because there were lovely clumps of pastels growing side by side with orange reds. The pink pastels, in particular, seemed to come in a number of different forms and sizes. There were also dark orange reds in all shapes and shades. Flitting around and hard at work pollinating the *Clivia* were at least three different butterflies, including a huge black and turquoise beauty.

During the trip, we had kept an eye out for wide leaves and in this locality we were rewarded with the widest leaves which measured 78mm. Here also were seedlings growing in a receptacle created by aerial tree roots on bare rock. There were also clumps of *Clivia* blooming and growing right on the bare rocks with no access to the soil at all. In fact, a fairly common sight is *Clivia* growing on the branches, like orchids, and in the cleft of a tree or a small crack in the rocks. There was also an

Old storage dam. Port St. Johns

old tree stump sporting three *Clivia* artistically arranged by nature (Figs. 45 - 47). This is a beautiful gorge with high canyon walls bedecked with tall trees and a river running along at the bottom. It seems that if you have the time and energy, besides *C. miniata*, there are also *C. gardenii* and *C. robusta* to be found in here.

From what I have observed, these habitat colonies appear to be in good condition, probably because they are fairly inaccessible and in areas unsuited to human habitation or grazing. However, there was still strong evidence of the little fly (some claim it is the Gladiolus Fly, others that it is the Potato Fly) which stings the ovaries and damages the petals and, in time, tiny yellow maggots appear that destroy the umbel and seed capsules and allow secondary infections to set in. Another disturbing item is that the Amaryllis Worm has appeared in the habitat.

Once again Wayne Haselau was our habitat guide. The caring and charming driver and "*Clivia* Buddy" on this trip was Hein Grebe, and it was his first and long-awaited trip to the habitat. A really big "thank you" to both of them as without them I would have missed out on this wonderful experience. I would like to conclude by saying that a trip into the habitat or bush is such a very special experience for me that nothing else can compare with it.

Chinese Clivia, a leaf love story

By Marilyn Paskert

(Printed with permission from NACS) (Photos by M. Paskert)

Imagine arriving at Changchun train station in northern China on an unseasonably warm morning in late March. The station is modern and the light standards (Fig. 48) decorated with a stylized version of your favourite flower: *Clivia*! *Clivia miniata* is the Changchun city flower and nowhere is this plant from South Africa more revered and grown in greater quantity in the world than here. Later in the evening, after touring several growers on the outskirts of town, we returned to the city to streets lined on both sides by flashing neon *Clivia* lights (Fig. 49). Having been taken by these plants for more than three decades, I still never could have imagined the delight and reverence this plant has instilled in so many in China and how much I would come to love their vision in breeding *Clivia* for leaf structure. My education in Chinese *Clivia* has only begun but it is a love story of sorts and I would like to share it with you. In the course of this article I will tell you about important leaf characteristics that have been focused on by Chinese breeders and how their *Clivia* are grown.

Eddie Pang is an Australian businessman who has collected and bred Chinese *Clivia* for many years. He could see that many *Clivia* collectors in the West were attracted to the wide-leaf compact form of Chinese *Clivia* but didn't know enough to separate that which is good from poor quality and plants that appear to be one thing but when grown at home will not maintain desirable characteristics because they don't really have the genetics but have been manipulated (not necessarily with ill intent) in some way. Fortunately for all of us Eddie is writing a book about Chinese *Clivia* but as a businessman who flies around the world on a constant basis, he has been too busy to complete it yet. I was very fortunate to be included in a group Eddie

Fig. 48. Changchun Railway Station Lamp post

Fig. 49. Changchun City Street Lamp

Fig. 50. Entry sign for *Clivia* housing

Fig. 51. Typical *Clivia* housing

Fig. 52. Eddie Pang surrounded by the He family

Fig. 53. Mr. He in his *Clivia* house

Fig. 54. Beautifully grown Chinese plants

took to China for a week of intensive *Clivia* viewing, education and yes, buying. My travelling companions besides Eddie were from South Africa: Joubert van Wyk, Paul Kloeck, and Dawie and Ebeth Strydom. We were also joined by Eddie's good friend Mr. He Shi Zhong and his son Jun Hua from Shenyang, China who treated our group with the warmest hospitality.

Clivia arrived in China in the mid-1800s brought by German missionaries but were confined to the glasshouses of the wealthy. *Clivia* found their way into the general population well after the revolution and that is when the breeding of Chinese *Clivia* became uniquely theirs. The major *Clivia* growing area in China is northwest of North Korea in the cities and environs of Shenyang, Anshan and Changchun. Winters here are harsh so all *Clivia* are grown indoors in glasshouses with heaters. Outside of the cities large

Fig. 55. Leaves with position-correcting silver paper

Fig. 56. Leaf will move towards the side that has light

developments of *Clivia* glasshouses have been built. Imagine large tracts of small living units with attached *Clivia* houses in long rows, each with a small yard in between for livestock, fruit trees, and a vegetable garden. Most of these glasshouses run east to west so the primary sun exposure is south. These developments are for breeders and hobbyists. Some of the *Clivia* development units are owned while others are rented. Some have been divided up inside to be occupied by many growers so there is availability for a range of budgets (Figs. 50 - 51). There was an iron banner over the entrance to one of these subdivisions, I certainly couldn't understand the Chinese symbols, but the *Clivia* in the middle certainly rang a bell!

Mr. He, our host, is a retired engineer and is well known for breeding a favourite variety of table grape in China. He is a real Renaissance man, playing Chinese tunes on his flute, speaking to me in bits of English and sharing his love and knowledge of *Clivia* which he has been collecting and breeding for many years. He and his wife invited us to his home in Shenyang and his *Clivia* glasshouse in a development outside the city (Fig. 52). What was surprising about entering Mr. He's glasshouse for the first time was how hot and humid it was. I could just imagine my own plants melting into a bacterial pile of mush! The leaves were covered with water droplets and the plants were all in tidy rows facing the same way (Fig. 53).

Important leaf characteristic: Unlike the spidery plants I grow, Chinese *Clivia* plants should be grown in one plane with rows of leaves directly over each other and preferably each leaf spaced evenly apart (Fig. 54). This is partially a genetic feature but also controlled with light and manipulation if necessary. Plants are grown with one set of leaf tips facing south and have to be rotated 180 degrees at certain intervals. All is not lost if a plant sends out an askew leaf as long as the leaf is not very old and has stopped growing. The leaf can be nudged back over the leaf under it by attaching a piece of folded cardboard or foil on the side of the leaf farthest from its ideal centerline. Attach the cardboard with a loosened paperclip or bobby-pin. The cells in the leaf that is deprived of light will elongate and pull the leaf back to center (Figs. 55 - 56). To get proper spacing between leaves, growers tuck pieces of styrofoam between leaves. This is not cheating, it is the manipulation of the plant to get an idealized

Figs. 57 - 59. Proud growers

form and such perfect plants are a treat to see! It is also a treat to see the joy and pride in the faces of the growers (Figs. 57 - 59)!

It stands to reason if you want perfectly spaced upright leaves, they must have the important leaf characteristic: thick and rigid. As you can see from the photos, not all Chinese *Clivia* have wide compact leaves. In fact, taller plants are becoming the fashion. What does it take for long leaves to remain upright? Some leaves are short and thick but others have been bred from plants with thick u-shaped leaves, denser in the middle as if they had a spine (Figs. 60 - 62). Fig. 62 is a Big Victory cross that Mr. Liu Ji Yan is rightfully proud of. Very little can be done to correct drooping leaves, the genetics are there or they are not. That said, a plant that already has u-shaped leaves can be given a boost with wires, as you can see in Fig. 63.

An important leaf characteristic Eddie Pang pointed out to us repeatedly is a leaf's shine. Shine can vary from waxy to super reflective and oily looking. This characteristic is called "painter" because it is as if the leaf was painted with oil or shellac. Have you ever looked at the back of your *Clivia* leaves? Plants with shine on the back as well as the front of the leaves are most promising for breeding painter characteristics. The shine on a good genetic painter is far more entrancing than a faked oiled plant. There are many products like MSG in water that can give a leaf a false temporary shine. Like most of the important leaf characteristics it is important to know the integrity of a seller before buying plants because as you have probably realized by now, many leaf characteristics are easy to emulate but are not the real Chinese genetics that are desirable to own and breed with (Fig. 64).

Prominent (or protruding) veins are another important leaf characteristic highly prized and

Figs. 60 - 62. Rigid leaves

Fig. 63. U-clip to make leaf stronger

Fig. 64. Painted Face with shine

bred for by the Chinese. Not only are prominent veins attractive but these reveal something about the future of the plant. Some dwarf plants are not really genetic dwarfs but are kept small by root-pruning and by fertilizer deprivation. This is not "cheating"; it is an art not unlike bonsai. I am very attracted to compact wide leaf plants and would want to buy such plants when I saw them. Eddie Pang would always kindly inform me that the plant I selected would not stay small and pointed out the vein pattern. Not possessing a photographic memory like Eddie's, it took a while for his lessons to sink in. Let's look at some veins (Figs. 65 - 66). Both

Fig 65. Seedlings with vein "cells" close together at the leaf tip

Fig. 66. Seedlings with larger vein cells at the leaf tip

Fig. 67. Elongated vein "cells" that look like bamboo

Fig. 68. Elongated vein "cells" that look like bamboo

of these photos are of seedlings. The plants in Fig. 66 have leaf vein cells that are closer together at the tip of the leaf. These are more likely to stay compact than the seedlings in Fig. 67 with long leaf cells at the tip of the leaf because densely packed horizontal veins at the leaf tip are evidence of Chinese short-

Fig. 69. A 10! Great leaf placement, rigidity, shine and prominent veins

leaf genetics. In fashion now are plants with long leaf cells that look like bamboo (Fig. 67). These long cells mean the leaves will be longer. When the leaf color is pale, even yellow and the veins darker, this is called "painted face" (Fig. 68). This photo is of a painter x painted face, shiny and pale cells with dark veins make this a real beauty. A few market growers use a vein mould to stamp out temporary protruding veins but there are real genetics for these traits out there. That said, not growing plants in the conditions Chinese grow them in may lessen the protruding veins and painted face traits. For optimum protruding veins, the potting medium is drier but the environment humid.

My last leaf photo is of an amazing plant that one could only dream to own (Fig. 69). The form is excellent with leaves on each side directly over the older ones, rigid shiny leaves with protruding veins, so what is not to love? A plant like this is unobtainable for most of us but at least I was able to get a photo of it! None of its traits are manipulated; this plant is the result of years of breeding for such leaves.

Are you still with me? I don't want to be discouraging when I say most of the important leaf characteristics can be fabricated or that growing conditions can affect the shine and painted face characteristics. It is important to know these things if you want to collect

Fig. 70. Chinese *Clivia* potting mix components

or breed with Chinese plants. So how do the Chinese grow their *Clivia*? The growing medium varies from barely rotted oak leaves to well-rotted oak leaf compost (Fig. 70). At the base of the pot a small amount of boiled sunflower seeds, hemp seeds, and well fermented fish scales are blended in. The seeds are boiled because they want to grow *Clivia,* not sunflowers or hemp. The idea is that the seed oils help with the leaf shine while the fish scales give the plants calcium and phosphorus to aid leaf rigidity. As I mentioned earlier, the glasshouses are quite humid and these plants really thrive in that environment. The plants are repotted frequently thus refreshing the nutrients. When my shade house is built I will make sure I have an enclosed humid location for my Chinese plants since our air in California is very dry.

Figs. 71 - 73. Some beautiful flowering Chinese *Clivia*

All this leaf talk, what about flowers? Most breeding efforts in China have been towards improving the leaves. The leaves can be appreciated all year round after all. There is a rising interest in flowers other than orange and Mr. He, our host, has a stunning collection. I will write that article for a future NACS newsletter but here is a little teaser Figs. 71 - 73.

I know everyone in our little group is eternally grateful to Eddie Pang and Mr. He for allowing us to meet Chinese growers and see their collections. Trying to buy a plant in China would have been impossible without them. In my direct western way I normally just ask how much something costs…that simple. In China such a transaction is a lot more complicated. First you have to establish a friendship (in Chinese!) before you do business. If either party doesn't warm up to the other, no sale is transacted. Being a "friend" can get better prices but very special plants are indeed worth more than anyone in the west would normally pay, even at a Clivia Society auction! So how can we get quality Chinese plants here? Most purchases have to be made through middlemen, not directly from growers. It isn't easy for most growers to get phytosanitary certificates in China but that may change in the future. Seeds are probably the easiest way to get a hold of Chinese *Clivia* genetics as long as you know the person you are buying from is honest and that the person he is buying from is honest. Let's just say: "it's complicated!" I am grateful to Li Qiang, a middleman and grower himself, for making it possible to get my plants home.

It is impossible not to fall in love with the leaves of Chinese *Clivia*, the warmth of the Chinese people and REAL Chinese food… don't get me started!

Information from the archives

By Connie & James Abel

While sorting through some files, we came across the following table which will interest growers preparing soil for their *Clivia*.

In September 2002 the caulescens tour visited what must be the best known *Clivia* habitat – God's Window on the Eastern Escarpment. In the bus were Isabelle and Pierre De Coster, well-known enthusiasts and commercial growers from Belgium. They took a composite sample of soil from around the terrestrial *Clivia* and from the leaf detritus surrounding the roots of lithophytic plants. The first photo was taken on that tour. The sample was analysed in Belgium and the results are given in the table.

In requesting Pierre's permission for this publication, given immediately, he commented:

"Our *Clivia* growers' group in Belgium was surprised with the very low pH".

Aart van Voorst, well known plant scientist from the Netherlands, has been on three caulescens tours and requested to comment he said "About the soil the plants are growing

Resultaat chemische analyse 19.09.2002 door teeltinfo voor Pierre De Coster

Description	Result	Ideal	Comment
pH H20	4.95	6.00	
pH KCL	4.31	5.50	
Conductivity	87	400.00	Low
(N-NH3) Nitrate nitrogen	27.12	100	Moderate but good ratio
(N-NH4) Ammonium nitrogen	13.54		
(P) Phosphorus	29	50	
(K) Potassium	122.50	250	
(Ca) Calcium	982.50	1200	OK
(Mg) Magnesium	247.50	250	OK
(Fe) Iron	0.75	1.00	Moderate
(Mn) Manganese	49.05	<8	High
(SO4) Sulphur	14	200	Low
(Na) Sodium	35.00	<50	
(Cl) Chlorine	36.00	<50	

All values expressed in mg/l substrate. Conductivity in µ S/cm

REMARKS: pH OK, nutrition OK, Iron ratio a bit low and we consider the Manganese to be too high and the sulphur low

in, we don't mind the low pH for our plants in the greenhouse. The high manganese is remarkable and the low amount of other nutrients. What can I comment more on these nutrition data: well the plants are not overfed but like we have seen, will be healthy in this environment and grow happily but not too fast." He attached the second photo of a flowering *C. caulescens*, taken in September 2014, with typical snout beetle damage to the leaves evident.

The low pH and poor nutrient status of the soil are due to severe leaching by the heavy rainfall. We have never seen more than 20% of mature stems in flower at the same time, and this can perhaps be attributed to the alternate bearing which results.

Clivia caulescens plaats: Zuid Afrika, God's Window

160 years of *Clivia* breeding in Germany and the rest of Europe

By Theo Suchland
Original text in German, kindly translated to English by Heidi Nerurkar

The *Clivia* is a plant a lot of people know about and one which can be seen quite often. At some point a few plant enthusiasts started to breed with *Clivia*, but it needed a lot of time and work to develop the type of *Clivia* we see in the present day. This article intends to honour all those early pioneers of days gone by, their dedication and skills, without which *Clivia* breeding would definitely not be where it is today.

A modern breed of *Clivia: Clivia miniata* 'White Lips' (Photo: Ian Coates, England)

Belgium and Germany are the "classical" countries of *Clivia* breeding in Europe. In England and The Netherlands as well, the nurserymen were trying to improve the plant and the targets were quite similar in all these countries. Beginning with the introduction of *Clivia miniata*

Clivia miniata (Favourite flowers of garden and greenhouse, vol.4 t. 263 (1896-1897) D. Bois)

Regel around 1850 the *Clivia* breeding slowly took off.

THEODOR REIMERS from Ottensen near Altona, who started with the cultivation of *Clivia* in 1860, was in all probability the first German *Clivia* breeder with international recognition.

The plants he started his breeding with had umbels with only five to six single blossoms. The first crosses from Reimers already displayed 10 and more individual flowers. With success,

Clivia nobilis Lindl., only mentioned around 1862 in the Enzyklopädie from Dietrich

Photograph from 1921 (TU Berlin, Universitätsbibliothek, Sondersammlung Gartenbücherei)

he achieved plants with bigger and darker flowers. By 1880 he had bred approximately 15 new types. The multiplication of his *Clivia* was

Gardeninspector Theodor Reimers in Ottensen near Altona. (Photograph TU Berlin, Universitätsbibliothek, Sondersammlung Gartenbücherei)

exclusively through offsets. At that time THEODOR REIMERS had already observed *Clivia* which flowered in their third year of cultivation.

In Ghent in Belgium the breeding of *Clivia* also began in approximately 1860. The breeders there started with *Clivia nobilis.* REIMERS mentioned in 1879, that he had given some plants of his own breeding to LINDEN and VAN HOUTTE, Ghent. Around 1880 KRELAGE & SONS in Haarlem in The Netherlands also acquired *Clivia* bred by REIMERS. The Belgian *Clivia* originate exclusively from THEODOR REIMERS. This was for a long time in doubt, however, UHINK confirms that the best Belgian *Clivia* originally come from the work of REIMERS.

The famous Belgian *Clivia* were known in the gardening world as *Clivia lindenii.* Their triumphal journey throughout Europe and the rest of the world is attributed to a large extent to REIMERS diligent breeding efforts. *Clivia lindenii* arrived in the commercial venue for the first time in 1879 and received the highest award 1882 in Leuwen, Belgium. These plants showed long, narrow and downwardly curved leaves and were an improvement to the old *Clivia nobilis* (*Immanthophyllum aitonii*). Their blossoms resembled the Vallota in shape and colour.

Around the year 1880 R. H. MÜLLER in Dresden-Striesen achieved remarkable success in the colour and form of his *Clivia*. It has been reported that his plants displayed blossoms in colours ranging from sulphur-yellow to fiery-red.

In Belgium in 1886 many plants with big flowers were advertised and they already had serial numbers. In 1896 MÖLLER refers to Belgian nurseries because they had exhibited

Himantophyllum miniata var. 'Marie Reimers', bred by Theodor Reimers. Photograph from 1880 (TU Berlin, Universitätsbibliothek, Sondersammlung Gartenbücherei)

Clivia lindenii. Photograph from 1879 (TU Berlin, Universitätsbibliothek, Sondersammlung Gartenbücherei)

magnificient *Clivia* at the 'Allgemeine Gartenbauausstellung der Cerole herticole van Houtte' in Ledeberg near Ghent: G. VAN HERZELLE in Mariakerke, B. FORTIC in Ghent, CH. VERMEIVE in Gentbrugge. The plants displayed had umbels with a diameter of 30 cm and were named as varieties. MÖLLER, the most famous *Clivia* critic of his time, negatively points out the exorbitant use of naming new hybrids, as in the case of *Anthurium scherzerianum*.

Other sources around the turn of the last century speak of a yellow *Clivia* which was discovered in Zululand/South Africa. It was brought to Europe by Captain MANSELL and flowered for the first time in ROGERS Garden, Perrenwall (Cornwall) in England. This plants was named *Imantophyllum miniatum* var. *citrinum* and seems to

have been a novelty. The main aspect in breeding at that time was to improve the colour. STURM notes in 1899 that although most breeders considered the improvement of the mennigrot (orange red) colour as the most important point in their breeding, no real improvement was achieved. The colour was enhanced but remained within the usual colour spectrum.

With "lemon-yellow" a new colour appeared on the scene. Later these yellow *Clivia* disappeared, but from time to time have been mentioned again.

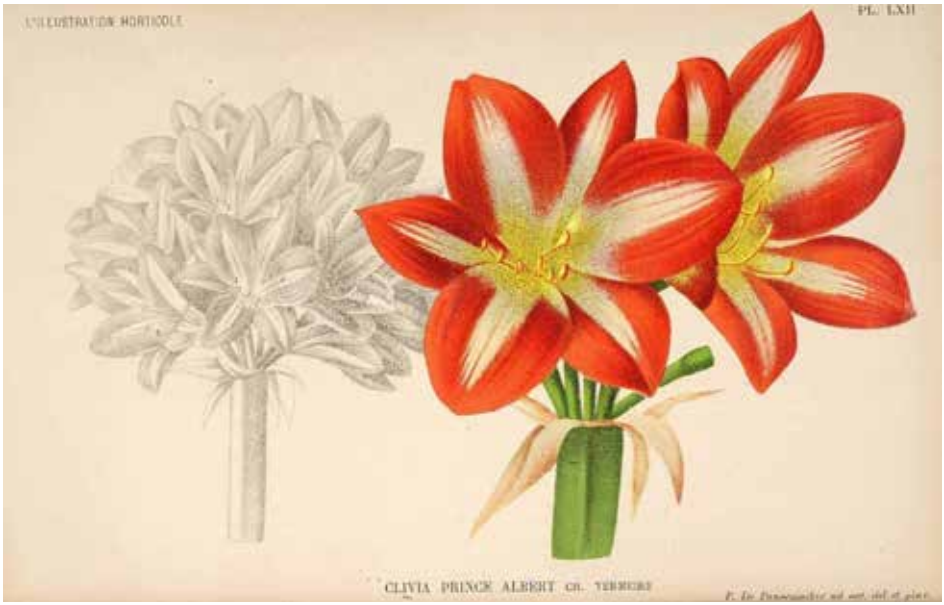
Motivated by REIMER's work, the first to follow as a *Clivia* breeder was NEUBERT in Wandsbek. Later STOLDT in Wandsbek continued the work of these two pioneers. For more than 25 years, STOLDT was involved in the breeding of colourful and floriferous *Clivia*. In 1913 – allegedly due to space restrictions – the *Clivia* were replaced by more profitable cultivations.

Around the turn of the last century G. BORNEMANN in Blankenburg am Harz was one of the most successful *Clivia* breeders and he also had observed three year-old seedlings in flower.

Botanical science was the name giver: Imantophyllum miniatum var. citrinum (Photo: Ken Smith, Australia)

In 1902 KIND from Angermünde points out that the buyers favoured bright coloured *Clivia* with big flowers. At that time people already preferred the darker colours, although this was not the prevailing sentiment. The seeds for these plants were acquired from STRAUSS from Ehrenfeld near Cologne.

The breeding targets of A. STÖGER in Ahrensburg were bright red colours, big and elegant flower shapes and easy flowering. He was able to improve the *Clivia* material from STOLDT



Clivia miniata 'Prince Albert' (L' Illustration horticole, vol: t. 62 (1896))

further. Before WWI, Belgium was to a great extent involved in the breeding development of *Clivia* and was supplying the whole of Europe with plants. Due to economic reasons, during the war Germany started cultivating the *Clivia* by itself and now the target-orientated breeding started here too. The meanwhile developed broadleafed 'Genter Rasse', also known as *Clivia miniata robusta*, began to assert itself. Leading Belgian nurseries were BIER&ANKERSMIT in Melle near Ghent and DELARUYE-CARDON in Ledeberg near Ghent.

Photograph from 1903/04 (TU Berlin, Universitätsbibliothek, Sondersammlung Gartenbücherei)

During this period REINHOLD KOENEMANN in Remscheid and most of all MAX LÖBNER in Friesdorf near Bonn (Gärtnerische Versuchsanstalt) became the most successful *Clivia* breeders. LÖBNER started breeding in 1917-1918 probably in Dresden, and later continued his work in Friesdorf. LÖBNER worked with narrow leafed, dark flowering *Clivia* he had got from RUNDE and crossed them with plants from SELZER, which were developed out of *Clivia lindenii.* These plants showed umbels with only a few flowers (amaryllisblütiger Typ) and good colouring. The most significant part in LÖBNER'S work is – because he had seen *Clivia* flowering in their third year after germination – for the first time a breeder included economical aspects in his breeding efforts.

The breeding material from the nursery KOENMANN & MAASSEN, Remscheid, was later to a great extent handed over to SCHÄFERS in Rastatt. Their breeding goal was the middle-

Photograph from 1929 (TU Berlin, Universitätsbibliothek, Sondersammlung Gartenbücherei)

to broadleafed type with early flowering. AHRENDS in Ronsdorf as well had plants from KOENEMANN. His breeding work was based on the material from KOENEMANN and the FRIESDORFER *Clivia*.

Most of the breeding and cultivation of *Clivia* was located in the Northwest of Germany. In addition to the already-mentioned nurseries, there were other breeders also working on the improvement of *Clivia*: BAUER in Lemgo, GRATHOFERS in Unna, KLEINZÄCHTIN in Lockstedt, KUHLMANN in Lemgo, and STRACK in Lobberich. Other names are: CONNERT in Wolmierstedt, GEYER in Dresden, ROTH in

Neuer Citvien-Typ in Gent. Einzelpflanze aus den Kulturen der Firma Delaruije-Cardon in Ledeberg bei Gent mit den typischen Merkmalen der heutigen Genter Rasse: gedrungener Bau, breite Blätter, kräftige, kurze Blütenstiele, große Einzelblüten, feste Dolden. Aufnahme für die „Gartenwelt".

Photograph from 1925 (TU Berlin, Universtätsbibliothek, Sondersammlung Gartenbücherei)

Marienfelde and WAGNER in Ludwigsburg. Through their intensive breeding efforts, quite a few valuable types were developed. Compared to the Belgian type, the plants were larger, not as broadleafed, showed darker colours and had a shorter cultivation time.

Due to WWII this breeding material, which was mostly built up after 1920, was to a great extent destroyed. Because of the after-effects of the war, the remaining breeding material was reduced to almost zero in quality and quantity. Around 1948 attempts were made to revive *Clivia* breeding in both the FRG (Federal Republic of Germany, West Germany) and in the GDR (German Democratic Republic, East Germany).

Due to the state planned economical structure in the GDR and the absence of insight into a market economy, the few tentative trials were consequently nipped in the bud. The previously achieved successes in Saxony were lost due to lack of interest and the aforementioned political and economical structure in the GDR.

Neuer Clivien-Typ in Gent. Haus mit blühenden Pflanzen des neuen, besonders gedrungenen Typs bei der Firma Bier & Ankersmit in Melle bei Gent. Aufnahme für die „Gartenwelt".

Photograph from 1929 (TU Berlin, Universitätsbibliothek, Sondersammlung Gartenbücherei)

Landwirtschaftsrat Max Löbner (Photo: Landwirtschaftskammer NRW)

***Der amaryllisblätige Clivientyp** der Firma Selzer-Bonn wurde in den letzten Jahren durch züchterische Bearbeitung weiter verbessert. Hierzu Text S. 141.* Aufn.: Heinrichs.

Photograph from 1937 (TU Berlin, Universitätsbibliothek, Sondersammlung Gartenbücherei)

The same situation occured in West Germany as well. A few nurseries cultivated *Clivia* as a sideline, however because of time constraints, they neglected the breeding work. The quality of the German *Clivia* rapidly diminished and the market reacted accordingly.

Until the present day the former quality could not be achieved. However, because of the determined elucidation about the cultivation and breeding of *Clivia*, HANS-GEORG PREISSL from Garbsen and THEO SUCHLAND from Isselburg have successfully contributed to recovering the lost heritage of our ancestors by bringing it back once again into the focus of the general public of Germany. Furthermore the successful cultivation and breeding with *Clivia* continues and in some cases has started again.

PHOTOGRAPH SUBMISSIONS

Photographs by Carrie Kruger

'Black Magic'
Interspecific

'Choco Bronze'

'Desert Rose' Multipetal Interspecific

'Ghoenang'

'Ghost'

'Hirao'

'Hotlips'

Interspecific 'Firefly'

'Lukie's Picotee' x 'Carrie's Picotee'

Miniata 'Estelle'

Multipetal 'Hirao'

'Naude's Peach' x Peach *Robusta*

Nobilis 'Blush'

'Primrose Peach' single flower

'QO8' F1 Seedling

'Star Green Two'

'Secret Rose'

Photographs by Felicity Weeden

Best Green Throat

'Betta Beauty Queen'

'Betta Bronze'

'Dainty One'

Interspecific - 'Pretty Penny'

Interspecific - 'Graceful in Gold'

Koike Green Throat

'Stars and Stripes'

'Symphony in Green'

Photographs by Helen Marriott

'Simplicity'

'Gladys Blackbeard' x 'Oribi Gorge Yellow'

'Mopi Hirt' x 'Oribi Gorge Yellow'

'Oribi Gorge Yellow' x 'Appleblossom'

'Q6' x 'Q2'

Photographs by John Hunter

Apricot Broadleaf

'Cransley Peach' x Pink *Robusta*

Top: *Cyrtanthiflora*

Below: Green and white throat red

Green throat yellow

Green tip pink *caulescens*

Nakamura Interspecific

Ngome yellow *gardenii*

Picotee *cyrtanthiflora*

Red edged Bicolour

Round tipped Akebono 'Light of Buddha'

Salmon Broadleaf

'Surprise No. 1'

'Surprise No. 2'

Two tone peach *cyrtanthiflora*

West Covina Salmon

White throat pink *miniata*

Photographs by Willie & Cynthia le Roux

'Nita'

'Delila'

'Ronel'

'Cloe'

'Milé'

'Nikki'

'Green Mist'

'Abbey'

'Ziva'

'Jolie'

'Dee'

'Adri'

CLIVIA

SEVENTEEN

Editor
Joubert van Wyk

EDITORIAL

Our thoughts go to the families of Keith Rose, Jurie Swart and the others in our midst who passed away this past year. All of them were great contributors to *Clivia* in their respective ways.

A great thanks to all the article contributors of this Yearbook and also to the Photographic Competition participants who sent in magnificent pictures, which all makes for a very interesting and informative read. There nine entrants that submitted: 24 photos in the *Miniata* category; 12 photos in the Pendulous specie category; 19 photos in the Interspecific category; 20 photos in the Single flower category; and 20 photos in the Other category. The competition appraising was done by three very capable judges: Claude Felbert, Gordon Fraser and James Haxton. The judges did not know who the entrants were, or for that matter who the other judges were. I compiled a folder, by category, of all the photos that had been submitted, with each photo linked to a number. Each judge received a flash drive with all the photos and a spreadsheet where they were required to enter their scores per photograph. I received the scoresheets back from the three judges, combined the three scores of each photograph thereby making each judge's contribution count a third toward the final score. Congratulations to all the different winners, runners-up and second runners-up. In many cases the competition was so fierce that there were only a few points between the different positions. I look forward to ever increasing quality contributions in next year's competition. A fine balance to be struck between the photographer's photographic skills and the subject.

It has been an honour to serve *Clivia* for another year as editor of the Clivia News and to be editor of Yearbook 17. This year has been successful from a publication's perspective, albeit a rather difficult one – sometimes barely scraping together sufficient material for publication purposes, usually a few weeks after the indicated submission date.

'Gorgeous Girl' (1), a Keith Rose selection

Two quotations ascribed to Warren Buffett caught my eye the other day, and I have been wondering about them for some time now from a *Clivia* perspective:

"Diversification is protection against ignorance. It makes little sense if you know what you are doing."

and

"Tell me who your heroes are and I'll tell you who you'll turn out to be."

Line breading and the very targeted crossing of specific parent plants versus near random crossings come to mind in respect of the first quote. I certainly am very aware of my ignorance. And the second, the behaviour, values, views and philosophies of our mentors, leaders and the people we look up to. I believe it is important that we remember to make place for all the different kinds of people who have an interest in *Clivia*, through our tolerance of one another and the love we have for nature and for our *Clivia*.

Frui flores!

Joubert van Wyk

26 May 2016

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2014 CLIVIA SOCIETY CONFERENCE - PAPER

'Appleblossom' – the way forward

By Wayne Haselau

(2014 Conference Paper dedicated to John Winter)

Introduction

I am a professional fly fishing guide and spend most of my year travelling. My base is Morgan Bay in the Eastern Cape, South Africa. My home is close to numerous *Clivia nobilis* habitats as well as to the most southerly known locality of *Clivia miniata* on the Kei River. During the off-season I am able to focus on my other passion, *Clivia*. Over many years I have established a *Clivia* biodiversity collection. The success has been with the help of prominent fellow *Clivia* addicts such as Sean Chubb, Hein Grebe, Andrew Harding, Francois Van Rooyen, Val Thurston, Felicity Weedon, Attie Le Roux and the late Fred van Niekerk, to name a few. My nursery, "Wild Coast Clivias", specialises in pendulous habitat species. We also have many unusual and unique habitat *C. miniata* plants. Many of these *C. miniata* are select clones originating from the Transkei and acquired over time from other breeders and collectors. My other plants have been selected from habitat seed grown at our nursery in Morgan Bay. The nursery has a number of original 'Appleblossom' clones or Q complex plants. We also have some "new" 'Appleblossom' clones which are now part of our breeding programme. There was a time when mystery surrounded the Q complex plants and for many years little was known about these sensational, sought-after plants. Record prices were paid by breeders for offsets of these rare plants in the late 1990s and early 2000s.

'Dwesa Yellow' habitat clone compatible with 'Appleblossom' and very hardy

Clivia growing in forest on scree on river bank

History

John Winter's discovery of the Q complex plants, consisting of eight wild-collected, uniquely coloured, blush habitat *C. miniata* clones from the Qhora River area in the southern Transkei in the mid-1990s, is now legendary. The discovery of these lovely and unusual clones created a sensation, especially when it was discovered that they bred true when crossed with each other. Ian Brown was the first to flower an 'Appleblossom' from seed and although of unknown parentage, he named this plant, 'Woodland Pink Blush'. John Winter collected these plants as part of the South African National Botanical Institute (SANBI) sanctioned programme to bring rare habitat clones back to Kirstenbosch. He did so very successfully over a period of many years,

Google Map of Qhora river mouth, Southern Transkei showing forest patches

John Winter at Cape Show with his 'Appleblossom'-strain plants

travelling extensively throughout South Africa, having visited many *Clivia* habitats. SANBI offered seed from these early 'Appleblossom' crosses and labelled them as 'Transkei Mutating Colony'.

On retirement John maintained a close connection with the Kirstenbosch Botanical Gardens, working extensively with his *Clivia*, which were housed in a special tunnel at the Gardens. It was here that he raised the first *C. mirabilis* in cultivation from seed. The resulting seedlings he distributed far and wide. Many of the seedlings were sent to overseas growers. I had the good fortune to spend quality time with him there, pottering around in his tunnel amongst a fabulous collection of habitat *Clivia* plants. He bred with his collection extensively and quite obviously his focus was on his collection of Q complexes and Q crosses. He was the first to breed hybrids with *C. mirabilis* and produced these crosses as well as the first *C. nimbicola* crosses. During these impromptu sessions in the tunnel we discussed the Q complex plants at length. Our discussions were very informative and I learned a great deal during the time we spent together. I have included a description of the eight known Q complex plants as I understand them.

The Q complex plants, a brief description:

Q1: A medium-sized plant with narrow leaves and an unusual fairly small flower, which is a white and yellow with a faint pink blush. A very distinctive clone that fades to almost white with age. It is difficult to establish in cultivation and does not like to be disturbed, however once

'Levundu' one year later

Peter Miles with garden clone 'Appleblossom' ex Levundu Forest

established it is a solid plant that forms offsets readily.

Q2: The famous mother of the Qs and the plant that inspired the name 'Appleblossom'. It has lovely flowers which remain slightly closed and blush deep pink as the flowers mature. It breeds true to type. Q2 fetches high prices, up to R15 000 has been paid for a mature plant! I purchased such a plant which did not flower true to type and I suspect that it may have been a selfed individual. John Winter had the plant and was trying to figure out where it originated from. He, however, became ill and no further progress on the origin of this plant took place. Q2 is an attractive large plant with narrow leaves. It is a fertile parent and breeds well with other 'Appleblossom' clones especially when crossed with Q4. Moderate formation of offsets occurs, unfortunately with a tendency to rot.

Q3 is a little known, underrated clone which is also quite rare. This clone breeds well and typically has a well-rounded umbel of perfect shape, open pink and white flowers. The flower count is generally higher than that of the rest of the group, often with 20 plus flowers in the head. It breeds well and has great potential for further breeding work. It is a fairly small compact plant.

Q4: Rare and the big daddy of the group. It

Q2 selfed

is a large plant with the large, open, superbly coloured flowers in pink and white. This clone has broader, heavier and tougher leaves but is very reluctant to make offsets. As a result it is still very rare in cultivation and is possibly the most valuable clone for breeding purposes. It is a slow grower and will also rot if not cultivated carefully. It is highly likely that it will self itself true to type.

Q5: Is a fabulous clone. It has full heads of lovely pink and white flowers. It is a medium-sized clone with great breeding potential. It is very similar to Q3, however the flowers are more textured and don't open fully. It is similar to Q3 although slightly larger. When viewed side by side, the differences between the flowers are obvious. This plant forms a moderate number of offsets.

Q6 is the largest plant of the group with large upright broader leaves and heads of fairly spidery yellow and white flowers suffused with pink. It is the most common 'Appleblossom' form in collections as it offsets well and as such is the Q plant most often used in breeding. John Winter selected out a plant from the original clump of plants collected in the wild which was infinitely superior to the standard plant. He

Q3 Sanbi Kirstenbosch. Photo: Ian Coates

called it Q6A and this is the plant he worked with extensively. It is a larger and more vigorous plant with better quality flowers. He believed it to be a self-pollinated or original plant from habitat that was growing within the original habitat clump.

Q7: Sadly most of the material in collections of this clone is possibly diseased, having a white viral pattern on the leaves. I was told that the original habitat plant was also infected with virus, however John was adamant that this was not so. It was possibly collected without any virus and became contaminated later in cultivation. It is the most yellow of the Q series plants and is a smaller compact plant. Q7 is valuable for future breeding programmes as it is yellowest of the Qs. Mr Masami Uno of Japan is a fanatical breeder of 'Appleblossom' and has a superb 'Appleblossom' plant he bred from Q7.

Q8: This is a very interesting clone according to Sean Chubb. The plant is a wild-collected clone, originating close to one of the original Qs as a wilding. It matured and flowered some years later at Kirstenbosch and was named 'Peach Glow' by John Winter. It is a peachy coloured 'Appleblossom' and is rare in cultivation. I have not had the privilege of seeing it in flower.

The above is a rough guide of the eight different Q habitat clones. Please be aware that unless you have an accurate, detailed providence you cannot be sure that the plant you have or want to purchase is in fact a true Q clone. The Q complex plants are all habitat plants. When acquiring Q complex material, do so from a reputable source. There are a number of new and undescribed habitat 'Appleblossom' clones. Of these undescribed clones little is known. Since 2005 "Wild Coast Clivias" has acquired a number of Q complex plants as well as a few of these newer clones and we use the prefix TB or 'Transkei Blush' when describing them. One of these named clones is 'Transkei (B) Grandslam', a superior form with a large full head of pink and white flowers that forms offsets readily. A number of offsets of this clone have been placed in heritage and biodiversity collections for safe-keeping. Some of its seedlings have matured and flowered and are very similar to the original clone.

Habitat and ecology

I am fortunate to have travelled to *Clivia* habitats throughout southern Africa. Most of my effort was simply to learn as much as possible about *Clivia* and their fascinating ecology. As a result of all the information I have gained during my many travels, I have decided to write a book on *Clivia* habitats. Many of the visits to habitat sites have been in the Transkei and as such I have learned a great deal about the regional *Clivia* distribution and ecology in

Qhora Estuary: note heavily forested valley and misty hills. Classic Southern Transkei *Clivia* habitat

this often remote and inhospitable region.

In the southern Transkei and the Eastern Cape, *Clivia* are sometimes found close to the the sea, often growing on coastal dunes just above the high water mark. The habitat from which the Qs originate is no exception, with many plants growing in the coastal forest close to the sea. The Eastern Cape coast is known for its strong winds and there is almost always wind blowing in these *Clivia* localities. As a result there is constant air movement in these habitats which ensures that water very seldom, if ever, lies on or around plants for any length of time. Wind movement and the presence of epiphytic lichens growing on the leaves of wild *Clivia* in many habitats help protect the plants from fungal pathogens. It is believed that these lichens produce anti-fungal chemicals and aid in the absorption of water. The coastal forest habitat provides a protected environment, especially with regards to proximity to water which helps buffer the changes in ambient temperature. The plants grow in scree (rocks) allowing further stabilisation of the growing environment. Rocks help to buffer temperature changes and hold moisture around the roots (i.e. rock mulching is a known landscaping and permaculture technique). Proximity to the sea and the estuaries moderates temperature and provides good humidity, keeping the associated *Clivia* cool, even during the hot summer months. *Clivia* in very heavy shade are often reluctant to flower, showing a fine line between too much and too little shade in the wild.

The narrowness of the river gorge and the heavily forested banks provide between 50% to 80% shade which varies only according to position and/or aspect and the season. In many colonies it is possible to see how positively *Clivia* plants respond to the increased light available when a large canopy tree such as a Wild plum (*Harpyphyllum caffrum*) falls over. The increased light often results in a mass show of flowers in the season following such an event. *Clivia* in this environment are found growing mainly on rock under the forest canopy. The locality from which the known 'Appleblossom' Q clones originate

'Qhora Lobster Orange' Appleblossom

and where the other newer clones were found is west facing. Plants here grow on rock and scree under a moderate to heavy forest canopy. Drainage is consequently very sharp (good) with *Clivia* plants rooted in leaf litter and Dassie dung. Dassie or Rock Hyrax are often closely associated with wild *Clivia* as they frequent the same steep rocky habitats and their droppings provide much needed nutrients for *Clivia*. Forest habitats are generally poor in nutrients and there is a great deal of competition among the various forest plant species for these essential and scarce resources. In this particular locality *Clivia* are in some instances rooted entirely in Dassie dung amongst the rocks. I mention this fact as when researching this area, the habitat was once described to me by an old Transkei trader as "Yes man, there were these white flowers growing there amongst the Dassie dung". We used to see the *Clivia* plants there when we went fishing.

When taking into account all these environmental factors, it follows that plants from this locality and similar localities in the Transkei

'Suzette Too', Appleblossom complex hybrid

and KwaZulu-Natal are particular about their growing conditions in cultivation. Every grower has his or her own particular recipe for success. I have found that the use of clay pots is a big help when attempting to grow these Q complex clones. Cutting longitudinal slots down the side and to the base of the pot further enhances the drainage potential. Using gravel chips and coarse bark as a major part of the potting medium ensures further good drainage. Plants from these localities enjoy a great deal of wind movement and stagnant air is not suitable for the growth of these plants. Providing good air movement in a greenhouse or shade house is essential. Growing the plants under 50% to 70% shade cloth is optimal. The deciduous nature of many coastal forest trees means that in winter when the hours of sunlight are limited, there is more light available to understory plants. The fallen leaves of such forest trees provide the much needed nutrients to understory plants as well as serving to mulch them. This helps to retain moisture and reduce heat loss. Bear this in mind when planning a winter regime in cultivation!

The plants

Why these wonderful wild clones occur specifically here in the Southern Transkei is not clear. The presence of two species, *Clivia nobilis* and *C. miniata*, together in this habitat is almost unique! In some places the two species are found literally growing side by side and although the two species have different flower shapes, one pendulous and the other open, they flower at the same time in spring. The two species have predominantly different pollinators, *C. nobilis* the sunbirds and *C. miniata* butterflies. There is a small black solitary bee that collects pollen on both species. It is this solitary bee which I have written about in the past that moves pollen freely between the two species and is extremely common in this locality. I believe cross-pollination in the wild has given rise to a hybrid-swarm with interbreeding producing some plants with obvious interspecific traits. It seems quite obvious that this free mixing of genes between the species has in some way had a role to play in creating this unique mutating colony. It is within this genetically diverse colony that the blush 'Appleblossom' plants occur. Scientists tell us that *Clivia nobilis* has a great deal more potential colour variation in its genes, because apparently the anthocyanin pathways in *C. nobilis* are far more varied and developed than in *C. miniata*. This is interesting as it means that by combining the genes of the two species there are better chances of colour mutations developing.

The 'Appleblossom' strain as it is now known, consists of eight known named clones, the so-called Qs numbering one to eight with each one of these plants being unique. What is however not common knowledge is that there are more wild or habitat blush clones from this immediate area.

Most of these other plants originate from wild collected seed and in some instances from offsets and wildlings from mature plants in the habitat. Over the years, local traders and fisherman visiting the area collected attractive or unusual plants to take home to their gardens. In fact, most of the recently discovered "new"

clones have been found in suburban and farm gardens in the Eastern Cape, as well as in the gardens of trading stores in the Transkei. Fortunately, we have the providence of these plants in most cases, as is the case with the now-famous 'Dwesa Yellow' *C. miniata* clones. Peter Miles is a passionate *Clivia* grower and breeder and recently he discovered a superb 'Appleblossom' clone in a garden in East London. We followed the providence of this special clone and it turns out that it was collected from a forest that no longer exists. The Levundu forest was part of the Qhora catchment, close to Willowvale in the Southern Transkei. Unfortunately, this forest has been destroyed and this *Clivia* is our last link with it.

Qhora river valley landscape – searching for Levundu forest!

Sean Chubb has questioned the fact that the '4 Marys' group of Blush clones is separate from 'Appleblossom' group of plants. I agree with his claim. They are morphologically very similar and DNA testing in the future may be able to throw some light on this mystery. Gordon McNeil purchased the collection of Gladys Blackbeard which originates from Grahamstown in the Eastern Cape. Gladys Blackbeard was a pioneer *Clivia* grower and started her collection in the 1940s and 1950s. Living in the Eastern Cape she would have had access to *Clivia* from many areas. The 'Appleblossom' locality on the Qhora river in southern Transkei is only a couple of hundred kilometres away from Grahamstown, as the crow flies. There is a famous hotel there called the Kob Inn which has been a popular holiday destination for a long time. I believe it is highly likely that there is a connection between these two groups, albeit it is only speculation at the present time. The spontaneous appearance of a blush *Clivia* almost identical in appearance to 'Appleblossom' in McNeil's collection seems just too much of a co-incidence. It has become clear that the 'Appleblossom' gene is a mutation, which although not presently fully understood, presents itself spontaneously amongst progeny of normal or orange flowered plants on occasion. To conclude, it is highly likely that the '4 Marys' clones are genetically compatible with the known 'Appleblossom' clones, as they may have the same origins and consequently the same genetic make-up. The Transkei has a wonderful and largely unexplored *Clivia* gene pool and the unique blush *Clivia miniata* clones of the 'Appleblossom' strain are no exception.

The future

The 'Appleblossom' complex presents a unique opportunity to current and future breeders. The blush genes of these wild clones are strong and constant, and although their breeding patterns are not currently fully understood, it is obvious from early results that this special group of plants will have a great influence on *Clivia* breeding in the future. Established breeding techniques such as line breeding could result in future 'Appleblossom' breeding programmes which produce sought after traits such as short, broad-leafed plants with large umbels of broad tepalled blush flowers. Personally, I enjoy larger well-formed plants and although the current trends are for more compact plants, I hope to improve on the wild forms by producing robust plants with both larger flowers and larger numbers of flowers in the umbel. Some of the problems associated with growing 'Appleblossom' plants is that

Select clone broad leaf full petal (Q2 x Q4)

they are slow-growing and may be inclined to rot. By breeding to improve on the hardiness and disease resistance of these plants and by incorporating traits such as leaf-variegation, rapid growth and good offset production, the future for this group is bright.

Conclusion

John Winter's 'Appleblossom' legacy will have a lasting influence on future *Clivia* breeding and the introduction of new clones into established breeding programmes can only bolster the currently available gene pool. It is essential that specimens of all original habitat clones are preserved in heritage and biodiversity collections for future generations and the 'Appleblossom' complex is no exception. It is important not to lose these valuable, original clones in uncontrolled and frenetic Q x Q x Q x Q breeding scenarios. While most of the current breeding programmes are of this type, more sophisticated techniques may be of benefit to future breeding programmes. If we are ever going to fully understand these plants and their breeding habits, it is of paramount importance to label plants correctly and to keep records of providence and stud books. Preserving the providence of this founding stock and keeping pure habitat *Clivia* clones as well as named clones resulting from breeding programmes will be vitally important to future breeders.

Finally, I think it is important that a group of specialist growers and/or breeders form a dedicated APPLEBLOSSOM WORKING GROUP to share knowledge and material. Such a group could facilitate easy co-operation internationally amongst serious breeders and help conserve these precious wild clones for further generations.

'Transkei (B) Grand Slam'

Clivia species: *Quo vadis*

By Johan & Paula Spies

Our interest in the validity of *Clivia* cultivar names started when we obtained 'Cynthia's Best' from four reputable *Clivia* collectors/breeders and discovered that we had at least three totally different "cultivars". Since we both worked in laboratories where DNA research is conducted and Forensic Science is part of the graduate course, we decided to employ the forensic methods in establishing the validity of cultivar names in *Clivia*.

In Forensic Science, 13 markers can be used to identify an individual (±1 in a million chance for a wrong identification). To make the identification more reliable some laboratories increased the number of markers to 18 or even 21 in some cases (1 in many billions chance for a wrong identification). The DNA markers help to construct a "DNA profile" that is unique to every person (except identical twins, which can be considered to be clones of one another). In the process you can also determine whether two people are closely related (share the majority of loci {the individual marks observed in a profile}). Since all plants belonging to a certain cultivar are supposed to be genetically identical (they should be clones {offshoots} and therefore mimic human identical twins), we tried to construct a few profiles of well-known cultivars and include 1-2 other species (other than *C. miniata*) to confirm that our profiles for related plants (cultivars of the same species) differ from other species. For this type of study you need markers that provide sufficient variation to separate slightly related individuals from unrelated individuals, yet they should be stable enough to indicate relationships between slightly related individuals (3rd cousin twice removed). Then the shock: we observed much more variation within *C. miniata* than between a *C. miniata* plant and members of other species!

More than five years of intensive research then followed. More and more gene regions were investigated, and more and more species were included. The overall result remained: our knowledge of what a *Clivia* species is, is at fault! For example: 'Eshowe Yellow', a well-known yellow *C. miniata*, is more closely related to *C. gardenii* than to any *C. miniata*! This result contradicts everything we think we know about *Clivia*. So an even more intensive molecular study on *Clivia* followed and this paper will handle some of the issues raised.

Clivia x var. *citrina*

In several species the yellow forms of the species have been described as a separate taxonomic unit, variety *citrina*. The molecular studies indicate that there is no justification for such a separation. Although the code of botanical nomenclature makes provision for such separation, there is no logical reason to do so. It is just as absurd as to group all blue-eyed people in a separate race in humans (with apology to some guy named Adolf). It is pointless, so why do it? You would have the same justification to separate all broad leaved plants in one variety or all variegated plants in another! Then tens of letters can appear in the Clivia Newsletter on suggestions of what to do with broad leaved variegated plants!

Clivia mirabilis

This species is really a species. It means that variation within this species is much smaller than the variation between any individual of this species and a member of another species. This study further indicated that this species is not the evolutionary forefather of *C. nobilis* as has been suggested, but that they both developed from the same ancestor (sister species is the term scientists use).

If we accept the assumption that a species shows the most variation at its point of origin, another interesting deduction can be made from these results: the point of origin of *C. mirabilis* is in the Western Cape, not the Northern Cape as initially thought. Almost no genetic variation exists in the Oorlogskloof area where *C. mirabilis* was discovered. The variation increases as you move through the mountains until the highest degree of variation is found on the south-western margin of the species distribution.

Clivia nobilis

Another fascinating result: although this species contains a very high degree of morphological variation, all samples studied provided exactly the same DNA profile. These plants represented different morphological traits and came from different geographical areas. *Clivia nobilis* is consequently a "good" species and cannot be confused with any other. Although some *C. nobilis* and *C. mirabilis* plants may look very similar (especially young plants), their DNA profiles will easily separate the two species.

C. nobilis (potentially distinct from C. x *cyrtanthiflora*) was not included in this study. Our first specimen (provided by Ken Smith) succumbed to a bacterial infection after rodents almost totally destroyed the plant. Helen Marriott tried to provide me with seeds and our postal service delayed delivery for more than two months. The seeds germinated and died in the envelope before they could be sacrificed to science!

Clivia caulescens

The last of the well-defined species contains much more internal variation than the previous two species. However, this variation within the species is still less than the variation between plants from this species and any other species. A closer look at the results suggest that this species can be subdivided into three geographical groups, the northern (roughly north of God's Window), Mariepskop and southern (God's Window and areas south of it) groups. At this stage there is no justification for a formal taxonomic division of *C. caulescens*.

Another interesting fact is that *C. caulescens* is also a sister species to *C. mirabilis* and *C. nobilis*. The ancestral species must have had a very wide distribution to produce this result.

Clivia x *nimbicola*

This mist dweller represents the natural hybrids formed between *C. miniata* and *C. caulescens* on Bearded Man Mountain. This hybrid species was poorly represented in this study, owing to the Department handling Nature Conservation repeatedly losing our applications to collect a small leaf sample from plants on Bearded Man. From the limited number of plants included it appears as if *C. caulescens* is usually the pod parent.

Introgression occurs in this area. Introgression entails the repeated hybridization followed by backcrossing to one particular parent. Since *C. caulescens* acts as the pod parent, *C.* x *nimbicola* will act as pod parent in the next generation. With *C. miniata* acting as the pollen parent in every generation, you find *C. miniata* looking plants in this area with some *C. caulescens* genes in them.

New *Clivia* species

A new, as yet undescribed, species exist near Ngome in KwaZulu-Natal. Up to now these plants were classified as *C. gardenii* and even *C. gardenii* var. *citrina*. The yellow, blush and orange flowering specimens are all one new species, with a closer relationship to *C. caulescens* than to *C. gardenii*. More specimens from Swaziland should be studied to determine the total geographical distribution of this species.

Clivia chaotica

This is the only way to describe the remaining three species of *Clivia*! Let us try to decipher the chaos.

Clivia miniata

Clivia miniata is the well-known open flowered species. Unfortunately plants from this species hybridized with plants from *C. gardenii* and

C. robusta. In many instances molecular techniques cannot separate these three species. Consequently, you will experience more hybrid vigour if you cross *C. miniata* with any of the "real species" than in hybrids with the "related" species. We need to study more plants to see whether one can find meaningful results in this group.

Clivia gardenii

This species is better delimited as *C. miniata* and three different groups can be identified. For lack of better knowledge, we can talk about the "real" *C. gardenii*, the *C. gardenii* x *C. miniata* and the *C. gardenii* x *C. robusta* groups. Once again more plants and more genes should be studied before we will be able to solve this problem.

Clivia robusta

Apart from hybridization with both *C. miniata* and *C. gardenii* this species can be subdivided into four genetically different groups. The first group is, according to our interpretation, the "real" *C. robusta*, previously known as "swamp *gardenii*". As the name indicates plants from this group grow in swampy areas. A morphologically similar group grows in dry areas, for example on the cliffs in Oribi Gorge. These two groups are not merely different ecotypes, but contain molecular differences suggesting that they should at least represent two different subspecies. The third group consists of 'maxima'. This is clearly a separate entity as the late Fred van Niekerk suggested. The 'maxima' group shows molecular similarities with a wide range of plants, such as the Mzamba collection and even *C. gardenii* plants collected by Francois van Rooyen near Olifantsfontein. This suggests that these diverse plants may be morphologically different remnants of the ancestral species from which all the species developed. The final group in *C. robusta* is actually not *C. robusta*, but misnamed *C. gardenii* specimens. It may be that some people confused the name "swamp *gardenii*" and renamed any *C. gardenii* plant growing in swampy areas, *C. robusta*.

In conclusion we can state that much progress was made with the molecular work on *Clivia*. *Clivia mirabilis, C. nobilis, C. caulescens* and the new Ngome species are well-defined. *Clivia robusta* should be further divided into two species, with one consisting of two subspecies. However, more studies are necessary to delimit *C. miniata* and *C. gardenii.* When this process is completed we can start to construct a database for the identification of cultivars. Thankfully we will not be available for those tasks (due to retirement). We can already see the arguments on whose 'Cynthia's Best', 'Bronze Green Boy', 'Chubb's Peach', etc. is the "real" one that should be used to construct the database! Our sincere sympathy to our successors!

CLUB SHOWS

Cape Clivia Club Show 2015

By Felicity Weeden, and photos by Claude Felbert

The 2015 Cape Club Clivia Show was a resounding success. This was Chris Smit's first term as show manager and he achieved an excellent outcome. I believe that he will go from strength to strength in the future.

The venue in the Tygervalley shopping centre is very attractive, providing an excellent

Best on Show – Piet Theron (George) Pastel

First Runner Up – Piet Theron (George): Orange red

Second Runner Up – Jim and Linda McDermott: Orange multitepal

Best Peach – Riél Lotter

Best Own Breeding – Felicity Weeden: Orange red

setting for the show. A record number of 365 plants were benched by 26 exhibitors and the standard of the exhibits was generally very high, proving a challenging task for the judges from Johannesburg, who judged in exchange with the Cape's judges who did the honours in Johannesburg. We also enjoyed a large increase in visitors to the show, which is very encouraging.

The winners were:

Best On Show – Piet Theron (George): Pastel
First Runner Up – Piet Theron (George): Orange red
Second Runner Up – Jim and Linda McDermott: Orange multitepal
Best Peach – Riél Lotter
Best Own Breeding – Felicity Weeden: Orange red
People's Choice – Leon Blom: Yellow green throat
Best Single Flower – Jan and Ceciel Pohl
Best Leaves – Leon Blom

People's Choice – Leon Blom: Yellow green throat

Eastern Province Clivia Club Interspecific Show 2015

By Dawid Botha

The Eastern Province Clivia Club's Interspecific Show was held on 18 July 2015 at Sherwood Garden Centre, Port Elizabeth. The number of entries continues to grow as interest in the interspecific flowers improves. The public and attending members voted for the best interspecific and species plant on display.

The honours for Best Interspecific went to Carrie Kruger with her beautiful plant 'Chameleon'. The name was chosen because the flower changes colour as it ages. Second Best on Show went to Gideon Botha for a very unusual compact and open pink interspecific. The best species flower was awarded to Carrie Kruger for her *Clivia gardenii*.

More pictures of interesting *Clivia* seen at the mini show.

Best Interspecific, Carrie Kruger

Second Best on Show, Gideon Botha, pink interspecific

Best Species Flower was awarded to Carrie Kruger for her *Clivia gardenii*

Other interesting flowers

Yellow interspecific

C. gardenii, orange

Bi-colour

C. 'Chameleon' close up

Below: Trading and talking, plant sales

Eastern Province Clivia Club Spring Show 2015

By Dawid Botha (Chairman/Show Chairman)

Our show was held on the 19-20 September 2015 at Sherwood Garden Centre, Port Elizabeth. It seems like the show date was spot on and we had 18 entrants with a record total of 225 plants. Judges were Piet Theron (Head Judge), Mark Joubert and Dawid Botha. Learner judges were Marius Meyer and Glenn Miles. The entry forms had more categories than previous years to showcase to the public the difference in flower colours and forms available. It is always a challenge to stay abreast of new breeding trends and getting them categorized, so that they can shine in their own right. A big orange umbel will always be a winner and should never disappear from cultivation.

This year the plants were displayed on a lower platform. This presented the plants in a more natural way to the observer. The weather was sunny and warm and a large number of visitors attended the show. During judging Piet Theron mentioned that they were spoiled for choice. This in itself made it very difficult to choose between the quality plants up for judging. Luckily, as all judges know, there are always those umbels that stand head and shoulders above the others in sheer size and splendour.

Show area

The winning table

Lester de Beer with his winning plants

Lester de Beer: Best on Show: *C. miniata* orange broad tepals

The judging results of the show:
Lester de Beer: Best on Show: *C. miniata* orange broad tepals;
Second Runner-Up to Best on Show: *C. miniata* apricot
People's Choice: *C. miniata* bi-colour;
Glenn Miles: First Runner-Up to Best on Show: *C. miniata* bronze;
Marius Meyer: Judges' Choice: *C. miniata* green; Richard Johnstone: Best Beginner: *C. miniata* red/dark orange.

The sales stalls were brimming with flowering *Clivia*, seedlings and seeds that enticed the potential growers. As usual the quality and unusual plants were spotted first and quickly sold at bargain prices. After the show at the prize-giving, Willie Le Roux and his lovely wife Cynthia were honoured for 15 years of selfless service to the club and its members. A collage of Willie's own favourite plants and happy *Clivia* memories was also handed over at the function.

I must thank my committee, Marius Meyer (Vice chair), Gideon Botha, Brenda Ferreira (Treasurer), Mark Joubert, Tinus Sonnekus and my wife Scherine (Secretary) for all the selfless time spent on preparations and presentation of the show.

To those members who helped with the setting up of the show area, a big thank you.

Glenn Miles

First Runner-Up to Best on Show, *C. miniata* bronze

Marius Meyer

Judges' Choice: *C. miniata* green

Second Runner-Up to Best on Show: *C. miniata* apricot

People's Choice: *C. miniata* bi-colour

Thanks also to those members who helped man the club tables. Without you there would not be a show. Thanks to Ever-Grow for donating some goodies to the show winners.

It will never be possible to showcase every plant at a show. This report includes some of the other highlights of the *Clivia* fashion show.

Richard Johnstone: Best Beginner:
C. miniata red/dark orange

Hand over of gift

Free State Clivia Club Show 2015

By André du Toit

Orange green throat – André du Toit

Pastel bi-colour – André du Toit

Winner leaf plant category

Orange – Stefan Ferreira

The Free State Clivia Club show winners for 2015.
From left to right: 2nd Runner Up – Stefan Ferreira with a bronze green throat, Best on Show – Hennie van der Mescht with a compact yellow and Runner Up – André du Toit with a group 2 yellow x 'Hirao'

'Ghost' – André du Toit

'Bruintjie' – André du Toit

First flower – Stefan Ferreira

Pastel – Stefan Ferreira

Yellow green throat – Stef de Swardt

Bronze green throat – Stef de Swardt

Garden Route Clivia Club Interspecific Show 2015

By André Meyer. Photographs: André and Anette Meyer

The 2015 Garden Route Clivia Club Interspecific Show took place on 25 July 2015 at the Outeniqua Research Farm in George. The weather leading up to the show was unsettled causing some plants to bloom early and others late. The number of entries was down on the previous year but the quality of the plants was good. The judges were Koos Geldenhuys and Rita van Rooyen, members of our club.

Second Best on Show: Carrie Kruger (Cat 7 1st Flower)

Best on Show: Carrie Kruger (Cat 4 Peach, Pastel, Pink)

2015 show winners, Carrie Kruger (left) and Kerneels Buitendach

The winners were as follows:
Best on Show: Carrie Kruger (Cat 4 Peach, Pastel, Pink);
Second Best on Show: Carrie Kruger (Cat 7 1st Flower);
Third Best on Show: Kerneels Buitendach (Cat 6 Own Breeding).

The show was well attended by 33 members and 8 guests. Dr Johan Spies gave a very informative talk on the different *Clivia* species and the DNA testing that his research team has been conducting on these.

Third Best on Show: Kerneels Buitendach (Cat 6 Own Breeding)

Garden Route Clivia Club Show 2015

By André Meyer

The annual *Clivia miniata* show was held on 26 and 27 September 2015 in the Outeniqua Primary School hall in George. This was a special occasion as it was the 10th anniversary of the Garden Route Clivia Club. The weather was very kind and visitor attendance of more than 800 over the one and a half days was similar to that of previous years. The visitors had a keen interest in the two workshops on *Clivia* growing. Some of the comments in the visitors' book are:

- Amazing!
- Very interesting
- Excellent

The plant/seed sales area was very busy and sellers were satisfied with their sales.

Exhibitors participated in 56 categories and 348 plants were benched for the show which is a big improvement on the 291 of the previous year when some unseasonal weather impacted upon the availability of plants. The committee changed a couple of categories for the show to encourage own breeding as well as newer trends in *Clivia* breeding. The judges for this show were Hennie van der Mescht (Free State Clivia Club) and Leon Blom and André Swart from the Cape Clivia Club. They were very impressed with the quality of the plants.

This was the last show co-ordinated by Fanie van der Merwe who has been the show director for four years. All the club members wish to thank Fanie for a job very well done. All the volunteers who work so hard to make this show such a success also deserve a very big thank you.

Gerhard and Karen Faber achieved the extraordinary feat of winning Best on Show (BoS) Gold, BoS Silver and BoS Bronze with some fabulous plants. Willie Freund won BoS Own Breeding whilst Piet and Jeanette Theron won the People's Choice award.

Variegated narrow leaf – Fanie van der Merwe

Any other flower not included on list – Gerrit & Sussurah van der Merwe

Ghost – Kobus & Ida Esterhuizen

Picotée – Ricky & Noelia Jardim

Bi-colour – Gerhard & Hester van Coppenhagen

Small flowers – Piet Claassen

Multitepal any colour – Gerhard & Karen Faber

Own breeding any other colour – Ricky & Noelia Jardim

Best on Show Bronze – Gerhard & Karen Faber

Best on Show Gold – Gerhard & Karen Faber

Best on Show Own Breeding – Willie Freund

Best on Show Silver – Gerhard & Karen Faber

People's Choice – Piet & Jeanette Theron

Snapshot of exhibition area

2015 Show-winners: Show director Fanie van der Merwe with Gerhard & Karen Faber

Public attending workshop at our *Clivia* show

Joburg Clivia Club Show 2015

By Glynn Middlewick

The *C. miniata* show is the highlight of the Joburg Clivia Club calendar. The opportunities for promoting the Club are endless. The Joburg Club has both a Flowering *Clivia* plant division and a Non-Flowering *Clivia* plant division on the show tables.

The number of entries in 2015 was larger than the previous year and we had the privilege of having judges who were non-members of the Joburg Clivia club assessing the plants. The winning plant of the flowering section was that of Chris Viljoen with a superb three umbel orange with a green throat. The first runner-up was awarded to Rassie Erasmus with a narrow tepal orange flower with a green throat. The second runner-up was awarded to Corra and Dawie van Heerden for a yellow *Clivia miniata* flower.

The non-flowering *Clivia* plant division was won by Paul and Sue Kloeck with a superb Light of Buddha plant. The first runner-up was awarded to Neil Rossouw for a variegated plant. The second runner-up was awarded to a large broad leafed plant, the owner of which was Johan Etsebeth.

Congratulations to the winners and a big thank you to all entrants for the time and effort spent ensuring the high quality of show plants on display.

Best on Show Flowering 2015: Chris Viljoen

JCC Clivia without flower Best on Show: Sue Kloeck

Best on Show non-flowering: Paul & Sue Kloeck

First Runner Up to Best on Show 2015:
Martiens Erasmus

Second Runner Up to Best on Show 2015:
Corra & Dawie van Heerden

Lowveld Clivia Club Show 2015

By Ian Radmore

The LCC annual Interspecific and Pendulous show was held at Ian Radmore's smallholding (Genade) on 18 July 2015. The show was a "closed" show in that it was not advertised to the general public. Members could, however, bring along any interested parties to the event. Fifty-five plants were entered by 10 exhibitors. Judging was done by a panel of judges consisting of members of the LCC. A plant of Paul Kloeck won Best on Show whilst Attie le Roux showed the first and second runner-up plants. Ian Radmore was awarded Judges' Choice.

The 2015 *C. miniata* show was held at the Botanical Gardens Educational hall over the weekend of 4-6 September. One hundred and twenty five plants in total were entered in the show by 15 members, of which three members were showing plants for the first time. Despite the low number of plants entered, the judges were impressed by the diversity and quality of the plants. The entries were judged by Piet Theron and Dawie Strydom. In the "plants with flower" section, Best on Show and First Runner Up were awarded to Clivia Kingdom (Paul Kloeck) with his well-known 'Blushing Virgin' and a seedling of 'Blushing Virgin'. Second Runner Up was awarded to Louis Lotter with an 'Andrew Gibson' F1 bi-colour. Judges' Choice was awarded to Clivia Kingdom (Paul Kloeck) with a green centre Tipperary peach and People's Choice also went to Paul for 'Blushing Virgin'.

In the "non-flowering" section, Best on Show was awarded to Avalon Clivia's (Ian Radmore) for a *C. miniata* variegated plant whilst First Runner Up was awarded to Sue Kloeck and Second Runner Up went to Attie le Roux. Judges' Choice also went to Attie le Roux.

The Saturday sales and attendance figures were very low due to persistent rain throughout the day. Sunday, however, made up for it, with the highest attendance figures ever recorded on a Sunday. In total, approximately 202 members of the public visited the show during the weekend. Unfortunately, despite all our efforts, we are not seeing an increase in show attendance figures. We mainly see the same people at our annual show every year and it does not seem as if the public is becoming more interested in *Clivia*. Maybe the change in date will have a positive effect on attendance figures in 2016. Two members had individual plant sales stalls and one member, a stall selling clay pottery, whilst five members opted to sell plants and seeds through the Club Stall.

Lowveld Clivia Club Show winners 2015

'Blushing Virgin'
Best on Show

'Blushing Virgin' F1 Sibling 1st Runner Up Lowveld Clivia Club Show 2015

People's Choice

Lowveld Clivia Club Show winners 2015

Best on Show *Clivia* without flower, Lowveld Clivia Club Show 2015

'CK Peach Demon', Judges' Choice, Lowveld Clivia Club Show 2015

Northern Free State Clivia Club Show 2015

By Ben Nel

A total of 190 flowering plants was displayed at our *miniata* show. Ten club members entered plants for the show. A record number of 538 visitors visited the show. This total is almost double the number of visitors of the previous year.

Piet Laubscher and Christo de Beer officiated as judges for the show.

Stefan Ferreira entered the Best on Show as well as the Second Runner Up to Best on Show.

Steven van Loggerenberg entered the Runner Up to the Best on Show.

André Steyn entered the special prize item.

Best on Show

Runner Up to Best on Show

Special prize

Prize winners

Northern Free State Clivia Show 2014

By Jan Schmidt

Below is a photo of the late Hannes van Rooyen with the three winning plants that he entered into the show. Best on Show is 'Mozart Yellow'. First Runner Up is 'Mozart Cameron Peach'. Second Runner Up is a 'Piet Multitepal Red'.

Hannes van Rooyen's winning plants

Hannes van Rooyen

Trophies made by Johan Olivier

Northern Clivia Club Show 2015

By Christo Topham

Our annual show is surely the highlight on the calendar of the Northern Clivia Club and 2015 was indeed a special year. We hosted our show at Anton van Wouw Primary School in Nieuw Muckleneuk.

Flowers are not made by singing "Oh, how beautiful" sitting in the shade (Rudyard Kipling). A lot of work was indeed been put in by exhibitors and organizers to enable the public and members to:

- Enjoy a spectacular display of *Clivia*
- Purchase *Clivia* plants or seeds for their garden or prestigious collections (remember the Indian proverb "All the flowers of all the tomorrows are in the seeds of today").

Our exhibition plants were as usual beautiful and the number of new colours seen continues to astound. The quality of the show plants far exceeded our wildest dreams and expectations. This led to judges having a very challenging time selecting the winners from amongst all the exquisite plants and we would like to sincerely thank the judges for their hard work and effort. Congratulations to the eventual winner, Anton and Rina Potgieter.

The winning plant of Anton and Rina Potgieter

The previous owner Rina Potgieter and the new owner of the winning plant, Peter Lambert.

The seller area was as usual a hive of activity. This is a very important area and it is here where bargains can be picked up and where new friendships are formed and old friendships rekindled. Not even the persistent rain could dampen the spirits of the buyers or sellers. A great time was had by all.

We also had our annual auction where members could bid on some of the best specimens of *Clivia*.

We would like to extend our biggest thank you to the organisers, exhibitors and sellers.

Overberg Clivia Show 2015

By Felicity Weeden. Photographs by Felicity Weeden

The Overberg Clivia Show, held in the NG Kerksaal in Hermanus, has become a sought after Spring event for many locals.

This year was exceptionally successful with nearly 150 quality plants displayed by six exhibitors.

The hall and sales areas were particularly colourful and attractive and we enjoyed about 30% more visitors than last year.

First Runner Up (Yellow green throat) – Felicity Weeden

Second Runner Up (Yellow) – Felicity Weeden

Winners of Overberg Show. The winners from left are Felicity Weeden, Pieter Kok and Gerrit Rohlandt

Best on Show (Peach) – Felicity Weeden

The winners were:
Best on Show (Peach) – Felicity Weeden
First Runner Up (Yellow Green Throat) – Felicity Weeden
Second Runner Up (Yellow) – Felicity Weeden
Best Leaves – Pieter Kok
First Runner Up Leaves – Gerrit Rohlandt
Second Runner Up leaves – Pieter Kok
People's Choice – Felicity Weeden

People's Choice was a stunning orange with a 33cm umbel, and also on show was an outstanding blush short broad leaf from André du Plessis. The winners from left to right on the podium are Felicity, Pieter and Gerrit.

People's Choice – Felicity Weeden left. First row: Best Leaves – Pieter Kok, First Runner Up Leaves – Gerrit Rohlandt, Second Runner Up leaves – Pieter Kok

Toowoomba Clivia Society Inc. Spring Show 2015

By Brian Steven

The Toowoomba Clivia Society Inc. once again held its annual *Clivia* show in Toowoomba, Australia during the city's annual Carnival of Flowers week in September. The society is one of three *Clivia* clubs in Australia, the others being in Melbourne and Sydney.

This non-competitive tenth annual Toowoomba show was held in the TAFE Horticultural Pavilion and ran for six days, which must make it one of the longest running *Clivia* shows in the world, if not the longest! Despite the longevity of the show, the 200 odd display *Clivia* remained in a good condition, with only a couple looking worse for wear over the time. With Toowoomba's mild winter weather and good growing conditions last summer, the *Clivia* proved their toughness by putting on one of the best flowerings for many years.

'Kimberley Dream'

Members found it very hard to keep up with the demand from the public of flowering *Clivia* seedlings and seed. Once again the venue was shared by our society and the Society for Growing Australian Plants. These two displays complement each other with one exhibiting and selling Australian native plants and the other *Clivia*.

From the comments of the visitors, the Toowoomba Clivia Society Inc. can be proud of its efforts in 2015. Asking the visitors for their thoughts on the show, the same answers seemed to come up, which were "they couldn't believe the diversity of the types, colour and forms of the *Clivia* on show."

The Toowoomba Clivia Society Inc. has over 80 members and is attracting members from other areas across Australia, all receiving the bi-monthly newsletter. With Toowoomba growers over the past few years buying good seed and seedlings from overseas and southern states, the standard of *Clivia* in Toowoomba has increased as the years go by. Toowoomba is proud of the title "The *Clivia* Capital of Australia."

Among the great display of *Clivia* this year many stood out, such as Heather Samuelsen's 'Green Eye', which won the public vote for the Kevin Walter's Memorial Trophy for the Best

Kevin Walter's Memorial Trophy

The crowd

European Peach

Presented *Clivia* in the show, Eileen Zahnow's beautiful European peach 'Superb', Lyn and Huxley Althaus's 'Kimberley Dream' and the myriad of European peaches from the proven 'Anderson's Peach', 'Jelena,' 'Jordan Apricot', Doug Manteit's 'Monty's Peach', and 'Lurline' breeding.

The society's show is a free entrance show, but the society encourages the visitors to donate a gold coin in our wishing well. Over $2000 was collected and the charity recipient was RACQ Careflight, a helicopter service for emergency patients and accident victims.

The society is looking forward to next year's show, which hopefully will be bigger and better than ever. For those contemplating coming to Toowoomba for the show, it is held during the Toowoomba Carnival of Flowers week which is the last full week in September, 2016.

More show crowds

Vryheid – Ngome Interest Group Annual Show 2015

By Rex Duke

The Vryheid – Ngome Interest Group show was held on Saturday, 12 September 2015 in the grounds of the Nieu Republiek Primary School and hosted a traditional Boere Mark with stalls offering from pancakes to *Clivia*. The stalls were spread around the school grounds and a good profit and time seemed to be had by all. Jeanrie Lotter, our able Secretary, arranged a Miss Clivia competition for the younger generation with various entrants for Petite, Little, Junior and Miss Clivia. The *Clivia* Show drew 200 entries from 13 exhibitors for 42 categories, proving to be the biggest show in KwaZulu Natal this year. The judges, Hennie van der Mescht and Andre du Toit from Bloemfontein, acquitted themselves well in awarding the medals and were on hand to offer guidance and assistance to enthusiasts after the judging had been completed.

Chairman Piet van Wyk

The results were as follows:
Best on Show – Ben van Niekerk
First Runner Up – Thomas Kleu
Second Runner Up – Ben van Niekerk
Most points on Show – Louis Lotter 88 points
First Runner Up – Leon van Rooyen 41 points

TK Yellow with Green Throat

Winners Ben van Niekerk, Thomas Kleu and Louis Lotter

Special mention must be made of a seasoned club member who sold a 'TK Yellow' with green throat to a new beginner member of the club on the Friday before entries closed allowing her to enter it as the new owner. He obviously knew that the plant was a winner, which it proved to be, receiving Gold in its class and to top it all it was the Judges' Choice. It is in this spirit that new members are attracted to the hobby and ensures the growth of the club.

Piet van Wyk thanking judges Andre du Toit and Hennie van der Mescht

Miss Clivia - Sarah-Lee Groening and Ashley Reimers

ARTICLES

The story behind an early *Clivia* painting

By John van der Linde

Marianne North was an eminent British botanical artist of the 19th century. She visited South Africa in 1882-3. While on her travels she painted this picture of a pendulous *Clivia* (see opposite page). It was labelled: "391, *Clivia* and Grapnel Plant". The plants were stated to be *Harpagophytum procumbens* and *Clivia nobilis*. But is this a *C. nobilis*? Read on!

First, something about Marianne North: She was born in 1830, the eldest child of Frederick North, a well-connected and wealthy Member of Parliament. She had her first lessons in oil painting in 1867, when 37 years of age. She described painting as "a vice, like dram-drinking, almost impossible to leave off once it gets possession of one".

Her father died in 1870. Marianne was 40 and unmarried. What to do with her life? She decided to use her inheritance to finance what she really wanted to do – paint flowers in their natural settings. This meant travelling abroad and her choice was to do that alone.

Her first journey was in 1871 to the United States, Canada and Jamaica. Over the next 12 years Marianne North travelled to Brazil, Tenerife, Japan, Singapore, Borneo, Sri Lanka and India. At her father's friend, Charles Darwin's, suggestion she visited Australia, Tasmania and New Zealand.

Not only are her paintings remarkable but she was also a keen observer of people and a superb travel writer with a great gift for description. Her sister edited her journals into three volumes, "Recollections of a Happy Life: Being the Autobiography of Marianne North". I quote liberally from that work in this article. Marianne probably learned "networking" from her father. She always carried letters of introduction to ambassadors, governors, ministers, missionaries and other people who could help her.

She landed in Cape Town in the spring of 1882, probably in late August. The voyage by steamer took 18 days. She was immediately captivated by the spring flowers then in bloom. She writes of "myriads of small flowers: oxalis of the most dazzling pink; yellow, white and lilac heaths, bulbs of endless variety; gazanias and mesembryanthamums".

Regarding the lady herself, it was said of her: "She inspired respect wherever she appeared, and good men everywhere were ready and eager to help her". Here is just one example of many that she gives in her journal. The well-connected Miss North records a lunch in Cape Town with the Governor of the Cape Colony, Sir Hercules Robinson. He offered to send her in a warship to "seek the welwitschia". She gracefully declined. Her journal says "I thought it was asking too much of Government good nature…"

During her stay in the Cape Colony she visited and painted in Darling, Malmesbury and Ceres. She went to Tulbagh (where "they talk of Beaufort West as we talk of London"). I am going to fast-forward you now. She wrote "Port Elizabeth is far more like a capital than Cape Town; it is full of life and work, very clean and neat…".

She travelled on past Grahamstown, Port Alfred, Queenstown and King Williamstown, painting all the way. She reached Port St Johns in late March 1883. There she was hosted by the official British Resident, with the grand title of Administrator of Pondoland. She had her host's study for a bedroom. I quote: "A native hut, with the extra luxury of a calico lining to its ceiling, which prevented the scorpions from falling on the top of my head".

She adds: "On the other side of my hut

were the rolling waves and golden sand, only separated by a narrow belt of milk trees, with ferns, lilies, and a sort of dracaena under them, tangled with convolvuluses. It was very peaceful to wake the next morning amid all this, and to be in no hurry". What a wonderful description of Wild Coast scenery!

While waiting for a ship bound for Durban

Looking seaward from the mouth of St John's River, Plants: *Aloe Strelitzia augusta* (now *alba*)

she spent her time painting. This was when she painted the picture shown at the beginning of this article. Although *C. gardenii* had been named at least 30 years previously, it was still far less well-known than *C. nobilis*, so it is not surprising that she should have described the plant she had painted as *C. nobilis*. Since the painting was done in early autumn, sometime in late March or early April, it is far more likely that the plant pictured is an early-flowering *C. gardenii*, or maybe even a *C. robusta*. After all, she was in *robusta* country, Pondoland, at the time. Certainly, the leaves of the plant pictured do not look like those of *C. nobilis.*

Eventually, on 11 April 1883 a steamer arrived and she left for Durban, arriving the next day. A tram ride took her to the Marine Hotel. Does that name ring any bells with readers of this article? I remember staying there in the 1970s; big fat cockroaches and a huge bath with shiny brass taps. A multi-storey parking garage and office block stand on that site today. Such is progress!

From Durban Marianne North travelled by rail to Tongaat to visit Katharine Saunders, who painted a picture of the first yellow *Clivia miniata* that was discovered in the wild. Marianne North spent six weeks in Natal. It isn't clear from her journals how long she spent with the Saunders family. We do know that the two ladies sat painting the same subjects together, including beach plants. They had much in common: both loved music and sang; they had both travelled; they were skilled observers; both had enquiring minds; and a thirst for knowledge.

Eventually it was time for Miss North to go; she took the ship from Durban on 22 May 1883, on her way home to summer in England. Her last great journey was an expedition to Chile in 1884. After that she retired, worn out from her travels. She was only 60 when she died in 1890.

A total of 832 of her paintings are housed in the Marianne North Gallery at Kew, in England. These paintings are a unique snapshot of the

Part of the "Residence", St John's, Kaffraria Plants: White Pear

Looking up Stream from the mouth of the St John's River

world's natural habitat more than 100 years ago. Many of the species she painted have since disappeared. She was, quite literally, documenting a vanishing world.

