

CLIVIA 11



Photo: Felicity Weeden

Clivia miniata Seedling from the Apple Blossom Complex — Grower: Felicity Weeden

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Editorial

The year 2009 marks the bicentenary of the birth of Charles Darwin and the sesquicentennial of the publication of his Origin of the species and so gives pause for Greig Russell, a welcome new – and in this issue, generous – contributor to the CLIVIA Yearbook, to reflect on Darwin's achievements and whether in fact Darwin was a *Clivia* grower.

Hannes Robbertse, who has before visited the anatomy and physiology of the *Clivia* root in The nutritional system of *Clivia* [CLIVIA Four (2002), pp. 31-35] revisits the topic and comes to some interesting speculative conclusions as to a eutrophic relationship of mycorrhizal fungi with the roots of *Clivia*, a topic expanded on in a contribution by Joanna Dames, which all help our thinking of the co-evolution of species.

Johan Spies presents the observations of their research – in part funded by the *Clivia* Society – at the University of Free State, and speculates on the genus *Clivia* being in fact an ancient polyploidy.

James Haxton takes us on a photographic observation on the predation by lacewings on the eggs of the Amaryllis moth, a marvellous piece of microphotography.

We have two visits to *Clivia* in habitat. Ian Coates takes us on a tour of *C. mirabilis* in habitat, and as supplement, Gerhard Faber introduces surprising consequences of his hybrid breeding with the species.

Kerrie McElroy, also a welcome new contributor, formalises discussions that have

been done on the *Clivia* Enthusiasts group for the breeding of what Mick Dower has termed a 'Universal Yellow', that is a hybrid *C. miniata* having both the recessive genes of both Group 1 and Group 2 Yellows.

Greig Russell presents a genus that is cousin to that of *Clivia*, namely *Cryptostephanus*, and in particular *Cryptostephanus vansonii* and notes on Georges van Son who introduced it to science.

Trevor Pearton and Attie le Roux take us to Bearded Man Mountain, the habitat of the naturally occurring *Clivia* hybrid, *C. × C. nimbicola*. While Trevor gives us the background to the discovery of these naturally occurring hybrids between *C. miniata* and *C. caulescens*, where these two species occur in conjunction, Attie le Roux discusses in layman's terms his observations over the years of the distinctions between the phenotypes of four areas of the naturally occurring hybrid, *C. × C. nimbicola*.

Greig Russell reviews the related literature to trace the introduction of the bred hybrid *C. × cyrtanthiflora* and offer us a revision of its introduction through the literature and proposes that *Clivia × cyrtanthiflora* is a nothospecies.

John Craigie helps the breeder wanting to grow for striation by recording the observations of their breeding programme at Pine Mountain Nursery, here presented.

Although not forming part of this Yearbook it cannot go unmentioned that next year is the *Clivia* Society's fifth International

Clivia Conference – the second to be held in Cape Town. While arrangements for speakers and their topics are well on their way, one of the interesting topics is on DNA testing of many different plants and species that was made at Kirstenbosch by Ferozah Conrad who will be presenting her findings at the conference. The Conference theme is to be Heritage of *Clivia* which must be of interest to enthusiasts. All *Clivia* Growers should make plans to attend. The activities will extend from the 21st September to the 26th September with the Conference taking place over the first two days. There will also be a number of tours arranged around the conference time including one to ‘mirabilis country’.

This issue will have photographs from more Clubs and Interest Groups than ever before. We encourage all Interest Groups that are not submitting pictures to make arrangements to do so for next year. Although the entries for the Photographic Competition have diminished, the standard is still very high with many interesting flower images submitted.

This publication is not the usual vehicle for recording the passing of our members but as he has had much to do with the decision making on the financing and the volume for print runs of this publication it would be remiss of us as Editors not to pause and remember Bossie de Kock and perhaps when we look below, or at the cover of Yearbook 6, with the photograph of his *Clivia miniata* ‘Deklan’ we will all think of Bossie.

A moral standpoint for accurate descriptions of *Clivia* is something we all should agree and act upon. We take this opportunity to encourage everyone to use the Colour Chart II in photographs, particularly where they are going to be used to sell plants.

While the CLIVIA Yearbook is meant to be the vehicle for authoritative and scientific pieces offered in accessible language, we make space to give it a visual appeal. As always we present notes and images of visits to breeders and growers and the results of their breeding programmes, as well as the best that shows have to offer.

The Editors - July 2009



Clivia miniata ‘Deklan’
Grower: Bossie de Kock

**NB: All Photos
are courtesy of the
author of the article
unless otherwise
stated. Eds.**

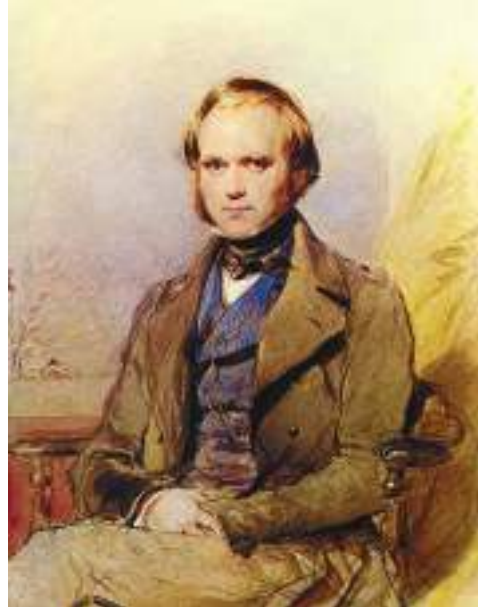
Charles Darwin — Clivia Grower?

Greig Russell, South Africa

Warning: Those readers who consider Darwin's work to be akin to the work of one of Lucifer's minions should forget this article and go and water their plants or something. Much as I do not consider the existence of a spherical earth to be a theory, so do I not consider evolution to be a theory - I see its effects all around me, every day.

Charles Robert Darwin was born on the 12th February 1809 - just two hundred years ago. I will not expand much here on his life; there are any number of biographical and interpretive works on the man available in any reasonable library. For a basic primer on Darwin see: http://en.wikipedia.org/wiki/Charles_Darwin

Darwin attended the universities of Edinburgh (studying medicine) and Cambridge (studying divinity) and was then recommended to accompany Captain Fitzroy's scientific voyage on the *HMS Beagle* as a naturalist/geologist/companion. It was while on this five year long voyage that Darwin observed much, visited the Galapagos and also had time to reflect of what he had seen and experienced. He unfortunately probably also contracted Chagas disease (a South American form of sleeping sickness - trypanosomiasis) on this voyage, or perhaps some other disease, and although a healthy young man departed, a chronically ill man returned. Sufficient family money meant that he did not need to go out to work and he could thus get married, have a family and devote his time to study and a vast correspondence.



Water-colour portrait of Charles Darwin painted by George Richmond in the late 1830s. from *Origins*, Richard Leakey and Roger Lewin

Darwin said that the works of Humboldt and John Herschel “stirred up in me a burning zeal to add even the most humble contribution to the noble structure of Natural Science” (Darwin 2004). This was something he did more than admirably. Over his relatively long life (he died in 1882) he considered and contributed to a wide range of scientific disciplines, the most famous of his vast output being the *Origin of Species* (1859 - so it is the sesquicentennial of the publication of this work) and the *Descent of Man* (1878), both works dealing with evolution of species through the mechanism of natural selection. Darwin's works gave huge impetus to the understanding of biology in its broadest sense. Modern biology only makes sense when organisms are viewed as the products of an

evolutionary process. It has been pointed out that Darwin's disease played a large part in his success, as it isolated him from the usual time-wasting activities of a job and social interaction, giving him so much more time to think, correspond and conduct studies to clarify the cloudy.

Darwin visited the Cape once; and it was the only time he ever set foot in Africa. Although the *Beagle* had travelled down the east coast of South Africa on the way to the Cape, landfall was never made there, and thus Darwin would have never seen *Clivia* in their natural habitat. I have made a special task of studying what Darwin wrote at this time and he apparently did not really enjoy or appreciate his sojourn at the Cape. But then he was already a sick man (his journal entry for Thursday, 9 June says nothing but "not very well", and for Saturday, 11 June there is no entry at all) and he had arrived at the wrong time of the year (lousy weather and no carpets of flowers). The nineteen days of his journal keeping at the Cape resulted in the writing of only 900 words; most of which deal with observed geology.

The *Beagle* arrived in Simon's Bay on the 31st May 1836. The following day, Darwin travelled (for many hours) to Cape Town,



The Beagle - Painting by Conrad Martens

then a town of some 15 000 souls, and he stayed there in barely-adequate lodgings. He then organised a four day trip, taking in "Praal", "French Hoeck", the road to Caledon (Houhoek Pass) and "Sir Lowry Coles Pass" (sic). Back in Cape Town, he visited with Dr Andrew Smith at the Museum, Thomas Maclear (the Astronomer Royal at the Cape), Colonel John Bell (the Colonial Secretary), and Sir John and Lady Herschel (having earlier been greatly inspired by Sir John's writings, this was the highlight of his visit).

Now we can examine Darwin's association with *Clivia*. Bear in mind that he preferred to use the old genus name *Ima(n)tophyllum*, so when I quote him directly, this name is the one often used. One of Darwin's correspondents was John Scott, the foreman of the propagating department at the Royal Botanic Garden, Edinburgh. Scott tended to and had done some work with *Clivia*, and they are briefly mentioned in letters. In one letter dating to late November 1862, Scott said: "I am extremely sorry that I can afford you no information whatever on the relative fertility of varieties of plants. I may mention, here, however, though you may already be aware of it an experiment which I made in illustration of the fertility of hybrids. This was made upon *Clivia* cyrtanthiflorum, which was raised by crossing the *C. nobilis* with *C. miniata*. I find it to be perfectly fertile with its own pollen as well as that of either parent." (Darwin 1997, p. 542).

In early December, Darwin enquired of Scott: "I see few periodicals: when have you published on *Clivia*? I suppose that you did not actually count the seeds in the hybrids in comparison with those of the parent-forms" (Darwin 1997). Scott replied on the 6 December: "I have made no notice of *Clivia*, nor have I counted the seeds.

This I will now, have an opportunity of doing, as the hybrid & one of its parents are at present in flower.” (Darwin 1997).

At this point there was a letter from Scott to Darwin which has unfortunately gone missing; but from Darwin’s book, *The variation of animals and plants under domestication* (Darwin 1868) we understand that: “Mr. John Scott informs me that in 1862 *Imatophyllum miniatum*, in the Botanic Gardens of Edinburgh, threw up a sucker which differed from the normal form, in the leaves being two-ranked instead of four-ranked. The leaves were also smaller, with the upper surface raised instead of being channelled.”

Darwin wrote to Scott on 16 Feb 1863: “Your case of *Imatophyllum* is most interesting; even if the sport does not flower it will be worth my giving.” Darwin again wrote to Scott on the 2 May: “Let me hear about the sporting *Imantophyllum* if it flowers.” (both Darwin 1999, p. 140 & 376)

That is the extent of this series of letters and nothing further came of it. I really don’t understand the comment inferring that four-ranked foliage represents the norm in *Clivia*. Perhaps Darwin inverted what had been written originally?

Donald Beaton (1802–63) was a Scottish gardener who became an expert on hybridisation. Trained in Scotland, he eventually gardened for William Fowle Middleton of Shrubland Park, Suffolk, a pelargonium enthusiast. Beaton was a regular contributor to the *Gardener’s Magazine* and the *Cottage Gardener*, the latter becoming the *Journal of Horticulture* after 1861. Beaton, although ‘only’ a horticulturist, was prepared to criticise scientists who he considered were purveyors of nonsense. Darwin did not like this lack of ‘respect’, and took on Beaton at every opportunity.



Photo from the KZN Show — a double Umbel *C. miniata* — Grower Liz Boyd

Photo: Clive Graham

In a letter to the *Journal of Horticulture* in January 1863, Darwin said: "About a year ago Mr. Beaton gave an analogous case, far more remarkable than any hitherto recorded, for he showed (if my memory does not deceive me) that the pollen of one species acted on the footstalk of the seed-capsule of another species, and caused it slowly to assume a position which it would not otherwise have acquired. I forget the name of the plant, and have vainly spent an hour in trying to find the passage, though I am sure I marked it." (Darwin 1999, p. 90).

Further research has shown that in an article on crossing flowers, Beaton (Darwin 1999, p. 91) reported as "the most curious thing I know of among plants", that the capsules of *Clivia miniata* stand erect as the umbels of flowers, and the capsules of *C. cyrtanthiflora* hang down as the flowers do. By crossing the two, the capsules of the former become as pendent as those of the latter. Darwin double scored this passage in the margin of his copy of the journal, so we can be fairly sure that *Clivia* were the plants to which he had been referring in the above letter.

Interpreting this one is not that easy. Unfortunately I cannot find a copy of Beaton's original article to check exactly what he said (it is always preferable not to work from secondary sources). What I believe was intended is that when *Clivia miniata* is self-pollinated then the pedicels remain erect, whereas when *C. x cyrtanthiflora* pollen is used on *C. miniata*, the capsules hang. It is impossible that the origin of the pollen would have any effect on the pedicel post-pollination. Although even the thinnest pedicels on my plants of *C. miniata* can support the largest capsules in an upright position, growing conditions in England are very different, and the plants were in all likelihood much softer, meaning that larger capsules may have caused pedicels to bend over.

C. miniata is a species which is known to be somewhat sexually self-incompatible, meaning that selfed flowers would produce fewer seed than those that were crossed. Further, taking hybrid vigour into consideration, it is most likely that the capsules produced from the cross pollinations were larger and heavier and thus bent the soft pedicel over, whereas the selfed capsules do not. One would however have hoped that, if this were the case, Beaton would have pointed out the greater fullness of the pendulous capsules.

Darwin wrote a letter dated 26 October 1875 to William Turner Thiselton-Dyer, the then Assistant Director at the Royal Botanic Gardens, Kew. Thiselton-Dyer later became the third Director of this institution, but not before marrying the daughter of J D Hooker, the second Director, who himself was the son of the first Director, Sir W H Hooker - this all sounds like some early version of *Dynasty*? Darwin wrote because he wanted "*Imantophyllum* for crossing experiments" (Darwin 1994, p. 438). Darwin had long since (January 1863) had a 'hothouse' constructed at his home, "Down House", to house such treasures.

In Darwin's 1880 book *The power of movement in plants*, (Darwin 1880), in a chapter dealing with movements made by leaves; it says the following: "*Imatophyllum vel Clivia* (sp.?) (Amaryllideae). A long glass filament was fixed to a leaf, and the angle formed by it with the horizon was measured occasionally during three successive days. It fell each morning until between 3 and 4 P.M., and rose at night. The smallest angle at any time above the horizon was 48°, and the largest 50°; so that it rose only 2° at night; but as this was observed each day, and as similar observations were nightly made on another leaf on a distinct plant, there can be no doubt that the leaves move periodically,

though to a very small extent. The position of the apex when it stood highest was 0.8 of an inch above its lowest point.”