I wonder whether, in her later years and sitting in her armchair, she had happy memories of her painting expedition to South Africa, her time in Port St Johns and meeting with Katharine Saunders and of their painting together, in warm, far off Tongaat?

The interested reader can view her flower paintings at: http://www.kew.org/mng/gallery/index.html. The edited version of Marianne North's autobiography "The recollections of a happy life" can be found at: https://archive.org/stream/recollectionsofh01nortuoft/recollectionsofh01nortuoft_djvu.txt

Also, there is a short summary of her life in a YouTube clip at https://www.youtube.com/watch?v=7lSDS4fFC_g

Soil analysis part 1: Soil reaction and *Clivia* husbandry

By Felix Middleton

Soil reaction or pH (potential Hydrogen ions) is defined as the negative logarithm of the activity of hydrogen (H+) and hydroxyl (OH-) ions in a solution. In laymen's terms, it is a measure of acidity or alkalinity on a logarithmic scale of 1 to 14. A pH of 7 is regarded as neutral, below 7 is acidic and above 7 is alkaline.

As a rule, soils in moist climates tend to be acidic and those in dry climates are alkaline. High precipitation leaches significant amounts of exchangeable bases from the surface layers of the soils resulting in a domination of H+ ions. Alkaline soils occur when there is a comparatively high degree of base saturation. Salts like carbonates of calcium, magnesium and sodium skew the equilibrium towards more OH- ions. For example, when salts such as sodium carbonate go into solution and hydrolyse in the soil, it gives rise to alkalinity.

Soil pH is a key variable in plant husbandry as it affects many chemical processes associated with growth and development. It affects nutrient availability to the plant by controlling the chemical properties of the nutrient. The optimum soil pH range for most plants is established as between 5.5 and 6.5. However, many plants have adapted to grow at pH values outside this range.

Correcting soil pH

Generally speaking, it is easier to make soils more alkaline than it is to make them more acid. Lime is used to correct an acidic soil. Different soil types react in different ways to the application of lime. You will, for example, need to add more lime to clay soils than you will to sandy soils to achieve the same result. The addition of rock sulphur, ash from a fireplace, sawdust, composted leaf litter, grass clippings, bone meal, crushed marble, or crushed sea shells may be used to lower the soil pH.

An alkaline soil in itself does not have a direct effect on plant development but affects nutrient solubility and availability to the plant. Plants differ in their ability to tolerate high pH soils. In moderately alkaline soils, some plant roots can secrete high levels of acids into the soil. This lowers the pH immediately around the roots and increases nutrient availability.

In addition to the indirect effect where an acid soil restricts access to water and nutrients, it can also have a direct effect on plant growth. When the soil pH drops, aluminium becomes soluble and toxic to cells. Furthermore, a low pH impedes microbial activity. Many plants benefit from nutrient release by microbes in the soil.

Soil pH has been proven to affect colour expression in the flowers of certain plants. For example, the flowers of old variety Hydrangeas (Christmas roses) tend to be blue when plants are grown in acid soils of pH 5.2-5.5 and pink when grown in more alkaline soils of pH 6.0-6.2. Although soil pH has been suggested by some to be a contributing factor towards the degree of blushing of light colour *Clivia*, this notion still needs to be corroborated.

Soil reaction of *Clivia* growing mixes

Most *Clivia* growers state that a pH of around 6.2 is optimal for *Clivia* growth. However, this has not been tested extensively and is only accepted as most commercially available potting mixes are of this pH and *Clivia* survive in all but a few commercial mixes.

So how do we test what is the best pH for *Clivia* without embarking on a tedious and expensive experiment where we grow plants in soils of different pH? As a preliminary study we can test potting mixes from growers whose plants thrive and compare it with the results from growers whose plants do not do as well.

This comparison is complicated as growers with plants that do not thrive often neglect their charge in general and the lack of success may be due to some other factor other than soil pH alone. A more practical method is to go to the source and test the pH of soils where the plants grow naturally. Although this has the advantage that we can obtain results in a short period of time it has the potential disadvantage that the exercise can become expensive due to the distribution range and often remote location of wild *Clivia* species.

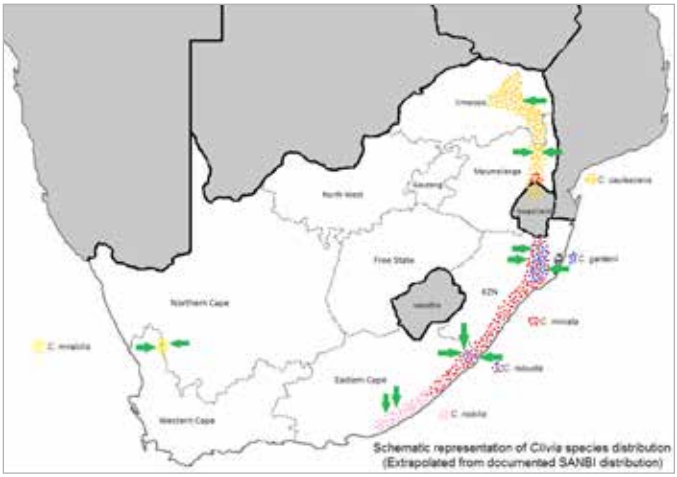
Sample collection

Natural occurring populations of *Clivia* were visited during 2015 in an attempt to document and photograph all six species in habitat. These trips were mostly scheduled during the flowering season which started with the flowering of the Midlands *C. gardenii* in April and ended with *C. mirabilis* in November. A total of 15 different locations were visited and soil samples were collected at 13 of these. Although this might not constitute a representative sampling of all the different habitats, it is representative of the *Clivia* distribution as a whole and should at least show tendencies toward soil reaction. Permission to collect soil samples was only rejected at one of the sites visited. Consent to take a soil sample at Oorlogskloof was initially granted; however upon arrival I was told that I needed a sample collecting permit to sample in a nature reserve. Unfortunately we could not reach the authority that gave me permission to collect samples in time to collect a sample at this location. I am grateful to the farmers, land owners and guides who allowed me to take soil samples while documenting the plants in habitat.

Small samples of soil or growing substrate (< 250cc) were taken from the surrounding area near healthy growing plants while making sure that the roots were not disturbed or damaged. Fourteen diverse potting mix samples were also tested and included in the comparison. The potting mix samples were submitted by, or collected from various *Clivia* enthusiasts.

C. miniata growing in a thin layer of leaf litter on a rock

Map of South Africa depicting distribution of *Clivia* and showing approximate locations where the soil samples were taken



Analysis of the samples

As the samples were not all collected at the same time, we analysed them in three consecutive sets. Two random samples from set 1 were included in set 2 and 2 samples from set 2 were included in set 3. These were used as checks. In all 4 of these pair-wise comparisons the pH did not differ by more than 0.2 units, confirming the repeatability of the results between the sets.

Samples of 75cc were dried at 60°C for 12 hours, weighed and then soaked with 150cc distilled water (pH 6.8). The saturated sample was left for two hours at 60°C after which the runoff was carefully decanted and filtered with the use of laboratory grade filter paper. The saturated soil sample was weighed directly after the runoff was decanted and then at intervals for 30 days thereafter to study evaporation trends between samples. The pH of the runoff was taken directly after filtering.

Results of the pH test

Refer to Table 1 for a summary of the soil reaction results. Soil reaction of all but two of the potting mixes were between or close to the pH range of 5.5 to 6.5 which is regarded as optimum for plant growth and development. The other two were on the acidic side which could be attributed to the large fractions of partly composted pine bark and pine needles in these mixes. It should be noted that these two potting mixes are known to work well for *Clivia*, as was communicated by the respective suppliers.

The range of soil reactions for samples taken from habitat is much more varied with the highest being 7.8 and the most acidic being 3.4. An interesting observation is that the environments with soil with the lowest pH are those in high rainfall areas, corroborating the leaching principle as stated in the introduction. This is especially obvious for *C. robusta* which grows in marshy or peaty environments. On the other hand, soils from the dry, arid regions where *C. mirabilis* grow are alkaline.

Observations and assumptions

It would be easy to conclude from this association study that the pendulous species, except for *C. mirabilis*, prefer a more acid environment and that *C. mirabilis* and *C. miniata* prefer more alkaline environments. Please remember that this assumption is based on an association between two variables which may be related in more complex ways. A study where *Clivia* are grown in media of similar composition but where only the pH differs could validate or discredit the observed differential response to soil reaction.

C. robusta growing in a marsh. The pH of these soils are generally low due to leaching

A more likely conclusion is that *Clivia* are not as sensitive to soil reaction as are other ornamental plants. The perceived correlation between pH and species is due to the respective habitats which co-incidentally have different pH characteristics due to associated climate or geology. Let us consider the differential soil response between the *C. nobilis* and *C. miniata* habitat at the Qorha river in the Transkei. The substrate where the *C. nobilis* grow is significantly more acidic than that of the *C. miniata*. The soil samples were taken

Table 1.1: Soil reacation (pH) of habitat collected as well as potting mix samples

Key to color formatting of cells:

3.0-3.4	Very Acidic
3.5-4.4	Acidic
4.5-5.4	Moderately Acidic
5.5-6.4	Horticulturally Recommended
6.5-7.4	Neutral
7.5-7.9	Moderately Alkaline

Species	Location	pH	Notes on habitat	Description of sample
C. miniata	Qorha river - Transkei	6.3	In leaf litter	Habitat
C. miniata	Qorha river - Transkei	6.4	Between rocks	Habitat
C. miniata	Central Transkei	7.8	On a rock	Habitat
C. miniata	Central Transkei	6.2	In leaf litter	Habitat
C. miniata	Ahrens - Natal	6.0	In leaf litter below cliff	Habitat
C. miniata	Ngome - Northern Natal	6.6	On a rock	Habitat
C. miniata	Oribi - natal	6.0	Between rocks	Habitat
C. mirabilis	Western Cape	6.9	Southern ravine	Habitat
C. mirabilis	Western Cape	6.8	Northern ravine	Habitat
C. mirabilis	Northern Cape - Site 1	5.3	Middle of population	Habitat
C. mirabilis	Northern Cape	6.9	Middle of population	Habitat
C. mirabilis	Northern Cape	7.1	Edge of population	Habitat
C. mirabilis	Northern Cape	6.4	Under cliffs	Habitat
C. gardenii	Ngome - Northern Natal	3.9	On dry slope	Habitat
C. gardenii	Ngome - Northern Natal	4.3	In shade	Habitat
C. gardenii	Ngome - Northern Natal	5.5	On rock	Habitat
C. gardenii	Ahrens - Natal	5.7	On cliff	Habitat
C. gardenii	Ahrens - Natal	4.7	In leaf litter below cliff	Habitat
C. robusta	Oribi - Natal	3.4	On cliff	Habitat
C. robusta	Port Edward - Natal	5.0	Well drained site	Habitat
C. robusta	Port Edward - Natal	3.8	Water logged site	Habitat
C. caulescens	Sabi - Mpumalanga	4.0	in Pine plantation between rocks	Habitat-plantation
C. caulescens	Sabi - Mpumalanga	4.5	in Pine plantation	Habitat-plantation
C. caulescens	Tzaneen - Limpopo	4.3	On granite rocks	Habitat
C. caulescens	Tzaneen - Limpopo	4.5	In leaf litter below rocks	Habitat
C. caulescens	Sabi - Mpumalanga	7.6	On cliff	Habitat
C. caulescens	Sabi - Mpumalanga	7.5	Below cliff	Habitat
C. nobilis	Qorha river - Transkei	4.8	In leaf litter	Habitat
C. nobilis	Qorha river - Transkei	3.8	Between rocks	Habitat
Domesticated Clivia	Gauteng	4.2	Potting mix (T mix with bark)	Potting mix
Domesticated Clivia	Natal	4.4	Potting mix (Pine mulch)	Potting mix
Domesticated Clivia	Gauteng	5.4	Potting mix (Earth 2 Earth)	Potting mix
Domesticated Clivia	Gauteng	5.5	Potting mix (Sand and manure)	Potting mix
Domesticated Clivia	Gauteng	5.6	Garden mix (Sand and manure)	Garden mix
Domesticated Clivia	Natal	5.6	Potting mix (40% vermiculite)	Potting mix
Domesticated Clivia	Gauteng	5.7	Potting mix (undisclosed mix)	Potting mix
Domesticated Clivia	Natal	5.7	Potting mix (Bark and manure)	Potting mix
Domesticated Clivia	Western Cape	5.9	Potting mix (Bark only)	Potting mix
Domesticated Clivia	Natal	6.0	Planting (Platt garden mix B)	Garden mix
Domesticated Clivia	Gauteng	6.0	Potting mix (undisclosed mix)	Potting mix
Domesticated Clivia	Natal	6.3	Potting mix (Complex mix)	Potting mix
Domesticated Clivia	Gauteng	6.3	Seedling mix (ProGro Cocopeat)	Seedling mix
Domesticated Clivia	Natal	6.3	Composted wattle bark	Toxic mix

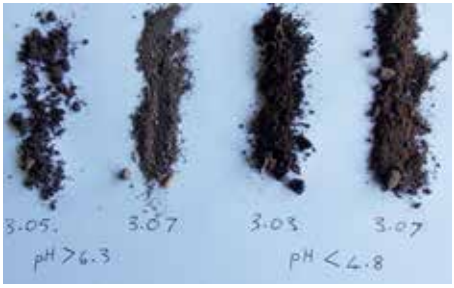
The dry and arid environment where *C. mirablis* grow. pH of soils from this type of environment is generally high

less than 100m from each other. The differential response between samples that were taken between these seemingly similar environments suggest that at least for these two species, a preference to pH may be valid. However, on reflection, the *C. miniata* at the Qorha site generally grow in wetter conditions in shade whereas the *C. nobilis* flourish in dryer areas in more sunlight. There is very little overlap between these two species in this area. *C. nobilis* is adapted to the dryer environment, irrespective of the prevailing pH of this micro-environment.

C. caulescens growing and thriving in a pine forest in the Sabie area. The pH of the substrate is low in these forests

A good example that may corroborate the insensitivity to pH theory is that of soil samples taken within *C. caulescens* habitats. In most samples the pH was very low. However, natural habitat samples taken from the Sabie area are uncharacteristically alkaline. In addition, many

Typical habitat of *C. caulescens* in the Sabie area; high on rocky ledges in moist areas. The pH in this specific environment was unusually high



Seemingly similar substrates from the Qorha site. The two samples on the left were taken within a *C. miniata* population. The two samples on the right from *C. nobilis* which were growing nearby

plants in the Sabie area survive and even flourish in pine forests that border the natural habitat. Substrate pH in these pine forests is very acidic.

Conclusion

I believe that *Clivia* are more tolerant of extremes in soil pH than many other ornamental plants. The differential response of species in habitat to soil pH is likely due to chance association of pH to the habitat micro-environments or micro-climates rather than an adaptation of *Clivia* species to pH *per se*. This said, it may not be a bad idea to use an alkaline substrate for growing the notoriously difficult *C. mirabilis.*

Soil analysis part 2: Comparing growing mixes and *Clivia* habitat substrates

By Felix Middleton

Although the main objective of the soil sampling experiment was to evaluate pH of potting mixes and habitat samples, we also noted and compared physical characteristics of the growing media.

Composition

It is clear that *Clivia* potting mixes are formulated to enable aeration and not to imitate the characteristics of the substrate as found in the *Clivia* habitat. Most potting mix formulations use partly composted pine bark as a foundation, an alien element to the *Clivia* natural habitat. In addition to the bark foundation, many mixes also contain sand and composted organic material. The sand is said to help with aeration but is usually just added to give weight to the mix as pots and especially bags tend to be unstable when only filled with bark. The compost is added as a source of organic nutrients and to buffer the mix against any nutritional imbalances. Other components like coconut fibre, peat, vermiculite, perlite and sawdust may be added to assist with moisture management.

Potting mix

The formulations of the submitted or sampled *Clivia* growing mixes varied in complexity. Table 2.1 notes a few of the mix formulations that were disclosed by enthusiasts. There is no universal recipe, all have been formulated to suit the specific requirements of the respective growers. Watering regime, prevailing macroclimate, availability of mix components, pot size and even pot stability is taken into consideration when formulating a mix.

Measuring the physical attributes of growing media

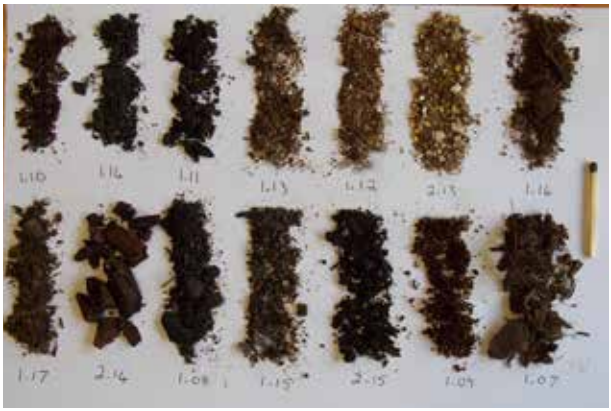
Differences in attributes of the submitted and habitat samples are presented in Table 2.2. We calculated and compared the following six attributes in an attempt to find an ideal growing substrate:

1) **Percentage organic matter – An estimate of the organic matter as a percentage of the total soil sample**

This attribute is often used to describe the health of a soil or growing substrate as organic matter improves the soil structure by increasing aeration. It can also improve the ability to retain water and store nutrients.

2) **Dry weight – Weight of the growing substrate after drying at 60°C for 12 hours**

The weight is expressed as the weight in grams of a litre volume of soil. A light soil tends to make the planting pot or bag unstable. On the other hand, a heavy soil results in higher transport costs when moving plants. One concern was that the structure of a sample can



Diversity in potting mixes used by enthusiasts. The number below the mix corresponds to the sample numbers in Table 2.1

Table 2.1: Clivia growing mix formulations as disclosed by enthusiasts

Mix	Components	Ratio	Notes
2.15	Bounce Back™, Commercial potting mix, Partially composted pine bark, Composted cattle manure, Bone Meal	2:2:2:2:1	Plants are healthy. Grower resides in a area with little rainfall. Watering is controlled and waterlogging in this seemingly compact substrate is not a problem.
4.01	Composted pine bark, Old kraal manure, River sand	2:1:1	River sand is added to weight the pots otherwise they tend to fall over
1.13	River sand, Dolomitic crush, Raw horse manure	1:1:1	For clivias in garden
1.12	Course river sand, Raw horse manure	1:2	For clivias in pots which dries out quickly
1.17	Composted pine bark. Composted sheep manure	2:1	Grower resides in a low rainfall area. Although mix is less aerated, plants are watered in such a way as to prevent waterlogging
1.08	Partially composted course pine bark, General compost, Fertiliser	1:1:pinch	Commercial veggie mix. Used in an area with high rainfall. Grower facilitates drainage by elevating plants on tables or places bags on a layer of course gravel.
2.14	5-20mm sieved partially composted pine bark, Slow release fertiliser	1:pinch	Needs constant watering but plants are exceptionally healthy due to no waterlogging.
1.07	Composted Wattle tree bark	1	Test substrate: said to be toxic
X1	Garden top soil, compost, acid compost, river sand, composted cow manure, Bounce Back™	2:2:2:2:1:1	Mix lasts for a year, then repot
X2	Pine needles, Milled pine bark, Bone meal	1:3:pinch	Poor growth in seedlings
X3	Pine bark, Chicken Manure	10:1	1cm sized pine bark works well
X4	Old potting soil, Compost, Potting mix, Acid compost, River sand, Swimming pool sand, Composted cow manure, Bounce Back™, Bone meal, Polystyrene	5:5:3:3:2:2: 2:1:1:5	Left in bags for at least 2 months to decompose
X5	Course river sand, Composted pine bark, Cymbidium orchid mix	2:1:1	Better suited for *C. mirabilis* and variegated clivia which have a higher susceptibility to fungal disease

be compromised during the process of extraction, transporting and drying. For example, the soil aggregates made by earthworm activity provides a porous aerated substrate. Breaking these fragile structures would result in a sample that has denser structure, weigh more and would absorb less water than in nature. We took care to disturb the natural structure as little as possible.

C. mirabilis growing in a sandy soil. Note the earthworm activity

3) Saturated weight – Weight of the sample when fully saturated with water

The weight is expressed as the total weight in grams of a litre volume of soil. A wet soil is substantially heavier than a dry substrate and will also influence the transport cost when moving plants.

4) Absolute moisture holding capacity as volume per volume

Amount of water that the growing substrate can absorb and hold. The holding capacity is expressed in millilitres water in a litre volume of soil. The holding capacity will influence watering scheduling. The lower the capacity, the shorter the intervals between watering.

5) Moisture holding capacity as percentage

Amount of water expressed as a percentage of the weight of the growing substrate. The holding capacity is expressed as the weight of water compared to the weight of the saturated sample.

6) Days to 50% moisture loss

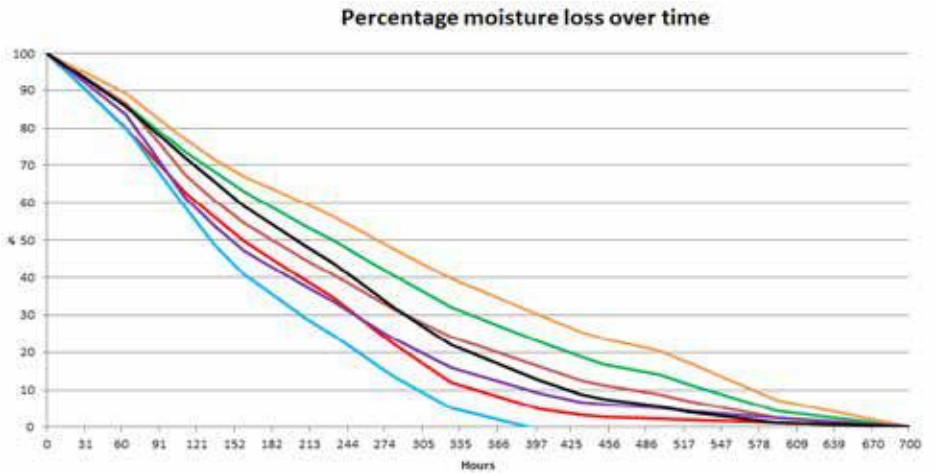
The rate of moisture loss differs between soil types. The rate depends essentially on the total surface area of individual soil particles. The larger the particles the lower the overall capillary attraction and the easier for the soil to lose moisture through evaporation. Dense soils with fine structure or large amounts of porous composted organic material generally dry out slower than soils that consists of course river sand.

Results of the comparison

Contrary to popular belief, not all habitat *Clivia* grow in substrates which are high in organic matter. On average, soils from habitat contain much less organic material and are thus also heavier. The moisture holding capacity per weight is similar between habitat samples and artificial planting mixes but the latter generally dry off quicker.

There is a correlation between the percentage organic material present and the water holding capacity. Additionally, a negative correlation exists between the percentage of organic matter and sample weight. Soils with a higher percentage of organic content show a higher percentage per weight water retention but on average weigh less.

The four samples that dried out the quickest had a high organic content. Furthermore, these soils did not retain a large amount of water. Although course pine bark is often used to facilitate aeration, these types of substrates are less porous than compost and dry out



Differences in the rate of drying out for 7 *Clivia* growing mix samples. Moisture loss is a function of not only the amount of water in the substrate but also an ability to retain the water

very quickly, requiring frequent watering. It is interesting to note that there is no significant correlation between the samples that took long to dry out and the amount of organic material in these samples.

There is a definite correlation between dry-out rate and absolute moisture holding capacity for the high and low moisture losing samples only. Samples with intermediate dry-off rates show no such correlation. For these samples we can therefore not estimate a moisture loss rate based on the absolute amount of water in the substrate alone. Water scheduling can only be calculated on a system of trial and error. Special attention should be taken when growing plants in soils with intermediate moisture holding capacity and long dry-off rates as these may easily become waterlogged from overwatering.

Comparison between a plant grown in Wattle bark (right) and a control plant from a similar genetic background

Composted Wattle bark as substrate

In an attempt to formulate a cheap growing mix, the author, against his better judgement and ignoring the cynical remarks from fellow enthusiasts, planted several *Clivia* plants in a growing mix consisting exclusively of Black Wattle bark. It was known from past experience that *Clivia* roots are not affected by Wattle bark as they grow into this substrate when it is used as ground covering in a greenhouse. The mulch

Table 2.2: Comparison of physical atributes of habitat collected and potting mix samples

Key to color formatting of cells:

Exceeding one standard deviation unit of mean

Lower than one standard deviation unit of mean

Sample number	Species	Location	Organic material in sample	Dry weight	Saturated weight	Moisture holding capacity (vol./vol.)	Moisture holding capacity (%)	Days to 50% moisture loss
		Unit of measure >>>	%	g/L of soil	g/L of soil	ml/L	% of weight	days
3.05	C. miniata	Qorha river - Transkei	75%	518	857	340	40%	9
3.07	C. miniata	Qorha river - Transkei	50%	457	901	444	49%	10
3.01	C. miniata	Central Transkei	5%	561	1001	440	44%	10
3.02	C. miniata	Central Transkei	99%	102	491	389	79%	9
3.06	C. miniata	Ahrens - Natal	30%	847	1267	420	33%	9
2.11	C. miniata	Ngome - Northern Natal	20%	341	953	612	64%	14
1.06	C. miniata	Oribi - natal	10%	862	1265	403	32%	8
2.05	C. mirabilis	Western Cape	5%	1000	1308	308	24%	8
2.06	C. mirabilis	Western Cape	10%	745	1170	425	36%	11
2.07	C. mirabilis	Northern Cape	60%	405	848	443	52%	12
2.08	C. mirabilis	Northern Cape	10%	883	1226	343	28%	8
2.09	C. mirabilis	Northern Cape	90%	216	584	369	63%	9
2.10	C. mirabilis	Northern Cape	5%	882	1237	354	29%	9
2.03	C. gardenii	Ngome - Northern Natal	10%	763	1106	343	31%	9
2.04	C. gardenii	Ngome - Northern Natal	5%	760	1153	392	34%	9
2.12	C. gardenii	Ngome - Northern Natal	5%	830	1306	476	36%	11
1.01	C. gardenii	Ahrens - Natal	60%	385	844	460	54%	9
1.02	C. gardenii	Ahrens - Natal	60%	336	899	564	63%	12
1.03	C. robusta	Oribi - Natal	70%	259	799	540	68%	11
1.04	C. robusta	Port Edward - Natal	60%	474	1047	573	55%	11
1.05	C. robusta	Port Edward - Natal	40%	437	1016	579	57%	11
3.12	C. caulescens	Sabi - Mpumalanga	80%	244	709	465	66%	9
3.13	C. caulescens	Sabi - Mpumalanga	99%	147	471	323	69%	7
2.01	C. caulescens	Tzaneen - Limpopo	60%	330	941	612	65%	9
2.02	C. caulescens	Tzaneen - Limpopo	80%	260	847	587	69%	13
3.08	C. caulescens	Sabi - Mpumalanga	50%	291	841	550	65%	11
3.09	C. caulescens	Sabi - Mpumalanga	20%	419	807	388	48%	10
3.03	C. nobilis	Qorha river - Transkei	95%	129	592	463	78%	10
3.04	C. nobilis	Qorha river - Transkei	50%	366	849	483	57%	10
		Average for habitat soils	47%	491	943	451	48%	9.9
1.10	Domesticated	Gauteng	90%	239	645	406	63%	9
1.14	Domesticated	Natal	99%	284	685	401	59%	8
1.11	Domesticated	Gauteng	99%	165	486	321	66%	7
1.13	Domesticated	Gauteng	65%	485	1003	519	52%	10
1.12	Domesticated	Gauteng	35%	960	1342	382	28%	8
2.13	Domesticated	Natal	60%	197	775	578	75%	11
1.16	Domesticated	Gauteng	99%	339	777	437	56%	8
1.17	Domesticated	Natal	99%	210	675	465	69%	10
2.14	Domesticated	Western Cape	100%	183	381	197	52%	5
1.08	Domesticated	Natal	90%	324	756	432	57%	10
1.15	Domesticated	Gauteng	70%	691	1113	422	38%	9
2.15	Domesticated	Natal	90%	259	710	451	64%	11
1.09	Domesticated	Gauteng	99%	58	602	544	90%	12
1.07	Domesticated	Natal	99%	110	434	324	75%	7
		Average for growing mixes	85%	322	742	420	60%	8.9

Exceptional root development in a Wattle bark growing mixture. Note the offset developing to the left in the root mass

is a deterrent against the unwelcome growth of weeds, algae and ferns. Results showed that Wattle bark contains a substance that hinders, but does not prevent development of *Clivia* plants. Plants grown in Wattle bark grew slower than the control group, had narrower leaves and developed a sickly yellow colour. They did flower though and have survived for the past two years. It came as a great surprise that the root development in the Wattle bark was superior to that from the control group. There were even offsets forming in the Wattle bark.

I am aware of only one other substrate that has a detrimental effect on the growth of *Clivia*. An out of bonds soil reaction (pH) was said to be the cause of the damage. However, upon closer inspection of the substrate it became clear that the plants were essentially being baked in the media. The compost component of the mix was still breaking down.

Conclusion

Clivia grow in almost any substrate provided that we manage the irrigation in such a way that the substrate does not stay wet. Furthermore, *Clivia* are very forgiving to extremes in soil reaction and also imbalances in nutrient and toxins, as evident from the Wattle bark experiment. No wonder it is jokingly referred to as a plant suited for bachelors. As the plant is so forgiving, you need not seek out the most expensive growing media on the market. Use what is available to you and formulate your mix to suit your specific situation. If it works, do not fix it. If you want to make it better, tweak it by making small changes to what you already know works. Some important considerations:

- There is no one-size-fits-all mix for *Clivia*
- Manage your water scheduling to prevent waterlogging
- Compost should be mature before adding it to the mix
- If a mix works for ornamental plants, it will work for *Clivia*.

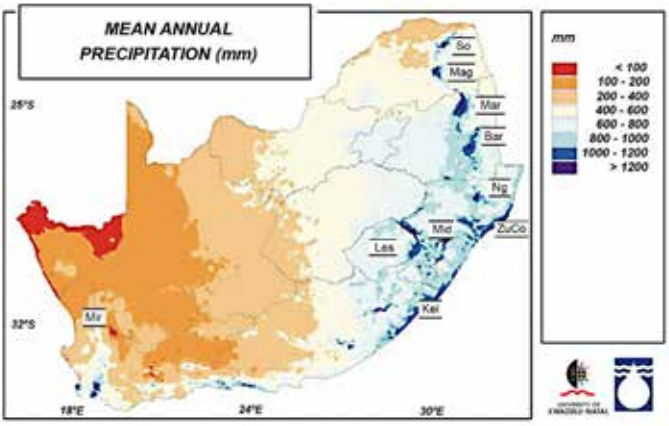
Clivia mirabilis and its water balance

By Connie & James Abel

Clivia in their habitats have always ranked high in our interests. The habitats are invariably in very scenic areas and one can but puzzle over their complex inter-relationships with climate, topography, soils and companion vegetation. Some years ago, on the internet, we came across the attached SA rainfall map from the University of KwaZulu-Natal. It is striking how in the summer rainfall region on the right, the dark blue 1 000+ mm per annum rainfall areas give an accurate image of the location of the five eastern *Clivia* species. From the north, the positions of such well-known habitats as Soutpansberg, Magoebaskloof, Mariepskop, Barberton, Ngome, Midlands and Kei Mouth are indicated by appropriate lettering. Several of these areas are commonly referred to as being "in the mist belt". Exceptions in this region are the too-cold high Drakensberg escarpment on the Lesotho border (east of 'Les') and the too-hot Zululand coast (centre right). Also striking is the habitat's temperature related inverse correlation of latitude and altitude, with the latter dropping steadily from 1800 m in the north to sea level in the south.

The description in 2002 by John Rourke in Clivia Yearbook #4 of a new species *C mirabilis* from the Northern Cape was exciting news for all *Clivia* enthusiasts. This was from the Bokkeveld escarpment in the Oorlogskloof Nature Reserve in the Northern Cape (see 'Mir' on map). The existence of a few more populations in the vicinity has subsequently been reported. Two major surprises were, firstly, that this new species was found more than 800 km distant from the closest of the eastern species and, secondly, in an "arid Mediterranean climate with a winter rainfall of just 414 mm pa". Rain was stated to start in April and fall mainly between May and September. Ian Coates reports having been soaked during October and November visits, and Mandy Schumann says "mist and some rain do continue through the

Bokkeveld escarpment map



Knersvlakte and Oorlogskloof map

On the flats, approaching the escarpment. A feature here is the cloud encompassing the escarpment. Photo Ian Coates

C. mirabilis habitat leading up to the sandstone cap in the background. Photo Ian Coates

summer months. The Bokkeveld Plateau is considered a transition zone of the summer and winter rainfall areas, so we also receive some of the summer thunder storm downpours. For example, this year in January, the Hantam National Gardens, just south of the town [Nieuwoudtville], recorded 54 mm for January".

Two major climatic adaptations of *C. mirabilis* are the very rapid maturation of its seed, to fit in with the different rainfall pattern, and its thick roots of about 20 mm where the mass of dead velamen cells provides an excellent storage mechanism for any surplus moisture.

With regard to origins, Felix Middleton has written: "So far it seems as if *nobilis* and *mirabilis* are very closely related. Both have, and segregate for, unique traits such as the leaf median stripe, the V shaped cross section of the leaf, the notch on the leaf tip, a mostly large flower count, darker red flowers as well as serration on the leaves (I observed a *C. mirabilis* with coarser serration than any nobilis that I have ever encountered). Although some of these traits have been reported for the other species, the occurrence is very low. My opinion is that you have two types of *Clivia*, the rough *mirabilis-nobilis* types and then the sissy soft leafed types that grow in moist forests. Which group is closer related to the ancestor I do not know. Many botanists regard the group with more diversity as indicative of the origin of a group, whilst those with less variation are spinoffs trying to populate a niche environment. Of all the species,

mirabilis has the most variation of all, so it could be closer to the predecessor. On the other hand, most of the Amaryllis family are bulbous, showing that the family originally developed within a semi-arid environment. *Clivia* do not have a pronounced bulb and therefore could have developed further, to grow in moisture rich environments. *C. mirabilis* may therefore be a species trying to re-colonise arid environments. Just food for thought".

With initial perceptions of the "aridity" of the area, from 2010 our attention was drawn to five other potential sources of moisture besides measured rainfall, namely fog, dew, plant interception, escarpment effect and the sandstone aquifer. This started with reading the research paper "Fog and Dew in the Succulent Karoo" by Matimati I *et al* in September 2010 in *Veld & Flora*, pp 140-141.

The map on page 68 shows the Oorlogskloof Nature Reserve (situated between 538 and 915 meters above sea level) on the edge of the Bokkeveld escarpment (right), about 100km from the Atlantic (lower left). The research was conducted in the Knersvlakte flats (top centre), between the escarpment and the sea at approximately 200 m altitude. The flats are well known for the dense fogs that arise from the onshore winds from the cold Benguella current in the nearby ocean. The research site has a rainfall of 149 mm pa. Use of appropriate equipment and procedures included:

- weighing lysimeters for accu-

Mist overhanging *C. mirabilis* habitat and escarpment. Photo Ian Coates

Contrasting vegetation on opposite sides of the Oorlogskloof. Photo Roger Dixon

Another "wet slope". Photo Felix Middleton

racy, and
- isotopic analysis of stem xylem moisture to distinguish whether it originated from rain, fog or dew.

Matimati and his colleagues found that:

Fog and dew: On quartz-gravel soil, fog and dew precipitated an additional 253 mm of water for a total of 402 mm pa, an increase of 170%.

Plant interception of fog and dew: On quartz-gravel soil with plants of the dwarf succulent *Agyroderma pearsoni*, the additional precipitation was 460 mm for a total of 609 mm pa, an increase of 308% of moisture.

Clivia, with their leaves funnelling run-off to the centre of the plant, are certainly "waterwise", although we are not aware of any quantification of their water interception ability.

Copies of Matimati *et al*'s paper are available on request by email from jcabel@absamail.co.za.

Escarpment or rain shadow effect: As prevailing onshore winds of moisture laden air rise over land, pressure and temperature drop and relative humidity rises towards saturation, resulting in the formation of clouds and the precipitation of mist (synonymous with fog), dew and rain. This is the escarpment effect which increases all of the above three forms of precipitation, in this case firstly over the flats and then over the Bokkeveld escarpment, home to *C. mirabilis*. This is the origin of the fog for which the west coast is so well known. The deeply incised re-entrants into the escarpment in *C. mirabilis* country are well illustrated in the Google Earth view on page 67, and ideal for "milking the breeze". The populations described by John Rourke

C. mirabilis habitat below the escarpment on a western aspect.
Photo John van der Linde

Wetland in the Oorlogskloof Nature Reserve.
Photo Mandy Schumann

C. mirabilis at the base of the sandstone cliff.
Photo Ian Coates

were "under the eastern cliffs", i.e. on western aspects facing the sea breezes.
Mandy Schumann's statement that "mist and some rain does continue through the summer months" has further relevance here. There will be days of mist without rain, and those days will extend the "wet season", through the mechanisms highlighted by Matimati *et al.*

Sandstone aquifer: Lena van der Merwe first pointed out to us that the cap of the escarpment is a 30 m thick layer of Peninsular Formation Sandstone, which serves as a massive aquifer. The sandstone has a porosity or water capacity, if saturated, of about 20%. Over-simplistically, this is equal to 6 000 mm of water or 15 times annual rainfall!
The effect of this aquifer has been summarized by Roger Dixon as follows:

"*C. mirabilis* grows at the bases of sheer sandstone cliffs, in the afro-montane forest. They grow associated with *Haemanthus, Zantedeschia* and other plants which like to have moisture, but can tolerate a few dry spells. The sandstone talus at the base of these cliffs acts as a moisture trap, and, although it may be dry on the surface, the wicking moisture percolating upwards keeps the humic sandy soil cool. The sandstone layers here are semi-horizontal, and water percolating through the layers encounters joints along which it can flow, so a lot of water which is collected on the escarpment can find

A flowering *C. mirabilis* on the edge of a raging torrent after rain. Photo Ian Coates

A flowering *C. mirabilis* enjoying a humid environment against its mossy backdrop. Photo Ian Coates

In contrast, a *C. mirabilis* in a dry river bed. Photo Felix Middleton

its way out horizontally into the talus at the base of the cliffs".

John van der Linde has sent us a photograph of a *C. mirabilis* habitat on the western aspect of the valley. He says "One *mirabilis* location was owned by the late Mias Volgraaff, whose occupation was drilling for water. As such he had geological knowledge. He pointed out to us that the *mirabilis* were concentrated on a specific part of the hill side, not to the left and not to the right. He said that was where the underground water flowed down".

A benefit of the underground water will be that, beyond rainfall, seasonal moisture availability will be extended as seepage steadily takes place.

It is clear from the above that *C. mirabilis*, in terms of its water balance, benefits from these factors in terms of both volume and length of season, and it may well join the over 1 000 mm pa band of its cousins. However, their moisture availability will also be greater than just rainfall, due to some or all of the above factors.

The above has been sketched with a broad brush, and for the Oorlogskloof there has been no quantification.

C. mirabilis standing proud in the slanting rain. Photo Ian Coates

A *C. mirabilis* seedling on a typical rough seedbed, showing the top of its thick root. Photo Ian Coates

A feature of *Clivia* populations in habitats is that they are usually limited in size (less than a hectare) and their boundaries are surprisingly abrupt. The reason for these boundaries is not evident to casual observation, and must be due to undetermined micro-environmental factors, perhaps soil, climate, aspect or other subtle influences.

Consequently any accurate quantification of *C. mirabilis*'s natural moisture regime will long remain beyond our reach.

With appreciation to the many *Clivia* friends who have contributed in discussion, and with special mention of the local knowledge freely shared by Mandy Schumann, detailed specialist advice from Felix Middleton and the experienced guidance and photos of Ian Coates who, incidentally, first featured in our Clivia publications in the Clivia Club Newsletter #2.1 January 1993, edited by Clivia Society founder Nick Primich.

Note: The despicable actions of some self-proclaimed "enthusiasts" who have blatantly stolen plants from the habitat, sometimes with the excuse of "saving them" [in their own collections!], are and will continue to be a serious threat to the survival of *C. mirabilis* and other *Clivia*. For this reason, we have avoided any directions to specific habitats.

Hybridizing and the quest for 'Susan 4'

Text and photos by Felicity Weeden

I have been fortunate to have been able to breed with interesting plants and have had some interesting results. In earlier days it was believed that 'Ella van Zyl' would always revert to orange. However, crossing it to a pale apricot with a green throat produced my earliest peach with a green throat called 'Dooley'. The name was coined because when it first flowered the peduncle was cracked, causing the umbel to hang down, so "Hang down your head Tom Dooley" came to mind! The nice thing about breeding with 'Ella' is that the offspring retain the perfect umbel and often display diamond dusting.

Christo Lotter gave me a dozen or so seeds of his cross between his 'C10/16' and 'Tienie's

'Dooley'

'Symphony in Green'

'Green Goddess'

Treasure'. The results were stunning. Most of the plants were bronze with green throats. The flowers were all the same shape but the umbels varied considerably. There were a few oranges, but most were of outstanding quality. Crossing between the best bronzes such as 'Green Queen' and 'Symphony in Green' produced some dark bronze flowers with no green at all.

The very best plant from this group, 'Green Goddess', is a superb plant. It is a big robust broad leaf plant and produces a variable umbel of huge flowers, usually light bronze with a green throat. Breeding with 'Green Goddess' has produced such superb plants as 'Outrageous' and 'Audacious', both bold plants producing enormous umbels with recurved flowers light bronze with a green throat of a superior quality.

Breeding with Ansie le Roux's lovely pink, registered as 'Ansie's Delightsome', also known as 'Nommer Y' or more commonly as 'Delightsome' has also been most satisfying. When crossing it with 'Gladys Blackbeard', Les Brown's 'L4' and Ian Brown's 'Powder Puff', lovely pink/pastel flowers appeared. All of these stunners are named with the 'De' of 'Delightsome' to identify them, as in 'Delightful', "Delovely', and 'Delicious', and so on in order to recall what the pod parent is. A number of gold awards have been achieved in this breeding line, including a Best on Show.

Red, of course, is an enigma. I was fortunate that a friend brought back a particularly fine dark orange/red plant purchased at a Dutch market, and I was the lucky recipient. Named 'Red Lady', this super plant is compact in nature with thick tepals and it flowers twice a year. I crossed this with 'Foxy Lady' (Best on Show 2002 and 2008) and produced 'Red Fox'. This is a truly magnificent plant which always flowers early – so has never been on show – and has huge umbels of dark orange/red. It is a healthy plant

and flowers beautifully every season. Top of the Pops! Crossing 'Red Lady' with Bing Wiese's 'Perfecta' strain, has produced some very fine reds. The flowers in the 'Perfecta' crosses are more cup-shaped and are usually quite large, and are displayed on excellent big umbels.

There has of course been much breeding with 'Hirao' and to date I have seen some outstanding results. I crossed a Nakamura coral-coloured plant with my 'Perfect Pastel'. When the resulting seedlings flowered, I was delighted to have first, 'Remus', a super bronze with a green throat, and then 'Romulus', a lovely pinkish brick with a green throat, come into bloom. I pollinated both of these plants with 'Hirao' and have some lovely results. By far the best seedling that has flowered so far is called 'Venus', a cross between 'Romulus' and 'Hirao' which bloomed last year, and won Best Own Breeding. It is a most unusual and attractive flower, almost appearing to have a white overlay.

'Outrageous'

'Delightsome'

'L4'

Breeding with 'Suezette Too', a very fine pink, which is a cross between 'Kirstenbosch Supreme' and, it is believed, 'Appleblossom', some superior quality peaches and near beige, with huge umbels have been produced and won gold, and Best Own Breeding. So, as can be seen, I have been blessed with some lovely breeding material. But there is one plant that I would very much like to retrieve and its name is, of all things, 'Susan 4'.

Years ago I was fortunate enough to view a *Clivia* of great beauty. This lovely pastel flower had wide tepals of the most stunning shade of

'Powder Puff' – Best on Show

pinky/apricot. Unfortunately when I saw it in bloom there were no colour cards in circulation, so I am unable to correctly identify the colour. The plant was fairly compact with wide round tipped leaves and a good umbel. The owner simply named it '4', but it became known as 'Susan 4'. The breeding remains somewhat obscure, but it was believed that this plant was an F1 hybrid between a *Clivia miniata* and a *Clivia nobilis*. I believe that this is possibly one of the very finest *Clivia* that I have seen, despite the advent of Louis Lotter's 'Holy Moly' and Pikkie Strumpher's '777'; and a superb newcomer of my own, called 'Serendipity'.

'Delightful'

I was fortunate in that I was able to procure some pollen of 'Susan 4' and was also favoured on two occasions with four selfed seedlings. The seedlings were slow and quite difficult to grow. Two were interesting oranges with a poor form and crinkled tepals but one turned out to be a very nice pink pastel with flaring trumpet-

'Delovely' Second Runner Up

'Red Fox'

'Remus'

shaped flowers called 'Pink Promise'. The last seedling, after malingering for years and rotting off repeatedly, finally flowered at about nine or 10 years of age. The colour came true to 'Susan 4' but again the flower is a flared trumpet of unusual and unsatisfactory form.

'Romulus'

'Suezette Too' Best on Show 2011 CCC

'Venus'

'Susan 4'

'Suezette Too' - Peach seedling No. 2

'Serendipity'

'Sweet Sixteen'

I named this last one 'Suzanna'. However, I believe that this plant could be put to successful hybridizing use.

I used the pollen from 'Susan 4' on an interesting plant that turns rose as it ages, a plant that Les Brown was particularly proud of called 'L4', and produced 'Sweet Sixteen' and 'Sixteen's Sister'. How did I come up with the names? Well 'Susan 4' x 'L4' can be thought of as 4 x 4 = 16. So 'Sweet Sixteen automatically followed, and when the sibling flowered the

'Sixteen's Sister'

'Pink Crystals'

'Pink Poppet'

'Pink Chiffon'

'My Pet' - 'Gladys Blackbeard' x 'Susan 4'

simple thought was "Sister"! Both these plants were slow to mature and flower, but both have perfect umbels with small pink recurved flowers with fairly short broad leaves. Both 'Sweet Sixteen' and 'Sixteen's Sister' have won gold on show.

There are a number of successful 'Susan 4' crosses including 'Pink Poppet', 'Pink Crystals', 'My Pet' (a cross of 'Gladys Blackbeard' x 'Susan 4'), 'Pink Chiffon' and 'Pale Promise', all of which are pink

'Serendipity'

flowers, and 'Fascinating Four', with a perfect small and round orange umbel with very recurved flowers. I have tried backcrossing and sibling crosses and every trick in and out of the book, but I have not been able to reproduce 'Susan 4'. I will attempt some new crosses on 'Suzanna' and hope against hope that at last I will succeed in retrieving 'Susan 4'. I would dearly love to reproduce this flower because of its peculiar beauty. The Quest for 'Susan 4' goes on!

'Fascinating Four'

PHOTOGRAPHIC COMPETITION 2016 WINNERS

Winner *C. miniata* 'Green Lady' – Carrie Kruger

First runner-up *C. miniata* 'Bella Crystal' – Carrie Kruger

Second runner-up C. *miniata* 'Reflex' – John Hunter

Winner Pendulous species C. *nobilis* – Helen Marriott

First runner-up Pendulous species *C. nobilis* – Helen Marriott

Second runner-up Pendulous species Yellow *Caulescens* – Carrie Kruger

Winner Interspecific *Cyrtanthiflora* – John Hunter

First runner-up Interspecific *C. caulescens* x *C. mirabilis* – Helen Marriott

Second runner-up Interspecific 'Marina' – Carrie Kruger

Winner Single flower *C. miniata* (bronze) x 'TKO' – Helen Marriott

First runner-up Pastel Ghost – Carrie Kruger

Second runner-up Single flower 'Desiré' – Kerrie McElroy

Winner Other *Clivia* photos: Grown from seed from Nakamura best variegated seed – Michael Riska

First runner-up Other *Clivia* photos: A bud of a bronze – André du Toit

Second runner-up Other *Clivia* photos – Carrie Kruger

PHOTOGRAPHIC COMPETITION 2016
SOME CONTRIBUTIONS

Miniata 'Maroon' x 'Hirao' – Helen Marriott

C. miniata – Helen Marriott

Interspecific – Johan Steynberg

C. miniata 'Crème de la Crème' – Kerrie McElroy

C. miniata 'Jade Fantasy' – Kerrie McElroy

C. miniata Conway parti-color 'Nancy Marie' – Michael Riska

C. miniata 'Covina Pink' – John Hunter

C. miniata 'Four Marys' – Dawie van Heerden

C. miniata 'Shakira' – Dawie van Heerden

C. miniata – Johan Steynberg

C. miniata 'Charl's Green' F2 – Carrie Kruger

C. gardenii Pendulous species – Photo by Jan Pohl

C. gardenii 'Hobbit' Pendulous species – Helen Marriott

Cyrtanthiflora Interspecific – John Hunter

Clivia Nobilis x *Mirabilis* Interspecific – Carrie Kruger

Nobilis Blush Pendulous species – Carrie Kruger

Interspecific – Jan Pohl

Interspecific 'Bellissima' – Kerrie Mc Elroy

Interspecific 'Belle Jade Forever' – Kerrie Mc Elroy

Interspecific Cyrtanthiflora – John Hunter

Interspecific 'Coral Peach' – Carrie Kruger

Single flower 'Gypsey Girl' – Jan Pohl

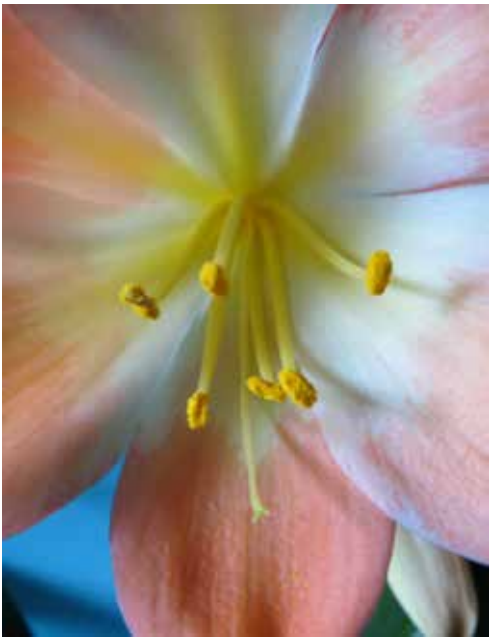
Single flower K. Russell's 'Green Girl' x 'Green Dream' – Helen Marriott

Single flower *C. miniata* 'Marble' – Helen Marriott

Single flower 'Jealous Guy' – Kerrie McElroy

Single flower Multitepal from James and Connie Abel just starting to open – Michael Riska

Single flower 'Vida' – André du Toit



Single flower White centred Pink – John Hunter

Single flower Broad petal 'Hirao' – Carrie Kruger

Other *Clivia* photos *C. nobilis* – Johan Steynberg

Other *Clivia* photos 'Greenflash' – Jan Pohl

Other *Clivia* photos Bud of *C. interspecific* 'Madelyne Rose' – Helen Marriott

Other *Clivia* photos Platter of berries – Helen Marriott

Other *Clivia* photos A bud of a yellow green throat – André du Toit

Other *Clivia* photos 'Gem's Morganite' x Red *Robusta* – John Hunter

Other *Clivia* photos 'Gem's Morganite' X Red *Robusta* – John Hunter

Other *Clivia* photos 'Morning Star' – Dawie van Heerden

Other *Clivia* photos 'Hotlips' – Carrie Kruger

Other *Clivia* photos 'Tana's Green' – Carrie Kruger

PHOTOGRAPHIC CONTRIBUTIONS – Carrie Kruger

'Chiba Yellow' x 'Vico Peach' f1, breeder Charl Malan, grower and photographer – Carrie Kruger

Clivia miniata 'Carrie`s Green' breeder Nakamura grower and photographer – Carrie Kruger

'Ghost' x 'Florid White Lips', grower and photographer – Carrie Kruger

Interspecific 'Her Majesty', grower and photographer – Carrie Kruger

CLIVIA

EIGHTEEN

Rudo Lotter's 'Tinkerbell' X 'Chandelier', Michael Riska

Editor
Joubert van Wyk

EDITORIAL

'Green Velvet'

As we come to the end of another publications term I find myself reflecting on what worked and what needs further attention going forward. The greater emphasis on visual photographic content seems to be popular and is in line with trends in the electronic media. Making the publications available electronically remains a priority. Canvassing more contributors and enticing article and photo submissions remain the most crucial elements contributing to the continuation of the Society's publications.

In line with the visual content strategy, another successful photographic competition was held with 125 photos submitted by 18 photographers. I would like to thank the four judges, Ian Coates, Gordon Fraser, Claude Felbert and James Haxton, for their time and thoughtful contributions which are set out below:

Ian Coates wrote: "I tend to view flowers as portraits. The beauty of the subject is not being judged here but it needs to be tidy and the positioning of the flowers needs to be good, such as no complete heads with a big gap through the middle, damaged tepals, etc. The composition and trimming needs to be balanced, such as not having everything to one side. Then, there are technical issues: Is focus correct and sharp where it should be; is there detail in highlights and shadows where necessary; is the lighting such that it gives shape and depth to the flowers and does not leave all the lower portion of the pendulous flowers too dark; is the background a distraction or does it tell us more about the species; and, of course, is there visual impact as befits a winner?"

Gordon Fraser stated that it was "a joy to see many beautiful *Clivia* photographed so well, but disappointing that to some, a little more attention was not given to one or more of composition, focus, light and background…" Whilst James Haxton indicated that he personally attributes a lot of value to image quality.

Claude Felbert commented that "the 'rules' of good photography apply first and then the beauty and interest that the subject brings to the image comes into it. Also, the subject should conform to the category it falls under and this is not always the case, particularly in the single flower category, where the main subject should be a single flower and in too many [photos] there were other flowers pulling the eye away from the main subject."

I trust that the judge's feedback provides insight to those budding photographers who are aiming to win a category in next year's competition.

We look forward to another quadrennial international conference in 2018, which will be hosted by the Johannesburg Clivia Club on behalf of the Society. The international conference provides opportunity for networking, sharing of knowledge and of breeding techniques with other *Clivia* enthusiasts. As such lots of material for Yearbook 20 should be available.

Whilst serving as Editor remains a labour of love, *Clivia* remains the winner when we all share our insights with enthusiasm and goodwill. The publications exist because contributors share expertise freely and enthusiasts support the efforts of our clubs and the Society. I'd like to thank all that have contributed to this publication and trust that we will continue with the expansion of our collective knowledge-base on *Clivia* into the future.

Joubert van Wyk
May 2017

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ARTICLES

'Jumbo Yellow' and offspring

By Dawie Strydom, Clivia Select, Northcliff, South Africa

Propagation history of yellow *Clivia* in my breeding program

In the mid 1980s, I found some *Clivia* plants in my garden in Hilton, Natal and have become a keen *Clivia* grower ever since. Cynthia Giddy yellow or Group 2 yellow plants, as offsets, sold for R80 per plant in Natal at that time. This price was regarded as expensive and these offsets were not readily available.

I bought two Group 1 yellow plants from Jim Holmes at the Pretoria Show, in the early 1990s, at R250 each. I also imported, mainly Group 1 yellow seeds, from Yoshikazu Nakamura as 'Vico Yellow' crosses from Japan. I also imported Group 1 yellow 'Aurea' seeds from Bill Morris, Kevin Walters and Pen Henry in Australia. Plants grown from these yellow seeds form the basis for my yellow *Clivia* collection. Something interesting I did then was to cross Group 1 and Group 2 yellow *Clivia* plants until I produced yellow plants that were compatible with my Group 1 yellow plants.

In 2000, I obtained some seed from Nick Primich's 'Yellow Big Flower', which represents the origin of my Jumbo yellows. I also planted seeds of 'Vico Gold' and 'Chiba Yellow' crosses from Mr Nakamura in 2002/3 as well as some Kirstenbosch yellow seeds.

The Origin of 'Jumbo Yellow'

Nick had grown four exceptionally big flowered umbels (Y106, Y107, Y249 and Y297) and one orange *Clivia* from Mr. Nakamura's seeds. I bought seeds from these plants and selected certain plants with the fullest and biggest flowers and called them Jumbo Y1-6. 'Jumbo 1Y' (Fig. 1) and 'Jumbo 2Y' were the overall best plants on the Joburg Clivia Show in 2005 (both plants being siblings from Nick Y106 seeds). Yellow plants, with the right credentials, that flowered a few years after Jumbo Y1-6 were selected as 'Jumbo Y' (Fig. 2). I cross-pollinated these outstanding yellow *Clivia* mainly with my best big light orange and orange hybrids. The first flowers from these crosses gave excellent breeding results and the flowers were above average and of good quality.

Fig. 1. Exceptionally large, recurving flowers of 'Jumbo 1Y' on the left in comparison with normal yellow flowers, 2005.

'Jumbo 2Y' is the most unusual plant and it can be regarded as a rare find where the offspring, both through the berry plant and by using pollen, produced plants with exceptionally large, recurving flowers with a diameter wider than 10cm, broad tepals of up to 4cm wide, and a strong peduncle supporting a flower head of 20-25 cm wide. It further produced outstanding multitepal flowers and broad

Fig. 2. An example of one of the early 'Jumbo Yellow' flowers. This plant has an open full flower diameter of more than 10cm.

leaf yellow plants.

I use the name 'Jumbo Yellow', because Nick compared the big flowers with an elephant and the smaller, normal yellow flower to the elephant's relative, the hyrax. At that time, Nick believed that they should not appear together on a show. This was so typical of Nick's dry sense of humour and that is why I have named these flowers and their offspring 'Jumbo Yellow', 'Jumbo Papaya', 'Jumbo Pastel' etc.

Origin of 'Jumbo Papaya' and 'Jumbo Pastels'

A relatively large number of orange and papaya coloured plants originated from 'Jumbo Yellow' crosses, but also from crossing 'Jumbo Yellow' with the best orange or light orange plants in my collection at that time. In the beginning, to maintain the vigour of the 'Jumbo' genes, I was quite careful not to cross the 'Jumbo Yellow' with other yellow plants, but rather with orange and lighter orange flowers. This assumption was not 100% correct (as I discovered at a later stage) and I will refer to this later in the article. Some of the seeds received from Nick flowered light orange.I selected one plant from these and called it 'Jumbo Papaya' (Fig. 3 – flower on the left side).

To grow a light apricot-coloured *Clivia*, I crossed a Nick Primich's wild Transkei (Wild Type X yellow) named 'Light Apricot-Nick', with

Fig. 3. 'Jumbo Papaya' and 'Jumbo Light Apricot' next to a 'Tipperary Peach' on the right.

one of the 'Jumbo Yellow' plants, resulting in a much bigger flower - second from left in Fig. 3 - in comparison, for example, with the 'Tipperary Peach' flower on the right.

'Jumbo Peach' plants

'Jumbo' peaches were produced following the same rationale and one plant in particular, a group 1 named 'Pretoria Peach', gave excellent

Fig. 4a. Typical 'Jumbo Peach' from 'Pretoria Peach' X 'Jumbo 2Y'.

Fig. 4b. 'Jumbo Peach' with a pinkish and green tint.

results. This cross produced large peach or yellow flowers, crossed both ways with 'Jumbo 2Y' used as the berry or pollen plant. I still have most of these plants in my collection because of the fine quality and the superior flower sizes (Figs. 4a-4e).

Fig. 4c. Full, light-peach.

Fig. 4e. 'Gold-Peach Jumbo' in the background with a pinkish flower, known as 'Pink Performer', in the foreground.

Fig. 4d. 'Jumbo Peach' with a light green throat.

Fig. 5. A most unlikely result of a green peach from a 'Tipperary Peach' X 'Jumbo 3Y'.

Another example with an unlikely result came from a 'Tipperary Peach' crossed with 'Jumbo 3Y', producing one peach plant with a prominent green throat (Fig. 5). The other siblings from the same cross were yellow or green- yellow flowers.

'Jumbo Pastels'

Crosses of 'Jumbo Yellow' with light oranges gave remarkable large, open, full and often recurving flowers. The first example was with 'Shimmer', a Mc Neil plant, and the F1 gave- nice big 'Jumbo Pastel' flowers as a result (Fig. 6a). The F2 stages added softer colours, although the flowers were not always as big as the F1 flowers (Figs. 6b, 6c)

The next example is a Coleshaw Strain crossed with 'Jumbo 6Y' (Fig. 6d) and 'Peach Tips' with 'Jumbo Yellow' (Fig. 6e). The Coleshaw Strain came from seeds ordered through the Natal Clivia Club and the 'Peach Tips' is also of Natal origin, grown by Ray Topp.

The F2 generation examples of 'Jumbo Yellow' crossed with light orange flowers (Figs. 6b-6e) show the introduction of softer colours in abundance, adding interesting wow appearances and there is a good chance that they will produce flowers with a different multi-colour look in future.

'Jumbo Multitepal'

When I realized that 'Jumbo 2Y' produced special results on the light orange and orange flowers, I used the 'Jumbo 2Y' pollen on all my best yellow flowers e.g. 'Aurea' (yellow from Aus- tralia), Yellow X 'Vico Yellow', 'Kirstenbosch Yellow', 'Giddy Yel- low', etc. The results were encouraging, producing bigger and fuller flowers. The most remarkable re- sults were the number of multitepal flowers.

Fig. 6a. 'Shimmer' F1 cross ('Shimmer' X 'Jumbo Yellow').

Fig. 6b. 'Shimmer' F2 cross with 'Jumbo Yellow'.

Fig. 6c. Two 'Shimmer' F2 crosses with 'Jumbo Yellow'.

Fig. 6d. 'Coleshaw' crossed with 'Jumbo 6Y'.

Fig. 6e. 'Peach Tips' X 'Jumbo Yellow'.

Fig. 7. 'Jumbo Yellow' multitepal.

A very good example of such a multitepal yellow flower originated from a cross between a Yellow X 'Vico Yellow' from Nakamura with 'Jumbo 2Y', giving 80% multitepal in the F1 generation (Fig. 7).

I also have fine examples of 100% multitepal orange and light orange flowers out of 'Jumbo 2Y' crosses (Figs. 8 and 9). The future generation's results will definitely improve the quality of the multitepal ' Jumbo Yellow' flowers with broader leaves out of these light orange and multitepal plants.

One of my best multitepal plants flowered for the first time in 2016, also from 'Jumbo 2Y' progeny. This is a recurving bi-colour flower, named 'Multi Maxi' (Fig. 10). It has a large yellow-white centre and its strong recurving nature presents a beautiful, unusually well balanced flower shape. This flower has great potential to develop into a unique, new multitepal form where the tepals narrow systematically towards the centre of the flower.

'Jumbo Yellow' and '4 Marys' crosses

The last example that I want to present is a 'Jumbo Y' crossed with a '4 Marys' strain, which also flowered for the first time in 2016 and produced fuller flowers in comparison with the open tepal configuration of a typical '4 Marys' flower. The flowers are full, relatively small, but have a very different colouration from the traditional '4 Marys' flower: pink spots on whitish tepals (Fig. 11). This is probably one of my best results from my 'Jumbo Yellow' progeny, showing great colour potential and I cannot wait to see future results from this flower.

Fig. 8. Orange multitepal from a cross between 'Orange MP4' X 'Jumbo 2Y'.

Is 'Jumbo Yellow' comparable with 'Chiba Yellow'?

Nick Primich received the 'Yellow Big Flower' *Clivia* seed from Mr Yoshikazu Nakamura and my guess is that Mr Nakamura probably developed 'Yellow Big

Fig. 9. 'Jumbo Apricot' multitepal from a broad tepal yellow crossed with 'Jumbo 2Y'.

Fig. 10. 'Multi Maxi', produced from 'Orange Recurving' X 'Jumbo 2Y'.

Fig. 11. F2 result from 'Jumbo Y' crossed with '4 Marys'.

Flower' out of 'Vico Yellow', and 'Vico Gold' at more or less the same time when he produced his first 'Chiba Yellow' plants. This was confirmed at the time by Mr Nakamura who had sent me some posters, with photographs of 'Chiba Yellow' flowers next to normal yellow flowers such as 'Vico Yellow'. The size and shape of these 'Chiba Yellow' flowers looked very similar to the 'Jumbo Yellow' flowers in my collection.

There are some 'Chiba Yellow', 'Chiba Orange' and 'Chiba Light Orange' *Clivia* available in South Africa and I am sure also elsewhere in the world, grown from seed bought from Mr Nakamura. These plants have become extremely rare and should be looked after if you are lucky enough to have one in your collection. It was not possible, for example, when I visited Mr Nakamura in 2010, to buy 'Chiba Yellow' or any related material. Here is an example of such a yellow plant grown from seed bought as 'Chiba Orange' crossed with 'Best Yellow' (Fig. 12). In principal I am quite happy to compare the 'Jumbo Y' with the "Chiba" flowers, but the individual genetic make-up will probably differ between populations, because they are crossed with a wide range of variable genetic material by the different growers in South Africa and world-wide.

Fig. 12. 'Chiba Yellow', grown by Pikkie Strumpher, from 'Chiba Orange'.

Conclusions

It is great fun growing 'Jumbo Yellow' crosses and it often gives unexpected, positive results. There is no colour restriction in terms of what is possible. It is just a matter of finding the right combination. I am half-way towards growing compact, yellow flowering plants with a good leaf shape and extra-large flowers or with large multitepal flowers. This is still a challenge, but I believe it is possible. Claude Monet was still producing great paintings at the ripe old age of 85, so I still have a chance to produce that special flower!

Pollinating agents of *Clivia mirabilis*

KZN Club contribution, prepared by Felix Middleton

All good research projects start with a mystery. Solving the mystery is simplified when the researcher diligently focuses on the problem alone. However, many of us tend to get side-tracked along the way and then find that these detours are more rewarding then the original challenge. This is a report on such a situation which started with a mystery but ended up with so much more.

The mystery

During my visit to Oorlogskloof in October 2015, I took several pictures of *Clivia* in flower. Some were from plants grown in a shade-house but most were from habitat specimens. I was recently asked for good pictures of *Clivia mirabilis* species taken in habitat to serve as examples for a poster presentation. The posters were designed and while proofing them, I decided to submit an alternative picture of *C. mirabilis*, as there was damage to the flower

Damage to flowers of *C. mirabilis* in habitat.

No damage to flowers of *C. mirabilis* grown in a shade house.

on the picture originally presented. However, going through the 20 or so pictures taken on the Oorlogskloof visit, I could only find one flower without any damage. Unfortunately, this was the one that was photographed in the shade-house. In addition to the pictures, I managed to videograph more than 50 flowering plants on the trip. These videos also showed the damage to the flowers. I have not seen this type of damage on any of the other pendulous *Clivia* species in habitat. Some earlier pioneering explorers of the Oorlogskloof site had recorded that sunbirds vandalise flowers.

Why were all the habitat plants damaged? The flowers are pendulous, a feature which indicates that sunbirds are likely the main pollinating agents. An efficient biological system of pollination should not be associated with damage to the reproductive structures. Besides, if the sunbirds penetrate the flowers from the top, their beaks will not come into contact with the anthers and cross-pollination between plants will not be achieved. Are sunbirds therefore responsible for cross-polli-

nating *C. mirabilis* or are they just robbing the plants of nectar?

Location and population structure

Although I have visited all three documented *C. mirabilis* sites, I have only seen the plants in flower at one of the sites. The plants at this site are mainly found in ravines that slope down in a Southerly or South-Easterly direction. It is interesting to note that the plants do not grow in the waterways but along the sides and mostly up against the rocky ridges. Trees in these gullies or ravines have moss growing on the underside of overhanging branches which indicates that moisture is blown up into the ravines from the South and South-East. Although you find the odd plant between ravines, most are clustered into small populations. There are no less than seven of these sub-populations which contain at least 50 plants or more in close proximity to each other. The term close proximity is used loosely here as plants within the populations are far apart and very few mature plants are found in viewing distance from each other. We could therefore summarise that *C. mirabilis* in habitat grow at several sites. However, subgrouping into populations exist for at least one of the sites.

Plants mostly occur in ravines that slope down in a Southerly to South-Easterly direction.

Diversity in populations of *C. mirabilis*

Of all the species that I have observed in habitat, *Clivia mirabilis* shows the most variation of all. They vary in size, leaf characteristics and flower appearance. The typical type specimen for *C. mirabilis* can be defined as a robust plant with thick, dark green leathery upright orientated leaves. It produces an umbel with an unusually high flower count of dark red flowers arranged on extended pedicels. It is difficult to find two plants that are alike. Variation in plant vigour, leaf texture, median stripe intensity, leaf orientation, leaf serration and leaf notching are evident in mature non-flowering plants. The differences in flowers are even more pronounced. Dissimilarities in flower count, flower size, flower shape and flower colour make this an exceptional plant to study. There are even plants which exhibit the multitepal trait.

An interesting observation is that the variation is greater between groups of plants than within a group of plants. It is as if each population contains a characteristic that distinguishes the population from the others. For instance, one population consists of plants with mainly dark red flowers, while another is characterised by segregation for light flowers. Most plants in another population have flowers that are either flared or have flower tubes that are wider than the typical pendulous type.

The diversity and clustering of variation leads

Predominantly red and even bronze flowers from sub-population 2.

to the opinion that:

1) There is extensive cross-pollination and little self-pollination
2) Pollen is moved readily within a population but less between populations.

Search for a good camera

I did not see any plant-pollinator interaction during my trip to the site in 2015 but knew that sunbirds are known to interact with the plants. The aim therefore was to find a sensor activated camera or trailcam to document the seemingly rare pollination event. There are many models available, each with different specifications and benefits. I borrowed a general-purpose camera from a friend and set it up in my aviary at home. It only activated when a large dove entered the sensor range and was not sensitive enough to photograph the small birds. The manufacturer informed me that all trailcams work by sensing not only movement but also heat and that detecting a small animal requires a sophisticated camera that has a near focus point. These are generally not sold in South-Africa as the main trailcam market is aimed at hunting, security

Variation in sub-population 6.

and poaching. However, there are specialised birdcams available and many are sold abroad to the nature conscious gardener. I contacted numerous retailers in South Africa directly and at last found and purchased a birdcam from an individual who sells only via the internet. The camera was not on his inventory but gathering dust on a shelf in his storeroom. It was delivered a mere two days before my trip to Oorlogskloof. My inability to experiment with the camera beforehand cost me dearly as the pictures obtained later are of inferior quality.

Observing pollination events

The birdcam takes a picture as well as a short video when motion is detected by the sensor. Even though the pictures were of inferior quality, the videos did prove useful in identifying the species of bird during each feeding event. The camera was initially set in a forested ravine high up against the cliffs. It was set here for 34 hours after which it was moved to a site closer to the access road. Here it was left for a further 26 hours. A total of nine visits by sunbirds were documented during this 70-hour period. Results are summarised in the

Lighter colouration of flowers in sub-populations 3 and 4.

table below. Two species of sunbird visited the plants. The Malachite sunbird (*Nectarinia famosa*) which has a longer bill than the Dusky sunbird (*Cinnyris fuscus*) visited the plants on eight occasions. A female from the latter species also visited the plants, but only once. It sat on the flower and robbed it from the top by puncturing the flowers. The Dusky female looks similar to the Malachite female but we could identify it from the video as it has a shorter bill and lighter feathers on the belly.

An interesting feature of *C. mirabilis* flowers which also distinguishes it from the other pendulous species is the unusually long flower pedicels. This may be a trait that developed over time in response to the robbing tactic of birds. Plants exhibiting this trait should be robbed less and have a survival advantage over plants with short pedicels. There are *C. mirabilis* plants with shorter pedicels in habitat. It would be interesting to note if they are robbed more than those with long pedicels.

The birds documented in this study were more active during the afternoon when tem--peratures start cooling down. It is also interesting to note that the main pollen shed period of *C. mirabilis* at this location is late in the afternoon.

Table 1: Summary of sunbird visitations over three days

Time of Day	Day 1 – Site 1	Day 2 – Site 1	Day 3 – site 2
00:01 – 01:00			
01:01 – 02:00			
02:01 – 03:00			
03:01 – 04:00			
04:01 – 05:00			
05:01 – 06:00			
06:01 – 07:00			
07:01 – 08:00			
08:01 – 09:00		Malachite male	
09:01 – 10:00			
10:01 – 11:00			
11:01 – 12:00			
12:01 – 13:00		Malachite female	
13:01 – 14:00			Malachite female
14:01 – 15:00			Dusky female
15:01 – 16:00		Malachite male	
16:01 – 17:00	Malachite female		Malachite female
17:01 – 18:00			
18:01 – 19:00	Malachite male	Malachite male	
19:01 – 20:00			
20:01 – 21:00			
21:01 – 22:00			
22:01 – 23:00			
23:01 – 00:00			

Malachite - Mirabilis interaction

Clivia mirabilis flowers from October to November. This coincides with the Malachite sunbird's breeding season which is from September to December. The Malachite is known to keep to a small feeding area while nurturing its young, often breeding in thickets holding a high concentration of nectar-producing plants. These small territories will likely correspond with a single subpopulation of *Clivia mirabilis* in a ravine. The birds will consequently only visit plants within a single sub-population. It is therefore no surprise that sub-populations of *C. mirabilis* differ from each other. Where the number of reproducing individuals in a population is limited, the chances for genetic drift increases. Genetic drift describes the process where traits that should be segregating at random are found to be increasing or decreasing over time due to chance segregation. As cross-pollination between plants within a *C. mirabilis* sub-population is higher than cross-pollination between sub-populations, we find that different traits tend to increase or decrease in different sub-populations. This may only hold true for the sites in Oorlogskloof where plants are clustered into relatively small isolated sub-populations.

Solitary bees

The objective of the trip was to determine what caused the damage to the flowers and I

Pollination by Malachite sunbirds as documented by the Birdcam. Unfortunately, the resolution of the pictures is of inferior quality due to improper camera settings.

searched for any interaction between wildlife and the flowers. I found such an interaction with insects at one site only. It was high up against the cliffs and also late in the afternoon. A very isolated sub-population of *Clivia* were being visited by a multitude of solitary bees and ants. The flowers were also damaged, indicating that sunbirds were robbing these plants of nectar. The ants and bees were accessing nectar not only from the open end of the flower tube but also from the puncture marks and tears near the ovaries. Although the ants may not be very active in cross-pollinating *Clivia*, the bees certainly are a major contributor to distributing traits among these plants. Refer to the packed pollen combs on the hind legs of the bee on the accompanying picture. While attempting to photograph the activity of the bees on one *C. mirabilis* umbel, I counted 25 visits from at least three different bees over a 30-minute period. As with the sunbird interaction, we can assume that the bees are moving within a sub-population of *Clivia* and not necessarily between sub-populations. Given the frequency of visits, the bees are the main pollinating agent in at least this isolated sub-population.

Summary

Although sunbirds are now documented as a definite pollinating agent for *C. mirabilis*, the Dusky sunbird may only be robbing the plants

A solitary bee collecting pollen. This plant was visited by at least three different bees.

A solitary bee accessing nectar from a damaged flower. The damage was caused by nectar-robbing sunbirds.

and not contributing to actual pollination. Solitary bees do visit some plants to collect pollen and utilise nectar and are thus also an important pollinator. The observable differences between sub-populations of *C. mirabilis* is caused by genetic drift due to a small population size and the lack of cross-pollination between sub-populations.

An ant visiting a flower in search of nectar.

Unusual colouration and flower shape of a *C. mirabilis.*

Acknowledgements and a warning

I would like to acknowledge the assistance from Ian Kiepiel as well as Wayne Haselau in this project. Furthermore, I would like to thank the farmers who allowed me access to their properties. For security reasons the farmers do not want to be named and also do not want any reference that may promote trespassing or poaching on their properties. We are fortunate that these custodians are protecting the species by limiting access to the sites. I would further like to appeal to all breeders who aim to utilise this species in their breeding to not make use of habitat specimens. It is easy to obtain hybrids from reputable sources such as from the breeding program of the late John Winter. Although the legality of owning and using a TOPS species hybrid is still debatable, I know of no individual who has been prosecuted for owning such a plant without a permit. However, owning, transporting or selling a true to type *C. mirabilis* without a permit is a prosecutable offence. Several *Clivia* breeders and growers have reported that the legality of their stock has recently been questioned by nature conservation officers.

Hajime "Hodge" Amemiya (1920-2009): Profile of a dedicated plantsman

By David Loysen

Hodge, as he was commonly known, was born in Los Angeles, California, in 1920. His parents had emigrated from Japan, by way of Australia, to the United States at the turn of the century and established a plant nursery, giving Hodge an introduction to the plant world from the day he was born.

In 1938, after growing up in America as a kid, his parents sent him off to school in Japan to learn the culture of their homeland. He was enrolled in the Tokyo Horticultural School in Setagaya.

At first, Hodge admittedly had a hard time in the school because he was not very fluent in Japanese! Discouraged, he was ready to drop out and return home. Fortunately, one of his professors, who was also a Master of Bonsai, saw something promising in Hodge and took him under his wing. In addition to the normal school curriculum, he began to teach Hodge about plant breeding, the ancient art of Bonsai, and the hybridizing of chrysanthemums.

After two years in Japan, Hodge returned to America, and continued to help out in the family business. Sadly, World War II intervened and all people of Japanese descent were rounded up by the government and sent to internment camps for the duration of the war. Their lives were disrupted and after the war they had to start all over again.

Hodge married May Chitori and they enjoyed a wonderful life together but had no children. One might wonder if that enabled him to devote more time to his plants and hobbies.

The history is sketchy here, but by 1953 Hodge was working as an independent landscaper/gardener back in the Los Angeles area. One of his clients was Dr. Allan Merkin. While mowing the lawn at the Merkin home, Hodge spotted

an unusually dark red *Clivia* in a border garden and asked if he could have an offset. As Hodge said, "I located a *Clivia* which I considered unusual because there was a greater number of flowers on the stalk and the individual flowers were a more vivid, darker red than any others I had seen". He shared that plant with his friend George Shimamoto at Mariposa Nursery and over the next 25 years they increased the stock to over 500 plants.

Hodge then went to Monrovia Nursery and asked them to apply for a plant patent in his name for his red *Clivia*. By then he had named it 'Flame' or 'Merlin's Flame'. In 1988 Monrovia was issued plant patent #6205 for the name of 'Monya'. 'Mon' for Monrovia Nursery and 'ya' for Amemiya. Hodge directed that all royalties from the patent would all be donated to California's South Coast Botanical Garden in Palos Verdes. Monrovia then continued to propagate 'Monya' before releasing it to the public for sale in 1990.

While 'Monya' was an exclusive name for

Monrovia Nursery, Hodge continued to sell the same plant as 'Flame' to other Garden Centers in the area. One of those was San Gabriel Nursery owned by Saburo "Ishi" Ishihara who had attended Tokyo Horticultural School at the same time as Hodge.

Always sensing new opportunities, Hodge teamed up with a partner and established the Far East Plant Rental Co., a totally new concept in the area. Later on, he formed Asian Plant Rentals on his own, supplying rental plants to large commercial offices in the region. He would cycle the plants from customers and then back to his greenhouses to keep them in prime condition.

All the while, Hodge dabbled in growing and breeding *Clivia*. Not much is known about his hybridizing activities, but he donated a lot of plants to the

Huntington Library and Botanic Gardens in San Marino, California. While there, Hodge's discerning eye caught sight of a pink-flowering cherry tree, a chance seedling from a single-flowered, white Prunus serrolata.

Pink-flowering cherry trees are revered in Japan but they do not do well in the constantly warm southern California climate. Hodge saw the potential for this one specimen as one that would grow well in warm areas and planted it in his yard. From that single tree, many thousands of pink-flowering cherries now exist throughout southern California. Hodge had L.E. Cooke Nursery propagate a lot of them. Somewhere down the road it was named 'Pink Cloud'. Now there are 2000 of these trees at Lake Balboa Park, perhaps some donated by Hodge. The South Coast Botanical Garden also received 300 trees from Hodge in memory of his mother and many more hundreds are growing even further south in San Diego, close to the Mexican border.

HODGE AMEMIYA

By 1998, Hodge was ready to retire from his businesses. That didn't stop him from being involved in the plant world. He continued to volunteer at the South Coast Botanic Garden, where he took on the propagation of plants for sale and creation of a typical Japanese-style chrysanthemum display. That involved growing several thousand "mums" and bonsai training of many large specimens. According to his friend Ken Ueda, Hodge was very good at being a mentor to the staff of volunteers. Meanwhile, every year, Hodge and May would set off on a trip to the Far East, Australia, and South Africa where they cultivated friends, visited gardens and traded seeds and plants, learning and sharing all the time.

Throughout his career and retirement, Hodge continued to grow and breed *Clivia*. He developed a particularly brilliant yellow variety and had some broad leaf yellows with 10 cm. wide leaves.

In the early 2000s, Hodge suffered a series of minor strokes and he knew his ability to keep up with his plants was getting limited. He gave a lot of his collection to Bruce Asakawa, a noted horticulturalist who, with his wife Sharon, had a gardening radio show in San Diego, California for many years. Unfortunately, Bruce is not in good health at this time of writing but the *Clivia* collection is still thriving at his home.

Despite his physical problems, Hodge and May never stopped enjoying life. He continued to volunteer, tend to his Bonsai plants, and enjoy photography along with wood and leather working. His generosity was unlimited and in 2008 he and May established a $100,000 endowment to Johns Hopkins University for Medical Education.

Hodge was a talented, energetic and generous person. He shared many of his plant introductions, donated to many organizations, and gave freely of his knowledge to help others. Throughout the years, he was dedicated to the belief that plants and flowers bring beauty and serenity to their surroundings.

Not bad for a kid who was ready to drop out of horticulture school.

When is one "too old" to start germinating *Clivia* seeds?

By Dawid Botha, photos by Dawid Botha

This story begins in 2001 when Herman Schoeman age 81 went to have a look at the Eastern Province Clivia Club's Annual Spring show. Willie Le Roux, the chairman of EPCC at the time, did his normal magic and conversed with all the visitors at the show soliciting seeds and offering membership to the visiting public. Herman innocently walked over and asked Willie for tips on *Clivia* cultivation and told him about the *Clivia* that were given to him by his neighbour in 1981, when he and his wife moved to Port Elizabeth. Interestingly the same *Clivia* still grows as a massive specimen under his palm tree which, in turn, was acquired from the Umtana River in 1965, making it a staggering 52 years old. Willie twisted his arm into buying some *Clivia* seeds that the club obtained from Kirstenbosch as a donation that same year. Herman jokingly asked Willie if he will live long enough to see the seeds flower. Willie's answer was "It should keep you busy in the meantime, what else can you do". The Kirstenbosch seeds flowered and some had a definitive scent according to Herman.

Herman's own pollination efforts started when he bought a yellow *Clivia* from EPCC in 2002, the year that he joined the club. He immediately pollinated it with his Umtana Habitat (orange) specimen under the palm tree. He dreamt about a field of yellow *Clivia* in years to come. To his surprise none of the *Clivia* seedlings did flower yellow. This did not bother him too much as he was determined to find out why, and then grow his own yellows eventually from those orange umbels swaying in the breeze under the macadamia trees. Please note that it seems he did reach the goal of flowering yellows sooner rather than later.

Fig. 13. Herman Schoeman with his beauties.

Fig. 13. Seedlings.

A visit to his house is a delight. Herman has all his *Clivia* seedlings stacked by the year they were germinated amongst healthy growing and flowering *Clivia* plants (Fig. 13). He has no formal greenhouse, but grows his *Clivia* under the available trees (Figs. 14-15). Herman also diligently records every pollination attempt on an envelope with the description of the parents (Fig. 16). Each seedling gets a number allocation as soon as it is transplanted into growing bags. As soon as a seedling flowers for the first time, the flower gets described and plant characteristics recorded for verification and future pollination efforts. The same number

Fig. 14. Under the fig trees.

Fig. 15. In the garden.

Fig. 16. Tagging each plant.

Fig. 17. Germinating seed.

Fig. 18. Germinating seed.

appears on the label in the growing bag. Who can say the same of their own collection? To date, he is still pollinating his *Clivia* and has bags full of seeds being prepared for germination (Figs. 17-18). Some of his own *Clivia* crosses flowering at time of my visit are shown here (Figs. 21-24).

Herman is to date EPCC's oldest member and is still

Fig. 19. At his sales stall with his son.

going strong. Herman celebrated his 96th birthday on 3rd January 2017. He still runs his own sales stall with his son (Fig. 19). He also volunteers every year to help as a marshal at our shows (Fig. 20). Now I am wondering if it's the *Clivia* hobby or some other secret that keeps him so healthy. I did discover that he was fed donkey milk as a child. Donkey milk! Yes, his mother lost his twin brother just before their birth and she could no longer produce milk. The donkey was the only available source of milk with no shops in those days to pop into and buy formula. Those were hard days and you had to use what was available.

Fig. 20. Marshalling at yearly shows.

Ultimately Herman's recipe seems to be to stay active and keep the thought processes going so pottering around in the garden and pollinating

Fig. 21. A lovely beauty.

Clivia and watching them grow is a good way to stay young. The thrill is still there to see each *Clivia* generation mature and flower. To top it all, Herman is still growing some orchids and has a growing veggie patch.

So what is your excuse for not buying some seeds at the next open meeting or show?

Fig. 22. A near white spider.

Just look at your plants and see those possible combinations. What else do you have to keep you busy?

Fig. 23. A white throat.

Fig. 24. A lovely green throat.

Downsizing

By Mike Jeans

Realising that we will be moving house within the next year or two, I am having to face up to a dramatic reduction in my collection of frost-tender plants. Downsizing will involve going from two heated glasshouses and a frost-free polytunnel to one small heated glasshouse. My *Clivia* collection, built up over the last 20 plus years presents a major problem. As with most enthusiastic growers, I want to have my cake and to eat it! I am pondering how with only just over 10% of my present capacity, I can retain 90% of my current pleasure and interest. The following article describes my plans to have as wide a ranging as possible *Clivia* collection within a bench space of 5m x 1m (16ft X 3.5ft). I hope to accommodate 20 to 25 flowing size plants in that space.

In addition to my *Clivia*, I grow several other genera and need all year-round flowers to give me the motivation to spend time in my plant houses, however foul the weather. I am determined to take a representative selection of *Clivia* with me. This will include at least one of every species and a selection of my favourite *Clivia miniata*. One luxury that I will try to afford is to have all the *Clivia* decently spaced apart, which will be very helpful in controlling mealy bug, the only serious pest encountered by *Clivia* in this country. Wherever possible, I aim to take specimen plants and match any propagation with willing homes. I am helping a couple of growers, one an enthusiast, the other a professional nurseryman build up a *Clivia* collection – so whatever may happen to my plants, the material should not be lost as I am already passing it on.

Fig. 25. *C. nobilis.*

I was given an absolutely invaluable amount of help in building up my collection from my friends in South Africa, all of whom I had the

Fig. 26. *C. mirabilis.*

privilege of knowing from my *Clivia* interest and the time when I looked after the Society's UK membership. It meant that I was able to acquire excellent forms of some of the species. My collection had "National Collection" status from Plant Heritage which is an organisation that aims to preserve the heritage from all forms of gardening in this country, both past and present. This gave me access to some of the older *Clivia miniata* cultivars that had been bred in the UK.

Of the species, I always had a particularly soft spot for *C. nobilis* which I regarded as a very tidy plant with leaves growing in an attractive fan shape, thereby earning its keep as a foliage plant all year round. I grew some from seed and also had plants propagated from various wild populations. In one case I managed to flower a plant within four and a half years from seed. I was always surprised that more bulb enthusiasts do not include it in their collections, as it certainly deserves a place in any South African *Amaryllidacae* collection. Fig. 25 is a particularly fine form which I was given by Ian Brown; it has no provenance but that does not matter in a plant of its quality. Fig. 26 is one of the two *C. mirabilis* that I bought from

Fig. 27. *C. gardenii* 'Ngome Yellow'.

Fig. 28. *C. robusta.*

Kirstenbosch as young seedlings. John Winter suggested that it might have been the first of the Kirstenbosch seed-sown plants to flower.

Clivia gardenii 'Ngome Yellow' was not for me the most reliable to flower but gave much pleasure when it did, and with several flowering size plants, I always had some flowers to enjoy. All the plants that I was given from South Africa had a very faint pink tinge to the yellow. However, one of my plants, Fig. 27, from seed did have pure yellow flowers sitting on a red stem which was very attractive. I suspect that the pink tinge, which was also very attractive, may have resulted from the lower light conditions over here. The standard *C. gardenii* had the advantage of flowering in the somewhat barren period leading up to Christmas. Sadly, it tended to be overshadowed by *C. robusta* which relished living up to its name. Fig. 28 shows a particularly at-

Fig. 27. *C. miniata* 'Huglett's Red Starburst'.

Fig. 30. *C. miniata* 'Quite White'.

tractive form with a large head of red flowers with a prominent green band, grown from seed and a victim of my careless approach to labelling, so is without provenance!

I grow several *C. caulescens*, a couple from habitat collected seed and some from other sources but I am unable to see any significant difference between them. They all to produce plenty of seed, so I will only need one specimen plant in my downsized collection.

Fig. 31. *C. miniata* 'Hugletts Red Starburst'.

Unsurprisingly, my attempts at breeding *Clivia* focused on *Clivia miniata*. Figs. 29-31 are three plants that I have named and will try to get registered. I aimed to breed plants with broad overlap-

Fig. 32. *C. miniata citrina.*

ping tepals or tepals that very nearly overlap. Additionally, a good head of flowers well above the leaves and carried on a strong stem is, I feel, obligatory. One of my observations was that nearly all *C. miniata* that I regarded as good quality had broad leaves in a relatively tidy fan shape, and this was reflected in a tidy flower. I also felt that a decent head of flowers, with individual flowers 9 or 10 cm. across, achieved the sort of impact which I sought. I am a keen photographer and realised a long time ago that with the right subject, a modern digital camera would do the rest. One of my personal foibles is that if the subject has enough impact, the background is relatively unimportant. Nobody goes around a botanical garden sticking a black background behind all the plants. This is a very individual view, and not supported by anybody else that I know!

Figs. 32 and 33 are a couple of yellow (Group 1) *C. miniata* that I grew from seed. Fig. 32 represents a strain rather than a cultivar. Many years ago, I acquired a yellow that had been grown from Japanese seed. It had relatively small funnel-shaped flowers of a good, relatively dark yellow. By using it or suitable progeny from it, I was able to retain much of the colour on plants with larger and better shaped flowers. I felt that the best yellow flowers had a trace of orange in them and this tended to give an attractive yellow more substance, but there was no way of ever proving it. Very few *C. miniata citrina* ever have the quality of yellow that *C. gardenii* 'Ngome Yellow' has, and that is anything but a pure yellow *Clivia* with its red flower stem!

I have a selection of light oranges, peaches and pink flowering *C. miniata*, not to mention various forms with variegated leaves to choose from for my downsized collection. One plant that I definitely cannot leave behind is *C. miniata* 'Appleblossom' Q2 x Q4, shown in Fig. 34. I also have a strong attachment to *C. miniata* 'Westonbirt Perfection', Fig. 35

Fig. 33. *C. miniata citrina.*

Fig. 34. *C. miniata* 'Appleblossom'.

Fig. 35. *C. miniata* 'Westonbirt Perfection'.

which is a very old cultivar that was given to me by the Royal Botanic Gardens Edinburgh. To me, it appears the equal of any orange *C. miniata* that I have seen, which is probably not surprising as most growers prefer to work on some of the more exciting colours.

One of the strengths of the genus *Clivia* is the ease with which it can be grown from seed coupled with the variation in a batch of sibling seedlings, which adds excitement to seeing the first flowering. The corresponding downside is that having selected any seedling of merit, it is a long and slow business to build up stock by vegetative propagation, usually having to wait for offsets. As with other plants, micro propagation often produces very noticeable deficiencies in *Clivia*. Some growers note the generation of an offset on its label, suggesting that even using offsets has a limited number of generations before the plants deteriorate.

Having passed much of my more worthwhile material to other growers, I hope to have a relatively compact collection which I can enjoy for a few more years. My collection concentrated on well-formed plants and flowers, and not making much of an attempt to push out the boundaries regarding new colour forms. The time will come when I can no longer look after the collection and would hope to find an institution to whom I can pass it on. Given a considerable amount of luck, it will be an institution which, in addition, to being open to the public has a shop selling amongst other things, plants produced on the premises. I also hope that it will be used as a base for breeding plants that can adapt better to domestic conditions than the current breed of *Clivia* where frost protection often means having to grow them under glass to avoid the dry atmosphere of a centrally heated house.

I have a plant called 'Betta Blonde'

By Felicity Weeden

While visiting Chris Viljoen in Pretoria in 2008, he and I agreed on a cross between two of his stunning plants, namely his 'Sweet Honey' and 'Florid White Lips'. He duly made the cross and very kindly sent me a few of the resulting seed in 2009. In 2013 after all the excitement and drama of the silly season was behind us, I noticed a little whitish flower trying to make itself seen through the mass of seedlings. I rushed over and pulled it out and what a treasure I had found! The colour was stunning. Very near white, with just the faintest touch of pink with large flowers and a compact plant and it had flowered within four years from seed. Of course, everyone who saw this beauty wanted an offset, but true to Murphy's Law, the plant is very slow growing and unwilling to produce offsets.

The following year when 'Betta Blonde' and sibling 'Betta Beauty Queen' flowered, both sent up nice buds which produced very acceptable umbels, but the colour of both had changed to a dull peach! Imagine my disgust, but I decided to give it another chance, and just as well I did. In 2016 'Betta Blonde' and sibling 'Babe-a-licious' flowered simultaneously. Of course, they were both too early for the show, but what beauties. The peach colour had gone and instead of the original near white the flowers had morphed into a background of the pale whitish pink but now had lovely painted on patterns round the edges in a rich shade of pink-orange. 'Babe-a-licious' is a beautifully formed flower with slightly more colour than 'Betta Blonde' and 'Betta Beauty Queen' has

'Betta Blonde'.

smaller flowers and exhibits more overall colour.

I did not pollinate 'Betta Blonde' during its first season. When it flowered peach, I definitely didn't pollinate it. However, last year when it showed such beauty, I crossed it with 'Babe-a-licious', 'Hirao' and another very pale beauty and I found that it was very "pod fertile" which is yet another virtue. I am not sure that these plants shouldn't be renamed 'Chameleon'!

'Babe-a-licious'.

'Betta Beauty Queen'.

It is clear that excellent results can be obtained by crossing with 'Florid White Lips'. There was one such cross on display at the Overberg Show which won 2nd Runner up to Best On Show. A truly beautiful pink ghost named 'Lilians Pink Lips'. I wonder if there are more of these lovelies around. I think they could be successfully used to create new and interesting patterns in *Clivia*.

'Lilians Pink Lips'.

Understanding mutations and variations

By Sean Chubb

Mutations are not a result of slow continuous selection!

Mutations in *Clivia* are distinct deviations from the normal type of a strain of *Clivia*. This could be in a variety of forms but the most well-known mutations are the mutations that result in colour variations of the flowers in *Clivia*. Mutations are distinct from ordinary variations, and may be described as a sudden but accidental deviation from the normal type. It appears that mutations are unexpected and unanticipated new types. These do not come as a result of the slow process of selection. Mutations have no intermediate stage between the old type and the new. Mutations are a sudden change in form and or colour of flower.

It is impossible to predict the appearance of mutations. Some are easy to perpetuate while others affect the plant in a way that they cease to reproduce. The appearance of mutations happens very seldom, breeders need to keep a look out for them and to recognise the potential, if any, in the mutations that do occur. As breeders, we cannot wait for new mutations to occur. We need to work with variations and selections as described below.

Variation through selection is an effective tool for improving a strain of *Clivia*. Although variation is responsible for producing an exceptional individual, selection is responsible for preserving it. Charles Darwin describes two distinct types of selection, unconscious selection and methodical selection.

Unconscious selection is when a breeder in an attempt to reach perfection breeds only from the best genetic material available to him. This is done not with the intention of establishing a new strain or type but improving the strain already in existence. Methodical selection is to do with fixing new and desirable traits and establishing a new strain from the existing strain. Here the breeder must be constantly on the lookout for new and valuable characteristics. When the breeder finds these valuable characteristics, he makes them the basis of a new breeding program. The easiest characteristics to select are flower colour and plant form.

So what the breeder needs to do is recognise the valuable variations in a strain and methodically select these variations over generations, gradually establishing a new, more desirable strain. So methodical selection is the tool the breeder needs to use to eventually achieve perfection.

'Love child'.

CLUB SHOWS

Cape Clivia Club Show 2016

By Felicity Weeden, and photographs by Claude Felbert

It promised to be a scintillating affair! The exhibitors rolled in with loads of stunning plants to fill the benches and create a lovely display making it a very worthwhile show for members and the public to enjoy. A big vote of thanks to Christ Smit who co-ordinated the show set-up and the show and also to his team of able assistants. Thanks also go to all the volunteers who filled the gaps during the show. Without them the show can't go on!

This year judges from Pretoria were invited and again this proved to be a successful arrangement. It is beneficial to the judges to deal with unknown plants and different standards, and to pass on their knowledge to local learner judges.

Every year there are some additions and refinements made to the classes and this year was no exception, providing wider opportunities to exhibitors, and also attempting to encourage hybridizers to strive towards ideals such as wider petals, darker and true reds and so on.

This year 381 plants were benched by 27 exhibitors, which made it the biggest show in the country for 2016. Encouraging also is the fact that there were new names on the winners' table this year.

Best on Show - Gideon van Zyl.

Best Variegated Broad Leaf - Felicity Weeden.

Best Own Breeding - Gerrit Rohland.

Best Peach - Gideon van Zyl.

Cape Clivia Show - 2016.

First Runner up - Johan Kotze.

Second Runner up - Bart Cilliers.

Congratulation to this year's winners who were:

- Best On Show – Flowering plants – Gideon and Lorraine van Zyl
- 1st Runner up – Johan Kotze
- 2nd Runner up – Bart Cilliers
- Best On Show – Leaf plants with flower – Koos Bredenhand
- Best Own Breeding – Gerrit Rohlandt
- Best Peach – Gideon and Lorraine van Zyl
- People's Choice – Gideon and Lorrainne van Zyl

Eastern Province Clivia Club Interspecific Show 2016

By Dawid Botha, and photos by Dawid Botha

The Eastern Province Clivia Club's interspecific show was held on 23 July 2016 at Sherwood Garden Centre, Port Elizabeth. The number of entries has been growing slowly but surely as the popularity for interspecific breeding has increased. As usual it was up to the public and attending members to vote for the best Interspecific and best species on display.

The honours for Best Interspecific went to Carrie Kruger with her beautiful

Fig. 37.

Fig. 36.

Fig. 39.

Fig. 38.

Fig. 40.

plant a *C. Mingard* 'Secret Desire', after she had seen how *Clivia* growers/collectors desired it, with its first flowering at an earlier interspecific show (Fig. 36.). Second Best on Show went to Marius Meyer who brought a specimen plant with multiple flowering umbels that charmed the socks of everybody (Fig. 37).

The best species was awarded again to Carrie Kruger for her *Clivia gardenii* 'Ngome Yellow' (Fig. 38). More pictures of interesting *Clivia* seen at the mini show are also printed here. (Figs. 39-44).

After the mini show, Dawid Botha had an informative PowerPoint presentation on *Clivia* colour forms and how they would be classed for show judging. After the talk the winners

Fig. 41.

were announced and trophies handed over. The usual coffee and treats were served while members could trade plants and catch up on news or boasting of that stunner that had already flowered or not opened enough to enter into the show. See you all in 2017.

Fig. 42.

Fig. 43.

Fig. 44.

Eastern Province Clivia Club Spring Show 2016

By Dawid Botha (Show Chairman)

Our show was held at Sherwood Garden Centre on 17th and 18th September 2016. Strange weather patterns meant that the *Clivia* just would not push peduncles, creating a feeling of trepidation. Adding to my fears was that rain showers were guaranteed to occur, as we usually experience such showers during our spring, that may throw a spanner in the works. But nerves started to lessen as soon as the entries flowed in and some sunshine was forecast for the weekend. Strangely enough we had more visitors on Saturday during the rain than the sunny Sunday.

Fig. 45.

Fig. 46.

Planning made it possible to do benching on Thursday and Friday. This allowed judging to take place in daylight for the first time, rather than under artificial fluorescent lighting.

The panel of judges was Joubert van Wyk, Mark Joubert and Dawid Botha. The learner judge attending was Marius Meyer. Congratulations to our winners and great thanks to one and all who entered their plants on the show. Without you there would be no show. We had 20 exhibitors and the wide variety of quality plants challenged the judges' decisions on who would ultimately walk away with best on show.

A total of 197 plants were entered and the winners' table was made up as follows:
Best on Show: Marius Meyer - *Miniata* peach broad tepals (Fig. 45)
Runner up to best on Show: Thys Groenewald - *Miniata* bronze (Fig. 46)

Second Runner up: Carrie Kruger - *Miniata* apricot (Fig. 48)
Judge's Choice: Carrie Kruger - ghost seedling flowering for first time (Fig. 47)
People's Choice: Louis & Elsa de Swardt - *Miniata* peach (Fig. 49)
Best Grower on Show: Marius Meyer - New trophy (Fig. 50)
Best leafed plant on Show: Marius Meyer - Akebono variegation - New trophy (Fig. 51)
Best specie on Show: Charl Coetzee - yellow nobilis - New trophy (Fig. 52)
Best Beginner: Tinus Sonnekus - with first flowering seedling (Fig. 53).

Fig. 47.

Fig. 48.

Fig. 49.

The Best Grower on Show was determined by a point system for the number of plants entered and a value allocated for every first, second and third prize won in each category. The grower with the most points wins this trophy. This trophy was donated by Dawid Botha and awarded for the first time this year.

The Best Leafed plant on show was awarded to the plant only categories, those plants without flowers that still enchant with variegation or leaf form and growth patterns, including miniatures. This trophy was also donated by Scherine & Dawid Botha.

The Best Species was awarded to any species *Clivia* flowering at the time of the show, excluding *C. miniata* that is of high quality. Thanks to Louis & Elsa de Swardt for donating this trophy to the club.

As usual the sales stalls guaranteed a feast for the eyes, true *Clivia* islands in their own right that conjured up dreams on how they would look in those empty

Fig. 50.

spaces at home. Those bitten by the bug will always find an excuse to buy one more plant for their collection, whether or not there is any space left in the garden. The unusual plants were spotted first by the discerning eye and quickly sold (Figs. 54 and 55).

I want to take this opportunity to thank all the willing people who helped before, during

Fig. 51.

Fig. 52.

and after the show. It is your help that made it a success.

We also want to thank the judges for their effort and time invested in our club and in the learner judges. It was the first year that the Clivia Society had the willing Judges Exchange program to help the clubs and judges as a tool of information sharing and to allow for an impartial judging system. EPCC made use of this opportunity to get a random Judge from a pool of Judges willing to travel. Joubert van Wyk was chosen to be our Judge at EPCC and I was asked to Judge in Joburg.

We had a lovely function on the Saturday night that was well attended. The show and the results were discussed over a glass of wine and a display of delicious food after which the trophy presentation followed (Fig. 56).

The show was a wonderful event and apart from the main attraction, we had a chance to catch up with old friends and make new ones. We are all looking forward to the next show with great anticipation (Figs. 57 and 58).

Some special plants must be shared with members that I personally found to be a notch above the rest, including a plant of "Ebb" Elizabeth Graham (Fig. 59), a near ideal picotee.

Fig. 53.

Fig. 54.

Fig. 55.

Fig. 56.

Fig. 57.

Fig. 58.

Willie le Roux exhibited a peach with a green centre (Fig. 60). Johan Mostert had a first flowering bronze seedling that showed great potential (Fig. 61). Christiaan van Niekerk showed a rare green *C. miniata* sporting a full umbel without any empty spaces in sight (Fig. 62).

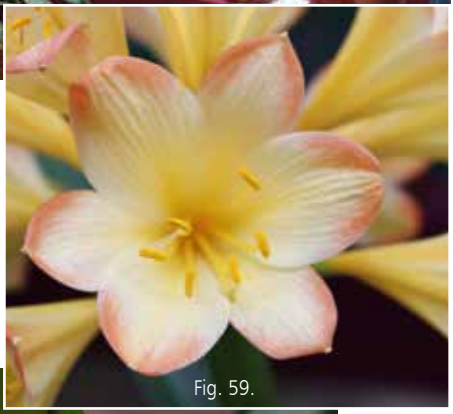

Fig. 59.

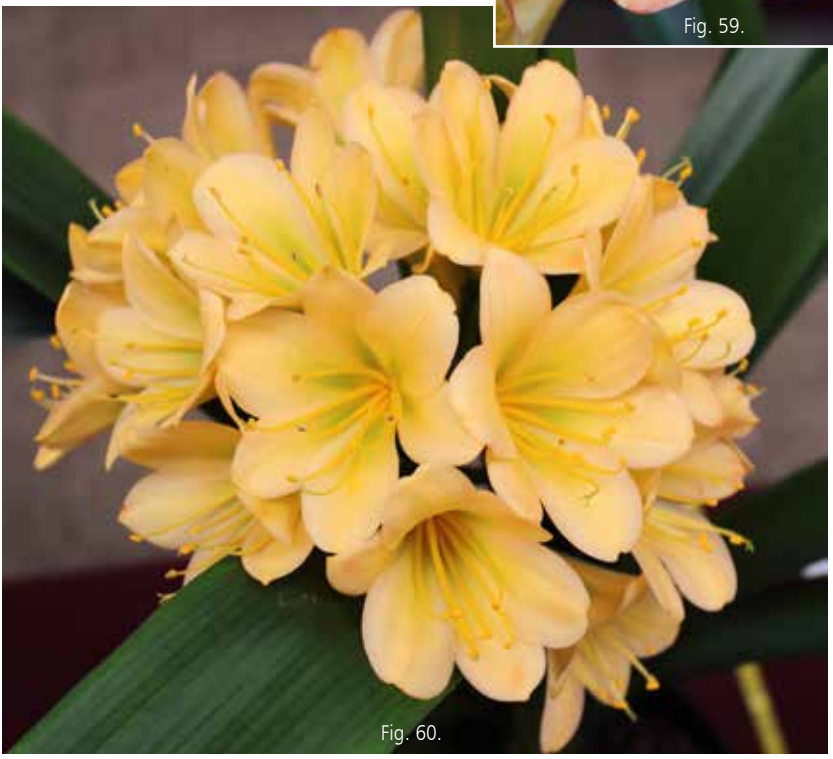

Fig. 60.

Fig. 61.

Fig. 62.

Fig. 63.

Fig. 64.

Fig. 65.

Fig. 66.

More *Clivia* pictures that were points of discussion amongst the visiting public are also included here (Figs. 63-69).

Fig. 67.

Finally, we would like to thank Sherwood Garden Centre for making this facility available to us, and the caterers for the excellent snacks they provided. Also thanks to those who prepared meals, snacks and something to drink at our food corner.

Fig. 68.

Fig. 69.

Free State Clivia Club Show 2016

By Andre du Toit

The 2016 year was again a good *Clivia* year for our club. It was an odd year with many flowers for some members and few for others. Our yearly show was however a huge success with the highest number of flowers ever.

The number of club members remained steady with some new members joining the club and some losses.

We started a WhatsApp group that added to the positive spirit in the club and resulted in regular communication concerning clivia matters. Annelize Swart, the widow of the late Jurie Swart sold the biggest portion of his huge collection at very affordable prices and caused a healthy buzz amongst the members. The article concerning Jurie in the Clivia News was well received. Our Facebook page was well attended and although much effort was needed to keep it relevant it was worth the effort.

Our monthly meetings were also well attended. Matters that were discussed included buying of new plants, the cultivation of *Clivia* with reference to plant medium, seed, feeding, spray programs, new developments on the clivia front and preparing plants for the winter in the Free State. Those members who have brought plants in flower to our meetings are especially thanked. It emphasised that the main object of our club meetings is the *Clivia* plant. Donating a *Clivia* plant to each new member has become a tradition like our coffee and refreshments after each meeting.

The interspecific exhibition at Greenside nursery was well supported by our members but few members of the public attended because of the very cold weather in July. We have therefore decided to move the exhibition in 2017 to Fleurdal Mall.

The Clivia Show in September was again the pinnacle of our operations during 2016. The support by the Management of the Mall helped us to make it a huge success. Large numbers of the public attended and the number of flowers increased to 205. 15 members exhibited plants and plants sales were also well supported by the public. The social function on the Friday night of the show weekend was also a big success. The auction of plants also resulted in the record prize of R6 500 for a plant and caused quite a stir amongst members. The outside Judge, Dawie Strydom gave a very interesting talk about his visit to China and Chinese *Clivia*.

3rd Runner up.

Best on Show - Stefan Ferreira.

A show in the Mall.

Selling of *Clivia* books.

Thank you to the management committee for their dedication and hard work during the past year. The immense contribution on many levels by the Vice Chair, Hennie van der Mescht is appreciated. David Fourie, our secretary, the treasurer Neil Nathan and Riaan Roux the Show Manager, all exceeded in the execution of their tasks.

The success of this club is to be founded in the attitude of the members. The positive attitude towards each other and *Clivia* in general are the main contributing factors. The good rains during the first two months of 2017 after the drought of 2016 resulted in a belief that this year will be a special *Clivia* year. May every member of the club enjoy 2017 and have a very good flower season.

Explaining to the public.

2nd Runner up (2nd and 3rd Runner up: André du Toit).

The three winning plants.

The Garden Route Clivia Club Interspecific Show 2016

By Andrè Meyer, with photographs by Andrè Meyer

The 2016 Garden Route Clivia Club Interspecific Show was a big milestone in the history of the Garden Route Clivia Club as it was the first interspecific show that was open to the public. It was with great anticipation but also concern that the show date of 6 August neared. Will we have enough quality plants for the display? Will the public show any interest at all?

The club had very good support from the local newspaper, The George Herald. They allowed us to place three articles before the show and one after the show. We used these opportunities to educate the public at large about the *Clivia* species and Interspecifics. We also had great support from one of our local nurseries, Norga River Nursery. We used their facilities free of charge and they allowed our members to sell *Clivia* as well.

Best on Show - Bronze.

Best on Show - Silver.

Best on Show - Gold.

Show Winners.

We ended up with 51 plant entries for the show (a big increase compared with the previous year) and we had approximately 100 visitors. The quality of the entries was high as can be seen from the photographs. The judging was done by two of our learner judges (Karl Rost and Gerrit vd Merwe) under the guidance of Dr Piet Theron – a great learning opportunity for them. The sales area was quieter than we would have liked but we realise that there is great potential for our members in future.

The winners were as follows:

Best on Show Gold: Nico Cloete (Cat 6 – own breeding)

Best on Show Silver: Carrie Kruger (Cat 4 – Peach, pastel and pink)

Best on Show Bronze: Andre Meyer (Cat 5 – any other colour)

People's Choice: Dave Garriock (Cat 5 – any other colour)

Peoples' Choice.

Garden Route Clivia Club Show 2016

By Andrè Meyer, with photographs by Andrè Meyer

The annual *miniata* show was held on 24 and 25 September 2016 in the Outeniqua Primary School hall in George. The weather was very kind and visitor attendance of approximately 830 over the one and a half days was similar to that of previous years. The visitors had a keen interest in the two workshops on *Clivia* growing as well as the necessities for *Clivia* growing which were for sale. Some seasoned *Clivia* growers from other clubs described the show as the best they had ever attended.

The local George newspaper, The George Herald, allowed us to place *Clivia* articles in the run-up to the show and reported on the winners as well. The local radio station, Eden FM, broadcasted two interviews with club committee members. These are resources that should be utilized more extensively in future.

The plant/seed sales area was very busy and sellers were satisfied with their takings. This was an area where gardeners could interact with *Clivia* growers and *Clivia* growers from various clubs could socialise. An auction of special

2016 Winners - Gerhard en Karen Faber.

2016 Winners - Noelia en Ricky Jardim.

Best green flower and People's Choice.

Category 11 Peach narrow tepal - Gordon Fraser.

Category 15 Orange with Green Throat narrow tepal - Kobus and Ida Esterhuizen.

Category 17 Bronze-brick with Green Throat narrow tepal - Piet Claassen.

plants was conducted on the Saturday as part of a social function for exhibitors and sellers. The club saw a slight increase in commission income from these activities.

A total of 23 exhibitors participated in 66 categories and 318 plants were benched for the show, which is slightly down on the previous year. Our club this year used exhibition tables (shutter board on plastic crates) that were much lower than the standard tables used in the past. This presented the plants in a more natural way for both the public and judges. The judges for this show were Hennie van der Mescht (Free State Clivia Club), Dawie Strydom (Joburg Clivia Club) and Cape Clivia Club member Leon Blom.

Judges: Hennie van der Mescht (Free State), Dawie Strydom (Johannesburg) with Leon Blom (Cape) and Garden Route Clivia Club chairman Karl Rost.

Category 18 Bronze - brick Green Throat broad tepal - Piet and Jeanette Theron.

Category 37 *Miniata* 1st flower any colour - Kobus and Helena Kearney.

Three of our club's learner judges participated in the judging process and the head judge provided feedback to the club committee on their performance/capability.

The club thanks all the exhibitors, sellers and volunteers who made this show the success that it was. The volunteers who work so hard are often the unsung heroes of all the Clivia shows around the world – we salute you!

We congratulate the overall winners at the show:

Best on Show Gold: Gerhard and Karen Faber

Best on Show Silver: Gerhard and Karen Faber

Best on Show Bronze: Ricky and Noelia Jardim

Best on Show Own Breeding: Gerhard and Karen Faber

Best on Show non-flowering plant: Nico Cloete

Red with Green Throat narrow tepal - Fanie van der Merwe.

Best green flower: Ricky and Noelia Jardim

People's Choice: Ricky and Noelia Jardim

Exbition hall.

Joburg Clivia Club Show 2016

By Glynn Middlewick

While we consider the annual show in September to be the end of the club activities for the year, the *Clivia* growth cycle and following madness only starts with the flowering period. Our club calendar year starts in January with the Annual General Meeting and the election of office bearers, then we look for speakers for the monthly meetings. The build up to the show takes place in August and once the show is over, the prize presentation follows with a final end of the calendar year in November.

The Joburg Clivia Club Show was held at the Garden World Nursery on the 10th and 11th of September 2016. This is the 13th year that the

Close-up of Best on Show.

Flowering Best on Show - Dawie Strydom.

Foliage Best on Show - Hilton Atherstone.

Foliage Second Runner up - Hilton Atherstone.

show has taken place at this venue. The Garden World nursery meets our show requirements and we have the advantage of having a regular venue for our show.

We all wait with baited breath to see what new flower colour or spectacular bloom will appear on the show bench each year. We were well supported by exhibitors, however there is a potential for a greater number of entrants. The public support remains good. We make most of our profit from the entrance fees of visitors. The expenses for the show venue and other show expenses are covered by the hirers of the stalls. The stalls were well supported and we thank the sellers for the provision of some superb plants available for sale to the public.

Judge's Choice for most potential - Chris Viljoen.

Foliage Runner up to Best on Show - Martiens Erasmus.

Our band of hard workers, remain the backbone of our show preparations and should not be forgotten. The photographs of the show winners were taken by James Haxton. Thank you for your time and effort James.

The Show Winners are divided into Flowering and Non/Flowering or Foliage classes. The Best on Show of the Flowering class was won with a superb yellow *C. miniata*, exhibited by Dawie Strydom. The Runner up to Best on Show was awarded to Paul Kloeck for a remarkable pink *C. miniata* bloom. The Second Runner up to the Best on Show was awarded to a newcomer, Travis Imbrailo, for a variegated plant with an orange bloom of excellent quality.

The Foliage class saw a good representation of these *Clivia* plants that don't even need a

flower to impress us! The winner for the Best on Show, foliage class was awarded to Hilton Atherstone with an impressive miniature Chinese plant. Hilton also won the award for the Second Runner up to Best on Show with a cute Henglan specimen. The Runner up to Best on Show was awarded to Martiens Erasmus for his well-groomed Akebono plant.

An eye-watering peach bloom of Chris Viljoen was nominated as the flower with the most potential by the judges.

Runner up to Best on Show - Paul Kloeck.

Second Runner up to Best on Show - Travis Imbrailo.

Lowveld Clivia Club Show 2016

By Adri Pienaar

We had a successful Interspecific and Pendulous Show on the 16 July 2016 for members only. (In 2017 we are going to open the interspecific and pendulous exhibits to the public and exhibit plants at a shopping mall.) Eight members exhibited a total of 49 plants. Attie Le Roux, John van der Linde and Piet Theron adjudicated the plants.

Clivia Kingdom had a clean sweep and has won the ''Daan Dekker Commemorative Trophy" for the seventh consecutive year. Best on Show was a tricolour interspecific hybrid, First Runner up was a burgundy bronze interspecific hybrid and Second Runner up was a yellow *C. robusta.*

The Miniata show was held from 9 - 11 September 2016 at the National Botanical Gardens in Nelspruit. A total of 227 plants were entered by 15 exhibitors. Hennie van der Mescht and Andre du Toit (both from Bloemfontein) were the judges. The weather was lovely and we had 280 visitors through the doors.

Best on Show was awarded to Chris Welgemoed's 'Tipperary Peach', First Runner up to Sue Kloeck's broadleaf, broad tepal yellow and Second Runner up to Chris Welgemoed's Hirao. Ian Radmore was awarded Best on Show in the Foliage section for his magnificent variegated broad leaf Fukurin. Ian's green throat peach was considered by the judges to be the plant with most potential.

Presentations were delivered by John van der Linde on Interspecific Breeding and Felix Middleton on a number of his research projects. These were both interesting and inspirational.

We are looking forward to 2017 with two new shows, the Interspecific and Pendulous show in July which will be open to the public and the Clivia Show in September that we are going to hold with 12 other exhibitors.

Paul Kloeck at the Interspecific Show.

Show winners Chris Welgemoed with Tepperary and Sue Kloeck with broad tepalled yellow.

Best on Show without flowers - Ian Radmore.

The Orchid and Cycad Society as well as succulents and other indigenous plants will all be displayed at one venue from 8-10 September. This may be the start of a massive plant exhibition and sale.

We remain hopeful to start a Plant Show for Nelspruit and increase membership numbers, and then encourage young people to become involved with *Clivia* growing.

North American Clivia Society (NACS) Clivia Show and Sale at The Huntington Library, Art Collections and Botanical Gardens in San Marino, California, USA (18 & 19 March 2017)

by Malcolm R. Shrimplin, NACS President &
2017 Huntington Show Secretary and Classification Chair

The Huntington Library, Art Collections, and Botanical Gardens (www.huntington.org) provided a fitting backdrop for The Fourteenth Annual NACS Clivia Show and Sale. The event was co-sponsored again this year by The Huntington and NACS' Southern California Clivia Club. What follow this summary are photos and descriptions of the show's top prize winners from 324 entries in 3 categories, 11 divisions, 29 groups, and 102 classes, as well as the People's Choice Award winner and runners up.

'One Million Questions' - Plant Horizons

Congratulations to all who entered: Quyen Cao, Dina Cuppinger, Joyce Dean and The Redlands Gardens & Floral Guild, Wanda Grunwald, Alexander Mikhalevitch, Manuel Morales (Plant Horizons), Norman Nakanishi, Marilyn Paskert, Carey Schneider, Malcolm

'Cunningham's Pink' x 'Helgaard' - Wanda Grunwald, photo by Marilyn Paskert

Best in Division - Floral Arrangements - Joyce Dean

Blooming Variegated *C. miniata* - Quyen Cao

People's Choice third Runner Up - TKO x TKO - Norman Nakanishi

Best in Show - Peach Akebono - Plant Horizons, photo by Marilyn Paskert

Shrimplin, Eileen Slattery, and May Tom.

More coverage, including details about the slate of international speakers who presented at during the event and all the activities from that weekend, can be found on the NACS website (www.northamericancliviasociety.org) and in the coming May and August editions of the NACS newsletter, Clivia Quarterly. Next year, The Fifteenth Annual Clivia Show and Sale at The Huntington will be the weekend of March 17 & 18, 2018. Additionally, next year in Kennett Square, Pennsylvania, The NACS Longwood Gardens Clivia Show returns for the weekend of March 10 & 11, 2018.

Newcastle Interest Group Annual Show 2016

By Alfred Everson

The Newcastle Interest Group show was held on Saturday, 3 September 2016 at the Drakensberg Primary School. The show drew 102 entries from seven exhibitors for 30 categories proving to be one of the biggest for the interest group. The judge Willie Wesselman form Bela Bela assisted by Jock Dennill and Johnny Clark from Newcastle acquitted themselves well in awarding certificates and were available to offer guidance and assistance to enthusiasts after the judging was completed.

Henry Howard with Alfred Everson (Chairperson) with winning plants.

The results were as follows:

Best on Show – Henry Howard
First Runner up – Louis Lötter
Second Runner up – Henry Howard
Most points on show – Henry Howard - 42 points
First Runner up – Louis Lötter – 26 points.

An creative colouring-in competition was also held with the theme CLIVIA, the objective being to encourage children in the cultivating of *Clivia*. There were a total of 100 entries received and the best three of each grade was chosen. Special thanks for the donation of *Clivia* plants as prizes to the group winners and the Interest Group members for the donation of gift vouchers.

Best on Show.

An educational program will be developed going forward to assist the pupils with the care and grooming of their *Clivia* plants. These pupils will then have an opportunity to enter their plants in a special category to see how well they cared for them

P Hannekom and staff from Drakensberg Primary School arranged a Mr and Miss Clivia beauty pageant for the younger generation, and all the Primary Schools from Newcastle were invited to partake. This was divided into two sections, a junior and a senior section. The Drakensberg Primary School staff has supported the Newcastle Interest group for the past four years and the Interest Group has gained a lot of interest, so we extend a special thanks to the principal and his staff.

The results were as follows:

Junior Section Miss Clivia
1st – Jodine Schoombee
2nd – Tamzin Nel
3rd – Siphokazi Ziquba

Junior Section Mr Clivia
1st – Canon Brown
2nd – Banele Msimango
3rd – Akhumzi Dlamini

Senior Section Miss Clivia
1st – Asanda Dube
2nd – Siphazi Hadebe
3rd – Landelihle Mkhize

Senior Section Mr Clivia
1st – Bamanye Mthembu
2nd – Divan Lubbe
3rd - Phiwe Radebe

Front: Riaan, Cathy Janse van Nieuwenhuizen, Divan Nieuwoudt, Lucian Labuschagne, Lynette Lap, Joey du Preez, Merloe van der Walt, Bianca Sherrin, Martonique Odendaal
Middle: JC Senekal, Derick, Zane Geurtse, Lizz-Marie Hanekom, Mary-lee Griesel, JD Sutherland, Anzel Botha, Cherralize Kriel
Back: Tanya Botha, AJG Everson (Chairperson) & P Hannekom (School Principal)
Absent: Kaylee Pelser & Kiara Faul.

Junior Section Miss Clivia.

Junior Section Mr Clivia.

Senior Section Miss Clivia.

Senior Section Mr Clivia.

Northern Clivia Club Show 2016

By Peter Lambert

For any Clivia Club the highlight of the year is certainly their annual show. This is definitely the case for the Northern Clivia Club. Our show was once again held at the Anton van Wouw Primary School during the first weekend of September 2016. We had fewer entries than previous years, but the quality of the plants entered was excellent. This year we were blessed with excellent weather, unlike 2015 when we had pouring rain.

2016 saw the NCC making sole use of external judges who had the unenviable task of selecting winners from among all of the beautiful plants entered.

First Runner up - Martiens Erasmus.

My sincere thanks go to Felicity Weeden and Louis Blom from the Cape Clivia Club and Peter Miles from the Eastern Province Clivia Club for a task well done.

Plant without flower. Runner up - Hilton Atherstone.

Plant without flower. Winner - Danie Pretorius.

A lot of hard work, effort and dedication go into raising and nurturing our beloved plants and also in preparing them for the show. Congratulations to AJ de Klerk our winner in the flower section, and Martiens Erasmus and Bronwynn Engelbrecht with their second and third placed entries. In our plant without flower section Hilton Atherstone and Danie Pretorius shared the spoils.

Thanks must surely go to all of the members that entered plants, to the sellers and to the organizers who all helped to make the 2016 Show the success that it was.

Winner - A J de Klerk.

Second Runner up - Bronwyn Engelbrecht.

Northern Free State Clivia Club Show 2016

By Ben Nel, photographs by Stefan Ferreira

The annual *Clivia miniata* Show was held at the Toronto Hall Wekom.

Judging took place Friday afternoon by Willie Wesselman, Piet Laubcher

Best Leaf Plant on Show Chinese Daruma - Andre Steyn.

First Runner up 'Marchmellow' - Johan Kruger.

Second Runner up 'Sky Chase Yellow' - Johan Kruger.

Overall winner 'Hester Copperbronz Green Centre' - Stefan Ferreira.

Show hall.

and two learner judges, G. Laubscher and J. Wiesner.

The Saturday and Sunday the show was well supported by *Clivia* enthusiasts.

Congratulations to our trophy winners. I would like to thank one and all who entered their plants for the show. Without you there will be no show.

Trophy winners:
Best on show - Stefan Ferreira
Bronze - 'Hester green center'
1st Runner up - Johan Kruger 'Marshmellow'
2nd Runner up - Johan Kruger 'Sky Chase Yellow'
Most Points on Show - Stefan Ferreira
Best on Show Leaves - Andre Steyn
'Miniature Chinese Daruma'

Winners' table and trophies - 2016.

Overberg Clivia Show 2016

Text and photos by Felicity Weeden

I am pleased to report that the Overberg Show is very much on a par with the Joburg Club. The Overberg Group had eight exhibitors who benched 144 plants, while Johannesburg benched 155 with 15 exhibitors. For a small group with few members benching plants, it is a very successful effort. A sincere vote of thanks and appreciation is due to those who made an all-out effort to make the show a success once again.

Some really outstanding specimens were displayed in both the Leaf only classes and the Flowering classes, and we had a number of entries from the Cape Clivia Club members. Two of the top awards went to these exhibitors.

In total, 75 awards were made, including the main prizes, and it is pleasing that new names are appearing on the winners' table. Andre Swart and Leon Blom, judges from the Cape Club, ably handled the judging, which was much appreciated.

Best on Show.

Peoples' Choice.

First Runner up.

Second Runner up.

The winners were:
Best on Show – Flowers – Felicity Weeden
1st Runner up – Tony Trew
2nd Runner up – Andre and Sandra du Plessis
Best on Show – Leaves – Felicity Weeden
1st Runner up – Pieter and Dalene Kok
2nd Runner up – Andre and Sandra du Plessis
People's Choice – Andre and
Sandra du Plessis.

From left - Pieter Kok, Tony Trew, Felicity Weeden,
Andre and Sandra du Plessis.

The winning plants.

KwaZulu Natal Club's Report for Kloof One Day Show

By Deon Bean, Show Manager

This show excelled all previous club shows especially when it came to numbers through the gates – 257 to be exact! The weather was shocking, cold and drizzly, with heavy downpours here and there. Despite the inclement conditions, people arrived smiling and excited to scurry off with a wonderful selection of flowering beauties, seedlings and seeds. The sales tables were sold out in some cases, others went off home with collectors

Any Other Colour - Sean Chubb.

Bicolour - Sean Chubb 3rd.

Best Broad Leaf in Flower - Liz Boyd.

and breeders stock left over. We managed to obtain 72 plants that were presented for benching with 14 exhibitors including one novice and two juniors competing for the top prizes.

The following results were nominated by our Judges, Chief Judge, Chris Viljoen from Pretoria assisted by Peter Lambert, Liz Boyd and Val Thurston, who were very impressed with the quality and variety of colours on the tables.

Best Yellow - Gem Wild Flowers.

Hirao - Sean Chubb 2nd.

Best on Show - Liz Boyd
1st Runner up - Sean Chubb
2nd Runner up - Sean Chubb

Best Broad Leaf - Val Thurston

Best Novice - Nico Prinsloo

Best Junior - Simon Chubb
1st Runner up - Trent Chubb
2nd Runner up - Trent Chubb

Most Points on Show -
Sean Chubb
1st Runner up - Liz Boyd
2nd Runner up -
Gem Wild Flowers

Congratulations to the prize winners and to the rest of the exhibitors, Chairman, committee, stewards, helpers and plant sellers, who assisted to make this show the resounding success it was for a One Day Show.

Thank you to those members who come from afar for bringing the bulk of the exhibits we really appreciate your time and effort.

We sold a 115 raffle tickets, another much needed cash injection of R1 150-00 for the coffers. Mrs A Scheepers won the lovely plant donated by Liz Boyd - thank you Liz.

'Green Throat' - Liz Boyd 1st.

Val's winner - 'Ndwedwe Orange Flare'.

PHOTOGRAPHIC COMPETITION 2016 WINNERS

Clivia miniata

1st 'Iced Green' - Carrie Kruger.

2nd 'Pink Ice' - Carrie Kruger.

3rd Versi - Pikkie Strumpher.

4th *C. miniata* (variegated peach) - Helen Marriott.

Interspecific *Clivia*

1st 'Star Green' - Carrie Kruger.

2nd Versicolour f2 - Carrie Kruger.

3rd Rudo Lotter's 'Tinkerbell' X 'Chandelier' - Michael Riska.

4th Interspecifics 2 *caulescens-miniata* natural hybrid x C. mirabilis - Helen Marriott.

Pendulous

1st *C. caulescens* - Helen Marriott.

2nd Compact *Robusta* - Carrie Kruger.

3rd *C. nobilis* - Helen Marriott.

4th *C. mirabilis* - Andre Swart.

Single flower

1st 'Bella Beauty' - Carrie Kruger.

2nd Bicolour *miniata* - John Hunter.

3rd *C. miniata* 'Vico Yellow' hybrid - Helen Marriott.

4th - Aart van Voorst.

Other

1st 'Frizz' - Pikkie Strumpher.

2nd Berries tumbling out - Helen Marriott.

3rd '777 Wizard Green' - Carrie Kruger.

4th Berries in Japanese lacquerware box - Helen Marriott.

PHOTOGRAPHIC COMPETITION 2016
SOME CONTRIBUTIONS

Chinese Fukurin - Michael Riska.

'Corli' - Dawie van Heerden.

Kutani bottles - Michael Barrett.

Emperor Swallowtail - Greg Jones.

'Golden Dusk' Strain - Michael Loh.

Floral arrangement - Michael Barrett.

Ngome interspecific - Dewald Coetzer.

'Olivine' - Michael Loh.

'Red green - Johan Steynberg.

'Reflex yellow' - John Hunter.

To open - Jan Pohl.

'Trixie' - Johan Etsebeth.

Willie le Roux.

C. miniata 'Simplicity' - Helen Marriott.

PHOTOGRAPHIC CONTRIBUTIONS – Carrie Kruger

'Florid white lips x Ghost'.

'Ghost f1'.

'Ghost f2'.

'Green Jade' polipetal group 1.

'Her Majesty'.

'Iced Mint'.

Interspecific ‘Multi Dreams‘.

Interspecific ‘Secret Desire‘.

'Jingle Bells'

'Lucky Girl F1'

'Narina Green'.

'Saki Benni'.

'Woodland`s Beauty'.

PHOTOGRAPHIC CONTRIBUTIONS – Pikkie Strumpfer

'777 Green Velvet'.

'Deklan F1'.

'Deklan x Y'.

'Efydd 1'.

'Fancy Girl'.

'Four Marys F2A'.

'Jessie Girl'.

'Mountain Breeze'.

'Pico Starlet'.

'Rimplestilskin F2'.

'Rumple x SCC'.

'Sunshine Lady'.

'Tanika'.

CLIVIA

NINETEEN

NPO no. 139-860

SARS PBO Tax Exemption no. 930036393

The Clivia Society caters for *Clivia* enthusiasts throughout the world. It is the umbrella body for a number of constituent Clivia Clubs and Interest Groups which meet regularly in South Africa and elsewhere around the world. In addition, the Society has individual members in many countries, some of which also have their own Clivia Clubs. An annual Yearbook and quarterly Newsletters are published by the Society. For information on becoming a member and / or for details of Clivia Clubs and Interest Groups contact the Clivia Society secretary or where appropriate, the International Contacts, at the addresses listed in the inside back cover.

The objectives of the Clivia Society

To coordinate the interests, activities and objectives of constituent Clivia Clubs and associate members;

To participate in activities for the protection and conservation of the genus *Clivia* in its natural habitat, thereby advance the protection of the natural habitats and naturally occurring populations of the genus *Clivia* in accordance with the laws and practices of conservation;

To promote the cultivation, conservation and improvement of the genus *Clivia* by:

3.1 The exchange and mutual dissemination of information amongst Constituent Clivia Clubs and associate members;

3.2 Where possible, the mutual exchange of plants, seed and pollen amongst Constituent Clivia Clubs and associate members; and

3.3 The mutual distribution of specialised knowledge and expertise amongst Constituent Clivia Clubs and associate members;

To promote the progress of and increase in knowledge of the genus *Clivia* and to advance it by enabling research to be done and by the accumulation of data and dissemination thereof amongst constituent Clivia Clubs and associate members;

To promote interest in and knowledge of the genus *Clivia* amongst the general public; and

To do all such things as may be necessary and appropriate for the promotion of the abovementioned objectives.

Front cover 'Joubert's Stripy'

Back cover Other Special mention – Dawie van Heerden

Title page Interspecific, (*C. miniata* x *C. caulescens*) x *C. miniata* – Helen Marriott

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CLIVIA

NINETEEN

Editor
Joubert van Wyk

IN MEMORIAM

Tribute to Tino Ferero

By Christo Topham

I am writing this tribute as a Clivia friend of Tino and will focus on the friendship we had.

Tino was a remarkable man. A man who always had time for others. A man who in his own quiet and gentle way truly loved this life. A man who always chose to see the beauty and the wonder of this world.

I have wonderful memories of Tino. He was the one who took me under his wing when I joined the Northern Clivia Club in the late nineties. I had the privilege of serving under him on the management team of the Northern Clivia Club. What stood out for me, was the way he handled matters, in a soft and gentle way. He was an example to everyone he met, a true gentleman.

Amusing comments made by Tino:

- If you plant seed you will may be get one Miss World and two Miss South Africas, the rest will be average or below average.
- All Clivia flowers are beautiful; some are more beautiful than others.
- *Clivia* seeds are the flowers of the future.
- His love of Clivia stories.

Tino loved people and believed that every person with whom he came in contact had something good in them and should be given a chance. He loved to give seeds and plants to people because it made him very happy. He was carried away by a beautiful flower. His knowledge of *Clivia* was endless. *Clivia* were a passion and a way of life for Tino. He had *Clivia* friends all around the world. He corresponded with *Clivia* people in Australia, New Zealand and America. He exchanged seeds with them. Tino visited other countries to deliver talks and visited shows. He was respected in the *Clivia* community in South Africa and the rest of the world.

Tino Ferero

His *Clivia* collection was of world standard and he had many well-known *Clivia* clones which formed the basis of his *Clivia* breeding program. His collection of plants included those from Bing Wiese, Ammie Grobler, Pat Gore, Adri Wessels, Bertie Guillaume, Nick Primich, Yoshikazu Nakamura, Sean Chubb, Tienie Holtzhausen and several other well-known breeders. Tino made sure that he stayed up to date with the latest trends in *Clivia* breeding. Out of his collection came many show winners. He left a treasure of genetic material for us to work with. In my collection I have a few of his plants which I will always treasure.

Tino's contribution to the *Clivia* world was the following:

- Chairman of the Clivia Society
- Separation of the Clivia Society and Northern Clivia Club
- Chairman of the Northern Clivia Club
- Master Judge
- Honorary member of the Clivia Society and of the Northern Clivia Club.

Tino will be missed, but our memories of him will live forever. Be quiet! Alas, a great man has passed.

Tino was born on 9 September 1936 and passed away on the 28th May 2018 at the age of 80 years and six months.

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Glynn Middlewick - Northcliff, Johannesburg

I have been interested in garden plants since childhood. For the past 27 years, I have lived at my present address. As with most Clivia growers, there now is a shortage of suitable places for my Clivia plants on this property. Crosses are made with exciting pod and pollen parents and carefully placed in a suitable tray and secured in a safe position. Unfortunately, seedlings grow slowly and although I do ensure adequate watering and fertilization, the importance of a potential prized hybrid is soon forgotten. The price is also something better not to be remembered. The following year, my interest is diverted to new lists of interesting seed crossings as well as planting out my own crossings. The passing pets, gardeners and hose pipes also play a part in challenging the existence of the seedlings. The labels, carefully placed at the end of a row of seedlings, is easily moved by a number of involved parties. My own lack of well-organized seedling tray placement doesn't help matters either. The shade houses are more organized, but empty spaces allow one to add another plant, then another! A more ruthless approach and the culling of unworthy plants would help with my space crisis.

My interest in the hobby started with the purchase of Nakamura seed from the Northern Clivia Club in about 1998. Rats re-arranged most of them as they were not protected from such invaders. The greatest enjoyment I get is when a new seedling flowers. Often the flower is orange and shows no signs of improvement compared with other flowers that I already have. The appearance of a flower, different from others in my possession, re-assures me and stimulates my interest in further germination of seed. The adult plants provide a spectacular display each year. We don't take enough time to appreciate how great they are. How do we improve their appearance in the next

generation? What pollen or pod parent should this plant be crossed with in order to improve the number of flowers, the size of the flowers or the green throats. A fault many collectors make is the purchase of seeds that are not 'compatible'. The disappointment that occurs when another orange bloom appears, is solved by planting the plant in the garden or giving it as a gift to a fellow gardener. I now can claim my oranges contain a mixture of all the best genes available. The sellers themselves often have not attempted the specific cross previously. A guide for collectors is to depend on the expertise of the sellers and the development of trust in the hybridizer. Germination of seeds is a challenge, particularly when large numbers are involved. Fellow growers often comment that if a disease occurs, be assured that your most valuable seed will be affected. Over the years, trying different methods for germination, the easiest and simplest method for me is the use of paper towelling in a zip lock bag. Keeping the paper moist and not too wet is the secret. Too much water may result in rotting of the seed.

Regular checking of the progress of the seed is important and avoids any disappointments with disease and entanglement of roots in advanced germinating plants. Large numbers of seeds may be germinated in this way and they don't occupy much space in your kitchen.

The range of suitable potting soil mixtures that I have used, has changed over the years. How often I am surprised by the potting soils of fellow growers. We all know that the *Clivia* plant is very forgiving, but I have found that some potting mixtures are almost too heavy to lift. The variation of mixtures used, ranges from solid soil to orchid type bark mixes. I try to follow advice by potting all the plants in a similar potting mix. A good commercial, bark based potting soil works well for me. I have recently started adding perlite to the mix, with the hope of increasing the drainage of the potting soil. The potted plants are on wire racks, theoretically creating 'perched' pots with poorer drainage of water. I have been advised to use a capillary mat to increase drainage, but so far have not done this.

Fertilization is an interesting aspect of *Clivia* growing. We all aim for the shortest time-period between seed germination and blooming. We all want the plants to bloom every year and preferably at the show date. I have tried various foliar feeds over the years. Some are very expensive and are discontinued before a 'true' result is obtained. I have been

using a slow/controlled release 3:1:5 mixture, applied twice a year, but have now started using 'Osmocote'. This fertilizer claims to have trace elements, which may justify the high price. Time will tell whether this magic bullet will make a difference.

The choice of shade netting is almost standard in South Africa. The degree of shade cloth chosen is usually '80 per cent shade.' The colour to select may create a problem. Bright colours are not very suitable in an area that is visible to all. Black, green and perhaps a mix of white and black are all suitable. Is there a distinct difference in the plant health where different colours are used?

My property is at the end of a cul-de-sac. Some of the original indigenous trees on the hill are still present. Several *Acacia robusta* have died from old age. Some wild pear, Buffalo thorn and wild peach are still surviving on the

property. My cycad collection has spread and as they grow much better in the ground, I have moved other things to make way for them. The bird cages are also occupying the space where the swimming pool used to be. The pool water was always too cold to swim in, so after the third crack in the fibreglass lining of the pool, I decided to fill the pool in with soil. Many *Clivia* plants grow in the garden under the indigenous trees as well as under the buddleias on what should be the pavement. There are two shade houses of a reasonable size and a third small one.

The flowering time for the shade house plants is later than the garden *Clivia* plants and I hope that Mother Nature will be considerate this year and allow the plants to flower in time for the show! My interest also extends to succulents, mainly Lithops plants, which are kept in a covered 'hot house' which occupies half the patio!

The first lot of *Clivia* I bought, for the garden, were 100 plants at R5.00 each via the Farmer's Weekly magazine. Out of these or from somewhere, I was fortunate to find a pale pink that darkens with time. Some claim the flower has an 'Appleblossom' like colour, but obviously from Natal. This plant I called 'Willow Bright'. It is not the fastest grower and reluctant to set offsets. The seedlings that were self-crossed have produced similar flowers, ten years later! Just two of them that is, with the rest flowering orange – the 'milkman' is to blame for the oranges! A visit to Margo McNeil at 'The Shack' was a great outing. Reluctantly she parted with a 'Four Marys', different from the one I had been given previously in exchange for Louisiana irises. A 'Bronze Green Boy' followed for R6000.00. This was pollinated with 'Tienie's Treasure'. One seedling flowered, no green throat, but a similar flower form to 'BGB'. Variegated leaves appealed to me as did the 'Light of Buddha' plants. Nakamura supplied a lot of seed to various growers and some of these seedlings became available. Five of the crosses of 'Good Yellow' by 'Vico Yellow' flowered in due course. All were yellows of good shape. One umbel of flowers was exceptional; large and attractive. This has been a consistent pleasure in my collection, attacked sometimes by pests, but also slow to multiply. Yellow flowering plants were not readily available in the early days, but I managed to get 50 seedlings from Christo Lotter. Kirstenbosch supplied yellow seedlings, limited to two per customer. Many of the early yellow flowers did not have attractive umbels or flowers. A visit of Cynthia Giddy provided me with two Natal yellow plants. The flower shape of these appealed to me more than the available Group 1 yellows. At that time the belief was that the Giddy yellows could not produce yellow seeds. Cynthia sent most of her offsets to Japan. Daruma plants were imported, Chinese miniatures, plants from the USA and some from Australia. Plants were bought at auctions, *Clivia* shows, and from offset and seed-lists. The hunger did not seem to lessen with time. Peaches, not readily available, were obtained. The names 'Inspiration', 'Sunset' were two Cameron peaches I obtained also at high prices.

The one disadvantage of offering to accommodate visitors to my garden, is the necessity to moving plants out of the way, so that visitors may safely walk between the plants. I look forward to the visitors and hope that they in turn will be pleased with what they see.

Dawie and Ebeth Strydom also live in Northcliff, so their and my collections may be visited together on the western side of the city, near the Western Bypass.

Michael Boyce – Houghton, Johannesburg

The first time I became aware that there was a plant called 'Clivia' was when I was a teenager and I saw some plants growing near my mother's front gate. I was immediately taken by the contrast between the bright orange flowers and the dark green strap-like leaves.

Until approximately 2009, I never got remotely involved with gardening, with the exception of starting a vegetable patch and admiring various species of plants in other peoples' gardens. In the summer of 2009, I bought some *Clivia* from my local nursery, for a dark shaded area in my garden. I planted the *Clivia* and religiously watered them, hoping to bring them into flower – but to no avail. The plants provided some greenery, other than the bare earth, and as they would not flower, I soon forgot about them, however, about six months later I was rewarded when one of the *Clivia* flowered. I once again bought some *Clivia* from the nursery, however, this time they were in flower.

A friend, who was staying with me at the time, saw me planting the *Clivia* and told me that Peter Gray, a member of the same old boys' club of which I was a member, was also 'into *Clivia*' and was a member of a Clivia club. On contacting Peter, he invited me to attend a meeting with him that coming Saturday. I attended the meeting, joined the club, and so became a member of the Joburg Clivia Club.

Peter told me about a guy called Ray Top, who he informed me, had hundreds of different coloured *Clivia*, the seed of which he propagated in a propagator and then grew under grow lights. I contacted Ray and became absolutely smitten after visiting him and viewing his *Clivia*, which were then in flower.

When I attended my first Joburg Clivia Club show I was doubly smitten; however, on becoming aware of the prices, tried to fool myself that the reason I was 'into' *Clivia* was for the greenery. Eventually and after numerous visits to Ray's *Clivia*, which I could not stay away from, and after being introduced to Hilton Atherstone by a mutual friend and seeing his plants, I realised the game was up and that I was well and truly addicted.

Over the years I have bought plants from

Floral display

'Fairytale' Cross

and, very generously, have been given plants, offsets and seed by a number of our more prestigious and well-known growers. A few of these include, Hilton Atherstone ('Forest Fire' – a sibling of 'Bertie's Bronze', 'Playgirl'), Liz Boyd ('Cameo', 'Rose Dew'), Sean Chubb ('Lady of Oribi Gorge', 'Appleblossom'), Peter Gray ('Coromandel', 'Meyer Green'), Adri Haxton (Nick Primich plants, Nakamura multitepals), Paul Kloeck ('Virgin Queen'), Trevor Pearton ('Trevor's Treat' – my name, various Bearded Man crosses), Andre Potgieter ('Potties Peach', 'Katrina') Pikkie Stumpher ('4 Marys', various excellent bronzes – regrettably not 777), Dawie Strydom ('Bronze Star' – my name), Ray Top ('Peach Tips', 'Big Daddy'), Rouzell van Coller ('Eugene', 'Andrew Gibson' – original Mick Dower plant), Piet and Rina van

'Salacious Sue'

'Virgin Queen'

'Almost Picotee'

der Merwe ('Greta Louw' – my name, various Hirao/Group 2 crosses), Francois and Ginny van Rooyen ('Gem's Golden Renaissance', 'Luke's Special'), Leon van Rooyen ('Brown Betty', 'Jumbo' – not the Dawie Strydom plant) and Bing Wiese ('Polyploid' – ex Adri Haxton).

My set up is a real Heath Robinson affair, consisting of split pole fencing (which has been replaced by a wall), supports and shade cloth, which varies between 20% – 80%, depending on the tree cover. There are approximately 2000 – 3000 plants, with an additional 1000 seedlings. All the various colours, bronze, orange, peach, pink and yellow are represented. The better plants have been placed on plastic picking crates, turned upside down. The picking crates are not economically sensible, but they allow me to move the plants around, without too much of a problem. The seedlings are housed in two shade houses, which I purchased from the father of the woman who sold me my (presently unused) greenhouse.

Over the past year or two I have had major problems with various pests, including snails, the lily borer caterpillar, mealie bug and scale. The stage has been reached where a hand sprayer is completely inadequate and I intend investing in a petrol driven back pack mister.

'Michael Boyce's Beatrice'

'Yellow Green Throat'

Clivia have driven me to the very limits of insanity, however, even if one could take a pill to cure the affliction, I would not take it, as the insanity has been more than counter-balanced by the joy *Clivia* have given me and the lovely people I have met.

Joubert van Wyk – Houghton, Johannesburg

My mom brought our first *Clivia* home in the early nineties, and in early 2005 my mom was employed by me to look after the nearly 600 plants that the collection had grown to. I read all the books my dad Louis Potgieter had collected, which were all the books that had been published or had been translated into English up till then, and the bug bit me hard. I started buying on eBay, bought car loads at the shows for a few years, visited many of the *Clivia* growers year after year and bought and bought. In retrospect, it was all rather silly and a significant waste of money, but I learnt a lot about many people involved with *Clivia* at the time. I acquired the collections of Ammie Grobler, Bing Wiese and of some other *Clivia* people. The 2006 Conference was amazing, the tours, the people, the presentations and meeting Marilyn Paskert from California, USA. Marilyn and I had often bid against one another on eBay, and whom I would say has become my best *Clivia* friend. She invited me to visit California, and together with Diana Holt and her we travelled from San Francisco to Los Angeles visiting a number of notable collections. She also invited me on my first trip to Japan (organised by Shige), which I have visited on three occasion for *Clivia*, and a trip to China organised by Eddie Pang – all truly amazing.

I erected a shade house on the tennis court, and double stacked plants – again in retrospect a very unfortunate mistake, as I lost a number of plants because of such over-crowding. I have made many mistakes over the years, paying hefty school fees. I have bought many amazing plants from many amazing breeders.

owners, collectors and hobbyists over the years. The negotiations were rather often not simple and not easy, and I learnt a lot. At times the responsibility of taking care of and doing something with the genetic material that in a manner of speaking has been entrusted to me weighs on my conscience. Involving and exposing Jan (my nearly five year old son) to plants and the love our club members have for their *Clivia* and seeing his growing interest in collecting all kinds of seeds with the objective of growing them into plants, gives me great joy. Undertaking habitat visits such as during the *Caulescens* tours of 2006 and 2010, which included Bearded Man, and seeing *C. robusta* growing in streams in Natal and the *C. miniata* at Umtamvuna are amazing. I would love to see *C. mirabilis* in Oorlogskloof, and do a tour with Wayne.

Organisationally I have been

involved as follows with *Clivia* over the years: Was asked to join the Judges Committee of the Northern Clivia Club in 2008 by Tino Ferrero, and have been invited to judge at a number of shows in the Cape, George, Port Elizabeth, Natal up to Polokwane and Nelspruit over the years. Organised the Society Conference Auctions on two occasions: 2010 in the Cape and 2014 in Natal, and a number of yearly auctions for the NCC. Have been Editor of the *Clivia* News since 2012, and published five Yearbooks (Numbers 15 through to 19). Currently, I am serving as the Chairman of the NCC.

I don't generally believe in fertilising my plants as I would like to be able to observe every plant's visible genetic characteristics with as few influences as possible that may trigger phenotype differences. A few things that get me within the *Clivia* community include the envy that at times shines through, the theft of plants, seeds, or pollen that one hears of from time to time, the concept that someone has 'created' a particular plant as compared to the reality that all that they have done is selected

a plant from a particular crossing of plants that have been placed in their care, and people that take newbies or such like for a ride or take advantage of others.

I hope to one day be able to grow my plants as well as Liz Boyd, and breed like Bing Wiese or many of the amazing breeders we have in our midst. Collecting and breeding Clivia has certainly been a very enjoyable hobby.

Pikkie & Elize Strumpher – Pretoria

We bought our first *Clivia* 20 years ago for the garden and soon afterwards joined the Northern Clivia Club to find out more about this wonderful plant. Offsets of quality plants were not available in those days and we frequented the nurseries for plants. We had a lucky break when we bought a bronze green throat from a wholesale nursery, Frohman's Eden, in the Mpumalanga Lowveld. The colour of the flowers was good, but the shape needed improvement.

When the first seedlings flowered in 2002, we were over the moon and put one of them on show at the Joburg Show. It was awarded Best Green Throat and Second Runner-up on Show.

Koos Geldenhuys suggested the name, Gunston, since the colour was similar to the colour of a Gunston cigarette package. 'Gunston' and its brothers formed the core of our breeding program for the next few years and we are now at the fourth generation of green throats.

'New Hope'

'Serenity'

'African Princess'

'Fancy Girl'

'Taichoo Tips'

'Tranquility'

One of the pleasant surprises from our breeding program for green throats was the 777 series. Although the 777s proved to breed true, we were surprised by the diversity of the range of colours. It seems that the 777s will keep us busy for some years to come.

Through the years we have expanded and diversified our collection of breeding plants. This was done mainly through own breeding and selective buying of plants and seeds that will enhance our breeding program.

Although our collection consists of all the different colour variations, we prefer the more exotic colours.

Originally we got interested in *Clivia* for our garden and through the years we expanded the *Clivia* area in our garden. Presently we have a few thousand *Clivia* in our garden. Each year we replace and "upgrade" some of the garden plants to represent our collection. It's difficult to pick which one we enjoy more, our collection or our garden.

ARTICLES

Developing a *Clivia* Heritage Collection

Christo Swart

Introduction

I have enjoyed the beauty of the *Clivia miniata* flowers for many years and still have an orange flowering *Clivia* given to me in the late seventies by the then Director of Parks (Pretoria), the late Jimmy Aves. It was only much later while attending the KwaZulu-Natal Clivia Club Show in September 2012 that I signed up as a member and became a collector of these beautiful plants. Further research, reading articles and papers, and interaction with *Clivia* growers and collectors, highlighted that *Clivia* in habitat are not only threatened but are being destroyed at an alarming rate. The main causes of *Clivia* vulnerability are:

i) Housing and related urban development,
ii) Land made available for agriculture,
iii) Plants collected for traditional medicine, and
iv) Plants collected for ornamental horticulture.

There is a dire need to conserve threatened *Clivia* habitat and heritage species for future generations. Botanic gardens as part of their mandate are well placed to provide a refuge for *Clivia* heritage species.

The Durban Botanic Gardens was approached in December 2015 with a proposal to establish and manage a *Clivia* Heritage Collection in the gardens. This included access to the Departmental propagation facilities and where possible to assist in conserving *Clivia* species within their existing natural habitat.

The Durban Botanic Gardens (established in 1849) is currently the oldest surviving botanic garden on the African continent and manages major plant collections that include cycads, palms and orchids. The Durban Botanic Gardens is also a member of Botanic Gardens Conservation International (BGCI) and responsible primarily for plant conservation and plant-based education as outlined in its key strategic principles namely:

- Biodiversity,
- Education,
- Heritage,
- Research,
- Horticultural Excellence, and
- Green Innovation.

As a Botanic Garden with plant conservation, education, research and botanical heritage as part of its core values, a *Clivia* Heritage Collection was considered to be a worthy addition to the Gardens already existing collections. The conservation of *Clivia* as a genus as well as the conservation of its genetic and cultural heritage will be addressed in this undertaking.

The feasibility of such a project was discussed with members of the KZN Clivia Club and it was agreed that this project is of great importance. The consultation process in terms of the project was then escalated to the Clivia Society of South Africa and support obtained from the Chairperson, Glynn Middlewick who kindly provided guidance and raised some pertinent issues for consideration. One issue that will need attention when taking the project forward is compliance in terms of legislation.

The new Clivia Heritage Programme is a collaboration between the retired Deputy Head of eThekwini Parks, Leisure & Cemeteries, Christo Swart and the Durban Botanic Gardens Collections, Horticulture and Education Team. On-going research and development will be undertaken by the Department's Micropropagation and specialist nursery staff, with support from the Clivia Society in this endeavour as well as assistance from the KZN Clivia Club, a member of the Clivia Society.

CLIVIA HERITAGE PROGRAMME: SCOPE OF PROJECT

A series of meetings commenced and the objectives for the Project were defined, namely:

- Goal 1: Develop a *Clivia* Heritage Collection at the Durban Botanic Gardens as part of a broader conservation gene-banking initiative.
- Goal 2: Integrate *Clivia* conservation as a theme into the existing Education Programme at the Gardens with suitable learning support materials and activity-based learning programmes aimed at students of all ages.
- Goal 3: Explore further research, publications and partnership opportunities, so as to add value to the overall conservation effort of *Clivia*.

Goal 1

1.1 Develop a Management Programme for the Clivia Heritage Collection requires that:

i) The information on a particular plant is correct and complete. Only specifically selected habitat plants with accurate traceability should be allowed in the collection.
ii) Heritage plants grown by way of Tissue Culture collected from reputable growers and/or collectors and documented accordingly are to be included in the collection.
iii) The Heritage Collection will be accurately labelled and documented.

Every effort will be made to maintain the plant in its original form in the collection. To this end only offsets from reputable sources will be accepted. Seedlings of a type will not be regarded as the type.

In situ work: will include mapping of local *Clivia* populations.

Ex situ work: The Production & Display Section has included *Clivia* in the Department's Threatened or Protected species (ToPs) permit application. A collecting and research permit for *Clivia* will be obtained to comply with legislative requirements.

1.2 Collection Display and Interpretation

Selected *Clivia* species will be grown in the Gardens at particular sites suitable for *Clivia* cultivation. The more valuable habitat plants will be placed in a secure environment.

The *Clivia* Heritage Collection will include information and insight on the historic background of *Clivia*. Information provided will also include the distribution of *Clivia*, as they are endemic to South Africa with many occurring in KwaZulu-Natal.

The descriptive text will be in both English and isiZulu. Bold visual elements will be included as part of the Gardens Signage Master Plan and map.

Goal 2

2.1 Integrate *Clivia* conservation into the existing education programme

A *Clivia* propagation project and challenge for local schools will be incorporated into the Durban Botanic Gardens Schools Programme and training workshops will be held with DBG Education Guides. This will form part of a long term schools project, taking into account that a *Clivia* propagated by way of seed takes four years or longer to reach maturity. On-going contact with the schools that have entered the *Clivia* Challenge will therefore be important, given that progress of the plants needs to be monitored and assistance with replanting and pest control needs to be given. The objective will be to educate, stimulate conservation, learning and engendering a lasting interest in *Clivia* or simply growing plants. Hopefully many will be encouraged to embark on a future career in Horticulture or Botany.

The plants grown from these activities can then be planted at the respective schools as part of the *Clivia* Challenge Programme. Schools will also be encouraged to visit Clivia Society shows in order to stimulate and sustain further interest.

Goal 3

3.1 Conservation

All *Clivia* species are utilised for the traditional medicinal plant trade, whilst *Clivia miniata* (Lindl.) Bosse is the most popular species of this genus in the international ornamental plant industry. Other *Clivia* species also have the potential to be successful in the international floricultural industry but on a smaller scale. The current plant sold as *Clivia miniata* is generally far removed from its habitat ancestor. It can now be regarded as a domesticated *Clivia* and is seldom

pure as breeders have interbred species to obtain more attractive plants. However, quite a number of plants are still being collected mainly for the landscaping market.

Unsustainable harvesting from natural populations has caused population sizes of all species within the genus to decline to vulnerable conservation status. The South African National Biodiversity Institute (SANBI) has Red-listed habitat *Clivia* as "Vulnerable" and they thus face a high risk of extinction due to over exploitation.

Clivia have important cultural and economic benefits, be it for horticultural or medicinal value. Identifying and conserving individual plants from wild populations needs to be considered. The focus needs to include the preservation of variations especially variation that differs from the norm as this may have potential for future breeding or research.

Strategies to ensure conservation of *Clivia* species need to include both in situ and ex situ conservation. To implement both in situ and ex situ conservation strategies, it is necessary that all aspects of plant propagation be thoroughly investigated.

The conservation of *Clivia miniata* in relation to traditional medicine

The entire plant or rhizome of *Clivia miniata* is reportedly used in traditional medicine for the treatment of snakebite, fever and to ease child birth. It is also sprinkled around the homestead to stop people damaging the property. The uses of plants to treat diseases go back to ancient times and plants have continued to play an important role in traditional Zulu medicine. However, the growing demand is threatening the existence of habitat plants as unscrupulous collectors strip the wild of its natural flora.

The "illegal harvesting" of plant material poses a major management problem for the Nature Reserves within eThekwini. In an effort to control the removal of plant material, The Silverglen Medicinal Plant Nursery was established to cultivate plants required by herbalists and also to propagate rare plant species that are in danger of extinction. It further seeks to reveal the scope of opportunities in the medicinal plant nursery industry and promote awareness of the need to sustain medicinal plant populations in their natural environment.

The Silverglen Medicinal Plant Nursery is an important part of the *Clivia* Heritage Programme, in that it aims to provide education on plant propagation and focuses on the conservation of plant material used in traditional medicine. In this regard herbalists and herb collectors are encouraged and empowered to conserve the medicinal plant population by collecting seed for planting in their own gardens.

The main mechanism used to pass on the skill of plant propagation is a three day course with emphasis placed on the practical application of knowing and growing medicinal plants. The outcome is that by the end of the training programme, herbalists and herb collectors will understand how a nursery functions and how the imparted skills will benefit them in growing their own medicinal plants.

3.2 *In Vitro* Propagation

In vitro propagation techniques are considered useful tools for cultivating and conserving plants which are difficult or slow to propagate conventionally. This project will assess the potential of *in vitro* culture technologies as a tool to be used in a conservation programme for *Clivia* species. The present Tissue Culture project focuses on evaluating *in vitro* propagation of species indigenous but not restricted to KwaZulu Natal, South Africa. The species *Clivia miniata*, *Clivia robusta* and *Clivia gardenii* which are found in KwaZulu Natal, are the focus species of the present study.

Available micropropagation protocols are being assessed for their efficiency to regenerate *Clivia*. Modifications to existing protocols are being investigated with the ultimate aim of optimising tissue culture procedures. Components in this process are:

- Optimise suitable decontamination procedures for various explant types considered for *in vitro* culture
- Establish a micropropagation protocol for seed derived explants
- Identify and establish *in vitro* collection procedures for explants from wild populations and rare genotypes

- Establish long-term slow growth storage procedures for tissue culture plantlets to ensure long-term sustainable availability of threatened and rare genotypes

Information gathered in this regard will assist in the propagation and conservation of significant *Clivia* species, especially habitat plants. The project is regarded as a long-term endeavour with several short and medium term milestones. Specific areas of interested that will be documented and ultimately published:

- Challenges experienced during the propagation process and recommended solutions.
- Establishing the best method of harvesting plant material for propagation and development of protocols for *Clivia*.

Phase 1: Launch of the Heritage Program: Display and Education Programme

The *Clivia* Heritage Programme was launched on the 10th September 2016 and included a weekend-long display of all six *Clivia* Species in the Durban Botanic Gardens Biodiversity House. Assistance was generously provided by the Durban Botanic Gardens who made available the Biodiversity House and also assisted with the preparation of the display.

Interpretation signage formed an integral part of the display, providing information on a variety of relevant *Clivia*-related topics in English and isiZulu.

Plants for the display were provided by Sean Chubb and Felix Middleton, who also assisted with the transport and display permits.

The exhibition was a success as attested by the number of visitors viewing the display.

SCHOOLS EDUCATION PROGRAM

The Durban Botanic Gardens Education Team together with Val Thurston of the KZN Clivia Club ran three school programmes, with approximately 30 learners per programme, during the second week of September.

Learners from Clayton Primary were introduced to the wonders of *Clivia* and then given hands-on experience in propagation of *Clivia*. The learners were shown how to clean and prepare the seed for planting. The different stages of seedling development were also explained. The children had the opportunity of cleaning, treating and planting seed themselves. This was done with much excitement and enthusiasm. The seed was taken back to school and a follow-up visit is scheduled for June this year when the seedlings will be transplanted in bigger containers. Learners attending the programme last year had the opportunity of seeing *Clivia* in full bloom in the Gardens Biodiversity House.

Seed for the project was kindly made available by Sean Chubb, Val Thurston and members of the KZN *Clivia* Club. Francois van Rooyen made available an information brochure on how to care for your *Clivia*, which was provided to each teacher and learner. This was a successful programme hosted by the Gardens Education Officer, Jody Fuchs and his Education Team.

CONSERVATION WORKSHOP

A workshop on indigenous *Clivia* and Orchid conservation was also held during the same week for all eThekwini Parks Department Horticultural and Conservation Staff.

Phase 2: *Clivia* Heritage Programme, 2017

The *Clivia* Heritage Programme now moves into its second phase:

Sustainability:

This will be an on-going long term project which builds on the 2016 projects. It includes the collection of habitat heritage plants, continuing with research and cultivation of *Clivia* plants and the hosting of a curriculum based *Clivia* Heritage Program as part of the Gardens Schools Education Programme.

Assistance with the preparation of the plants

The display at the Durban Botanic Gardens

Collection:

- Obtaining required permits for collection and research purposes.
- Development of collection protocols which include:

Collection *ex situ*

- Preparations for the housing of the collections
- Recording and labelling of Habitat Heritage plants

Display:

A display similar to the one held in 2016 at the Durban Botanic Gardens was undertaken at the KZN Clivia Club Show in September 2017. The KZN Clivia Club in partnership with the Durban Botanic Gardens and EThekwini Parks' Production and Display Section also participated in the 42nd Witness Garden Show which took place from 22 to 25 September 2017 in Pieter Maritzburg. The show saw 18 125 visitors.

The theme and brief provided for our stand was the "Beauty and the Beast". In this presentation the Beauty is the six Clivia species and the Beast shows and highlighted the fact that Clivia and its natural habitat are not only threatened but are

Educating a new generation of horticulturalists

being destroyed at an alarming rate. This was depicted in the interpretative signage within the display. A big thank you goes to the team that made the display possible: Sean Chubb making plants available, Felix Middleton and the team from EThekwini Municipality lead be Justin Oxland and Sipho Sipho Mhlongo.

The displays were judged by Chelsea Flower Show mentored judges who applied objective standards, a vital prerequisite, to preserving the credibility of the adjudication process. The Clivia Society's KZN Clivia Club was awarded a Bronze.