This interesting little experiment was undertaken by Darwin in the ‘hothouse’ at “Down”. I would suggest that this observation indicates that the stomata on the leaves of *Clivia* open when illuminated, causing loss of water and hence a reduction of the turgidity of the leaves; this is the cause of the change in the angle of the attached glass filament - and would take place daily on a cyclical basis.

One can thus surmise that Darwin’s plea to Thiselton-Dyer had been fruitful, that he grew *Clivia* in his hothouse and had more than one of them (although he didn’t know which particular species he had acquired - so much for “crossing experiments”).

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Hail Darwin, the *Clivia* Grower.

Photo from KZN Show — Grower Liz Boyd
Best Yellow / Cream *C. miniata*



Photo: Clive Graham

Comparing Root Anatomy of *Clivia*

Hannes Robbertse, South Africa

Comparison of the root anatomy of different *Clivia* species with special reference to the velamen

Introduction

According to Dycus and Knudson (1957), the envelope around orchid root was discovered in 1835 by H.F. Link, but the name “velamen radicum” was suggested by Schleiden who studied the roots of a large number of orchids). Sanford and Adanlawo (1973) remarked that “... there is surprisingly little published information on the velamen, even on the number of layers comprising it, to say nothing about its development and structure”.

Most of the work on the velamen was done on the roots of epiphytic orchids, but a velamen is also found in other Monotyledonous plants such as some Araceae and Amaryllidaceae like *Agapanthus* and *Clivia*. If there is “little” information available about the velamen of orchid roots, there is even less published information on the velamen of other plants. In a paper on “The Nutrition System of *Clivia*” (Robbertse in *Clivia* 4), I gave a brief description of the root anatomy of *C. miniata* but no reference was made to the other species. In this paper a comparison is made between the root structure of *C. mirabilis* and roots of the other species. A proper understanding of the structure and function of the roots may assist growers in optimising the fertilising programme of their *Clivia* collection.

Materials and methods

Roots of *C. mirabilis* were collected from plants in Sakkie Nel’s collection that were obtained from the natural habitat. Roots of

the other species, (*C. caulescens*, *C. gardenii*, *C. miniata*, *C. nobilis* and *C. robusta*) were obtained from James and Connie Abel’s collection. All these plants originated from natural habitats. The roots were fixed in a mixture of 50% alcohol, acetic acid and formalin and transverse hand sections were made of all the roots. The sections were stained in Toluidin Blue or Safranin and studied with a Leitz microscope fitted with a digital camera for taking micrographs.

Results and discussion

General structure and function of *Clivia* roots

All *Clivia* roots are relatively thick, which is characteristic of storage organs for storing water and reserve nutrients. All roots are covered with a multilayered epidermis, called the velamen, that develops from the young epidermis close to the growing point of the root. Cells of the outer layer of the velamen, also called the epivelamen, are converted into root hairs that stay on the

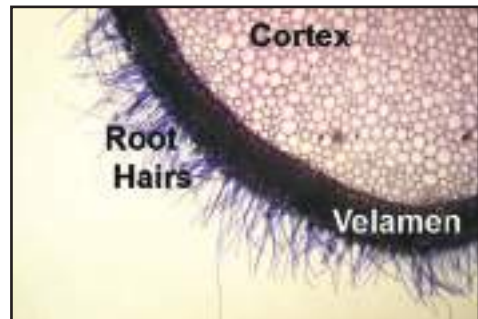


Figure 1: Transverse section of *Clivia miniata* root showing abundant root hairs.

roots even if they are very old. (Fig 1) Close to the root tip the velamen cell walls develop net-like thickenings (striations) (Fig 2) and become impregnated with suberin (corky



Figure 2a: Transverse section of *C. mirabilis*

substance). They lose their cellular contents and are therefore dead. The possible function of the velamen will be discussed later in this paper.

The exodermis, just below the velamen, is the outer layer of the cortex (Fig. 2) and consists of relatively large cells of which the outer cell walls become thickened and eventually die, except for some smaller cells that retain their cell contents and serve as passage cells (transfusion cells) forming gateways between the velamen and the cortex.

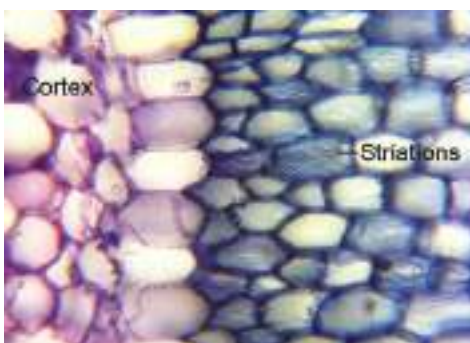


Figure 2b: *C. gardenii* roots showing striations on the velamen cell walls

The rest of the cortex, up to the endodermis, consists of thin-walled parenchyma cells with intercellular spaces filled with air (Fig 1). The

cortex serves as the storage centre of the root, but also serves as a passage route for water and nutrients taken up from the substrate by the root, to the vascular cylinder. An iodine test was performed to determine whether the roots are storing starch, but no starch grains were observed in the roots of any of the species, meaning that the roots are probably storing soluble substances such as sugars. In the roots of the species with pendulous flowers, small spherical bodies that stained violet-red with Toluidin Blue were observed in the cortex cells (Fig. 5). The composition and function of these bodies are unknown.

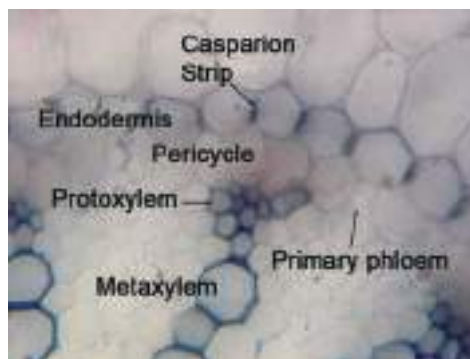


Figure 3: Section of *C. mirabilis* root showing Casparian strips in radial walls of endodermis cells, pericycle, primary xylem elements and primary phloem

The endodermis is the inner layer of the cortex (Fig. 3) and similar to the exodermis, consists of a single cell layer that also contains transfer cells. Characteristic of the endodermis are the Casparian strips in their radial walls. The Casparian strips contain suberin which is impermeable to water and is responsible for blocking the apoplastic movement (movement of solutes through the radial walls of the endodermis cells). Any solute entering the vascular cylinder has now to pass through the cell membranes of the endodermis cells which are semi-permeable and will only allow the passage of

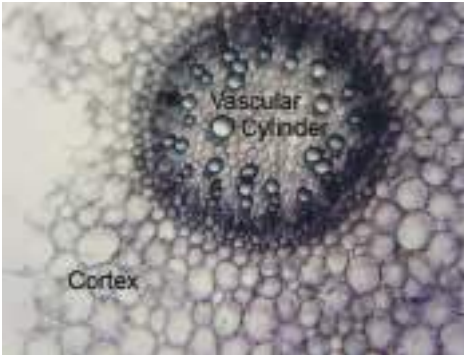


Figure 4: Section of *C. robusta* root showing vascular cylinder surrounded by cortex

water and mineral ions. The function of the endodermis is therefore to regulate the entering of substances into the vascular system.

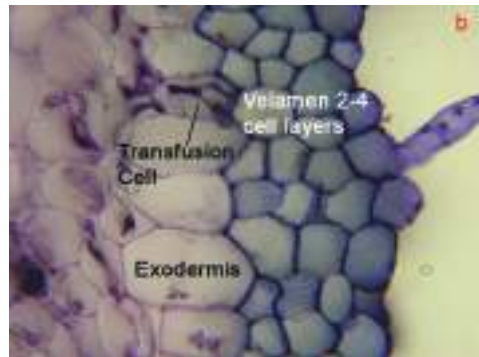
The pericycle is the outer cell layer of the central cylinder and consists of thin-walled cells (Fig. 3) that retained their capacity to divide and they are responsible for the formation of lateral roots.

The rest of the central cylinder (Fig. 4) consists of alternating groups of primary xylem and primary phloem embedded in a parenchymatous ground tissue. The vessels of the primary xylem are responsible for transporting water and solutes taken up by the root, to the transport systems in the stem, leaves, flowers and fruit. The phloem elements of the primary phloem receive the products of photosynthesis (photosynthates) that were loaded into the phloem elements in the leaves, via the phloem in the stem. These photosynthates are then either consumed by the roots or stored in the cortex cells and ground tissue of the vascular cylinder.

Except for anchoring the plant in its substrate, the other functions of the roots are therefore:



Figure 5: Sections of mature (a) and young (b) roots of *C. mirabilis* showing thin (2-4 cell layered) velamen



- the uptake and transport of mineral ions from the substrate through the xylem system to other parts of the plant and
- receiving photosynthates via the phloem system and storing it in the cortex and ground tissue of the vascular cylinder

Comparing the root structure of the species

C. mirabilis: *C. mirabilis* has a massive, succulent root system and individual roots are up to 15-20 mm in diameter (See Rourke in Clivia 4) and therefore thicker than those of any of the other species where the diameter of the roots vary around 5-10 mm. The velamen is thinner than that of the other species and consists of about two to four cell layers (Fig 5).

It is covered with root hairs and stretches up to the very tip of the root, meaning that there is hardly any part of the root where live root hairs make contact with live cells of the cortex. The striations of the velamen cells are not as conspicuous as in most of the other species. The cortex contributes to most of the diameter of the root, indicating that the roots of *C. mirabilis* have become true storage organs (Fig 6). In the other species the rhizomes are thick and fleshy and are better storage organs than in the case of *C. mirabilis* where the rhizomes are not as thick and the roots have taken over most of the storage function.

Roots of the other species.

Roots of the other species are thinner (5-10 mm) than those of *C. mirabilis*. All the roots are densely covered with long, persistent root hairs (Figures 1, 6 and 7). The thickness and number of cell layers of the velamen vary amongst the

species. In *C. nobilis* (Fig 6a) and *C. caulescens* (Fig 6b) the velamen is about 8-10 cell layers thick (about 0.27 mm to 0.3 mm) while in *C. miniata*, *C. robusta* and *C. gardenii* (Fig 7) it consists of only 5-6 cell layers and is only about 0.2 mm thick. The thinnest velamen of 2-4 cell layers (about 0.1 mm thick), was found in *C. mirabilis*. In a study of the velamen in orchid species, Sanford and Adanlawo (1973) found that the “presence of epivelamen, number of velamen layers and shape of the epivelamen and velamen cells are remarkably consistent within broad taxonomic groupings”. The thick, multi-layered velamen of *C. nobilis* and *C. caulescens* on the one hand, the thinner velamen of *C. miniata*, *C. robusta* *C. gardenii* on the other and the exceptionally thin velamen of *C. mirabilis* are very striking, and relates to some extent to the cladistic relationship between these species that was reported by Conrad and Reeves (Clivia 4).

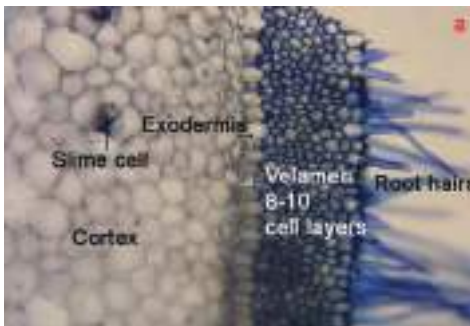
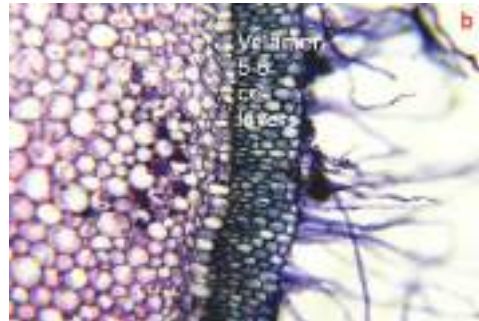


Figure 6: Sections of *C. nobilis* (a) and *C. caulescens* (b) roots showing thick (8-10 cell layered) velamen



Figure 7: Sections of *C. miniata* (a) and *C. gardenii* (b) roots showing medium thick (5-6 cell layered) velamen



The striations or reticulate thickenings of the velamen cell walls normally do not occur on the root hairs, but in *C. robusta*, even the root hairs contained very prominent striations

Except for the thicker roots of *C. mirabilis* and variation in the thickness of the velamen, the roots of all the species look very similar, also having a similar function.

Function of the velamen

Research on the functioning of the velamen has been done exclusively on the aerial roots of epiphytic orchids. Dycus and Knudson (1957) came to the conclusion that the function of the velamen of epiphytic orchids roots is mainly for protection against water loss and that absorption is restricted to the adpressed portions where the roots make direct contact with supporting medium. However, they also mention that “The velamen cells and exodermis are modified if the aerial root enters the potting medium or affixes itself to a solid substratum. Absorption of water and nutrients can then occur and transportation to the cortex and stele is possible”. *Clivia* roots are not aerial roots and are mostly found inside the substrate and should therefore be able to absorb water and nutrients. Considering the fact that *Clivia* have no other roots than those with a velamen and the fact that the velamen covers the root up to or very close to the root tip, there is no other alternative for absorption of water and nutrients except for via the velamen. This statement has, however not been properly researched and unless this is done as a matter of urgency we will never fully understand the nutrition of *Clivia*. Velamen cells are dead and dead cells can only allow apoplastic transport, but the problem is that the cell walls are impregnated with the corky substance suberin that does not allow for apoplastic transport! This leaves us in a difficult situation as how to proceed but we still do feed them and they do respond to nutrition.

The same kind of fungus illustrated in figure 8 was observed in most of the root sections. Could this be a kind of mycorrhiza? It is a well-known fact that mycorrhiza are associated with the roots of many plant species where they play a role in the uptake of nutrients especially phosphorus. This observation also requires further investigation.

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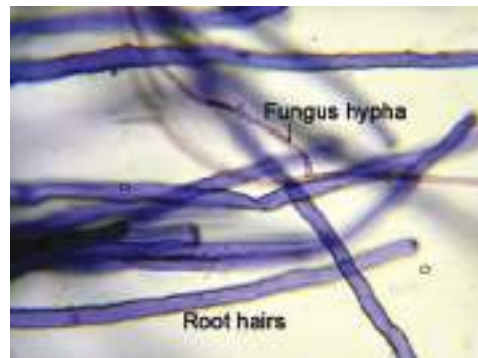


Figure 8: Fungus hyphae amongst root hairs of *C. miniata*

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Do Clivia have Roots?

Joanna Dames, South Africa

Plants do not have roots...they have fungal roots.