Education:

Building on the 2016 program the next Schools Program will take place during the last week in May and September. We plan to reach out to approximately 180 Grade 4 learners who will experience an introduction to *Clivias* and their propagation. Each learner will receive a small container, a *Clivia* seed and some potting soil. Members of the KZN Clivia Club will instruct learners on the finer details of *Clivia* propagation from seed.

Fig. 1

Fig. 2 (annotations: a = basal callusing, b = bud proliferation)

Fig. 3

Clivia micro-propagation via Tissue Culture

Research: Micro Propagation (*In Vitro*)

Progress and future expectations:

Thus far, the potential of using seed derived explants to regenerate *in vitro* plantlets is being carried out using seed of *C. miniata* plants that were maintained under greenhouse conditions. The investigation focused on deriving shoots from the leaf bases of seedlings. Bud multiplication was influenced by subculture frequency in the multiplication phase, therefore further work to evaluate the most optimum subculture frequency in the multiplication phase is being investigated. There was no difference in the bud multiplication frequency observed in the two different multiplication medium compositions considered in this investigation, however there was a difference in the frequency of basal callusing for explants transferred to the two different multiplication media considered. To evaluate the survival of *in vitro* generated plantlets in natural growing conditions, acclimatisation of *in vitro* rooted plantlets (Fig 3) is currently in progress.

The onset of initial flowering will also be monitored, once acclimatized plants reach maturity. Seedling derived explants from various hybrid crosses of *C. miniata* are now being evaluated for their response to *in vitro* propagation and to evaluate if genotypic differences amongst explants influence the rate of *in vitro* plantlet regeneration. Similar work is also being carried out with *C. gardenii*. The potential of using basal tissue of young petals and young ovaries as explants described by Wang *et al* (2012) for *in vitro* propagation will also be attempted for elite *Clivia* genotypes believed to have floricultural potential and the clonal fidelity of the *in vitro* derived plants will be evaluated.

Network and support:

As with any project of this nature, support is crucial to success. Support is needed not only in access to plant material but also to local expertise in *Clivia* husbandry and distribution. To ensure legal compliance with collecting of plant material on-going communication with SANBI and Ezemvelo Wild Life will be pursued.

My thanks to the following staff of eThekwini Municipality Parks, Leisure & Cemeteries Department (Durban Botanic Gardens, Production & Display and Silverglen Medicinal Plant Nursery) for their contribution in the project: Sbu Mkhwanazi, Martin Clement, Jody Fuchs, Viloshanie Reddy, Teddy Govender and Brian Abrahams.

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Roots - Part 1: Take good care of the roots of the *Clivia* plant

By Lena van der Merwe

Clivia enthusiasts go out of their way to buy the Cliva plants with the best genetic material for their collections. In the first few years, these plants flourish and are the joy and pride of their owner. Then disaster strikes: the plants don't grow well anymore and the leaf tips start to die back.

This die-back of the leaf tips is usually noticed in the older leaves. Is it a disease? Is it caused by a bacterium, a fungus or a virus? What treatment will cure this sick plant? Some enthusiasts remove the affected leaf entirely; others just cut off the tip and reshape it, while others start spraying with every kind of fungicide or chemical available, but to no avail. These actions do not cure the problem of the plant.

The fact is that the die-back of the leaves is a manifestation of poor growth conditions. The overlooked factor for growing healthy plants is the growing of healthy plant roots. Healthy plant roots not only require water and nutrients, but also oxygen. A potting medium with a porosity of 25% is needed to ensure enough oxygen at root level.

When potting the plant originally, the potting medium met this porosity requirement and the plant grew well. The coarse material in the potting medium (for instance pine bark) decomposes over time forming a very fine material, leading to compaction and loss of porosity in the medium. This leads to shrivelling of the roots and dying of the root tips. The roots are unable to supply the necessary 'food' to the leaves. The plant then tries to compensate by drawing "food" from the older leaf tips (older part of the leaf). Not all elements can be moved and this then leads to poor overall growth of the plant.

Plant with dead leaf tips

Potting medium of the plant with healthy roots showing signs of compaction

Comparison of healthier roots (on top) and shriveled roots

Healthy root plant on top of the shriveled root plant

Plant with dead leaf tips

Not a single healthy root tip here

Plant with healthier roots

Next time, before spraying chemicals unnecessarily, remove the plant from the pot and inspect the roots. Is there any sign of fungi, such as mycelia or fruit bodies present? If so, spray with a suitable fungicide. Do the roots look thick, plump and healthy or are they shrunken and withered with mainly dead root tips? If poor roots are noticed, replace the compacted mix with the correct potting mix. Remember only the root tip – about 20 mm – is involved in the uptake of nutrients. If the root tip is lost, the root dies off and the plant needs to grow a new root from scratch.

Take good care of the roots and the plant will reward you with healthy foliage and flowers, justifying all the money spent on its acquisition.

Only one healthy root tip on the plant

Potting medium of the plant with the healthier roots. Here is already signs of compaction of the potting medium

The obviously shriveled roots

After four months, the same repotted plant should be revisited and photos taken to highlight any positive changes.

The plant medium of the bad roots plant. Look at the fineness of the potting mix

Root tips all shriveled

Third from the right the healthy root tip compared with the shriveled root tips

Roots – Part 2: Give the roots oxygen for healthy growth

By Lena van der Merwe

Aquatic plants, such as water lilies and lotuses, have special cells – aerenchyma – in their stems that allow for the exchange of gasses between shoot and the root. This spongy tissue forms spaces or air channels with low-resistance, which serve as an internal pathway for the exchange of gasses such as oxygen and ethylene between the leaves above the water and the submerged roots.

Aerenchyma does sometimes develop to a certain extent in plants not adapted to grow in water during flooding, but is unable to really supply enough oxygen to the roots. The roots suffer from a lack of oxygen – anoxia – which leads to the production of 1-aminocyclopropane-1-carboxylic acid, ACC, which is then transported to the leaves where it gets oxidised and ethylene forms. Ethylene has several unwanted effects for the *Clivia* grower:

- Ethylene causes leaves and flowers to die.
- It causes leaves to curl into themselves
- It causes leaves to hang down, perhaps helping the plant to lose water.

This picture clearly shows the adventitious roots growing out at the top of the stem (left of the thumb)

Plant no 4 Note the roots growing out of the soil – begging for new growth mix

Plant no 4 showing unhealthy leaves & tips

Plant no 4 Note the healthy roots close to the stem; rotten roots in the growing medium

Plant no 4 showing that the pine bark was not well composted before use as growing medium

Plant no 4. Rotten roots

Plant no 4. Note the roots all dead to the left with the healthy roots climbing out of the growing medium to the right bottom close to the leaf base

Plant no 4 leaf showing possible fungus leasions

Plant no 4 with a leasion showing fungus

- It causes short and stumpy growth of the plant.

Plant roots need oxygen to grow new cells, to repair cells and to absorb nutrients and water. Potassium uptake is the most sensitive to a lack of oxygen, while nitrate is the least sensitive, as the plant is able to get some oxygen from nitrates in their reduction to ammonia.

Roots undergo measureable changes within minutes of complete absence of oxygen. The root growth ceases. The uptake of especially calcium, potassium and phosphorus is almost stopped. The transport of water in the roots is reduced by up to a third . The roots produce alcohol and ethylene, which are toxins, and the production of hormone (auxins) is upset. The combined effect of these changes is to cause the death of the roots, wilting, chlorosis and a downward curving of the plant leaves, calcium deficiency and adventitious root growth on the stem.

Chlorotic leaves of Plant no 2. No new leaves

Chlorotic leaves of Plant no 3

Folded leaves of Plant no 3

Oxygen moves into the growing medium by diffusion. First it moves from the atmosphere through the larger pores in a well-drained medium, then through the maze of pores to the roots where it is used. Micro-organisms together with the roots deplete the oxygen concentration and more oxygen diffuses in from the atmosphere. The diffusion-rate depends on the size of the pores. Small pores can be compared to a closed door – slow movement of oxygen. Large connected pores lead to a more substantial supply of oxygen to the roots.

There are other minor ways oxygen can enter the growing medium:

- Heating and cooling. During heating some air escapes; cooling results in air being drawn back in.
- Wind. Wind gusts increase entry of air into the top layers of the medium.
- Water. Water pushes air out, but as it moves down, it pulls more air into the medium.

Likewise, other gasses produced in the growing medium leave it through diffusion.

Porosity measured as air-filled porosity, AFP, of the growing medium for *Clivia* should be around 25%, similar to that required for cymbidium orchids. This porosity also prevents fungal diseases, such as Phytophthora, of the roots and a high growth rate can be attained with the correct watering regime. In cooler and wetter parts, the AFP should be 35% to 40% if root rotting is to be prevented.

Fertilisers containing peroxides and claiming to improve oxygenation in the growing medium do so only for about one hour and are not a solution for too low AFP of the growing medium and too low oxygen concentration at the roots.

Every *Clivia* grower has his own preference for a growing medium, based on his cultivating regime. Most suppliers of growing media will be able to assist you with a growing medium with the suitable AFP of about 25%.

Roots – Part 3: *Colletotrichum* and *Clivia*

By Lena van der Merwe

"*Colletotrichum*: complex species or species complexes?" (Eds, Damm, U., Cannon, P.F. & Crous, P.W., 2012). Well known mycologists have battled with this question since the advent of microscopes. Professor Johan Spies, the previous chair of the Clivia Society, collected affected Clivia leaves, which were analysed at the Free State University. He reported back in 2005 that the only fungus found was *Colletotrichum*.

Like plants, fungus propagates asexually and sexually and cross breeds. The morphology (study of form) of the sexually bred fungi differs from the asexually bred ones. Morphology-based (or pre-molecular era) identification led to the proliferation in *Colletotrichum* species. The names of the sexual forms differ from those of the asexual forms. So, *Colletotrichum* is recognised as the asexual genus of the fungi with some species linked to sexual forms of the genus *Glomerella* (also known as *Glomerellaceae* or *Glomerellales*). The advent of the molecular era (gene analysis) or " the fungal molecular phylogenetic revolution" (post 1995) gave geneticists the tools to identify organisms on a molecular level and mycologists can now identify fungi more "correctly" and are busy untangling the tangle surrounding the genus *Colletotrichum*.

This is enough regarding the organism's classification.

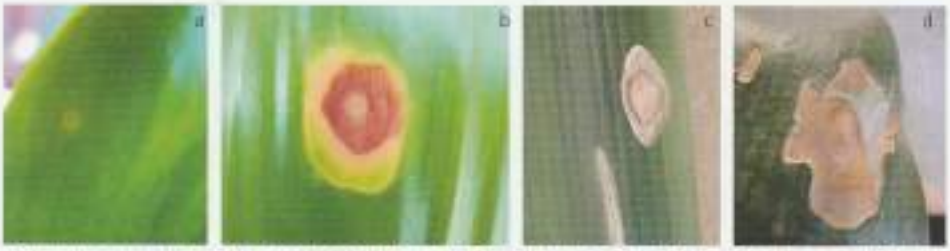
It was believed in the past, incorrectly, that *Colletotrichum* is host-specific and location-specific. These beliefs contributed to the proliferation of species names in the genus.

Many *Colletotrichum* species exist as endophytes (live within a plant for part of its life cycle without causing apparent disease) especially in angiosperms (flowering and seed-bearing plants) in the temperate, tropical and sub-tropical regions. This applies to cultivated crops and ornamental plants, as well as to wild plants.

Like other fungal pathogens the *Colletotrichum* asexual form is most commonly associated with disease symptoms. The sexual forms tend to be limited to dead host tissues. In other words, they aid in composting dead plant litter, making bound nutrients available once more to living plants. In contrast to the asexual form, the sexual form of *Colletotrichum* is not well studied.

The genus *Colletotrichum* is the eighth most important group of plant pathogenic fungi in the world. It causes the disease anthracnose, a well-known disease in plants. The disease develops in warm, humid and wet conditions which favour the infection, sporulation and spread of *Colletotrichum* species. In the dispersal of the pathogen, the sexual stage of the fungus, Glomerella, is generally thought to be less important than the *Colletotrichum* stage, because dispersal is primarily via asexual spores (conidia) produced by *Colletotrichum*. The pathogen can also be spread through infected seed produced in infected pods or fruit of plants.

Colletotrichum species may be seed-borne and can survive in soil by growing saprophitically as a decomposer of dead plant material, and may be spread by water-splash dispersal of conidia and air transmission of ascospores from the sexual form. The spores germinate on the plant surface, penetrate the cuticle and epidermal cells and start the infection. They first exhibit a biotrophic phase with infected tissues remaining symptomless and may also, for some time, be dormant in the plant cells (the endophyte stage of its life cycle). The fungus then enters a necrotropic phase resulting in significant dead plant cells and the emergence of pathogenic lesions. The biotrophic life strategies adopted by *Colletotrichum* species contribute to their prominence as symptomless endophytes of living plant tissues. When the plant is stressed (not growing well such as when the roots are unable to absorb water and nutrients) and not supplying



Disfiguring spots with typical concentric rings observed on Clivia leaves. a. The slightly sunken brown spot forming in the beginning. b. The typical yellow halo around the brown spot. c. Dead plant tissue in the spot. d. The dead plant tissue breaking loose.

enough nutrients to the fungus, the fungus then become necrotrophic killing the living plant cells and pathogenic lesions are observed.

Symptoms

The most common symptoms of "*Colletotrichum*" anthracnose on Clivia are disfiguring spots with more or less concentric rings on the leaves.

Eventually the leaf dies. Lesions initially appear as small water-soaked circular areas, which over time become slightly sunken, tan to dark brown or black in colour, surrounded by a bright yellow halo. Under favourable environmental conditions (i.e. high humidity and/or temperature) fruiting bodies may be observed on dead tissue in the centre of spots. When the sexual stage of the fungus is present, globose fruiting bodies (perithecia) may be produced by the fungus. Foliar symptoms of "*Colletotrichum*" can easily be confused with leaf spots caused by other species of fungi and need to be confirmed by laboratory identification.

All plants investigated confirmed the view that when the Clivia plant is stressed and unable to supply the endophyte *Colletotrichum* with enough nutrients, the fungus then starts to destroy the plant cells and pathogenic lesions are observed disfiguring the leaves with brown spots surrounded by yellow halos.

Disease management

Use a growing medium that will not decompose over time, losing its air filled porosity. Further decomposition will result in a decrease in oxygen supply at root level.

The key to effective management of anthracnose is appropriate nursery hygiene practice. There are some basic principles which generally apply.

- If possible, avoid high temperatures and humidity.
- Minimise plant stress (e.g. water and temperature stress).
- If possible avoid overhead irrigation or exposure to rainfall as spores are spread by water splash.
- Preferably water early in the day so that foliage dries out before evening.
- Reduce periods of leaf wetness by promoting air circulation and avoiding close packing of plants.
- Do not handle plants when wet.
- Control insect pests and avoid injury to the plant.
- Separate diseased plants from healthy ones.
- Remove and discard severely affected plants.
- Prune out and discard diseased leaves and remove any leaf litter accumulating at the

Plant showing typical signs of anthracnose

All roots (older roots) in the middle are rotten, the growing medium is a fine mass. Between the container and the growing medium newer roots grow as seen left in picture A. Picture B shows the dead roots in the centre of the growing medium.

base of plants to minimise the build-up of spores.

- To aid recovery of plants affected by leaf spots and blights, fertilise and water well.

Apply a protective fungicide (e.g. Chlorothalonil, Mancozeb and copper-based fungicides) to prevent infection from occurring in the first place, but use fungicides only when necessary. In the case of removing offsets, it is necessary to pre-treat them with a fungicide before planting.

The fungus, *Trichoderma harzianum* mixed into the growing medium, aids in the prevention of anthracnose infection. Other fungicides are listed in Table 1 above. Do not use the same fungicide more than about seven times in a row.

Use a grow medium that will not decompose to finer material over time. Apply good hygiene measures in your plant house, prevent water stress and water splash and ensure good ventilation to prevent this disastrous disease anthracnose from disfiguring and destroying the leaves of your Clivia plants.

Table 1. Examples of fungicides for the treatment and prevention of Anthracnose disease

Active ingredient	Example of formulated product
Captan	Captan 80WDG
Trifloxystrobin	Flint 50WG
Trifloxystrobin +Fluopyram	Luna Sensation
Pyraclostrobin + Fluxapyroxad	Merivon
Pyraclostrobin + Boscalid	Pristine WG
Potassium Phosphite	Prophyt
Ziram	Ziram 76DF
Fluazinam	Omega 500F

Summary

Clivia leaves contribute significantly to the attractiveness of the genus, and the frequent appearance of disfiguring marks on their surfaces is a significant problem for enthusiasts. *Colletotrichum* fungus is frequently the cause and, prior to 1995, its variability in form led to the taxonomic naming of many species. Then came the molecular revolution in genetics, and it has been determined that many of these forms are but variants of *Colletotrichum*. For example, Glomerella tucumanensis is now accepted as the sexual form of *Colletotrichum* falcatum, the cause of red rot of sugarcane.

This variability includes the growth of the fungus on dead or living plant tissue, with positive (composting) and negative (disease) results.

The article concludes with advice on cultural practices to avoid and fungicides to control *Colletotrichum*.

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A trip through *Clivia* wonderland

By Felicity Weeden

This is a journey through some of the beautiful habitat colonies of the various *Clivia* species.

Included are a few interesting items regarding the discovery and breeding of certain *Clivia* and also the preservation and destruction of certain colonies.

The journey starts where the first habitat *Clivia* appears in the Eastern Cape near Grahamstown and continues up northwards to the Swaziland border and the Zoutpansberg, and then right across the country and ending at Oorlogskloof near Nieuwoudtville.

Clivia are known to us largely as pleasing orange-flowered lily-like plants growing in shady parts of the garden.

However, even in the habitat there seems to be a great deal of natural hybridising taking place with the result that shades of orange, red, pastel shades, peach and yellow and patterned flowers are also found.

Starting in the Eastern Cape near Grahamstown, *Clivia nobilis* with its hard dark green serrated leaves and pretty pendulous flower, often with green tips, grows in the dense and rich forest and it is here that the first collection of *Clivia* was made by Miss Gladys Blackbeard in the 1920s. She was probably the first local grower and hybridiser who attempted an interspecific cross i.e. a cross between two species, crossing *C. miniata* and *C. nobilis*.

Moving up the East Coast to the Morgan Bay area and beyond, both *C. nobilis* and *C. miniata* grow in vast quantities and close proximity to each other in the most beautiful surroundings on very steep very rocky inclines and very close to the sea. Some plants actually grow on the top of enormous boulders with virtually no soil or leaf mould around them. At Kei Mouth, *C. nobilis* grows in pure sea sand under the milkwood trees, where the sea is eroding the sand dunes. It is close to this area in the southern Transkei near

Photographs taken by Felicity Weeden

C. nobilis

PHOTOGRAPH TAKEN BY FELICITY WELSH

Giant rocks topped with Clivia

the mouth of the Qhora River that the highly prized white or cream blushed pink *C. miniata* was discovered, now named 'Appleblossom'. Interestingly when attempting to breed with this lovely form, it was found that the plants were not all compatible and annoyingly, orange flowers resulted. With considerable time, care and effort Cape Clivia Club member Ian Brown discovered which clones were compatible and so success was achieved, and thus this exceptional beauty has been preserved for posterity; happily, as this habitat location has been completely denuded.

Moving further North to the Port St. John's area the journey takes us up a really steep mountain track through the ancient and stately trees. Here *Clivia miniata* were growing and blooming beautifully in unbelievably dry conditions in incredibly dense and thorny bush. In another location a short distance away where it was suspected that *C. robusta* might grow, the mountainside was so steep that it was necessary to wedge oneself behind huge boulders!

KwaZulu-Natal is the next port of call. During the mid 1800s, Major Robert Garden, a professional soldier, identified and collected an unusual plant here which was subsequently named *Clivia gardenii* in his honour. This is another pendulous species with long soft leaves and comes in a wide range of colours from near white to rich brick reds, very often with the tepals beautifully tipped with green.

Usually *Clivia* grow, as described, in dry and very well drained situations. In swampy areas, however, *Clivia* were discovered growing with roots right in the water. This plant is very similar to *C. gardenii* but very much bigger, usually referred to as the "Swamp Gardenii", but is actually named *C. robusta*. This species also enjoys a wide range of colours and is considered to be a very good candidate for breeding interspecifics.

Near Port Edward there is an exceptionally lovely *Clivia miniata* colony in the Umtamvuna Nature Reserve. Climbing down a clearly marked and very steep trail, through wonderful ancient forest, this stunning natural *Clivia* garden emerges, set among huge fallen trees and enormous boulders higher than a tall man, decked with *Clivia* in full bloom. Here the colours vary from orange through many pastel shades to some remarkably fine pinks.

While *Clivia* is normally associated with narrow strap-like leaves, in this area remarkably broad

PHOTOGRAPHS TAKEN BY FELICITY WEEDEN

Nature's landscaping – Morgans Bay

leaved specimens were identified.

On the opposite side of this gorge is another outstandingly lovely natural *Clivia* garden in an area known as Mzamba. Almost impossible to reach because of the rugged terrain, it is perched on the edge of a cliff which drops away for hundreds of feet. Here the most amazing plants flourish exhibiting thick grey leaves on bigger than average plants, and enormous red or pink flowers. This is truly *Clivia* wonderland!

Seafront at Kei Mouth

PHOTOGRAPHS TAKEN BY FELICITY WEEKS

C. miniata 'Appleblossom'

There are many places in KwaZulu-Natal that have outstanding *Clivia* populations, perhaps one of the best known is the Karkloof where many unusual and special specimens have been identified. Some of the better known and really outstanding ex-habitat plants which were found on private property are 'Fennel Picotee' and 'Lukes Special', 'Andrew Gibson', 'Lyn Janisch Parfait' and 'Gem's Hesper.'

In the Ixopo district a local farmer, Roly Strachan, was so entranced by the beautiful *Clivia* flourishing in the nearby forest, that he set about collecting them and planting them on both sides of the long driveway leading up to his house. A spectacular sight indeed and this turned out to be the saving of much of this colony as it was totally destroyed by woodcutters and truck loads of plants were chopped up and driven away.

Somewhat further north and slightly inland is a mountain known as the Bearded Man on the border between South Africa and Swaziland. Here the first natural interspecific known as *C.* ×*nimbicola* was found and is thought to be a cross between *Clivia caulescens* and *Clivia miniata*, both of which are found in this locality. The flowers of the *C. miniata* at the Bearded Man are interestingly different, being mostly spider shaped with a stand-alone star-shaped eye pattern.

Still further north and to the Zoutpansberg in Mpumalanga and also the famous God's Window area, *C. caulescens* flourishes. This is also a pendulous species and an epiphyte (a non-parasitic plant growing on other

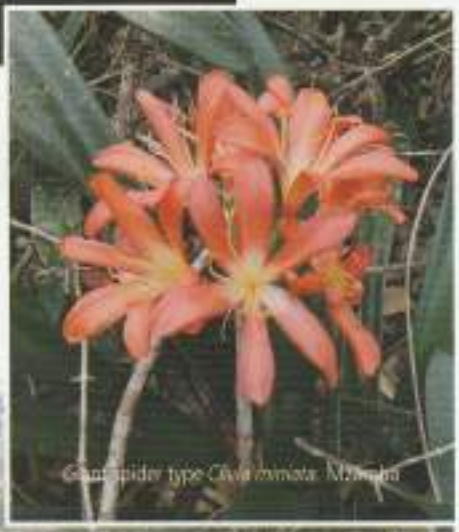
Port St. Johns habitat

PHOTOGRAPHS TAKEN BY FELICITY WESTON

C. gardenii

plants) and has the distinction of being the only Clivia sporting a stem which allows it to scramble over rocks and up tree trunks. A very rare yellow form has also been identified.

C. miniata 'Fennel Picotee'



Giant spider type Clivia miniata 'Mirella'

Umtamvuna Wild Garden

Photographs taken by Felicity Wilson

Above: Umtamvuna Gorge and Nature Reserve

Right: *C. miniata* 'Lynne Janisch Parfait'

Above: Mzamba habitat

Right: *C. miniata* 'Andrew Gibson'

Photographs taken by Felicity Weeds

PHOTOGRAPHS ON THIS PAGE TAKEN BY IAN COATES

Clivia mirabilis

Clivia mirabilis

Then the big surprise! In 2002, a new form of *Clivia* was found in the south-western corner of the Northern Cape – far away from the usual easterly habitat. This is also a pendulous form, but with some interesting differences. This plant is extremely tough with an enormous root system and has adapted to much harsher conditions and is able to grow in sunlight though still preferring shaded conditions. It has long very hard brittle leaves and the pedicels (little stems holding the seed pod or berry) are a very bright red. Unlike other *Clivia*, the seed ripens in about four months as opposed to the nine-plus months required by most other species. This plant is aptly named *Clivia mirabilis*.

For those interested in gathering plants from the habitat, please be aware that indigenous plants may not be removed from the habitat without the requisite permit from the local authorities.

CLUB SHOWS 2017

Border Group Clivia Show

Photos by Glenn Miles

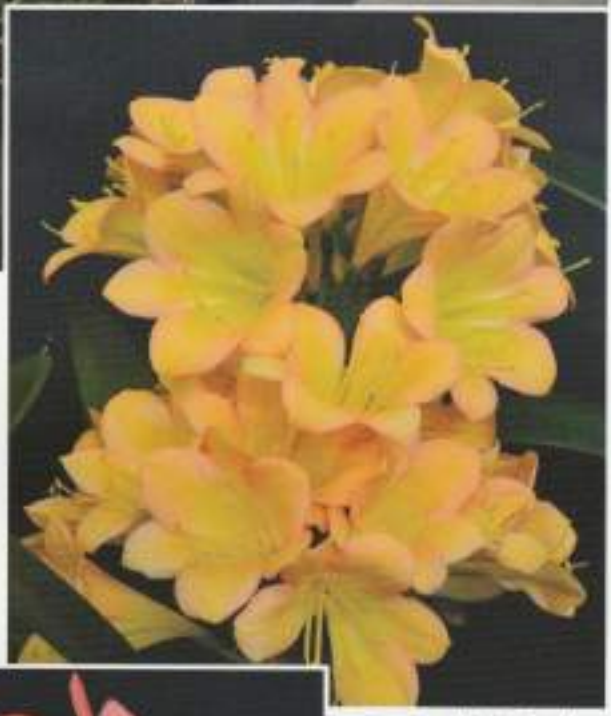
'377 Belgie Bronze', 2nd, Bronze, Glenn Miles

'Bonanza 1st Pastel', First Runner Up, Glenn Miles

'Jackpot Seedling', 1st Bronze, Best On Show, Glenn Miles

Ella van Zyl, 3rd, Double Umbel, Glenn Miles

Show Table



'Euro Peach', 2nd, Double Umbel, Llewellyn Mountfort

'Pudding & Pie', 1st, Bi-colour, Anne-Marie de Wet Steyn

'Lovely Inter', 1st, Interspecific, Anne-Marie de Wet Steyn

Multitepal, 1st, Multitepal, Peter Miles

'Red Lady' x 'Toy's Red', 1st, Red Class, Glenn Miles

'Star King', 3rd, Any Other Colour,
Glenn Miles

'Tipperary Peach', 2nd, Peach,
Judges Choice,
Anne-Marie de Wet Steyn

'Tipperary Peach', 1st Peach,
Second Runner Up,
Anne-Marie de Wet Steyn

'What a Beaut', 1st, Any Other Colour,
Peter Miles

'Who Can Tell', 1st, Versicolour,
Peter Miles

'Yesterday, Today and Tomorrow',
1st, Double Umbel, Glenn Miles

Cape Clivia Club Show 2017

By Felicity Weeden and photographs by Claude Felbert

If the 2016 Cape Clivia Show was a "Wow", the 2017 Show was better! The benches were filled to capacity with a "gaggle" of outstanding plants. A total of 395 plants were benched by 28 exhibitors.

It was good to see new names among the Major Award Winners and well done to Show Manager Chris Smit for winning Best Single Flower. Johan Kotze who won Best-On-Show, is a long time member and breeder and Old Timer Eric Heine's son in law.

The Major Awards were:

Best On Show – Johan Kotze
1st Runner Up To Best On Show – Gideon and Lorraine Van Zyl
2nd Runner Up To Best On Show – Gerrit Rohlandt
Best Peach And Blazer Trophy – Frans Mouski
Best Own Breeding – Felicity Weeden
Best Leaf Plant – Koos Bredenhand
Best Single Flower – Chris Smit
People's Choice – Eric Clur

Well done to Eric and Sheila Clur for winning People's Choice with a very unusual and attractive plant of Eric's own breeding.

The show was judged by Joubert van Wyk and Danie Pretorius from Gauteng and Dawid Botha from Port Elizabeth, Eastern Cape.

'Apricot' 2nd Runer Up, Apricot - broad tepal, Gerrit and Alet Rohlandt

'Koos se Bree Blaar', Best Leaf Plant on Show, Class 92. Non variegated between 75 and 125mm. Koos Bredenhan

'No Name' Best Single Flower, Single flower class, Chris Smit

'Multitepal', Best on Show, Multitepal 7-9 tepals, Johan Kotze

Winners from left – Koos Bredenhand, Johan Kotze, Gerrit Rohlandt, Frans Mouski, Chris Smit, Gideon van Zyl and Felicity Weeden

'Triumphant' Best Own Breeding, Own Breeding, Felicity Weeden

'Yellow' 1st Runner up, Yellow – Broad Tepal, Gideon and Lorraine van Zyl

'Eric's Choice', Peoples Choice,
Salmon – Broad Tepal, Eric & Sheila Cur

'Peach', Best Peach,
Wide Tepal Peach,
Frans & Elize Mouski

Peoples Choice

Eastern Province Clivia Club Interspecific Show 2017

By Dawid Botha and photos by Dawid Botha

The Eastern Province Clivia Club's interspecific show was held on 22 July 2017 at Sherwood Garden Centre, Port Elizabeth. We did not get our usual number of entries as our dry weather and unusually mild winter did not help with the flowering of our interspecific plants. At our show the public are the judges and they decided who should take the honours.

The honours for Best Interspecific went to Carrie Kruger with her beautiful plant called C. 'Secret Desire' The pink and apricot glow of those flowers stole our hearts (Fig 1.). 2nd Best on show went again to Carrie for a plant with unusual characteristics called C. 'Golden Showers' with golden yellow arching flowers (Fig. 2). The best species was awarded to Glenn Miles with a beautiful *C. gardenii* (Fig.3). More pictures of interesting *Clivia* seen at mini show.

After the mini show Carrie Kruger gave us all an informative PowerPoint presentation on Interspecific hybridising and the successes she has had over the years. After the talk the winners were announced and the trophies handed over. The usual coffee and treats were served while members could trade plants and catch up on news or boasting with pictures on cell phones and promises of great flowers

Carrie Kruger 'Secret desire'

Carrie Kruger 'Golden Showers'

Carrie Kruger 'Galaxy' leaf

Above: Carrie Kruger 'Galaxy' flower

Below: Marius Meyer interspecific

Töl Mostert interspecific

Willie Le Roux C. gardenii

Eastern Province Clivia Club Spring Show 2017

By Dawid Botha (Show Chairman)

Our show was held at Sherwood Garden Centre on 16th and 17th September2017. This year our mild winter resulted in an almost absence of flowers in Port Elizabeth. We only had a small percentage of plants that were ready for the show from local club members. Our neighbours came to our rescue with loads of flowers in perfect condition.

This year we had 140 plants entered from 13 entrants. For the first time we had 122 classes to choose from. Some mistakes did creep in and we had unhappy campers. Those mistakes will be corrected for the 2018 show.

The panel of judges was Andre Swart (Cape Town), Mark Joubert and Dawid Botha. The learner judge in attendance was Marius Meyer. A major upset this year was that the judges did not go for the biggest umbels in the show, but judged every class on its own merits. Strangely enough that meant that the perfect umbel walked away with the Best on show and not the biggest plant. Using this method even the Runner-up best on show went to an Interspecific. Congratulations to our winners and great thanks to one and all who entered their plants for the show. Without you, there will be no show.

The winners' table was made up as follows:

Best on Show: Carrie Kruger – *C. miniata* Pink

Runner up to best on show: Carrie Kruger – Interspecific any colour in flower

Second Runner up: Glenn Miles – *C. miniata* Red

Judge's Choice: Anne-Marie De Wet Steyn – *C. miniata* Bi Colour

Best Beginner: Anne-Marie De Wet Steyn

Anne-Marie De Wet Steyn 'Pudding & Pie'

People's Choice: Carrie Kruger – Multitepal own breeding

Best Grower on show: Carrie Kruger

Best-leafed plant on show: Carrie Kruger – Akebono variegation

Best Beginner: Anne-Marie De Wet Steyn

The Best Grower on Show was determined by a point system for number of plants entered and a value allocated for every first, second and

Anne-Marie de Wet Steyn 'Pudding and Pie'

Carrie Kruger (Versi Colour)

Best Grower on show: Carrie Kruger

Carrie Kruger 'Akebono'

third prize won in each category. The grower with the most points won this trophy.

The Best-Leafed plant on show was awarded to the plant only categories, those plants without flowers but which enchanted with variegation or leaf form and growth patterns, including miniatures.

The Best Species was not awarded this year as the plants on display were not at their best, although they did get first in their class. I must thank the individuals who brought species plants to the show as it showed the public how these plants look in nature and also served as an educational tool.

This year our sales tables would have counted as a second show area. Public and grower alike browsed through rows of Clivia and tried to spot that elusive idealised plant that you would like to take home. I could see some wives and husbands glaring at their

Carrie Kruger 'Sixteens Sister' – Best on Show

People's Choice: Carrie Kruger – Multitepal own breeding

Ebb Graham (light peach – Standard tepal)

spouses as the latter tried to hide that extra treasure explicitly forbidden due to restricted space or cost involved. The unusual plants were spotted first by the discerning eye and quickly sold.

I must take this opportunity to thank all the willing souls who helped before, during and after the show. It is your help that made it a success. The benching was a bit hectic as some time lines did not meet up or were not met at all this year. There was that individual who stepped up and helped smooth over the hitch points. Believe me we do appreciate the effort and time donated to make this show the success it was.

We exchanged judges with Cape Town this year. We thank the individuals who are willing to travel and judge at our show. We know that after judging there will be a group of individuals who question every decision and some choices made. That's why we expect judges to stay for a second day and face the music. 80% of the time when choices are explained, exhibitors or the public walk away satisfied or with a lesson learned. That's why we have the shows in the first place. To brag and educate!

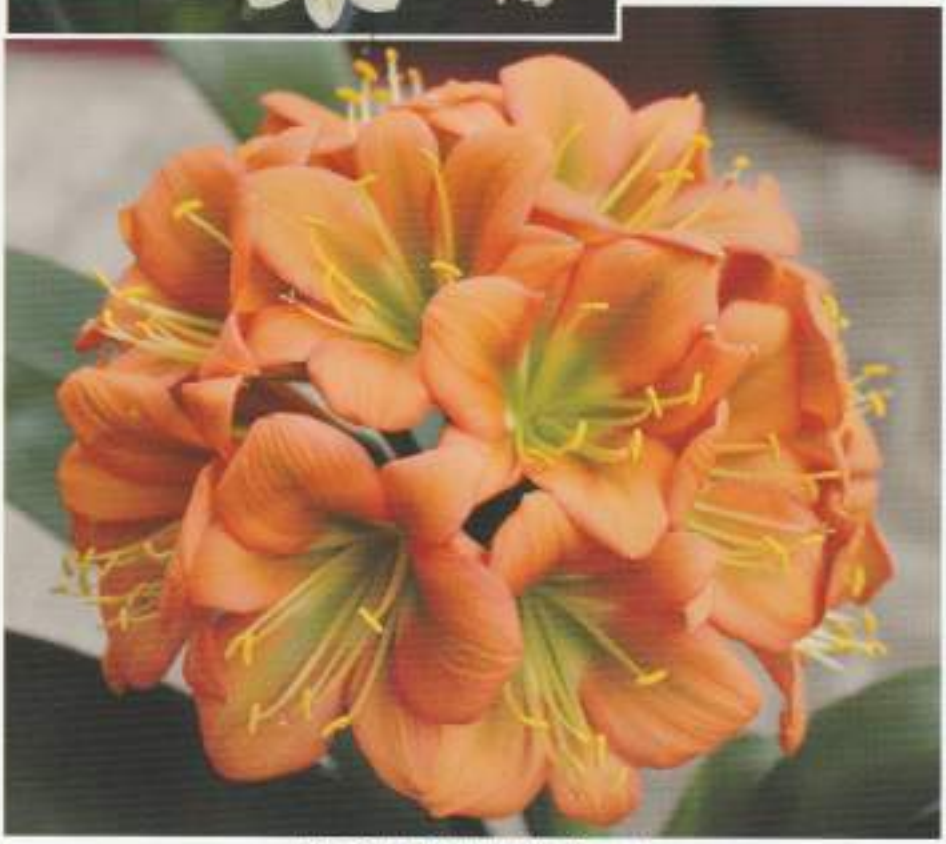
We had a lovely function on the Saturday night that was well attended. The show and the results were discussed over a glass of wine.

The show was a wonderful event and apart from the main attraction, we had a chance to catch up with old friends and make new ones. We are all looking forward to the next show with great anticipation.

Gideon Botha (*C. nobilis*)

Carrie Kruger – Interspecific any colour in flower

Comments on some special plants that I personally found to be a notch above the rest must be shared with members, and these were a plant of 'Tol' from Johan Mostert , a perfect plant for a first time flowering Bronze. Willie le Roux exhibited an interspecific that would look great in any collection. Louis de Swardt had the palest Yellow broad tepal on show – it nearly looked white. R&N Jardin showed a rare Green *C. miniata* of own breeding.



Johan Mostert (Bronze first time flowering)

Glenn Mikes 'Emerald Eyes' (multitepal, Ghost with Green center)

Lester De Beer (light orange standard tepal)

'Little Red Hen' Second Runner up to Best on Show

Willie Le Roux (interspecific)

Louis De Swardt (Yellow-Broad tepal)

More pictures of plants that were points of discussion amongst the visiting public are shown in this article).

Finally, we would like to thank Sherwood Garden Centre for making their facility available to us and the caterers for the excellent snacks provided. Also thanks to those that prepared meals, snacks and something to drink at our food corner. We would like to see you all if all goes to plan at our new show venue at Bay-West Mall in 2018.

R&N Jardin
(Green own breeding)

Free State Clivia Club Shows 2017

By David Fourie

Peach Interspecific

Red Interspecific

Show area

André du Toit with the Best on Show

Stefan Ferreira with Runners up

Yellow Interspecific

1st Best on Show, Andre du Toit

Broad leaf peach section, Winner

Broad leaf yellow section, Winner

2nd First runner up, Stefan Ferreira

Left: 3rd Second runner up, Stefan Ferreira

Bronze section, Runner up

Bronze section, Winner

Multitepal section, Winner

Pastel green throat section, Winner

Versicolour section, Winner

First flower section, Winner

Leaf section, Winner

Yellow section, Winner

Garden Route Clivia Club Show 2017

By André Meyer, with photographs by André Meyer

The Garden Route Clivia Club annual *C. miniata* show was held on 23 and 24 September 2017 in the Outeniqua Primary School hall in George. The weather was kind and visitor attendance of approximately 800 over the one and a half days was marginally down on the previous year. The visitors had a keen interest in the 2 workshops on *Clivia* growing as well as buying the necessities for *Clivia* growing.

The local George newspaper, The George Herald, allowed us to place *Clivia* articles in the run-up to the show and reported on the winners as well. The local radio station, Eden FM, broadcasted two interviews with club committee members. The club was also fortunate in obtaining sponsorship from Santam (for hire of hall) and Old Mutual Private Wealth (for medals). Barcko, a local producer of bark growing medium, again provided some of their product free of charge for sale at the show whilst Leading Edge Signs changed some of our advertising material free of charge.

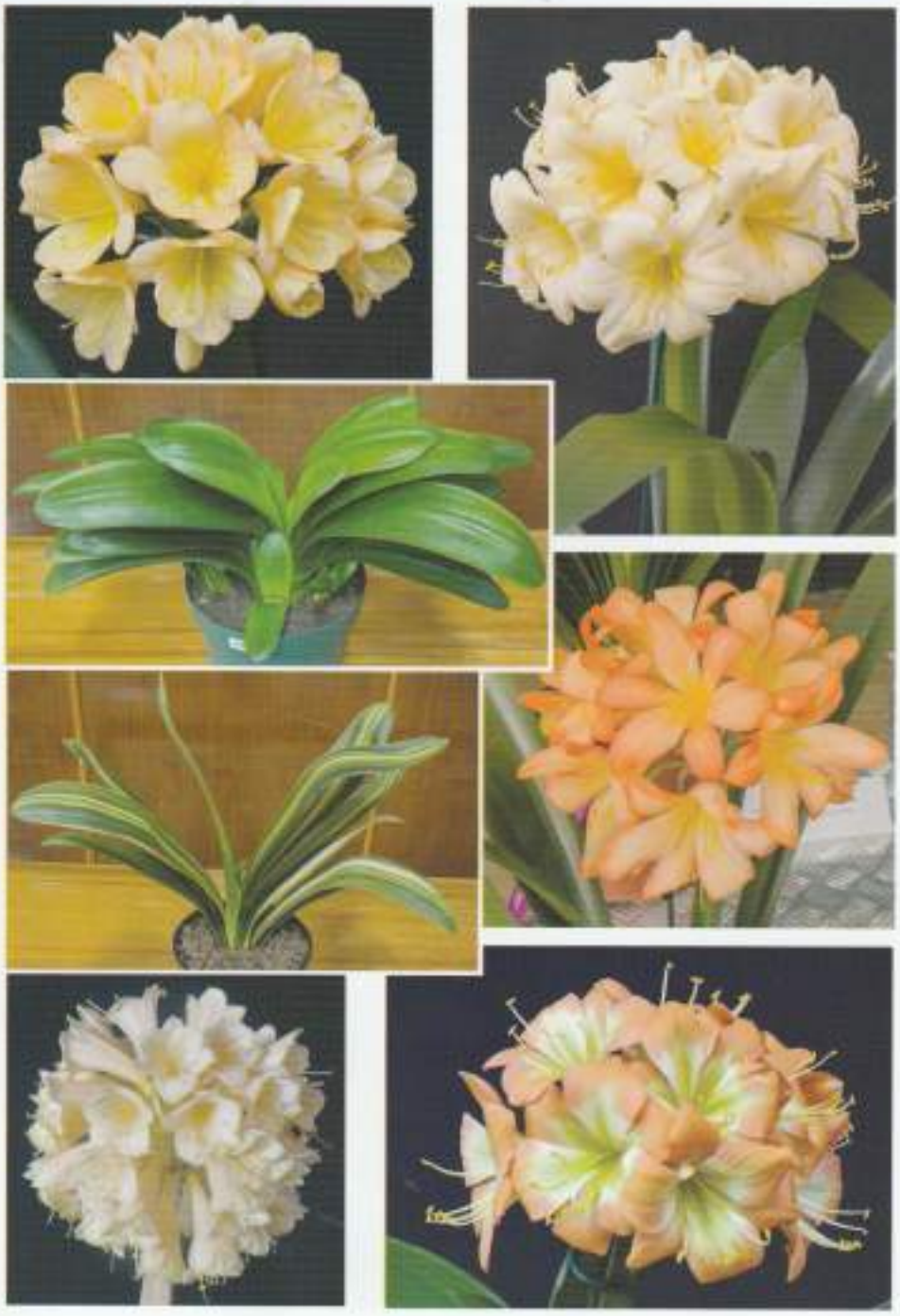
The plant/seed sales area was very busy and sales income nearly doubled year-on-year. An auction of special plants was conducted on the Saturday as part of a social function for exhibitors and sellers. The highlight of the auction was Nico Cloete's 12-leaf interspecific offset (Light of Buddha X 'Gems Golden Renaissance') fetching R11 700.

This was the first time that our club used the Clivia Society's standardised category list for show purposes. We had 121 categories available for entries and 37 of these categories received no entries. Our club members benefited from the clear descriptions for the categories and we encourage other clubs to use this standardised list so that practical experience can be gained to refine it.

24 (previous year 23) exhibitors with 309 entries (318 in the previous year) participated in the show. The weather leading up to the show influenced both the quantity and quality of show entries, with many members' plants being in full bloom a week or two after the show. The judges for this show were Hennie van der Mescht (Free State), Liz Boyd (KZN) and Francois van Rooyen (KZN). Two of our club's learner judges participated in the judging process and the head judge provided feedback to the club committee on their performance/ability.

The club thanks all the exhibitors, sellers and volunteers that made this show the success that it was. The volunteers who work so hard are

often the unsung heroes of all the Clivia shows around the world – we salute you!
Best on Show Gold: Gerhard and Karen Faber
Best on Show Silver: Ricky and Noelia Jardim
Best on Show Bronze: Ricky and Noelia Jardim
Best on Show Own Breeding: Karl Rost
Best on Show Variegated leaves:
Kemeels Buitendag
Best on Show Non-variegated leaves:
Willie Freund
People's choice: Kobus and Ida Esterhuizen



Thurlow Flora

Garden Route Clivia Club Interspecific Show 2017

By André Meyer, with photographs by André Meyer

The Garden Route Clivia Club annual Interspecific show took place on Saturday 5 August 2017 from 09:00 to 13:00 at the Garden Route Botanical Garden (GRBG). This was the 2nd Interspecific show that was open to the public and we attracted at least 150 visitors – a big increase on the previous year. We were blessed with a beautiful day after a severe storm on the Friday night. We had a number of people providing positive feedback about our venue (GRBG) and we thank the management of the GRBG for their excellent support. A number of our members commented that they had not visited the GRBG (for years or ever) and we truly hope that this mutually beneficial relationship will thrive in years to come.

We had 10 exhibitors who entered 44 plants compared to 14 exhibitors and 51 plants in 2016. The quality of the plants entered was very good. We had numerous reports of Interspecifics that bloomed before the show or flowers that were not open in time. The timing of flower shows will always be a debate, but we need to fix a date in advance when we have the public involved.

The judging was done by three of our learner judges (Karl Rost, Louis de Swardt and Gerrit van der Merwe) under the guidance of Dr Piet Theron – a great learning opportunity for them.

We had 6 sellers compared to 3 sellers the previous year. The sales more than doubled year-on-year. Some sellers commented that buyers were much more *Clivia* knowledgeable than those dealt with the previous year.

We wish to thank our sponsors for their support at this show. Evergrow donated some product and also had a stand at the show selling their products. The George Herald was very kind in publishing articles (both print and electronic) before the show, which helped our marketing efforts and assisted in educating the public at large about these wonderful plants.

Carrie Kruger took all three of the major prizes:

- Best on Show Gold: Offset of 'Secret Desire', an F2 interspecific bred from the famous '*Five Star'
- Best on Show Silver: "Lingerie" an F2 'Cynthia Giddy' x (*C.* × *cyrtanthiflora* x 'Best yellow' Grp1)
- Best on Show Bronze: First flower bred from 'Ngome Yellow'

The public voted for their special plant and the People's Choice award was won by Louis and Elsa de Swardt.

Joburg Clivia Club Show 2017

By Glynn Middlewick

The Joburg Clivia Club present their annual show during the second week of September 2018.

As with many Clubs, the *Clivia miniata* show is the highlight of the year. Other *Clivia* species flower at various times during the year, but the *Clivia miniata* flowers are spectacular in September. The interest in the hiring of stalls was great in 2017. This shows a remarkable growth in the interest of commercial *Clivia* sellers. The number of 'Club' sellers was small. We appreciate the importance of an opportunity for a *Clivia* hobbyist to sell some of his or her plants.

Judges Felicity Weeden, Danie Pretorius and Francois van Rooyen

Large advertising outlays are unaffordable in general. Use is thus made of social media. The nursery at our venue also promotes our show, as do some magazines. The usage of the same venue for the last 14 years has helped with the recognition of the venue by the public.

Any organizer of a show is worried whether there will be enough exhibits on the tables; whether the flowers will be open in time for the show. Every year we worry and then still manage to present a spectacular site for the visitors. 2017 was no different, the members presented a superb selection of flowers and foliage plants for the show tables. The show winner's selections, both in the flowering and foliage categories, met with most people's approval.

The attendance at the show was evenly split over the Saturday and the Sunday, with most of the serious selling take place on the Saturday. The Club wishes to thank all the members who participated in the organisation of the show. The sellers provided extra interest by supplying a wide variety plants available for sale.

3rd, Multitepal of Pieter le Roux

The winning entries in the flowering section were: First – Francois van Rooyen with yellow *Clivia*. The flower head was full, with flowers of darker yellow colour and recurved tepals. Second was a peach flower. This entry was entered by Corra and Dawie van Heerden.

2nd, Corra and Dawie van Heerden peach

1st, Francois van Rooyen yellow

This flower head presented a very attractive picture. Third best was an entry by Pieter le Roux. He entered a multitepal orange flower with a dramatic display of flowers with more than the normal six tepals.

Multitepal from Japan, Andre Swart

1st, Variegated Pikkie and Elize Strumpher

Green winner, Sean Chubb

The foliage section had three superb examples of plants with leaves that did not depend on a flower for their beauty. The winner here was a well-groomed variegated plant displayed by Elize and Pikkie Strumpher. The second best was a plant entered by Anton Potgieter Snr. In third place was an entry by Hilton Atherstone.

Pink winner

Lowveld Clivia Club Show 2017

By Adri Pienaar

A very successful Interspecific and pendulous specie show was held at Nelspruit Garden Pavilion. It was held over two days (22-23 July) and was the first occasion that the LCC introduced and exposed the general public to these species and hybrids.

69 plants were entered and formed a spectacular display leaving the very appreciative public aghast at the diversity and intensity of colors, forms and shapes. Sales were brisk and attracted breeders from as far afield as KwaZuluNatal.

Best on Show was awarded to Paul and Sue Kloeck for their zigzag tricolor. Their Clivia Kingdom's yellow *robusta* was first runner up while Neethling du Toit's peach interspecific was second runner up. Ian Radmore entered a very interesting *caulescens* where the outer whorl of tepals were considerably shorter than the inner whorl.

The miniata show was again held at the Lowveld National Botanical Gardens but was dove tailed with a broader indigenous plant sale including cycads, succulents etc. This led to a greater number of feet through the door.

Best on Show was awarded to Neethling du Toit, First Runner Up to Gideon Bean and Second Runner Up to Ian Radmore. Clivia Kingdom and Henriette Bean shared the Judges Choice.

Multicolour 'Zig Zag'

Chris Holzhausen's Second Runner-up

Kwa-Zulu Natal Clivia Show 2017

By Alfred Everson (Jnr)

It is with great pride that I am able to write the following article.

On the 16th of September 2017 the Newcastle Interest Group hosted the first ever KZN Clivia Club show in Newcastle.

It was a mammoth task to take on, considering the small number of members that belong to the Newcastle Interest Group. As far as we are concerned, it was a great success, but then how does one measure success?

Firstly, when Newcastle Interest Group was formed in 2014, we requested the KZN Clivia Club Committee's approval to accept our proposed constitution.

At that meeting the following question was asked: "What do we, the Newcastle Interest Group, expect from the KZN Clivia Club?"

Judges Choice. Breeder, Grower and Owner H Howard

Not being fully prepared for this question I replied, "We wish to be a part of the KZN Clivia Club and would like to have an opportunity to host the KZN Clivia Show".

These were some of the answers given to the committee at that time.

- We were successful in voicing our point of view as an active interest group in KZNCC.
- We instigated and witnessed a change of opinion taking place and could see we were working with a committee that was willing to give us a chance.
- Furthermore, we had 90% of the KZNCC Committee members attending the Show.
- We presented a completely new layout of the exhibit plants on show and also the Best on Show display table.

Winner of Picotee Section, 'Iceberg Picotee'. Owner H Howard

For the first time ever, the KZNCC awarded cash prizes for:

1. Best on show, First Runner Up and Second Runner Up on Show, as well as Best Novice and Best Junior on Show.
2. A complete new class list was formulated to fall in line with the Clivia Society who is attempting to standardize the showing criteria across South Africa.
3. A new system of having 2 groups of judges was introduced to enable on time public viewing of the plants.
4. An updated and automatic electronic scoring system was developed to calculate Most Points.

5. Leaner Judges were trained.
6. New members joined NCIG bringing our total current membership up to 13.

A total of 108 plants were entered and the Judging panel consisted of Brian Tarr (Head Judge), Paul Kloeck, Piet Theron, Karl Rost, Johnny Clark (Leaner Judge) and Louis Lotter (Leaner Judge).

Francois van Rooyen once again, walked away with the Best on Show award - with a plant he entered in Group 3 Orange. (As Francois was unable to attend, Mrs Middleton accepted the award on his behalf.)

1st Runner Up was Piet & Riana van Wyk with a plant that was entered into Group 7 - Light Yellow.

Piet and Riana managed to take 2nd Runner Up as well with a plant that was entered into Group 18 - Bronze/ Brick with Green Throat.

Best Novice on Show was Juanita Jansen van Rensburg with her exhibit that was entered into Group 44 Striata Variegated Leaf without Flower.

Only one junior, Alfred Everson IV, entered. He was awarded Best Junior on Show with a plant he entered into Group 42 Broad Leaf without Flower.

Best Foliage plant on Show was awarded to Felix Middelton with his exhibit, which was entered into Group 48 Miniature without Flower. (Unfortunately, no photo is available). Congratulations to Alf Everson who was awarded Most points on Show. His entry of 36 plants accumulated him total of 57 points. Well done Alf.

Two Primary Schools participated in the Creative Art Colouring Competition. This was well supported and the prizes were awarded to the pupils at the school during assembly.

Place	Exhibitor's Name	Total	Plants Entered
2	Louis Lötter	32	15
3	Felix Middleton	31	12
4	Henry Howard	28	10
5	Glen Boyd	19	6
6	Francois van Rooyen	17	5
7	Roshan Neeraj Dheochand	14	5
8	Piet van Wyk	12	3
9	Alfred Everson Jnr	7	4
10	Val Thurston	4	1
11	Belinda Ellor	2	2
12	Leon van Rooyen	2	1
13	Paul de Klerk	1	2

After the prize awarding the learners were treated to a demonstrated on how to transplant their newly-owned clivia. They all really enjoyed getting their hands dirty.

In my opinion, the Newcastle Interest Group and all those people who assisted can be very proud of the many successes achieved. I have received numerous compliments and words of praise from all who attended the show. Thanks to you all for your assistance in making this Clivia Event a great success. A special thanks to all our sponsors, whose generosity will be documented at the AGM function.

Tannie Val, you are a 'Lady in a thousand' and your ideas and coaching in the past year helped me tremendously. Thank you for your time and timeously response to all my questions.

Northern Clivia Club Show 2017

By Marlene Topham

First place: Interspecific Show

Martiens Erasmus

Second place

Karel Stanz taking photographs

Third place

Northern Free State Clivia Club Show 2017

By Ben Nel, photographs by Chris Nel

The annual *Clivia miniata* Show was held at the Toronto Hall, Welkom on the 9th and 10th of September.

Judging by Willie Wesselman took place on Friday the 8th in the afternoon.

The Saturday and Sunday the show was well supported by *Clivia* enthusiasts.

Congratulations to our trophy winners. I would like to thank one and all that entered their plants for the show.

Above: Best plant on Show

left: 1st Runner Up

Without you there will be no show.
Trophy winners:
Best on show: Stefan Ferreira
1st Runner up: Stefan Ferreira
2nd Runner up: Stefan Ferreira
Most Points on show: Stefan Ferreira
Best on show leaves: Andre Steyn 'Miniature Chinese Daruma'

2nd Runner Up

Stefan Ferreira with his winning plants

Overberg Clivia Show 2017

Text and photos by Felicity Weeden

The Overberg Show was really excellent this year. There were 141 plants exhibited by 9 exhibitors and the benches were filled to capacity, with a few exhibits having to be displayed on the floor.

We were blessed with good weather and had 467 visitors; nearly three hundred more than the previous year, which was most encouraging. This was put down to good advertising, so thanks to Andre and Sandra du Plessis (local newspapers) and Etienne Kriel (radio).

The winners this year were:
Best on Show – Carrie Kruger
1st Runner Up – Felicity Weeden
2nd Runner Up – Andre and Sandra du Plessis

'Just B'. Peoples Choice, Specimen Class, Etienne and Analene Kriel

'Bicolour' Second Runner Up, Bicolour, Andre Du Plessis

Andre's Broad Leaf, Best Leaf Plant on Show, Leaf longer than 250 mm, between 75-99mm wide, Andre du Plessis

Andre's LOB, 1st Runner Up Leaves, LOB Class, Andre du Plessis

Andre's variegated, 2nd Runner up Leaves, Variegated Leaf, Andre Du Plessis

'Jungle Fire' Best On Show, Bronze, Carrie Kruger

Best on Show Leaves –
Andre and Sandra du Plessis
1st Runner Up Leaves –
Andre and Sandra du Plessis
2nd Runner Up Leaves –
Andre and Sandra du Plessis
People's Choice –
Annalene and Etienne Kriel

This is only the third time Andre and Sandra have exhibited and all credit to them for winning four of the six main awards.

Other first timers Etienne and Annalene Kriel benched 6 plants and went home with 6 awards including People's Choice with a spectacular yellow specimen plant and Willem Fourie who also exhibited for the first time and won two Silver awards for leaf plant exhibits.

Well done people!

Winners Overberg Club, from left: Sandra du Plessis, Andre du Plessis, Carrie Kruger and Felicity Weeden

Melbourne Clivia Group - Clivia Expo 2017

By Michael Barrett

Terry Edwards (right) and Lisa Fox (left)

The Melbourne Clivia Group held its seventh annual Clivia Expo on the Saturday, 23rd of September 2017. The one day event was held at St Scholastica's Community Centre in Burwood, for a second year, and the venue is booked for this coming year's expo.

The flowering and foliage plants are displayed on large round tables, often with one exhibitor having an entire table. There were 111 plants from 16 exhibitors. Plants were brought from interstate by South Australian member, Alan O'Leary, and imported Japanese plants were displayed by Lisa Fox. The visiting public were delighted by the presented feast of colours Clivia, with bronze and peach being well admired.

People's Choice winner – 'Westleigh Wonder'

The expo continues the tradition of a People's Choice award for best plant on display. It came as little surprise to many members that a most unusual chimera effect plant was chosen as the winner of the Kevin Walters Memorial Trophy for People's Choice. Terry Edwards bred and displayed *Clivia* 'Westleigh Wonder'. Not only did it have the umbel with different colour flowers (both green and a muted bronze), it had an offset with darker bronze flowers. Runner up for the Peoples' Choice was 'UQ', a small compact plant with bronze flowers imported from Kazumi Hattori in Japan, owned by Lisa Fox. Third place went to a 'Florid White Lips Bronze' owned by Terry Edwards. This impressive plant had three umbels of distinctive flowers.

A silent auction created another interesting aspect to the day. Thank you to Hugh Williams

Plant display

Floral art created by Michael Barrett

As in the previous years, many first time visitors were keen to learn about pollination and propagation from seed. Free seeds were available for those keen to go home and start growing *Clivia*. Others took the 'quick' method to have a beautiful flowering plant and bought very reasonable priced plants from individual sellers and a combined members' trading table. Once again our superb catering created a relaxed and hospitable environment to spend time catching up with fellow *Clivia* enthusiast.

To see the plants on display, please visit our website and view the gallery.

http://www.melbourneclivia group.org.au/

from South Australia for the incredibly generous donation of the two lots, a 'Hirao' and a 'TKO'. The auction raised in excess of $1000. Congratulations to the successful bidders on winning such impressive plants.

A demonstration by Helen Marriott

PHOTOGRAPHIC CONTRIBUTIONS

Clivia – A wider picture

By Ian Coates

At school I seemed to differ from others. My fellow pupils all wanted to be good at everything, whereas I strived to master just one. My point, as I argued on the debating team, was that to excel in one subject you would inevitably gain knowledge of others, thus becoming both a master of one subject and a jack of all trades. So I believe it is with plants, and *Clivia* are an excellent example. If you view *Clivia* as just a simple plant to sit in your garden or on your windowsill, then I hope you will soon look further.

I am writing here of long before the internet and mobile phones. All I knew was the *Clivia miniata* which I had and that the plants had a Victorian history in England. I therefore spent what time I could travelling around England's old Stately Houses. This taught me not only about English geography but also grand architecture and the aristocracy. I also found that most Stately houses did indeed still have a *Clivia* which had been considered essential decoration in Victorian times. Mostly orange *C. miniata* but the occasional other species or a yellow which I found most exciting. On one such visit to Bodnant House in North Wales, I was given a *C. miniata* 'Bodnant Yellow' which has quite a history and has to be one of my favourite plants. It was an offset from one of the original two yellows brought into England in the 19th century.

I discovered that *Clivia* are not just a pretty plant for the garden or windowsill but a genus of six species, all of which interbreed. What a challenge! You not only have the more flamboyant species, *C. miniata*, where you can cross pollinate various colours etc, but five other species which you can cross both with themselves and with *C. miniata*. Just imagine the results you can get. In the process you will

Leaving Mirabilis country. The view towards Vanrhynsdorp

Ian Coates has kindly made his extensive collection of *Clivia* photographs available for the Yearbook, from which we have selected the following for the enjoyment of fellow enthusiasts.

THE ENVIRONMENT

Five of the *Clivia* species are found in eastern South Africa, from *Caulescens* at high altitudes in the far north through *Miniata*, *Gardenii* and *Robusta* to *nobilis* on the beaches in the south east.
Mirabilis is in the far distant south west.

Ian in the morning mist in *Mirabilis* habitat.

learn of various genetic dominances. Not just with flower shape and colour but also with the added bonus of leaf variegation. All subjects can be studied in depth scientifically or merely observed visually from your results. There is something for everybody at every level. Because of the efforts of others, even that windowsill plant has changed out of all recognition since I started collecting over 50 years ago.

Nobilis growing on the sand dunes near Kei River.

The morning call. Hadedas flying over.

Clivia flowering by the Qwaninga river.

THE HABITATS

Clivia are generally found in light to medium shade in amongst a wealth of companion vegetation. Populations occur on valley bottoms, hillsides and rocky outcrops, often epiphytically on trees or lithophytically on boulders. The habitats are found generally in higher rainfall areas, but Clivia are surprisingly drought resistant, thanks to water retention by their thick roots. Only *Robusta* tolerates poor drainage. In nature's beautiful settings, Clivia warrant close up enjoyment.

Caulescens growing on trees up Mariepskop

A stony habitat

To me it appears inevitable that one would also want to learn more of the plant's history and natural habitats. Having owned my first *Clivia*, a *C. miniata* 'Lady Holford', as far back as 1965, it was then the Conference over forty years later in 2006 before I could afford the time and money to travel to South Africa and visit some of those habitats. I can remember the excellent post conference tour of that year, seeing my first plant grown in natural habitat and kissing the ground where it grew. I would still do that today and am grateful that I have now been able to do it for each of the species.

Nobilis preferring the tree to the ground.

Left: A high up Ngome.

Red Caulescens at over 1,850 metres altitude.

Caulescens with 2 metre stem.

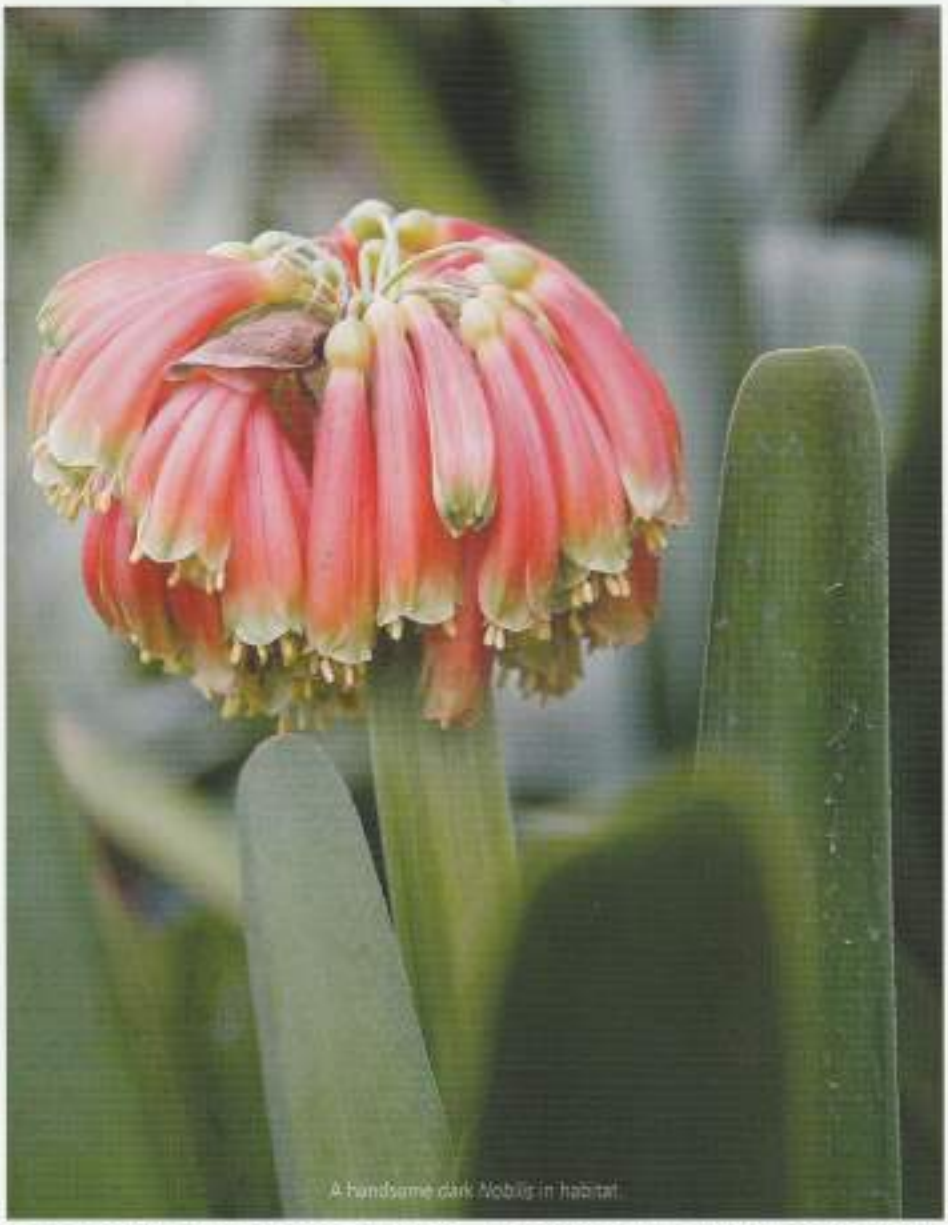
Yellow Ngome in habitat.

Having been to several habitats, I became interested in the pollinators. With flying by so relatively fast, how did they know where to find the pollen? This I learnt was because each *Clivia* flower gave them markers through their anthers. The relevant insects view ultra violet and this is absorbed by the flower pollen, which therefore appear black to them. Not surprisingly, this led me to UV photography which showed me that the markers were quite different for other plant families and genera.

I was naturally curious after visiting habitats of several different species to learn why they were so located. Is it the soil? Is it the weather? Is it associated plants? There are so many aspects to investigate. Which species came first? Why is *C. mirabilis*, at around 1,000 kilometres further west, such a distance from the other species? Since all the species interbreed, why, when *C. miniata* and *C. nobilis* often grow closely together, are there not numerous interspecific crosses in the habitats? There is so much to learn and not all is simply available. For instance, I have experienced more rainfall in one day in *C. mirabilis* country than the records show for the whole month. Couple this microclimate with the fact of regular mists and you will see that the moisture available for the plants can be much more than it appears at first from rainfall records.

Clivia are not just about the habitats of the various species or, indeed, merely about South Africa. They are now grown in many countries around the world and visiting them one does not learn just more about the diversity of the plants but also about World cultures; the fascination of such places as Japan, China, New Zealand, Australia and America to mention just a few. All growers seem to be such interesting and generous people.

Closer to home for me are the plants in the Atlantic islands, including Madeira and the Canary Islands. A garden was created in the largest of the Canaries, Tenerife, in 1788 to acclimatise plants from the tropics on their way to Europe and especially Spain. Shortly afterwards a ship called in for supplies on its way to Spain from southern Africa. The Garden of Acclimatisation persuaded the Captain of the ship to part with an example of *C. miniata* and



A handsome dark Nobilis in habitat

C. × *cyrtanthiflora* from his cargo. The islands now have an abundant supply and, as far as is known, all are descended for those original plants of 130 years ago. I have been studying them for over fifty years and, in that time, have spotted just a single variegate and have only recently seen my first cross there. These islands have a lovely climate varying from 14° centigrade on a winter's night to 25° C on a summer day. The annual rainfall is around

Above: *Miniata* in habitat at Umtamvuna. Below: Ever the professional. The author getting the lighting right.

AFTER THE CONFERENCE, A VISIT TO CAULESCENS IN HABITAT?

As part of the 2018 conference activities, James Abel is co-ordinating self-drive visits to iconic *Caulescens* habitats on the eastern escarpment.

He suggests that on Monday, 10 September participants drive (+/- 4.5 hours) to Graskop and spend the afternoon visiting the renowned Gods Window and The Pinnacle, about 15 km from the village. For the night, reduced tariffs for enthusiasts have been arranged at the Graskop Hotel where all previous tours have enjoyed the hospitality. On Tuesday morning visit the new Graskop Lift, descending from the cliff top into the subtropical forest amidst masses of caulescens. Although a bit early for peak season, there will be some early *Caulescens* flowers to admire, as shown in Ian's photo.

On Tuesday afternoon participants can decide to return to Johannesburg, extend their stays in the scenic mountains or spend a day or two in the Kruger National Park, where among Africa's best in wild life they may see all of the Big Five (elephant, lion, leopard, buffalo and rhino).

If interested, email us with any queries and for a details:
James and Connie Abel, jcabel@absamail.co.za.

280mm and gardeners will need to water their plants in the summer months. The soil is slightly acidic and very free draining, consisting of broken down volcanic rock.

As in all walks of life, amongst *Clivia* enthusiasts there are some bad eggs. One classic example regards the 'Q' strain of plants. This beautiful variety was found near a river bank

UV picture showing what the pollinators see.

One of the Big Five.

in East London. With the appropriate permissions, seven specimens were collected for Kirstenbosch Botanic Garden. The location was kept secret and the plant protected and yet many collectors had specimens in their collections before Kirstenbosch sold any to

Enthusiasts all. A habitat tour.

the public. I wonder how? When I visited the site some years ago, there was not a single 'Q' *Clivia* plant remaining in the area. Indeed, there was not even a *Clivia* of any kind within 50 metres of the site. All had been removed by 'collectors' just in case any plant might have some appropriate 'Q' genes. A further sad example is *C. mirabilis*. Location of the sites was jealously guarded for some time. Since they became known, a farmer returning to his remote home met a truck travelling away. Upon being challenged, it was found to contain a load of plants taken from the habitat on his land. Such plants are, of course, firmly protected by the South African authorities and CITES. There are still only about four known areas of *C. mirabilis* habitat and even honest enthusiasts are now, understandably, not welcomed by the landowners. And then many of you will have seen the blue flowering *C. miniata* seeds for sale on eBay. With some adjustment by Photoshop! Even the pollen has turned blue. Did you buy any?

If you are lucky enough to get out into the *Clivia* world, you will also have the opportunity to extend your language skills: Afrikaans, Spanish, Japanese etc. I have learnt a few words although I can never differentiate between a pin, a pen, a pun and a pan in New Zealand.

As a photographer, I have also had the opportunity to extend my portfolio. I hope the following pages will encourage you to travel also.

After a hard day in habitat, it is so rewarding discussing matters with ones colleagues – even if there is a power cut!

I could not have done any of this without the help and generosity of enthusiasts around the World. Thank you everybody.

Following the Conference, I was fortunate to take a coach tour organised by James Abel. Apart from the wonderful camaraderie and sharing of information, we visited such sites as God's Window, Mariepskop and The Bearded Man where we viewed *C. nimbicola*, the first known naturally occurring interspecific. *Clivia* also taught me about wildlife - baboons and leopards in habitats to the 'Big Five' in the Kruger National Park. I assumed on a *Clivia* tour that the 'Big Five' would be *Miniata, Nobilis, Gardenii, Robusta* and *Caulescens*. (A bit early for *Mirabilis*). How wrong I was. Rather lion, elephant, leopard, rhinoceros and buffalo. But it rather proves my point. Try to learn everything about *Clivia* and you will learn all sorts of other fascinating things.

If you would like to continue your *Clivia* adventure, or even get started, an excellent way would be to join the self-drive group of delegates going to the eastern escarpment on the day after the Joburg Clivia Club show.

PHOTOGRAPHIC CONTRIBUTIONS

Aart van Voorst, SCU16 with Maxima

Florid White Lips, Henry Howard

Miniata '777 Genie', Carrie Kruger

'Pink Radiance', Carrie Kruger

PHOTOGRAPHIC COMPETITION

MINIATA SECTION

Miniata 1st, 'James Dearing' x ('Vico Yellow' x 'Vico Gold'), Helen Marriott

Miniata 2nd, Akebono Multitepal, Helen Marriott

Miniata 3rd, 'Crown Prince', Carrie Kruger

Miniata Special mention, Felicity Weeden

Miniata Special mention, 'Bertie's Pink', Glenn Miles

Miniata Special mention, 'Emerald Eye', Glenn Miles

Miniata Special mention, Felicity Weeden

Miniata Special mention, 'Moekie', Glenn Miles

Miniata Special mention, Nakamura Multitepal, Mike Riska

Miniata Special mention, Solomone Yellow, Malcolm Shrimplin

Miniata Special mention, 'Sixteens Sister', Carrie Kruger

INTERSPECIFIC SECTION

Interspecific 1st, 'Jingle Bells', Carrie Kruger

Interspecific Special mention, Felicity Weeden

Interspecific Special mention, Huntington Interspecific, Malcolm Shrimplin

Interspecific Special mention, 'Orange x yellow' x 'Dream', Mike Riska

Interspecifics 2nd, (*C. miniata* x *C. caulescens*) x *C. miniata*, Helen Marriott

Interspecifics 3rd, *C. caulescens* x *C. mirabilis*,

SINGLE FLOWER SECTION

Single flower 1st, 'Pink Crystals', Carrie Kruger

Single flower 2nd, 'Katie D', Helen Marriott

Single flower 3rd, 'Star Green Destiny', Carrie Kruger

Single flower Special mention, 'Tadai' x 'Hanyae', Mike Riska

Single flower, Special mention, 'Honaye', Helen Marriott

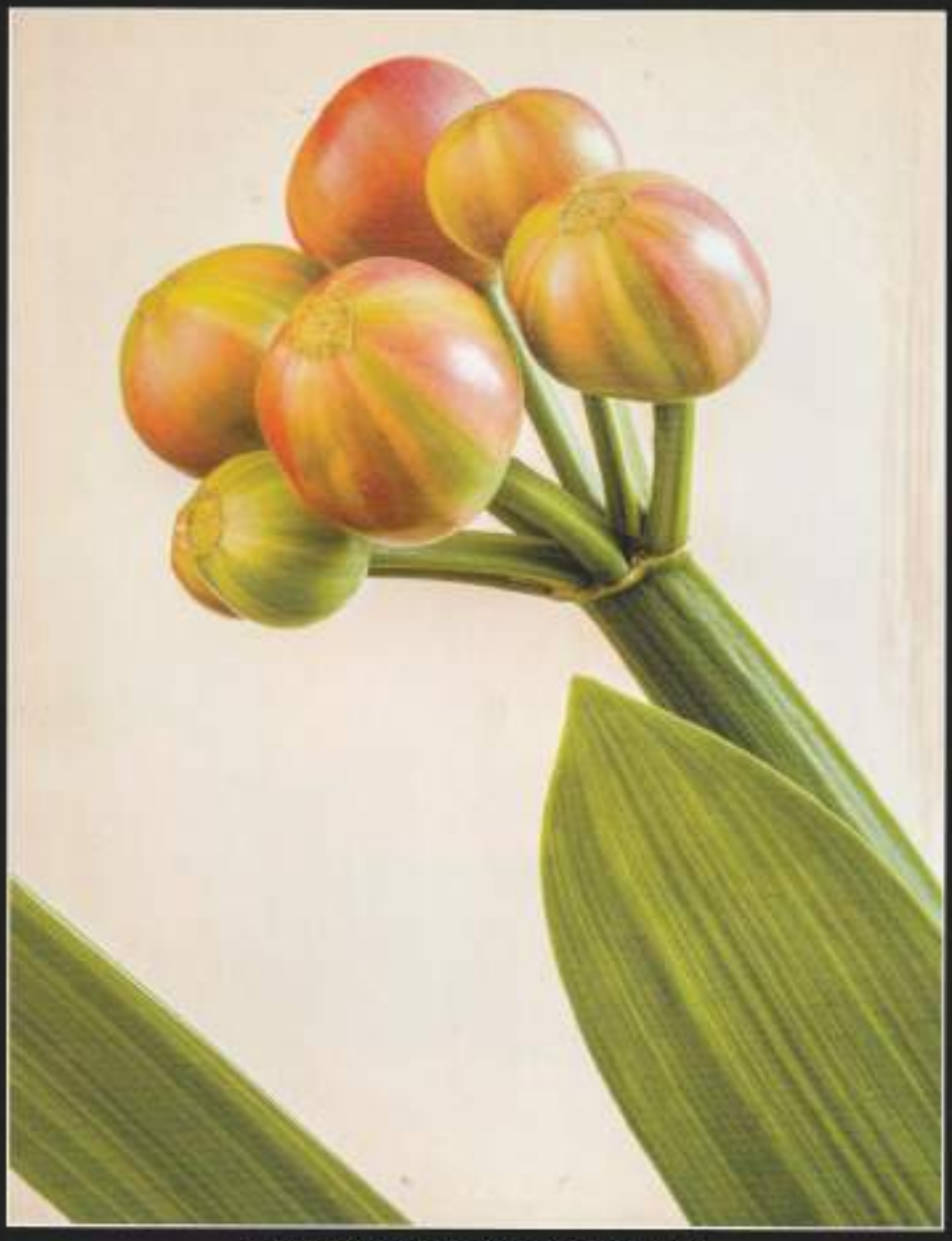
PENDULOUS SECTION

Pendulous 1st, John Hunter

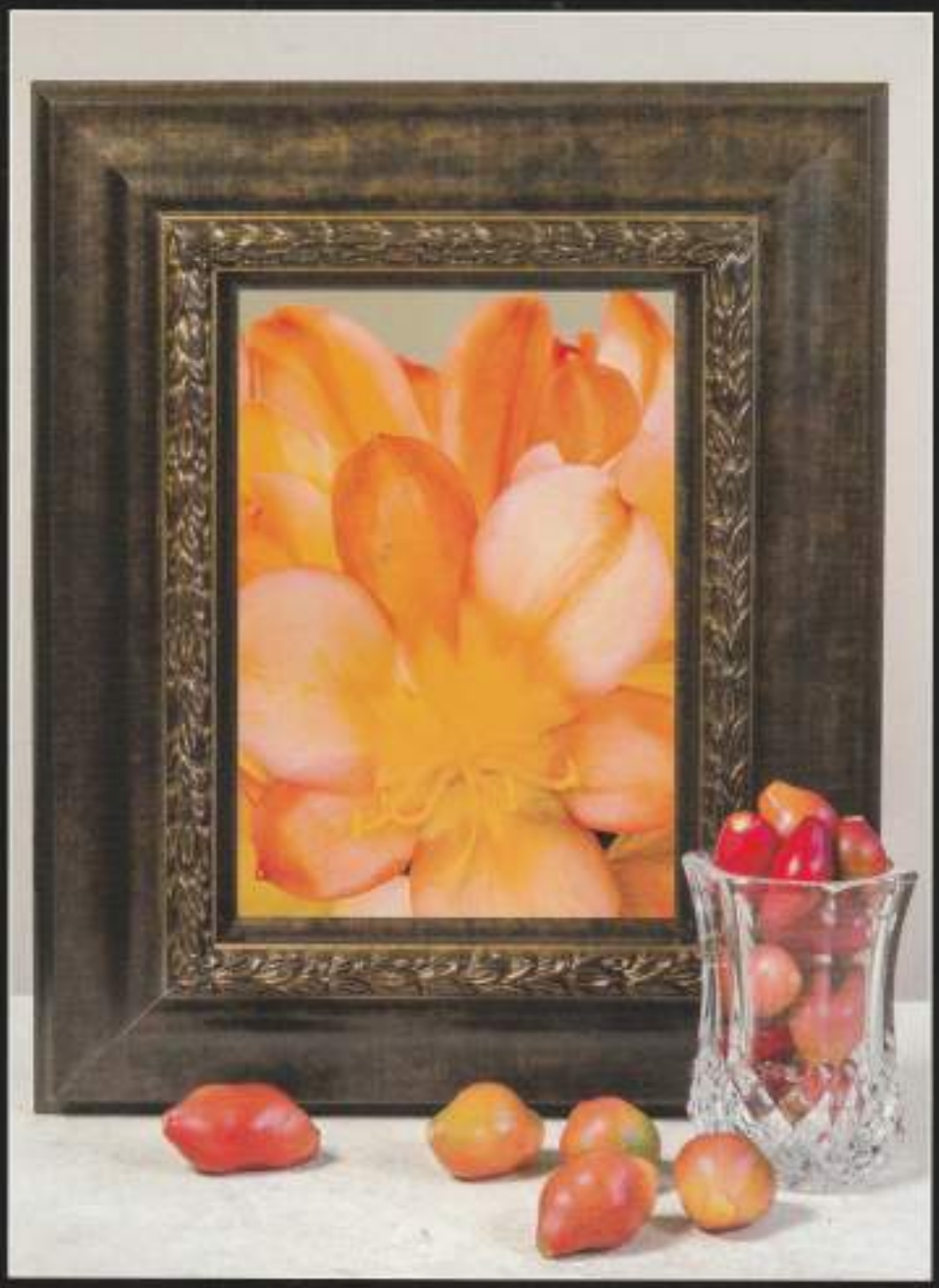
Pendulous 2nd, John Hunter

Pendulous 3rd, Felicity Weeden

OTHER



Other, 1st, Variegated berries and leaves, Helen Marriott



Other 2nd, 'Mary Helen' in frame with berries, Helen Marriott

Other Special mention, Plate of Interspecific flowers, Helen Marriott

Other Special mention, Pollinator, André du Toit

Other 3rd, 'Tana' s Green', Carrie Kruger

MESSAGE FROM THE EDITOR

I would like to thank all the people who have played a role, in whichever way, in helping produce the two Society publications over the past years: including but not limited to Glynn, Sakkie, Helen, Graig, Jacky, Claude, Sue, Marlene and Christo, Frêda, Annetjie, Anita and all the article contributors. Thank you for your time and interest in our publications.

A great thanks goes out to the four judges that judged the photographic competition this year: Ian Coates; Gordon Fraser; Claude Felbert; and James Haxton. Comments from the judges included: "A common problem was trimming the image. In many cases the flower head was complete apart from cropping off leaf tips or stamens."; "...images that do not conform to the rules [such as:] inclusion of watermarks and images that were too small etc."; "With few exceptions the lighting was much too flat so you could not visualise the depth of the flower."; "Lots of poorly taken images that are soft and have terrible backgrounds but some good ones."; and "I was pleased to see attention had been given to our comments about composition..."

I would like to thank Glynn, our Chairperson of the Society, for his support over the past years.

It has been an honour to serve Clivia as editor of the Clivia News since 2012 and also producing five Yearbooks. I step aside with a heavy heart, as I have enjoyed being editor of the Society's publications but know that the time has come for me to focus on other pursuits. The publications will benefit from new ideas and input, to be provided by the next editor. I have achieved the objectives I originally set for myself as editor and I am grateful for the opportunity that I had to make this contribution to the Society.

Be kind and generous!

Joubert van Wyk

Publications Editor

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CLIVIA

TWENTY

The Clivia Society www.cliviasociety.org

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The Clivia Society caters for Clivia enthusiasts throughout the world. It is the umbrella body for a number of constituent Clivia Clubs and interest Groups which meet regularly in South Africa and elsewhere around the world. In addition, the Society has individual members in many countries, some of which also have their own Clivia Clubs. An annual Yearbook and quarterly Newsletters are published by the Society. For information on becoming a member and / or for details of Clivia Clubs and Interest Groups contact the Clivia Society secretary or where appropriate, the International Contacts, at the addresses listed in the inside back cover.

The objectives of the Clivia Society

1. To coordinate the interests, activities and objectives of constituent Clivia Clubs and associate members;
2. To participate in activities for the protection and conservation of the genus Clivia in its natural habitat, thereby advance the protection of the natural habitats and naturally occurring populations of the genus Clivia in accordance with the laws and practices of conservation;
3. To promote the cultivation, conservation and improvement of the genus Clivia by:
   3.1 The exchange and mutual dissemination of information amongst Constituent Clivia Clubs and associate members;
   3.2 Where possible, the mutual exchange of plants, seed and pollen amongst Constituent Clivia Clubs and associate members; and
   3.3 The mutual distribution of specialised knowledge and expertise amongst Constituent Clivia Clubs and associate members;
4. To promote the progress of and increase in knowledge of the genus Clivia and to advance it by enabling research to be done and by the accumulation of data and dissemination thereof amongst constituent Clivia Clubs and associate members;
5. To promote interest in and knowledge of the genus Clivia amongst the general public; and
6. To do all such things as may be necessary and appropriate for the promotion of the above-mentioned objectives.

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CLIVIA

TWENTY

Editor
Glynn Middlewick

EDITORIAL

Editorial

By Glynn Middlewick

This is my first attempt at producing a Yearbook. I am fortunate in having some articles available from the Quadrennial Conference in 2018. Some new articles have been provided. To balance the content of the Yearbook, I have some scientific articles, some less scientific articles and of course the entries for the photographic competition. Two 'show' articles have been included in the Yearbook, one from Toowoomba and the other from the Melbourne Expo. The other shows will be covered in the next Clivia News.

Felix Middleton has contributed two articles, the first is on the Ngome *gardenii,* detailing the uniqueness of this variation of gardenii. His second article gives us feedback from the past and reminds us that clivia flowers have been present for a long time and we hope they will not be more threatened than they are at present. Aart van Voorst updates us on his tetraploid clivia breeding programme. Doubling the number of chromosomes should provide our clivia with many more beneficial characteristics. We have an article by Calvin Becker on diseases in clivia. He wrote this article as part of his research thesis. Carrie Kruger presents an article on interspecific clivia breeding. An interesting article on Legionnaire's disease is included. The condition is rarely acquired from potting soils. This is a good informative article.

The photographic entries provided the judges with a pleasant challenge, to make an objective choice of the best images. A note was sent to me, notifying all, that the prettiest photograph would not necessarily win the competition. The decision would depend on the qualities of the image presented. Aspects such as: composition, lighting, clarity, focus and absence of noise would be considered. Thank you to all the entrants and congratulation to all the prize winners.

Regards,

Glynn Middlewick

FRONT COVER
Collage of photographs
Helen Marriott

TITLE PAGE
'Interspecific'
Pieter Saayman

BACK COVER
'Yellow Clivias'
Helen Marriott

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ARTICLES

Honorary Life Members

The Clivia Society is privileged to award an Honorary Life Membership to six Society members this year. Each candidate has, in their own unique way, made an exceptional contributed to the promotion of clivia.

The proposals and motivations follow:

Brian Tarr

Proposal for the award of Honorary Life Membership of the Clivia Society

Proposed by – A Everson – Chairman of the KwaZulu-Natal Clivia Club

Seconded by – G Middlewick – Chairman of the Joburg Clivia Club

I first met Brian Tarr at the Pietermaritzburg Botanical Gardens, where we held our first KZN Clivia Meeting in 1994. He was a founder member of the KZN Clivia Club and this year, 2019, he will help celebrate the twenty-fifth anniversary of the KZN Clivia Club. Brian has been involved with plants most of his life. He graduated with a Diploma in Horticulture and first worked in the Port Elizabeth Gardens Department. While he was in Port Elizabeth he won a scholarship to join the staff at Kirstenbosch Gardens. He followed this up with a grant to join the staff at Longwood Gardens in Pennsylvania, USA, for a year!

He returned to Kwa Zulu Natal n 1979 and accepted a post at the National Botanical Gardens in Pietermaritzburg and returned to Kwa Zulu Natal.

Brian is a happy, friendly and helpful person. The knowledge he has acquired over the years, has provide him with an exceptional botanical knowledge. He willingly shares his knowledge with fellow clivia enthusiasts. He has been involved with the education of members with regards to germination, pollination, pests and diseases and the advice on the choice of ideal potting mixtures for clivias.

Brian Tarr

Brian is involved in the conservation of all plant species, particularly the protected and vulnerable plants. He was responsible for collecting some of the material for the Clivia Heritage Collection, housed at the Pietermaritzburg Botanical Gardens. As the Curator of the gardens he was responsible for the management of the gardens and continued in this role until his retirement in 2009 at the age of 63 years.

He served as Vice-Chairman of the KZN Clivia Club from 2000 until 2008. He followed on as Chairman of the KZN Clivia Club in 2009 and 2010. His organizational skills were put to good use and he organized the first KZN clivia show at the Pietermaritzburg Botanical Gardens in 1995. At this show he won first place with his 'Watkins Golden Yellow' plant. Brian is a well - recognized breeder, show exhibitor and an experienced judge.

Brian was responsible for arranging and running numerous shows, workshops and outings to see clivia in their natural habitat. He enjoyed teaching fellow members about clivia and gave many talks on cultivation, show preparation, dividing offsets and on repotting plants. At no time did he ever expect compensation for his time spent educating enthusiasts. His reward was the enthusiasm generated in people his was instructing. He was acutely aware of the importance of conservation to ensure that the national heritage is retained for future generations. He was passionate about locating and recording the locations of

areas of natural habitat of clivia in South Africa.

Brian's commitment to the KZN Clivia Club has been continuous for the past 25 years. His commitment to all aspects of clivia cultivation makes him a worthy recipient of an Honorary Life Membership.

Alfred Everson

Izak Hendrik Johannes Nel

The Joburg Clivia Club wishes to propose Sakkie Nel to be awarded and Honorary Life Membership of the Clivia Society. This is to reward him for his invaluable work he has contributed to the Clivia Society.

Izak Hendrik Johannes Nel

Izak Hendrik Johannes Nel, popularly known as Sakkie Nel, was born on a farm in the dry Northern Cape. Sakkie's mother died when he was nineteen months old. Sakkie grew up with his father and step mother Chrissie, together with fourteen siblings. He spent his school years at a boarding school in Kenhardt, about 120 kilometres away from Upington.

After leaving school, Sakkie joined an insurance company. With the amalgamation of this company with others the final banking giant was Absa. Sakkie was promoted to manager and worked in various towns. His final position as manager was in Pretoria. Sakkie retired in 2003 after 39 years in the banking service.

Sakkie married Esme van Schoor in 1968 and they have been married for 51 years. His hobby of collecting clivias is probably part of his character. Not only does he collect clivia, but is also involved with the collection of knives, stamps, walking sticks and silver coins.

His first introduction to clivia was in 1996. His neighbour, Erna Pretorius, gave him his first orange clivia. At the clivia show in 1996 he purchased his first yellow clivia. This plant took nine years to flower, but luckily produced a lot of offsets. In 1998 he decided to join the Northern Clivia Club. In 2000 he started helping out at the annual clivia show and his first duty was to control the access to the show. He continued with this task for several years. The first Society Conference he attended was in Pietermaritzburg in 2002. At the Society Conference in 2006, together with Koos Geldenhuys and Danie Botha, Sakkie was instrumental in ensuring a very successful auction.

In 2009, Bossie de Kock, the Society treasurer passed away and Sakkie volunteered to take over this position. He was elected as treasurer at the AGM in May of 2009 and this position he holds to date. In addition to the responsibility of the financial affairs of the Society, Sakkie has been a valuable contributor of articles which have been published in the Clivia News and Yearbooks. To date he has written more than 42 published articles and will probably continue to contribute in the future.

Sakkie served in the role as the Society representative of the United Kingdom for 2015 and 2016.

'Griet'

Together with his wife and Eric, Sakkie has ensured the distribution of all the publications for the last few years.

Sakkie has a few favourite plants. One of these is 'Griet'. He bred this from 'Coba', an orange clivia as the pod parent and a yellow McNeil plant as pollen parent. 'Griet' has an unusual flower with yellow stripes along the length of tepal. Some of his other favourites are an interspecific plant 'Kalahari Moon' from Dave van den Burgh and a yellow Coromandel plant.

Modern inventions such as GPS and smart mobile telephones have not appealed to Sakkie. He has managed to master the function of a computer which allows him to keep up to date with his correspondence. Sakkie remains a loyal, committed member of the clivia fraternity. The interests of the Clivia Society have always been placed first in his responsibilities. He believes in a fair deal for all, irrespective of whom they are.

Proposed by the Joburg Clivia Club – Chairman – Glynn Middlewick.

Seconded by the Northern Clivia Club – Chairman – Joubert van Wyk

Ken Smith

The Clivia Society of NSW wishes to propose Ken Smith as an honorary life member of the Clivia Society.

Proposed by Peter Hey – President of the Clivia Society of New South Wales.

Seconded by Glynn Middlewick – Chairman of the Joburg Clivia Club.

Ken Smith

Ken Smith has been and continues to be instrumental in the promotion of the genus Clivia, not only in Australia, but world-wide. His involvement with clivia has been ongoing since 1990. He was a keen plant collector as a teenager and received his first clivia seeds from well- known clivia breeders which included, Bill Morris, Kevin Walters and later on, Yoshikazu Nakamura. Ken then increased the size of his collection by importing plants from South Africa, New Zealand, Japan and the USA.

Ken, a horticulturist, taught horticulture at the Western Sydney Institute of TAFE – Richmond campus for most of his adult life. He has addressed a variety of Garden Clubs and Horticultural Societies and the Royal Botanical Garden on several occasions. His knowledge of clivia has made him a popular person to invite when a speaker was needed at many gardening events.

Ken is a founding member of the Clivia Club, later to become the Clivia Society, and was the Australian representative of the Clivia Society from 1994 until 2016. He contributed several articles to both the Yearbook and the Clivia News. He has presented talks at various conferences and has participated in talks and tours of many countries.

In 2002 he was appointed as the Registrar for Cultivars of the genus Clivia, publishing Volume 1 of "A Checklist and Register of Clivia Cultivar Names" in 2009. Ken has judged clivia shows in Cape Town, Port Elizabeth, Pietermaritzburg, Pretoria, California and Philadelphia and a show at Clivia Classiques in Perth, Western Australia.

In recent years, Ken has been a founding member of the Clivia Society of NSW, serving as the foundation Secretary for two years, foundation Public Officer for the last five years and Vice-President from 2015 – 2019.

He has addressed numerous Society General Meetings as well as being a Key Speaker at the 'Rare Clivia Expo' featuring interspecific clivia plants in May 2018. He has been instrumental in co-ordinating the spectacular floral displays and layout of the Spring Shows, acted as the registrar for display plants and has co-ordinated the 'People's Choice' award and the 'Best First Flower' award at the NSW Shows. He arranges the distribution of various publications and promotional items to existing, new and prospective members.

Ken Smith has a wealth of knowledge and has spent close to thirty years promoting Clivia not only locally, but also world-wide.

Neil Nathan

Neil Nathan

The Free State Clivia Club would like to nominate Neil Nathan for an Honorary Life Membership of the Clivia Society. Neil is one of the founding members of the Free State Clivia Club, which was formed on the 5th February 2005. Prior to this, Neil was a member of the Bloemfontein Interest Group.

From the time of his appointment as treasurer in 2005, Neil has held the position of treasurer. Owing to his financial expertise, he has ensured that the club has remained on a sound financial footing. Neil does not limit his time with the club to the financial affairs. He enjoys mentoring the new members of the club. Neil readily shares his knowledge of clivias with his fellow members. Neil and his wife Dorrie are actively involved at every annual clivia show. There, the couple, sell books, answer visitors' questions and recruit new members.

Neil's greatest contribution to the Clivia Society and fellow members, is the digitalising of the Society publications. Complete records were not kept of early publications, the Yearbook and Clivia News and to date he has completed the conversion of 107 of these publications. This is a slow and complicated task. The process starts with the scanning of each page of a publication to ensure an exact copy is produced, checking that the fonts are correctly transcribed, that the images are as clear as the original document. Lastly the pages need to be compiled into the same order as the original. Neil has almost completed the transcribing of the publications and hopefully these will be completed by the end of 2019.

The preservation of these documents, some of which are available on the Clivia Society web site, provide a bank of knowledge to both new and current Clivia enthusiasts and can be retrieved at the click of a button. We all know that this is a challenge not many of us would be prepared to tackle. Neil has given up many hours to complete this task.

We would like to thank Neil for his invaluable and selfless contributions, not only to our club but also to the Clivia Society. The Free State Club feel that there could be no better way to thank Neil for his contributions than by awarding him

Honorary Life Membership of the Clivia Society.
Proposed by the Free State Clivia Club – Chairman – Hennie van der Mescht

Seconded by the Northern Free State Clivia Club – Chairman – Ben Nel
14th February 2019.

1st February 2019.
The Northern Clivia Club wishes to propose that both Peter Lambert and Christo Topham be awarded Honorary Life Memberships of the Clivia Society.

Both nominees have spent the last twenty years dedicating their time and efforts to the promotion and management of various aspects of *Clivia* plants.

Peter and Christo remain active members of the Northern Clivia Club.

Proposed by the Northern Clivia Club Chairman: Joubert van Wyk

Seconded by Joburg Clivia Club Chairman: Glynn Middlewick

Peter Lambert

Peter took over as chairman of the NCC in 2002 and continued in this role until the end of 2017. He served at Vice-Chairman of the Clivia Society from 2003 to 2007.

Peter Lambert

He successfully encouraged the Joburg Clivia Club to be established as an independent club in 2005. He served as a mentor to the Joburg Club in their infancy.

The Successful 2006 Quadrennial Clivia Conference hosted by the Northern Clivia Club was led by Peter as the Chairman. A highlight at the auction after the conference was the sale of 'Charl's Green', for the highest price paid for a clivia at the time, of R32 000.

Peter, a keen photographer, was active in photographing the show plants at the Northern Cliva Club for several years. He is an avid wildlife photographer and is happiest in the unspoilt open plains of a game reserve.

In addition to filling the role of club representative of the Northern Clivia Club, he headed the judging committee of the Northern Clivia Club for several years until his retirement in 2017.

Peter, a patient person by nature, an anaesthesiologist by profession – needing the patience of Job, would patiently listen to complaints, assess them and after careful consideration make an objective decision. This helped a lot in his role as chairman of the Northern Clivia Club for 15 years.

In his quiet way, he looked after the well-being of many members within the clivia community and made the time to visit several members during their hospitalisation.

Peter encouraged the practice of keeping habitat plants in South Africa and was a keen participant at the Society auctions. He has a good collection of plants which are grown mainly under trees in his garden.

Peter will be remembered as a peace maker in the clivia community and he often explained why collecting clivia was so popular. His often quoted line is: 'Flowers, Fun and if you are lucky Friends'.

Perhaps we can all take a leaf out of his book and remember this quote.

Christo Topham

Christo Topham

Christo joined the NCC in 1999. In 2001 he served on the management committee of the show and was responsible for running the show together with Lena van der Merwe. In 2002 he took over as the show manager. In 2003, Christo was elected as deputy Chairman of the NCC, a position he held until the end of 2017.

In 2008, Christo took over as vice-chairman of the Clivia Society. He served as vice-chairman for three years and was then appointed as chairman of the Clivia Society. He remained in this position for the next four years.

Christo started growing clivia in 1998 on a small scale. Prior to this he was more interested in growing trees. Once he had become an active member of the Northern Clivia Club, he started buying clivia seeds and plants. Like most clivia collectors, he soon ran out of space for his collection. In 2010 he had the opportunity of purchasing an extra piece of land. Here he erected shade houses and expanded his collection. At present he has a collection of more than 5000 plants. Some of the favourite plants in his collection are the 'Narcotic' seedlings, purchased from Sean Chubb.

Christo, a quiet person, is always prepared to help. All the materials for the show stalls are stored on his property. Christo is ably supported by his wife, Marlene. The two were long-standing organisers of the Northern Clivia Club show. Christo also has a hobby of bird collecting and has a special interest is parakeets.

He and his family will now have the opportunity to enjoy the clivia flowers, without the added responsibility of the show commitments.

Ngome *Clivia gardenii*: a new species or a subgroup?

2018 Conference contribution, Felix Middleton

Classification of Clivia Species according to flowering season:

Autumn-Flowering *Clivia*

C. gardenii	April – May
C. robusta	May – June

Spring-Flowering *Clivia*

C. nobilis	September – October
C. caulescens	October – November
C. mirabilis	November
C. miniata	August – October

What we know of *Clivia gardenii*

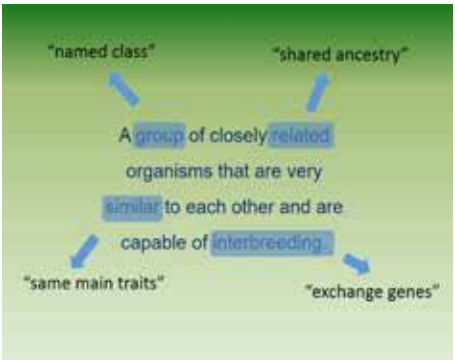
Clivia gardenii is named after Major Robert Garden, a soldier who was stationed in KwaZulu Natal between 1848 and 1853. The conservation status of *Clivia gardenii*, which is often referred to as the forest *Clivia*, was last assessed in 2008 and is currently described in the red list database as Vulnerable. This is disturbing as the species was documented as Not Threatened in a 1996 assessment. The disparity can partially be explained by the regrouping of the autumn flowering *Clivia* species in 2004. There are now two groups, the smaller *C. gardenii* found to the North of Durban and the more robust form, *C. robusta* which grows in isolated ravines to the South. The separation resulted in the overestimation of the previous range and population size of *C. gardenii*. Also, *C. gardenii* is one of the prevalent Clivia species sold on the traditional medicine market and overexploitation is nationally considered as a threat to this species. Plant numbers are estimated to have declined by at least 30% in the last 90 years and this decline is expected to continue. Although it is regarded as of little importance in horticulture, some populations are exploited for the landscaping market.

Yellow forms or mutations of the autumn flowering *Clivia* have been documented but are generally not common. The first yellow *C. gardenii* described was found in the Ngome forest in Northern KwaZulu Natal and was described in a paper by Swanevelder, van Wyk and Truter in 2005. They designated it as *C. gardenii* var. *citrina*. Unlike most other yellow forms of *Clivia* that occur as single clones in larger populations of orange or red flowering plants, these yellow *C. gardenii* grow in large stands of plants. The South African National Botanical Institute (SANBI) keeps records of the distribution of a species. The distribution of *C. gardenii* is depicted in Picture 1 but excludes the locality of the yellow form found in Northern KwaZulu Natal.

Picture 1: Distribution of *C. gardenii* as documented on the official SANBI website – (http://pza.sanbi.org/clivia-gardenii)

Defining a species

A species is defined as a group of closely related organisms that are very similar to each other and are capable of interbreeding. Although this definition is accepted by most biologists, variations in this wording are often found in the literature. Naming a new species is not an easy undertaking. The complexity of the decision-making process of naming a new species can only be appreciated when we start to examine



the main concepts in the definition of a species.

A species is a named class: The classification may in some instances not be obvious to the layman. If an academic institution says it is a species, it will be regarded as a species until further notice. There are two extremes when it comes to botanising, we find botanists who split and those who lump. Splitters attempt to create many groups, often for academic gain and the alleged 'respect' associated with naming of a new species. Lumpers on the other hand believe that simplifying the system by reducing the number of classes will facilitate the process of understanding the plant group involved. For instance, not recognising a subgroup will result in leniency when assessing the consequences of urban development in wilderness areas. The process of classification needs to be somewhere in between.

Individuals in a species share essential attributes: Traits that have evolutionary significance need to be used to describe and separate species. These main traits can be of the dominant or major type where for example differences in the severity of predation based on skin colour can result in the separation of groups into those that flourish in savannas and those who survive in dark forests. However, most adaptative traits are the result of the accumulation of many genes, each with minor effects. The result may not be discrete, but it may create a slight shift towards better survival or reproduction. For instance, the shape of leaves may provide plants with a small advantage regarding the utilisation of available moisture. It will take many generations of natural selection for such a trait to get fixed in a population, but in the end, it will separate a group into a species that can tolerate drought and a species that grows only in moist forests.

Individuals from a species interbreed: The lack of the production of offspring is a consequence of speciation and is not the precursor needed for a species to develop. Groups that diverged long ago into separate species have less chance of still being able to interbreed and produce viable offspring. One reason for this is the structural differences in chromosomes that may arise by chance in each group when groups are reproductively isolated. Chromosomal incompatibility is only one of these reproductive barriers but may be the easiest to explain. In some intergroup crosses, chromosomes do not pair up properly, cell division is abnormal, and the embryo is aborted. Either no progeny are formed, or sterile progeny are produced.

Several *Clivia* Breeders have remarked that the outcome of wide crosses between *Clivia* species do not always produce the expected results. It seems as if the F1 (first outcross) between species contains traits from both parents as expected but the variation in the more advanced crosses or through self-pollination of these F1s is limited and often biased towards one of the parents. We might be encountering a form of chromosomal incompatibility as described above. The chromosomes are inherited individually as large linkage blocks due to a lack of chromosomal crossover events and therefore individual genes are not segregating independently. But this is a topic for another day.

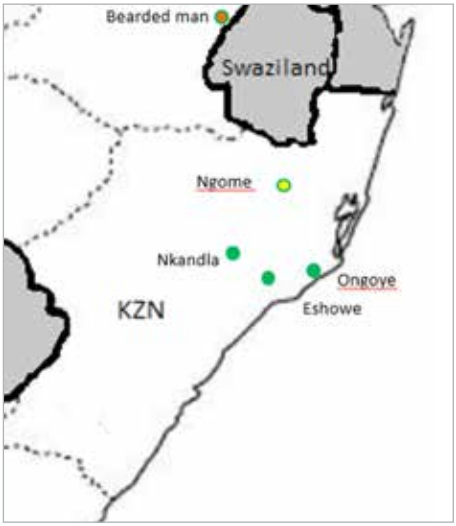
There are other ways that preclude interbreeding in *Clivia*. The most obvious is flowering time. The autumn flowering species generally cannot breed with the spring flowering species. A further barrier to restrict interbreeding, although not perfect, is the shape of the flower. The open-flowered species is typically pollinated by insects, whereas the pendulous species are mainly pollinated by birds. The differences in

flowering period, pollinator preference and distance isolation can all be used to classify *Clivia* into species.

Individuals in a species are closely related: Speciation is based on the premise that individuals with similar traits interbreed to form a new generation that is hopefully better adapted. These traits, which the individuals have in common, are either there due to their survival or reproductive value or because of inbreeding. In the absence of selection pressure, we find that in large populations traits are randomly distributed and inherited from generation to generation. However, the inheritance of such traits in a small population is affected by chance and genetic drift. This may lead to a trait being fixed in one population but not in another.

Ngome *C. gardenii* – Distribution

The yellow form of *C. gardenii* is described as *C. gardenii* var. *citrina* and was first observed in the Ngome forest in Northern Kwazulu Natal near the town of Vryheid. The area forms part of the Ntendeka Wilderness Area and has been protected for more than a hundred years. It is now managed by Ezemvelo Nature Conservation on behalf of the traditional healers of Ngoma. This forest is not a conventional Mist Belt forest but is regarded as a transitional forest between Mist Belt and Coastal Scarp forests. The actual forest, which is approximately 3000 ha in size, is isolated from other forests and consequently harbours unique insect, reptile, arachnid and plant species. Although some small pockets of natural forest are known to occur in kloofs and ravines around Vryheid, Paul Pietersburg to the north and even as far north as Piet Retief, the nearest forested area of significance is Nkandla forest to the south. *C. gardenii* do grow in the Nkandla forest and in the forests around Eshowe to the East but there are no documented sightings of *C. gardenii* to the North of the Ngome forest. Pendulous species of *Clivia* have been documented at the Bearded Man site which is situated on the Northern border of Swaziland. These are a subgroup of *C. caulescens*, a spring flowering species. Pendulous *Clivia* have also been documented within the borders of Swaziland, the identity of these still need to be verified.

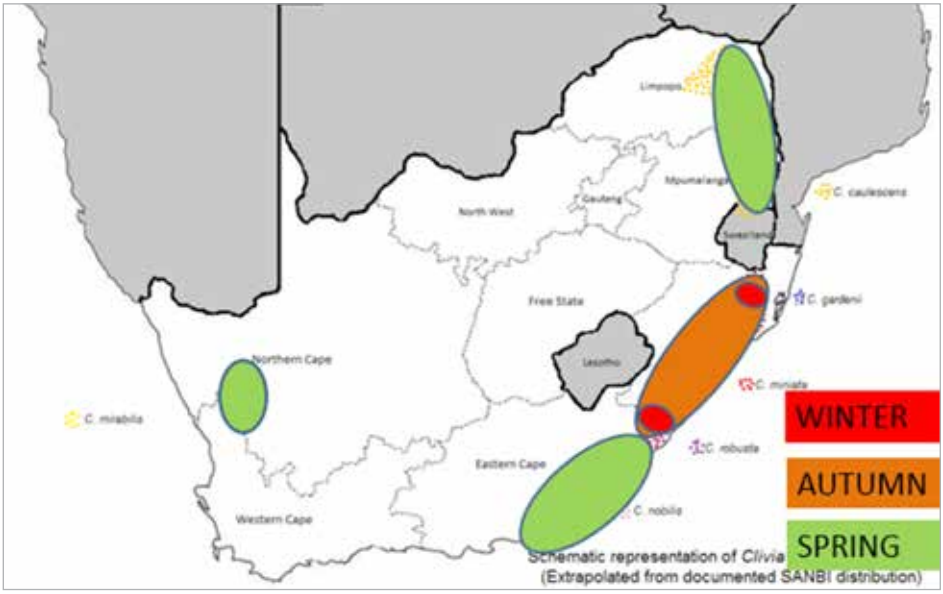


Picture 2: Location of the Ngome Forest in Kwazulu Natal

Ngome *C. gardenii* – Classification based on flowering time

The pendulous species of *Clivia* can be separated into autumn and spring-flowering types. Although *C. gardenii* and *C. robusta* flower in autumn, populations towards the southern and northern ends of the distribution range are known to flower in winter. These winter-flowering populations could be the result of an ancient hybridisation with spring flowering species or could simply be intermediate forms between the spring and autumn flowering types. The winter-flowering *C. robusta* to the south is morphologically distinguishable from the spring-flowering *C. nobilis* that grows further south. The differences between the winter-flowering *C. gardenii* and *C. caulescens* to the north of its range are unfortunately not so clear.

The yellow form of Ngome *C. gardenii* has in the past been mistaken for the rare yellow form of *C. caulescens* as it flowers closer to spring and many enthusiasts have unknowingly bought these plants as *C. caulescens* mutants.



Picture 3: Distribution and flowering periods of *Clivia* species

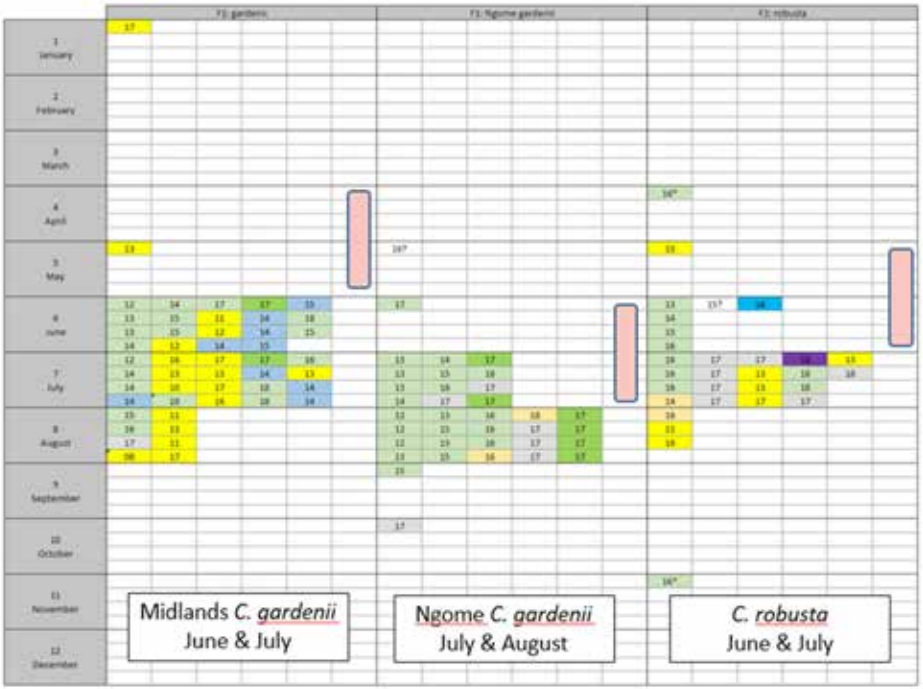


Table 1: Flowering time of *Clivia* species observed in different years at different habitat locations

Unfortunately, there are very few true yellow clones of Ngome *C. gardenii*. Many will flower yellow when procured but then in later years produce flowers that sport a pink hue.

The flowering season for the autumn-flowering pendulous species is short. Even though the onset of flowering is different between locations, the period of flowering within a population is generally less than 30 days. This is not true for Ngome *C. gardenii*. The population starts flowering in June but there are still some plants in habitat that flower during the first part of August.

Ngome ***C. gardenii*** – Classification based on DNA

Several scientists have attempted to differentiate the *Clivia* species with the use of molecular markers. Generally, DNA studies evaluate differences in the genetic makeup of individuals only after the Genus has already been separated into groups or species. The sampling of individuals for such a study attempts to weigh the sampling in order to have representative samples of groups instead of an unbiased sampling of all the variation in nature. These studies often result in splitting of a current species into two or more new groups. Unfortunately, starting from the beginning and reclassifying species in a genus with molecular markers is almost impossible. An unbiased representative sampling of all variation found in nature is needed for such a study to be meaningful. As the technique is expensive and the bureaucracy of obtaining permits to sample in nature is complex, scientists rely mainly on the *Clivia* enthusiast for plant material. The *Clivia* enthusiast has in his collection not only a very biased germ pool of the atypical types found in nature but also possesses many prised plants that have incorrect pedigree information. Given all these hurdles, there are still some very informative DNA studies on *Clivia*. For instance, Prof Spies, a retired professor from the University of the Free State, has in one of his studies found that some of the *C. gardenii* samples from Ngome forest are related to the *gardenii-robusta* group while others are related to *C. caulescens*. This, on its own, suggests that Ngome *C. gardenii* should be documented as a transitional form between the autumn flowering species and *C. caulescens*. However, in a later study where he used a different method of DNA analysis, the Ngome gardenii grouped separate from all the other species but showed a close relationship with *C. caulescens* species.

Ngome ***C. gardenii*** – Classification based on morphology

Using a single specimen to describe a species will lead to incorrect assumptions. This is especially true if the plant has been grown and nurtured by a *Clivia* enthusiast. In nature there are always the exceptions to the rule, and these are the plants that a collector will target. Pendulous species in most collections are therefore not always representative of the wild-type. The description or idiotype of the Ngome *C. gardenii* plant below is made from not only observing several plants in a shade house but mainly from observations in the Ngome forest over a 5-year period.

- The general plant type is more robust than that of the Midlands and Coastal form of *C. gardenii* but not as Robust as the *C. robusta* forms found in Pondoland.
- The shape of the leaf is not exceptional and cannot be used to differentiate it from that of *C. gardenii*. However, most plants have leaves with a somewhat leathery appearance which lack the ribbing of the typical *C. gardenii*.
- When grown in a greenhouse the plant develops a swollen base that gives the impression of an onion or leak plant. This characteristic is not always evident in nature, likely due to the lack of excessive feeding and nurturing. It should be noted that some *C. caulescens* plants, especially those robust forms from the Magoebaskloof area also develop this bulbous base when grown in a shade house.
- The seeds often occur singularly in a seedpod and are huge when compared to those of *C. gardenii*. The embryo is also exceptionally

large. Seeds germinate quickly after planting and seedling growth is rapid.

The main feature that sets it apart from the autumn flowering pendulous *Clivia* species is the flowers.

- There are many flowers on a Ngome *C. gardenii* umbel in contrast to the low flower count of midlands and coastal *C. gardenii. C. gardenii* has been described as having a flower count that averages in the order of 15 flowers per umbel. This is also the feature which precludes its utilisation as an ornamental garden plant. On the contrary, it is not uncommon to find a plant of Ngome *C. gardenii* with a flower count that exceeds 40.
- *C. gardenii* has been described as a pendulous species of clivia where the anthers and stigma protrude from the flower, but this is not true for all *C. gardenii*. Many have anthers that do not protrude. The general flower structure of Ngome *C. gardenii* includes anthers that protrude markedly.
- Although the flowers are tubular like the other pendulous *Clivia* species, the tepals of Ngome *C. gardenii* separate at the mouth into a flared shape accentuating the protruding anthers.

Flower colour is not necessarily an indicator of species divergence, except if it can be associated with modifications that affect pollination. There are several yellow and pink flowering mutations that have been observed among orange-flowered clivia plants in nature. Ngome *C. gardenii* is not one of these. We have not encountered a true orange-flowered plant to date. Furthermore, although there might be a few plants that produce flowers that are devoid of any orange pigment, the majority produce flowers that open yellow and then changes colour to pink as the flower matures. The colour is also not evenly distributed in the flower. Flowers are mostly pink at the base of the tepals near the ovary, but the pink lightens to yellow as we move to the tip of the tepals. The green colouring that is associated with the tips of tepals of all the pendulous *Clivia* species

Picture 4: True yellow *C. gardenii* of the midlands type. Picture taken in habitat near Greytown in the KZN Midlands. Note the low flower count.

is often spread over the whole flower in Ngome *C. gardenii*. The change in colour or blushing is associated with not only the maturity of the flower but also with light intensity. The colour of Ngome *C. gardenii* plants grown in a shade house is unstable as it changes from year to year. Some enthusiasts have attributed the changes to differences in growing media, but this observation still needs to be verified.

Picture 5: True yellow Ngome *C. gardenii.* Picture taken in Ngome forest. Note the high flower count, protruding anthers and flared tepal tips.

C. gardenii (Midlands form) Ngome *C. gardenii*
Picture 6: Difference in structure of flower between Ngome *C. gardenii* and *C. gardenii*

Picture 7: Ngome *C. gardenii* in habitat. Note the difference in shading of colour especially the infusion of green.

Ngome *C. gardenii* – Classification based on hybridisation results

Although not regarded as a parameter to use in species classification projects, results from crossing individuals of different origin is a well-known way of determining the magnitude of the difference between groups. The more diverse the individuals, the higher the chance for and the greater extent of hybrid vigour in the progeny. Furthermore, if plants from one group

Picture 8: The colours of Ngome *C. gardenii* flowers change as the flower matures

differ in the way they react in a hybridisation program when compared to another group, it may also demonstrate genetic differences between the two groups.

C. gardenii are not regarded as good breeding stock when used in a *Clivia* hybrid breeding program as the offspring are generally inferior with respect to colour as well as flower count. It is said that the *C. miniata* species developed from an ancient *C. gardenii* type and are thus more closely related to *C. gardenii* than to any of the other pendulous species. The lack of hybrid vigour in the progeny between a *C. gardenii* and a *C. miniata* supports this hypothesis. However, a cross between a Ngome *C. gardenii* and a *C. miniata* almost always leads to progeny that show hybrid vigour. The vigour is expressed in the size of the flowers, thickness of the leaves and the robustness of the progeny. Furthermore, a cross between a Ngome *C. gardenii* and a midlands *C. gardenii* also produces progeny with hybrid vigour. Unfortunately, I have not seen many of these as breeding programs with the pendulous species are generally aimed at crosses between species and not within a species.

The true yellow genes found in *C. miniata* are expressed as recessive traits. This is also true for the yellow *C. caulescens* as well as the yellow Midlands *C. gardenii.* Contrary to this uncomplicated, single gene type of inheritance of yellow, the light colour of Ngome *C. gardenii* is inherited as a dominant trait. If Ngome *C. gardenii* is crossed to an orange or even red *C. miniata*, the progeny produce light coloured flowers. These often show the colour change

over time (blushing) and a diffusion of green from the Ngome *C. gardenii* parent. The flower count of a Ngome *C. gardenii* hybrid is also superior to a midlands C. gardenii hybrid when crossed to a *C. miniata*.

The slight flare on the tips of the tepals of Ngome *C. gardenii* is preferentially transferred to the hybrid progeny. A hybrid between *C. miniata* and Ngome *C. gardenii* has a more open flower than the semi-tubular flower seen in the progeny from a *C. miniata* by *C. gardenii* cross. This, together with the higher flower count gives the impression of a full umbel when compared to the loose, flat-topped umbel seen in progeny from a midlands *C. gardenii* cross.

Ngome ***C. gardenii*** – Interspecies hybrids flower later

The actual flowering times of hybrids created from interspecies crosses between the autumn flowering species and *C. miniata* was established by inspecting actual pictures of F1 hybrids. Each data point in the table below relates to a picture that was taken of a flowering hybrid. The numbers and colours of each data point depict the year as well as the breeder who presented the picture. Several reputable *Clivia* breeders contributed to the dataset. Only F1 hybrids, where the pedigree is known to be correct, were used. Subsequent generations such as progeny from advanced self-pollinations or backcrossing of an interspecific hybrid were not taken into consideration. The study did not differentiate between reciprocal crosses and both types were used, i.e. where the *C. miniata* was used as pollen parent or as the pod parent. Furthermore, data from crosses with *C. miniata* that are in advanced stages of

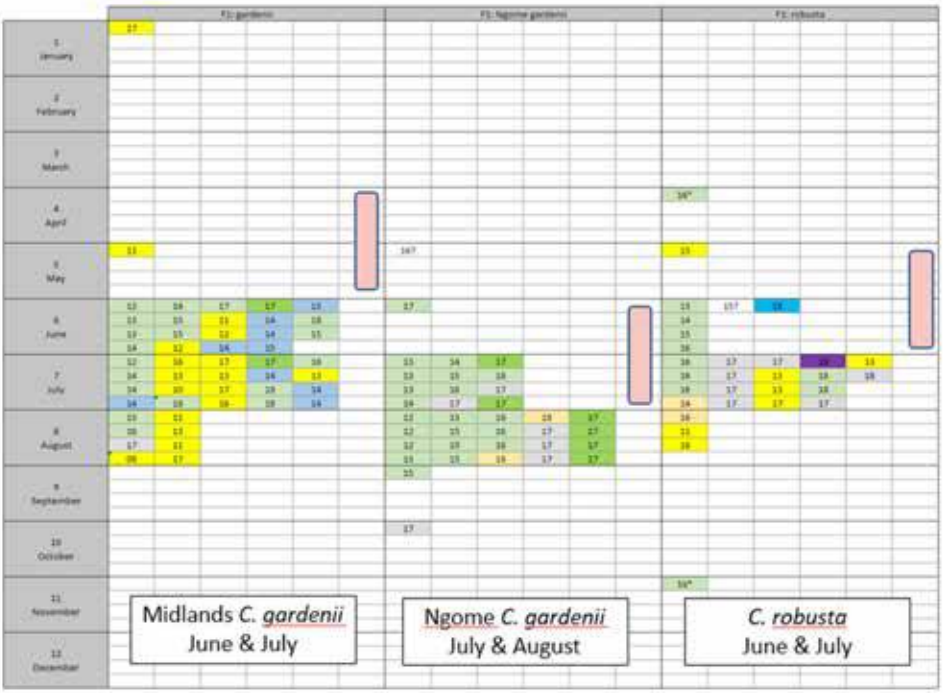


Table 2: Flowering time of F1 hybrids that were created between the autumn flowering pendulous species and *C. miniata*. Flowering time of parental species is noted as bars in pink to the right of the respective F1 data points.

Picture 9: Ngome *C. gardenii* interspecific hybrids

domestication, such as Florid White Lips and Daruma, were not included in this study. These varieties may already contain germplasm from pendulous species due to past introgressions or their natural flowering response may have

Picture 10: Midlands *C. gardenii* interspecific hybrids

been altered through selection in consecutive breeding cycles.

Although the main flowering month for the F1 hybrids is July, the Ngome *C. gardenii* tend to flower a month later. This flowering time overlaps with that of the *C. miniata* parent.

Ngome *C. gardenii* – Pollinating agent

Studies on natural pollinating agents of *Clivia* show that the main pollinators of the pendulous species are sunbirds, whereas butterflies are

Picture 11: Ngome *C. gardenii* showing the protruding anthers and tepals that are flared at the tips

said to be the main pollinators of *C. miniata*.

We set a Birdcam at two sites within the Ngome forest and obtained pictures of an Olive sunbird pollinating Ngome *C. gardenii*. A Birdcam is a category of trail camera that is sensitive enough to pick up small animals. It is triggered by a combination of heat and movement. The frequency of visits by the sunbird was very low. Only two visits were documented in the eight days that the camera was set. This is much lower than that which we found for the other pendulous species, where a flower was on average visited more than once a day. In addition to the two bird sightings, the camera did pick up several visits by honey bees. The frequency of these visits, although documented at twice per day by the camera is likely much higher as the camera is rather insensitive to insect activity.

The light colour of the flowers may be attracting the bees. The slight flare of the tepals as well as the protruding anthers seems to facilitate pollination by bees. However, the tube of the flower is narrow and the bee cannot reach the nectar. The colour change from yellow to light pink shows that the plant still attracts birds. In contrast to *C. miniata* it presents bees with pollen and sunbirds with nectar and therefore gains from pollination by two agents. We also observed several solitary or Allodapine bees which were also visiting the flowers only for pollen.

Should Ngome *C. gardenii* be classified as a species? - Summary

Classification of Ngome *C. gardenii* as a separate species is not just of academic importance.

Picture 12: Ngome *C. gardenii* showing the shading of pink and infusion of green

This population has adapted to incorporate insect as well as sunbird pollination in its strategy of reproduction. During the process of adaptation, the biochemical pathways for colour have changed to such an extent that the colour inheritance is unlike to be the straightforward monogenic inheritance that we find in other *Clivia* species.

Currently the Ngome type of *C. gardenii* is not managed with the conservation importance that it deserves. Until further localities are found, the population is for now known to be limited to the Ngome forest, where it is exploited as a medicinal plant. The population seems stable, but this may change in future as pressure is placed on this species due to over exploitation and shortages of suitable medicinal material in other areas. Reclassification is not only of importance for conservation purposes but will also classify this group as a type that should be managed differently in breeding programs aimed at the ornamental plant market.

Picture 13: Ngome *C. gardenii* interspecific hybrid

For future reading or reference:

Website on SA red list species:
http://redlist.sanbi.org

Paper on Ngome *C. gardenii*:
Swanevelder ZH, Wyk AEV, Truter JT (2005) AMARYLLIDACEAE. Bothalia 35: 67-68.

Paper on DNA analysis:
Clivia taxonomy revisited, using DNA barcode regions. Spies, J.J. Spies (2018), 10.17660/ActaHortic.2018.1201.67
(Abstract : https://www.actahort.org/members/showpdf?booknrarnr=1201_67)

Legionnaires' disease – what is it and what can gardeners do about it?

Nicole Wolter

Centre for Respiratory Diseases and Meningitis (CRDM)
National Institute for Communicable Diseases (NICD)

Recently an article appeared in an Australian newspaper documenting a death from Legionnaire's disease, which was acquired from potting soil. The incidence is rare. All clivia growers have close contact with soils, and we should be aware of this rare possibility.

What is Legionnaires' disease?

Legionnaires' disease is a lung infection (pneumonia) which is caused by the *Legionella* bacteria. If you become infected with the *Legionella* bacteria, you may have no symptoms, have a mild flu-like illness known as

Pontiac Fever or develop a severe pneumonia known as Legionnaires' disease. The symptoms can include a cough, shortness of breath, high fever, headache and muscle aches. Symptoms normally develop 2-10 days (up to 3 weeks) after a person is exposed to the bacteria. The disease was named after a large outbreak in 1976 that occurred at a meeting of the American Legion in Philadelphia, USA.

How do you get infected with *Legionella* bacteria?

Legionella bacteria grow in water and moist soil, and especially like conditions where the water is warm (20° - 50°C) and stagnant. Some common sources of infection include hot and cold water systems, cooling towers, jacuzzis, fountains, sprinklers, soil, potting mix and hospitals. A person can become infected by breathing in water droplets that contain the Legionella bacteria. You cannot get Legionnaires' disease from another person or an animal.

What should you do if you think you might have Legionnaires' disease?

Anyone can get Legionnaires' disease but it is normally people that are over the age of 50, smokers, people that have weakened immune systems or have chronic lung, heart or liver diseases that have a greater chance of getting the disease. It can be diagnosed by laboratory tests, and your doctor will ask you for a sputum (phlegm) or urine specimen to be tested. About 10-20% of individuals with Legionnaires' disease will die, and so it is important that a person diagnosed with the disease be treated early with an antibiotic that is effective against the Legionella bacteria.

How common is Legionnaires' disease?

Legionnaires' disease is quite rare. About 2-5% of all pneumonia cases around the world are caused by *Legionella* bacteria. In 2018 the National Institute for Communicable Diseases was made aware of 38 cases from South Africa. However, we know in South Africa that Legionnaires' disease is not often diagnosed and that the number of cases that we are aware of is much less than the true number of cases. Legionella pneumophila, the strain that is mostly found in water, causes most cases of disease in America and Europe whereas in Australia and New Zealand, *Legionella longbeachae*, the strain that is found mostly in compost and potting soil, is common. In South Africa we have found both pneumophila and longbeachae to cause disease.

How can we prevent Legionnaires' disease?

There is no vaccine for Legionnaires' disease. It is important that water systems must be properly designed and maintained so that water does not sit for long periods at any point in the system. Water pipes must be flushed regularly. Water must also be kept at the right temperatures where Legionella bacteria cannot grow, so cold water should be stored below 20°C and hot water above 60°C.

Advice for gardeners

It is rare to catch Legionnaires' disease from gardening. However, the use of potting mixes, composts and other soils puts a gardener at greater risk of getting the disease. Care should be taking when working with potting soil or compost including (i) wearing a mask and gloves when handling the soil, (ii) washing hands with soap and water after handling the soil, (iii) storing bags of potting mix in a cool, dry place, (iv) opening bags of soil slowly and away from the face, (v) wetting potting mix when working with it to prevent dust and (vi) avoiding breathing in droplets of water from dripping pot plants and when watering plants.

Polyploid Breeding in *Clivia*

Aart van Voorst

Abstract

Polyploids are important in many crops. Although there are a limited number of natural tetraploids found in *Clivia*, to be able to use the advantages of polyploidy in this genus, a project of converting diploid material into tetraploids has been ongoing since 1995. After the first artificial tetraploids flowered in 2000 a continually growing number of new clones are being created. To utilise the full possibilities of polyploidy in *Clivia* all existing types and species (with their hybrids) need to be available in polyploid form. The recessive mutations should also be made available in tetraploid form to speed up breeding in this slow growing crop. Extra possibilities for polyploidy breeding in *Clivia* can be found in using unreduced gametes from interspecific crosses and hybrids. Triploids in *Clivia* that can be grown from seeds can additionally make polyploidy breeding more successful.

'Sleeping Beauty' from Johan Conradie

'Big Boy' from John Craigie

'Mathias Monster' from Joubert van Wyk

'Gentle Giant' from Pierre De Coster

Introduction

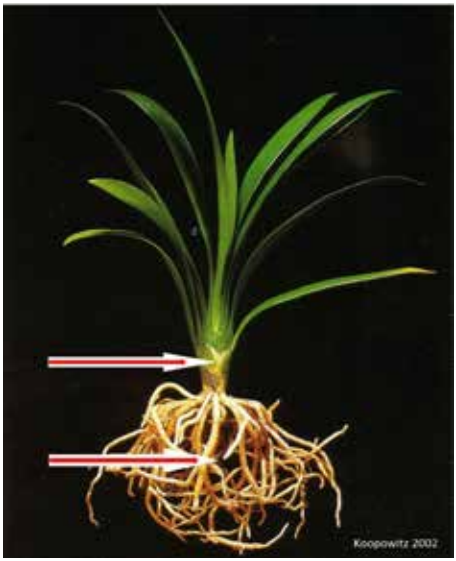
In many horticultural crops the advantages of polyploidy are widely recognised and appreciated. The larger flowers, firmer stems, darker and harder leaves can give something extra to a crop. Tetraploids also appear naturally in many crops, formed by what is generally accepted to be unreduced gametes (Harlan and DeWett, 1975, Ramanna, 1992) *Clivia* have naturally occurring tetraploids, such as the following four plants:

To be able to work on a polyploid level, one can make use of these plants, but there are not many and they are not freely available. A good polyploid breeding program needs sufficient genetic variation to be able to develop its benefits to the full.

This is why I started the Polyploid Project, converting many types of diploid material into tetraploids with the use of colchicine. Two methods are described in Clivia Five (page 33-39), Clivia 6 (page 43-46) and Clivia 8 (page 56-63). The Layman's method is still a good start for people who do not have access to laboratory facilities. My own method has been slightly changed over the years and uses dissected embryos in tissue culture.

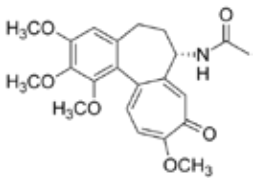
Ideally one would choose the best hybrids or plants that give the best progeny as starting material for treating diploid material with colchicine or another chemical that disturbs the spindle in the cell cycle. In that way cells with the double number of chromosomes are formed. If those cells grow out into a plant, it will be tetraploid. One needs fast dividing cells to treat with the chemical, they are found in the shoot meristem and the root meristem.

The problem in *Clivia* is that the stem- and leaf-forming meristem (shoot meristem) is hidden deep in the trunk (upper white arrow) and is very difficult to reach with a chemical. The other type of meristem in a growing *Clivia* plant is the root meristem (example at lower



Colchicum autumnale

Gloriosa superba



Colchicine

arrow).

It is not necessary to convert the latter into the tetraploid form, because if the shoot meristem is converted, tetraploid roots will eventually be formed when the plant grows on. The second difficulty is the need for many plants, because only a small number of plants exposed to the chemical will be turned into a tetraploid.

The only way to reach the apical (stem) meristem is to utilise germinating seeds (see the Layman's method) or use embryos.

I use embryos of a promising cross under sterile conditions after the seedpod has been dipped in ethanol and flamed three times. The seeds are taken out and the embryos dissected from these. The embryos are then put on a simple tissue culture medium (Murashige and Skoog,1962) comprising macro and micro nutrients, 3% sucrose and a gelling agent. After 10-20 days, depending on the cross, 0,1% filter-sterilized colchicine is added to the germinating embryos for 1 day at about 20° C. After this treatment they are placed on fresh medium without colchicine and grown till they have several leaves and roots before they are hardened off under a plastic cover in the soil.

Colchicine is a naturally occurring chemi-

Colchicine treatment of *Clivia* embryos *in vitro* results:

'4Tune'

'4Midable'

94001-13

94001-27

cal that is found in *Colchicum autumnale* and *Gloriosa superba*. In human medicine it is used to treat gout.

Results

After treating the first cross of fast-flowering Belgian-type plants in 1995, it took about 5 years before the first tetraploid flowered (its status checked using flow cytometry: A. van Voorst 2003), a couple of these have been named, others are just used as breeding parents.

RGT06 tetraploid showing different throat colouring at successive flowering seasons.

08009-06 is a tetraploid from a cross between a Nakamura variegated and 'Vico Yellow'. Seedpods were supplied by Helen Marriott. These gave unpigmented tetraploid variegated offspring.

After my first attendance at a Clivia Conference in 2002, some Clivia friends like Tino Ferero gave me seeds of their breeding stock and the tetraploid RGT06 ('Red Greengirl' cross of Tino) was bred.

'Vico Yellow' introduced via several different genetic blood lines to improve flower shape in my tetraploid material.

At the Clivia Conference in 2006 the late Bossie de Kock, at that time treasurer of the

03012-34 One of my first tetraploid yellow miniatas. It is a cross between yellow miniatas of Jaap Keijzer and Pat Gore. Yellow material from different origins is used to create a broad genetic base. In the newer crosses undergoing colchicine treatments, the darkest yellow material from Solomon is also used.

'4Yellow'. Again a cross between a Jaap Keijzer and Pat Gore yellow. This is a very big plant and has huge flowers.

05036-13 The first tetraploid Cameron Peach, derived from seeds I got from Peter Lambert in 2006.

08044-02 Another Peach tetraploid derived from colchicine treatment, but of group 1 this time, bred from 'Chubb's Peach' and 'Vico Gold' by Helen Marriott.

Two pictures from two different flowering seasons. 'Deklan' the mother of this plant has 'Vico Yellow' blood and in this way important genes are incorporated in the tetraploid lines.

Clivia Society, gave me two seedpods of a 'Deklan' cross. From these two seedpods with only few seeds in each, a couple of tetraploids were derived and one of the most appealing tetraploid miniata types thus far is probably '4Bossie'.

One of the best examples of the influence of tetraploidy on material of *Clivia* is found in *Clivia robusta*. SCU16 (Swamp Clivia Umtamvuna) named '4Security', with reference to the original code.

The most important tetraploid interspecific till now is '4Tissimo'. It came from a cross between a diploid *Clivia robusta* type and one of the first tetraploid miniatas: '4Tune'. So on the maternal side an unreduced gamete should have been involved.

The long search for a white *Clivia* can also be found on the tetraploid platform. The diploid SCU01 white crossed with a diploid 'Bing Wiese

In both pictures, on the left the normal sized C. robusta and on the right '4Security'. Fertility is quite good, so this tetraploid *C. robusta*, together with other tetras from the same background are good starting material for tetraploid interspecific crosses.

'4Tissimo'. Above on the right are two pictures, with '4Tissimo' at the top and a diploid hybrid of the same cross, at the bottom.

SCU01 (diploid)

Polyploid01 (diploid)

07002-08 (tetraploid)

Polyploid' that splits for yellow, could be the start of this quest.

Unfortunately the mutation in the white *C. robusta* only seems to be compatible with the mutation in the 'BW Polyploid' that is normally compatible with other Group 1 yellows. All other combinations with Group 1 and Group 2

yellows gives only coloured stems and flowers. This slows down the possible use of my white *C. robusta* form for breeding white tetraploid *Clivia. Whether this white form of* C. robusta has the same type of mutation as other white *C. robusta* forms, like 'Carolina's Pride' or 'Ice Giant', has not yet been tested.

One of the things to consider when raising the ploidy level of plants, is that the flower count usually goes down. Later in the breeding process, you can select and breed again for a higher flower count, but it is a good thing to start the colchicine treatment on crosses between material that initially has a good flower count. One of those crosses between *C. miniata* and *C. nobilis* gave, after treatment, a number of tetraploids and one of them, 04017-66 is a fine example of an excellent start.

The Future of Polyploid Breeding in *Clivia*

Although tetraploid breeding may be more difficult than breeding on a diploid level, this effect is mainly evident at the start, when the recessive mutations are incorporated. The Punnett squares show that a recessive character will only turn up 1 in 36 when a tetraploid plant with that character is selfed compared to 1 in 4 in a diploid. That is why I treat plants with that kind of characters (yellow, peach and green as example) with colchicine, to get tetraploids that are homozygous for that character. Crossing with other superior tetraploid plants, without that mutation and backcrossing on the homozygotic recessive tetraploid will get the mutation back at almost 17%

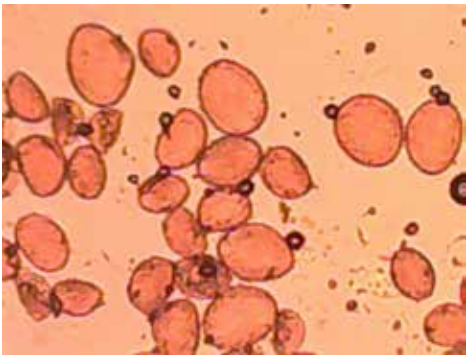
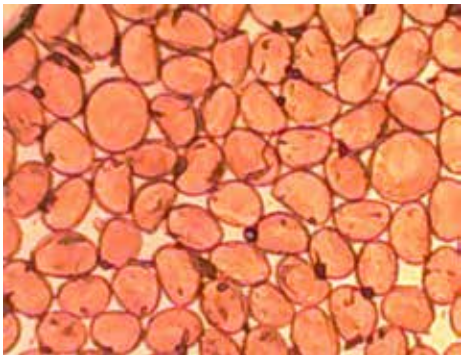
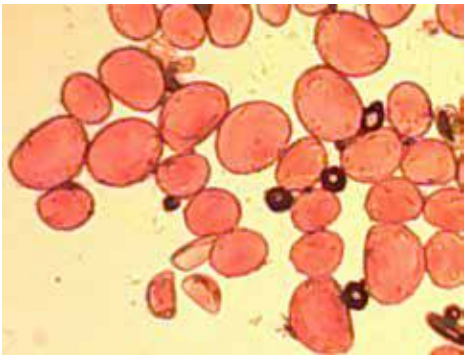
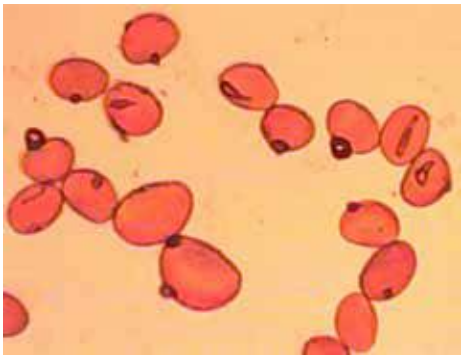
To make polyploidy breeding in *Clivia* a success, there should be a growing involvement of breeders that see the benefits of tetraploidy and they should have the opportunity to get material to work with. Not everybody can or wants to do their own colchicine treatments. It is not my intention to hold this material closely, e.g. to be able to sell material at high prices. In the beginning of 2018 more than 400 seeds of tetraploid crosses were distributed among Clivia friends, and hopefully this helps to get more people involved. In future years more seeds will become available.

An important speed-up system could come about through the occurrence of unreduced gametes in hybrid material. Distant and inter-specific crosses could cause problems with fertility. Problems with meiosis may result in pollen grains or eggs with the double number of chromosomes, known as unreduced gametes.

The bigger pollen grains in the pictures are unreduced gametes and they occur in many hybrids. In normal situations these unreduced gametes (on both female and male side) have little chance of success in the breeding process.

The unreduced pollen grains normally grow their pollen tubes a little bit slower, so in the race to reach the female egg, they may arrive rather late and even when they fertilize an egg, in most cases normal seed may not develop. But in cases where the receiving plant is a tetraploid it is just the other way around. Here the unreduced gametes have the advantage to

2x(2n gametes) X 2x(2n gametes)	———	2x (normal diploid): most of the time 3x (triploid): very rare 4x (tetraploid): extremely rare
4x(tetraploid) X 2x (2n gametes)	———	3x (triploid) rare 4x (tetraploid) possibly not rare.

give rise to a balanced chromosome number after fertilisation.

I have not made many crosses yet in this direction because the production of tetraploids is still the main goal of my crossings, but with the use of the newly produced tetraploids and the great possible source of unreduced gamete-producing (interspecific) hybrids, the number of tetraploids could rise quickly. In the pictures below the bigger pollen grains are the unreduced ones, containing the diploid number of chromosomes.

There are so many beautiful interspecific hybrids around nowadays and a great many of them may produce unreduced gametes. I have checked only a small percentage and I found several producing unreduced gametes. But even 'normal' *C.miniata* hybrids can produce unreduced gametes. For breeding purposes it is important to identify such plants.

It is a relative simple procedure to check the pollen size, to deduce whether on the male side, unreduced gametes are being produced. If they are produced on the female side, this is much more difficult to determine and I haven't done that so far.

With a simple microscope and the use of a digital eye-piece (e.g. Bresser) to make an image, with the use of a free measuring program from the internet (Micro-Measure) it is

possible to measure the size of the pollen grains after colouring with Acetocarmine.

A possibility for the development of new hybrids not yet mentioned specifically here, are the triploids. Crosses between tetraploids and diploids can result in triploids. Although in many cases triploid seeds are not viable due to poor embryo growth or bad endosperm development, sometimes normally-growing plants can be produced. These triploids are in most cases sterile, but in *Clivia* sometimes fertile plants occur. In many cases when used as a mother with the father being diploid, again diploid plants with no special characters may be found or there may be some triploids. In rare situations one can find triploids that produce unreduced gametes which when combined with diploid mothers may give rise to tetraploids (2x X 3x(2n) = 4x: 1set of chromosomes from the mother and 3 sets from the father). In the 2018 crossing season I made a lot of crossings in this manner, resulting in more than a dozen normal seeds. Later it will have to be checked if tetraploids have really been formed.

The future of polyploid Clivia may be bright when all the benefits are recognized and the growing number of tetraploid forms available and the potential of utilising unreduced gametes to produce hybrids are used together in the breeding programs of tomorrow.

Triploid cross between a diploid yellow *C. miniata* and a tetraploid orange *C. miniata*

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Investigating *Clivia* Diseases

Calvin Becker
Discipline of Plant Pathology University of KwaZulu-Natal Pietermaritzburg

EXECUTIVE SUMMARY:
Investigating *Clivia* Diseases

Research to date: 2012 -2013

1. Isolate Pathogens:
   a. brown leaf spot
   b. soft rots
   c. leaf mosaic virus-like symptoms
2. Identify Pathogens
   a. Brown Leaf Spot: Causal agent – a fungus Genus: *Colletotrichum*; Species: this is not clear

Control – use of systemic fungicides and biocontrol is feasible but trials are needed.

   b. Soft Rot: causal agents – several bacteria so far: - *Pseudomonas*, *Pectobacterium*; not clear yet what species.

Control – difficult, but a management programme can be developed and tested. Use of beneficial viruses (bacteriophages) is feasible.

   c. Virus diseases: 2-3 viruses found so far. Identification – not sure but they are definitely not 3 virus families so far

Control – need to identify vectors before we can plan the control of the viruses.

CLIVIA SOCIETY REPORT 2
27/11/2013

Synopsis of research methods and outcomes since previous report:

This report serves to update the members of the Clivia Society on the results I have obtained in my research on three *Clivia* diseases (leaf spots/lesions, soft rots and virus-like diseases) detailed in my previous report.

I presented a sequence of steps for each of the diseases (Report 1: Tables 1, 2 and 3) that outlined my research plans. In all cases, I have

verified the presence of pathogenic organisms involved with each disease.

2.1) Fungal leaf spot

My investigation into this disease was with fresh samples of symptomatic leaves, as pictured in Figure 2.1.1 below.

Figure 2.1.1 Leaves of *Clivia miniata* showing symptoms of spots, lesions and necrosis.

I put these leaves in what is called a sporulation chamber to observe any changes that occurred as the leaves aged. A sporulation chamber keeps the environment warm and humid and encourages any fungi present to produce spores. I then viewed the yellowing and withered leaves with a dissecting microscope and what I observed is depicted on the following page.

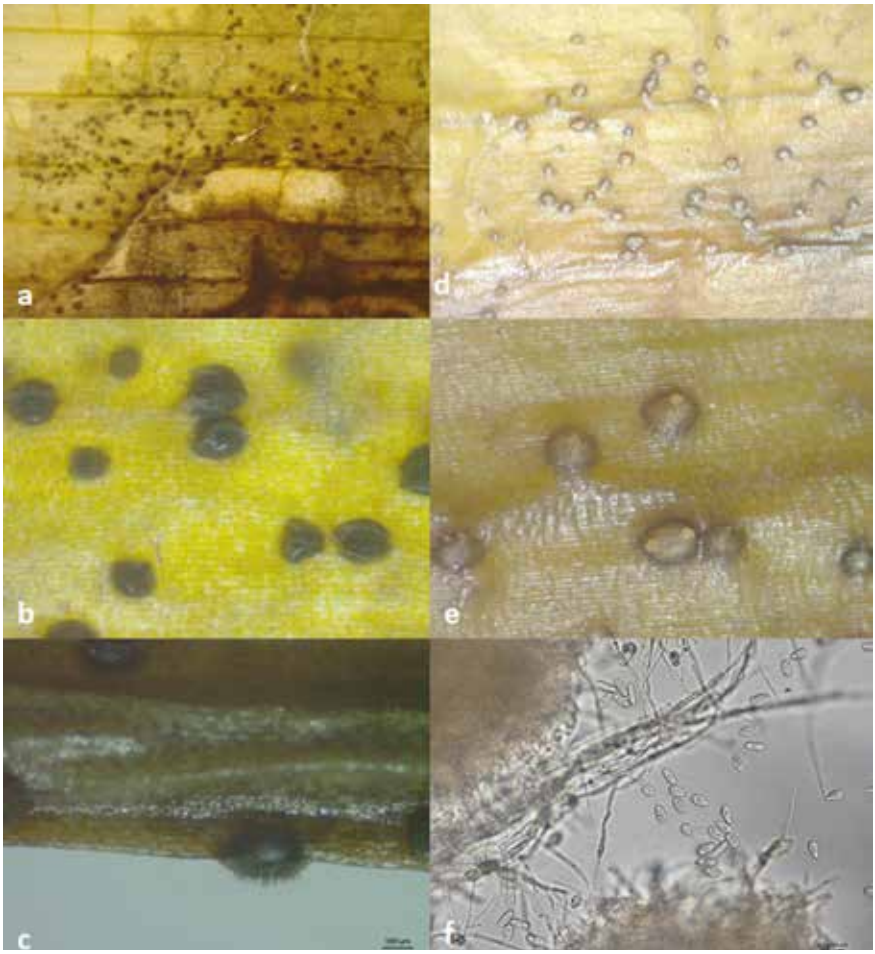

Figure 2.1.2 Development of fungal fruiting bodies (acervuli) and spores (conidia) from infected leaves: (a) acervuli appearing in a circular fashion towards the edge of the lesion; (b) some showed the presence of hair-like projections (setae); (c) acervulus and setae seen from the side; (d) extrusion of conidial masses from acervuli; (e) close up view of acervuli and orange conidial masses; (f) wet mount of fungal mycelium and conidia.

Figure 2.1.2f shows what I saw under a light microscope when I put one of the conidial masses on a slide. I used the key provided by Williams-Woodward (2001) to key them out as conidia (which are asexual spores that fungi produce and which are often dispersed by splashing water) belonging to the genus of fungus known as *Colletotrichum*. *Colletotrichum* fungi cause diseases on a wide range of plants (which are collectively known as anthracnose diseases). I refer you to Figure 1 by Cannon *et al*. (2012) - page 182 in Damm *et al*. (2012) – for a good pictoral overview of anthracnose symptoms and affected host plants. The fruiting bodies and spore masses shown in Figure 2.1.2d and 2.1.2e are very similar to those of a *Colletotrichum* species depicted in Figure 5 (page 247) by Yang et al. (2011).

Figure 2.1.3 (a) young culture showing white mycelium; (b) older cultures showing abundant orange spore masses.

In order to confirm that the *Colletotrichum* isolate that sporulated from the diseased leaves as being responsible for these symptoms. I grew some of the conidia on nutrient media under laboratory conditions. The conidia grew into a fungus that grows initially as white and cottony mycelium that then produces orange masses as it ages, illustrated in Figure 2.1.3 above.

The orange colour that can be seen on the cultures comes from the millions of conidia that the fungus produces as a method of asexual reproduction. I sprayed a suspension of these conidia onto the leaves of healthy *C. miniata* seedlings and observed that they developed the symptoms illustrated in Figure 2.1.4 following inoculation. Other seedlings that I inoculated with water did not develop any symptoms over the same duration.

I re-isolated a fungus from the lesions on these seedlings shown in Figure 2.1.4. It displayed the same initial morphology as what I put on (Figure 2.1.3a) and aged to produce orange masses like those in Figure 2.1.3b. I examined them microscopically and the conidia I observed are shown in Figure 2.1.5 below.

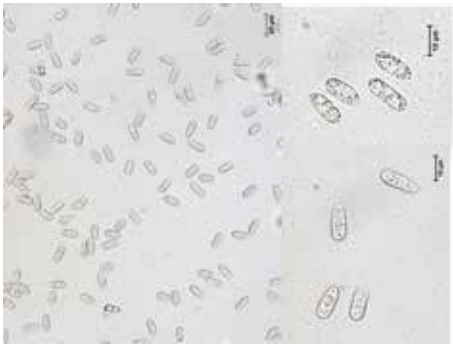

Figure 2.1.5 Bright field images of the conidia of the *Colletotrichum* species implicated in anthracnose of *Clivia miniata*.

Figure 2.1.4 Symptoms that developed on seedling *C. miniata* following inoculation with conidia of the *Colletotrichum* isolate.

Table 2.1.1 Reports of anthracnose of *Clivia miniata* caused by *Colletotrichum* species.

Colletotrichum species	Symptoms (as described in report)	Host	Country reported	Reference
C. boninense	Leaf spot	*Clivia miniata*	Japan	Moriwaki *et al*. (2003)
C. cliviae	Leaf spot	*Clivia miniata*	China	Hyde *et al*. (2009); Yang *et al*. (2009)
C. gloeosporiodes	Anthracnose	*Clivia miniata*	South Africa	Whitlock (1986)
C. trichellum	Anthracnose	*Clivia miniata*	Iran	Mirabolfathy (1989)

These are similar to the conidia I observed that developed from the initial leaves I started with (Figure 2.1.2f) and I therefore concluded that the pathogen responsible for some, if not all, of these foliar spots, lesions and dieback shown in Figure 2.1.1 is the *Colletotrichum* species I have isolated and worked with.

I have surveyed all the literature that pertains to anthracnose diseases and *Colletotrichum* infections of *Clivia*. I have found that similar disease symptoms have been described and studied on *C. miniata* and that at least three species of *Colletotrichum* have been reported to infect *C. miniata*. This information is summarised in Table 2.1.1 above.

Whitlock (1986) published the only prior, definitive record of a similar disease from South Africa. Although he did not provide pictures of the symptoms that he observed, what he described sounds very much like what we have been observing. Swart (2005) reported that he isolated a *Colletotrichum* species from leaves displaying very similar symptoms to what I have observed but that it did not cause disease when applied on healthy plants – in his words 'Koch's postulates was negative'. I think this is likely due to the environmental conditions not being conducive for infection at the time that he carried out his study.

Yang *et al*. (2009)'s paper entitled 'Colletotrichum anthracnose of Amaryllidaceae' shows symptoms that various *Colletotrichum* species cause on various amaryllid species. Although symptoms on *Clivia* are not shown, those depicted on various *Crinum* and *Hippeastrum* species (close relatives of *Clivia*) are very similar to those observed on infected plants in my study (Figure 6, page 140). I am confident that the range of foliar symptoms that various growers and I have observed is caused by infection of plants with a species of phytopathogenic *Colletotrichum*.

I have sequenced the ITS region of this isolate and assessed some of its morphological characters in an attempt to identify this *Colletotrichum* isolate at a species level. My preliminary opinion is that we are dealing with *C. boninense* but I need to conduct further studies to be confident. There exists the possibility that this isolate may represent an undescribed *Colletotrichum* species because Yang et al. (2009) stated that 'the Amaryllidaceae comprises 51 genera, with over 800 species and a worldwide distribution. A high diversity of *Colletotrichum* species, including many undocumented new species, could be expected if more hosts are studied'. I need to consult with an international *Colletotrichum* expert to verify my assessments, which I am in the process of arranging.

Another line of inquiry that strengthens the implication of a *Colletotrichum* species in this disease development is the fact that a member of the society who lives in Pretoria told me that he observed that application of the fungicide Switch (Syngenta: http://www.syngenta.com/global/corporate/en/products-and-innovation/product-brands/crop-protection/fungicides/pages/switch.aspx) appeared to stop the tips of the leaves of his plants from dying back. Sygenta

state on their website that Switch provides high level of control of a number of different fungal pathogens, including *Glomerella*. *Glomerella* is another name for *Colletotrichum* - they are different forms of the same fungus that were initially named as separate species but it has since been realised that *Glomerell*a represents the sexual form of the fungus and *Colletotrichum* the asexual form of the fungus [see Table 2 from Cannon *et al*. (2012) – pages 190 and 191 in Damm *et al*. (2012)].

The next step in this disease issue will be to study and develop recommendations for measures to control this disease. Cannon *et al*. (2012) stated that 'in common with many other fungal pathogens, the *Colletotrichum* asexual morph is most commonly associated with disease symptoms, with the sexual morph tending to develop on moribund or dead host tissues'. It is likely that plants become infected in spring, when environmental conditions are conducive to spore production and infection (humid and warm, like in the sporulation chamber where I incubated the diseased leaves). Splashing water (rain, irrigation etc.) may then splash the spores from the sites where they are produced (dead and dying leaves and other debris from infected plants) onto the new, fresh and susceptible leaves that the plants are producing around the same time. As the fungus grows through the infected leaves, it produces the symptoms we have observed.

Control measures of fungal diseases revolve around taking a multi-faceted approach towards decreasing diseases levels. Growers should try not rely solely on the use of fungicides for disease control but also on cultural and sanitation techniques in conjunction with spraying fungicides. I am not able to make further fungicidal recommendations at this point as there are currently no fungicides registered for anthracnose control on *Clivia* in South Africa and none of the studies cited in Table 2.1 looked at controlling the diseases they studied. Studies assessing the efficiency of various fungicides at controlling or reducing this disease are warranted before I can make any concrete recommendations to the Clivia Society. Growers may like to begin to look at testing the fungicides that are registered for the control on anthracnose of other crops (such as avocado for example) in South Africa.

In common with many fungi, the spores of *Colletotrichum* species require a layer of standing water (usually dew) to be present on a leaf surface before they can infect the leaf. Removing this layer of free water by supplying adequate ventilation in the growing area and moving away from overhead irrigation techniques may help reduce the dispersal and germination of the spores of this pathogen. The removal of dead and dying plant material in and around

Clivia growing areas may also help reduce disease incidence by decreasing the number of inoculum sources in the nursery. A third option for disease control is the use of biological control, which would entail the use of other microorganisms to stop disease development and spread. Studies to isolate and assess various biocontrol options may be warranted.

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2.2) Bacterial soft rots

In my previous report, I detailed two cases of *Clivia* plants suffering from soft rot symptoms. My research into the literature of *Clivia* diseases has indicated that only four studies on bacterial soft rot on *Clivia* sp. have been published worldwide with only one, Laing (2009), coming from South Africa. These reports are detailed in Table 2.2 below.

I can confirm that I have isolated bacteria from each locality that are capable of producing soft rot symptoms when previously healthy plants are inoculated with them. My research methodology is outlined in the figures below.

I isolated bacterial samples from some diseased tissue of the *C. miniata* seedlings from Howick and the mature plant from Nelspruit (Figures 6, 7 and 8 in the previous report). I then assessed whether any of these isolates had soft rot abilities by inoculating slices of potato with each isolate and observing any changes that occurred (Figure 2.2.1). I found that a single isolate from each locality was able to cause soft rot of the potato slices (Figure 2.2.1b and 2.2.1c). This indicated to me that these

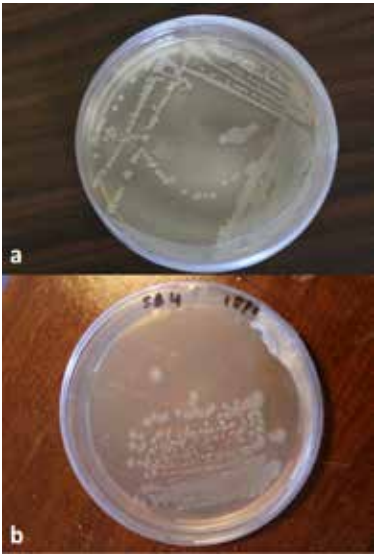
Figure 2.2.1 Rotting potato slices after inoculation with bacterial isolates: (a) evaluation of all bacterial isolates for their soft rot ability; (b) isolate obtained from Howick; (c) isolate obtained from Nelspruit.

Table 2.2.1 Reports of bacterial diseases of Clivia

Genus	Species	Common name of disease	Host organ affected	*Clivia* Host	Country of report	Reference(s)
Erwinia	*cypripedii*	Brown rot	Leaves and roots	*Clivia* spp.	Korea	Han & Choi (1994)
Pectobacterium carotovorum	subsp. *carotovorum*	Soft rot	Leaves and roots	*C. miniata*	Korea, South Africa	Choi & Lee (2000); Laing (2009)
Pseudomonas	*syringae* pv. *syringae*	Brown spot	Leaves	*C. miniata*	Germany	Khan & Rudolph (1997)

Left: Figure 2.2.2 Development of soft rot on *Clivia miniata* seedlings inoculated with each isolate: (a) seedling inoculated with the isolate from Howick; (b) seedling inoculated with the isolate from Nelspruit.

Below: Figure 2.2.3 Colonies of (a) Howick isolate and (b) Nelspruit isolate, on tryptone soy agar (TSA) incubated for 72 h at 25 ± 2 °C.



isolates possessed soft rot abilities and were potentially the pathogens responsible for the disease symptoms observed.

I confirmed their pathogenicity on *C. miniata* by inoculating healthy seedlings with a suspension of each isolate. Soft rot symptoms developed on the plants shortly after inoculation. These were similar to those that I initially observed (Figures 6, 7 and 8 in the previous report) and are depicted in Figure 2.2.2. The bacteria that I reisolated from the rotting seedlings were morphologically identical to my original isolates, which lead me to conclude that these isolates are the bacteria capable of causing soft rot diseases of *C. miniata*, and possibly other *Clivia species.* Colonies of each isolate are shown in Figure 2.2.3.

I initially thought that what I had isolated were *Pectobacterium* species, in line with that reported by Laing (2009). However, the results from my DNA sequencing investigationsindicate that the bacterial isolates currently being studied are not the same as those reported by Laing (2009), i.e., they are not a Pectobacterium species. The isolate from Nelspruit appears to be a Pseudomonas species but I have not yet had definitive results with the Howick isolate and am attempting DNA sequencing again.

My results seem to highlight that soft rot diseases of Clivia are actually caused by a wider range of bacteria than we initially thought and that the bacterial species assemblage associated with this disease complex requires further study.

I think that the bacteria that cause rots of *C. miniata* and other *Clivia* sp. are environmental inhabitants that do not normally cause diseases unless something in the environment is imbalanced in some way. As I mentioned in the

previous report, hot and humid environmental conditions encourage bacterial growth to higher levels than normal, combined with plants that are stressed (due to heat, lack of water, nutrient imbalances, infection with other diseases etc.) leads to outbreaks of these bacterial soft rots. Any physical damage to plant organs like leaves or roots (caused, for example, by insect pests or improper chemical applications or sunburn) provides sites of entry for bacteria to easily infect plants.

It is impractical to attempt to completely eradicate bacteria and the soft rot diseases they cause from the environment because bacteria are so widespread and multiply so rapidly. Antibiotics have been applied to control bacterial diseases in the past; the bacteria have shown their resilience by rapidly developing resistance. Healthy plants are better able to defend themselves against pathogens than stressed plants are and bacterial diseases are thus best controlled through the implementation of cultural practices that ensure the healthiest plants possible. There is an avenue for research focussing on the isolation of viruses that use bacteria as their hosts (bacteriophages) from the environment and assessment as to whether any will be able to control the bacterial strains I have isolated for a potential long term control strategy.