Soil is more than just an accumulation of sand and clay – it is a frontier where the battle for existence, food, space and resources wages continuously. Bacteria and fungi are just some members of this underfoot community and they congregate in and around the roots of plants that grow in the soil-forming microbial societies. Within these societies there are microorganisms that promote soil health, preventing the decay that becomes prevalent in an unruly society. A group of critically beneficial soil microorganisms are the mycorrhizal fungi. These fungi grow by producing straw-like filaments in the soil connecting plant roots to the soil and environment, similar to the network of cables connecting our world. The energy source required for these fungi to grow is obtained from the sugars that plants produce, a renewal resource resulting from solar power and carbon dioxide. In return for this energy plants have access to nutrients required for their own growth provided by the extensive fungal cable network. As in our own community, when the source of energy is affected chaos reigns and bad elements cause havoc. The undesirable microbes then cause disease which affects the growth of plants, causing stunting, wilting, decay and root rot.

Mycorrhizal means fungus root and closer microscopic examination of the majority of plant roots reveals that in undisturbed healthy soils the roots are more fungus than root. This symbiotic relationship occurs between plants and fungi and has existed for over 450 million years. The successful transition of plants from their aquatic to terrestrial existence is due

largely to the presence of these fungi. These fungi live within the roots of plants and extend their fungal filaments into the soil environment where they search for nutrients such as phosphorus far beyond the plants own rooting zone. These nutrients are absorbed by the fungi and are transported back to the plant where specialised structures inside the root (Fig. 1) will allow these nutrients to be shared with the plant in return for energy. The branching tree-like structures seen within the roots are called arbuscules and characterise this group of mycorrhizal fungi as the arbuscular mycorrhizas.

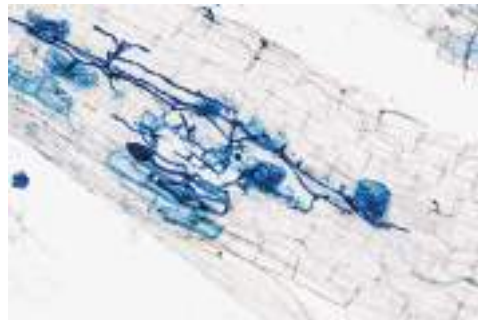


Figure 1: Specialised fungal structures within plant roots (stained sections) allow for nutrients to be transferred to the plant in return for energy in the form of sugars which are needed for fungal growth. Arbuscules are the finely branched tree-like structures.

It is estimated that for every one millimetre of root there is over a metre of fungal filament forming a network in the soil, which can extend beyond the plant roots. This ultimately results in the plant gaining access to nutrients that normally wouldn't be available to it. The mycorrhizal fungi form a secondary rooting system, which assists with plant growth. In natural undisturbed soils mycorrhizal fungi are common inhabitants. Soil that has

been degraded by over-fertilisation, particularly of inorganic phosphates, indiscriminate application of pesticides and physical disturbance, ends up with reduced populations of these beneficial fungi. Reintroduction of these fungi ensures that plants such as vegetables, shrubs, trees and grasses can take advantage of their numerous benefits.



Ian Brown's 'Ghost'

Photo: Claude Felbert

Plants belonging to the Amaryllidaceae family such as *Clivia* also benefit from this relationship. The benefits that you will see include improved plant growth, as is evident by the "little plant - big plant" syndrome.

The improvement in plant growth is due to improved nutrition of the plant and this indirectly enhances the plants tolerance to diseases and stress. Other benefits often ignored relate to the soil environment. The most important component of a healthy soil is the organic matter that in undisturbed environments is generated through falling leaves and decaying vegetation. Soil microbes work hard to release the nutrients bound up in the organic matter so that these can be recycled back to the plant, providing natural food. In an artificial environment organic matter can be supplied by applying compost and mulches. Humic acids are a breakdown product of organic matter and contribute between 2-5% of the soil organic carbon. Arbuscular mycorrhizal fungi produce a protein that is

released into the soil. This protein is called glomalin and contributes between 6-14% of the soil organic carbon. This is a pool of soil carbon that we almost totally ignore and one that depends entirely on the presence of these mycorrhizal fungi. Inoculating plants with suitable mycorrhizal fungi can more than double the amount of glomalin in the soil. Glomalin has been called the superglue of soil, as it enhances the aggregation of soil particles allowing for better moisture holding capacity and improving the structure of the soil.

Ensure that your garden or nursery environment has the benefit of these amazing fungi and let them assist you with creating a healthy soil environment. At the root of every healthy plant are mycorrhizal fungi.

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Polyploidy in *Clivia*

Johan Spies & Hesmari van der Westhuizen, South Africa

Polyploidy appears to be a “magical” term for *Clivia* lovers. The term has even been used as a name for a specific cultivar, because “the cultivar is so easy to grow”! Artificial polyploids are produced by Aart van Voorst in the Netherlands and these plants are in high demand. But what is a polyploid and how will it benefit *Clivia* lovers?

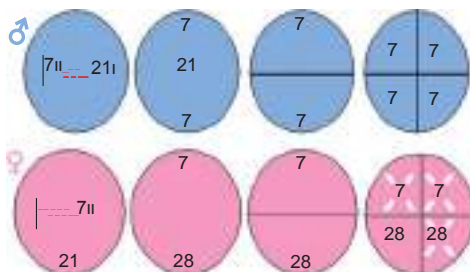
A polyploid is a plant containing more than two sets of chromosomes. In *Clivia* each cell contains 22 chromosomes. The plant receives 11 of these (or one genome) from the berry parent and 11 (another genome) from the pollen parent. A polyploid *Clivia* will consequently contain more than two genomes or sets of chromosomes. With the addition of each genome specific names are assigned to the plant: a plant with two genomes (“normal”) is called a diploid; 3 genomes – triploid; 4 – tetraploid; 5 – pentaploid; 6 – hexaploid; etc.

It is necessary to define certain terms before we discuss this issue any further:

- **Somatic chromosome number (abbreviated as 2n):** This is the number of chromosomes observed in a body cell (somatic cell). It is used to indicate mitotic results. Please note that this is not a diploid chromosome number as suggested in many books! In approximately 80% of plants in South Africa the somatic chromosome number differs from the diploid chromosome number and unfortunately the incorrect name is usually used.
- **Gametic chromosome number (n):** This is the number of chromosomes observed in a male gamete (or pollen) of an individual. It is used to indicate results from a meiotic study. It is not always half the number of chromosomes in a somatic cell!

If we look at the example of the English dog rose *Rosa canina* (the whole process is schematically presented below), we see that with the formation of pollen seven pairs of chromosomes participate in meiosis in the normal way, forming seven bivalents on the metaphase plate and segregating normally during anaphase I. Another 21 unpaired chromosomes (univalents) is also present in the same position but these chromosomes do not segregate during anaphase I. During cell division these 21 univalents disappear and four pollen grains are formed, containing seven chromosomes each. Hence the gametic chromosome number is seven.

The situation on the female side differs significantly. With the formation of the embryo sac seven pairs of chromosomes participate in meiosis in the normal way, forming seven bivalents on the metaphase plate and segregating normally during anaphase I. Another 21 unpaired chromosomes (univalents) are also present in one pole of the cell. Meiosis I results in seven chromosomes in one pole and 28 in the other. The second meiotic division is followed by degeneration of three cells and an embryo sac containing 28 chromosomes is formed. This is not the gametic chromosome number! Fertilisation of the 28 chromosome embryo sac by a seven chromosome pollen grain restores the chromosome complement of $2n = 5x = 35$ of *Rosa canina*. This is not the only exception and therefore the chromosome number nomenclature as described, should be used.



➤ **Basic chromosome number (x):** This is the lowest gametic chromosome number in a taxon.

In nature the overwhelming majority of plants will be on an even ploidy level, di-, tetra- or hexaploid. The reason for this is that uneven ploidy levels usually cause unbalanced chromosome segregation during meiosis, resulting in sterility. This phenomenon is often used by plant breeders to cross a diploid (2x) with a tetraploid (4x) to obtain a sterile (often seedless) triploid (3x). Even in *Clivia* this phenomenon can be used: cross a diploid with a tetraploid and sell the seeds. The resulting plants will be sterile and can only be propagated with vegetative reproduction (offsets) or tissue culture. In this way the original breeder has a perpetual market with his/her seed production and sales.

Another advantage of a polyploid is that the polyploid plant is usually larger than its diploid counterpart. The leaves will be thicker; flowers larger and even the pollen will be larger. Unfortunately the price for this increase in size is a slower growth rate. However, there are also disadvantages linked to polyploidy. It is difficult to breed with polyploid lines. If a recessive mutation occurs in a diploid plant and you self-pollinate the plant, approximately ¼ of the offspring will exhibit the mutation.

You start with a “normal” diploid plant with two copies of a certain gene, for example AA. One of these genes now mutates to a, thus your plant is now Aa. You self-pollinate the plant and obtain the following results in the F1 according to Mendelian genetics:

	A	a
A	AA	Aa
a	Aa	aa

However, if you get the same phenomenon in a tetraploid (4x) plant, the result is that no F1 offspring will exhibit the trait and in the F2 generation only 1/16 of the plants will show the recessive trait.

You start with a “normal” tetraploid plant with four copies of a certain gene, for example AAAA. One of these genes now mutates to a, thus your plant is now AAAa. You self-pollinate the plant and obtain the following results in the F1 according to Mendelian genetics (no plant exhibits the recessive trait):

	AA	Aa
AA	AAAA	AAAa
Aa	AAAa	AAaa

If the AAaa offspring is self-pollinated (remember, you do not know which plant carries this gene combination, so you will have to self-pollinate all the F1 offspring), only 1/16 will exhibit the trait.

	AA	Aa	Aa	aa
AA	AAAA	AAAa	AAAa	AAaa
Aa	AAAa	AAaa	AAaa	Aaaa

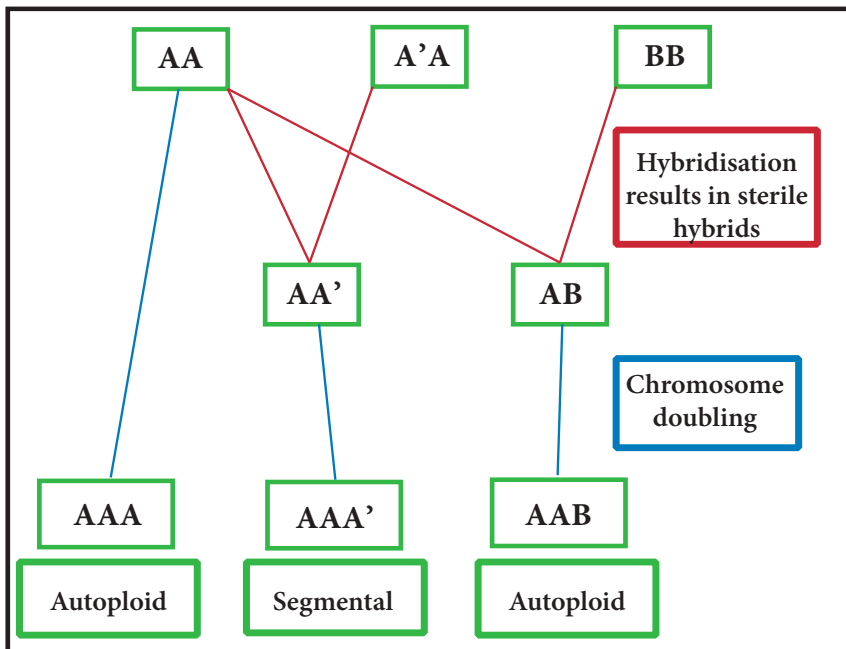
The result is that you will have to propagate many (hundreds) of tetraploid offspring to obtain the same result as with a few diploids (tens of offspring).

Things can get even more complicated. Three different types of polyploids have been described. Autoploidy is where the same genome has been multiplied. The plant will contain four sets of chromosomes (genomes) which are very similar. This will happen for example if one uses colchicine to double the chromosome number. The existing chromosomes are doubled and no “new genes” are added to the plant. A study of meiosis in an autoploid plant will reveal that the different sets of chromosomes pair with one another and four chromosomes will pair instead of the two observed in diploids. The morphology of the chromosomes will place them in groups of four.

Allopolyploidy involves cases where two species have hybridised and the chromosome number of the hybrid doubled. If the chromosomes

did not double the plant would have been sterile. This is an increase in chromosome number involving different genomes. Where the autoploid will contain AAAA genomes, the allopolyploid will contain AABB genomes and only two chromosomes will pair. During meiosis the allopolyploid will mimic a diploid plant and chromosome morphology will indicate groups of two chromosomes.

The third type of polyploidy is called segmental allopolyploidy and occurs when partially similar genomes are doubled. This implies that some chromosomes of the four genomes are similar while others differ, resulting in chromosome morphology that will group two chromosomes together in some cases and four in others. In addition to these three types of polyploidy various combinations of the different types occur.



In autopolyploids and segmental allopolyploids you get a tendency towards diploidisation, where the plant will act more and more like a diploid plant through time. The reason for this phenomenon is that “competition” for chromosome pairing occurs in autopolyploids. Since the initiation of chromosome pairing is random, you may get the formation of a quadrivalent (four chromosomes pairing), two bivalents (two pairs of two chromosome pairing) or even the formation of a trivalent (you have guessed it - three chromosomes pairing) and a univalent. Quite often a univalent will not participate in meiosis and the chromosome will get “lost” during cell division. This leads to reduced fertility. With a quadrivalent the orientation of this group of chromosomes will determine whether you get a 2-2 segregation (fertile) or a 3-1 segregation (infertile). So, through a process of natural selection, the number of plants which form more bivalents will gradually increase. Any structural changes to the chromosomes that cause them to form bivalents instead of multivalents will have an evolutionary advantage. Structural chromosome changes in plants are quite common. In a very extensive study on South African grasses we observed many inversions. One species, *Tribolium brachystachyum*, contains at least one inverted chromosome pair in every specimen!

In nature autopolyploids are almost non-existent. Although some molecular studies suggest autopolyploid origins for some natural population, this is not backed up by cytogenetic studies. In nature allopolyploidy (increase of different genomes) or segmental allopolyploidy (increase of similar [but not identical] genomes) reigns. If we look at large plant families we see various basic chromosome numbers in each one. Usually you get $x = 5, 6, 7, 8$ and 9 , as well as numbers like $11 (5 + 6), 13 (5 + 8 \text{ or } 6 + 7), 17$

$(8 + 9)$, etc. The higher numbers can usually be derived from the lower ones. Remember, we are dealing taxonomically with plant groups (eg. families) based on what we observe today. In the past (10 000 - 100 000 years ago) each basic chromosome number could have represented a family. Due to hybridisation between them we now consider them to be one family because of morphological overlap. This is for example the case in families such as the Verbenaceae and Hyacinthaceae. In the early 80's Peter Goldblatt (Missouri Botanical Garden, USA) did a study on different basic chromosome numbers in families of flowering plants and concluded that all basic chromosome numbers higher than 9 were secondarily derived (as we indicated above with $11 = 5 + 6$, etc.).