References:

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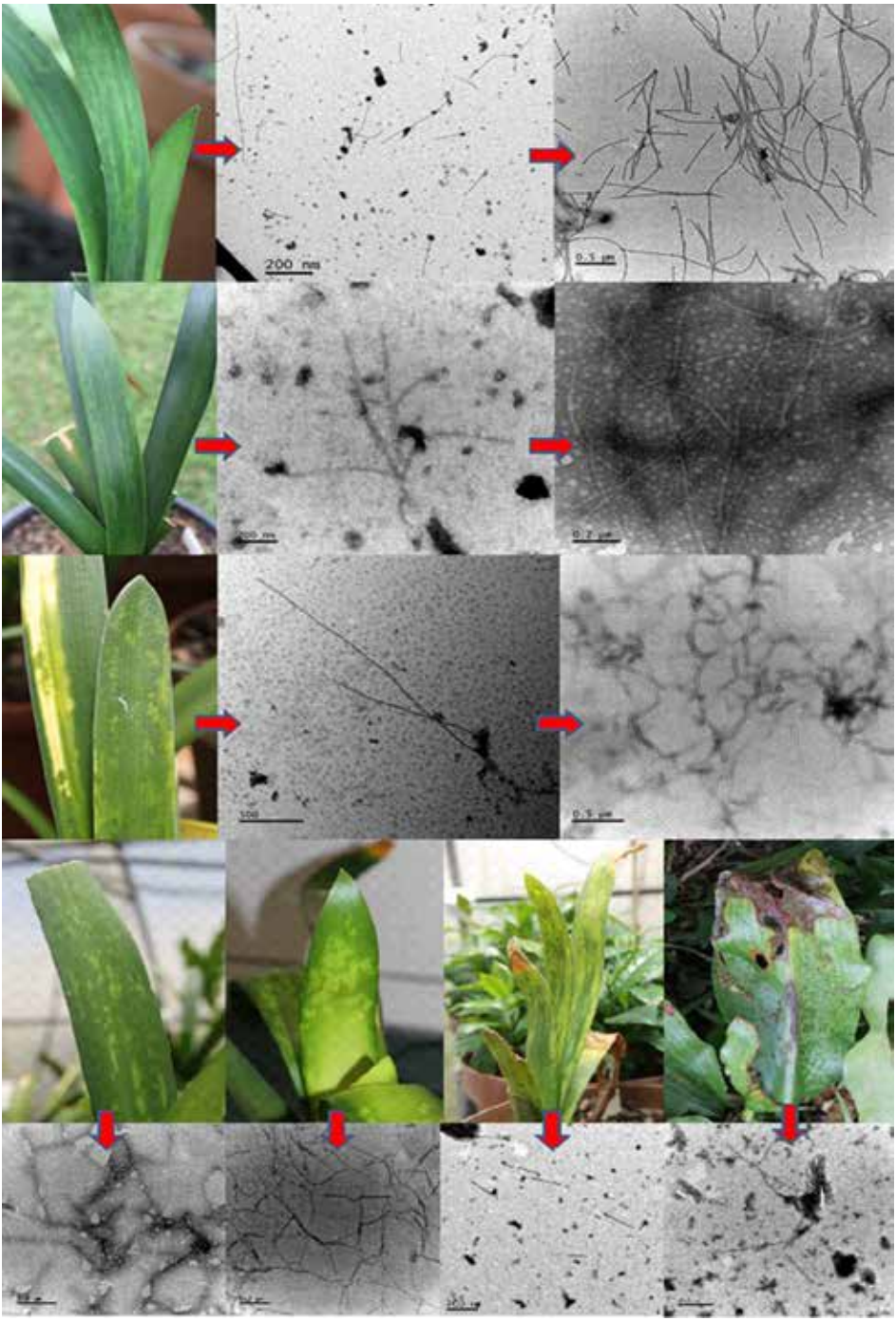
2.3) Virus diseases of *Clivia*

I reported previously the presence of virus particles in *Clivia* plants displaying symptoms of viral infection and a tentative identification of these viruses as a closterovirus. The hsp70 gene that I reported to have amplified is found in both plant and closterovirus genomes and the DNA sequencing results I obtained indicated that the DNA products I illustrated in Figure 14 are actually plant DNA and not from viruses. I realised that I did not manage to effectively exclude all plant DNA from the samples that I analysed. I thus need to retract their identification as a closterovirus species.

I needed to work with purer samples of each virus to ensure more accuracy with my results. I decided to attempt to purify virus particles from the leaves of plants showing symptoms of virus infection. I was unable to find any protocols that have described virus purifications from *Clivia* plant material. I based my attempt

Opposite page: Figure 2.3.1 A compilation of *Clivia* plants showing virus-like symptoms: a-j are from the plants I initially thought were infected with closteroviruses (CMB= *Clivia miniata* Benoni, CIH= *Clivia interspecific* Howick, CCM= *Clivia caulescens* Mariepskop); a,d and g are symptomatic leaves of each plant; b, e and h are transmission electron micrographs of virus- like particles isolated from the sap of infected leaves; c, f and i are transmission electron micrographs of virus-like particles purified from symptomatic leaves of each plant; i and j are plants (CEVZ = *Clivia* 'Elsa van Zyl', CUY = *Clivia* 'USA Yellow') I received for analysis from members of the Lowveld Clivia Club; n and o are virus-like particles purified from the leaves shown in i and j; l and p show symptoms and virus-like particles isolated from the sap of CIH (an interspecific from Nelspruit); l and p show symptoms and virus-like particles isolated from the sap of SPP (a *Scadoxus puniceus* from Pietermaritzburg that I thought was infected with a closterovirus).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on a protocol successfully used by some of my colleagues for purification of viruses similar in morphology to what I observed and reported in Figures 11, 12 and 13 of my previous report. I modified the protocol I was given and managed to successfully purify virus particles from the leaves of three plants with virus-like symptoms. My investigations into viral diseases of *Clivia* is summarised in Figure 2.3.1.

I have searched for literature pertaining to virus infection of clivias worldwide and was able to generate Table 2.3.1, which summarises all available reports of viral diseases affecting *Clivia*.

It is evident that research into the field of viral diseases of *Clivia* species and hybrids is still in its infancy, particularly in South Africa. Using the information in Table 2.3, I excluded tospoviruses as the cause, since the particles of tospoviruses are spherical. I then attempted to test for the presence of potexviruses, due to Hammet's report from New Zealand. I was unable to generate DNA products from these viruses using potexvirus-specific tests and I therefore exclude potexviruses as the cause too. There still exists the possibility that these viruses are new and unnamed viruses, therefore I need to investigate their identities further.

I have taken steps towards further study of these viruses by mechanically inoculating susceptible tobacco plants with ground up leaves and sap of CIH. This is standard for assessing the host range and transmissibility of viral isolates. The response of inoculated plants compared to control plants is shown below in Figure 2.3.2.

Plants inoculated with leaf material and sap of CIH appeared stunted compared to: plants inoculated with water instead of infected leaves/sap and plants not inoculated at all. Besides apparent stunting and slowed growth rates, the tobacco plants that I inoculated did not seem to show any other symptoms that are usually associated with viral infection (leaf distortion, mottling and streaking etc.). I thus found the results from this transmission study inconclusive.

I have attempted to use molecular methods to test for the presence of three virus genera; Closterovirus, Potyvirus and Potexvirus. These molecular tests were carried out through the use of reverse transcription (RT) to convert the RNA of these suspected viruses (isolated and purified from symptomatic *Clivia* leaves) to DNA and then PCR using primers reported in available literature to be specific to each virus group mentioned above. I have not been able to amplify definitive viral DNA products from any of my purified virus samples using the primer sets I have tested thus far. The implication

Table 2.3.1 Worldwide reports of viruses infecting the genus *Clivia*

Genus	Species	Symptoms of infected plants	Clivia species	Country reported	Reference
Potexvirus	Undetermined		*Clivia* hybrids	New Zealand	Hammet (2004)
Potyvirus	Narcissus late season yellows virus (NLSYV)	Streaking and mottling of leaves	*C. gardenii*, *C. miniata* 'Belgium hybrid', *C. miniata* var. *citrina*	Australia	Adcock (2007)
Tospovirus virus (IYSV)	Iris yellow spot *Clivia* spp. Tomato spotted wilt virus (TSWV)	Streaking and mottling of leaves	*Clivia* spp.	Japan Holland, USA	Jones (2005); Gent *et al*. (2006) McDonough *et al*. (1999)

is that these viruses may be novel and that further, detailed study is necessary for conclusive identification of the viruses observed.

References

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McDonough, M.J., Gerace, D. & Ascerno, M.E. (1999) Western flower thrips feeding scars and tospovirus lesions on petunia indicator plants. http://purl.umn.edu/51809. Accessed 05/07/2013.

Conclusions and future research:

The disease tables I present in this report (Tables 2.1.1, 2.2.1 and 2.3.1) summarise all the literature I could find that has been published on investigations into *Clivia* diseases. These are adapted from tables I have compiled on ornamental plant diseases and included in my literature review. I have been using these references as starting points for my research techniques and also to point me in the direction that I need to follow in order to confidently identify the pathogens that I have shown to be present in association with each disease. I am currently in the process of attempting to identify the fungal, bacterial and viral isolates I have been working with to the best of my ability.

As I have mentioned in previous reports, adequate control can be implemented only once the pathogens have been adequately identified. I feel that my brief foray into *Clivia* disease research (both identification and control) highlights how little-studied the field is and that much of the international literature has only recently been published or is not freely available, particularly

Figure 2.3.2 Plants of *Nicotiana tabacum* 'Xanthi' mechanically inoculated with symptomatic leaf material of an interspecific *Clivia* hybrid.

in South Africa. I feel that I have made good progress with the study of all three diseases I have been looking at but that all three issues require more study, particularly since there has been so little previously reported in South Africa.

I have made an application to the University for an upgrade of my MSc registration to PhD. I am still waiting to hear the outcome of my application. If I am successful, this will allow me the time I mention to study these and possibly other *Clivia* diseases further and to begin to look at testing various control measures for the diseases I have been studying, for example: testing various fungicides on the control of the Colletotrichum-induced leaf spots and lesions that so many growers experience.

I hope that this report serves to effectively communicate to the Clivia Society what I have being doing since my previous report, how and why I did it and what it means to the clivia grower. This report is a summarised version of my in-progress thesis chapters, which include detailed reports on the techniques I have mentioned that other researchers will be able to follow and build on.

Unlocking the potential of interspecific breeding

Carrie Kruger

Interspecific *Clivia* flowers hold the added appeal of extending the flowering season. With the forming of the first flower, on crosses made four or five years previously, excitement is in the air. The hope that the flower will bloom in a way anticipated from your crossing, holds you in suspense and hope.

With all *Clivia* breeding there are good and disappointing results. Occasionally there are some outstanding results, which justify the time and effort spent hybridising the plants.

The range of colours found in the interspecific crosses, provides a treasure trove of hidden genetics. Most of the new and unusual colours found in clivia today originate from

Fig. 1 Star Green Destiny – Carrie Kruger

Fig. 2 'Ember Spirit' – Carrie Kruger

Fig. 3 'Planet Earth' – Carrie Kruger

Fig. 4 'Lucid Dreams' – Carrie Kruger

Fig. 5 'Over the Moon'– Carrie Kruger

the interspecific breeding programmes. The inclusion of the interspecific plants in a breeding programme, may be considered a 'new age' of clivia breeding.

As with many breeding programmes, patience is needed. Some of the F1 hybrids of interspecific crosses, provide pleasing results, but the largest improvement takes place with the second generation. Many of the F1 hybrids are tubular with a slight flare, which is not that spectacular. Many breeders may be discouraged by the appearance of the F1 hybrid flower, but will be rewarded when the F2 hybrids flower.

The interspecific breeding popularity is a relatively recent development. When I started breeding interspecifics, several years ago, the choice of plants was limited. Most of the plants available were mainly the tubular F1 hybrids. Selecting from these hybrids, for the best flower shapes and colours, I started our breeding programme. I now use the best of our F2 hybrids, making either sibling crosses or self-pollination.

Working with the interspecific plants has made me aware of the large gene pool involved in these crosses. As a result, the offspring colours are not always guaranteed. Ideally, I would grow all these plants to a flowering stage and then select the best. Unfortunately, like most breeders, I do not have the space to keep the plants until they flower.

Advice I can offer from breeding with interspecific clivia plants:

Start with superior F1 and F2 plants from the start. By doing this you will save a good few years in your programme, instead of starting from scratch.

We have bred some superior versi-colours flower plants from non-versi- coloured parents, for example 'Ember Spirit' Fig. 2. Versi-colour traits are carried over in the pollen as well as pod parent plants.

Avoid using miniata pollen, too often, on the interspecific cross. The repeated use of miniata pollen may result in an inferior looking 'miniata' type flower.

Fig. 6 'Mirror Beauty' – Carrie Kruger

Results from self-pollinating F2 hybrids have often resulted in flowers that are superior to the parent. Consider self- pollination as an option when developing your interspecific plants. An example of this is 'Planet Earth' Fig. 3.

When you do decide to hybridise plants, know which groups your plants belong to, to avoid unwanted orange offspring.

To produce shorter leafed plants, use a compact plant as a parent. I have been working with a yellow Daruma plant as a parent, producing good results. 'Mirror Beauty' Fig.6 is a good example of this type of cross.

Crossing your interspecific plants with either variegated or LOB type plants have resulted in beautiful plants. "Light of Africa" is an example of this type of cross. This cross was made by Francois van Rooyen.

Plants I used in breeding the various hybrids

Fig 1: 'Star Green Destiny' - F1 of 'Star Green Original' ('Star Green Original' is a F2 bred by Nakamura)

Fig 2: 'Ember Spirit' – 'Carnival (*miniata* x *gardenii*) x 'Secret Wish' ('Stella Parish' *miniata* x *gardenii*) x Grp1 Yellow)

Fig. 7 'Carnival' – Carrie Kruger

Fig.3: 'Planet Earth' – 'Jupiter' (*gardenii* x *miniata*) x (*miniata* x *gardenii)* x Self

Fig 4: 'Lucid Dreams'- 'Dreaming' (Best Nakamura F1 x self) x sibling

Fig 5: 'Over the Moon'- 'Secret Whisper' ('Stella Parish' *miniata* x *gardenii* x Grp1 Yellow) x 'New Moon' (Yellow F2 interspecific)

Fig.8 'Jupiter' – Carrie Kruger

Fig 6: 'Mirror Beauty'- (Yellow Daruma x *mirabilis*) x Yellow Daruma

Fig 7: 'Carnival' = (*miniata* x *gardenii*)

Fig 8: 'Jupiter' = (*gardenii* x *miniata*) x (*miniata* x gardenii)

Fig 9: 'Dreaming' = (Best Nakamura F1 x self)

Developments and observations

The popularity of the interspecific hybrids has grown in the past few years and continues to attract many collectors and breeders. Many clubs now have exhibitions of the interspecific flowers. The advantage of the interspecific flowers is that they flower from the beginning of June up until the end of August in the Southern hemisphere. They often flower at odd times during the year, extending the flowering season of the *Clivia* plants.

Another advantage of interspecific flowers is that they are more disease resistant than the *Clivia miniata*. Interspecific plants grow faster and multiply well with some of the plants forming offsets before they have flowered.

The range of colours and flower forms are unlimited. These plants should be found in every collection.

I look forward to the next year's variety of interspecific colours!

Fig.9 'Dreaming' – Carrie Kruger

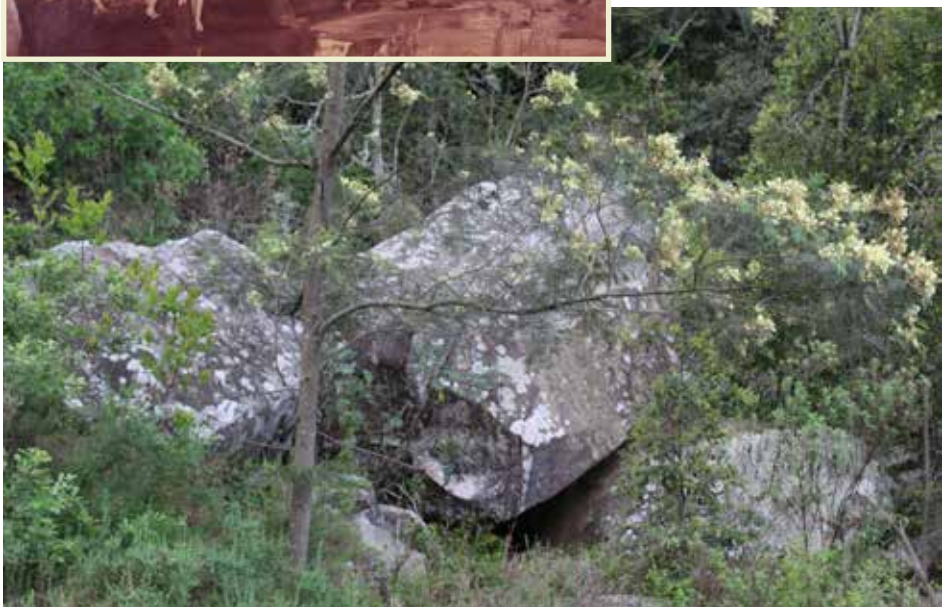
Site Description: "The Dassies" Greytown area

KZN club contribution, prepared by Felix Middleton

John van der Linde presented a talk at the 2018 International Clivia Conference which was titled "the great Chinese Clivia Bubble". In this presentation John described the boom and bust cycle of value growth and decay which is often associated with the marketing of ornamental plants. As introduction he provided a speculative but rather credible account on how *Clivia* might have migrated to the Orient via the German Missionary workers in South Africa. A total of 126 German missionary stations were established in Southern Africa during the eighteen hundreds, bringing not only the Scripture but also training indigenous peoples in farming techniques. The missionaries who were posted in Hermannsburg, Wartburg and Lunaburg were known to be ardent botanists and could have been the link for some of the Clivia introductions abroad.

Picture 1 –'Then'

By chance the Hermannsburg School Foundation asked me just the week prior to the conference if I knew of a botanist who would be willing to present a talk at their fundraising dinner. I asked John if he would be willing to address some of the German descendants of the missionaries who he was

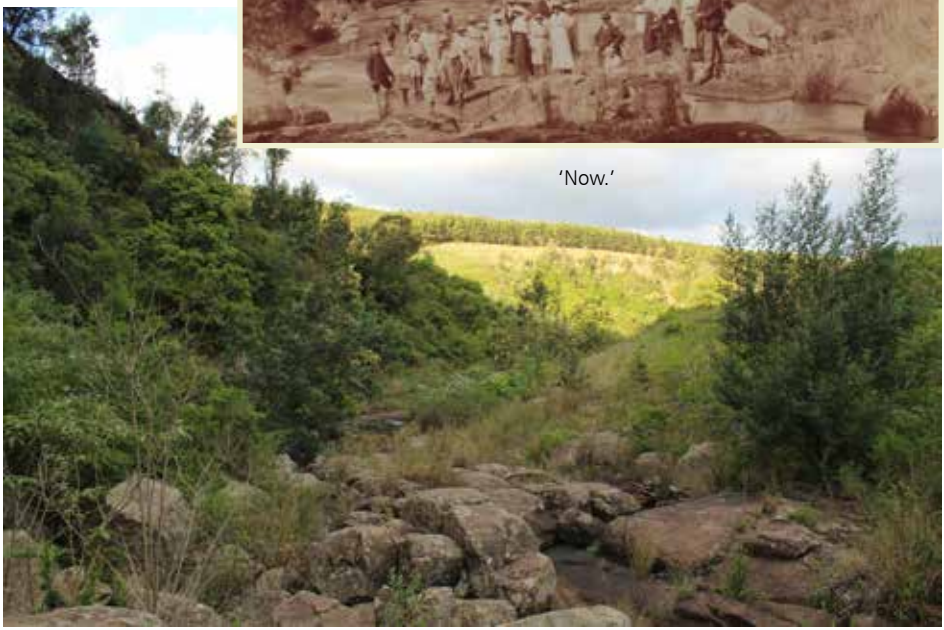


Picture 2 – same site now.

referring to in his talk and he accepted the challenge. We needed an old photograph of the missionaries to use in the advertisement for the dinner. My wife is the assistant curator at the Hermannsburg Museum, so instead of pestering John for a picture from his talk, I asked her if I can photocopy one from the museum archive. She presented me with the one shown in Picture 1.

The site where the subjects were photographed is well-known to me. It is situated about 10km from my house in a bend in the upper reaches of the Hlambitwa River. The Hlambitwa River is a tributary to the Umvoti River. For the past few years we have been documenting all the isolated forested areas where indigenous trees still grow within the vast plantations around Hermannsburg. This is one of the few sites where there are still some *Clivia miniata and C. gardenii* to be found. Most other indigenous forest patches have either been ruined to make way for subsistence farming or have been so infested with pine and wattle seedlings from the adjacent plantations that very little natural underbrush survive. I found this undisturbed site in 2014 and have been visiting it annually to follow the flowering cycle of *Clivia*. The colours of the flowers are mainly dark orange but there are a few with lighter shades. Variation is mainly in the colour of the flower throat. Most of the flowers are with yellow throats but a few have white and there are even some with green throats. An interesting phenomenon occurred in 2016 when very few plants produced flow-

'Then'



'Now.'

ers. They all pushed umbels but almost all were infested with worms during the bud stage. As a result no seed set that season but the flowering in 2017 was spectacular.

Let's get back to the photo in picture 1 which was taken around 1890. In the right bottom quadrant is a small boy holding a single flower. It is odd that he is the only boy in this picture who is holding a flower. He seemed to have dropped the others just before the picture was taken. Furthermore, the flowers are clearly *Clivia* and with a little imagination we may surmise that it is a yellow or light form of *C. miniata*. Al the other flowers that are held by the subjects seem to be *Clivia* but are dark in comparison to this one single umbel.

The scholars and teachers of the Hermannsburg missionary station often held picnics at this site. The site was then called "The Dassies" due to the large population of Rock Hyrax that were living among the rocks. There are still some rock rabbits living there but the population has decreased in recent years. We found over 30 pictures of these outings all dating back to the period between 1880 and 1920. Although the details in many of these pictures are blurred, others do show individuals holding bunches of *Clivia*. These picnics were organised to celebrate the onset of spring. They were mostly organised during September and October after the cold winters but before November which marks the onset of the rainy and misty season. The rain would have made travel on the muddy roads a nightmare and the mist would have damaged the photographing equipment.

Yellow *Clivia* from the area

When I moved to Hermannsburg in 2008, the garden was unkempt but contained many *Clivia* and *Agapanthus*. The original owners loved gardening and were enthusiastic plant collectors. There was one patch of *Clivia* that was special to me. This favourite patch of plants had 10 umbels of yellow flowers in 2009. I split the clump and gave many of these yellow flowering plants away as they did not have a great form. I labelled the offsets HMB Yellow. It later came to my attention that many gardens in the town contained this yellow clone. Unfortunately the origin to the HMB yellow clone is lost as no one could recall its source. One theory is that it could have originated from

Examples of *Clivia* flowering in the area.

the German trader who owned a shop on the road to Stanger in the mid nineteen hundreds as he sold flowering *Clivia* plants during spring. These plants were apparently collected from a farm near Hermannsburg. Another explanation could be that the original clone came from the Dassies site and spread through the small town over the years. The yellow clone has a thin leaf with a sharp point that is typical to the *Clivia* that grow on the Hlambitwa River. However, the form of the flower is more like the plants found to the South of the site on the Ersken Farm.

One other spectacular plant from near the area to the South is Vroegop Yellow, a yellow *C. gardenii* that was discovered on a privately owned farm in 2012. An offset of Vroegop Yellow was collected and documented with Ezemvelo Plant Collection Permit # OP49/2016 and has been presented to the Botanical gardens in Durban for preservation in their heritage collection. Unlike other natural yellow variants in nature, there were more than one clone of this yellow. To date thirteen different clones have been documented, all with slight differences in leaf, and flower characteristics.

The first documented yellow *C. miniata* was collected in Zululand in 1888. It was named Saunders yellow to honour the Saunders family who were instrumental in its discovery and documentation. It was later formally described as *C. miniata* var. *citrina*. Collectors now refer to this clone as Eshowe yellow as it was collected in the Eshowe area. If the *Clivia* in picture 1 was a yellow, it is likely the first yellow *C. minata* ever discovered as the date of the picture precedes the discovery of Saunders yellow. Unfortunately the identity of the boy in the picture is not known. But one thing is certain, he was an ardent *Clivia* enthusiast, not being ashamed to be seen by future generations as the only boy holding flowers in this picture!

Acknowledgements

- John van Der Linde for his efforts to connect the dots.
- The Hermannsburg Museum for allowing the reprinting of the photographs.

CLUB SHOWS 2018

Toowoomba Clivia Club show

The 2018 Toowoomba Clivia Society's Clivia Show held at the TAFE Horticultural Centre was again a great success over the 6 days of the Show. Over 140 plants were on display this year as well as seeds, seedlings and plants available for sale. This was the 13th show held at the TAFE College. We were privigiled to have Mr. Kev Larsen, our Patron and a founding Member of our Society officially open the show. Kev is also a Nursery owner and is well known in Toowoomba/Fernvale area for his very informative *Clivia* knowledge. We are very proud of the fact that we raise much needed funds for our nominated charity each year through our gold coin donation entry and our raffle. We presented a cheque to Beyond Blue, an organization assisting in the mental health area for $3,500. We were visited this year by the Premier of Queensland, Annastacia Palaszczuk who was awestruck by the beauty

Lionel Marten received the Kevin Walters Trophy for Best Plant on Display, as voted by the public. Plant, Grace Miller

of the displayed plants shown in the attached Show photos. Our congratulations went to Lionel Marten who won the Visitors Choice, Kevin Walters Trophy for 2017 as well as for 2018, this year with his Clivia named Grace Miller, hybridized and owned by L & J Marten.

Melbourne Clivia EXPO 2018

Lisa Fox

Despite the concerns of the members that there would not be enough blooms for the show, owing to the cold weather, the 2018 Clivia EXPO the best one to date. The quality of the plants surpassed all other years and the public complemented us on the huge variety of colours, sizes, shapes of the flowers. The variegated *Clivia* leaves held a strong attraction for several visitors.

There was a steady stream of visitors throughout the day. The busiest part of the day was the early morning, witheveryone looking for the best plants on the sales tables. Sales were well represented by four individual sellers plus the 'Trading Table'. Visitors enj oyed the display plants, the floral art, demonstrations, raffle, and took advantage of the relaxed atmosphere, enjoying coffee, tea, cake and sandwiches surrounded by a mass of coloured flowers.

Tanchoo

We were very pleased to see a good number of new members sign up with the club. We look forward to welcoming these new members at out next meeting.

This year, 2018, we held a live auction of 26 quality plants and a *Clivia* print. The auction was well attended, with bidding constant and at times, fierce. The auction is an opportunity for members of the public to bid on rare plants that are generally not available to them, and it was great to see the public bidding and winning plants, not just the enthusiasts. The winning prices varied between $55 and $320 with the highest price being paid for the well-known peach, Comet. Five green flowering plants were sold for prices between $150 and $280 proving that the plants remained popular with the public.

'People's choice'
The winning plants with their owners. Alan O'Leary, Peter Haeusler and Terry Edwards.the requisite permit from the local authorities.

A few well-bred red bronze flowering plants sold at prices ranging from $130 to $200 and offsets of Sir John Thouron, The Artist and a yellow *C. caulescens* reached into the $200s. A few lots did not sell during the auction but several were sold after the auction. Two lots were very kindly donated to the Melbourne Clivia Group by Hugh Williams and Helen Marriott.

The People's Choice Awards

The most popular flower, chosen by the public was Tanchoo 1 x Tanchoo 2 owned by Peter Haeusler. The second most popular flower was 'Best Kept Secret', owned by Alan O'Leary and the third place was awarded to 'Terry's Green', bred and owned by Terry Edwards. These are three very beautiful plants and worthy winners of the show.

We look forward to the challenge of making the 2019 show bigger and better than our 2018 show.

PHOTOGRAPHIC ENTRIES

HABITAT ENTRIES

Winner – 'Habitat' – category – Chris Holtzhausen

Second – 'Habitat' – category – Felicity Weeden

Third place – 'Habitat' – category – Alfred (snr) Everson

SINGLE FLOWER ENTRIES

Winner – 'Single flower' – category – Andrew Kajewski

Second – 'Single flower' – category – Pieter Saayman

Third – 'Single flower' – category – Helen Marriott

'OTHER CLIVIA PHOTOS' - CATEGORY

First place – 'Other clivia photos' – category – Helen Marriott

Third place – 'Other clivia photos' – category – Helen Marriott

Second place – 'Other clivia photos' – category – Helen Marriott

INTERSPECIFIC CATEGORY

Winner – 'Interspecific' – category – Carrie Kruger

Second place – 'Interspecific' – category – Andrew Kajewsky

Third place – 'Interspecific' – category – Pieter Saayman

PENDULOUS CATEGORY

Winner – 'Pendulous' – category – Carrie Kruger

Second place – 'Pendulous' – category – Andrew Kajewsky

Third place – 'Pendulous' – category – Pieter Saayman

'CLIVIA MINIATA' - CATEGORY

Winner – '*C. miniata*' – category – Dawie van Heerden

Second place – '*C. miniata*' category – Carrie Kruger

Third place – '*C. miniata*' category – Dawie van Heerden

OTHER PHOTOS OF INTEREST

'Pendulous species' – Henry Howard

Pendulous species – Carrie Kruger

'Single flower' – category – Andre du Toit

'Single flower' – category – Andrew Kajewski

'Single flower' – category – Carrie Kruger

'Interspecific flower' – category – Pieter Saayman

'*C. miniata*' – category – Carrie Kruger

'*C. miniata*' – category – Frikkie Potgieter

'*C. miniata*' – category – Felicity Weeden

'*C. miniata*' – category – Frikkie Potgieter

'C. miniata'
– category –
Henry Howard

bELOW:
'C. miniata'
– category –
Mike Riska

'*C. miniata*' – category – Pieter Saayman

'*C. miniata*' – category – Andrew Kajewski

'*C. miniata*' – category – Marilyn Paskert

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CLIVIA

TWENTY-ONE

The Clivia Society www.cliviasociety.org

NPO no. 139-860

SARS PBO Tax Exemption no. 930036393

The Clivia Society caters for Clivia enthusiasts throughout the world. It is the umbrella body for a number of constituent Clivia Clubs and interest Groups which meet regularly in South Africa and elsewhere around the world. In addition, the Society has individual members in many countries, some of which also have their own Clivia Clubs. An annual Yearbook and quarterly Newsletters are published by the Society. For information on becoming a member and / or for details of Clivia Clubs and Interest Groups contact the Clivia Society secretary or where appropriate, the International Contacts, at the addresses listed in the inside back cover.

The objectives of the Clivia Society

1. To coordinate the interests, activities and objectives of constituent Clivia Clubs and associate members;
2. To participate in activities for the protection and conservation of the genus Clivia in its natural habitat, thereby advance the protection of the natural habitats and naturally occurring populations of the genus Clivia in accordance with the laws and practices of conservation;
3. To promote the cultivation, conservation and improvement of the genus Clivia by:
   - 3.1 The exchange and mutual dissemination of information amongst Constituent Clivia Clubs and associate members;
   - 3.2 Where possible, the mutual exchange of plants, seed and pollen amongst Constituent Clivia Clubs and associate members; and
   - 3.3 The mutual distribution of specialised knowledge and expertise amongst Constituent Clivia Clubs and associate members;
4. To promote the progress of and increase in knowledge of the genus Clivia and to advance it by enabling research to be done and by the accumulation of data and dissemination thereof amongst constituent Clivia Clubs and associate members;
5. To promote interest in and knowledge of the genus Clivia amongst the general public; and
6. To do all such things as may be necessary and appropriate for the promotion of the abovementioned objectives.

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CLIVIA

TWENTY-ONE

Editor
Glynn Middlewick

EDITORIAL

By Glynn Middlewick

This is my second Yearbook publication. The task of the Editor is often oversimplified. My task is summed up for me by my fellow members, indicating that as an Editor, all I need to do is to decide on the order of the articles submitted!

Working on this latest edition of the Yearbook leads me to admire previous Editors and the many challenges that they have faced over the years. Negative criticism is a destructive tool which is used by many members, mostly back seat drivers, to find fault in a publication that targets the hobbyist. The number of articles, the complicated subjects, the absence of any substance in an article, the absence of or the lack of a winning position for their photographs submitted, the late date of publication, too few or too many pages in a Yearbook, are some of the unpleasantries the Editor is subjected too. If you did not have a thick skin before, you soon develop one!

I appreciate the hard work spent by the authors, in writing articles for the Yearbook or Clivia News, the submission of beautiful photographs for the competition, all of which are essential for the publication of an edition of the Yearbook or the Clivia News. Regular contributors are worth their weight in gold. So many aspects of *Clivia* have been written about previously, making it difficult to come with an original article or with a modification of a subject previously covered.

The articles in this publication have managed to do just that. An interesting read will be found for all members. A regular surprise for me is how often recent articles in the publications are not remembered. I am tempted to republish some of the articles of previous publications and see if anyone notices.

Digital media has changed our lifestyle. We expect instant gratification and this is achieved by publishing an image of a flower or plant on a platform such as Facebook or WhatsApp. The response is immediate from anyone logged into that service. The communication between participants doesn't extend beyond the image. Any written material is not really desirable or if it is brief then it may be acceptable.

The Yearbook 21 includes an article on the breeding of better picotee pattern flowers by George Mann. George has teamed up with Michael Holt and Pieter Saayman and sifted through groups of colour mutation breeding. This is an ongoing project and will updated with time. Felix Middleton covers the adaptation of *C. mirabilis* to arid conditions. Carrie Kruger shows how she has managed to develop some striking 'ghost' flowers. Paul and Sue Kloeck detail the breeding lines that they have decided to concentrate on. Dawie Strydom details his success in developing multitepal bronzes and provides some sound advice. Dirk Lootens of Belgium has submitted an article which compares the good and the bad of Clivias growing, when compared with Phalaenopsis and issues a challenge for the development of a series of hybrids to compete with the likes of Phalaenopsis.

Thank you to all the photographers that entered images for the competition and congratulations to the winning photographs. The photographs were assessed for their photographic merit and not on anything else. Thank you to the judges that had the task of judging each photograph. These include Ian Coates, Claude Felbert and Peter Lambert.

I wish all members an enjoyable read of this Yearbook and encourage everyone to consider the submission of an article for a future publication.

Regards,

Glynn Middlewick

COVER: Highest points of all entries. Anzette Snyders.
TITLE PAGE: Art Category. 7th Place. Mike and Angie Riska
BACK COVER: 2nd Highest Overall Score. Carrie Kruger.

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CORRECTION FOR PAGE 54, OF THE YEARBOOK 20 OF 2019

Dear Glynn,

On behalf of our President Kerry Robinson, we request that a correction be made of an error on Page 54 of the Clivia Society Yearbook 20.

In particular, the last sentence should read ' this year with his *Clivia* named Grace Miller, hybridized by Kevin Walters and owned by L & J Marten.' The initial error was made on a Display card on this *Clivia* whilst on display at the 2018 Clivia Show and the error was only picked up by Mr. Lionel Marten when reading the Yearbook itself.

We seriously value honesty and authenticity with breeding details of any *Clivia* and request that a correction be published in a way you see fit to do so. Thank you.

Yours sincerely,

Gary Conquest
Secretary, Toowoomba Clivia Society Inc
info@toowoombacliviasociety.com.au

REPORT FROM THE CHAIR

G Middlewick

The host for 2020 Annual General Meeting was meant to be the KwaZulu Natal Clivia Club, but fate intervened and as a result of the Covid-19 virus pandemic, the executive committee decided to cancel the physical meeting, replacing it with a teleconference.

The pandemic has led to a lockdown in many countries, which is disastrous for businesses and employment in most sectors. Learning from the lockdown, many have managed to work from home in this digital age. Is there a place for future Annual General Meetings of the Society to be held by teleconferences? The digital age has changed a lot of the behaviour of the Society members. The norm now is to use media such as WhatsApp or Facebook to share photographs mainly, with everybody. This is an easy and inexpensive way to communicate. Do younger members wish to meet up at a venue for club meetings? With the busy lifestyle, family responsibilities and little free time, a digital platform is becoming ideal. The membership fees to affiliate with the Society may be considered by some to be expensive. The option of meeting fellow members at a club venue seems not to be as pleasant or desirable as it was previously. Networking at a neutral venue, with like-minded people was considered an event to look forward to. This has changed and now we mix with fewer people, not even telephone calls are held but instead sms's or WhatsApp messages. Learning from clubs around the country, evidence is that the membership numbers have decreased and that there is a shortage of members who are willing to participate in club affairs.

What is the solution or is there a solution? Some groups on Facebook have a large number of members, but from a recent poll on one of my groups, I learned that the number of active members on the group are few. Some members feel that there is always more to be learned about a hobby and for this reason, meeting up with more experienced members is a good way forward to gain knowledge. The Society, together with the clubs, has been in existence for over twenty years. At the start of the formation of the Society the growth of membership was rapid and then the membership numbers stabilised. Have these members, from that era, got less interested, too old or frail, downsized or are unable to travel to meetings? Whatever the reason, the interest, in general has decreased.

What surprises me most of all, is the lack of interest of members in club matters. Some claim to be unhappy with the activities of a club, but are not prepared to do anything about expressing their feelings to change the routine of the club. If the number of active members attending meetings is not too large, a solution would be to meet at a member's garden to see the cultivation methods employed by them and to interact on a personal level with fellow members.

A positive outlook is perhaps the best way forward for our enjoyable hobby. As long as the *Clivia* growing and hybridising provides challenges, the appeal in the *Clivia* hobby will not decrease.

HONORARY LIFE MEMBERSHIP

Jean-Luc Bestel

PROPOSAL FOR THE AWARD OF HONORARY LIFE MEMBERSHIP OF THE CLIVIA SOCIETY

Proposed by – A. Everson – Chairman of the KwaZulu-Natal Clivia Club

Seconded by – G.Middlewick – Chairman of the Joburg Clivia Club.

Jean-Luc Bestel was born and educated in Pietermaritzburg and joined the KZN Clivia Club in 1996 as a young man studying accountancy. He qualified as a Chartered Accountant and served on the committee several times, usually as treasurer.

Jean-Luc was fortunate to befriend Sean Chubb who willingly guided him in his long and interesting journey with clivias. He has been interested in plants for most of his life. The bulbous species are of particular interest to him. All indigenous plants attract his attention and he developed a major interest in clivias after attending the Annual General Meeting of the Clivia Society in 1995.

In 2000, Jean-Luc assisted the Newcastle Interest Group with their first show, helping with the setting-up, assisting the judges and taking photographs of the show winning plants. He continues to be the club photographer and plays an active role at the shows, meetings and club outings.

Jean-Luc also played a big part in the establishment of the KZN Seed Bank. The seed bank initially offered bulbs and rare plants in addition to the clivia seeds.

As a member, he has been actively involved in the promoting of all aspects of clivia cultivation, not only giving talks at club meetings in Pietermaritzburg, but also travelling to Newcastle and other Northern Natal towns. On his tours he has often supplied pots, potting media and clivia plants to satisfy the need of his enthusiastic learners.

Jean-Luc Bestel

At no stage has he ever expected to be compensated for any of his efforts and duties and feels that the enthusiasm of the members provided him with adequate compensation.

He is aware of the importance of conserving the natural habitats of clivia and other endangered plant species. Living near to many indigenous populations of clivia, he has seen the threat to these areas and to the many changes that have resulted from the destruction of habitat over the years. The challenge to preserve the few remaining habitat areas for future generations, remains a major problem. Unfortunately, the under-resourced Department of Nature Conservation will not be able to preserve some of the habitat areas.

We of the KZN Clivia Club, are very proud of our fellow member, who has developed into a knowledgeable, willing helper, likeable and respected clivia enthusiast. Jean-Luc's commitment to the KZN Clivia Club has been continuous for the past 23 years.

Owing to his commitment and dedication to the KZN Clivia Club, we as a club, would like to nominate Jean-Luc Bestel for the award of Honorary Life Membership of Clivia Society.

Alfred Everson III

ARTICLES

Ghosts: Are they real?

Carrie Kruger: Utopia Clivias, SA

'Ghost flowers' – This description includes flowers with distinct dilution or loss of colour on the inner surfaces of the tepals. (Fig. 1)

'Ghost' or 'watercolours' have earned their rightful place at local shows with a category specifically for 'watercolours', 'ghosts' and 'particolours'. 'Florid White Lips' would also fall into this category. (Fig.2)

As the standards of the 'ghost' and 'watercolour' type of flowers have improved over the years, their colouring has made them very popular with collectors.

Breeding aims:

- One of the fundamentals of plant breeding is to have a passion for what you are doing. Following on from this it is necessary to decide which flower colour or plant form you prefer. You cannot successfully breed all colours and plant types.
- Use only the pollen of the best plants, in this case the 'ghost' plants. The pollen is used for both line breeding and out crossing.
- Our 'ghost' breeding programme has produced some beautiful new colour variations. These include 'pale pink ghosts' and 'picotee ghosts'. Two examples of our 'picotee ghosts' are 'Lipstick Ghost' (Fig.3, 4) and 'Spirit Ghost'. (Fig.5)
- Most of our 'ghost' colouring successes

Fig.1 'Ghost 1 x 2'

Fig.2 'White Lips Blonde'

Fig.3 'Lipstick Ghost'

have resulted from the breeding with our plant 'Ghost 2'. (Fig.6)

History of 'Ghost 2': (information from Charl Malan)

During a visit to Yoshi Nakamura in 1994, Charl Malan received a few 'ghost' seeds. These were planted and when they flowered in 2000, Charl selected the best two 'ghosts' and named them 'Ghost 1' and 'Ghost 2'. These two plants were then cross pollinated and the offspring produced top quality 'ghosts', pinks and yellows.

Fig.4 Ghost with a picotee edge.

Fig.5 'Spirit Ghost'

Breeding results with 'Ghost 2'

- Crossing 'Ghost 2' with 'Florid White Lips' resulted in superior 'ghost' flowers with a lot of white on the tepals. One of the first of these crosses to flower was 'Spectre', which was named the 'Judge's Choice' at the Eastern Province Clivia Club Show in 2016. (Fig. 7)
- When using the pollen of 'Ghost '2, a large percentage of the offspring have the 'ghost' colour pattern. From the cross of ('Pastel' x

Fig.6 'Ghost 2'

Fig.7 'Spectre Ghost'

Fig.8 'Vision Ghost'

Fig.9 'Ghost Phantasm'

'Chiba Orange') x 'Ghost 2' a stunning pink 'ghost' was produced which we have named 'Vision' (Fig.8)

- Another example of our 'ghost' breeding line, using the pollen of 'Ghost 2', is 'Kelly's Globe', bred by the late Mark Lewis. 'Kelly`s Globe' (Large yellow) x 'Ghost 2' resulted in a superior quality 'ghost' flower named 'Phantasm'. 'Phantasm' has been used extensively in our breeding programme over the last three years. (Fig.9)
- 'Ghost 2' does not self well and there is usually only a poor seed set. It is a large robust plant, but does not make many offsets.

Fig.10 'Jon Snow'

Fig.11 'Daenerys'

- The unpigmented stems of the 'Chiba orange' x 'Ghost 2' cross have resulted in some amazing large, near white and some pink flowers. This demonstrates that 'Ghost 2' is split for group 1 yellow. 'Greater White', 'Jon Snow' and 'Daenerys' are typical examples of this cross. (Fig.10, 11).

Collaborative breeding: info - John Craigie Australia

Collaborative efforts between growers have proved to produce some beautiful new 'particolours' as shown by John Craigie of Australia and Hugh Bollinger of the USA.

"Hugh Bollinger provided me with seed of a number of crosses with Dave Conway's 'particolored' clivias. These included crosses with 'Cynthia Ann', 'Louisa' and others. In the years that followed, I provided pollen to Hugh from my 'Aussie Dawn' and 'Aussie Sunset' clivia which were picotee and bicolour types for crossing with some of Dave Conway's clivia. Each year we shared the seeds of our crossing

Fig.12 'Particolour' photo courtesy John Craigie.

Fig.13 'Particolour' John Craigie

Fig.14 Multitepal 'Ghost' photo courtesy of Kevin Akins.

efforts to improve the particolored breeding efforts of Dave Conway. These two clivia are related to a beautiful earlier particolored clivia I bred with internal pencil edging in the throat of the flowers." (Fig.12 and 13)

Conclusion

New developments now also include multitepal 'ghosts'. (Fig.14).

'Ghost'/'particolour' breeding is still in its infancy and going by the results we have achieved this far, we look forward to further amazing colour combinations and the increase in the number of multitepals.

'Colour pattern breeding' to improve the *Clivia miniata* picotee flowers

George Mann

From time immemorial mankind has been manipulating anything and everything around them, from elements to the natural organisms themselves. Hybridisation of organisms can be defined as the purposeful manipulation of organisms in order to produce the traits we like. All living organisms have certain traits that are unique to that organism. By playing matchmaker, a breeder can select the parents to produce offspring with the desired traits.

There are 6 species of Clivias endemic to South Africa and Swaziland namely, *Clivia caulescens, C. gardenii, C. miniata, C. nobilis, C. mirabilis* and *C. robusta*. The term 'hybrid' refers to a cross between any two plants.

Clivia miniata has been a subject of great fascination to gardeners, plants collectors and hybridisers, as one of the most striking member of the family Amaryllidaceae. In South Africa, the genus *Clivia* is unique in that they are shade loving plants.

'Colour pattern breeding' is an inexact method of breeding *Clivia* and leads to varying degrees of success. This method of breeding must not be confused with compatibility breeding that occurs when working with colour mutations of various Groups.

'Colour pattern breeding' can be defined as breeding plants with similar colour patterns with each other to increase the number of plants or to improve the desired colour pattern.

This article will focus on the 'colour pattern breeding' method to improve the quality of the

Fig.1

Fig. 2

miniata picotee flowers.

The picotee flowering plants are basically 'orange' plants genetically with an atypical large throat colour. A true picotee flower is defined as a flower with a colour strip along the outer edge of the tepal, the width of which is not broader than ten percent of the tepal length. This pattern of colour is rare in *Clivia*.

In my own breeding programme, I have used the following four plants to improve the picotee pattern in *Clivia miniata* flowers.

'Klein Erda'

This is a *Clivia miniata* plant that I obtained from Bertie Guillaume. This is a tall plant with the umbel held well above the leaves. The flowers are a pale orange colour with a prominent white throat. Tepals are broad and recurved in a full umbel. This plant is split for Group 1 yellow. (Figure 1)

'Pico Starlett'.

This *Clivia miniata* plant is a medium sized plant with narrow leaves. The umbel flowers are loosely spaced and small. The flowers are light yellow to cream in colour with an edge of pink on the tepals. It is a true picotee and produces flowers with a similar pattern when self-pollinated. I used a self-pollnated seedling of this plant in my 'pattern breeding'. (Figure 2)

I pollinated my seedling flower with 'Andrew Gibson', another *Clivia miniata* plant.)

'Andrew Gibson'.

This *Clivia miniata* is a medium sized, narrow leaf plant, that offsets well but is prone to flowering out of season. When flowering in season the plant produces an umbel well above the leaves. The flowers are a 'Splash' versicolour with the colour on the back of the tepals bleeding through on to the front of the tepals with age. (Figure 3)

Fig. 3

Fig.4

Fig. 5

Fig. 6

throats and prominent orange tips. (Figure 4).

I used the 'USA Orange' plant as the berry plant and pollinated it with 'Klein Erda'. My theory was to breed plants with a similar large throat pattern. The 'USA Orange had a large throat pattern, but the flower was not that impressive. 'Klein Erda' has large well shaped recurved tepals with a big throat size.

All the seedlings from this cross had large throats with one plant that was exceptional. This plant I named 'USA Orange x Klein Erda No 2'. (Figure 5). Two other siblings had larger flowers, with the throat not as large as the first

'USA Orange'

This plant was also obtained from Bertie Guillaume. Bertie had received seeds from Joe Solomone in the USA. A range of flowers emerged which all had a picotee pattern. All the plants were named as 'USA Orange Strain'. The plant I received was one of a group of similarly looking plants. It is a large, tidy, broad leaved plant. The umbel flowers on a tall peduncle, well above the leaves. The flowers are of a medium size with large white

Fig. 7

Fig. 8

Fig. 9

one. (Figure 6) and (Figure 7). A comparison of the seedlings in flower may be seen in Figure 8. The flowers were similar, with Figure 5 being different and exceptional. (Figure 5). The 'colour pattern breeding' method is imprecise. By crossing two plants with similar patterns together, the appearance of the plants in Figure 8 demonstrate that the expected outcome was achieved. The seedlings mentioned above have been crossed with each other and as yet the seedlings have not flowered.

The second line of plants that I worked with

Fig. 10

in order to try and breed an improved picotee pattern, was the crossing of a self-pollinated seedling of 'Pico Starlet' with 'Andrew Gibson'. The seedling flowered for me in 2011. (Figure 9), This flower had a very large throat with some colour present only on the tips of the tepals.

Take a closer look at 'Andrew Gibson' and then look only at the pattern on the tepals. The colour pattern on 'Andrew Gibson' can at best be described as a versicolour that bleeds into the front of the tepals, thus it does have a picotee type colouration. By crossing 'Andrew Gibson' with a plant having a large throat, 'Pico Starlet', we obtained pigmented seedlings with a pico-

Fig. 11

tee type pattern. This results illustrates that 'colour pattern breeding' played a large role, with the pattern clearly having carried over into the progeny. Similar good results have been achieved by other breeders using 'Andrew Gibson' on plants like 'Chiffon' and obtaining superior picotee pattern plants.

I had to make a decision with regards to further breeding with the flower in Figure 9. ('Pico Starlet'

Fig. 12

X 'Andrew Gibson'). My decision was to pollinate the flower with a similar pattern plant. The best choice I had available, was 'Klein Erda'.

Four plants from this cross have flowered so far with a large variety of flowers. All the flowers had large white throats with picotee patterns. The first plant that flowered had a double umbel, was dark orange in colour with a large throat. The tepals had a large percentage of colour on their tips. (Figure 10). The second plant to flower was a superior plant with light orange tips and a light green throat. The tepals were broad and recurved. (Figure 11). The third flower was just as good but with slightly smaller flowers. The colour pattern is a true picotee. (Figure12). The fourth seedling to flowers had small flowers but retained the picotee pattern on the tepals. (Figure 13).

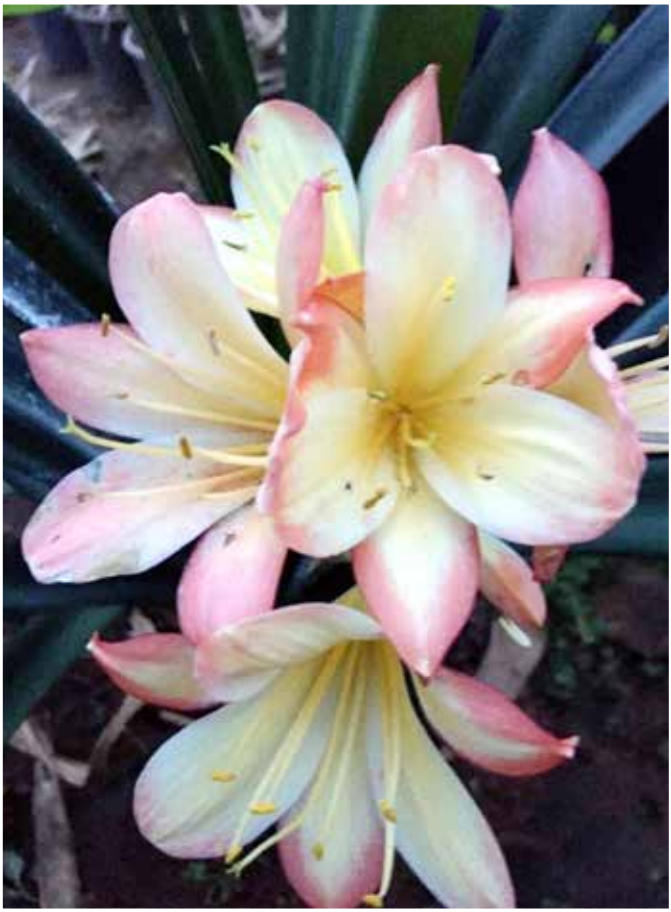


Fig. 13

The value of 'colour pattern breeding' is often disregarded owing to the unpredictability of the results. Using 'colour pattern breeding' in the correct way, opens new doors with endless possibilities with 'colour pattern breeding'. This method has been used in breeding a whole range of interesting flowering plants, for example 'ghosts' and 'watercolours'. The possibility of including various colour patterns in a variety of plant colours is an interesting challenge.

When you look back and realise what has been achieved in general plant breeding, it is difficult to believe that many further changes are still possible. With *Clivia* breeding I believe that we are still in the infancy of the eventual potential of this fascinating plant. Flower colours and patterns are two aspects of *Clivia* breeding. Other fields for further development include the flower shape and size, the plant size, the leaf width, length and colouring, making the possibilities almost endless.

Clivia mirabilis: Adaptation to an arid habitat

Felix Middleton

It is well known that *C. mirabilis* survives in an environment where other plants of the genus would not survive. This species is believed to inhabit specific ravines in Oorlogskloof, a location which is dominated by semi-arid vegetation. The rainfall in the upper reaches of the Oorlogskloof valley is slightly higher than that of the environment above the escarpment to the East and much higher than that of the flats to the West below the escarpment. Nevertheless, the annual rainfall is less than half of that found in other habitats of *Clivia* species. I contacted the South African weather Bureau in 2018 in an attempt to obtain the average rainfall in six areas around South Africa. The objective was to compare the precipitation patterns of all the locations where the different *Clivia* species grow. Unfortunately, this was not readily available unless I supplied a formal application to describe the project, the possible outcome of the project, and my collaboration with academic institutions on this project. I motivated with all the relevant information and to date have received no reply. Fortunately, one of the landowners in Oorlogskloof has been keeping daily rainfall readings for more than a decade. He kindly supplied me with the raw data.

The objective of this writing is to show the variation in rainfall between the growing sites. Do not expect to find a definitive answer to the question of how *C. mirabilis* survives in this arid setting.

C. mirabilis in shade.

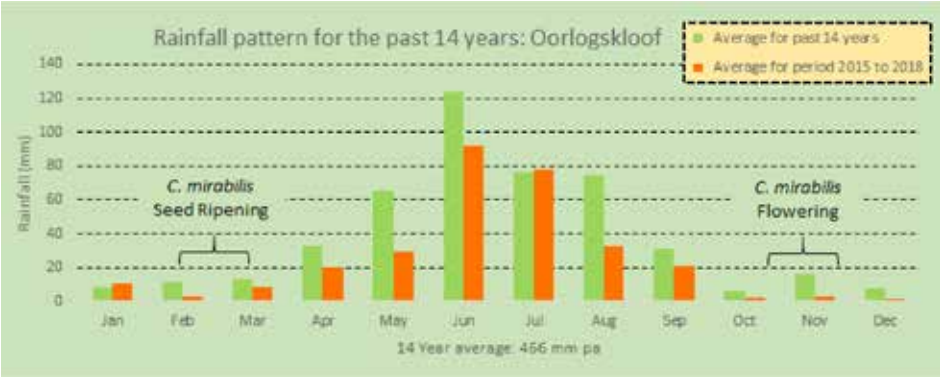
C. mirabilis in full sun.

What we know and can deduce from observations in Oorlogskloof

C. mirabilis plants generally grow at an altitude between 600m to 800m above sea-level. Mist accumulates on the West side of the escarpment, outside the actual Oorlogskloof valley and seldom drifts over the escarpment into the valley itself. I have only seen mist in the valley on one of my visits and the mist was well above the zone where plants grow. My personal observations were collaborated by local landowners. The mist is thus, I believe, not the main source of moisture for these plants.

Several people believe that the plants receive significantly water runoff from the sandstone capping of the mountaintop above them. This may however not be the main source of moisture for the plants. Plants are found in

Systematic die back of leaves.



Rainfall patterns for Oorlogskloof over the past 14 years.

sparsely forested ravines but do not populate all wooded ravines. The plants that I observed are only found in the ravines that are directed towards the East or South-East. Humidity in these ravines is noticeably higher than in the surrounding area. Moss is abundant on the underside of branches and on the South facing side of the rocks in these ravines. This indicates that moisture is moving in from the river up into these ravines from the South. A more definitive way to understand the survival of these plants in this harsh environment, would be to set temperature and humidity data-loggers in sites which contain plants and in similar sites in the area that do not contain clivia plants. These data-loggers would be able to show the differences in microclimate that promote the survival of these plants. Unfortunately, the cost of such a project may not justify the usefulness of the results.

Imprinting of leaves clearly demonstrated.

C. mirabilis plants generally grow among rocks, boulders and in rocky screes. Seed dispersal by birds and rodents may partly explain the high incidence of plants among the rocks. Birds perch on rocks while removing the edible seed coating and rodents prefer to eat in the safety of the rocky surround. Another reason for the plants surviving amongst the rocks, is that would receive more moisture in that position. Roots easily grow down the side of the rocks and extend deep among the subterranean rocks where they gain from the runoff. Moisture also evaporates rapidly from the topsoil where temperatures can be very high. On the other hand, soil temperatures are generally more stable and cooler among the rocks which can result in higher condensation and runoff down into the subterranean spaces among the rocks. This fact is well illustrated by observing the lush growth of weeds and grasses alongside a tarred road. This growth is a lot different from the grassland further from the road.

Seedling survival rate of *C. mirabilis*

C. mirabilis seedlings are for the most part not easy to grow to adulthood. I assume that not many have the genetic potential to reach adulthood. We are currently experimenting with different potting mixes to determine which will best benefit the cultivation of this challenging species. This experiment has been running for the better part of five years but

Natural selection of the strongest.

we still need to find a significant difference in medium preference. This is owing to the genetic diversity and apparent genetic disposition of many seedlings. Very few are quick growers, some are still the same size as when they were first planted and several are unhealthy. Only about 5% are maturing at the same rate as seedlings from the other *Clivia* species. In nature we estimate that on average less than 1% survive to year 6. I have visited the sites for the past 5 years and am surprised at the large number of seedlings among the few mature plants. In contrast there are very few sub-adults of between 3 and 5 years of age. There seems to be groups of similar aged plants in some populations, illustrating a possibility that in some years no seedlings survived and in other years a larger number survived.

The dry spell over the past 5 years has been described as the worst drought in a century for Oorlogskloof. Graph 1 is a representation of the average rainfall over the past 4 years as compared to the average long-term rainfall. The average annual rainfall for the site is just over 450mm. In 2017 the area received only 150mm for the whole year! Most seedlings survive to the two-leaf stage then die. However, immature plants in the area are possibly the result of the normal rainfall which was experienced in the period prior to the drought. For instance, 2007 and 2008 are noted as years with above average rainfall. Seedlings germinating in this period would have had a better than average chance of survival. The large number of sub-adult plants attests to this.

Seed dispersal amongst rocks.

Development of multitepal bronze flowers using 'Bronze Green Boy'

Dawie Strydom

1. Introduction

Multitepal development of clivia flowers is an interesting challenge for breeders. Most of the existing multitepal flowers are orange or shades of orange. Some yellow multitepal yellow flowers are available, but many of them are not yet up to the standard of the orange multitepal flowers. Most of the multitepal genetic material in South Africa has been obtained from Mr. Nakamura in Japan.

The breeding results included below are derived from the crossing of two green throated multitepal plants grown from seed obtained from Mr. Nakamura.

'Bronze Green Boy' does not readily form seeds with pollination. The green throated multitepal plants from Mr. Nakamura were used as the pod parents and 'Bronze Green Boy' as the pollen parent. The description that follows is the method by which I used the pollen of 'Bronze Green Boy' to develop a multitepal plant with the characteristic flower shape and colour of 'Bronze Green Boy'. Two generations of breeding were required to optimise the multitepal shape and colour.

Figure 1. 'Bronze Green Boy'. Note the petaloid development in some of the flowers.

Figure 2. 'Orange green throat multitepal A' with 7-9 tepals grown from seed of Mr. Nakamura.

Figure 3. First generation result. F1 'Orange with Green Throat Multitepal A' pollinated by 'Bronze Green Boy'.

Figure 4. 'Orange green-throat mutitepal B' used in the 2nd generation as the pod parent. Recurving tepals with symmetrical spacing illustrated.

2. First Generation

'Bronze Green Boy' flowers have a broad tepal which is slightly recurved with a bronze to brick colour. (Figure 1). The 'Bronze Green Boy' in my collection was purchased as an offset from Louis Swanepoel about fifteen years ago.

The 'Green throated orange multitepal A'. (Figure 2) This plant was used as the pod parent because of the green throat.

The first generation of the pollination of the flowers in (Figure 2) by 'Bronze Green Boy', produced green throated multitepal flowers with some petaloid flowers present. (Figure 3).

3. Second generation

The pollen of the F1 flower in Figure 3 was used to pollinate another plant of Mr. Nakamura. This second plant has a multitepal green throated flower with recurving tepals which are symmetrically spaced. (Figure 4).

4. Results of the multitepal breeding programme using 'Bronze Green Boy'

There is a great deal of variation in both the bronze colouring and the flower shape in the F2 generation. A selection of the best bronze multitepal flowers, with more than 8 tepals per flower and with open recurved flowers are illustrated in figures 5-8. The flowers have inherited the strong bronze characteristics as well as the broad tepals and recurving tepals. These features are prominent in both 'Bronze Green Boy' and the 'Orange green throat multitepal B' of figure 4. The green throats are more prominent F2 generation than in 'Bronze Green Boy', adding an additional colour characteristic to the flower. Some of the plants of the second generation will be culled. These include flowers with narrow tepals and tulip shaped flowers.

Figure 5. Plant 1 – 'Bronze Green Boy' F2 multitepal.

5. Conclusions

The 'Bronze Green Boy' flower was a successful choice from which bronze multitepal flowers can be developed. Some of the offspring had broad recurving tepals, evenly spaced with prominent green throats. (Figures 5, 7 and 8).

The key to the successful development of the multitepal offspring is, I believe, the presence of the petaloids (Figure 1) present in the 'Bronze Green Boy' flower. Adding to this is the use of the

Figure 6. Plant 2 – 'Bronze Green Boy' F2 multitepal

Figure 7. Plant 3 – 'Bronze Green Boy' F2 multitepal.

tepaloid pollen in the first generation hybrid. The second generation crossing with a superior green throated open flower, (Figure 4), made a positive contribution to the open, recurving flowers in Figure 5.

Future development to enhance the bronze colour and flower shape are the challenges that lie ahead. This I will attempt by sibling crosses and by using the tepaloid pollen of 'Bronze Green Boy' on the offspring.

Figure 8. Plant 4 – 'Bronze Green Boy' F2 multitepal.

AN OPPORTUNITY FOR THE *CLIVIA* WORLD
In search of a new series of hybrid Clivias

Dirk Lootens

1. Introduction.

In Western Europe the role of a *Clivia* is as an indoor pot plant. The plant is often placed on a windowsill in close proximity to a radiator. When the plant grows too big for the pot, the plant is transferred to a hallway, a dark corner or on the veranda. The growing conditions vary a lot and may be in too dark a position or receiving natural light, temperatures varying from frost conditions to a fixed 20 degrees centigrade throughout the year. Watering of a clivia plant is often on a weekly basis. As with all indoor plants the clivia is often given excess water. The growing condition are often not ideal for reblooming of the clivia flower or often the flower peduncle is too short.

The insulation standards of homes in Europe are being improved every year, providing a constant temperature throughout the year. The ideal living standards for the residents do not allow for the ideal conditions for clivia cultivation.

2.Phalaenopsis, the most popular of all pot plants.

Over the last 35 years, Phalaenopsis has become the most popular of all house plants. Analysing the reasons for the popularity of the Phalaenopsis plants, allows us to understand the strengths and weaknesses of the *Clivia* as a pot plant.

The reasons for the popularity of the Phalaenopsis:

- The first Phalaenopsis pot plants were produced in the early 1980s. At that time there were more than 350 000 Clivias produced in Europe (own estimation). In 2018 the total turnover of house plants at Royal Flora Holland, the most important of the auction sales in the Netherlands, was 1676 million Euros. The turnover of Phalaenopsis was 470 million Euros, about 28 percent of the market. (Annual Report Royal Flora Holland 2018). *Clivia* turnover was probably between 1.4 and 1.8 million Euros. (own estimation). As can be seen the Clivia production is small compared with the Phalaenopsis.
- The annual production of Phalaenopsis is between 150 and 200 million units (own estimation). Given that (before Brexit) there are 512.4 million inhabitants in the EU, this means that every European is buying a new Phalaenopsis every three years. If a family unit has three people on average, then each family buys a new Phalaenopsis every year. For *Clivia* the figures are: based on an annual production of +650 000 pieces, only 1 out of every 262 families has purchased a *Clivia* in a single year. In other words, the time lapse before a new (three member) family would buy a new *Clivia* is almost 9 generations.

Why has the popularity of the Phalaenopsis grown so much? Why is the *Clivia* not so popular anymore? The main reasons, I believe, are listed below:

Phalaenopsis	Clivia
Orchids still have an exclusive reputation. Everybody wants an orchid and they pride themselves if they are able to rebloom an orchid. They often have a small collection of different colours.	*Clivia* plants are considered as old-fashioned, especially in Belgium. This is less true for the rest of Europe.

Phalaenopsis	Clivia
A Phalaenopsis scape or spike often has flowers in bloom for 3 to 6 months at a time. By cutting off the stem once the flowers are spent, about 1 cm above the second or third dormant bud, it is possible to get the same flower stem to flower a second time. In this way, a plant can flower 6 to 12 months a year.	If a consumer manages to get a *Clivia* to flower again, this will usually be limited to a maximum of one flower peduncle per year. The flowering time is usually limited to 1 month. A positive feature of a second flowering stem is the pride of success of the owner. By pollinating the flowers and producing seed, the feeling of achievement is a positive outcome for the owner.
Cloning Phalaenopsis has decreased the production costs of the flower. The loss rate has been reduced from 20% for Phalaenopsis seedlings, to less than 1%.	Depending on how you define loss percentages (not flowering / broken stems) of clivia, you can expect a loss of between 10% and 20%. This high percentage loss has a strong negative impact on the production cost
The production of phalaenopsis is predictable, owing to the success with cloning and thanks to the knowledge gathered over the last few years This makes it possible for a grower to plan (e.g. >100,000 Phalaenopsis in the requested colour mix and the right blooming time for sale at a specific week number).	The *Clivia* production is much less predictable. For example, in order to be able to deliver 100,000 plants in a given week, at least 3 times as many plants need to be prepared from which the sales batch can be chosen.
Phalaenopsis are now produced throughout the year and production can be arranged for such a demand.	*Clivia* is a seasonal product. Large orders in the perfect flowering stage can only be arranged for the peak season.
New techniques have made it possible to produce Phalaenopsis with three to four flowering stems/scapes. Each new leaf can produce a flower peduncle. Creativity in the breeding of the Phalaenopsis has developed a multitude of different forms, such as the waterfall form, the coloured ones, 'singolo', which have become designer objects. (photo 1A & 1B).	With *Clivia* there is not yet sufficient knowledge on how to get the *Clivia* to flower at a specific time of the year. *Clivia* plants have already been developed to have double umbels. The growth model at present is still one bloom spike for every 3 leaves. There are examples of creative applications with Clivia (see photo 2).
The colours vary from perfect white, yellow, purple, pink, salmon...	The colour mix goes from bronze, red, orange, pink to yellow & green with a lot of new colour variations.
The current clones can also be re-flowered perfectly in the living room by the owner. This enhances the consumer's experience. New buds only develop during Spring, the natural flowering period.	Clivias have 2 natural flowering periods: the first and main one is in Spring. There is a 2nd flowering period about 4-5 months later. Re-flowering of *Clivia* is perfectly possible, but unfortunately the buds are aborted or the peduncle length is short and flowers develop at the base of the plants.
The plant leaves are not always special, the leaves are often even half shrivelled 'hanging ears'.	*Clivia* plants may have exceptionally attractive foliage throughout the year. This leaf characteristic of green and variegated colouring may have great appeal throughout the year for the owners.

Photo 1A. Phaleanopsis in a 'Green Bottle'.

Photo 1B. Multibranched plant.

Photo 3. *Clivia* in a glass receptacle. roduced by VDE plants. Exclusive varieties sold under the 'Intenz Home Brand'.

3. In search of a *Clivia* that will compete with the appeal of the Phalaenopsis

Martin Luther King was quoted as saying "I have a dream……"
Well, let's define the 'dream' with regards to *Clivia*:

Flower volume > 35

The flower volume is determined by a formula that is a function of time and variables such as the number of peduncles, the number of flowers, the length and width of the tepals, the diameter and fullness of the flower head ...
The basic principle is: 'Measuring is knowing'.

- Flowers:
  - Flower peduncles must extend above the leaves, at a temperatures of 21°C.
  - a long blooming period: > 6 weeks at 21 °C.
  - Full flower heads: e.g. 17 cm across, >15 flowers on one peduncle, pedicel between 2 and 3 cm; petals > 25 mm wide and > 60mm long.
  - Flowers that are already displaying some colour before they open. This is important for the shelf life in the shops.
- The flowering frequency:
  - Each plant must be able to produce 3 flower peduncles per year with at least 2 different flowering times. This aim is to ensure that the peduncles are seen growing twice a year and the flowering period per year is extended.
  - In total we obtain a flowering experience, from the bud to the end of the flowering stage, of at least 20 weeks per year.
  - If pollination is successful, the ripening of the berries and the harvesting and germinating, will lead to an added benefit for the owners.

Production lines

We need at least 10 production lines in which phenotypic variation within the population does not diverge by more than 10%.

- This means that all plants within the lines conform to the flower, leaf length and width and the same number of flowers allowing for no more than 10% variation.
- The production lines are distinguished by features such as colour or by plant size. The above production lines will find their way to the end consumer mainly in the retail market. In addition to the above production lines, provision must be made for the purchaser

to 'grow their own unique plant'. This group would purchase a plant that is grown by Clivia breeders with the aim of flowering something unusual and this the central objective of this group of purchasers.

Other characteristics which will add value:

- A well-shaped plant:
- characteristic 'fan-shaped' like the Chinese Clivias.
- dark green leaves, without any leaf damage.
- leaves with a length to width ratio of > 5,5 (e.g. leaves 32 cm long should be at least 6cm wide). For the standard *Clivia* line (= pot size 12/13 cm) the longest leaf length at first flowering should be 32 cm long.
- Fragrance
  - there are many lightly scented *Clivia*. If we could intensify the fragrance with inbreeding, this would greatly improve the appeal of the plant.
- Fisease susceptibility
  - the plants must carry a very high level of resistance to disease so that bio-production is possible. By breeding the resistance must be developed against fungi, viruses, mealy bugs and aphids.
- Air-purifying
  - if it can be scientifically proven that *Clivia* improves the air quality in an indoor room, this would be a strong selling point.
- Climate improver
  - if we could incorporate *Clivia* into a system that improves the indoor climate of an insulated room, this would prove to be an added benefit of having *Clivia* plants indoors.
- Extending the vase life of *Clivia* as a cut flower.

4. What material is available to develop the *Clivia* as an ideal pot plant?

4.1.1. Belgian hybrids fast, faster, fastest"

Throughout the past decades in Europe/ Belgium breeding by selection has produced Clivias that flower earlier in the season and flower after two years from germination. The De Coster family were the first to achieve a major breakthrough in this regard.

Through intensive selection and breeding work, the following has currently been realised:

- All Clivias produce their first flower bud after 12/13 leaves.
- about 70 % can be sold with a good bud within 25 months after germination and 85% within 30 months. Optimal climatic conditions are necessary to achieve this result.
- A growth module standard of 4 or 5 leaves, for the next flower peduncle to develop.
- The average growth rate (defined as the number of leaves produced per time unit) is faster compared to the average of the *Clivia* plants from e.g. South Africa. My estimation is that, depending on the climatic conditions, Belgian hybrids can produce up to 5-6 leaves in one year while South African hybrids produce +-3 leaves in the same period of time.
- There are plants that develop 7 to 8 leaves per year, using 'frost-free conditions'. This refers to a condition where the plants are stored dry and frost-free for at least three months of the year. During the other nine months the plants are kept in the house.
- 'Vinkske', a plant of mine, produces 11 up to 12 leaves a year when kept under standard room conditions all year round.

4.1.2. Early flowering/out of season

- The objective of breeding selection has been to produce early flowering plants as these plants would sell at a higher price.
- Another achievement of this breeding selection is the production of out of season blooming. If the plants are grown under ideal conditions the plants can flower during two different time periods.

4.1.3. Plants with multiple peduncles

(Below I use a few new terms to define previously undefined plant characteristics for *Clivia*.)

- Dub=
  - This is the plant characteristic whereby a 2-year-old *Clivia* plant has two peduncles at the same time. The flower peduncles are formed in different leaf axils.

- In an average batch of 2-year-old Belgian hybrids plants, +- 5% will flower dub=. Of course, this depends a lot on the realized growth over those 2 years. In the past, there have be records of a batch with a flowering rate of >85% dub=.

• Oks2
  - This is the plant characteristic whereby a *Clivia* plant gives 2 flower peduncles in the same leaf-axil. The flower peduncles may grow separately at +- the same time and can bloom together or one directly after the other (photo 3). It is possible that the 2 peduncles are grown similar to Siamese twins (photo 4).
  - This "Oks2" feature is quite rare in 2-year old batches: +- 1/15 000 plants.

Photo 3. Example of 'Oks2'.

Photo 4. Example of a fused 'Oks 2'.

• Tris
  - These plants have 3 visible flowering peduncles at the same time.
  - These are plants that are a combination of the 2 previous plant characteristics: oks2 & dub=
  - This feature is rare in 2-year old batches: +- 1/60 000 plants.

• Quattro
  - these plants have 4 visible flowering peduncles at the same time.
  - 'Il Quattro' (photo 5). This is the name of the only plant we were able to select from the breeding with 4 flower stems at the same time.
  - This plant came from a cross carried out in March 2009, was sown January 2010 and was selected February 2012 with 4 flower stems.
  - There were flower peduncles developed after 3 consecutive closed modules and one of these had an oks2 developed (although the stems of these last 2 were fused together).
  - This feature has only been found once to date.

Photo 5. 'Quattro' – Sown in January 2010. Photograph February 2012. Peduncle with open flowers on the left. On the right is a fused 'Oks 2'.

4.1.4. More frequently flowering plants.

• Rebloomers (photo 6)
  - If a plant develops a new flower stem in the same leaf-axil months after the first flower peduncle, then this plant can be called a rebloomer.
  - In spite of the fact that this trait may be

Photo 6. The timeline of a first flower, specifically bred for its reblooming characteristic.

more common than we now think, this has been confirmed to my knowledge by two plants only.
- In the meantime, it has been confirmed to be genetically inheritable.

- Blooming twice a year.
  - Plants which flower at least twice a year at different times.
  - A characteristic of these plants is that they often have a different growth model. The number of leaves per growth model is varied to realise the second flower peduncle should there not be sufficient growth that year. I have no knowledge of plants that have made a module of only 2 leaves (mod2). Modules with 3 leaves (mod3) do occur on a regular basis on these plants. (Photo 7)
  - 'Il quattro' is showing this characteristic. This one does this under frost-free conditions. Another plant belonging to this category is 'Tris'.
- 'Vinkske' (photo 8)
  - This is a yellow flowering plant, a species cross.

Photo 7. 'Quattro'. Three consecutive peduncles can be seen. There are only three leaves between the latest flowering buds.

Photo 8. 'Vinkske' timeline.

- This plant bloomed twice in the Summer of 2013, from January 2014 to September 2016 a total of 9 flower peduncles were produced, the number of flowers formed was 184 (or an average of >20/flowers per peduncle). The plant bloomed again February 2017 (28 fllowers), May 2017 (23 flowers) and July 2017 (21 flowers).
- During this period the plant was in a living room, at room temperature. The flower peduncle has always reached a sufficient height.
- In 2018, something must have changed as the flowering schedule has become completely irregular. To date there is no obvious reason why this resulted in the change in flowering.

The South African colours

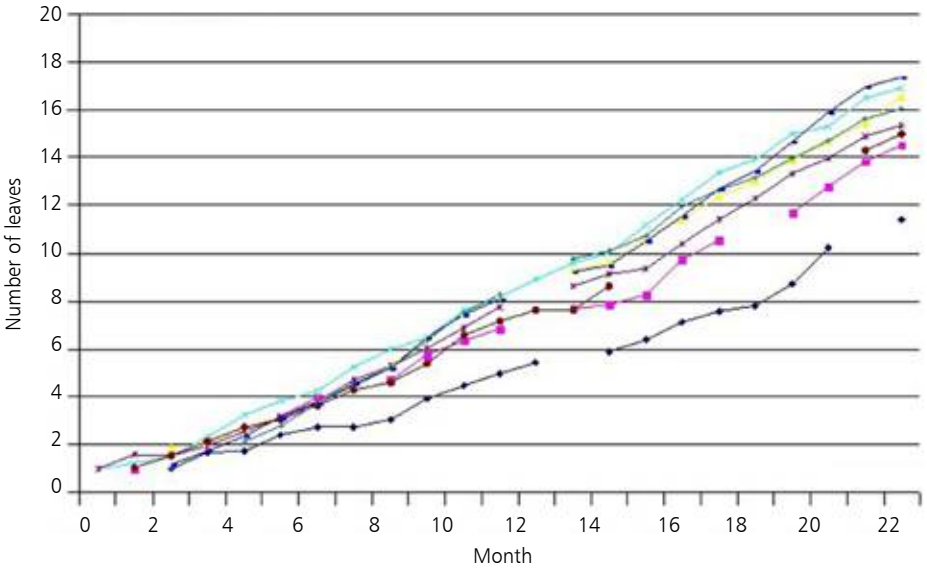
- Internationally, a lot of *Clivia* breeders are hybridising to produce exquisite new colours. There is enough variety in colour and quality to work with for the commercial market.
- At this stage very few of the Belgian Hybrids have been crossed with the newer flower colours.

Chinese forms

- In China, a phenotype of the plants developed there, strives for perfection with regard to the leaves. The desired plants feature dark green leaves which are broad and fan shaped.
- Including this plant characteristic in the 'new' *Clivia* generation adds value to the *Clivia* and the emphasis of the appeal of the *Clivia* may shift to one of a green houseplant.

Other material

- Tetraploids
  - The future will tell, but tetraploidy and multiploidy will undoubtedly play a very important role in the future. The flowering times and flower size will be influenced.
- Multitepal
  - This will also allow the flower volume to be further increased. As far as I know, this form has not yet been crossed with the existing 'Belgian Hybrids'.
- Japanese variegations and Japanese breeding



Graph 1: Clivia's growth curve of 8 different years. If after 23 months a growth of ±16 leaves can be realized, a floweing percentage of ±75% can be expected.

based on the unusual

- Owing to the large variation in the offspring, this does not yet offer any opportunities for a retail market.
- There are possibilities with Akebono forms of leaf colouring, but wholesalers at this time tend to believe that these leaves are unhealthy.

5. Further thinking…

Is *Clivia* interest decreasing? Is it correct that *Clivia* interest appeals mainly to older people? If so, what can we do to change this? Should we accelerate efforts to breed new colours? What else can we do to make the *Clivia* more desirable?

Is there an opportunity leading on from the above story or for garden Clivias?

Is it possible to achieve the above goal on our own, or is co-operation the magic word to arrive at desired results much faster?

- We could start by comparing the same 'clones' by sowing the same seeds and see how their growth varies under different conditions? Do they all have the same length to width ratio?
- How fast are they growing? We could design a graphical tracking system, with each one with his own growing circumstances. (see graphic 1)
- We could encourage universities all over the world to do more research on the possibility of the *Clivia* as an air purifier.
- Promoting an interest among consumers in all countries, as Steve Hickman is currently doing in the UK.
- We could develop a central database that could co-ordinate the collection of knowledge by breeders and lead us to a new understanding of Clivias.
- We could investigate other aspects of *Clivia* growth. What is the reason why some peduncles remain short or are slow to lengthen? What influence does altitude, latitude and light spectrum have on *Clivia* growth? Why do the Spring buds need a cold period, whereas the late summer buds and flowers do not seem to need this cold period?
- Is there at present a plant that happily flowers at higher temperatures?

Review of *Clivia* Groups and Mutations

George Mann, Michael Holt & Pieter Saayman

The flowering season is an exciting time for breeders and growers of *Clivia* plants. The challenge facing all enthusiasts is the decision regarding the pollen and berry plants for seed production. The decision to be made is not a simple one and will depend on the outcome desired. The breeding of specific colours is more easily achieved with a knowledge of the colour groups of plants. Wessel Lotter wrote an article on the yellow flower groups. These are now well established as Group 1 and Group 2 yellows. Some of the yellow plants do not breed as the yellows in Group 1 and 2 so groups have been added to accommodate these yellow flowering plants.

Group 1 yellow Group

Group 2 yellow Group

Various classifications haven been made listing the names of plants and Groups to which they belong.

Some plants on the lists previously available are known not to belong to a certain listed group, so we were tasked with updating the known plant groups. The lists we have made is based on the current information and may at some point be altered.

5.1. What is a compatible group of plants?

When referring to plant compatibility, we are referring to the flower colours the seedlings will produce, when two compatible plants are crossed with each other. The seed-

lings of such a cross will produce flowers of a similar colour to the parents. The reason for this is the sharing of genetic colour mutations by the parents.

The advantage of knowing which groups the various plants fit into will help with the prediction of the flower colour when crossing compatible plants.

Plant compatibility groups are known for yellow peach, peach, splash and blush types of *Clivia miniata*.

5.2. Colour Mutations vs Colour Patterns

A colour mutation is a genetically inherited variation found in *Clivia miniata*. A colour pattern describes the colour distribution on a *Clivia miniata* flower.

Not all *Clivia* flowers fall into the groups listed below. Orange for example is the standard dominant colour of *Clivia* and as such is not a mutation like those listed below. The orange flowers do however have various colour patterns.

A good example of colour patterns would be the 'Chiffon' type plants which are generally large white throated orange flowers. Other examples are 'White Lips' and 'Ghost' flowers which have parts of the tepal colour diluted, giving the appearance of a 'ghost' pattern. When breeding with these plants the outcome produces a percentage of similar flowering plants. With a cross of similar genetic mutations, the offspring produce a 100 percent similar results to the parents. We will focus on genetic mutation groupings rather than on colour patterns.

Group 1 Peach

Group 2 Peach

5.3. Methods used to test a group

There is only one fool proof method of finding out which group a *Clivia miniata* belongs to. This is done by pollinating the flower with the pollen of a known plant Group. With some mutations you will be able to identify the compatibility by observing the pigmentation of the seedlings. In other crosses, flowering is necessary to prove compatibility.

'Bleeding' of the colours on the tepals or berries when damaged is not a good indication of the Group. Similarly the leaf shape and

'Four Marys' hybrid

'Appleblossom' hybrid

leaf tip are also not a reliable source for grouping plants. bit of deductive knowledge, it is also possible to include a specific plant into a group. Common sense is also a way in which plant Groups can be deduced. For example: if Plant A is compatible when crossed with Plant B and Plant B crossed with Plant C are genetically compatible then it's safe to assume that Plant A and Plant C are genetically compatible and belong to the same group.

5.4. 'Splits'

A split can be defined as a plant that came about by crossing a plant with a mutation with a plant with no mutation or crossing plants with different mutations, resulting in a plant that is orange in colour. This plant will now be carrying 50% of the genetic mutation of the original parents.

These orange splits are often the result of ignorance, incorrect information, misunderstanding of the Groups, a labelling problem or part of an intentionally breeding programme. To improve certain traits such as flower size, flower count or flower shape the production of a 'split' is intended. This 'split' is then crossed back to the parent or a sibling. The result will produce a percentage of plants with the same mutation but with some better traits than the original mutation plant. By breeding a split plant back to its parents' mutation one can retrieve a percentage of plants with a mutation but also some better traits than the original plant.

5.5. Strain or Series of plants

Many plants available for sale have resulted from the crossing two plants with the same mutation or selfing a plant with a colour mutation. This method is an easy way in which to produce a similar colour mutation. All these resulting plants will be included in the same strain. All the plants in the strain are similar without been identical. Examples of these include the 'Pretty Pinks', 'Hirao', 'Tipperary Peach' and '777'.

The plants in a strain may not be identical in looks, however they look similar in colour, are classified in the same Group and will be compatible with each other. When outcrosses are made with plants not included in the

'Alpha Ndwedwe' Group

strain, the resulting seedlings are no longer part of that particular strain of plants.

5.6. Current Known Compatibility and Groupings.

From our own experience and from colleagues, we have compiled the lists of plants included in various Grousp. Only *Clivia miniata* and freely available hybrids are included.

The terms Group 1 and Group 2 were originally used for yellow flowering plants. Over time some peach flowering *Clivia* have been found to be 'compatible' with Group s – however over the years some peach coloured *Clivia* have been found, that are 'compatible' with either Group 1 or Group yellow flowering plants. The seedlings are unpigmented resulting in flowers of varying shades of yellow and peach. These peaches have been included in a subcategory within the group of yellows with which they are compatible.

'European Peach' Group

GROUP 1 PLANTS

Yellows

The majority of yellow *Clivia miniata* fall into this group. Flowers are yellow, produce yellow berries and the seedlings from crosses within the same group are unpigmented when germinated.

- Albany Yellow
- Arturo's Yellow
- Blitz
- Chiba Yellow
- Col Pitman Yellow
- Eshowe Yellow
- Howick Yellow
- Jim Holmes Yellow
- Jumbo Yellow
- Karkloof Yellow

- King Hamelin Yellow
- Kirstenbosch Yellow
- Mare's Yellow
- Miss Perfect
- Noyce's Yellow
- Pat Quinn Yellow
- Pen Henry Yellow
- Saunders Yellow
- San Marco Yellow (syn. Solomone Yellow)
- Sir John Thouron Yellow
- Sleeping Beauty
- So Excited
- Vic Daniels Yellow
- Vico Gold
- Vico Yellow (syn. Smithers Yellow)
- Watkins Yellow
- Yellow Green Girl

Peaches

Flowers are a peach colour and seedlings from crosses within the same group are unpigmented when germinated

- Albany Peach
- Chubb's Peach
- De Villiers Peach
- Gail's Peach (syn. Reed's Peach)
- Lotter's Peach
- Vico Peach

GROUP 2 PLANTS

Yellows

The flowers are yellow, produce yellow berries and seedlings from crosses within the same group are unpigmented when germinated.

- Auriel Batten Yellow
- Banshee Yellow
- Centani Yellow (syn. Qntani Yellow)
- Cynthia's Best
- Cynthia's Dream
- Dwesa Yellow
- Golden Fleece
- Nano
- Natal Yellow (syn. Giddy Yellow, Gibelo Yellow, Holl's Yellow, Swellendam Yellow, Stella Parish Yellow)
- Pat's Gold
- Port St. Johns Yellow

'Pretty Pink'

'Splash' by '777' hybrid

- TK Hirao
- TK Miniature Yellow
- TK Original
- TK Yellow
- Transkei Yellow
- Tsolo Yellow

Peaches

Flowers are peach in colour and seedlings from crosses within the same group are unpigmented when germinated.

- Cranrao
- Cransley Peach (syn. Meg's Peach)

GROUP 3 YELLOWS

Plants flower yellow with a pink colouration of the tepals as the flowers mature, berries are red and seedlings from crosses within the same group are pigmented when germinated.

'Tessa'

- Celtis Kloof Yellow
- Greendale Yellow
- Oribi Gorge Yellow
- Peacevale Yellow
- Potterill Blush Yellow

ALPHA YELLOW GROUP

A small group of yellow flowering plants. The flowers are yellow, produce yellow berries and seedlings from crosses within the same group are unpigmented when germinated.

- Ndwedwe Alpha Thurston
- Ndwedwe Beta Thurston
- Mvuma Yellow

'EUROPEAN PEACH'/PINK GROUP

Flowers in this group are various shades of peach / pink, seedlings from crosses within this group are unpigmented when germinated (Tipperary and Cameron will occasionally have pigmented seedlings which flower peach in colour).

- Anderson's Peach (USA and Aus.)
- Anna Meyer Peach
- Cameron Peach
- Conway's Sunrise Sunset
- Conway's Tessa
- Pretty Pink
- Simply Pink
- Tipperary Peach
- Victorian Peach
- Wittig Pink

APPLEBLOSSOM - TYPE GROUP

Flowers are generally white, infused with pink towards the tips of the tepals and seedlings from crosses within the same group are pigmented when germinated.

- Appleblossom Strain
- Gloria
- Helgaard
- Mopi Hirt

FOUR MARYS - TYPE CLIVIA GROUP

Flowers are light yellow or white infused with pink that bleeds to a darker shade of pink to hints of mauve as the flowers age, unpigmented seedlings are produced when crossed with plants within the same group.

- Hanti (syn. Brenthurst)
- Four Marys
- Gordonia
- Lady Jane
- Meltzer's Picotee No.2 (pink blush)
- Monet
- Ngidi Pink Champagne
- Paljas
- Wintersong

SPLASH CLIVIA GROUP

Flowers are generally yellow in colour with a pronounced red colouration on the back of the tepals, seedlings from crosses within the same group are unpigmented when germinated.

- 777 Series
- Andrew Gibson
- Discovery
- Fairytale Series
- Meltzer's Picotee No.1 (spotted)
- Msubo Nguni
- Msubo Wow
- Naude's Peach
- Royal Gala Series
- Ruby Stewart
- Rumpelstiltskin
- Splash Series
- Strawberry Cheesecake
- Waterkloof Blush (syn. Pietersen Blush).

Clivia Kingdom's Vision of the Future

Paul and Sue Kloeck

We have always loved Clivias and they have always had an important place in our garden. In 2003 after an accident, we decided to pursue *Clivia* growing and breeding as a serious hobby. Our approach to *Clivia* breeding was to get hold of the best breeding material available. We visited most of the leading breeders in South Africa and managed to get hold of some superb genetic material. After completing our visits to the local breeders, we than decided to visit the tour international *Clivia* growers and visited Belgium, Australia, New Zealand, Japan, China and the USA.

We have approximately 40,000 Clivias growing under shade cloth and a further 40,000 plants in the garden under trees in an area of 2 hectacres. Like all *Clivia* collectors, we started off by collecting a wide range of species and *Clivia miniata* hybrids. We find that by concentrating on a more limited number of breeding lines, we are able to develop the best features of the plants in our chosen groups.

Our choice of *Clivia* breeding is now limited to five different breeding lines.

Our first line has been developed from our plant 'Blushing Virgin'. This plant has been exceptionally successful at several shows around South Africa and we have now 'retired' from show appearances. The progeny of this plant always have perfect, spherical umbels, often with double peduncles. This 'flagship' pollen parent, has produced a variety of colours from pink to pale oranges, watercolours and guava colours. 'Blushing Virgin' is split for yellow and has produced some spectacular yellow flowers.

'Blushing Virgin'

'Blushing Virgin Pink Princess'.

'BV Virgin Queen'

Our second breeding lines has developed from the hybridising two of our Japanese plants and one of our Chinese plants to produce a range of *Clivia* flower patterns, we call 'Tangelo'. The range of 'Tangelo' plants are small and compact with broad leaves. They have high flower counts and form offsets readily. The range of colours vary from picotee patterns to splash and blushes. Versicolour and 'tanchoo' patterns have also been produced.

'Tangelo range'

'Tangelo range'

The third breeding line is the 'COTY' range. This range developed over time from seed produced originally by crossing yellow and light orange plants. The offspring from this range of plants have light velvety colours and spectacular versicolours. The pollen viability is a challenge and the seed production is poor.

Pierre de Coster gave us five seeds in 2007. He predicted that they would produce interesting versicolours. Photographs of

'Tangelo range'

'COTY range'

the first flowers were sent to Pierre and he suggested we call these plants 'Belgian Four Marys' (B4M). The choice of name was related to the diverse range of colours that form as the flowers open and then age with time. We have been successful with this range, producing several eye-catching versicolours, picotees and bicolours.

Our fifth line of breeding is our interspecific range. We have concentrated on breeding

'COTY Flushed Pink'

'B4M range'

an olive and bronze range of interspecific flowers. This line of breeding has provided great pleasure, but also some frustration in breeding the colours we want to strive for. The most successful of these are 'Gangrene Swirl', 'Brazen Hussy', 'Kumikazi' and 'Gun Metal Chartreuse'.

'Gun Metal Chartreuse'

'Kumikazi'

PHOTOGRAPHIC COMPETITION

Introduction

Glynn Middlewick

Thank you to all the photographic entrants. All of you are winners. The selection of images submitted was a feast for the eyes.

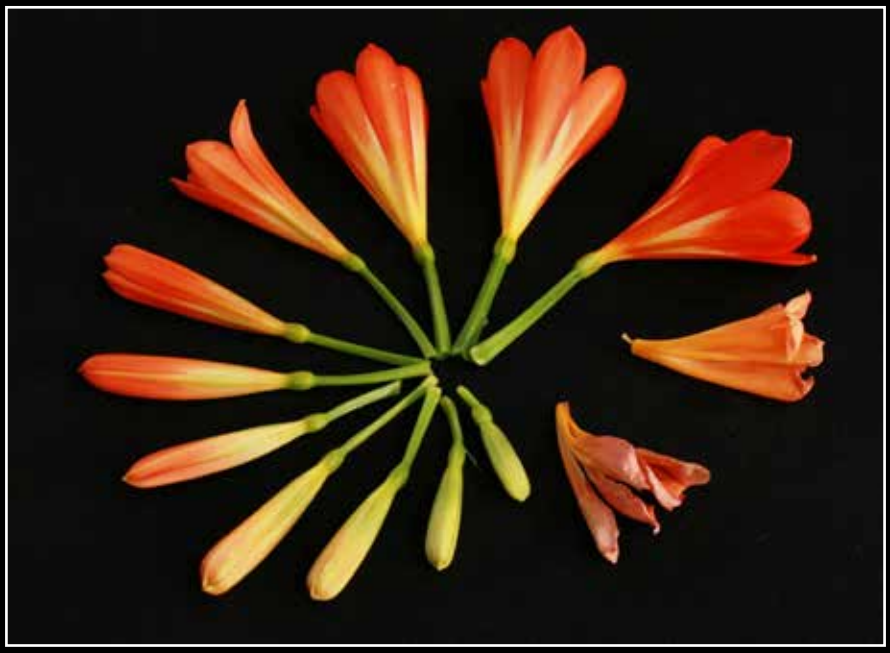
The images were assessed for their photographic quality, so the prettiest image would not necessarily win the competition.

The three judges for this competition were Ian Coates, Claude Felbert and Peter Lambert. Each judge assessed the images independently and allocated a mark out of 100. My role was to add up the marks and find our which were the highest scoring images. The final positions were based on the combined points of the three judges. The two plants chosen for the front and back cover were decided on points alone. Congratulations to the top two entries by points in the overall competition. The top two were Anzette Snyders and Carrie Kruger. Anzette's image of the stages of maturation of a clivia flower has been chosen for the front cover of this Yearbook and Carrie's image of an interspecific flower will appear on the back cover of this Yearbook.

Some wise words from Ian Coates: The visual basics have never changed. Images need to be correctly exposed and they need to be in focus in certain areas and deliberately out of focus in others. The subject matter will always be part of the attraction in an image which needs to be suitably lit and the lighting controlled, if necessary, by additional lighting or using baffles or reflectors even in habitat. Getting the perfect picture can be hard work! The composition of an image is vital, as are any unwanted distractions or blemishes. Such features must add to the impact of the image and not be distractions.

PHOTOGRAPHIC ENTRIES

ART CATEGORY

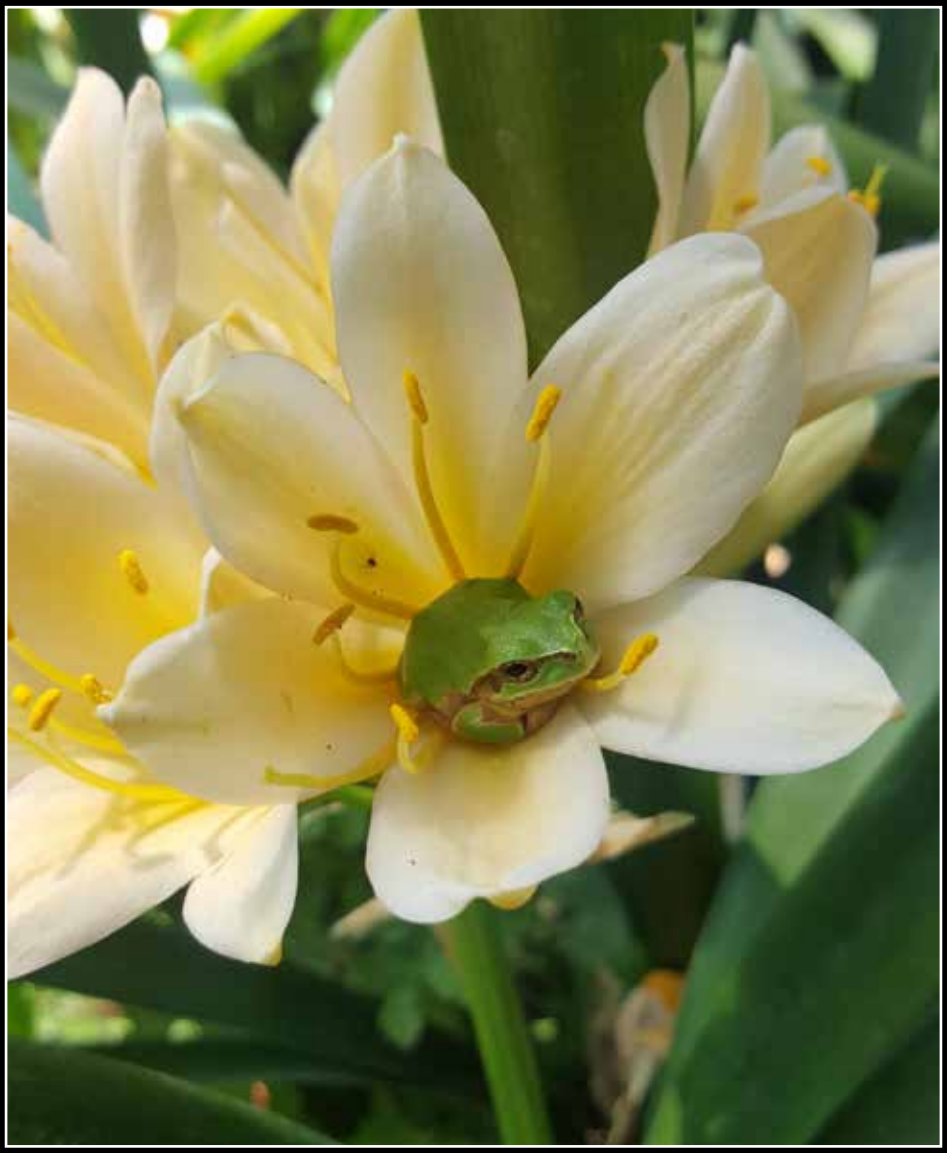


Art Categroy, 1st Place. Anzette Snyders

Art Category, 2nd Place. Cary Schneider

Art Category. 3rd Place. Karel Stanz

Art Category. 4th Place. Carrie Kruger



Art Category. 5th Place. Cary Schneider

Art Category. 6th Place. Carrie Kruger

Art Category. 7th Place. Mike and Angie Riska

Art Category. 8th Place. Karel Stanz

INTERSPECIFIC CATEGORY

Interspecific Category. 1st Place. Carrie Kruger

Interspecific Category. 2nd Place. Carrie Kruger

Interspecific Category. 3rd Place. Alex Mikhalevitch

Interspecific Category. 4th Place. Carrie Kruger

Interspecific Category. 5th Place. Elize and Pikkie Strumpher

Interpecific Category. 6th Place. Dawie van Heerden

Interspecific Category. 7th Place. MIke and Angie Riska

Interspecific Category. 8th Place Alex Mikhalevitch

MINIATA CATEGORY

Miniata Category. 1st Place. Carrie Kruger

MIniata Category. 2nd Place. Pikke & Elize Strumpher

MIniata Category. 3rd Place. Carrie Kruger

MIniata Category. 4th Place.
Dawie van Heerden

Miniata Category. 5th Place.
George Mann

Miniata Category. 6th Place. George Mann

Miniata Category. 7th Place. Jaap Smit

MIniata Category. 8th Place. Carrie Kruger

Miniata Category. 9th Place. Elize and Pikkie Strumpher

Miniata Category. 10th Place. Pieter Saayman

PENDULOUS CATEGORY

Pendulous Category. 1stp Place. Carrie Kruger

Pendulous Category. 2nd Place. Carrie Kruger

Pendulous Category. 3rd Place. Andrew Kazewski

Pendulous Category. 4th Place. Karel Stanz

Pendulous Category. 5th Place. Alex Mikhalevitch

SINGLE FLOWER CATEGORY

Single Flower Category. 1st Place. Andrew Kazewski

Miniata category. Carrie Kruger

Single Flower Category. 2nd Place. Anzette Snyders

Single Flower Category. 3rd Place. Carrie Kruger

Single Flower Category. 4th Place. Karel Stanz

Single Flower Category. 5th Place. Anzette Snyders

Single Flower Category. 6th Place. Andrew Kazewski

Single Flower Category. 7th Place.
Carrie Kruger

Single Flower Category. 8th Place.
Karel Stanz

Single Flower Category. 9th Place. Mike and Angie Riska

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CLIVIA

TWENTY-TWO

The Clivia Society www.cliviasociety.org

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The Clivia Society caters for Clivia enthusiasts throughout the world. It is the umbrella body for a number of constituent Clivia Clubs and interest Groups which meet regularly in South Africa and elsewhere around the world. In addition, the Society has individual members in many countries, some of which also have their own Clivia Clubs. An annual Yearbook and quarterly Newsletters are published by the Society. For information on becoming a member and / or for details of Clivia Clubs and Interest Groups contact the Clivia Society secretary or where appropriate, the International Contacts, at the addresses listed in the inside back cover.

The objectives of the Clivia Society

1. To coordinate the interests, activities and objectives of constituent Clivia Clubs and associate members;
2. To participate in activities for the protection and conservation of the genus Clivia in its natural habitat, thereby advance the protection of the natural habitats and naturally occurring populations of the genus Clivia in accordance with the laws and practices of conservation;
3. To promote the cultivation, conservation and improvement of the genus Clivia by:
   - 3.1 The exchange and mutual dissemination of information amongst Constituent Clivia Clubs and associate members;
   - 3.2 Where possible, the mutual exchange of plants, seed and pollen amongst Constituent Clivia Clubs and associate members; and
   - 3.3 The mutual distribution of specialised knowledge and expertise amongst Constituent Clivia Clubs and associate members;
4. To promote the progress of and increase in knowledge of the genus Clivia and to advance it by enabling research to be done and by the accumulation of data and dissemination thereof amongst constituent Clivia Clubs and associate members;
5. To promote interest in and knowledge of the genus Clivia amongst the general public; and
6. To do all such things as may be necessary and appropriate for the promotion of the abovementioned objectives.

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CLIVIA

TWENTY-TWO

Editor
Glynn Middlewick

EDITORIAL

By Glynn Middlewick

This edition of the Society Yearbook is number 22. Will there be enough information to fill the pages? Our limit is 80 pages, including the four pages of the outer covers. The challenge for an Editor is to fill the pages with interesting information. Fortunately, we have some regular contributors of articles and I wish to thank them all. The correct balance for the Yearbook is some academic articles, for those that like a good read and photographs that appeal to everyone. This Yearbook has achieved a balance with some articles that are meant to be read!

A research article has been received from Ian Kiepiel and Steve Johnson, of the University of KwaZulu-Natal, covering their research into the evolution of *Clivia miniata*. This article clarifies any doubts we may have had about the main pollinators in the natural habitat. Further interesting information follows with regards to the evolution of flowers to adapt to their pollinators and their flowering times. Dirk Lootens from Belgium contributes an article on the possible classification of clivias according to their flowering physiology. This article follows on his interesting article in the previous Yearbook on his 'Search for a new series of hybrid *Clivia*'.

Anzette Snyders our winning photographer of last year, presents us with an article on the 'Phases of the Moon' and whether this has any relevance to the ideal time to plant seeds or plants. David Loysen, out representative in the USA, has a short comment on the correct pronunciation of 'Clivia', which, considering that *Clivia nobilis* was named in 1828, still has some relevance. Carrie and Luke Kruger have submitted and interesting article on some of their plants they consider to be 'Timeless *Clivia* Classics'. Interesting aspects of these selected plants and beautiful photos are included.

The Clivia Society Photographic Competition fills the rest of the pages of this edition. I was fortunate to have Claude Felbert, Ian Coates and James Haxton volunteer to participate in the judging of the photographs. A big thank you to all the members that have submitted entries into this competition. To decide on the best images in the various categories is a challenge to all. We should remember that the best photographic entry will win the competition. The most pleasing image to a viewer is not necessarily the best photograph.

My decision as what image to choose for the front and back covers is not that easy. What I choose is not always pleasing to everyone else. Any beautiful flower could grace the front and the back cover and be suitable. To honour Ian Coates, an English photographer, I have used his image of four clivia seeds on the back page. The top three winning photographs of the overall competition are included in a collage on the front cover.

Regards,

Glynn Middlewick

COVER: Top three positions in the Photography competition – Carrie Kruger, Roger Dinsdale and Carrie Kruger.

TITLE PAGE: Highly Commended 'Pendulous Category' – Andrew Kajewsky.

BACK COVER: Ian Coates Tanchoo Seeds.

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REPORT FROM THE CHAIR

G Middlewick

The Year 2020 will be remembered as the year of the Covid pandemic. Unfortunately' the pandemic is not yet over. As I write this, the 'experts' are predicting another surge which will peak in the middle of May 2021. The vaccinations are not freely available and hopefully the Government will improve their competence in providing vaccines to all sooner than later. We all hope that the physical 'C.miniata' shows will take place in September. The Society has made plans for Virtual miniata and interspecific Shows. Details have been circulated to all clubs and will appear on the Clivia Society Website. 'www.cliviasociety.com'

The limitation of physical club meetings has taken its toll on the membership numbers of the various clubs. Zoom meetings were provided in 2020, which were poorly attended. Perhaps the age group of the Society is one of the limiting factors in joining a Zoom session? Most members have 'smart phones' or computers and the download of the Zoom programme is easy and free of charge. Added to this is the convenience of sitting at your own home, drinking coffee or tea and listening to an interesting talk. No travel is necessary! No risk of unnecessary contacts or the possibility of being infected or of spreading the Covid infection is present.

The number of members that regularly attend meetings is small. For these members, I have a lot of sympathy. The social get-together and the physical interaction provides an enjoyable experience for these loyal supporters. Learning from the experience of the Covid lockdown, we realise that the social media is a convenient way of communicating and sharing images. Social media allows for instant downloads and comments.

The activities of individual clubs are dependent on the contribution from the members. Constructive suggestions are welcome. The number of Facebook pages available that cover various clivia interests are numerous, perhaps too many? WhatsApp groups are successful provided that there are regular contributions from members. These groups do not restrict membership and most people are welcome to join them. WhatsApp does form a useful means of communication with members if no e-mail is available.

Owing to the unreliability of the South African postal service, many clubs now expect members to collect their copies of the Society publications from a suitable source. A digital distribution would obviously cut Society expenditure and allow for a far more efficient delivery of the publications.

The clivia hobby, involving the collection of exceptional plants, the breeding of your own special plants, remains a rewarding occupation. Are formal large shows necessary? Suitable venues are not easy to find. When they are suitable, the cost of hiring these venues is excessive. Should this cost be borne by the sellers? Plant nurseries prefer not to let 'visitors' sell plants on their premises. Some schools claim that their facility is not available for rental in accordance with the rules of the Education department. Going forward the difficulty in finding a 'suitable' venue will remain a challenge for most clubs.

The next Quadrennial Clivia Society Conference takes place in Cape Town in 2022. The organising of this event is a challenge. The uncertainty of the vaccination status of the country and the lockdown demands will hopefully not be a problem in September next year. The success of the Conference depends on the number of members attending the event. I appeal to all members to consider attending the Conference, probably towards the end of September next year. Combining the Conference with a holiday to the Cape would be an ideal opportunity for all to consider.

ARTICLES

The evolution of *Clivia miniata*

Ian Kiepiel and Steve D. Johnson

Clivia miniata flowers have a subtle fragrance, the scent of which is best enjoyed during a forest walk on a warm sunny spring morning as the first buds of the season begin to open. It takes a keen nose to fully experience the subtle nuances of the fragrance. The scent becomes hardly noticeable on cold rainy days, fading quite quickly after pollination as the flowers begin to wither. The perfume has previously been described as "Azalea-like" (Swanevelder and Fisher 2009), a "sweet floral fragrance" (Manning 2005) that adds another dimension of beauty to the bush lily. Unlike *C. miniata*, the pendulous flowered *Clivia* species do not have fragrances that is discernable to a human nose. The lack of fragrance of *C. caulescens*, *C. gardenii, C. nobilis* and *C. mirabilis* flowers by no means lessen their beauty and scent is but one of their many floral trademarks. Flowers come in an awe-inspiring brilliant diversity of shapes and forms and are much lauded throughout human cultures. We are all drawn to gardens, parks, and nature reserves, using flowers in celebration and commemoration. We share our love of flowers with the animals that visit them; the colours, shapes, textures and fragrances that we enjoy are exactly the same traits that are used by animals depending on them for their survival.

Although some plants such as *Clivia* reproduce clonally, most plants reproduce through seed production. Seed production allows plants to spread and colonise new locations. More importantly, the seeds produced through cross-pollination maintain a population's genetic diversity, which prevents a population (or species) from going extinct. Being seed factories, flowers are an essential part of plant survival because they are the reproductive machinery of life. They produce pollen and ovules in the hopes that pollen grains will somehow reach a receptive stigma. With the right conditions, a well-placed pollen grain will germinate on a stigma and the emerging pollen tube will grow its way down into style and down further still into the ovary. The pollen tube then enters the ovule (through the micropyle) release two sperm cells, one fertilizing the egg to from an embryo, whist the other fuses with different ovular tissues to form the endosperm (the seeds nutritive tissue) – this is termed double fertilization. Pollination of the stigma depends on the design of the flowers and more specifically, how flowers have evolved to accomplish pollination. Although many plants are pollinated without the help of animals (i.e. by rain, water and wind), for those species like Clivia that rely on animals to carry their pollen to where it is needed, we can think of their flowers as sensory billboards (see Raguso 2004). Flowers are essentially multisensory advertisements to help pollinators locate them, and like any billboard, there is a great deal of information in a flower available to potential visitors. Much like we read billboards driving down the highway, information is given to pollinators through different flower advertisements. Plant advertisements are made up of various floral signals such as colour, scent and shape, all of which pollinators use as cues for finding, orientating (positioning to land) and landing on flowers. Without these signals, a pollinator would be like a pilot flying blind. Floral advertisements are therefore essential to plant survival and are one of the reasons that plants and animals have such intricate evo-

lutionary relationships. A simple architectural analogy would be that of "form following function", where the form of the flower functions as advertising to pollinators. *Clivia* flowers have evolved to make use of very specific pollinators and those pollinators can result in the creation of new species.

We are still learning a great deal about the way that flowering plants came into being and how flowers evolved different systems of pollination. Flowers have had a long and intricate relationship with their pollinators. By some estimates it is thought that flowers first evolved between 140 and 250 million years ago (Beaulieu, O'Meara *et al*. 2015). Many flowers fit the morphology of their pollinator's, like a key fits into to a lock. Such design can arise though a process of coevolution, a process of natural selection where two (or more) species develop or evolve together. In most instances it is the plant that adapts unilaterally to its pollinator(s). In his ground-breaking work 'The Origin of Species', Charles Darwin described evolution as the process of natural selection through the survival of the fittest (Darwin 1859). Darwin himself was puzzled by the origins of so many different flowers and described the origin of the flowering plants as an 'abominable mystery' (Darwin 1859). It was during his work on orchid pollination, that Darwin gained a better understanding of the origins of flowering plants, leading him to the conclusion that flowers adapt and evolve through selection for those floral traits which enhance a plant's mating ability (Darwin 1862, Darwin 1877). Darwin realised that traits which increase reproductive success were vital to survival and suggested that the origin of the flowering plants was due to selection for specific floral traits by different pollinators. A pivotal moment for Darwin occurred in 1862, after he received a specimen of the white-flowered Malagasy star orchid (*Angraecum sesquipedale*), he predicted that the long narrow nectar-filled spur of the orchid was likely shaped precisely for the tongue (proboscis) of an insect. Although Darwin had never seen the orchid's pollinator, he suggested that when his hypothetical insect was drinking from the deep narrow nectar tube, the creature would bump into the pollinia (grouped pollen) and so transfer pollen to the next flower in a similar fashion. It was only four decades later in 1903 that the hawk moth *Xanthopan morganii praedicta* was discovered, whilst the pollination of Darwin's star orchid by this hawk moth would only be described almost a century later (Wasserthal 1997). Darwin's hypothesis would eventually become known as the concept of pollinator-driven diversification and understanding his 'abominable mystery' continues to be an essential part of biological science. As the name suggests, the concept advocates that when a plant's pollinators change, preferences and morphology of the new group of pollinators result in selection of new floral traits. Another way of looking at this would be that plants adapt by modifying their flowers to suite the morphology and tastes of the new group pollinators.

Wild Clivia plants are inferred to have quite low rates of successful selfing. (see Kiepiel and Johnson 2014a). Fertilization through self-pollination is itself another floral trait that like colour or shape, can be selected for breeding. Any floral traits that that increase the efficiency and effectiveness of pollination will be selected and retained in future generations – natural selection and survival of the fittest. When a pollinator is more effective at transferring cross pollen, more seeds will be produced and those traits which helped the pollinator forage on the flowers will have a better opportunity to infiltrate and persist in the population. Pollinators exert a strong selection pressure on a flower's characteristics and thus have a strong influence on floral evolution. The function of a flower is to distribute and receive pollen for seed production, so when a species is self-incompatible the form of a plant's flowers are influenced by the need to attract pollinators. Advertising cues that are more attractive or better tailored to the likes of a pollinator (including various phenotypes, forms

Figure 1. *Clivia miniata* flowers displaying uncommonly large anthers in a Mistbelt Forest situated in the KwaZulu-Natal midlands. These anthers produce significantly more pollen than those of other plants (a trait beneficial to the plant and less so to its pollinators). Photo: I. Kiepiel.

or varieties) will produce better pollination results. As pollinators are responsible for plant reproduction, the floral traits which pollinators find irresistible will be selected for and those traits which increase seed production will be transferred to the next generation.

Mutations may also alter floral traits and any adaptations which enhance mating may undergo selection (see Figure 1). Plants that are more desirable to pollinators are pollinated more often and the genetics of those plants with more desirable features will be better preserved in future generations. Another way to think of this is through your own line breeding. Every year you painstakingly select and pollinate those plants with desirable traits that you wish to enhance, usually recessive traits, culling those plants with leaf or flower characteristics which you deem less desirable. Over time, your breeding program comes to fruition and your collection takes a certain shape or quality so to speak. The likes and dislikes of a person starts to be seen in their collection and we get a measure of a breeder's personality. In a similar manner this is akin to how Darwin saw undescribed pollinators in an orchid flower simply by looking at its floral traits. The selection process we use as breeders is not unlike that of natural selection, the only difference is that we have taken the pollinators out of the equation and we are now guiding evolution.

Biologists are constantly testing the theory of pollinator-driven diversification and are continually finding more examples and evidence supporting this reasoning. *Clivia* provides a wonderful model group for testing and exploring some of the mysteries of floral evolution and several years ago, research was published doing just that, where the evolutionary shift from bird to butterfly pollination in *Clivia* was described (Kiepiel and Johnson 2014b). Our research tested the hypothesis that there was an evolutionary transition from bird to butterfly pollination in *Clivia*. We investigated how floral traits such as shape, colour, orientation and scent were either modified or retained as *C. miniata* evolved into the species we all know. John Manning initially proposed this theory in his article "Pollination in *Clivia*" (Manning 2005), where he speculated that pendulous flowering *Clivia* were pollinated by sunbirds and *C. miniata* was likely pollinated by butterflies. Manning drew his inferences from the concept of floral or pollination syndromes, which suggest that unrelated groups of plants which share similarities or suites of floral traits such as shape, colour or scent are often pollinated by similar pollinators (Faegri and van der Pijl 1979). For example, many plants that are pollinated by sunbirds have tubular shaped corollas, the flowers of which allow birds access to the nectar, whilst preventing other animals such as bees from robbing the nectar without pollinating the flowers. Although this is not always the case and plant-pollinator interactions often do not involve a lock and key type of reciprocal morphology, applying this concept can provide quite accurate pollinator predictions, a very useful starting point when little is known about a plants ecology. Being a taxonomist, Manning understood that pendulous flowering *Clivia* species occupied more basal lineages, whilst

Figure 2. Male White-bellied sunbird (*Cinnyris talatala*) feeding on a *Clivia gardenii* flower. Photo: S. D. Johnson.

Figure 3. Male Mocker swallowtail (*Papilio dardanus cena*) just before a brush visit to a *Clivia miniata* flower in a Coastal-lowland Forest situated in the Pondoland Centre of Endemism. Photo: I. Kiepiel.

C. miniata occupied a relatively derived position in the genus. By this we mean that the *Clivia miniata* is a relatively newcomer to *Clivia*, having evolved from its pendulous flowering ancestors (Ran, Hammett *et al*. 2001, Conrad, Reeves et al. 2003, Conrad, Reeves *et al*. 2006). Harold Koopowitz had described an Olive sunbird (*Cyanomitra olivacea*) visiting *C. gardenii* in a coastal KwaZulu-Natal garden (Koopowitz 2002), and Manning was also aware of a Malachite sunbird (*Nectarinia famosa*) feeding on *C. mirabilis* at Oorlogskloof Nature Reserve in the Northern Cape, a Black sunbird (*Chalcomitra amethystina*) visiting *C. caulescens* at God's Window in Mpumalanga, and a citrus swallowtail (*Papilio demodocus demodocus*) visiting *C. miniata* flowers at Morgan's Bay in the Eastern Cape Province (Manning 2005). With these observations in mind and by drawing on floral syndrome inferences, Manning predicted that the two distinct *Clivia* flower morphologies went hand in hand with a shift from bird to a butterfly pollination syndrome (Manning 2005).

To test this hypothetical pollinator shift, we focused on wild populations of *C. miniata* and *C. gardenii*. We documented the floral traits and pollinators of these two species and evaluated which of these traits were modified and which served to facilitate the transition from bird to butterfly pollination in the context of the available phylogenetic studies (all of

Figure 4. Female Mocker swallowtail (*Papilio dardanus cena*) having fed and about to depart a *Clivia miniata* flower in a Coastal-lowland Forest situated in the Pondoland Centre of Endemism. Photo: I. Kiepiel.

which indicated that *C. miniata* was the most recently evolved of the genus (Ran, Hammett *et al*. 2001, Conrad, Reeves *et al.* 2003, Conrad, Reeves *et al*. 2006, Conrad 2008, Conrad and Snijman 2011)). We studied several *C. miniata* and several *C. gardenii* populations in their KwaZulu-Natal habitats. *Clivia miniata* and *C. gardenii* share similar habitats and are distributed in the same areas along parts of the eastern coast of South Africa and where possible we opted to study populations of the two species growing in close proximity to one other. When studying closely related species that can interbreed this is

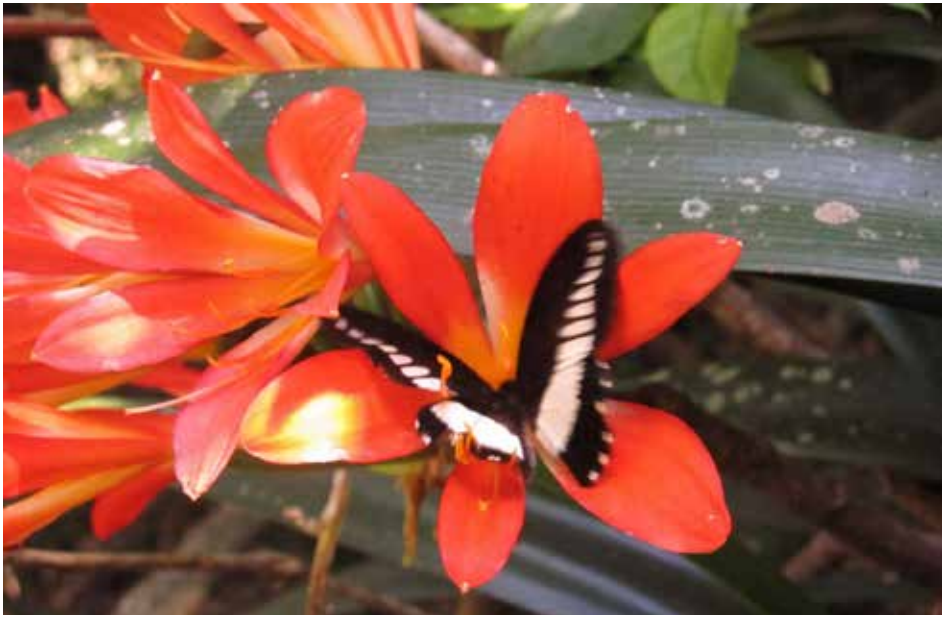

Figure 5. Male White banded swallowtail (*Papilio echerioides echerioides*) in a Mistbelt Forest situated in the KwaZulu-Natal midlands shortly after alighting on a *Clivia miniata* flower. Here the butterfly is folding its wings as it moves deeper into the corolla to feed. Photo: I. Kiepiel.

important because any differences in a species' pollinators should be reflected in the floral traits the pollinators select rather than being indicative of regional differences in the abundance of pollinators. We studied both *C. gardenii* and *C. robusta* – the robust from of *C. gardenii.* Although *C. robusta* has been described as a species based on its unusual karyology, anther exsertion, swamp habitat and large size (Murray, Ran et al. 2004), characterisation of *C. robusta* as a separate species is controversial because of inconsistent differences in DNA sequences between studies and because there has been no thorough research on the morphological differences between wild populations. Because of this we followed taxonomic authorities in treating *C. robusta* as a robust form of *C. gardenii* (Conrad 2008, Rourke 2012). Many populations of *C. gardenii* and what we refer to here as the robust form of *C. gardenii* are located very close to one another. Their flowering times overlap and it is highly likely that these two forms readily interbreed. It may be worth mentioning that we have found very robust *C. gardenii* plants, well over a meter in height on forest cliffs and scree slopes as well as gracile (non-robust) forms on the outskirts of swamps.

Tracking down the pollinators of *C. miniata* and *C. gardenii* involved many hours in the forest, documenting activity on the flowers. Some of this time involved observations during the night to ensure that no potential nocturnal pollinators such as moths were overlooked.

We discovered that like Darwin's orchid hypothesis, Manning's *Clivia* predictions were correct (Manning 2005) and sunbirds pollinate *C. gardenii* (Figure 2) whist butterflies pollinate *C. miniata* (see Figures 3-6 for examples). We found that *C. miniata* was visited by 20 different butterfly species (from three families) and that there were pronounced differences in the species visiting coastal populations compared to populations situated inland at higher altitudes. Although a variety of different butterfly species visit *C. miniata*, the swallowtails are its most common pollinators. Coastal populations of *C. miniata* were visited most often by Mocker swallowtails (*Papilio dardanus cenea*). The most frequent visitors to the KwaZulu-Natal midlands populations were White-banded swallowtails (Papilio echerioides echerioides) and Emperor swallowtails (*Papilio ophidicephalus*; Figure 9). We documented how the butterflies interacted with the flowers, recording how they approached or alighted and if they were likely to have pollinated a flower (measured by recording if they made anther and stigma contact). We also recorded the number of flowers per plant that each butterfly probed for nectar as well as the feeding duration and the overall time a butterfly spent on a flower. On warm days, butterflies began feeding on *C. miniata f*lowers at around 08h00 in the morning and stopped feeding in the afternoon around 16h00 (Kiepiel and Johnson 2021). During rain, butterflies took cover in the forest canopy by hiding under leaves, and when temperatures dropped below 220C they waited for warmer conditions to return before continuing their breeding routines (Kiepiel and Johnson 2021). We found that whilst inspecting the flowers in mid-flight (Figure 3), butterflies frequently pollinated them by brushing the pollen which collects on the underside of their wings onto the stigma (see Figure 4 for behaviour prior to brush visit). These brush visits were often made by males which often engage in territorial disputes in their frantic search for females. Butterflies also pollinated flowers with the underside of their wings as they landed or just after alighting on a flower before folding their wings at rest (e.g. Figure 6). A fresh batch of pollen is deposited on the ventral surface of the butterfly wings as they brush the flowers during their inspections or when they are feeding on the nectar of the flowers.

Nocturnal observations revealed that moths did not feed on the flowers although they were abundant in the forests. To verify our nocturnal observations that moths (or other nocturnal animals) were not in fact pollinating the flowers, we bagged inflorescences and

exposed them either only at night or only during the day and recorded fruit and seed production. We found that plants exposed during the night to potential pollinators produced far less seed than those exposed during the day. We also collected stigmas from flowers and preserved and stained them (which allows pollen to be better seen) on a microscope slide, which was later checked under a microscope for pollen and butterfly scales (Figure 8).

Because *C. miniata* pollination takes place via butterfly wing pollination we correlated wing-scales with pollen grains

Figure 6. Male Emperor swallowtail (*Papilio ophidicephalus*) feeding on *Clivia miniata* in a Mistbelt Forest situated in the KwaZulu-Natal midlands. Note the heavy pollen load clustered around the ventral wing venation. Photo: S. D. Johnson.

Figure 7. Forest white (*Belenois zochalia zochalia*) about to unfurl its proboscis to feed shortly after alighting on a *Clivia miniata* flower in a Coastal-lowland Forest situated in the Pondoland Centre of Endemism. Photo: S. D. Johnson.

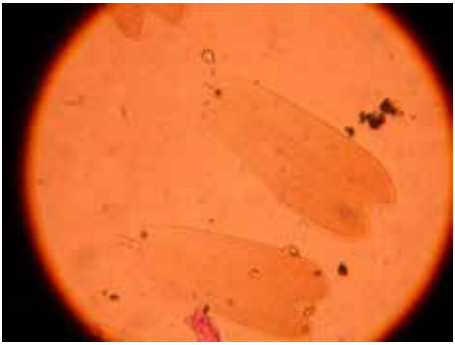

Figure 8. Butterfly scales and *Clivia miniat*a pollen (stained pink) deposited on the stigma of *C. miniata* in a Coastal-lowland Forest situated in the Pondoland Centre of Endemism. Photo: I. Kiepiel.

and found a strong positive correlation between stigmatic pollen deposition and stigmatic wing-scale deposition. In fact, we found that the scales from butterfly wings were present on almost every single *C. miniata stigma* that we examined. Data from hundreds of butterfly visits showed that the wings of the primary pollinators of coastal and inland populations (the Mocker swallowtail and the White-banded swallowtail respectively) made contact with the stigma and the anthers more than two thirds of the times that they visited the flowers. Amazingly, most butterflies would only feed on a single flower of one plant before moving off to the next plant. This means that butterflies are not only very efficient pollinators, but they are also effective pollinators and ones which promote the outcrossing of *C. miniata*. We conducted further experiments to determine how much pollen a butterfly deposits on a stigma each time it visits a flower by bagging *C. miniata* flowers and exposing them to only a single visit from a Mocker swallowtail butterfly. We harvested these stigmas and looked at the deposited stigmatic pollen loads under a microscope and discovered that more pollen was deposited during brush visits than when

Figure 9. Common mother-of pearl (*Salamis parhassus*) resting on a *Clivia miniata* flower in a Coastal-lowland Forest situated in the Pondoland Centre of Endemism. An example of one of many butterflies that do not feed on (or are likely to pollinate) *Clivia miniata*. Photo: I. Kiepiel.

butterflies actually landed on the flowers. We also revealed that any physical interaction between butterfly and flower was more than enough to pollinate all the ovules of a flower (approximately 16, see also Kiepiel and Johnson 2014). Although we attempted this for the sunbirds, we had no luck as the sunbirds proved to be too timid.

As for the pendulous *Clivia* species, we found that the robust form of *C. gardenii* in the Pondoland Centre of Endemism was pollinated primarily by the Olive sunbird (*Cyanomitra olivace*), whilst White-bellied sunbirds (*Cinnyris talatal*a) pollinated the gracile form of *C. gardenii* (Figure 2). Sunbirds began foraging on the flowers at daybreak and fed on the flowers throughout the day until dusk. The birds typically landed on the peduncle of the plants and fed on the nectar by probing the flowers in an upward direction. Claw marks were frequently seen along the peduncle of the plant where birds had perched to feed. It is worth mentioning that we double checked to see that birds and butterflies were carrying *Clivia* pollen by capturing the animals using mist and hand nets respectively. Before being released, samples of pollen were taken from their bodies which we later verified under a microscope. Pollen collected from butterflies was found to be only that of *C. miniata*, whilst the pollen collected from the single sunbird we were able to capture, was found to be exclusively from *C. gardenii.* This suggests that both groups of pollinators feed on and may rely almost exclusively on *Clivia* for their survival during their respective flowering times. We observed *C. gardenii* pollen inadvertently being collected as the birds thrust their bills into the flowers to feed. We watched as pollen was dusted onto the heads and bills of the birds – observations of which were later verified by our captured sunbird pollen samples. Butterflies were very rarely seen in the swamp forests and with one exception (see below) none were seen feeding on *C. gardenii* flowers. By the same token, aside from an isolated event of a Southern double-collared sunbird feeding on *C. miniata*, sunbirds were not seen feeding on the flowers of this species. This is because the flowers of *C. miniata* prevent birds which are perching on the flowers from reaching around to feed on the nectar. The birds have to rob the flower by breaking through the corolla to feed – a feat which is tricky and time consuming. *Clivia miniata* has a number of toxic alkaloids and broken tepals exude a very bitter clear liquid which likely contain some of these compounds. It is likely that these compounds act as a deterrent, which further discourage the birds from feeding on the flowers.

We also needed to test if small insects such as bees, flies, ants and wasps (as well as small butterflies and moths) were responsible for pollination and to do this we covered the flowers using plastic mesh cages. These cages prevented bigger animals such as birds and butterflies from entering, but still allowed small insects to reach the flowers. When birds and butterflies were excluded with these mesh cages, far less fruit was produced compared to the fruit produced on plants that were left untouched in the forest, meaning these selective exclusion experiments demonstrated that small insect's contribute very little to *Clivia* pollination. In a separate treatment, we hand pollinated flowers with supplemental 'cross-pollen' to test for pollen limitation of seed production. We did not find any differences in fruit or seed production between those flowers that were open pollinated (our controls) and those which were supplemented with 'cross-pollen'. This means that there is no shortage of pollen in these populations, and the pollinators of *Clivia* are doing a splendid job. It also alludes to the fact that seed production of wild *Clivia* is limited not by a lack of pollen, but by maternal resources. Suffice to say that no amount of quality pollen will increase seed set in these populations because the plants have limited energy resources with which to produce seeds. You can observe resource limitation in your collection. Prize winning plants getting all the love and light that they need, often throw

out multiple inflorescences per season, whilst neglected plants growing in the deep shade of trees only flower sporadically.

We measured floral traits of both species including the dimensions of the flowers as well as recording the volume, concentration and the percentage of sucrose found in the nectar. Both species were found to be protogynous, where the stigma is receptive before anther dehiscence (release of pollen), and both species showed a marked separation between their anthers and stigma. Although the length of protrusion of the stigma and the anthers from the corolla is similar in *C. gardenii*, the stigma is usually presented either behind or in front of the anthers, which creates a little spatial separation (herkogamy). Both protogyny and herkogamy are characteristics which promote outcrossing and are floral traits that are typically associated with species such as *Clivia* that are predominantly self-incompatible (Kiepiel and Johnson 2014a). *Clivia gardenii* were found to produce more than four times the amount of nectar compared to *C. miniata*, but the concentration and type of sugars it produces are similar. These findings are of particular importance because it reveals that both sunbirds and butterflies consume the same type of nectar. Sunbird pollinated flowers are well known to produce more nectar than butterfly pollinated flowers and most importantly, the concentration and the types of sugars that these two groups of pollinators like are very similar (Johnson and Bond 1994). This sugary food plays a vital role in *Clivia*-pollinator interactions and this finding suggests that sunbird-pollinated flowers were actually pre-adapted to being pollinated by butterflies, a scenario that the famous evolutionary biologist and palaeontologist Steven Jay Gould referred to as an exaptation or a pre-existing adaptation (Gould and Vrba 1982). Because nectar need not be altered much in order to suit the preferences of butterflies, nectar likely greatly facilitated the evolutionary transition from bird to butterfly pollination in *Clivia*.

We measured the colour of flowers using a spectrophotometer (which measures the wavelengths reflected by various parts of the flowers) and found that both *C. gardenii* and *C. miniata* reflect UV light, a feature common in both bird and butterfly pollinated plants. The obvious colour difference between the two species being that C. gardenii has green perianth tips and lacks the yellow throat so typical of *C. miniata*. Aside from the abovementioned differences, these patterns of spectral reflectance revealed that the overall colour of these two flower species are similar, and like nectar, colour is a trait that was probably little modified during the shift from bird to butterfly pollination. Colour is an important floral trait used by feeding butterflies and it is likely that nectar feeding birds rely almost exclusively on colour cues whilst foraging (Johnson and Bond 1994). The similarity in colour would have acted as an important pre-adaptation assisting the evolutionary transition in pollinators. The yellow throat of *C. miniata* flowers is similar to other to other species pollinated by butterflies such as Lilium philadelphicum (Barrows 1979) and Hemerocallis fulva (Hirota, Miki *et al*. 2019) and likely functions as a target or nectar guide. We have found that some butterflies such as the Mocker swallowtail show a strong preference for these targets, visiting flowers which have these nectar guides far more frequently than those which lack them (Kiepiel and Johnson, in press). Other studies have shown that the foraging efficiency and ability of butterflies to distinguish between different plant species is significantly improved when they use these guides (Kandori and Ohsaki 1998).

We were able to analyse the scent of *Clivia* using gas chromatography coupled with mass spectrometry, which allows for accurate analysis of the chemical compounds which make up fragrances. We found that *C. miniata* scent is comprised of a simple blend of only a handful of volatile compounds. The fragrance is dominated mainly by benzaldehyde, benzyl alcohol, and benzyl benzoate. Benzyl benzoate is described as having a sweet somewhat

balsamic fragrance whilst benzyl alcohol has a sweet floral odour. Benzaldehyde may be one of the more easily distinguishable of the bouquet to the human nose and has a characteristic almond-scented aroma. *Clivia gardenii* flowers are effectively unscented (*C. miniata* fragrance was found to be approximately 50 times greater than that of *C. gardenii*), a trait which is common in bird pollinated flowers and one which is thought to reflect the fact that birds generally have a poor sense of smell (Knudsen, Tollsten *et al*. 2004). Scent is important to many butterflies and butterflies often use floral fragrances to distinguish between different plant species (Andersson 2003). Butterflies also use a combination of both colour and scent to locate flowers and although no clear-cut universally appealing butterfly perfume has been identified (Andersson 2003), many butterflies are attracted to benzaldehyde and benzyl alcohol (Ômura, Honda *et al*. 1999). It is likely that the sweet almond scent of benzaldehyde is attractive to many different butterfly species and has an important role as an advertising signal (see Kiepiel and Johnson 2021). As the floral scent of *C. miniata* is simple, we can infer that the common ancestor of the species lacked a fragrance and that scent production in the genus is under phylogenetic constraint. Also called phylogenetic inertia, this means that there are restrictions in the ability of an organism to evolve down certain evolutionary paths due to the constraints imposed on those pathways by earlier adaptations. The evolution of scent production must have occurred through the modification of existing biosynthetic pathways and may have been one of the later adaptations to butterfly pollination that could have developed along with the yellow bullseye target pattern found *C. miniata* flowers.

By mapping the distribution of pollination systems onto available phylogenies (Ran, Hammett *et al*. 2001, Conrad, Reeves *et al*. 2003, Conrad, Reeves *et al*. 2006) we identified an evolutionary shift from bird to butterfly pollination in *Clivia*. Not only was this a special discovery for the *Clivia* fraternity but to the best of our knowledge this was the first ever documentation of a shift from bird to butterfly pollination. This shift in pollinators went hand in hand with the evolution of smaller nectar volumes, upright floral orientation, the production of scent and a widening of the corolla into a trumpet-shape. The colour and nectar of the flowers were largely unmodified and likely facilitated this transition. This shift also involved considerable modifications to the morphology of the flowers and is likely the reason why *C. miniata* appears as we know it today. The most obvious traits to be modified were also likely the most important in facilitating this shift. The upturning of the flowers from a pendulous to that of an upright orientation and a widening of the corolla were pivotal in accommodating butterflies (see Kiepiel and Johnson 2021). Upright floral orientation is critical for butterfly pollination because butterflies cannot readily alight on pendulous orientated *C. miniata* flowers to feed and they are unable to walk over the lip of the corolla to get to the entrance of the flower (Kiepiel and Johnson 2021). The trumpet-shape of *C. miniata* flowers not only provide an ideal landing platform for butterflies but also accommodates the folded wings of butterflies whilst they are feeding on nectar, allowing the anthers the perfect opportunity to deposit copious amounts of pollen on the ventral surfaces of the wings. By the same token, butterflies find it quite difficult to access pendulous flowering *Clivia*, but we did observe an Emperor swallowtail attempting to feed from a *C. gardenii* flower in the KwaZulu-Natal midlands. Similarly, in the same region, we observed Double-collared sunbirds (Cinnyris chalybeus) alighting in an ungainly manner on *C. miniata* inflorescences and robbing the flowers of nectar by breaking the corolla with their beaks. Although such cases are rare, they may happen from time to time. Like many other animals when food is scarce, pollinators can become opportunists out of desperation,

and events such as these allude to the origins, similarities and potential evolutionary direction of these species' pollination systems.

In the context of our pollinator-driven diversification hypothesis we may speculate that the shift from bird to butterfly pollination occurred when the abundant butterflies in certain areas increased whilst sunbirds decreased, resulting in adaptive specialisation for floral traits favouring butterfly pollination. It would have taken the flowers untold millennia of gradual change to better accommodate their new butterfly pollinators in this manner, and during this time it is likely that both birds and butterflies fed on the flowers as the plants adapted to the new group of dominant pollinators. It is helpful to think of the flowers of a *C. miniata* interspecific hybrid here. Such plants lack the classic upright trumpet shape of *C. miniata* flowers, but their flowers are also not quite the hanging tubular flowers so typical of a pendulous flowered *Clivia*. This is what *C. miniata* may have looked like early in its evolutionary history, and as butterfly pollination increased, selection for the new pollination vectors was reinforced, with subsequent speciation ensuing through reproductive isolation (traits preventing interbreeding between the two forms). Over the past eight million years there have been significant changes in the climate of tropical Africa with glacial-interglacial cycles resulting in the contraction and expansion of forests, significantly altering their ecological dynamics and patterns of distribution (Hamilton and Taylor 1992). It is likely that these climatic fluctuations resulted in a change in the abundance of pollinators in certain areas and selection was directed by the most locally abundant pollinators. Johnson and Bond (1994) have suggested that butterfly pollination in the red-flowered Aeropetes-guild evolved from the robbing of nectar from ancestral bird pollinated flowers. This scenario was also very possible in *Clivia*, were the colour and nectar of the sunbird pollinated species would have certainly offered an enticing prospect to curious hungry butterflies. It may have been that a random mutation for floral width allowed butterflies such as swallowtails to more readily probe the semi-pendulous flowers of the new sport. Here, further selection would have widened and lengthened the corolla from a tubular to trumpet shape.

Another trait that was likely modified in *C. miniata* along with that of morphology was that of flowering phenology or flowering times. *Clivia gardenii* flower from autumn to winter, a time when many butterfly species are overwintering and not on the wing. It is likely that a shift in flowering times occurred in response to the synchronization with spring and butterfly peak-flight periods. Perhaps the propensity of *C. miniata* to sporadically flower throughout the year is a throwback-trait (atavism) representative of its evolutionary history. Spring flowering would have coincided with the emergence of a wide variety of butterfly species making for a better prospect for pollination than relying on only those few species on the wing during winter. It may have been that inland populations such as those situated at higher altitudes in Mistbelt Forests (which face much colder winter temperatures) had a greater influence on this shift in flowering times, since lower temperatures are not tolerated by many butterflies. Birds are also far hardier when it comes to facing cold and rainy conditions than butterflies and a shift from a cold to warmer climate may well have resulted in an increase in butterflies and the resulting shift in pollination systems. The emergent *C. miniata* may have presented an insufficient nectar supply to meet the high energetic requirements of sunbirds (given the awkward feeding positions and lengthy handling times), whilst the unpleasant exudations from damaged flowers would have discouraged the birds from habitually feeding on the flowers. With the energetic resources of the plant being just as much in demand, there would have been a trade-off between the production of larger amounts of costly nectar and the production of larger scented flowers.

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It's only a phase: Moon phase gardening

Anzette Snyders

Folklore or not? It is as old as agriculture itself. Dating from the Inca, Aztec, Mayan, Greek and Chinese, who had all kept meticulous records of their natural events. Finding repetitions and using these to make predictions on when to plant and harvest. Some believe in it and plant according to zodiac sign with correlation to the phases of the Moon. Those who believe in it, feel that if it is not planted in the correct phase of the Moon, the plants will be more prone to disease.

I will present my findings here, I was a sceptic myself, then you may make your decision.

The story goes as follows. Isaac Newton established gravity and in 1687 he explained how the gravitational pull of the Sun and Moon together creates ocean tides. The Moon's gravity in relation to that of Earth is 2.951.800 times lower, sitting at around 384.800 km from earth with a mass of 7.3x1019. The Sun on the other hand is 27 million times larger than the Moon. Its gravitational attraction is 177 times greater than that of the Moon, but it is 390 times further away. That makes the tide generating force half of that of the Moon. Some will argue that it cannot be strong enough to have any effect on the tides, let alone soil moisture. But the two together on New and Full Moon do have an effect.

The Moon phase gardeners believe that at New and Full Moon the gravitational pull of the Moon causes moisture levels to rise within the soil, which in turn, the seeds will absorb. These seeds will thus germinate faster. In mature plants, the movement of the sap from the roots up to the canopy, influence when the plant should be fertilized, the fruit harvested or pruned. Ute York, in her book Living by the Moon says: "The old-time gardeners say, with the waxing of the Moon, the earth exhales. When the sap in the plants rise, the force first goes into the growth above ground. Thus, you should do all activities with plants that bear fruit above ground during a waxing Moon. With the waning of the Moon, the earth exhales. Then the sap primarily goes down towards the roots. Thus, the waning Moon is a good time for pruning, multiplying, fertilizing, watering, harvesting and controlling parasites and weeds."

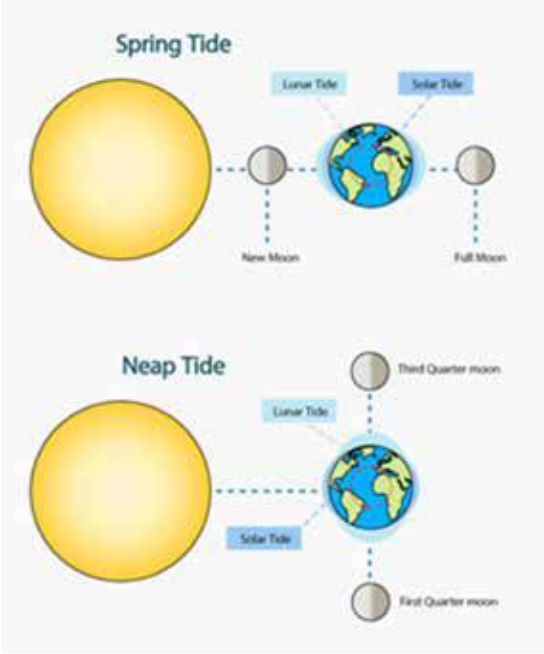
On a closer look, there should be sap movement daily, if you want to base it on the Moon, with a point on Earth passing the Moon with each rotation of the day. This effect is only lesser in the First and Last Quarter.

Plant growth is regulated by internal and external factors. Internally phytohormones are responsible for the coordination of metabolic and development processes at molecular and cellular level. Phytohormones can be divided into two groups: Firstly, growth promoting,

Moon Phase	Date planted	7 days	14 days	21 days	28 days	35 days
FQ	30/05/	Still healthy	1 germinated Day 15 - x4	Still the same	5th seed germinated	All germinated
FM	06/06/	Still healthy	No germinations	Some germination	X3 germinations	Still the same
LQ	13/06/	Still healthy	No germinations	No signs	X1 germination	X2 germinations
NM	21/06/	Still healthy	Day 15 – x3 germinated	1 more germination	All germinated	

and secondly promoting synthesis. Phytohormones together with external factors, can activate growth. External factors include temperature, direction and duration of the Sun's radiation and position with relation to the Earth's gravitational field. These factors can initiate and regulate the timing of development. Physical factors like soil composition, salinity, pH, temperature, pollution, wind and ultraviolet radiation all play a role. A scientific study of the functions and mechanisms in the plant species in question should be made to cultivate it to its full genetic potential and obtain maximal growth and reproductive potential.

According to Semmens, during certain periods, the moonlight is partially polarised. That polarised light can favour the diastase enzymes which catalyses the hydrolysis, first of starch into dextrin and afterwards into sugar or glucose, to favour germination. This was his observations in crushed mustard seeds in the presence of polarised light.



How does this affect *Clivia* plant growth?

Most of the information available relates to the use of vegetable seeds. *Clivia* seed in general will germinate after 1 month or longer. Is it possible to affect the germination rate in clivia seeds?

Keeping in mind that *Clivia* flowers show effects from external factors, such as flower colour and shape may changes may occur with altitude change. Furthermore, colour changes may result from the use of a metal-laden water source compared to rain-water usage. The question now is whether Moon phase planting will affect clivia germination?

My first experiment involved the usage of 3 *Clivia miniata* seeds and 3 interspecific Clivia seeds per phase of the Moon. They were all planted in the same seedling mix and placed

Moon Phase	Date planted	7 days	14 days	21 days	28 days	35 days
FQ	28/06/	Still healthy	15 days – small amount germinated	Still the same	Still the same	More germinations
FM	05/07/	Still healthy	No germinations	Little to no germinations	Some germinations	More germinations
LQ	12/07/	Still healthy	No germinations	No germinations	Some germinations	Still the same
NM	19/07/	Still healthy	Good germinations	High percentage	Slower rate	Good growth

in an incubator at a constant 24 degrees Celsius. The first phase was First Quarter on the 30/05/2020, next phase Full Moon on the 06/06/2020, Last Quarter on 13/06/2020 and New Moon on 21/06/2020. Surprisingly, those planted at New Moon did the best and started to germinate on day 14. Those planted on the last quarter did not do well at all and took more than a month to start germinating.

My curiosity was ignited. To obtain conclusive results I felt that the usage of 6 seeds might be too few and I would repeat the trial. This time all the seeds were from Coromandel stock for control purposes. With each phase a new seed-bearing stem was harvested, keeping the seeds as fresh as possible for each passing phase. The seeds were placed in Vermiculite this time, dampened, covered and placed in the incubator.

Now that I have seen the results, I have decided to run another trial in 2021. This time half of the seeds will be soaked in water for a half an hour before planting and again planted in each phase of the moon. Two types of media will be use, Vermiculite as well as a seedling mix, to reach a better conclusion regarding whether the "rising moisture content" on the New and Full Moon really does have an effect on the absorption and germination of the seeds. I intend keeping better records. I would also like to see the results of whether the seedlings are more disease prone if planted during the wrong phase of the Moon.

The findings so far have seen some positive results and I see myself in a long-term experiment to reach a decisive conclusion over Moon phase planting.

What's Its Name?

David Loysen

Probably the most frequent question I get at flower shows is how to pronounce *Clivia*.

Is it clivia with a long i as in ice cream or ivory? Is it *Clivia* with a short i as in fit or gift?

Many of us know that the name originated in 1828 in tribute to Lady Charlotte Florentia Clive who had an extensive conservatory at Syon House, across the Thames from Kew Gardens in London. It may have been the first clivia to flower in England and was a *Clivia nobilis*. For more history go to www.CliviaSociety.com and click on '*Clivia*'.

A lot of plants have a variety of common or popular 'names' and such is the case with clivia. Some I've heard used are: Natal Lily, Bush Lily, and Fire Lily. And, of course, clivias are not really lilies.

But in the horticultural world, the Swedish botanist, Linnaeus, established a system of plant nomenclature which resulted in only one name for each plant in Latin. That scientific name for our genus is *Clivia*.

So, which is the correct pronunciation? Long i or short i? You may have noticed that I have also used both clivia and *Clivia* above.

The answer is that either one is acceptable but here's the difference:

The most popular common name is clivia, named after the Clive family with a long "i" and is not case specific.

The scientific name is *Clivia* from Latin, pronounced only with a short "i" and always capitalised. In botanical nomenclature, the genus (*Clivia*) is always capitalised and italicised, and the species, (eg. *miniata*) is in lower case. Varieties (i.e. *citrina*) follow in lower case and registered cultivars (i.e. 'Mary Lou') are capitalised and in single quotes.

Classifying Clivias according to their flowering physiology

Dirk Lootens

INTRODUCTION

Mass production of plants multiplied by seed creates enormous opportunities for selecting new & improved variants. Growing Clivias in smaller numbers, on the other hand, also has its advantages: it is much easier to follow up individual plants and to keep records of all plants. Since almost all Clivias are multiplied by seed, each plant is genetically different. For some pronounced phenotypic characteristics, a lot is already known (e.g., flower colour, leaf width, leaf variegation, ...), but what do we know about characteristics such as flowering duration, flowering frequency, triggers for flower peduncle growth, flower fragrance, ... some of these characteristics are fundamental if we want *Clivia* to reach its full potential as a potted plant.

As quoted in chapter 3 of the article "An opportunity for the Clivia World. In search of a new series of hybrid Clivias" (yearbook 2021, p31) the aim is

- that each plant must be able to produce 3 flower peduncles per year with at least 2 different flowering times and
- Inflorescences must extend above the leaves, at a temperature of 21°C.

Classification of all Clivias, used for breeding, according to their flowering frequency and other flowering characteristics could help us identify the underlying heritable features and provide us with new breeding targets to develop the ideal Clivia pot plant.

CONSTANT MODULE-BLOOMERS

This category always blooms after closing a module of exactly the same number of leaves, once its specific flowering time has come. Characteristically:

- they almost always bloom at the same time of the season: if they are late bloomers, they will bloom late in the season every year. Rarely if ever do we see such plants flowering outside of the flowering season. In the Northern hemisphere these plants bloom from March on and the last ones around May/June.
- if for some reason no module could be formed, then the plant will not flower that year.
- If, on the other hand, 2 modules can be completed (e.g., a "half module" from the previous year and a completely new module in the latest growing season), then the plant flowers with 2 flower stems, being the flower stalk after the first completed module and one after the youngest module. It can be stated that the flower stalk after the oldest module often has a stiffer stem and needs a lower temperature to grow above the leaves. In such cases, we speak of an old and young flower stem with different levels of required stretching stimulators (I suppose cold, but...).

The importance of understanding this characteristic from the perspective of an end consumer, lies primarily in finding out why all Clivia do not bloom year after year. Consumers have high expectations and this is certainly part of it.

1.1. Plants with growth modules of exactly 4 leaves

- Q08 from ID'Flor is such an example.:
  - there are always 4 leaves between two consecutive inflorescences (according to own data, under Northern conditions!)
  - On average, this plant grows 4 leaves/year under my "standard" conditions (= frost-free for 6 months and a +-6-month growth period).
  - Consequently, this plant blooms with an

average of 1 flower scape per year.
- Possibly this is heritable. I have evidence that this characteristic is also manifested in certain offspring.

1.2. Growth modules of 5 leaves

- DL,016 (a dark red miniata):
  - is year after year the last bloomer of the season. It blooms always late May and always has 5 leaves between two consecutive flower stems.
  - The number of flowers on one inflorescence is variable depending on the total growth achieved that year.
  - This plant has never made any offsets, yet!
- 11,031 (a Cameron Peach)
  - this plant blooms in May, but always with three years between. Only then is a 5-leaf module completed.
- Other examples of this category have confirmed that if there is not enough growth in a certain year, you don't get a flower in that year.
- due to flower bud abortion, the number of leaves between 2 flower stems can be a multiple of 5.

1.3. Other types of module-growers.

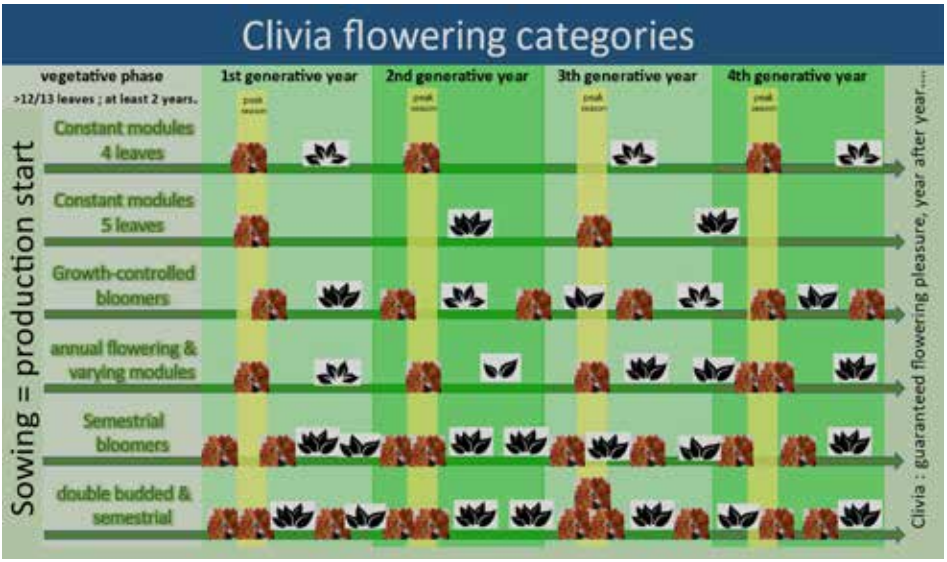
- At this stage I don't have any evidence of plants that have modules of e.g., exactly 6, 7 of more leaves.
- I have found that a number of Chinese plants make 6-leaf modules, but under the given Northern European conditions these plants don't flower enough to be able to state this as the absolute truth.
- it should be noted that plants that for some reason do not have a flower, can come to the top e.g. by flower abortion, so that here we are not going to aggregate the number of leaves of 2 modules into one module.

GROWTH-CONTROLLED BLOOMERS

- blooms at any time of the year provided a module is fully grown
- DL,020 is an example (a dark red miniata)
  - The modules of this plant consist of 3 or 4 leaves.
  - This plant can bloom in any month of the year.
  - The number of flowers per inflorescence can vary greatly: from 7 to 19. The feeling is that this varies along with the "seasonally driven" urge to still give a flower in the high season.
- Vinkske is another example (a yellow interspecific) (see yearbook 2021, p31-38)

ANNUAL FLOWERING PLANTS WITH VARYING MODULES

- These plants are guaranteed to bloom every year and at the same time
- The size of the module depends on the growth the plant could make that year
- 11,003,01 (a Twin flowering Robusta from South-Africa, breeder: Utopia Clivias)
  - Is guaranteed to flower year after year,
  - Has at the time when it blooms, already 4 new full-grown leaves after the flower stalk and 4 new not yet mature leaves in the heart of the plant.
  - The number of leaves between 2 consecutive flower stems, varies from 5, 6 or 7 leaves ...so the plant adapts = seasonal bloomer!
  - This plants always blooms in October in the Northern hemisphere
- 16,022 (a tetraploid miniata)
  - this plant has bloomed annually so far, except for a single time. That time there were 9 leaves between 2 consecutive flower stems, making it plausible that one inflorescence did not come up but dried up between the leaves.
  - always flowering in May
  - modules consist of 4 or 5 leaves. The last time the module was no more than 2 leaves! This is the first time that I have ever been able to observe this phenomenon.
- 17,010 5 (a Hot Lips type)
  - Flowers always in May
  - Modules are 4 or 5 leaves.
  - the inflorescence seems to have remained more vegetative in one year, while in other years more flowers matured orange and thus continued to develop genera-



tively.

- 2001.510.1 (a yellow miniata)
  - flowers at least once a year
  - this plant blooms regularly with 2 inflorescences in the same year
  - flowering period March/April and May/June for the second flower
  - modules of 3 or 4

SEMESTRIAL BLOOMERS

- These are plants that are guaranteed to flower twice a year,
- they usually flower the first time very early in the season (November/December in the northern hemisphere) and a second time later in high season.
- I have only two examples of this type
  - 'Il Quattro'
  - 'Triske' = sibling of Il quattro.
- If a module closes at an accelerated rate in order to bring the second bloom (modules will be 3 leaves), the flower stalk will have a lower number of flowers. Achieving sufficient growth is therefore essential. It goes even further: since these plants also close their modules with 2 buds, the chance of developing two full-developed inflorescences out of the same leaf axil is greater if sufficient growth has been realized.
- As these plants makes modules of 3 or 4 leaves, they have to grow at least 7 leaves each year.
- Important to note here is that because these plants start flowering for the first time in December, their natural cold period is much shorter than the other plants. After all, as soon as they show their flower buds between the leaves, the plants come under indoor conditions and growth can restart.

PLANTS WITH DOUBLE BUDDED MODULES

- These are plants that close their module with 2 buds instead of one single bud.
- these are the plants with the characteristic "Oks2" or are from the "rebloomers" type (see yearbook 2021, p35)
- it is assumed that plants with the 'oks 2' characteristic actually have the same underlying explanation as rebloomers: they are plants that simply form 2 buds at the termination of a module. Re-flowering branches are flower branches that for some reason are not triggered to stretch until later. If a plant is reflowering, the second inflorescence always appears within one year after the first. One can assume that in the

case when a second inflorescence doesn't appear, the second bud has dried up and the bud must have been aborted.

- There are indications that under certain circumstances dormant buds can be transformed into vegetative buds and that all the buds still present will develop into new shoots.
- If this is indeed the case, this genetic trait could help to increase the multiplication factor in in vitro production and make tissue culture of Clivia profitable.

DISCUSSION

- plants can also be classified according to the duration of their juvenile phase. Today's varieties often flower as early as 12 to 14 leaves, whereas in the past this was only after 17 leaves or more. Plants that flower for the first time after 10/11 leaves may also be in the pipeline.
- in addition to the flowering physiological characteristics listed above, the growth rate also determines the annual flower volume obtained. This might be subject for another article.
- It seems that the number of flowers on an inflorescence is also determined by the growth rate or that the number is reduced in case not enough growth is realized.
- research into the causes of flower bud abortion is certainly a very interesting subject
- It remains to be seen whether this proposed classification can be maintained or will be expanded in the future. Worldwide records of e.g., Clivias of a completely different origin, can provide a great input here. Here one is looking forward to, for example, the Chinese types of which it could be suspected that they may be different. I am greatly looking forward to new discoveries.

The ultimate goal is to sell our customer a product that meets his expectations. He expects our product to look perfect as a green plant for many years, and he wants his *Clivia* to bloom at least annually under a wide variety of conditions.

‘TIMELESS CLIVIA CLASSICS’: A HISTORY - PART 1

‘Some of our favourites’

Luke and Carrie Krüger

A timeless classic, in this case a specific clivia, is a plant that despite the passage of time remains an exceptional contribution to the clivia world. The Clivias we have selected for this article, all fit into this description. The following plants have all been used extensively in breeding programmes by various growers over the years and they all led the way in a new breeding direction.

We have always enjoyed finding out further information about all the exceptional Clivia plants. Learning about their origins, their compatibilities when crossed with other plants, and features that they may have which may be evident in their offspring. When we decided to write this article, we realised that there are so many exceptional plants, that making a choice for this first article would not be easy. As everyone knows, we all have our own favourites and so we have decided to write more than one article, to include many more of our favourite and exceptional plants.

Figure 1 ‘Andrew Gibson’

We started off making a list of our favourite plants. When we realised that there were so many exceptional plants, we settled on featuring the first sixteen in this article. Finding out more details about these exceptional plants has been an interesting journey, involving many e-mails, phone calls and WhatsApp messages to breeders. Many hours were spent looking through previous Clivia Yearbooks and Clivia News publication for further information about these plants. Although some of these plants do not have known breeding origins, they have over time proved themselves as plants worthy of including in all breeding programmes and have produced spectacular results.

Figure 2 'Andrew Gibson' F1

1. 'Andrew Gibson'

'Andrew Gibson' a habitat plant was acquired by Andrew Gibson and gifted (as a yellow and named Andrew Gibson) to Etzel Nuss in 1998 by Andrew Gibson. Andrew Gibson was a real estate agent specializing in farms and was an

Figure 3 'Splash'

avid clivia breeder and collector. It has been suggested that the first clone originated from a farm or forest in Karkloof, Kwa-Zula Natal in the 1980's. The friendship of Etzel Nuss and Andrew Gibson was a fortunate event, otherwise we may never have seen this plant.

Figure 4 'Royal Gala'

Notable breeding from 'Andrew Gibson':

- 'Royal Gala' ('Andrew Gibson' x 'Naude's Peach').
- 'Fairytale' '(Msubo Wow' x 'Andrew Gibson').
- 'Splash' (Line bred from 'Andrew Gibson').

Photos supplied by Carrie Kruger and Val Thurston. Thank you to the contributors: Liz Boyd and Val Thurston. Clivia news Vol.17 No.3-4 2008 pg.23 'Andrew Gibson' by Etzel Nuss. Clivia news Vol.25 No.1-2 2016 pgs. 14-18 'Andrew Gibson' breeding by Rouzell van Coller.

2. 'Autumn Whisper'.

Not much is known about 'Autumn Whisper'. Most of the information about this plant has been lost with time. 'Autumn Whisper' is an interspecific plant bred by the late Bertie Guillaume of Brom 'n Nel Nursery, Louis Trichardt, Limpopo, South Africa. It was first identified at his nursery by his daughter Celia.

Figure 5 'Fairy Tale Green Kelp'

Figure 6 'Autumn Whisper'

Figure 7 'Efydd'

'Autumn Whisper' was first named 'Stolen Bronze' as it was liked by both Bertie Guillaume and his daughter Celia and it was constantly 'moved' between their individual shade houses.

It was later renamed 'Autumn Whisper' by Celia.

It is speculated that is could be from Bertie's Bronze breeding but like many other plants from the Guillaumes' collection, its breeding history is unknown.

'Autumn Whisper' has been used in the breeding some fantastic bronze interspecific plants.

Figure 8 'Autumn Angel'

Notable breeding successes from Autumn Whisper are:

- 'Autumn Angel'. ('Bell Boy' x 'Autumn Whisper').
- 'Eydd'. (Small Bronze Green throat x 'Tropical Bronze').
- 'Tropical Bronze'. ('Berties Bronze' x 'Autumn Whisper Seedling').
- 'Autumn Crusade'.

Photos supplied by Carrie Kruger and Nico Cloete. Thank you to the contributors, John Handman, Pieter Saayman and George Mann.

3. 'BELLA DONNA OPRAH'

'Bella Donna Oprah' was named for Oprah Winfrey in 2004. This particular plant was chosen from a list of entries in a competition organised by the Clivia Society and the Oprah Winfrey magazine.

Bella Donna translated from Italian means 'beautiful lady'. This plant may have been grown from seeds acquired from Mr Nakamura of Japan by the late Bertie Guillaume of Brom 'n Nel Nursery. Unfortunately, the breeding history is unknown.

This however did not deter growers from continuing the frantic pace of breeding with Bella

Figure 9 'Bella Donna Oprah'

Figure 10 'BDO' F1

Figure 11 'Bella Shae'

Figure 12 'Bella Baby'

Donna Oprah and its offspring.

It is a highly favoured plant for its unique breeding results.

'Bella Donna Oprah' is split for yellow and all the green stemmed seedlings produce stunning compact yellow plants with large full umbels with giant flowers.

Notable breeding from 'Bella Donna Oprah'.

- 'Bella Mia'. (Seedling of 'Bella Donna Oprah').
- 'Bella Johan'. (Seedling of 'Bella Donna Oprah').
- 'Bella Baby' ('Bella Donna Oprah' x 'Cameo').
- 'Bella Shae'. ('Bella Donna yellow').

Figure 13 'Hantie'

Photos supplied by Carrie Kruger and George Mann. Thank you for the contributions from Ricky Jardim and George Mann. Clivia Yearbook 7 pg.49 Clivia miniata 'Bella Donna Oprah' by Ajam, Kashiefa. Clivia Newsletter Vol.13 No.1 2004 pg.11-12 Correspondence of Jane Raphaely Editor: The Oprah Winfrey Magazine, John Winter and Clivia Society PRO Cobus Roos. https://www.iol.co.za/news/south-africa/a-flower-for-a-bella-donna-226260

4. 'HANTIE'

`Hantie` comes from the gardens of the Brenthurst Estate owned by the Oppenheimers. The estate is located in Parktown, Johannesburg. This plant was first spotted by Hantie Weitz while attending a function at the estate. The flowers are yellow with a touch of pink that mature to a darker pink with ageing. Claims have been made that the plants in the Brenthurst gardens were obtained from the McNeils in Tzaneen and would explain the compatibility with other 'Four Marys' strains.

Notable breeding from 'Hantie':

- 'Brenthurst' x 'Hattori Saki Beni'.
- 'Best Brenthurst'.
- 'Hantie' F2.

Figure 14 'Brenthurst' x 'Saki Beni'

Figure 15 'Hantie' F2

Figure 16 'Brenthurst' F2

Photos supplied by Norman Weitz, Francois van Rooyen and Carrie Kruger. Thank you for the contributions from Francois van Rooyen, George Mann and Norman Weitz.