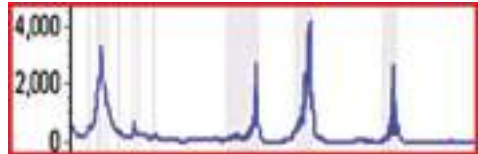
Following this line of thinking, the genus *Clivia* has a secondary basic chromosome number of $x = 11$ and is, by implication, a polyploid plant. However, we are dealing with an ancient polyploid (at least tens of thousands of years old). A well-known case where ancient polyploidy has been established is maize ($2n = 2x = 20$) that should actually be $2n = 4x = 20$. Chromosomal changes, however, of the duplicated genomes resulted in totally different looking chromosomes but almost all the genes are duplicated, although the sequence of the genes often differs.

So getting back to *Clivia*: we should look further for the closest relatives, if they are still alive! The link between *Clivia* (putative genomes AABB) and *Cryptostephanus* (putative genomes AACC) may be a pivotal genome (AA) present in both, with the other genome differing. If *Clivia* originated as an allopolyploid, the ancestors could be $2n = 2x = 10 (x = 5)$ and $2n = 2x = 12 (x = 6)$ {although this seems unlikely if we look at the different basic chromosome numbers of the Amaryllidaceae}. A combination of

these genomes (i.e. allopolyploidy) will not show similar chromosomes (autopolyploidy or pairs of four), but it will contain duplicated genes. With chromosomal evolution some of these genes may disappear over time. This may be the reason why it is so difficult to find normal Mendelian segregation in *Clivia*.

With the research done in our laboratory we have observed many indications of more than two copies of certain genes. Genes may be duplicated in a genome without polyploidy. But the number of genes where we find signs of duplication exceeds the number expected by “accidental duplication” of genes. Duplicated genes in the anthocyanin pathway of *Clivia* will be discussed in future issues of *Clivia*. Duplicated DNA areas leading to four copies of the DNA instead of two will also be discussed in future issues of *Clivia*. At this stage we just

want to show an example of a microsatellite analysis of a *Clivia nobilis* specimen clearly showing four alleles instead of the expected two. In a diploid specimen a maximum of two peaks would have been visible.



Our conclusion at this stage is that *Clivia* represents an ancient polyploid. More genes should be studied and eventually we will have to use *in situ* hybridisation techniques (FISH) to determine whether these copies occur on different chromosomes. Within the next five years we should be able to present more evidence on the validity of this hypothesis.



David Brundell's Vico Yellow New Zealand Hybrids

Photo: Tino Ferero

Georges van Son's *Cryptostephanus*

Greig Russell, South Africa



The Young Georges van Son



The older Georges van Son for comparison purposes

by Koopowitz in his work. Duncan (2002) offered more regarding the history and naming of this plant. The point of this piece is to fill in and expand on this subject.

Evidence from DNA phylogeny indicates that plants of the genus *Cryptostephanus* are the closest relatives of *Clivia*. Of the three known species in this genus, *C. vansonii*, although rare, is the one most commonly encountered in cultivation and thus there is a small, constant stream of comment about this species in the *Clivia* literature and on related Internet groups and forums. Most of this comment deals with sources of material, and ideas regarding the culture and hybridisation potential of this plant. Little is available in the popular literature dealing with the history of this species or the origin of its name. In Koopowitz's *Clivia*, this aspect received scant attention; all that was said is that "It was named for a Mr. Van Son who flowered a plant in his garden near Pretoria, South Africa, and the species was described in 1943". The beautiful origin of the genus name was also not explained

Cryptostephanus is a genus that was erected in 1878 by John Gilbert Baker (1834-1920), the Amaryllid expert at Kew; the name having been coined some years earlier in manuscript by Friedrich Welwitsch (1806-1872). Welwitsch was the man whose name has been immortalised in that weird, two-leaved, cone-bearing plant of the Namib; the one that appears more suited to the set of a sci-fi movie than real life - *Welwitschia mirabilis*. He is also noted for being the first important botanist to work in Angola, collecting there from 1853-1861 and discovering many hundreds of then unknown species of plants and animals.

The plant for which the generic name was created, now known as *Cryptostephanus densiflorus*, is Angolan, but more recently it has entered the Namibian national plant list courtesy of Dr Peter Bruyns. It is known from less than a handful of herbarium specimens (mostly from the type collection) and living material is not apparently yet to be found in cultivation.

On close examination of the flowers, Welwitsch observed that hidden within the flowers of his plants, at the top of the

floral tube, there were six small appendages pointing outwards that look like a crown or corona. The genus name *Cryptostephanus* is derived from the Greek words κρυπτος (transliterating as 'kruptos') meaning 'hidden' and στεφανος (transliterating as 'stephanos') meaning 'crown' (the names Steven, Stephanie, Esteban, etc. all mean 'Crown'). The crown may be seen in all three currently-accepted species of *Cryptostephanus*, and in *C. vansonii* and *C. haemanthoides* this crown is even more elaborate, as each of the six processes is bifurcated towards the tip yielding a crown with twelve ornamentations. Crown-like structures can also be seen at the mouth of the floral tube in *Tulbaghia* (wild garlic) and *Cyrtanthus herrei* (a plant initially believed to be a species of *Cryptostephanus*). Contrary to what has been said, the species epithet does not commemorate "a Mr Van Son", but rather "THE Mr van Son". Georges van Son, who both first collected the plant and then later flowered it in his garden, was one of a handful of scientific greats working in South Africa in the middle of the 20th century. He is best known as the chief entomologist of the Transvaal Museum in Pretoria who primarily worked on butterflies; and aside from a whole slew of entomological papers, he wrote up his life's work in the four volume *The Butterflies of southern Africa* (1949-1979 - the last volume having been published posthumously).

Georges van Son was born at the Castle Gorodistsche, Narishkino in the province of Orel in Russia, about 200 km south of Moscow on the 1st October 1898 (or the 19th September by the Julian calendar if you prefer - which is how it would have been rendered on his birth certificate, as Russia only adopted the Gregorian calendar in 1902). He was the child of a French-born, Dutch diplomat, Henri Stéphane van Son, and a Russian Countess,

Comtesse Nathalie Kamarowsky. His first-language was French and he was schooled initially by private tutor. He spent much of his childhood observing and studying nature on his family's estate, "Doubròva". His father was a keen amateur entomologist. At a young age Georges had learnt from the estate head gardener how to graft roses and fruit trees, but was unable to pursue his interest in gardening while enrolled at a military cadet school, followed by a period with the Marine Corp at St Petersburg. During this time, in the service of the Imperial Russian Navy, he visited China and Japan.

While he was on a cruise, the Russian Revolution of 1917 began; this altered the course of his life forever. His father was shot by a Bolshevik sniper in July 1918 and the family's wonderful estate was laid to ruin. Georges, together with his mother and sister, Eleonore (b. 1900), were imprisoned; but he was sometimes released to play the piano for a butcher's wife! With great hardship and some help from the Dutch Embassy (who apparently altered some details on Georges' father's diplomatic passport), Georges managed to flee with his mother and sister from Russia to France in 1921, and then on to Holland to his father's family.

In Holland, he learnt to speak fluent Dutch and he found employment firstly at the Zoological Laboratory in Utrecht, then the Colonial Institute in Amsterdam and finally the Rijksmuseum in Leiden. He also spent time in London learning entomological technique. He was then recruited by the Dutch-born Dr. A. J. T. Janse of Pretoria, as a personal assistant to work with Janse's private entomological collection and came out to South Africa at the end of 1923. In 1925 he was appointed entomologist at the Transvaal

Museum. Having no formal education, he studied as an extramural student through the University of Pretoria, gaining a B.Sc., M.Sc. and ultimately a D.Sc. in 1948. Some of his great attributes were his generosity, enthusiasm, excellent memory, an encyclopaedic knowledge of insects, his love of field work and his mastery of six languages; he often acted as translator for other museum staff. In 1936 he married a Miss Elfrieda Saunders (b. Johannesburg, 1910) and their honeymoon comprised a field trip to the northern Transvaal! They had three sons, born between 1939 and 1949. Georges van Son became a Fellow of the Royal Entomological Society, President of the South African Entomological Association and he was also President of the South African Biological Association.

His interest in botany and horticulture, rekindled after his arrival in South Africa, was expressed in collections of succulents and orchids. His interest in succulents derived from his participation in the legendary Vernay-Lang Kalahari Expedition of 1932. He was both entomologist and botanist on this expedition, emerging from the bush at the end of the expedition with, amongst others, 1 800 botanical specimens. In 1934 he made a trip to Europe where he swapped succulent seed for orchid plants which he brought home to Pretoria to cultivate. He seems to have been the first South African to have made and raised orchid hybrids.

Field trips to assemble a world-class butterfly collection for the Transvaal Museum allowed him to travel widely in southern Africa. On a trip in 1935 to the Vumba Mountains, a short distance south-east of Mutare (formerly called Umtali) in eastern Zimbabwe, he encountered and gathered non-flowering plants of an unknown amaryllid growing under trees and

among rocks on a southern slope of these mountains at an altitude of about 1 700 m (5 500 feet). When plants were first seen by the staff of the National Herbarium, the growth-habit of was thought to resemble that of a *Clivia*. However, when flowers were finally produced in van Son's garden in October 1942, this assumption was proved to be wrong. This new species was described as *Cryptostephanus vansonii* in *Flowering Plants of South Africa*, vol. 23 of 1943, as plate 885; appearing in the same volume of this work as the first description of *Clivia caulescens* (plate 891).



The plate of *Cryptostephanus vansonii* (plate 885) accompanying the original description of this species in *Flowering Plants of South Africa*, 1943

Georges van Son died on the morning of the 29th of May 1967, at his home in Pretoria North, after a long period of ill-health. He has been commemorated in the names of a large number of organisms; there are species or subspecies with

the name *vansonii* in nine genera of butterflies, at least four genera of beetles, a wormlion fly, another fly, a lacewing, a leaf miner, a grasshopper, a spider and a solifuge. Van Son's Thick-toed Gecko and a subspecies of Yellow-fronted Canary are also named *vansonii*. *Vansonia* was a genus of pipistrelle bats which has not survived taxonomic scrutiny. Amongst the plants, there is a grass, a stapeliad (now sunk into *Orbeopsis lutea*) and, of course, *Cryptostephanus vansonii*. Plants somehow attract the attention of some of the most amazing people - and here, surely, we have a fine example of such a person.

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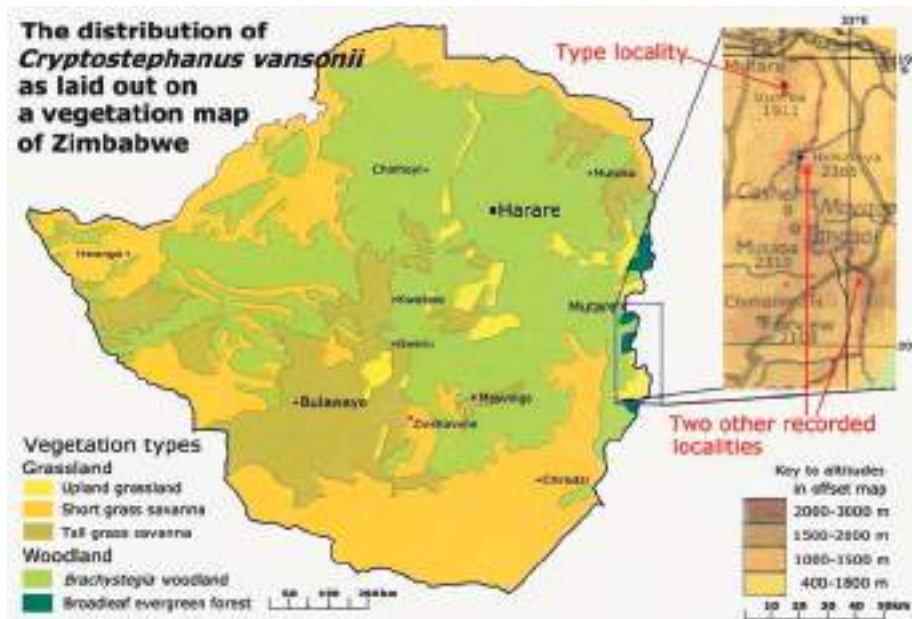
Other references commonly given, eg McNeil (1963), Bennett (1980) and Saunders (1998) contain no original information.

I have assembled some material on Georges van Son as a pioneer South African orchid grower, and have published a piece on him in *Orchids South Africa* **37**: 94-99 (2006), with my collection of material and a fairly comprehensive bibliography available on: <http://pennypoint9.ustrator.com/vanson/>

Thoughts on growing *Cryptostephanus vansonii*

(Bearing in mind that I haven't yet attempted growing one of these myself).

C. vansonii is a narrow endemic with a small range in the eastern highlands of Zimbabwe, south of Mutare. It has been found in the Vumba, in the eastern Chimanimani, and over the Mozambique border in the Himalaya Mountains (I bet you didn't know there were any Himalayas in Southern



This map indicates the distribution of *Cryptostephanus vansonii*, which occupies just the smallest corner of Zimbabwe; itself not a huge country.

Africa!). This distribution ranges along about 75 km of the escarpment. What is particularly interesting about these mountains is that they are all granitic.

Granite soils have particular characteristics. They are acidic, very low in calcium and phosphorus, high in potassium and able to hold onto some nitrogen. Plants of *C. vansonii* have been seen to grow in pads of leafmould atop granite boulders (Koopowitz, 2002, p. 62). This area gets about 65 cm (30 in) of rain per year mostly in the warm summer months, which is not a great deal in such a warm environment, and electric storms bring down some nitrogen in forms that plants can assimilate. It is also obvious that those common flying fertiliser-spreaders, birds, would contribute notably to the mineral nutrition of the plants, supplying quantities of calcium, phosphorus and nitrogenous compounds.

I would guess that these plants would do best in a fairly shallow tray (ca. 8-10 cm deep) well crocked with a layer of medium granite

chips, in a compost of small granite chips, leaf mould and peatmoss (an expedition to the base of Paarl Rock may be useful for acquiring the granite chip component). The plant should not be over-watered, rather using the rule of giving water today if you think it will be totally dry tomorrow. If possible use rain water. Fertilise with bird manure (I like rock pigeon droppings the best - but that's because I have these pests living on and fouling my property), by placing a walnut-sized lump (per 2-3 litres of compost) on top of the compost, far from the plant, and letting physics and chemistry do the rest; repeating this about every four months.

The temperatures in this plant's natural range resemble those experienced in Pretoria in summer, but on average these localities are about 3° C warmer than Pretoria in winter; the plants should thus not be considered frost-tolerant. In late autumn place a suitably perforated piece of 20 mm polystyrene sheeting under the tray and top dress with a layer of dryish, mature, dark leafmould to help insulate the roots from the cold.