Figure 17 'Best Brenthurst'

5. 'BRONZE GREEN BOY'

'Bronze Green Boy' as it was so aptly named, was discovered in September of 1998 by Ian Vermaak and his wife Geraldine Vermaak while walking their dog. It was discovered in the garden of a Mr. & Mrs. Slabbert in George, Western Cape, South Africa. It was found among the orange clivias and stood out immediately. Hannes (Mr. Slabbert) told Ian Vermaak that it was bought at a nursery in Johannesburg before moving down to George. An offset was offered to Ian Vermaak, and it flowered two years later. Ian Vermaak was to name it 'Chardonnay' but after discussions with Hannes and Louis Swanepoel the name of 'Bronze Green Boy' chosen.

'Bronze Green Boy' was taken to the Cape Town Clivia Show in Sep-

Figure 18 'Bronze Green Boy'

tember of 2000 where it was a huge hit. Never before has a clivia with such remarkable colour been seen by both public and breeders alike. 'Bronze Green Boy' has gone on to win multiple 'Best on Show' awards over the years and is remains an exceptional bronze plant.

Breeding with 'Bronze Green Boy' has been a challenge for many. 'Bronze Green Boy' is self-sterile and has an extremely poor seed set even when pollinated with other pants. Moderate success has been achieved with the breeding of 'Bronze Green Boy'.

Dawie Strydom of South Africa has had success in the 2nd generation with 'Bronze Green Boy' pollen on multi-tepals plants. 'Clivia Yearbook 21, Pg.26-30'.

Notable breeding from 'Bronze Green Boy':

- 'DS Bronze' - ('BGB' X 'McNeil Bronze').
- 'Multitepal bronze'.

Photos supplied by Dawie Strydom and Carrie Kruger. Thank you for the contribution from Dawie Strydom. Clivia Newsletter Volume 12 No.4 pgs. 9-10 2003 The story behind 'Bronze Green Boy' by Ian Vermaak. Clivia Yearbook 21, Pg.26-30 by Dawie Strydom.

Figure 19 'DS Bronze'

Figure 20 Multi tepal from 'BGB'

6. 'CAMEO'

'Cameo' is a plant bred by the late Bertie Guillaume of Brom 'n Nel Nursery, Louis Trichardt, Limpopo, South Africa. Liz Boyd selected the first flowering seedling from a batch of plants at the Brom 'n Nel nurserey and named the plant 'Cameo'. The parents of 'Cameo' are unknown. but it is split for yellow.

'A cameo' is a form of glyptography or carving, cut into a variety of materials, but most often into glass, hardstones, and shells. These detailed reliefs were often used to adorn pieces of jewellery, such as brooches, necklaces, bracelets, and rings. In this instance the colour of a brooch after which Liz named her plant.

It has been proven to be a very worthy breeding plant in any collection.

Figure 21 'Cameo original'

Figure 22 'Cameo Supreme'

Figure 24 Cameo Brooch

Figure 23 'Bella Cameo'

Notable breeding from 'Cameo':

- 'Cameo Supreme' (The best 'Cameo Plus').
- 'Cameo Plus'.
- 'Bella Cameo'. ('BDO' x 'Cameo').
- 'Sunkist'. ('Cameo Yellow').

Photos supplied by Liz Boyd and Carrie Kruger. Thank you for the contribution from Liz Boyd. https://mymodernmet.com/history-of-cameo-jewelry/

Figure 25 'Cameo' Yellow - 'Sunkist'

7. 'CHARL'S GREEN'

'Charl's Green' was one of the first green Clivias available in South Africa. Charl's Green was sold for R32 000 at the 2006 Clivia conference held in Pretoria. At that time, it was the highest price paid for a Clivia in South Africa. Prior to the auction, 'Charl's Green' was originally named 'Green Lad', but then renamed 'Charl's Green' by Charl Coetzee after he acquired it from Charl Malan from Grahamstown.

'Charl's Green' followed the same route in history as 'Star Green'. In 1997 Charl Malan received seed from Mr. Nakamura of 31 different crosses. Charl Malan and Philip Crous (Charl's neighbour) simply numbered the batches 1-31. Batch no.13 was described by Mr. Nakamura as 'Special Seed'. Charl Malan grew 15 seeds from this batch and Philip Crous grew the other 9 seeds. From this batch (No.13) 'Charl`s Green' would emerge.

Figure 26 'Charl`s Green'

Notable breeding from 'Charl's Green'.

- 'Ice Ice Baby'. ('Vico Yellow' x 'Charl's Green') x 'Charl's Green'.
- 'Charlston' ('P8/Shimmer' x 'Gunston') x 'Charl's 'Green'.
- 'Iced Beauty' ('Coromandel yellow' x 'Charl`s Green' x sibling).

Photos supplied by Chris Smit and Carrie Kruger. Thank you for the contribution from Charl Malan. Clivia Yearbook 9 pg.112 Charl's Green: The coolest clivia by John van der Linde. https://www.iol.co.za/news/south-africa/prize-clivia-auctioned-for-record-amount-2931

Figure 28 'Ice Baby'

8.

Figure 27 'Iced Beauty'

Figure 29 'Crown Prince'

'CROWN PRINCE'

'Crown Prince' is a dark bronze bred by the late Bertie Guillaume of Brom n Nel Nursery, Louis Trichardt, Limpopo, South Africa. This was a seedling selected by Celia out of the breeding house. It was named Crown Prince because it stood out like royalty among the other plants. Breeding history is unknown. This plant started Celia`s "Africa Range" of bronzes.

Notable breeding from Crown Prince:

- 'Crown 7' ('Crown Prince' x'777').

Figure 30 'Crown 7'

Figure 31 'Gothic'

- 'Gothic' ('Crown Prince' F1 x Hirao).

Photos supplied by Carrie Kruger. Thank you for the contribution from John Handman. http://www.cliviaforum.za.net/forum/index.php?topic=4608.0 http://www.cliviaforum.za.net/forum/index.php?topic=4828.0

9. 'DEKLAN'

'Deklan' is a plant with a beautiful head of recurved pastel pink flowers bred by the Late Johannes Boshoff de Kock (Bossie De Kock). Deklan was named after Bossie De Kock`s son. The

Figure 32 'Deklan'

Figure 33 .Deklan`s Diginity'

Figure 34 'Deklan`s Virtue'

breeding is unknown, but has been proven to be split for Group 1 yellow. 'Deklan' crosses, breed beautiful recurved pink and pastel coloured flowers. This plant was featured on the cover of the Clivia Yearbook 6.

Notable breeding from 'Deklan':

- 'Deklan`s Virtue'.
- 'Deklan`s Dignity'.

Photos supplied by Carrie Kruger. Thank you to all contributors: Clivia newsletter vol.18 no.1 pgs.3-4 2009. http://www.cliviaforum.za.net/forum/index.php?topic=26632.0

Figure 35 'Four Marys'

10. 'FOUR MARYS'

'Four Marys' is a strain of plants originally obtained from Margot and Gordon McNeil. The flowers have narrow tepals, the buds starting off green, changing to near white, then to yellow and finally colour up to pink with age. Margot McNeil mentioned that Gordon named the plant 'Four Marys' after the ladies in waiting of the Mary, Queen of Scots. They are known in history as 'The Four Marys' - Mary Seton, Mary Fleming, Mary Beaton and Mary Livingston. The number four was used for the four colours seen with the flowering of 'Four

Figure 37 'Four Marys' F2

Figure 36 'Paljas Magic'

Figure 38 'Gordonia'

Below: Figure 39 'Monet'

Marys'.

Notable breeding from 'Four Marys':

- 'Paljas Magic'. ('Jumbo Yellow' x 'Four Marys' x siblings).
- 'Monet'. ('Four Marys' seedling).
- 'Lady Jane'. (A selected 'Four Marys').
- 'Gordonia'. ('Four Marys' Seedling).

Photos supplied George Mann, Dawie Strydom and Hilton Atherstone. Thank you to all contributors. Clivia newsletter vol.27 no.3 pgs.6-14 2018 'Paljas Magic – A new colour strain' by Dawie Strydom.

Figure 40 'Gunston'

Figure 41 'Janneman'

http://www.cliviaforum.za.net/forum/index.php?topic=9028.15

11. 'GUNSTON'

In 1997 Pikkie and Elize Strumpher travelled to Fronehave Nursery near Badplaas also known as eManzana and eBhadini is a small town on the R38 road in eastern Mpumalanga, South Africa. At the nursery they spotted a bronze flowering clivia. This clivia was named G06. The plant had been pollinated at the nursery and developed berries. Pikkie germinated the seeds and the offspring were named 'Gunston Brothers'.

Figure 42 'African Princess'

Figure 44 'Verdi'

At the Metro Show in 2001 'Gunston' was awarded 'Second Best on Show'. The late Koos Geldenhuys, one of the judges present and suggested the name 'Gunston', as the colour

Figure 43 'Mrs Brown'

Figure 45 'Klein Erda'

of the flower was the colour of a packet of Gunston cigarettes.

Notable breeding from 'Gunston':

- 'Mrs. Brown'.
- 'Gunrao'.
- 'African Princess'.
- 'Janneman'
- 'Classics series'.

Figure 46 'Play Erda'

Figure 47 'Best on Show 2018'

Photos supplied by Pikkie and Elize Strumpher. Thank you for the contributions from Pikkie and Elize Strumpher. Clivia newsletter vol.21 no.3 pgs.18-20 2012 'Breeding green throats' by Pikkie Strumpher.

12. 'KLEIN ERDA'

'Klein Erda' is a plant grown from Nakamura seeds by the late Bertie Guillaume of Brom `n Nel Nursery,

Louis Trichardt, Limpopo, South Africa. This plant was exceptional and Bertie Guillaume and his late wife Erda Guillaume,named it after their granddaughter Erda (now Erda Ferreira Coxen). It is an orange-coloured flower with a white throat, now classified as a bicolour. This plant has proven itself as noteworthy breeding plant in many collections.

Notable breeding from 'Klein Erda':

- 'Play Erda'- Best on show NCCK show 2018.
- 'David'.
- 'F1 USA orange x Klein Erda'

Photos supplied George Mann and Carrie Kruger. Thank you to the contributors George Mann and Erda Ferreira Coxen. https://www.facebook.com/clivias2go/photos/ a.223890504781372/329084917595263/https://cliviasociety.com/clivia-register/clivia-register-detail/?pdb=1889

Figure 48 F1 'USA orange x Klein Erda'

Figure 49 'Naude`s Peach'

13. 'NAUDE'S PEACH'

'Naude's Peach' was first noticed by Mrs. Olive Naude in a neighbour's garden in Kloof, Kwa-Zulu-Natal in 1977. Their neighbour had yellow flowering clivias, as well as this plant in their garden. Olivie Naude potted up this plant and this plant rewarded her 2 peduncles annually.

'Naude's Peach' was first entered into the Natal Clivia show in 1997 by Olive Naude. The flower starts off as a yellow flower. With age the outside of the tepals change colour to a light pink/peach. At the show in 1997 the plant created a large amount of interest with the interesting colouring of the flowers. This colouring is now classified as a versicolour. Although the original 'Naude`s Peach' flowers are not spectacular, it has

Figure 50 'Zol'

Figure 51 'Naude`s Peach' F2

Figure 52 'Best on show 2007'

Figure 53 Size comparison of 'Sleeping Beauty'

proven to be one of the best plants to use in a breeding programme.

Notable breeding from 'Naude's Peach':

- 'Pastel Blush'. (Group 2 yellow x 'Naude's Peach').
- 'Narcotics Series' e.g., 'Zol', 'Daggakoekie'.
- 'Royal Gala'. ('Andrew Gibson' x 'Naude's Peach').
- 'Blushed Yellows'.

Photos supplied Liz Boyd, Sean Chubb and Carrie Kruger. Thank you to the contributors, Sean Chubb and Liz Boyd. http://cliviasa.co.za/index.php/naude-peach

14. 'SLEEPING BEAUTY'/'F14'

'Sleeping Beauty/F14' was purchased from the collection of the late Nico Frik from Swellendam in the Western Cape. Nico Frik's plants were bought by Johan Conradie. The late Johan Conradie numbered them with an F preceding the number of the plant. 'Sleeping Beauty' was number 'F14'. 'F14' was a big plant with thick leathery leaves and roots much thicker than the usual clivia plants.

'Sleeping Beauty' was named after the mountain in Riversdale, which resembles a reclining woman. Johan Conradie grew up next to the mountains of Garcia Pass, Riversdale, in a small place called Novo. The plant would often not flower every year and was another reason for naming it 'Sleeping Beauty'. This plant flowered in 2007 and won the award for the 'Best on Show' at the Garden Route Clivia Club Show. With this win, many clivia growers showed an interest in this plant. Aart van Voorst of the Netherlands tested the pollen and confirmed that it was a 'tetraploid', different from the rest of our clivia, which are 'diploid' chromosome number.

Seed set on 'Sleeping Beauty' is very poor. The pollen is infertile on plants that are not tetraploids. The seed pods look as though they

Figure 54 'Sleeping Beauty'

Figure 55 'Star Green Original'

have formed seed, but are soft and struggle to germinate. 'Sleeping Beauty`s' offspring are slow growing and take many years to mature and flower.

Photos supplied by Carrie Kruger and Wouter Conradie. Thank you to all contributions of Wouter Conradie and Aart van Voorst.

15. 'STAR GREEN'

'Star Green' is an unusual green versi-colour with red/brick on the outer petals. The name 'Star Green' was randomly chosen by Phillip Crous because of the green undertones. 'Star Green' is a slow grower and it does not self-pollinate very successfully. When pollen is used on other plants, seed set is also poor.

In 1997 Charl Malan received seed from Mr. Nakamura of 31 different crosses. Charl Malan and Philip Crous (Charl's neighbour) simply numbered the batches 1-31. Batch no.13 was described by Mr. Nakamura as "Special Seed".

Figure 56 'Star Green Destiny'

Figure 57 'Star Power'

Figure 58 'Warmheart'

Charl Malan grew 15 from this batch and Philip Crous grew the other 9 seeds. From this batch (No.13) 'Star Green', 'Charl`s Green' and 'Cromwell Bronze' would emerge. This confirms that these plants are siblings.

These plants are now in the hands of a lucky few breeders to take breeding one step further.

Notable breeding from 'Star Green':

- 'Star Green Destiny'.
- 'Charl's Green' x 'Star Green' (Bronzes)
- 'Star Power'.

Photos supplied by Carrie Kruger. Thank you to all contributors Carrie Kruger and Charl Malan Clivia news Vol.24 No.1 2015 pg.15-18 'A Star is Born' by Carrie Krüger, Utopia Clivias https://cliviasociety.com/clivia-register/clivia-register-detail/?pdb=2521

16. 'WARMHEART'

'Warmheart' is one of those timeless Clivia

Figure 59 'Arishook' F1 'Warmheart'

Figure 60 'Shen'- 'Warmheart' F1

classics. Bred by the late Wessel and Rudo Lotter, this interspecific has proven to be an asset to any breeder's collection.

The name is a very accurate description of the colour of this flower. It is a versicolour, but as it matures the inside of the tepals develop a warm red glow. It is speculated to be a f2 caulesescens interspecfic hybrid.

Notable breeding from 'Warmheart':

- 'Arishook'.
- 'Shen'.
- 'Sheriba'.

Photos supplied Pieter Saayman and Carrie Kruger.
Thank you to all contributors Pieter Saayman and Carrie Kruger.

Figure 61 'Sheriba'- 'Warmheart'F1

PHOTOGRAPHIC COMPETITION

Introduction

Glynn Middlewick

I wish to place on record my thanks to Claude Felbert, James Haxton and Ian Coates for their willingness to judge the photographic entries.

Some of the comments from the judges are repetitions of previous competitions. These include aspects such as: leaves appearing blue, image not sharp, file too small, distraction from main image, overexposed, depth of field shallow, untidy background, flower cut off in image, background colour not suitable, bad lighting and oversaturation of colour.

All entries are welcome for this competition. Most of the photographs submitted have been taken in 2020. Going forward, I would like to suggest that the Yearbook be published at the end of the year. This would allow for the photographs to be taken of the current year's blooms. A big thank you to all entrants.

The six categories for this competition are:

1 Habitat.
2 C. miniata umbels.
3 Interspecific flowering umbels.
4 Pendulous species.
5 Single Flowers.
6 Other *Clivia* related images.

There are winners of each category and then the overall winners of the competition.

The choice of the Judges for the best photograph overall is this one of Carrie Kruger. This image also won the award for the best '*C. miniata*' photgraph.

The 'Second Best' Photograph of the Overall Competition was this image submitted by Roger Dinsdale. This photograph also won the award for the 'Second Best' *C. minata* photograph entered.

The position for the 'overall' 'Third Best' photograph entered was submitted by Carrie Kruger. This photograph was also awarded the 'Best' in the 'Single Bloom' Category.

PHOTOGRAPHIC ENTRIES

CATEGORY: C. MINIATA

FIRST POSITION C. MINIATA CATEGORY – Carrie Kruger

SECOND POSITION C. MINIATA CATEGORY – Roger Dinsdale

THIRD POSITION C. MINIATA CATEGORY – Carrie Kruger

HIGHLY COMMENDED C. MINIATA CATEGORY – Anzette Snyders

HIGHLY COMMENDED C. MINIATA CATEGORY – Pieter le Roux

HIGHLY COMMENDED C. MINIATA CATEGORY – Rudi Koekemoer

CATEGORY: 'INTERSPECIFIC FLOWER'

FIRST POSITION – 'INTERSPECIFIC FLOWER' – Andrew Kajewski

SECOND POSITION 'INTERSPECIFIC FLOWER' – Roger Dinsdale

THIRD POSITION 'INTERSPECIFIC FLOWER' – Carrie Kruger

HIGHLY COMMENDED INTERSPECIFIC CATEGORY – Dawie van Heerden

HIGHLY COMMENDED INTERSPECIFIC CATEGORY – Anzette Snyders

HIGHLY COMMENDED INTERSPECIFIC CATEGORY – Mike Riska

CATEGORY: 'SINGLE FLOWER'

FIRST POSITION 'SINGLE FLOWER' – Carrie Kruger

SECOND POSITION ' SINGLE FLOWER' – Anzette Snyders

THIRD POSITION 'SINGLE FLOWER' – Mike Riska

HIGHLY COMMENDED SINGLE FLOWER CATEGORY – Carrie Kruger

HIGHLY COMMENDED SINGLE FLOWER CATEGORY – Carrie Kruger

HIGHLY COMMENDED SINGLE FLOWER CATEGORY – Andrew Kajewsky

PENDULOUS CATEGORY

FIRST POSITION 'PENDULOUS CATEGORY' – Carrie Kruger

SECOND POSITION 'PENDULOUS CATEGORY' – Dawie Strydom

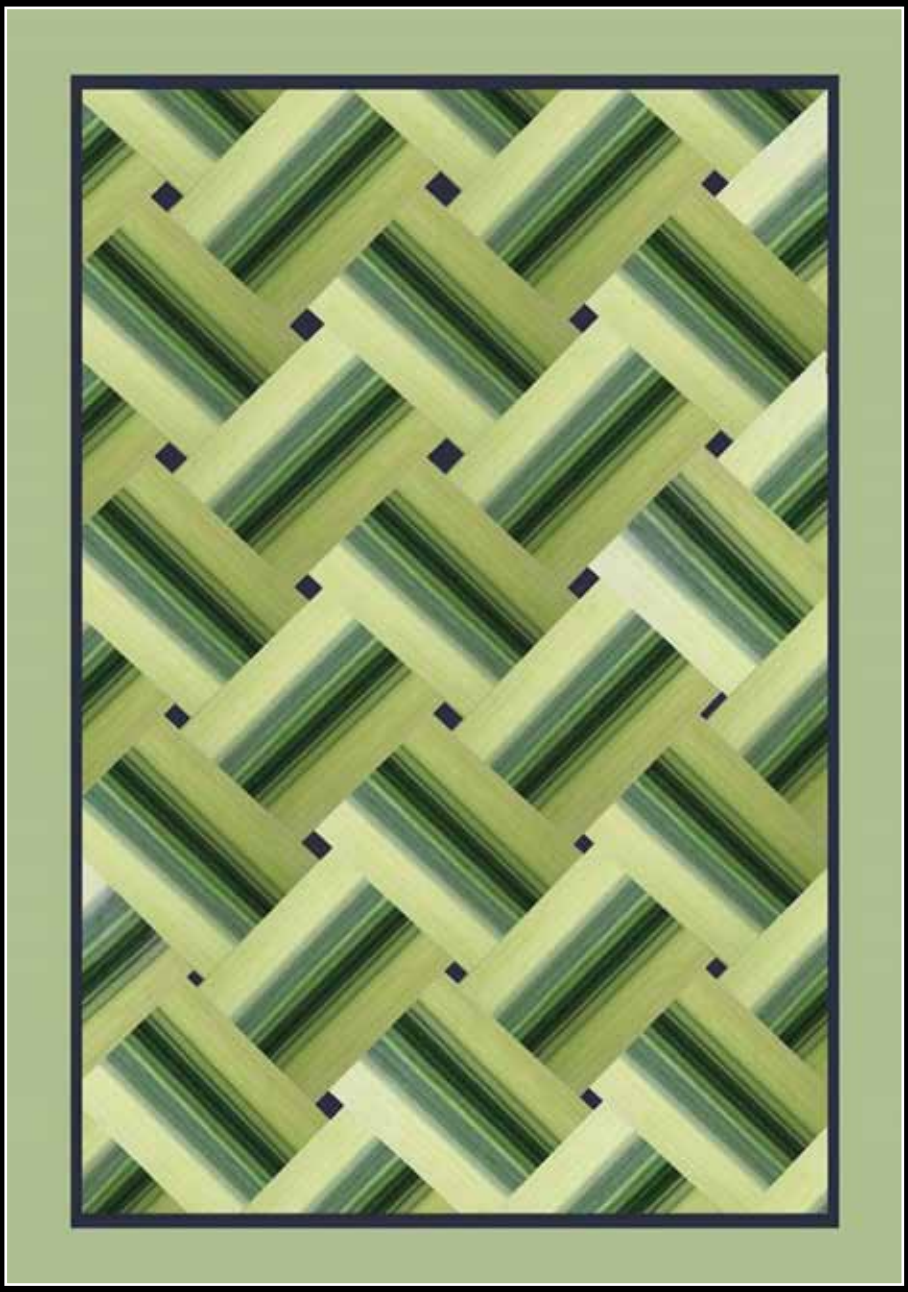
THIRD POSITION 'PENDULOUS CATEGORY' – Carrie Kruger

HIGHLY COMMENDED 'PENDULOUS CATEGORY' – Andrew Kajewsky

HIGHLY COMMENDED 'PENDULOUS CATEGORY' – Carrie Kruger

HIGHLY COMMENDED 'PENDULOUS CATEGORY' – Andrew Kajewsky

CLIVIA RELATED CATEGORY



FIRST POSITON 'CLIVIA RELATED CATEGORY' – Werner Sanders

SECOND POSITION 'CLIVIA RELATED CATEGORY' – Roger Dinsdale

THIRD POSITION 'CLIVIA RELATED CATEGORY' – Andrew Kajewski

HIGHLY COMMENDED CLIVIA RELATED CATEGORY – Wessel Barnard

HIGHLY COMMENDED CLIVIA RELATED CATEGORY – Alex Mikhalevitch

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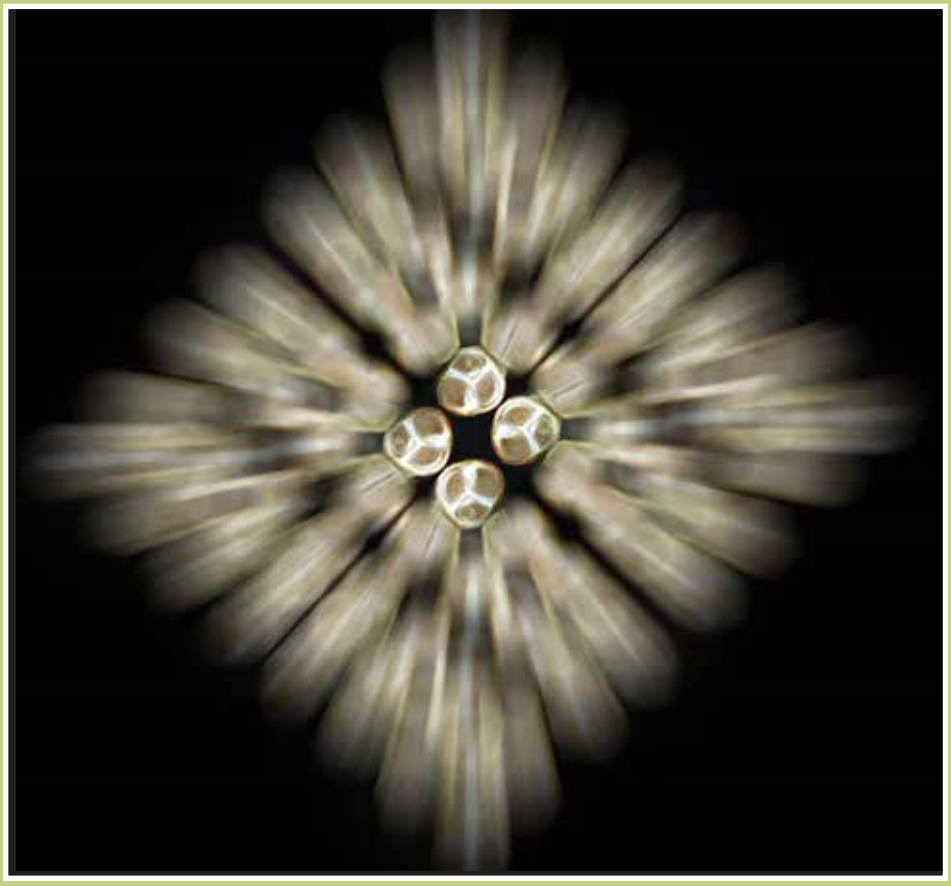

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CLIVIA

TWENTY-THREE

The Clivia Society www.cliviasociety.org

NPO no. 139-860

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The Clivia Society caters for Clivia enthusiasts throughout the world. It is the umbrella body for a number of constituent Clivia Clubs and interest Groups which meet regularly in South Africa and elsewhere around the world. In addition, the Society has individual members in many countries, some of which also have their own Clivia Clubs. An annual Yearbook and quarterly Newsletters are published by the Society. For information on becoming a member and / or for details of Clivia Clubs and Interest Groups contact the Clivia Society secretary or where appropriate, the International Contacts, at the addresses listed in the inside back cover.

The objectives of the Clivia Society

1. To coordinate the interests, activities and objectives of constituent Clivia Clubs and associate members;
2. To participate in activities for the protection and conservation of the genus Clivia in its natural habitat, thereby advance the protection of the natural habitats and naturally occurring populations of the genus Clivia in accordance with the laws and practices of conservation;
3. To promote the cultivation, conservation and improvement of the genus Clivia by:
   3.1 The exchange and mutual dissemination of information amongst Constituent Clivia Clubs and associate members;
   3.2 Where possible, the mutual exchange of plants, seed and pollen amongst Constituent Clivia Clubs and associate members; and
   3.3 The mutual distribution of specialised knowledge and expertise amongst Constituent Clivia Clubs and associate members;
4. To promote the progress of and increase in knowledge of the genus Clivia and to advance it by enabling research to be done and by the accumulation of data and dissemination thereof amongst constituent Clivia Clubs and associate members;
5. To promote interest in and knowledge of the genus Clivia amongst the general public; and
6. To do all such things as may be necessary and appropriate for the promotion of the above-mentioned objectives.

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CLIVIA

TWENTY-THREE

Editor
Glynn Middlewick

EDITORIAL

By Glynn Middlewick

The Yearbook now appears at the end of the calendar year. The Clivia Society has altered the format of the publications. The Clivia News editions are available in digital format only. Owing to the prohibitive postal costs, the Yearbook is the only hard copy publication produced by the Society. Some international members will unfortunately only receive digital copies of the Yearbook.

This Yearbook offers some interesting articles. The first one is an historical account of Burchell's travels in Southern Africa. Roger Stewart and Marion Whitehead are the authors of this article. Burchell's journey also covers the probable location of his discovery of Clivia nobilis. Bernard Slippers has produced a scholarly article on the anthocyanin pigmentation and the regulation of the production of this pigment.. James Haxton has updated and simplified his article on photographing clivia. Taking beautiful photographs is essential for all of us who may wish to enter either the Virtual Shows or the Photographic Competition. An article previously and edited by Bill Morris on 'A system of Grouping Peach Clivias' follows. Dawie Strydom gives us an insight into his development of his 'Paljas Magic' 'Cultivar Group' of plants.

The Clivia Society Photographic Competition attracted some exceptional photographs. The quality of the photographs is the most important factor in assessing these entries. The content of the photograph complements the quality of the image. The judges of the photographic submissions this year were James Haxton, Ian Coates and Claude Felbert. We are fortunate to have these knowledgeable photographers assessing the entries in this year's competition. No submissions were received for the Habitat Class. Congratulations to the entrants and to the winners, for the high standard of photographs submitted.

The Clivia Society 'Virtual miniata and Interspecific Show' was held again this year with exceptional entries. At the end of the Covid pandemic, we were not sure what the interest in the 'Virtual Show' would be like. As you may know, the results are determined by a panel of judges, led by Hennie van der Mescht, that assess the entries by examining a single photograph submitted by the entrants – not an easy task! These photographs are included on the website. Some may appear in the Clivia News of February 2023. The winners of the various shows held during the 2022 year will be included in the next Clivia News publication in February 2023.

Our Chairman, Dave Garriock, has updated us on the plans for the 2023 Cape Town Conference. Please make an effort to attend this quadrennial event (Five years this time owing to the Covid pandemic).

Regards,

Glynn Middlewick

COVER: Details of Cover pictures
Photographic Competition – Tie for First Place – Carrie Kruger and Cora de Kock
Photographic Competition – Tie for Third Place – Cora de Kock and Carrie Kruger
TITLE PAGE: Photographic Competition – Single Flower – First Place – Wanda Grunwald
BACK COVER: Photographic Competition – Miniata Entry – Johan Jooste

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REPORT FROM THE CHAIR

David Garriock

With the Covid pandemic at an end, the South African Clivia Clubs' activities returned to a new normality. Meetings, workshops and most importantly, shows, were held by the various clubs. I was fortunate to attend a few of the Clivia Shows and I was re-assured that the interest in clivias remains strong. Hennie van der Mescht and and his fellow judges efficiently assessed the 'Clivia Society Virtual Show' for 2022. Images of the entries and winning plants may be found on the Clivia Society website: www.cliviasociety.com. Congratulations to all the winners.

The Society's long-term survival depends on increasing the membership numbers. The role of the various clubs and groups is essential in attracting and motivating the members to ensure their participation in the activities of the club affairs. A big thank you to Glynn, the Editor, ensuring that the publications are produced on time. I know he battles finding content for the publications, so I am appealing to each club to please submit at least one interesting article for publication for the year 2023. The digitalization of the Clivia News seems at this stage to be well accepted. In future, as decided at the AGM, the only printed publication will be the Yearbook. The cost saving on postage, both local and overseas is significant and we are able to reduce the affiliation fee paid by the members to the Society.

The planning for the Cape Town 2023 Conference, organised by the Cape Clivia Club and convened by André Swart is well underway and we appeal to Society club members who want to attend, to please start planning their visit to Cape Town in 2023. Please note that only the conference delegates may participate in the excursions before and following the conference. The tour group numbers will be limited, owing to the number of vehicles required to transport visitors to these venues. The Wildflower tour will be led by the well-known Mike Spies, Mike knows the 'Knersvlakte' intimately, so even if we miss the peak flowering time of the world famous Namaqualand daisies, we will have the opportunity of viewing the many succulent species available. Following on from the Wildflower tour, the delegates will travel to the annual show of the Cape Clivia Club in Cape Town. Garden visits to the collections of some local growers will be arranged. The dates of the show are the 30th of September and the 1st of October. The Conference follows, on the 2nd and 3rd (may also involve the morning of the 4th) of October. An auction of exceptional plants will be offered as well as a tour to the Kirstenbosch Botanical Gardens. Following on from the Conference, there will be a tour to some of the mirabilis habitat areas. Felix Middleton will be the guide for this tour. A full day will be spent exploring the mirabilis plants in their natural surroundings. All the relevant information, application forms and further details will be available on the Clivia Society website 'www.cliviasociety.com' early in the new year. Lisa has once again done an outstanding job maintaining the website for us. We will be using her expertise for the promotion of the Conference. I would like to request clubs and groups to update their website information regarding shows, to allow visitors to be aware of other possible venues to visit.

The Clivia Society is busy planning a new 'Clivia Colour Card III'. This card will be available in hard copy and in a digital format for international members to print their own copies. The target date for the release of this colour card is August 2023.

Finally, a big thank you to the Society Executive members for their support through the year.

ARTICLES

Burchell's lucky *Clivia* find

Roger Stewart & Marion Whitehead

William John Burchell (1781-1863) is credited with being the first European naturalist to discover the plant now known as *Clivia nobilis*, which he found in 1813 while travelling in South Africa's eastern frontier region. It was a lucky find that puzzled him.

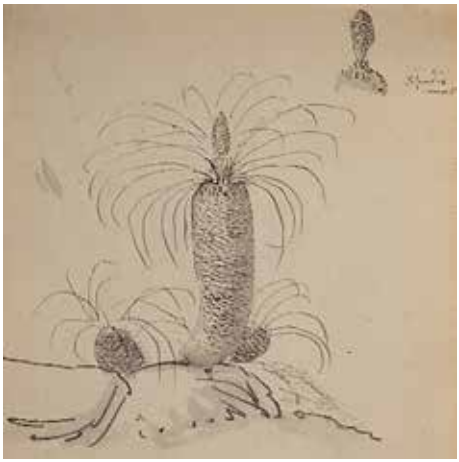
William John Burchell's discovery of the clivia was serendipity: the fortuitous consequence of a failed crossing of the notorious drift across the Kowie River (at today's Port Alfred). According to John Barrow, the drift was a 'horrible chasm' that required a team of sixteen oxen to draw a wagon across the river and up the opposite bank.

In an unsent letter to Capt. Lynch at Rietfontein, Burchell explains that, on 26 September 1813: 'I …narrowly lost one of my wagons' 4: one became stuck in the mud while attempting to cross the Kowie drift towards the west bank. The tide turned and some wagon contents 'were wetted.' Fortunately, he and his team managed to extricate the wagon and get it back to the eastern bank from which they had started the crossing.

On 28 September, he set off on a circuitous route to Rietfontein, which meant return to Grahamstown (now Makhanda). In the evening, he outspanned and camped beside a stream where wild date palms (*Phoenix reclinata*) grew abundantly on its banks and so, he named this campsite 'Date Tree Station'.

It must have been an attractive spot because he remained there for another day to explore the thicket. He collected the beautiful marsh lily (his *Crinum aquaticum*, now *C. campanulatum*) and a plant that puzzled him. It was new to him and to science and, ever the meticulous record keeper, he entered the details into his *Catalogus Geographicus*. His handwritten note for his specimen (CG 3873) reveals Burchell's uncertainty in classifying the plant genus. Was it an agapanthus or cyrtanthus? Dr John Rourke kindly translated Burchell's Latin entry for the plant in his *Catalogus*:

Cyrtanthus ??
Rootstock thick tuberous with fibres (Agapanthus)
Leaves radially arranged (Agapanthus) flat, often obliquely twisted
Flowering stem or scape two edged compressed
Flowers pendulous orange-red with green tips, stigma three lobed
No odour
Leaves brittle containing fibres



Burchell would later record above the description: '*nov gen* ('*novus genus*', i.e., new genus) Bot Reg', reference to the 1828 article in the *Botanical Register* in which the new genus, *Clivia*, was described by John Lindley.

While researching our book on Burchell's return journey and retracing his route, we set ourselves the challenge of finding 'Date Tree Station'. After poring over old maps, farm surveys and using Google Earth®, we concluded that his 'Date Tree Station' was probably near Birbury farm, about ten kilometres on a bearing 15° east of true north from the Kowie River mouth. In September 2020, we visited The Glen, a neighbouring farm, and were delighted to find the wild date palms (*Phoenix reclinata*) on the banks of a stream and a *Clivia nobilis* hidden in the dense thicket nearby. Of course, we cannot be sure of the exact location of Burchell's 'Date Tree Station', but we were probably close.

Burchell's *Clivia* adventure did not end there. After exploring the area around his 'Date Tree Station', Burchell proceeded towards Grahamstown, stopping off at the Blaauwe Kranz military post, commanded by

Lieut. John Laycock. Burchell had befriended Laycock and his wife earlier in the month when he lingered at the outpost to botanise for a fortnight.

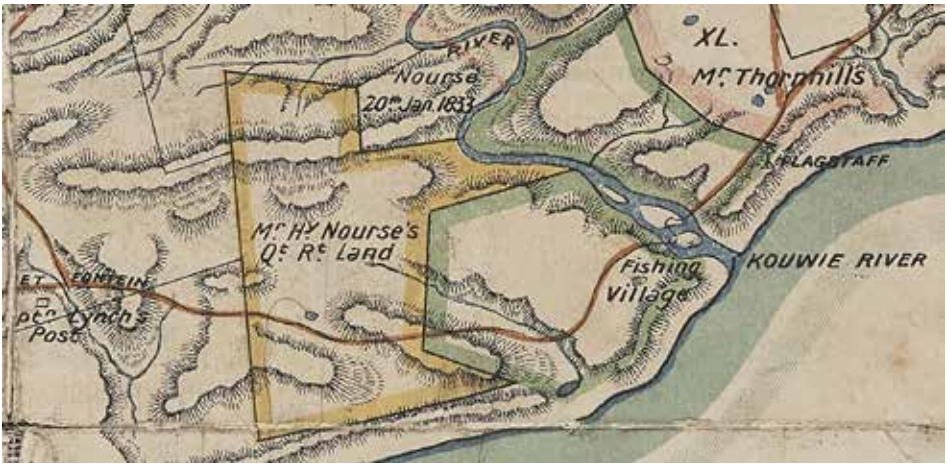
However, on this visit, he remained only for the night of 29 September. Nevertheless, he noticed and drew the unusual Eastern Cape blue cycad (Zamia horrida, now Encephalartos horridus), now endangered in the wild. Laycock must have convinced Burchell that he did not need to return to Grahamstown and rather take the circuitous route via Rautenbach's Drift to reach Rietfontein, less than ten kilometres west of the mouth of the Kowie River. There was a track used by the military that crossed the Kowie River at a drift some twenty-five kilometres upstream of the mouth. The track emerged from the tangled valley thicket not far from Lombard's Post, about ten kilometres north-west of Rietfontein.

The next day, Burchell's party set off on this route to Lombard's Post, together with an armed escort of three soldiers from the Cape Regiment, who were riding oxen, a common practice in those days. But Lombard's Post was some twenty kilometres away and the going was tough, especially with his overladen wagons. The route, probably no more than a rough track, traversed dense Albany thicket and hilly terrain. Could they reach the safety of the military post before nightfall? The military post would be preferable to camping out in the country that had been the site of regular raiding during the fourth frontier war that had ended the previous year.

However, 'from the badness of the road I was unfortunately compelled to pass the night camping out in the bush' , rather than at one of the fortified outposts, as had been his usual practice since departing for the frontier from Bruyntjes Hoogte (near today's Somerset East). He had not yet crossed the Kowie River and therefore was still some distance from Lombard's Post.

During the night, his staff and the soldiers heard 'an unusual bustle among the oxen' but did not investigate or alert Burchell. In the morning he discovered that twenty-four oxen had been stolen and the soldiers had absconded, leaving the party unprotected. Burchell was furious and, while keeping guard of his wagons and their precious cargo, he sent one of his staff to deliver a letter requesting assistance from Lieut. Gair, the officer commanding Lombard's Post. The party managed to reach Lombard's Post later that day. Burchell's book does not cover his return journey and there is no record of how the party managed to reach Lombard's Post; it is probable that that Lieut. Gair responded by sending oxen to Burchell.

The following day, Burchell continued to Rietfontein (now Elmhurst), a farm with a fortified house, some ten kilometres to



the south-west of Lombard's Post. For almost three weeks, he botanised from this base, adding 140 herbarium specimens to his collection. On the 25th of October he headed back to Lombard's Post, *en route* to Rautenbach's Drift, from where he would proceed to Uitenhage, then the seat of the *landdrost* of the Zuurveld (i.e., Albany). Along the way, he must have meandered into the thicket because he collected the torch orchid (*Disa chrysostachya*) and discovered another specimen of the same mystery plant (his specimen CG4131) that he had discovered at Date Tree Station and which he had tentatively named *Cyrtanthus sylvatica*.

The land to the east of the Rietfontein-Lombards road is still well known for its wild *Clivia nobilis*, some with unusual colouring.

This area has another, unanticipated association with Burchell. In 1821, when Burchell was back in London, the land where he discovered the second clivia specimen was allocated to Henry Nourse. This businessman had persuaded Burchell to be interviewed in 1819 by the British parliamentary committee investigating possible locations for emigrants to the Cape Colony under the Poor Laws. Burchell's views were published in his '*Hints on Emigration to the Cape of Good Hope*'. In 1820 British settlers landed at Algoa Bay and then proceeded to land allocated to them in Lower Albany.

Annie De Wet Steyn's Clivia Wonders Nursery is on this land (now named Riverview) between the Kowie River and Rietfontein that was allocated to Nourse: see below John Knobel's 1820-1822 survey of Lower Albany.

Burchell's herbarium specimens of the clivia

are conserved at the Royal Botanic Gardens, Kew and can be viewed online. However, Burchell did not play any role in the intriguing story of the source and naming of *Clivia nobilis* in 1828 – related by John van der Linde in the Clivia Society's 2005 Yearbook. Burchell was in Brazil at the time, when his unnamed plant, discovered fifteen years earlier, but not referred to by any of the key actors in the cast of the saga: William Hooker, John Lindley, William Aiton or James Bowie. Would they have mentioned Burchell's discovery in 1813 had he been in England in 1828?

Almost a decade after the naming of the new genus, William Herbert reported that Burchell had shown him some roots of the mystery plant shortly after Burchell's return to Fulham, London in November 1815. He had explained to Herbert and John Tate, the nurseryman, exactly where he had found the plants. In 1816 James Bowie arrived in Cape Town, having been sent by Aiton to collect plants in the colony for Kew , and he may have collected the roots that were later successfully cultivated, perhaps the plant described in the Botanical Register. I cannot find any record in Burchell's unpublished *Hortus Fulhamensis* that he successfully cultivated *Clivia nobilis*.

Failure to acknowledge Burchell's role in the discovery of what became a popular garden plant may have been par for the course in the competitive field of horticulture in the nineteenth century. However, it must have been another disappointment for a man who devoted his life to the study of not just plants, but to whole systems in nature and who developed into an ecologist, long before the term was invented.

Roger Stewart and Marion Whitehead are the authors of the book, *Burchell's African Odyssey: Revealing the Return Route* (Struik Nature, 2022). We thank Dr John Rourke for his Latin translation and John and Sandy Richter for access to The Glen.

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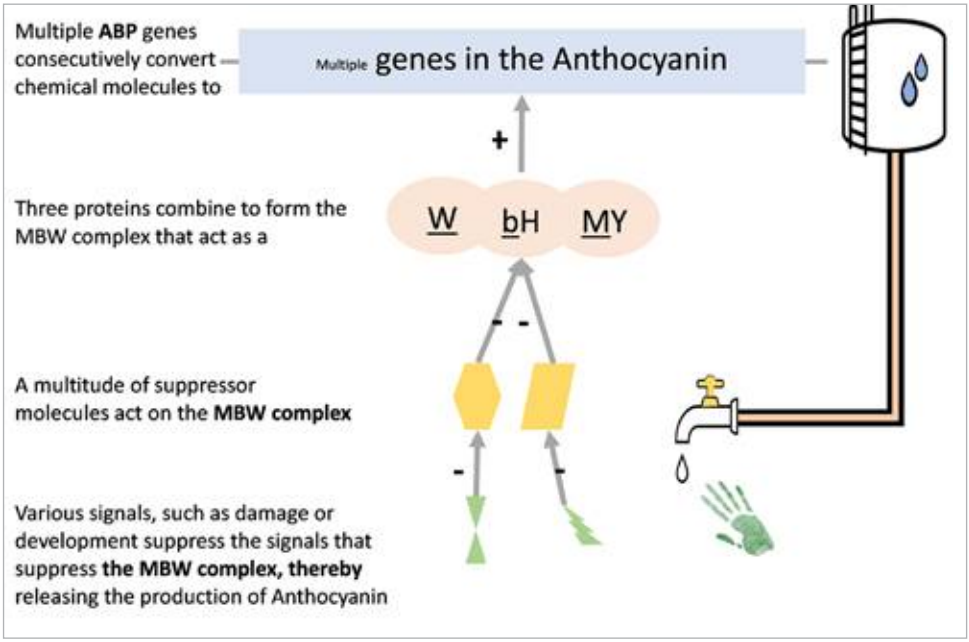
The complexity of flower colour formation: Regulation of anthocyanin production and its relevance to flower colour in *Clivia*

Bernard Slippers

Background

The colour in *Clivia* flowers is produced by three types of pigments, namely anthocyanins (red), carotenoids (yellow) and chlorophyll (green). The colour in the flowers is formed by the intensity (amount) and pattern of the deposition of these colour-reflecting molecules in a 3D matrix of the cellular layers of the tepal/sepal. The colour we perceive is not formed by the physical mixture of these pigments (like paint), but by the patterns in which the pigments are deposited across the tepal/sepal (and in layers) and the mixture of light reflections from these pigments.

Anthocyanins, carotenoids and chlorophyll are ubiquitous in flowering plants. These pigments are not only involved in reproduction for the formation of colour in flowers, but are produced throughout the tissues and developmental stages, with various critical functions in growth, development and defense. They are pleiotropic, meaning they affect a variety of biological functions in different plant parts. Consequently, the genes and pathways that underlie the production of these pigments are highly conserved amongst plants. While these genes have not been characterized in *Clivia*, they are also expected to be conserved in this genus.



Very few genes are expressed all the time. Virtually all our genes are regulated so that they are only expressed when they are needed. Such regulation happens in various ways, through proteins or molecules binding to the DNA or RNA. This prevents wasteful cellular processes, which would have negative energy consequences for any organism.

The same is true for colour variations in flowers, which in most cases is the consequence of the regulation of expression of genes that underlie the production of colour pigments in certain tissues. The expression of these genes and the processes they control are increased or decreased at certain times and in tissues during development.

In this article, we discuss what is known about the production and regulation of anthocyanins in flowering plants, and what this might mean for colour formation in Clivia. For this purpose we specifically refer to a recent international review on the topic by LaFountain and Yuan (2021).

Anthocyanin production

Anthocyanin is part of a group of chemicals or metabolites called flavonoids. These chemical compounds occur widely in plants and are responsible for red, blue and purple colors in flowers, autumn leaves and fruits. They are also present, albeit not always visible, in vegetative tissues, where they have various roles, for example, protecting the photosynthesis machinery from UV radiation, detoxifying harmful oxidants that build up during environmental stresses (such as drought, temperature and more) or to protect plants against pests and pathogens.

Anthocyanins are produced through a highly conserved pathway or process called the anthocyanin biosynthesis pathway (ABP). This pathway includes 10 or more proteins that all play a role, which consecutively converts starting chemicals into the eventual anthocyanin products.

The production of anthocyanins is regulated because the pigments are needed in different tissues of the plant at different times and in different quantities. For this reason, plants have evolved very complex regulatory mechanisms that can respond to a myriad of different internal (eg. development stage) and external (e.g. physical damage, temperature, etc.) signals during the development of the plant.

The regulatory mechanism of anthocyanin production is known as a 'double-negative logic' regulation. This regulatory mechanism is common in plants with molecular processes that require rapid response to environmental or other cues. The double-negative regulation means that there is a two-step process to the regulation of the gene – a primary regulator (often stimulating production continuously) and a secondary regulator (often repressing the primary regular) that responds to various input signals. Signals that suppress the secondary regulator (suppresses the suppressor – thus the 'double negative logic'), indirectly activate the primary regulator/stimulator.

An analogy to understand this is water in our homes. The water comes from a reservoir via a pipeline to our homes. This pipeline is like a primary regulator and is always full of water or 'turned on'. The flow of the water from this pipeline is regulated by a tap, the secondary regulator. The tap, however, needs a hand or a signal to open it– and can be opened fully or partly. The hand that acts on the tap is the 'double negative logic' that allows the water to flow.

The main or primary regulator of the ABP (Anthocyanin Biosynthesis Pathway) is called the MBW complex (Regulatory complex) and is conserved in all angiosperms studied to date. The complex is made up of different proteins that interact and bind each other. This regulator activates genes in the ABP, and thereby stimulates the production of anthocyanins.

In addition, there is a whole range of secondary regulators, most of which act on the MBW complex, and mostly to suppress its action. By suppressing the MBW complex, these regulators also suppress the production of anthocyanins. Various signals, such as

Figure 2. Examples of 'bleeding' in flowers of Group 2 yellow and green plants, which provides an example of a mutation in a regular influencing the normal production of this chemical in the flower, as opposed to a mutation that made its production impossible under all conditions. Photos curtesy of Dawie Strydom.

environmental triggers such as temperature, development – chemical processes relating to development (ripening, petal formation, etc), can deactivate the suppressors, and thus release the MBW complex to stimulate anthocyanin production.

In the case of anthocyanin production in flowers, the MBW complex is like a pipeline, while the secondary factors that regulate the MBW complex are like taps. The signals that control these secondary factors are like hands that turn the taps.

While these processes have not been fully studied in *Clivia*, it is expected that *Clivia* would have these same conserved processes as found in all other flowering plants (as explained by LaFountain and Yuan (2021)). Albeit limited, prior work done on *Clivia* and related plants support this hypothesis. This includes work to characterize the pigments, as well as on the genes underlying the production of the pigments in *Clivia* (see for example Snyman, Spies and Viljoen, and Hammett 2006). Quite extensive work has also been done in other Amaryllidaceae, which also support this hypothesis (see for example Wang *et al.* 2021). The study by Snyman, Spies and Viljoen confirms the presence of key genes in the ABP pathway in *Clivia*, and its close relation to those of other related monocots.

Anthocyanin and colour formation in Clivia

It has often been stated that yellow plants have a mutated gene for anthocyanin production in the ABP pathway. Given the general importance of anthocyanin in plants, and its conservation in all plants, it is unlikely that these are mutations in the ABP genes that completely disable its production. No anthocyanin production is likely to lead to developmental issues (weaker plants) and there is no evidence that yellow flowering *Clivia* suffer from any developmental issues. Rather, anthocyanin production is likely only suppressed in some developmental stages in yellow plants, and in these cases clearly in the leaf tissues in early development (green stems) and in the flowers. In the light of the

mechanisms described above, the mutations that create this effect are likely in one of the secondary repressors of the MBW complex. This suppressor does not respond in the same way as in orange plants, and thus the MBW complex is not 'released' to stimulate anthocyanin production.

This conclusion is supported by evidence that low levels of anthocyanin production is maintained in at least some yellow Clivia. For example, as Snyman, Spies and Viljoen demonstrated the anthocyanin pigments are present in the yellow flowers of Group 2 yellow plants, albeit at least 16 times lower than in a standard orange flowering Clivia plant. The analysis by Hammett (2006) did not detect anthocyanin in the flowers, but it is not clear if this is because of less – sensitive methods were used than in the later study by Snyman, Spies and Viljoen, to reveal the very low levels of anthocyanin that they found. Considering all the evidence, it is more likely that anthocyanin production is inhibited, and not altogether disabled by a mutation in a gene in the ABP pathway. This would also explain the red 'bleeding' upon damage to some yellow flowers. In this case the suppressor is inhibited by the damage signal in the flower, thus releasing the MBW complex to stimulate production of anthocyanin around the site of damage. This is a known protective mechanism in other plants as well and demonstrates that anthocyanin production is not completely disabled.

It is common knowledge among *Clivia* breeders that a cross of group 1 and group 2 yellows produce orange plants. In the light of the above discussion, the mutations and complementation of alleles is likely necessary for the regulators and not the ABP genes. A cross between these two lines will then provide a non-mutated regulator of the anthocyanin production from each parent, which then allows for the 'release' of the MBW complex at the right time, allowing anthocyanin to be deposited in the flowers and young stems.

A System for Grouping Peach Clivias

REPRODUCED AND EDITED FROM CLIVIA NEWS 19.2

Bill Morris

In the Clivia Newsletter Vol. 8, No.1, p.10-13, Autumn 1999, I proposed a list of yellow clivia cultivars divided into two types – namely Group 1 and Group 2.

I used this terminology as it had been used previously by C.C. Hurst. In his "Experiments with Genetics (1925) he described two types of white Cattleya orchids which breed true when crossed within their groups but when crossed between the groups produce normal purple Cattleya flowers (presently this is described as the action of complementary genes). I had also suggested in an article in Herbertia No. 46, p.95 – 96 nearly ten years earlier (1990) that the crossing of various yellow clivias to give orange flowers was also due this same mechanism.

More recently I have been trying to understand the situation with Peach clivias and related types (pinks, apricots etc.). My conclusions about these clivias and their pigments formed have led to the groupings I have given below and I will outline these steps.

A number of years ago I had the opportunity to observe and compare a number of peach *Clivia miniata* plants in the collection of Mark Cant, a young Australian horticulturist – namely five separate peach plants which have been registered as 'Cant's Europeach Cultivar Group' (which emerged from a batch of imported European imported orange seed) and two imported Dave Conway (ex U.S.A.) peaches, 'Tessa' and 'Helen' – which were on loan to Mark.

It was possible to match the 'Tessa' and 'Helen' flowers with the 'Cant's Europeach" flowers as far as my eye was concerned – however the 'Cant's Europeaches' all produced peach coloured berries whereas both 'Tessa' and 'Helen' produced orange/red berries. This immediately suggested that although the flowers of these peaches were very similar, they were in fact two different types of peach.

Following on from this observation, I have since been trying to collect information about the berry colours of as many peach, pink, apricot miniata flowers as possible. Unfortunately, I have found that berry colours are rarely published when particular cultivars are described or pictured. I have managed to obtain information about a few examples. 'Naude's Peach' has red berries, 'Wittig Pink' has maroon berries and 'Anna Meyer's Peach' has red berries.

From the book 'Clivias' by Harold Koopowitz, I found that the Dave Conway-bred 'Dorothy' described as having 'bright cerise berries'.

Koopowitz then details Conway's breeding method – which was to put mixed pollens (presumably from his own plants on to 'yellow and orange flowers. From one such endeavour, Conway obtained around one thousand seeds which he grew to flowering stage. What would I expect the result to be? Probably, mainly shades of orange flowers with occasional yellows (depending on how much yellow pollen was in the pollen mix). Some may have flowered darker orange or red. Koopowitz then states that the flowering batch included several peach-coloured flowers and some had pink flowers, one of which was named 'Tessa'. The peach and pink colours were rare. The rest probably bloomed light orange. Conway kept the rare flower colours and some others he decided were worth keeping. Conway then

named these plants them and they became his commercial stock, propagated vegetatively and offered for sale. Based on the above detail, all of Conway's pastel, peach and pinkish flowers would have orange, or similar, berries.

Again in 'Clivias', Koopowitz writes that 'Anna Meyer's Peach' is an 'apricot coloured clone that appeared spontaneously in Meyer's Breeding program' Koopowitz states that Anna Meyer bred her first peaches using yellow pollen.

Christo Lotter's peach breeding information stated that in 1993 he flowered a cross of an orange (berry parent) with a yellow (pollen) which was pink. In 1994 when it flowered again the colour was said to be apricot'. He put this apricot pollen onto another yellow and when the offspring flowered they were peach. Presumably his peach strain derives from line breeding these plants. However, the fact is they started from an orange x yellow cross.

In an email, dated 23rd April 2009 Rudo Lotter explains his breeding experiments aimed at recovering 'Naude's Peach' from his father's cross of 'Naude's Peach' with a (Group 2) 'Giddy Yellow'. Rudo backcrossed 'Naude's Peach' onto his father's cross with the expectation of 25% Group 2 yellow flowers, 25% 'Naude's Peach' flowers and 50% orange. From this backcross (about 500 plants) Rudo has flowered yellows (green stemmed seedlings), 'pastels' (pigmented stemmed seedlings) but only one peach. Unfortunately, no counts were quoted but one out of hundreds is roughly similar to Dave Conway's 'several out of one thousand'. The reason that the peach was so rare is simply because they are not a single gene mutation but probably just rare gene combinations of regulatory genes.

Victor Murillo explains the history of 'Victorian Peach' in his article in the Clivia Yearbook No. 9. He states that the breeding involves a Belgian peach and two high quality yellows from Eric Anderson. They produced a group of original peach-flowering plants. Eric Anderson mentions that he crossed a peach with yellows. The results that Eric produced were a variety of dark and light peach-coloured flowers.

Peach is usually dominant over yellow (both 'Chubb Peach' and 'European peaches'), but they can produce varying depths of colour.

Having originally used Group 1 and Group 2 labels for yellows, in addition, it now appears there is a third group (Group 3 Alpha yellow and yellow offspring). To avoid confusion with 'groups' I suggest we now use Type A Peach and Type B Peach for the different Peach types as follows:

TYPE A Chubb Peach

TYPE B Cransley Peach

TYPE C European Peach
Cant's Europeach Victorian Peach
Original Cameron's Peach

TYPE D Meyer's Peach
Conway Peaches
Poor Man's Peach
Tessa

Type A and Type B are different, single gene mutations similar in that they both produce peach pods.

Type C and D are both rare, multiple gene combinations similar in that they produce non peach berries – generally orange or red.

Note that I have ignored referring to 'green stems' versus 'pigmented stems' in this article because I do not believe it means anything except how much pigment the plant can produce and how long it takes to produce it and under what environmental conditions

There are numerous other plants that can be added to these groups.

The most important thing is that crosses within the Types will breed true while crosses between the types will generally give oranges. However, TYPE A and TYPE B will give 100% peach when selfed (unless they have been crossed with yellow and are thus heterozygous,

when yellows can occur).

In other TYPES of peach, because of their orange x yellow background they will not give 100% peach flowers. There will be a much higher percentage of peach, possibly 50% or more, but some yellows and oranges of varying colour intensity will be produced. Line breeding these peaches will increase the percentage of peach flowering plants.

'Wittig's Pink' and other pinks are sometimes called peaches and should be placed in the various Types in this article. They are basically flowers that contain dilute concentrations of anthocyanins.

Just as in my original yellow listing, some of these Types may be listed incorrectly.

'Artwork by Ian Coates'

Photography – Advice for the Layman

THIS ADVICE APPLIES TO THE PHOTOGRAPHING OF FLOWERS

James Haxton

There are times when the subject outweighs the quality of the photograph and sometimes the quality of the photograph is more important. Examples may be found in entries for the Virtual Show and in the Clivia Society Photographic competition.

The 'Flower' as the Subject

'Virtual show' judging has the images of flowers submitted, which will be considered for winning positions. For the 'Virtual show', we are having the flowers judged, not the pictures. However, if the picture is poor, this will distract from the quality of the flower entered. Care must be taken to ensure that important details are included and the colours are presented correctly. To ensure that your entry presents itself to the judges in the best possible way, you must get the picture right. Unfortunately, a good picture will not improve the appearance of a scruffy flower.

What is necessary to portray your pictures in the best possible way? Your pictures are a means of recording the image accurately. The picture is not meant to be artistic, colourful or appear with excessive contrast, unless entered into an 'Artistic Class'. The Judges are encouraged to observe the image and not be distracted by any surrounding effects.

'Product' photography is what we want. Advertisements in magazines display a complete absence of background distractions, to ensure the product is the most important item to be seen!

Competition Consideration Checklist

I made this list of all the C's just to make it easier to remember. This is a list of items that should be considered when photographing our plants.

CAMERA ANGLE

While aiming the camera at the subject, move the camera higher or lower, to the left or right and notice how the flowers in the umbel

Figure 1 and 2 are the same flower shot at different angles.

vary relative to one another. The view of the background also changes. This is a good time to watch for any distractions that may come into view. The idea is to move the camera around until the flowers 'present' themselves in a pleasing pattern, or the better flowers are in the front. If necessary, rotate the umbel to 'present' the better flowers in the front of the image.

When moving closer to the image, the frame is filled with the image, but the subject also starts to distort. The items in front are always larger that the items at the back of subject. This is normal perspective. If your move too close, the flower sizes are exaggerated and at this point the image distorts and is not what you want in your image.

When you are too far away from the subject, the item is too small in the frame and the image has to be cropped and enlarged. This results in a loss of image quality.

CLUTTER

Any unnecessary object contributes to clutter. Clutter distracts the viewer. Even a plain background can be distracting. If it is unnaturally smooth one wonders about the surface. If it is very rough one tends to make out detail in the background.

Foreground clutter is also a problem, which may easily be avoided by making the 'subject' the 'foreground'.

Isolation is achieved by shooting with a wide open lens and throwing the background out of focus. The background is then blurred so individual details do not attract attention. Unfortunately, this is difficult to do with an ordinary cell phone camera.

COMPOSITION

Composition is a moot point with only one item in a picture for a competition submission. The judges are not going to be looking at composition. However, pay attention to the following:

Rule of thirds: Place the umbel on the upper right or left intersection of the thirds.

Balance: can be exploited in 'Virtual Show' entries by placing the label with the entry information on the opposite third intersection of the umbel.

For symmetry, the umbel can be tightly cropped dead centre. The label, if necessary, may be placed below the image

COLOUR

This is one of the most important features to present correctly, as the colour is an important item that will be judged.

The first thing to consider is the 'white balance' (WB). It is quite easy to, do by observing the environment and choosing the corresponding setting on the camera. Do not use auto white balance as it is usually incorrect! 'Cloudy' means fully overcast, 'daylight' means sunshine directly on the subject. As a result of this choice, all the shadows will be blue – the reflection of the sky colour! There is usually a setting to correct that, provided that the subject is fully-shaded. If the leaves in the image appear blue, the judges will assume that the flower colour is incorrect. To fix the blue leaf problem, the white balance should be set to the ambient light. Ensure that any objects, like the leaves that may reflect light, are covered. The main cause of the blue leaves is the blue sky when the clivia is in the shade. It is also hard to screen out. What does work is using a white sheet placed between the subject and the sky, behind and above the camera.

Saturation is a much-loved evil in colour photography. The most beautiful *Clivia* colours are displayed as tonal ranges in the flowers and tepals. Too much of an increase of the saturation, spoils the subtle tones and we end up with a solid colour – one shade of colour fills the flower. The colour of the tepals in an umbel usually varies a lot, ranging from light orange to reddish orange to greenish orange. The variation in the shades of colour shades found in the flower enhances the beauty of the subject.

How can we provide the ideal saturation of our image? This is not simple, but it is always better to keep saturation low. Set the camera

Figure 3

to neutral settings rather than bright, vibrant, brilliant or similar settings. The images may look better with these settings, but is not appropriate.

Figure 3 is an image of eight shots taken under different lighting conditions. The background used was grey cloth. For the top row, all shots were taken with the White Balance set to SUNLIGHT.

The first image was taken in a shaded area. There is too much blue colour present, found on the leaves and on the white t-marker in the foreground.

For the second image, the full sun has been filtered through a diffuser, just to mitigate the harshness of the shadows we get in full sun. Now, the colours are correct; the grey background looks grey and the white t-marker looks white. The third shot was taken in the shade house. The shade cloth is green. We can see the colour is rendered incorrectly by observing the grey background and the white marker.

The last image in the top row was taken outside on a cloudy day.

Again, all images in the top row were taken with the White Balance on the camera set to SUNSHINE.

To correct the colour errors, one can adjust the settings on the camera to compensate for the different light levels. The bottom row was taken using more appropriate settings. The camera comp ensated in getting the colours correct, judging by the results. The only problematic shot was the one in the shade house as the camera did not have a setting for that. A custom set-up could be used, but not all phones/cameras can do that. I used an external flash to correct the colour in this example. A good flash on a cell phone is asking a lot, so that may not be satisfactory. I would chose to move the plant outside for the shot. As we will see later, the best option is diffused sunlight.

Here are three images of leaves, all taken in the same location, which is a shaded area. This is the usual place where clivia grow in

Figure 4

Figure 6

Figure 5

the in the garden. This position of the clivias in the garden and when grown in a green shade house are the most difficult locations for provision of good plant colours.

The first image (figure 4) was taken in shade using incorrect WB (White Balance) setting (sunlight).

The second image (figure 5) was taken in shade using SHADE WB setting. There is still a problem with the colour, which the WB (White Balance) setting cannot correct. The leaves have a sheen which reflects the blue sky behind the camera on to the the camera lens. The only way the colour may be corrected in this image by eliminating the reflection.

Figure 6. In this photograph, a white translucent sheet was used to screen off the blue sky behind the camera, with a reasonable measure of success.

CONTRAST

Most camera phones have a filter menu. One of them would be contrast or curves. The menu normally displays a histogram and the curve.

Histogram

The histogram is a bar graph of all the tints, shades or tones in the image. If we study the histogram we see the number of pixels (picture elements) as the height of the bar. The dark pixels are shown on the left, increasing gradually and evenly to the light pixels on the right. The idea is not to have any pixels outside the histogram of the image. To know whether the pixels are outside the histogram graph, we would look for pixels that are bunched up on either the left or right hand side of the graph. Detailed description of the histogram may be found in Wikipedia and is well worth looking up if one is not familiar with histograms.

The basic function of the contrast filter is to lighten the light areas and darken the dark areas, in effect increasing the difference between light and dark areas, creating more contrast. The downside of this is that the tonal differences in the boosted areas are compressed and detail is lost. If we reduce the contrast between light and dark, we land up with a dull image.

CLARITY

Clarity is another word for a good image quality. If the clarity is poor, the image quality is poor. Detail, tonal range and accurate colour representation is lost. There are a few easy actions we can take to ensure a good image quality.

Firstly, make sure the subject is in focus. The camera focuses automatically and can sometimes focus on the wrong object. The focus of the camera should be on the front of the subject, as this is the most important area of the image. Secondly, make sure enough of the image is in focus. It may be necessary to zoom in on the review to be able to view any out of focus-blur.

Motion blur is caused by a 'too slow' shutter speed which does not overcome shaky hands or the subject movement in a breeze. Motion-blur does not look the same as focus-blur, but it adds to the total blur. Any blur causes detail in the flower to be lost.

The use of lighting benefits the photographer the most. The more light there is on the subject, the easier the camera can cope. I personally prefer diffused light to direct light so I can easily avoid harsh shadows. Another way to avoid shadows is to use a reflector on the side of the shadows. A suitable diffusor or reflector is necessary to avoid shadows. Clouds are a good natural diffuser provided there are no large blue gaps between the clouds, that can be reflected off the leaves.

NOISE

When light is insufficient for a good shot, the camera will try to either increase the exposure by lengthening the exposure time, or simply by underexposing and lighten the image by means of the ISO setting. In automatic modes it may be necessary to keep an eye on the ISO setting, to avoid potential underexposure. The higher the ISO, the lower the exposure. Underexposed images are noisy and lack a good tonal and colour range. The chosen ISO setting does a good job at lightening the image but cannot mitigate the other issues.

EXPOSURE

The camera's image sensor must have the correct exposure to avoid overfilling the sensor. Overexposure can be seen on the histogram if the camera has that tool. Overexposure means that the bright areas are devoid of any detail. To avoid that, cameras have a meter that measures the light coming from the subject. The camera then adjusts the shutter speed to limit the light falling on the sensor. If our background is pure white or pure black, and we shoot this background, the camera will adjust the exposure to render the white or the black background to middle grey in the picture. By placing a clivia in front of the background, the camera will compensate and expose for the average light to be middle grey. It is now

apparent that the same flower will be exposed differently against different backgrounds. Now that we know how exposure may vary, we can correct for that by adjusting the exposure compensation, called (EC) on most cameras.

CROP FILTER

Using the crop filter on the camera is a handy way to cut unwanted surroundings from the image. One can also choose the aspect ratio of the image and how the subject is framed. Bear in mind that any loss in size also means a loss of image quality.

CALIBRATION

Not all monitors are well calibrated. Most people set their contrast and brightness levels, focussing on an arbitrary image. The reference image may not be calibrated, which means that one's calibrated monitor now works only for that image. The problem now is that you do not know what the image will look like on any other monitors.

My view on calibration is to reset the monitor or camera to the original factory settings. By doing this we know that we conform to a standard.

EDITING

In addition to the limited editing the cell phone camera offers, specialised editing software is readily available. User interfaces can be easy or very difficult to use. I suggest the download of a free application. FastStone is an example. It's free, easy to use and has an intuitive user interface. When submitting images for publication, a reasonable size is required, so the printer can downsize for better quality. At the popular 300 pixels per inch, the submitted image must be at least 1800 by 2400 pixels, or 4.32 megapixels, in size for a full page.

Your photo images will continue improving with practice. By manipulating the light, camera and plant position, your images will reward you with a true description of the image captured.

'Artwork by Ian Coates'

‘Paljas Magic’ *Clivia* ‘Cultivar Group’ Cultivation

Dawie Strydom Clivia Select, Northcliff, Johannesburg, South Africa

1. Introduction and objective

This article focuses on the development of a clivia ‘strain’ with new colours and shapes which I have named ‘Paljas Magic’ ‘Cultivar Group’. The variation in the shape and colour found in the 27 plants that were bred, is also documented. The results present a summary of two generations of breeding after the initial crossing of ‘Jumbo Yellow’ and ‘Four Marys’, as described in the Clivia News Vol 27 no 3, 2018.

This article covers the development of the ‘Paljas Magic’ ‘strain’, plants that were produced in the F2 generation. The genetic variation, flower forms and shapes are also discussed.

2. Plants used in the breeding program.

Firstly, ‘Jumbo Yellow’, a flower with broad, recurved tepals. (‘Y297’ from the late Nick Primich). The diameter of the flowers is 10 cm. (Figure 1). ‘Jumbo Yellow’ was used as the pollen parent.

Secondly, ‘Four Marys’, a small, open, narrow tepal flower. The exciting feature of this flower is the colour. This plant was used as the berry parent. The tepals open white and then with time a pink blush develops, which darkens to a magenta colour. In addition to this there is evidence of a versicolour pattern on the flowers. (Figure 2). The ‘Four Marys’ plant used in this hybridising was obtained from Margot McNeil in 2003.

3. Flower colours of the first cross – F1

The first cross produced orange and yellow flowers, nothing resembling the pale colours of ‘Four Marys’ parent.

I then proceeded to use the F1 orange and F1 yellow plants in sibling crossings. I also used the ‘Four Marys’ as a pollen parent in some of the crosses. The various crosses may be seen in Table 1 below. (See pages 26 & 27).

Figure 1. A typical ‘Jumbo Yellow’ flower. Recurving, overlapping, broad tepals.

Figure 2. The 'Four Marys' used in this experiment, early in its flowering cycle, with open flowers, narrow tepals and evidence of a versicolour pattern.

Figure 3. One of my best examples of the 'Paljas Magic' 'Cultivar Group' – 'PM 2', full flowers with broad, recurved tepals which have a pink infusion on a white background.

Table 1. Key: 'PM' -'Paljas Magic' F1 and F2 results. Abbreviation keys as indicated on the pots: 4 = 4 Marys; o4 – orange split for 4M, yo4 – orange with a yellow face – split for 4M, po4 – a light orange split for 4M, y4 – a yellow flower split for 4M.

Plant	Berry plant F1 - colour with 4 Marys' genes	Pollen plant F1 - colour with 4 Marys' genes	F2 sibling pot - codes based on F1 crosses	F2 flower shape outcome	F2 flower colour outcome
PM 1	Light orange	Yellow	po4 X y4	Full, broad tepals & slight recurving	Pink tips, white centre
PM 2	Orange	Yellow	o4 X y4	Full, broad tepals & recurving	Pink tips, white centre
PM 3	Orange	Yellow	o4 X y4	Full, broad tepals & slight recurving	Light pink tips
PM 4	Orange	Yellow	o4 X y4	Full, broad tepals & slight recurving	White, blush pink - light green centre
PM 5	Yellow	Yellow	y4 X y4	Full, broad tepals & slight recurving	White-yellow, pink blush
PM 6	Orange	Yellow	o4 X y4	Full, open & broad tepals	Pink spots white centre, blush red tips
PM 7	Yellow face orange	Yellow	yo4 X y4	Open, V shape & broad tepals	Strong versi, white pinkish centre
PM 8	Orange	Yellow	o4 X y4	Open, broad tepals	Light pink tips, early - light green face
PM 9	Orange	Yellow	o4 X y4	Open, broad tepals	Pink tips & versi
PM 10	Orange	Yellow	o4 X y4	Open, narrow tepals	Blush pink, early - light green face
PM 11	Yellow	4 Marys	y4 X 4	Open, narrow tepals	Dark pink tips
PM 12	Yellow face orange	Yellow	yo4 X y4	Open, broad tepals, recurving	Pink tips, early - light green face
PM 13	Orange	Yellow	o4 X y4	Open, narrow tepals, recurving	Strong blush to pink/ red
PM 14	Orange	Yellow	o4 X y4	Open, narrow tepals	Blush pink/ red & versi
PM 15	Orange	Yellow	o4 X y4	Open, V shape, narrow tepals	Very light pink blush
PM 16	Orange	Yellow	o4 X y4	Open, broad tepals & slight recurve	Light yellow, pink blush & versi

Plant	Berry plant F1 - colour with 4 Marys' genes	Pollen plant F1 - colour with 4 Marys' genes	F2 sibling pot - codes based on F1 crosses	F2 flower shape outcome	F2 flower colour outcome
PM 17	Orange	Yellow	o4 X y4	Open, broad tepals	Blush pink/ red & versi
PM 18	Orange	Yellow	o4 X y4	Open, broad tepals, slight recurving	Blush pink, early - light green face
PM 19	Light orange	Yellow	po4 X y4	Full, open & broad tepalds, recurving	Strong blush to dark pink/ red
PM 20	Orange	Yellow	o4 X y4	Full, broad tepals, slight recurving	Light pink versi
PM 21	Orange	Yellow	o4 X y4	Open, full & broad tepals, V shape	Light pink tips & versi
PM 22	Orange	Yellow	o4 X y4	Open, narrow tepals, slight recurving	Clean quality pink tips & versi
PM 23	Yellow	Yellow	y4 X y4	Open, broad tepals, slight recurving	Light pink tone, light versi
PM 24	Orange	Yellow	o4 X y4	Open, broad tepals, slight recurving	Light pink tone, light versi
PM 25	Orange	Yellow	o4 X y4	Open, broad tepals, slight recurving	Light pink tone, light versi
PM 26	Orange	Yellow	o4 X y4	Open, narrow tepals, slight recurving	Blush pink & versi, light green
PM 27	Orange	Yellow	o4 X y4	Open, narrow tepals, slight recurving	Blush light to darker pink tones
PM 28	Yellow face orange	4 Marys	yo4 X 4	Full, broad tepals	Yellow, broad leaf plant

4. The resulting flower colour and shape of the F2 generation

Of the almost forty flowered seedlings, about 70 percent had variations of the original 'Four Marys' colouring. There was a large variation in the colours and flower shapes. (Table 1). Except for plant 'PM – 28', I decided to discontinue with further breeding of any yellow or orange flowering plants of the F2 generation. Of the 27 results the best example I have of my ideal, is the 'MP2' plant flower. (Figure 3). The flowers are full, recurved, with broad tepals and they have a white colour as a background with pink tips that develop with th maturation of the flower. The flower size varies between 7 and 8 cm. in diameter.

The resultant variation of the F2 plants and their parents are show in Table 1 below. 'PM' 28 is one of the results of the F2 generation. This plant has broad leaves with a yellow flower. I have decided to continue with this plant in further breeding.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

Figure 4. Tile compilation of 'Paljas Magic' 'Strain' flowers, no's 1 to 27 displaying colour and shape variation. Number 28 has a yellow flower with broad leaves.

5. 'Paljas Magic' 'Cultivar Group' colours and flower forms

The 'Paljas Magic' 'Cultivar Group' flowers start out as white. This white colour starts to blush with time resulting in various pink tones. (Figure 4). The flower colour variation of the 'strain' may be broadly divided into slight pink blushing to pronounced blushing. Examples of the light pink tones may be seen in the flowers illustrated above: 1, 2,3,9,11,14 and 22 (Figure 4).

Examples of the pronounced blushing varieties, some with red colouring, may be seen in number 19. (Figure 4). Additional flowers with a similar strong blush are seen in numbers 13 and 14. (Figure 4).

Flowers displaying the versicolour pattern of the 'Paljas Magic' 'Cultivar Group' are represented by numbers 7, 16, 24 and 25. (Figure 4). The most striking versicolour is number 7.

The full, broader tepal form is evident in numbers 1,2,3,4,5,20 and 21. (Figure 4).

6. Conclusions

'Jumbo Yellow' crossed with 'Four Marys' produced excellent results.

- Two clivia generations were required to produce a successful outcome. A new strain of plants was developed, named 'Paljas Magic' 'strain'. (Paljas = charm, magic or potion). The variation in the flower colours achieved were truly charming!
- Flowers are white/yellow blushing with pink tones, but there are examples of flowers darker blushing with red. Good examples of a versicolour pattern are also evident. The evidence of flowers with broader, recurved

Figure 5. Strong blushing characteristics of 'Paljas Magic' 'Cultivar Group', varying from a pale pink colour shown in the flowers of the lower umbel at an early stage, to red colours at a later stage shown in the flowers of the upper umbel.

Figure 6. Prominent versicolour in one of the 'Paljas Magic' 'Cultivar Group'.

tepals in some of the flowers is a far superior form than the original 'Four Marys' flower used in this crossing.

The flower colours and shapes of the F2 generation have achieved positive results. My aim is to continue breeding with selected plants of the 'Paljas Magic' 'strain'. To further improve the flower size and shape, I will backcross the 'Paljas Magic' 'strain' to my 'Jumbo Yellow', and hopefully continue to improve the flower forms.

Cape Town
SOUTH AFRICA

Clivia Society

Clivia
INTERNATIONAL CONFERENCE

2 - 4 OCTOBER 2023 • infocliviasociety@gmail.com

- 27 - 29 September 2023
  Guided tour to the last of the Namaqualand spring flowers and succulents
- 30 September & 1 October 2023
  Cape Clivia Club Show and visits to growers and tourist attractions
- 4 - 6 October 2023
  Guided *Clivia mirabilis* habitat tour (a little early for flower spikes to open)

PHOTOGRAPHIC COMPETITION 2022

INTRODUCTION

Glynn Middlewick

An impressive number of superb photographs were submitted this year for the Clivia Society Photographic Competition.

A big thank you to all participants and congratulations to the winners of the various classes.

The judges this year were James Haxton, Claude Felbert and Ian Coates. Whatever final decisions the judges make, someone will be unhappy! A big thank you to the three of them for their time and effort. Some of the images submitted were of a small size and were difficult to assess. The images submitted should be at least 500Kb, but not to exceed 2MB. This is a photgraphic competition, so the quality of the photographs is the most important aspect. The beauty of the subject will no doubt complement the photograph!

The top photographs this year were difficult to place. After careful consideration and re-assessment, the decision was made to award the winning photographs to be shared by Cora de Kock and Carrie Kruger. The third place was also shared by the same two entrants. Carrie Kruger regularly features in the winning categories of the Photographic competition. This year provided us with a new name amongst the winners, that of Cora de Kock.

In addition to the overall winners which were all in the miniata class, the top three positions in the other classes were:

Single flower class – Wanda Grunwald, Carrie Kruger, Johan Jooste

Species class – Johan Jooste, Carrie Kruger, Johan Jooste

Interspecific class – Carrie Kruger, Karel Stanz, Carrie Kruger

Artistic class – Karel Stanz, Carrie Kruger, Carrie Kruger

The winning positions in the various classes may be found in the images that follow. No habitat entries were received.

PHOTOGRAPHIC ENTRIES

MINIATA CLASS

First Place – Cora de Kock shared with Carrie Kruger

Miniata Class – First place tie – Cora de Kock

Miniata Class – First place tie – Carrie Kruger

Miniata Class – Third place tie – Carrie Kruger

Miniata Class – Third place tie - Cora de Kock

Miniata Class 5th place – Johan Jooste

Miniata Class 6th position – Karel Stanz

Miniata Class 7th position – Karel Stanz

ARTISTIC

Artistic class- First – Karel Stanz

Artistic class – 2nd – Carrie Kruger

Above: Artistic Class – third – Carrie Kruger

Left: Artistic class – 4th – Carrie Kruger

Above: Artistic class – 5th place – Anzette Snijders

Below: Artistic Class – 6th place – Andrew Kajewsky

Artistic Class – 7th place – Andrew and Pauline Kajewski

SINGLE FLOWER

Single flower class – 1st – Wanda Grunwald

Single flower class – 2nd – Carrie Kruger

Single flower class – 3rd – Johan Jooste

Single flower class – 4th – Johan Jooste

Single flower class – 5th – Andrew and Pauline Kajewsky

INTERSPECIFIC CLASS

Interspecific class – 1st place – Carrie Kruger

Interspecific Class – second place – Karel Stanz

Interspecific class – 3rd place – Carrie Kruger

Interspecific class – 4th place – Carrie Kruger

SPECIES CLASS

Species class – 1st – Johan Jooste

Species class – 2nd place – Carrie Kruger

Species Class – 3rd place – Johan Jooste

Species – 4th place - Rudi Koekemoer

ENTRIES INTO PHOTOGRAPHIC COMPETITION

Andrew Kajewsky – Interspecific category

Right:
Anzette Snijders –
miniata category

Below:
Cora de Kock –
miniata category

Left: Cora de Kock – interspecific category

Below: Dawie van Heerden – Single flower category

Dawie van Heerden – Single Flower Category

Dawie van Heerden – Miniata category

Dawie van Heerden – Interspecific category

Dawie van Heerden – Single flower category

Above:
Ian Duncalf
– Miniata
category

Right:
Jan Schmidt
– Miniata
category

Above: Johan Jooste – Interspecific category

Left: Johan Jooste – Miniata category

Karel Stanz – Miniata category

Left: Karel Stanz – Single flower category

Below: Karel Stanz – Art category

Right: Kobus van Schoor – Minata category

Below: Kobus van Schoor – Art category

Mike Riska – interspecific category

Mike Riska – Interspecific category

Mike Riska – Miniata category

Mike Riska – Miniata category

Right:
Rudi Koekemoer – Miniata category

Below:
Wanda Grunwald – Single flower

Wanda Grunwald – Miniata category

Right: Carrie Kruger – Single flower category

Below: Andrew Kajewsky – Art category

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