*Cryptostephanus
vansonii*
Grower:
John van der Linde

Photo: John van der Linde

A Selection of Photographs from some Clubs and Interest Groups

EASTERN PROVINCE CLIVIA CLUB — 2008



Best on Show 2008 — Grower Annemarie Chalmers



Runner-up to
Best on Show:

Grower:
Charl Coetzee



Winner first time flowerer — Grower Utopia Nursery



Winner first time flowerer — Grower Luke Kruger



Winner Any Other Pastel — Grower Willie le Roux



Winner Peach — Grower Ian Vermaak



Winners Eastern Province Show 2008

Eastern Province Photos courtesy of: Charl Coetzee



Garden Route Clivia Club — 2008



Above — Class Winner
Grower Gerrie Brits



Left — 2008 Show Hall



Class Winner — Grower Piet Claasen



Garden Route Photos courtesy of: Gordon Fraser

Left — Class Winner
Grower Ricky and Noelia Jardin

Left Below — Class Winner
Grower Piet and Jeanette Theron

Below — Class Winner — Gordon and Yvonne Fraser



Northern Clivia Club — 2008



Above: Best Flower on Show
Grower: Fritz van Schalkwyk



Above middle: First Runner-up
Grower: Geoff Meyer

Above Bottom: Second Runner-up
Grower: John Handman

Right Top: Best Leaf Plant on Show
Grower: Paul Kloeck

Right Middle: Second Runner-up - Leaf Plant
Grower: Hilton Atherstone

Right Bottom: Second Runner-up - Leaf Plant
Grower: Roy Williams



Joburg Clivia Club — 2008



Joburg Clivia Club — Best on Show



Above: Joburg Clivia Club — First Runner-up



Left: Joburg Clivia Club — Second Runner-up
Joburg Photos courtesy of : James Haxton

Overberg Clivia Interest Group — 2008



Overberg Show Winners

From the left:
Carrie Krüger
Danie Meiring
Felicity Weeden

Waterberg Boslelieklub — 2008



Above: *C. miniata*
Grower:
Piet & Rina van der Merwe

Left: *C. miniata*
Grower: Ernst Ferreira

Waterberg Photos courtesy
of Rina van der Merwe



C. miniata — Grower Bets Rossouw



Above: *C. miniata* — Grower Bets Rossouw

Left: *C. miniata* — Grower Piet & Rina van der Merwe

Cape Clivia Club — 2008



Best on Show — Orange Broad Tepal — Grower Felicity Weeden



Winner — Orange Narrow Tepal — Grower John van der Linde

Cape Photos: Claude Felbert



Second Runner-up — Interspecific — Grower Ian Brown



Section Winner Cape Show



Section Winner — Grower Johan Schoombe



Best Own Breeding — Grower Ian Brown



Example from Cape Show



Example from Cape Show



Example from Cape Show



Winner Bronze — Grower — Ian Brown

KwaZulu-Natal Clivia Club — 2008



Best on Show — Grower Liz Boyd



Above Left: First Runner-Up — Gem Wild Flowers
Grower Gem Wild Flowers

Above Right: Best Peach — Grower Liz Boyd

Left: Second Runner-Up — Grower Liz Boyd



KZN Photos courtesy of Clive Graham



Best on Show — Gardenii Show: Robusta Yellow — Grower SANBI



Second Runner-Up — Grower Gem Wild Flowers



First Runner-Up — Grower Gem Wild Flowers



Winner Gardenii Peach — Grower Gem Wild Flowers



Winner Gardenii Blush — Grower Little Falls Clivia

Clivia mirabilis in Habitat

Ian Coates, South Africa

I was privileged to visit three *C. mirabilis* habitat sites in November 2008 and spend a day at each, a hastily arranged trip which I found tremendously informative. Each site was different and therefore interesting for that reason alone, as they are three of only a few known sites where *C. mirabilis* is to be found. Although there are kilometres of seemingly suitable terrain I had to wonder why there are only these three small sites and two others known. Since the plant has adapted to these fairly diverse habitats, why are there not many more of them?

(In future other sites may still be discovered but as the area in question is somewhat remote - Eds)



A young seedling. Note the root which is partly on the surface and coarseness of the 'soil'



Wow! *C. mirabilis* in all its glory

Site 1

The first site is only about 5 000 square metres in its entirety. It is near rectangular and *C. mirabilis* plants stop abruptly at its borders. It is situated at an altitude of over 750 metres and consists of large boulders, some several metres across, on a steep slope with plants growing in compacted shale and sandstone which has washed down or fallen from the decaying escarpment above and rests between the boulders.

The site is densely populated by shrubs, which provide almost complete cover from the sun, and also falling leaves and twigs for some nutrition and surface aeration for the plants. Falling *C. mirabilis* berries will roll to the lowest point, which is usually against the next boulder a few metres downhill.

Due to the severity of the climate, seeds ripen much quicker than other *Clivia* species in order to germinate during the autumn rains. I got the impression at all sites that, whereas some plants had flowered the previous year and even possibly a few in mid-season, the majority flowered only every four years or so. Although many plants were growing in clumps, it appeared that this was merely because they were in a natural collection place for seeds. There was very little sign of plants forming offsets. The only evidence I saw of any pollinators on the plants were ants and earwigs



A mature *C. mirabilis* has taken root between boulders and fallen branches

Birds were friendly but seemed to show no interest in the flowers. Maybe they were waiting for the berries and there are more evident potential pollinators between sunset and sunrise.

Site 2

The second site is several kilometres away and is much further below the escarpment, next to a river at 440 metres in altitude. Like the first site, it faced South West.



The steeply sloping Site Two with *C. mirabilis* growing in the shelter of a bush

which seemed to enjoy nibbling the edges of the petals. There were a few well camouflaged butterflies around but none were seen on the plants.

Although again very steep, (see bottom right of image) there are no big boulders here and the shrubs are much thinner on the



Two of the few possible pollinators seen - an Ant and a Butterfly

ground. But it is now these shrubs which stop any seeds from rolling further downhill and *Mirabilis* grow from the heart of them thus obtaining some shade and nutrient. (circled area). The slopes probably average 45 degrees. It was from this site in the 1960's that the current farmer picked an umbel and gave it to his mother. She liked it so much that she sent him back for the plant but nobody realised its significance until this century. There are other stories of the plants being known to be grown in local gardens at even earlier dates.



C. mirabilis growing next to bushes at Site Three and partially exposed to the direct sun

Site 3

Site three was back high up near the escarpment at around 650 metres in altitude and several kilometres further away and, this time, facing South East. It was much larger than the others and displayed a combination of their characteristics - a mostly shrubby overgrowth with large boulders spread out on the steeply sloping ground of two small valleys, one of them with a small stream running through it. Seeds here are now mostly rolled to areas of level ground between the boulders and halted in their path by small stones or fallen branches. The farmer told me that later in the year there are quite a number of birds and they have been seen taking the berries. If any seeds are dropped, this is presumably within the local area and will aid the distribution.

At this third site, a few *C. mirabilis* grew right to the edge of the shrub cover and spent some of the day in direct midday sun at temperatures exceeding 35 Celsius. They did not seem adversely affected although none grew completely beyond the shrub cover. By contrast, it rained for most of a misty day at the first site and plants were covered with rainwater whilst in full flower.

Even heavy rain mostly ran off the compacted soil surface. It was noticeable that many plants at all three sites were near-surface rooting. I assume this was both because of the near impossible effort required to grow roots deeper and the need to get that surface moisture.



A *C. mirabilis* flower drenched after late seasonal rains



The exposed roots of *C. mirabilis* showing the hard soil below and the leafy detritus on top

Variation between plants

The plants at all the sites were fascinatingly variable. They have grown in probably ever diminishing areas for millions of years and the pressure of survival is still producing a wonderful variety of plants. It is well-documented that some plants have a median stripe on their leaves, whereas others do not, and some have a retuse tip.



A selection of leaf tips

Cross section of a leaf



The stripe can vary considerably in width and, in some cases, will split into several stripes. Even on the same plant, the stripe and retuse tip can be present or not according to the age of the leaf. A few plants have leaves significantly paler in colour and less tough materially, more like a *C. robusta*. Leaf length varies from around 60 cm to more than 160 cm in exceptional examples. Several plant leaves have blunt edges as shown in the sectional photograph. Some of the larger plants, but not all, were close to areas of concentrated animal droppings where it was evident that the increased nutrition resulted in increased plant growth.

However, most noticeable, was the variation in the flowers. The numbers of flowers on an umbel can vary from less than 20 to over 60. I believe all my observations were made on similarly mature plants so that they make a valid comparison. The colour of the peduncle and leaf base is variable and there is often considerable magenta colouring to them, but by no means always. The pedicel also varies in colour, as shown in the illustrations, but most striking is the variation in the flowers.



A typical overhead view of a *C. mirabilis* umbel

Regeneration

Very sadly, all was not good news on the sites. One of them had not a single plant under four or five years old. I was told that

dassie (a hyrax the size of a very large rat) were prevalent there and this was evident by a number of concentrated areas of animal droppings (middens). Apparently, they just love the berries.



A dassie midden between boulders



Some plants show strong magenta pigmentation on their stems, leaf bases and peduncles

The most shocking thing of all is my final illustration. Several plants at one site had leaves with markings on. I assumed from the



Four umbels showing a range of flower colour and shape

I was also told that seed had been collected three years ago by man. Estimates vary greatly as to how much was taken. However, for me to not see even a single seedling in a full day, for whatever reason, was of great concern. Are we to lose another habitat? Thankfully, the second site seemed much healthier regarding seedlings and the third was thriving. The same birds seem to exist on all three sites so I do not think they can be responsible for the total lack of seedlings at site one.

one shown that alien pollen had been taken onto the site, possibly from a yellow *Miniata* and a *Daruma*. I hope I am wrong, but can see no other explanation. A single seed from this could, over time, contaminate the whole site. This is a protected habitat and I am horrified at the total irresponsibility of this action by a supposed plant lover. Such damage can never be undone.



A spectacle worrying in the extreme – introduction of alien genetic material into the habitat

My thanks must go to so many people but especially the farmers and their families for allowing me access and for their tremendous hospitality, and also the *Clivia* lovers in Pretoria and the Cape who helped and hosted me so generously. As I was leaving, I learned of another small, newly discovered site and hope to study this in 2010.

In closing, I would ask everybody to respect the privacy of the farmers and the future well being of all *Clivia* in habitat - especially *Clivia mirabilis*.



Photo: Claude Felbert

Clivia miniata 'Floradale Apricot' — Grower Mick Dower

'Floradale Apricot' was grown from seeds imported from New Zealand by Floradale Nursery, Beacon Bay. The source of these seeds and the breeding is unknown. The plant is an excellent plant to use for breeding and has produced many interesting hybrid flowers. 'Emma Leslie' and 'Katie D' and all the other siblings from this cross done by Mick Dower are outstanding. Emma Leslie can be seen on the back of Yearbook Five. Eds.

As Good as it Gets *Clivia mirabilis* — ‘Jadestone Angel’ Gerhard Faber, South Africa

Ever since the discovery of *Clivia mirabilis*, I was fascinated by this true wonder of nature. Dr John Rourke’s article in CLIVIA 4, pp.5-12, started a passion and desire to learn about and understand these plants better. Being born and raised in the old Southwest Africa, I had a pretty good idea of the incredible harsh growing conditions of another marvel of nature, namely *Welwitschia mirabilis*. If, I thought then, *C. mirabilis* is anything like the miraculous *Welwitschia* then I just have to find, visit and investigate these plants in habitat.

My research took me on a year long emotional rollercoaster ride where sudden adrenalin injected excitement were followed by the lowest of lows imaginable. This all changed, however, when unlucky Friday the 13th became my lucky Friday the 13th October 2006 as all my efforts were justly rewarded when Mother Nature opened her arms for Karen and me and allowed us to share in her magnificence. I had the privilege and pleasure to photograph my dear wife, companion and friend, Karen, in amongst a newly discovered habitat on a farm in

the Western Cape. It is extremely harsh terrain and conditions and to honour her I jokingly refer to my plants as *Clivia mirabilis Karensis*.

I am extremely fortunate to legally own a collection of *C. mirabilis* under the necessary permit and also posses a license to breed and sell protected flora. Two plants that are morphologically identical look completely different to any other habitat *C. mirabilis* I have ever seen. These are compact plants with rigid, upright leaves between 50 and 60cm long and 4.5 - 5cm wide. The leaves have beautiful medial a-chlorophyll lines as well as outer a-chlorophyll edging. The leaf colour at the base is not the characteristic carmine but rather a nice interplay of green and carmine.

When the first one flowered they were very different and truly unique. Apart from the incredible colouration it is novel in that the tubular flowers flare at the mouth, uncommon in the species. The tepals, ovaries and pedicels have a strange mottled effect, especially where the anthocyanins are present. Roger Fisher speculated in *Clivia News*, volume 16, number 2, p.8 that *C. mirabilis* ‘Candy Carousel’ is a plant to watch and that a hybridising program should yield interesting results. He was so right because next thing Leisl Brandt phoned me with the exciting news that she has got a green stemmed seedling of *C. mirabilis* ‘Candy Carousel’ X Self. On closer inspection I found that I also had green stemmed seedlings and George Mann confirmed that he also has one. The other seeds that I had given away did not survive and some seeds were confiscated in Australia so unfortunately we will never know



Karen Faber in ‘Mirabilis Country’

their outcome and progeny. On account of the results I do have, it looks as if Candy Carousel yields roughly 25% green stem seedlings. They grow very slowly but I hope to update you in a couple of years with a nice flower. [Picture of green stemmed seedling]

This year the Garden Route Clivia Club had



A 'Green Stemmed' *C. mirabilis* seedling

a display of *C. mirabilis* at their show and I decided to exhibit the other plant because it was pushing a flower that was two thirds of the way up. Those who visited our show will remember it very well. Although aware of the fact that Candy Carousel yields green stemmed seedlings, I never in my wildest dreams expected or was prepared for what was about to unfold before my eyes, a yellow *C. mirabilis*. The ivory, yellow and green flowers opened one by one with the same flaring mouths as *C. mirabilis* 'Candy



C. mirabilis 'Jadestone Angel'

Carousel'. The ivory white top of the peduncle sprouted ivory white pedicels that coloured to light green where they join the light green/yellow ovaries. The flowers maintained this colour for two weeks and then started turning a bright butter yellow colour which lasted until the flowers withered and dropped. In the last week of flowering the anthocyanins fought like crazy to come through and the ovaries and pedicels got a most desirable and spectacular light caramel mottled effect. All flowers resembled



C. mirabilis 'Jadestone Angel' with the anthocyanin effect showing

angels, complete with flaring skirts and glowing halos and the plant was aptly named *C. mirabilis* 'Jadestone Angel'.

Future breeding

My future breeding program with *C. mirabilis* will largely revolve around these two unique plants and another plant, *C. mirabilis* 'Karen's Blush', that is a yellow *C. mirabilis* that blushes right at the end of flowering. Unfortunately both yellows did not set a single seed with a variety of crosses and it looks as if there is a potential fertility problem. The pollen of both are male fertile but do not readily take on other plants. I have, however, been successful with some crosses and achieved a good seed set on certain plants. Although these plants have got the potential to revolutionise Clivia breeding, in particular interspecific breeding, only time will tell what they have in stall for us as a Clivia community.

Conclusion

I do think that yellow mutations are possible in *C. mirabilis* but doubt if they will ever be found in habitat. These plants need lots of protective anthocyanin in order to survive the brutal conditions under which they grow, especially when the seedlings are young and frail and at their most vulnerable. I lost some green stemmed seedlings in my greenhouse and really have to pamper the remaining ones to keep them alive and growing. I am convinced that yellow mutations will not survive in nature and yellow flowering forms of *C. mirabilis* will have to be produced by means of cultivation. For plants that originate from habitat I think that *C. mirabilis* 'Jadestone Angel' is about as good as it gets.

C. mimata 'Karen's Blush' before the blush begins to appear. Note the butter yellow ovaries that enhance the flowers yellow tones.



The Early Discovery of *Clivia* at The Bearded Man

Trevor Pearton, South Africa

The wagon road from Barberton to Lourenço Marques (Maputo) that was used by Percy Fitzpatrick and his fellow transport riders passes over the Makonjwaan Mountains on the eastern flank of the peak known as “The Bearded Man” (elevation 1335 metres a.m.s.l.). The mountain gets name from its shape, which is that of a man’s head facing upwards with a bearded chin (the indigenous forest on the southern slopes). The planting of eucalyptus plantations on the northern slopes has now spoilt that appearance. The old wagon road wound its way up from Swaziland crossing the mountain range at the site of the historical Kings Hotel on the Swaziland side of the border (the location is marked roughly on Google earth images – only the foundations now remain). Thereafter the road snakes its way northwards through the mountainous terrain down into the fertile farmland of Louws Creek, now the site of Louisville, the erstwhile capital of the Kangwane homeland.

The early access to these mountains resulted in explorers discovering a number of gold mines in the hills north of The Bearded



A view of the Bearded Man

Man. The mines, Crown, Maid O’ The Mist, Clifford Scott, French Bobs and Daylight, all form part of the current Barbrook Gold Mine. Although discovered prior to 1900, the mines were worked intermittently and the depth of workings was shallow because the gold could not be extracted from the deeper ores. In 1939 African Geophysical first consolidated the various mines and mined out the oxide ores but they too had difficulty treating the deeper unoxidised ores. In the early 1960’s Rand Mines acquired control of these mines and initiated a drilling campaign to explore the property fully. A geologist and naturalist by the name of Donald Macaulay was employed by Rand Mines to map out the gold reefs in the area. He noticed the beautiful collection of *Clivia* at the manager’s house and mine offices which were situated in the mountains near the Clifford Scott mine. The plants had been collected by the mining entrepreneur E. T. Andrews from The Bearded Man. The locality was well known by the early English speaking residents of Barberton and coach trips were taken annually by the manager’s wife and friends to see the plants in flower.



Photo: Felicity Weedon

C. miniata from Bearded Man grower: Felicity Weedon

Rand Mines moved the mine offices to the valley and the old buildings were stripped of useful materials and the site left to decay. Only the foundations can be found today and then only by the few who know where to look. As part of the relocation, Macaulay moved plants from the mine offices to his home on the hillside above Barberton.



Examples of flowers from the Bearded Man



I joined Anglovaal (the mining company which owned ETC mines) and moved to Barberton in 1980 to join the exploration team set up to revive the search for new gold deposits in the mountain land. Macaulay also joined this team and, having similar interests, we worked together for 6 years learning much about both the geology and the plants of the mountain land. Although we talked about the *Clivia* on The Bearded Man, I did not visit the locality, probably because Donald was old and not fit

enough to make the trip. When I left Barberton in 1987, Donald gave me a plant as a parting gift. When this plant flowered together with the few other plants that I had in Johannesburg, I noticed that the flowers were very pale but much larger than my other plants. It was only in about 2001 after I had made a few amateur hybrids of this plant, that knowledgeable *Clivia* enthusiasts informed me that the plant was special. By this time Donald Macaulay had passed away but his widow was very willing to give me suckers of a selection of plants from his collection. These have formed the main breeding stock of my collection and cover a wide variety of forms and colours. Among these plants was an interspecific which came from the area 'A' as described by Attie Le Roux. This plant was eventually described as new *Clivia* taxon in 2006 – *Clivia* x *nimbicola* (Swanevelder, Z.H., Truter, J.T. & Van Wyk, A.E., (2006). *Amaryllidaceae: A natural hybrid in the genus Clivia*. Bothalia, 36(1), pp. 77-80.). I visited The Bearded Man for the first time in 2002 and have made a number of trips to the area at various times of the year. On my first visit I collected at area 'A', a 15 cm piece of stem which had broken off at both ends (red ant damage) and which had two shoots 2 cm long with a distinctive pink colour at the base. This stem gave me two plants (one of which I swapped with Sean Chubb) which flowered as true *nimbicolas* with large pastel pink flowers.



Clivia growing in the Bearded Man habitat

A Layman's Observations of the Habitat of *Clivia x nimbicola* Attie le Roux, South Africa

In 1969 Koos Nel and Elise Buitendag of the Lowveld Botanical Gardens went to The Bearded Man Mountain (a peak of the Sondeza Mountain range on the border of South Africa and Swaziland) to collect some *Clivia* plants for the then newly established botanical gardens. In 1985 Willem Froneman, horticulturist at the gardens, noticed that one of the plants was different to the other Bearded Man *C. miniata* in the garden. He spoke to Prof. John Rourke from the Compton Herbarium at the Kirstenbosch Botanical Gardens and John Winter, then curator of the garden, about this plant.



Attie le Roux at the Bearded Man habitat

Despite a number of attempts to locate the plants in habitat, nothing was found. In July 2000 Prof. Rourke, John Winter and Willem Froneman went up to the Bearded Man and found a few flowering plants at what I now call Area B. A few specimens were taken to Kirstenbosch Botanical Gardens.

In about 1983 Elise Buitendag told her brother-in-law, Johan Schoeman, also a plantsman from Barberton, about the habitat

Clivia at the Bearded Man. Johan, a member of the commandos, a civil department of the South African army, did many patrols on the border of Swaziland and South Africa at that time. He found *Clivia* plants at various localities in the Sondeza Mountains.

In 1998 Johan found what was to be later described as *C. x nimbicola* at Bearded Man in the area which I now call 'Area A'. In 2004 I met Johan Schoeman and it was at that time I saw *C. x nimbicola* for the first time. In 2005, while arranging the *Clivia* tour with James and Connie Abel I met Steven van der Linde who is stationed at Mondri forest in the Sondeza mountains. Steven is a keen photographer of wild flowers in the veld. It is the locality at Bearded Man to which



From Area A

James Abel organised a Lowveld tour for the delegates to the 2006 the Clivia Conference where Johan and I acted as guides. At the time one plant was in flower, a special treat for all the visitors.

In 2007 Steven told me that his two sons frequently hiked in the mountain had found a new locality of what might be *C. x nimbicola*. By now I was visiting the plants as often as possible so as to write up all the details I observed. We immediately arranged to visit the new site \pm 1,5 km east of Area A, a very steep and rugged terrain. When I saw the plants I could not believe what I saw. There were 22 plants in flower. Thereafter I tried to visit all 3 localities every month.

In October 2008 we went to look at the *C. miniata* that were in full bloom by the thousands. It was a rainy day and everything was wet, but it did not stop us from going down the mountain slope into Swaziland and there, in a hollow on the slope we found *C. x nimbicola*, 22 plants in all with no flowers but with plenty of green fruiting umbels. We could not believe what we found. I have called this Area D. This had first been discovered by Trevor Pearton.



Bearded Man Area A habitat



The Area D habitat

T. Andrews from Barberton. Flower colour is a salmon pink, with one known light pink colour. The leaves are up to 65 mm wide.



A pink specimen from Area A

Only time will tell if there are more areas where *C. x nimbicola* are growing in the Bearded Man. Prof. Johan Spies was a member of the 2007 tour and collected samples for DNA analysis. Since then I have supplied him with samples of all these identified areas for DNA testing. The DNA study is not yet complete so that all that he could say to date is that it promises something different. The *C. x nimbicola* from the four identified localities are all of differing colours, leaf shape and the like.

Area A (\pm 12 plants)

This area is easily accessible to the side of the Bearded Man bush and has been much depleted of plants, with only a few plants left *in situ*. The first time it became known was in the 1950's when it was discovered by Mr. E.

Area B (\pm 25 plants)

This site has the greatest diversity in shape and colour of *C. x nimbicola*, from 80 mm lax broad leaves to narrow recurved leaves. Flowers range from dark orange to light pink. The area is about 200 square metres. In 2002 there was a mudslide that took half of the plants down the slope. I have yet to go to the bottom to see if there are any left growing there.

Area C (98 plants)

This area is located to the east of A and B all at the same elevation on a steep rocky ledge. The *C. x nimbicola* plants grow in light shade with a few plants growing on top of a rock

ledge in the full sun. The plants in the shade bear dark orange flowers while some plants have flowers with prominent green lips. The flowers of the plants growing on the rocks in full sun are a true red, a short plump flower with large mouth. The leaves are shorter and much more leathery. These plants flower all year around. The tree canopy at Area C is not as dense as in Areas A and B. They also flower 2 – 3 times a year, in a similar fashion to the *C. x nimbicola* plants in the Lowveld Botanical Gardens.



C. nimbicola from Area C decimated by Locust

Area D (22 plants)

There are very few plants at different altitudes elevations. The flowers range in colour from a salmon pink to a light orange. The leaves are not as wide as those plants in Area A, which they neighbour, some leaves presenting notched tips.

We hope in future to go and see if there are more areas of *C. x nimbicola* plants in the Sondeza mountain range and at The Bearded Man. Of significance in all areas is that all the plants are very old and that there are no young plants or seedlings. The seed of *C. x nimbicola* are normally small and when germinated the new roots or growth point are very thin and short. The first leaf of some of the seedlings



A pink *caulesces* from Area D

is so thin that it appears to be a shoot of grass. I think that for seed to germinate and survive in the veld the season must offer ideal conditions. In the Sondeza mountain range there are two or three other localities where *C. miniata* and *C. caulescens* grow in the same habitat but here there are no known natural hybrids or *C. x nimbicola*.



One possible pollinator from these areas

I wish to thank the following people: Steven van der Linde, Estate manager of Mondi (Sapico investment corporation); Willem Froneman, Lowveld Botanical Gardens; Johan Schoeman, Barberton; and Trevor Pearton, geologist and a director of Barbrook Mine.

(A goldmine adjacent The Bearded Man)

The Photographic Competition Winners

Entries for the Photographic Competition were down on last year but I am pleased that the winning standard was not. The choices were difficult ones and we include a selection including near misses after this section for you to see. No entry was received in the Habitat section.

Last year I mentioned that we judged both on photographic merit, that encompasses composition and technical correctness as well as flower form and balance. Once this is evident then the 'Wow' factor comes in – is there something about the photograph or flower that stands out above the other pictures.

I believe that the winning pictures all have this 'Wow' factor for both the flower form and the way the image has been presented. Many of the other pictures may have this impact in one or the other aspect but may just miss the boat in the other. Often this is just something small where attention to detail would have made the picture a potential winner.

Congratulations from the judging panel to the Winners and to all that participated. We hope to see your images again next year and ask you to be mindful of all the aspects we use to judge by.
Claude Felbert

BEST PHOTOGRAPH and WINNER of the PENDULOUS CATEGORY

Clivia mirabilis 'Jadestone Angel' — Photograph: Gerhard Faber (See his article on Pg. 40)





Above: Second Placed Pendulous
Clivia mirabilis 'Jadestone Angel'
Photograph: Gerhard Faber

The judges had a long debate about which of the two 'Jadestone Angel' images was the better and in the end it was so close that both images are included in the results of this section.

Right: Third Placed Pendulous:
Clivia caulescens
Grower: G Botha
Photographer: Bridget Randall



RUNNER-UP and the SINGLE FLOWER CATEGORY WINNER



Runner-up to Best Photograph — *Clivia miniata* 'Christo's Bouquet' — Photograph: Felicity Weeden

Second Placed Single Flower:
Grower: Bets Rossouw
Photographer:
Rina van der Merwe





Above: Third placed Interspecific
Grower: Piet van der Merwe
Photographer: Rina van der Merwe

Left: Third Placed Single Flower
Grower: Joubert van Wyk
Photographer Joubert van Wyk

Below: Second Placed Interspecific
Grower: Piet van der Merwe
Photographer: Rina van der Merwe





First Placed Interspecific — Grower M Connellan — Photographer Bridget Randall



Second Placed:
Clivia miniata from
the Bearded Man
Grower:
Felicity Weeden
Photographer:
Felicity Weeden



Winner — *Clivia miniata* 'Gordon's Gift' — Grower Gordon Fraser — Photographer Bridget Randall



Third Placed *Clivia miniata*
Photographer:
Michael E. Riska

A Selection of Competition Pictures



Above:
Clivia miniata
'Maria's Gold' —
Photographer:
Bridget Randall

Left:
Clivias miniata —
Photographer:
Joubert van Wyk



Clivia miniata (Yellow) x *Clivia nobilis*— Photographer: Helen Marriott



Clivia miniata — Photographer: Lisa Fox



Interspecific 'Gay Delight' Photo: Helen Marriott



Above:
Clivia miniata
'Stardust' —
Photographer:
Gordon Fraser

Left:
Clivias miniata —
Photographer:
S Ferreira



Clivia miniata 'Ghost' — Photographer: Helen Marriott



Clivia miniata — A James and Connie Abel multipetal — Photographer: Micheal E. Riska



An Interspecific — Photographer: Rina van der Merwe



Clivia caulescens
'Snuggle Up'
Photographer:
Gordon Fraser



A Pendulous *Clivia* — Photographer: Bridget Randall



Clivia caulescens — Photographer: Bridget Randall

Cyrtanthiflora's Début

Greig Russell, South Africa

The ongoing state of uncertainty regarding the nomenclature of hybrids between Clivia nobilis and C. miniata has failed to offer the grower a stable, correct label for such plants. The early history of these hybrids is here examined and the earliest valid name together with date, author attribution and reference located. A narrative account of this search, with ancillary information, is assembled here, followed by a list indicating the correct nomenclature and valid synonyms; and the consequences of this nomenclatural position have been considered. The concept of a "nothospecies" as it applies to Clivia × C. cyrtanthiflora is introduced.

The 'Clivia Fancy' of the twenty first century is a new phenomenon, having only really come to the fore during the final decade of the second millennium. Before this, plants of the genus *Clivia* were widely grown, but more as part of a suite of general flowering greenhouse and garden plants. Now the fancy tends to resemble somewhat the heydays of the Dutch Tulip Craze!

Before the commencement of the Clivia Club/Society in 1992 with its Newsletters and Yearbooks, and the appearance of Thurston's *The Clivia* in 1998¹⁶, Koopowitz's *Clivias* in 2002¹ and a few Japanese and possibly Chinese works, there was no specialist *Clivia* literature - what had been written before was lightly spread through the voluminous and often not readily accessible botanical and horticultural literature of the nineteenth and twentieth centuries.

Notwithstanding, Koopowitz and such authors as John van der Linde² and Pierre De Coster⁶ have worked towards assembling a comprehensive history of the *Clivia*. Like all

histories, agendas have some influence upon the final result, as does ease of access to a wide array of source material. The Internet in 2009 offers the most incredible access to information through various search engines and such resources as Google Book Search. Learning to ask relevant questions of search engines is really the only major obstacle to spectacular enlightenment.

Amidst the numerous facets of *Clivia* that I have interrogated over the last year or so, the history of *Clivia* × *C. cyrtanthiflora* (*C. nobilis* × *C. miniata*) is one that I have found wanting to the point of requiring comment. In this regard, the illustration and description of this hybrid in van Houtte's *Flore des Serres* of 1869-1870¹⁸ (sometimes dated 1877 - which actually refers to the serial number of the plate illustrating this hybrid) is generally offered as the starting point of the history of this taxon. *Clivia* × *C. cyrtanthiflora* does, however, have a history predating this by some ten years, and it is an interesting one. Not wishing to repeat what has been written recently on this subject, I refer the readers to the works of Koopowitz (2002, pp. 32 & 33; 300 *et seq.*)¹ and van der Linde (2003)².

Louis van Houtte, Belgian horticultural impresario extraordinaire, was certainly the originator of this hybrid, the pollination having been performed by Charles Raes, a section head at the firm. Charles Raes was primarily responsible for the gesneriads at the nursery, but later worked with the begonias, successfully raising many new tuberous begonias including *Begonia* 'Charles Raes'. This latter begonia, described as an improved *B. ×sedenii* (*B. boliviensis* x unnamed species

- Veitch 1870) was a single-flowered cultivar with deep vermilion flowers introduced in 1873 and was one of the earliest tuberous begonia hybrids - the breeding of this class of plants having only commenced in the late 1860's. It unfortunately did not contribute to further breeding as it was a sterile plant, this probably as a result of it being an unbalanced polyploid.

In 1869-1870, van Houtte recorded with a certain malicious joy that when first seen by a botanist, *Clivia* × *C. cyrtanthiflora* was assumed to be a new species and promptly named and described as such¹⁸. The literature from around 1859¹² records that it was in fact the famous British botanist and orchid specialist, John Lindley, who was to be lampooned here. The name "*Clivia cyrtanthiflora*" was coined by Lindley, although it was a manuscript name and was never published by him. Even Louis van Houtte admitted that Lindley was the originator of the name; the plate published in *Flore des Serres*¹⁸ is captioned

"IMANTOPHYLLUM CYRTANTHIFLORUM Lindl." A number of reports referring to *Clivia* × *C. cyrtanthiflora* (under variant names) dating from early 1859^{4, 9, 11, 12, 17} that will be discussed further on, suggest that the plant first flowered in van Houtte's greenhouses about that date. Lindley apparently saw it first when he was sent a plant in early 1859 for inspection by van Houtte. A search through the extensive Lindley papers in the Kew Archives should turn up more information on this, perhaps even the original manuscript description.

1859 is a very early date for this hybrid considering the fact that the one parent, *Clivia miniata* had only first been exhibited in 1854; although it had flowered in the two preceding

years in the greenhouses of the introducer, Messrs Backhouse of York. Aside from the Backhouse plants, there are no other records of *C. miniata* being exhibited during the balance of that decade, so I can only conclude that van Houtte may have begged pollen from Messrs Backhouse, and he had had the hybrid made on his own plants of the old *C. nobilis*. The early reports of this hybrid are unclear as to whether or not *C. miniata* was used as the pollen parent. Koch and Fintelman state that *C. nobilis* was the pollen parent^{7, 11, 12}; van Houtte's note suggests that *C. miniata* was the pollen parent¹⁸.

'Cyrntanthiflor-' is a somewhat uncomfortable name. At first glance it appears to be unusable. Since the time of Linnaeus, botanical names containing mixtures of languages have been either much frowned upon or considered to be illegitimate. In this case, the Greek words *κυρτος* (*kyrtos*) means "crooked" and *ανθος* (*anthos*) means 'flower' and the Latin word *flora* means 'flower' - hence a 'crooked-flowered flower' in mixed languages! But, in fact, once a botanical name has been created, irrespective of its language of origin, it becomes a Latin word. The genus name *Cyrtanthus* is thus a Latin word. Therefore the only meaning of 'cyrntanthiflor-' is 'Cyrntanthus-flowered', and it is a completely legitimate name.

Reviewing the spectrum of flower forms that occur within the genus *Cyrtanthus*, it is obvious that Lindley must have had one or other particular species of this genus in mind when he created the epithet 'cyrntanthiflora'. Although I am unable to track down any definitive information in this regard, it would seem to be likely that he was thinking of *Cyrtanthus obliquus*. An original plate of this latter species is reproduced here.



Plate 1133 from *Curtis's Botanical Magazine* of 1808, painted by Sydenham T. Edwards, illustrating *Cyrtanthus obliquus*. The amazing similarity between the architecture of this umbel and that of the relatively unrelated *Clivia nobilis* is a great example of parallel evolution acting to attract a similar pollinator. Image courtesy Missouri Botanical Garden. <http://www.botanicus.org>

Regarding the showing of *Clivia* × *C. cyrtanthiflora*, the first record of this that can be traced is its exhibition at the *Salon d'Hiver* (Winter Exhibition) of 5th March 1859 in Ghent (Gand), Belgium. Class 18 - for a "flowering plant, newly raised from seed in Belgium"(tr.) - was won by Louis van Houtte with *Imantophyllum cyrtanthiflorum* (in each case I give the actual name under which the plant was recorded), it garnering a silver medal in addition. No description was offered. The record of this was only published in 1861¹⁷.

The first mention in print of this new plant is in an advert that was placed for the van Houtte firm in the *Gardeners' Chronicle* of the 12th of March 1859³, which gives the following entry amongst others as extracts from van Houtte's List No. 76: *Imantophyllum*

cyrtanthiflorum Lindl., first prize at Ghent Exhibition last Saturday (5 March) as the finest of the plants gained this year by seed. --Louis van Houtte has lately sent the plant in flower to Dr. Lindley's inspection. It is a magnificent mule obtained from *Imantophyllum miniatum* and I. Aitoni (*Clivia nobilis*), splendid long leaves, large heads of flowers, like those of a large-flowered *Cyrtanthus*, shape of the most beautiful *Blandfordia*, fine colour. Very strong plants at 80s each. Sent out only now for the first time. Will soon appear in van Houttes "Flore".

Fortunately and unfortunately, for various reasons, this does not constitute a valid description as there are no diagnostic characters listed - ie. specific characteristics that are unique, singly or in a combination, to this taxon.

On the 3rd April 1859 at the *Ausstellung des Vereines zur Beförderung des Gartenbaues* in Berlin, *Himantophyllum cyrtanthiflorum* was exhibited, this being reported on and the plant being described by Koch & Fintelman in their *Wochenschrift für Gärtnerei und Pflanzenkunde* of the 21st April¹¹. As far as I can discover, this is the first validly published description of this hybrid. In the following issue of the same journal, a week later¹², these same authors expanded on the subject, offering a very comprehensive description and discussion encompassing some 965 words.

On the 16th May 1859, in the Parisian journal, *Revue horticole: journal d'horticulture pratique*⁹, Johannes Groenland described and discussed *Himantophyllum cyrtanthiflorum*, and an illustration of it was published, based on a plant that was flowering in the nursery of M. Rougier-Chauvière, Horticulteur, of the 11ème Arrondissement, Paris. This material is often cited as the original description of this hybrid, but as it appeared more than three

weeks after that of Koch & Fintelman, this is obviously not the case.

Others consider the van Houtte description of 1869-1870¹⁸ to be the first one published, which is most obviously incorrect.



The fine illustration of *Himantophyllum cyrtanthiflorum* drawn by the French botanical artist, Alfred Riocreux (1820-1912), then illustrator for the *Revue horticole*, which accompanied Groenland's description of the plant⁹

In November 1859, a long article on *Himantophyllum cyrtanthiflorum* appeared in the *Journal de la Société Impériale et Centrale d'Horticulture*⁷. It was written by Pierre Duchartre, a freelance French botanical researcher, writer and editor, destined to become Professor of Botany at Sorbonne in Paris two years later. This work was based on the plants grown by Rougier-Chauvière.

On the 14th June 1860, Messrs E.G. Henderson & Son of Wellington Nursery, St John's Wood, London exhibited a plant labelled *Imatophyllum cyrtanthiflorum* before the Floral Committee of the RHS⁴. In January of that same year, this firm had been offering seed of *Imatophyllum cyrtanthiflorum* (note the different spelling) at 3s 6d/packet in an American gardening journal⁵, having obviously flowered it in 1859. (It is most strange that the price was rendered in sterling in a New York publication).

All of the above references dealt with plants originated from the van Houtte greenhouses. It has been suggested that the actual parentage of *Clivia* × *C. cyrtanthiflora* could be in doubt, but the work of Ran, Hammett & Murray (2001)¹⁵ has shown that the parentage is as given, namely *C. nobilis* × *C. miniata*. Plastid DNA sequences of *C. × C. cyrtanthiflora* and various *Clivia* species (*trnL* and *trnF* with intergenic spacer) from Prof J. Spies and associates recently published on GenBank⁸ create phylogenetic trees which demonstrate that the hybrid carries chloroplasts which are in all likelihood those of *C. nobilis*, making this species its mother as plastids are generally inherited only from the female parent.

Combining the various descriptions accompanying the references listed above^{4,9,11,12} one can arrive at the following as characterising this original cross:

It is in habit very like *Clivia nobilis*. It has leaves, 70cm in length, 3cm wide, lorate (with slightly wavy margins), less fleshy than *C. nobilis* and with prominent transverse nerves. Unlike *C. nobilis*, the leaf margin is not finely toothed. The leaf tip is bluntish, tending towards that of *C. nobilis*. The leaves are arranged in two rows (distichous), up to 7 on each side and cover each other at the bases so that they create a kind of trunk. Being elbowed at the base, they stand somewhat outward.

The double-edged scape is convex on the sides, erect, 2.5cm wide at the base, however only reaching the length of 40cm. As in *C. nobilis* the flowers are presented in a down-turned arrangement; compact as a result of their very short pedicels and their considerable number, this being 20 plus flowers.

The flowers have the colour, the size and somewhat the form of those of *C. miniata*, being quite large and bell-shaped, but are however less fully open, about 5cm in length, being drooping, slender and tube-funnel-

shaped, over-hanging on short pedicels and up to 2.5cm in width on completely opening. The colour seems closer to that of *C. nobilis*. At first it is more yellow, but provided with a glimmer of the colour of red lead; however, as the flower unfolds more and enlarges, the latter colouring increases especially on the side facing the light. Only the hooded tips of the flower tepals are green.

The globular ovaries resemble those of *C. nobilis*, those of *C. miniata* being elongated.

***Clivia* × *C. cyrtanthiflora* as a nothospecies**

As many *Clivia* fanciers have cut their teeth on the nomenclature of cultivated plants while studying orchids, it appears to be generally believed that this latter group of plants would serve as a good model for the naming of the former. Unfortunately the nomenclature of cultivated orchids represents an exception rather than the rule.

In orchids, the nothospecies concept is applied only to natural hybrids, whereas in most other groups of plants, a nothospecies is any hybrid, naturally occurring or an artificial hybrid, at the species level, that is named in terms of the International Code of Botanical Nomenclature (ICBN)¹⁰. Like all specific epithets, the name of a nothospecies is in lower case and is italicized; but this epithet is preceded by a multiplication sign to indicate its hybrid nature. A multiplication sign is available on the character maps of most widely used computer fonts such as Ariel, Verdana and Times New Roman. In cases where a special multiplication sign is not available, eg. on a typewriter, a lower case, un-italicised x may be substituted.

Clivia × *C. cyrtanthiflora* is a nothospecies, and there is a long history of the usage of this name. Its validity may be explored and the consequences of its status as a nothospecies

should be considered. To do this, reference needs to be made to the ICBN. The current version in use is the Vienna Code published in 2006¹⁰.

ICBN 40.1. *In order to be validly published, names of hybrids of specific or lower rank with Latin epithets must comply with the same rules as names of non-hybrid taxa of the same rank.*

This requires publication in printed matter available to botanists and the general public. It should be accompanied by a description or diagnosis of the taxon. From this, the date of effective publication and authorship should be determined. The earliest publication of the concept is considered to have priority and this yields the accepted name.

ICBN 33.2. *Before 1 January 1953 an indirect reference to a basionym or replaced synonym is sufficient for valid publication of a new combination....*

Regarding the hybrid under consideration, it was originally described in a genus (*Imantophyllum*/*Himantophyllum*) that is no longer accepted as valid, and thus a new combination was required to place the hybrid into the now-accepted genus *Clivia*.

In the case of *Clivia* × *C. cyrtanthiflora*, the following relevant nomenclatural list may be assembled:

Clivia cyrtanthiflora Lindl. *ms. ca.* 1858-1859, *ined.*^{12, 18}

Himantophyllum × *cyrtanthiflorum* Lindl. ex K.Koch & Fintelm. *Wochenschr. Gärtnerer Pflanzentk.* 2: 122-123 (1859)¹¹.

Since *Imatophyllum* and *Imantophyllum* are simply orthographic variants of *Himantophyllum*, it is not necessary to characterise their first instances of publication in combination with *cyrtanthiflorum*.

Clivia × *C. cyrtanthiflora* (Lindl. ex K. Koch

& Fintelm.) T. Moore in Lindley, J & Moore, T. (eds.) *The Treasury of Botany: A Popular Dictionary of the Vegetable Kingdom*. 1: 300 (1866)¹⁴.

Moore lists "*C. cyrtanthiflora*" in his list of valid *Clivia* names and mentions the basionym - *Imantophyllum cyrtanthiflorum*. This is chronologically the first instance of the publication of a legitimate combination of *Clivia* with *cyrtanthiflora* that I can find.

Regarding the name/s applicable to related hybrids and subsequent generations of hybrids, the ICBN10 has the following to say:

H.4.1. *When all the parent taxa can be postulated or are known, a nothotaxon is circumscribed so as to include all individuals (as far as they can be recognized) derived from the crossing of representatives of the stated parent taxa (i.e. not only the F1 but subsequent filial generations and also back-crosses and combinations of these). There can thus be only one correct name corresponding to a particular hybrid formula; this is the earliest legitimate name in the appropriate rank, and other names to which the same hybrid formula applies are synonyms of it.*

The implication of this is that any hybrid containing only the genetic material of *C. nobilis* and *C. miniata*, irrespective of the proportions of the two parents present in the progeny, is named *Clivia* × *C. cyrtanthiflora*. This is a relatively unsatisfactory state of affairs. *C. miniata* × [*C. miniata* × (*C. miniata* × *C. nobilis*)] and *C. nobilis* × [*C. nobilis* × (*C. nobilis* × *C. miniata*)] will both land up being called *Clivia* × *C. cyrtanthiflora*, but will barely resemble one another.

More information can be attached to a plant by tagging a clonal or cultivar name on behind the nothospecies name; this being used to

differentiate exceptional plants. But this still leaves the bulk of the hybrid progeny having a name that is rather devoid of much useful information.

The addition of F1, F2, etc. for straight-up 1st, 2nd, etc. generation hybrids, and Bm and Bn for simple backcrosses to the parental species, covers some of the basic permutations; but where complete records are sought, any breeding that is more complicated requires that the cross be written out in full, perhaps taking up more space than a reasonable label could provide. Where clones or cultivars are registered, the full breeding of a plant would be recorded by the Registrar.

Whereas the use of grex names as suggested by Koopowitz (1998)¹³ is inapplicable, "(Minicyrt Group)" (Koopowitz 2002)¹ and similar epithets for each of the different hybrid formulas may be created and combined with the name *Clivia* × *C. cyrtanthiflora* to create further clarity.

I hope that this note does not discourage anyone from pursuing the wonderful potential in terms of colour, form and the carriage of flowers inherent in the advanced breeding of *Clivia* × *C. cyrtanthiflora*. That would really be a disaster.

Acknowledgements

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Photo: Anthony Miracolo

C. miniata 'LoB Sparrow' Grower Anthony Miracolo

Breeding the 'Universal Yellow'

Kerrie McElroy, Australia

In April of this year a number of posts to the Clivia Enthusiast e-group revealed that some members were hoping to breed a *Clivia* that was both a Group 1 and a Group 2 yellow. In the course of the e-group discussion, Mick Dower coined the term 'universal yellow' to describe such a plant. A number of issues arose from the discussion and they are mostly considered within Part 1 of this article along with the method for breeding a 'universal yellow'. One issue, in particular, raised questions that would be relevant to other breeding programs. This is discussed in Part 2 of this article.

Part 1 – Breeding for a 'Universal Yellow'

Breeding a 'Universal Yellow' from a known Group 1 yellow and a known Group 2 yellow would take two generations of breeding over about 10 years. The predominant characteristic of Group 1 and Group 2 yellow clivias is yellow flowers. A universal yellow would presumably also have yellow flowers; therefore I wonder what the objective of such a breeding program would be. Regardless of the objective, let us consider the feasibility of breeding for a 'universal yellow' and some other issues raised by the discussion about this.

To consider the feasibility of such an aim, we should start with what is already known about breeding for yellow flowers. It has been established by Koopowitz that there are a number of genes involved in the production of flower colour in *Clivia*. Each gene can exist in a number of versions, known as alleles. The alleles responsible for Group 1 and Group 2 yellows are mutated versions of two different genes. For the sake of clarity, let us call these Gene 1 and Gene 2. Gene 1 has at least three known alleles. These are: the allele responsible

for Group 1 yellows; the allele responsible for Chubb's Peach; and the fully functioning allele that allows for orange flowering plants. Gene 2 has at least two alleles, one of which is responsible for Group 2 yellows and the other which allows for orange flowers. In breeding for a universal yellow, the allele for Chubb's Peach can be ignored.

Let us refer to the alleles as in the table below:

Gene 1 allele for Group 1 yellow	a
Gene 1 allele for orange	A
Gene 2 allele for Group 2 yellow	b
Gene 2 allele for orange	B

Clivias have two copies of each gene, one from each parent. For a *Clivia* to be a Group 1 yellow, it must have the genotype aa for Gene 1 (i.e. it is homozygous recessive). If the genotype for Gene 1 was AA the flowers would be orange. If the genotype was Aa it would be heterozygous, having the allele for both Group 1 yellow and the allele for orange, and would commonly be said to be 'split' for yellow. The genotype Aa would produce orange flowers. When considering both Gene 1 and Gene 2, a Group 1 yellow will have the genotype aaBB presuming that it is not 'split' for Group 2 yellow.

Group 2 yellows must have the genotype bb for Gene 2. If the genotype for Gene 2 is Bb or BB, the plant will not be a Group 2 yellow. Group 2 yellows will have the genotype AAbb if they are not also 'split' for Group 1 yellow.

A 'universal yellow' will have the genotype aabb, with Gene 1 being homozygous for the recessive allele a and Gene 2 being homozygous

for the recessive allele b. The first question, then, is how can we arrive at this genotype?

First of all we must start by crossing a Group 1 yellow with a Group 2 yellow. This has apparently been done by Ken Smith and Graham Duncan and most likely by other people as well.

The cross can be represented as follows:

Group 1 yellow		Group 2 yellow
aaBB	X	AAbb
	↓	
	AaBb	F1 (Orange)

where AaBb is the genotype of the resultant F1 offspring.

The phenotype (with regard to flower colour) will be orange, since none of the F1 generation will be homozygous for either allele a or allele b. To test whether the cross has in fact taken place (ruling out stray pollination), the F1 plants should be test crossed back to known Group 1 and Group 2 yellows. In each case the expected outcome will be approximately 50% green-based seedlings, which would flower yellow, and 50% seedlings with pigmented bases, which would flower orange. The yellow flowering offspring of the test crosses will be either Group 1 or Group 2 yellows but will not be ‘universal yellows’, although approximately half of them will be ‘split’ for the alternative group.

Of the F1 orange plants resulting from a cross between the two yellow groups, arguably the most important and best known is Kirstenbosch Supreme. Mick Dower told

the e-group that “Kirstenbosch Supreme is a hybrid of Kirstenbosch Yellow (Group 1) x Kirstenbosch Natal Yellow (Group 2) = a very good big umbel; orange with deep yellow centre; recurved petals; and protruding stamens (see back cover of Yearbook 2)”. With regard to test crosses, Mick went on to say, “Crossed with Group 1 yellows it has produced very good green stem yellows and red stem pastels. There is no record of its having been crossed with Group 2 yellows, so I did that last year – see #97 on our seedlist”. Anyone growing this seed would do well to remember that there are four possible genotypes (with regard to the two genes we are discussing) that can be expected from this cross. These are: Aabb; AaBb; AAbb and AABb. The first of these, Aabb, will be a Group 2 yellow ‘split’ for Group 1 yellow. AaBb will be an orange plant with the same genotype as our F1’s from the crossing of the Group 1 yellow with the Group 2 yellow, and will be ‘split’ for both Group 1 and Group 2 yellow. The third genotype, AAbb, will be a Group 2 yellow, and the fourth one, AABb, will be an orange ‘split’ for Group 2 yellow. Thus the importance of breeding records can be clearly seen.

To return to breeding for a ‘universal yellow’, the second cross should be between siblings of the F1 cross, or by self-pollinating an F1 if it is possible. Thus we have the cross AaBb X AaBb.

The outcomes of this cross can be determined most easily by the use of a punnett square as below, where the left hand column and the top row contain the possible genotypes of the eggs from the ovary parent and the pollen sperm cells and the other squares show the possible genotypes of the F2 offspring.

	AB	Ab	aB	ab
AB	AABB	AABb	AaBB	AaBb
Ab	AABb	AAbb	AaBb	Aabb
aB	AaBB	AaBb	aaBB	AaBb
ab	AaBb	Aabb	aaBb	aabb

It can be seen that there are 16 possible outcomes with regard to genotype in the F2 generation. Only the genotype aabb is homozygous for both Group 1 and Group 2 yellow and could be said to be a 'universal yellow'. There are six other genotypes that will give the phenotype of a yellow flower. This outcome is dependent upon the independent assortment of Gene 1 and Gene 2 during the formation of the egg and sperm cells. If the genes are linked on the same chromosome, the chance of breeding a universal yellow would be considerably reduced.

Let us assume that the two genes under consideration are not linked. Then in the F2 generation we have a 1 in 16 chance of achieving a universal yellow. This raises some other issues. Firstly, how many F2 plants would we need to grow to have a fairly certain chance of producing at least one universal yellow? If you only grow one seed from the F2 generation, there is a 1 in 16 chance that it will be "it". Conversely, this means there is 15/16 or a 94% chance that it is **not** a universal yellow. If you grow two seeds, the chance of **not** getting the universal yellow is $15/16 \times 15/16$, or 88%. To reduce the chance of **not** getting a universal yellow in the F2 generation to 1%, it is necessary to grow 66 F2 seeds. So if you grow 66 F2 seed, there is a 99% percent chance of having at least one 'universal yellow'. This means that there is still a 1 in 100 chance of not getting a universal yellow.

The second issue is how to distinguish the universal yellow from the other yellows of the F2 generation. Unless the colour of the flower is significantly different, this could only be achieved by test crossing all the F2 yellow flowering plants back to known Group 1 and Group 2 yellows. Only the universal yellow should produce all green stemmed seedlings when this is done. Given the number of seedlings involved this would be a huge task. None of the green-based seedlings from the test crosses would be universal yellows. If the aim is to breed a universal yellow, this presents another issue because these seedlings should then be discarded.

Part 2 - Dominant Epistasis and The Trouble with Yellow

Another, and perhaps the most important issue, was raised by Mick Dower during the e-group discussion. An excerpt from one of Mick's e-mails is as follows: 'If you do succeed in breeding a yellow that has a pair of both Group 1 and Group 2 mutated genes are there then TWO "blocks" in the anthocyanin pathway and if so can one of them "kick in" before the other? And if so, which one?' In effect, Mick was asking, if a *Clivia* is bred which is homozygous for both Group 1 yellow at Gene 1 and homozygous for Group 2 yellow at Gene 2, could one of these genes be dominant over the other?

We are used to thinking in terms of one allele being recessive or dominant to another allele of the same gene. When a gene is dominant over another gene, this is called dominant epistasis. In fact, since flower colour in *Clivia* is determined by multiple genes, dominant epistasis is an important issue to consider. In the case of Group 1 yellows, Gene 1 is exhibiting epistatic dominance over the other genes involved in production of flower colour, while in Group 2 yellows, Gene 2 is exhibiting epistatic dominance over the other genes. I do not know the answer

to Mick Dower's question, but I suspect that in a 'universal yellow' Gene 1 would have epistatic dominance over Gene 2. Flower colour in *Clivia* is produced by a sequential pathway of chemical reactions and Gene 1 is believed to control a step in this pathway that occurs before the step controlled by Gene 2.

If this were the case, a 'universal yellow' would effectively be a Group 1 yellow. Other more interesting questions arise from this. What if we were to breed a *Clivia* which was homozygous for the Chubb's Peach allele at Gene 1 and homozygous for the Group 2 yellow allele at Gene 2? In this case Gene 2 may be dominant over Gene 1, resulting in a plant which is effectively a Group 2 yellow. On the other hand, Gene 1 may be dominant and the resulting plant would effectively be a Group 1 peach.

It is possible (and I think likely) that the Group 1 yellow mutation (in homozygous form) is dominant, in terms of phenotypic expression, to all the other recessive gene variants that result in Group 2 yellows, peaches, pinks etc. This has important implications for the breeding of other colours that result from recessive mutations.

Imagine the following scenario:

You obtain pollen from a rare mauve-coloured *Clivia*. Assume that this is caused by a mutation of a single gene which produces mauve flowers when the genotype of that plant is homozygous for the mutated version of the gene. Let us say that it is Gene 3 which can occur in this form and refer to the alleles as follows:

In an attempt to breed for more mauve-coloured plants, you use the pollen on some Group 1 yellows. The cross can be represented as follows:

Gene 3 allele for mauve	c
Gene 3 allele for orange	C

Where AaCc is the genotype of the resultant F1 offspring. The phenotype of all offspring will be orange, since none of them are homozygous for either allele a or allele c.

Group 1 yellow		Mauve
aaCC	X	AAcc
	↓	
	AaCc	F1 (Orange)

When the F1 generation flowers, you pollinate them all with pollen from the mauve flowering plant. This cross can be represented as follows, where the left hand column gives the possible genotypes of the egg cells from the F1 cross, and the top row gives the genotype Ac of the pollen from the rare mauve *Clivia*.

Two of the possible outcomes of the F2 generation will give us mauve flowers, namely the genotypes AACc and Aacc. It would be easy at this stage to assume that these plants would be true breeding for mauve flowers since they must

	Ac
AC	AACc
Ac	AAcc
aC	AaCc
ac	Aacc

be homozygous for the allele c. But note that the genotype Aacc would give mauve flowers in our imaginary scenario but would also be 'split' for Group 1 yellow. If a plant with this genotype is pollinated with the original mauve or the sibling that is not 'split' for yellow, the recessive Group 1 yellow allele of Gene 1 will remain hidden and this could occur for any number of generations.

However, if it is sibling-crossed to another mauve which is 'split' for yellow or if it is selfed, the next generation cross would be represented as in the following punnett square.

The genotype AAcc would give a true breeding mauve-flowering *Clivia*. Aacc would

	Ac	ac
Ac	AAcc	Aacc
ac	Aacc	aacc

give a mauve-flowering *Clivia* carrying a hidden allele for Group 1 yellow just the same as its parents. The genotype aacc will be homozygous for both mauve and Group 1 yellow. Would it have mauve or yellow flowers?

At this stage, only practical breeding results will tell us which genes will exhibit dominant epistasis over which other genes. I asked Sean Chubb if he had any breeding results which support the theory that a gene which is homozygous for yellow would be dominant over another recessive gene that is also in homozygous form. His reply in part said "I have a plant which flowers pink and is bred from my pretty pink line, which also carries the genes for Group 3 yellow (yellow flowers but red berries). This plant when selfed will give you 50% Pretty Pink and 50% yellow with red berries." Rudo Lotter has also

mentioned in e-mails that yellows will sometimes result from the offspring of some peach *Clivia* and he has advised, 'try to keep your groups separate, if possible! Keep dedicated breeding records. Always try to know the background of plants and seeds that you purchase. Never ever interbreed two different groups, if the breeding results are already known.'

In the imaginary scenario given above, the mauve-flowered *Clivia* could just as easily have been peach or pink or another unusual colour. So a peach or pink flowering *Clivia* may be homozygous for a particular recessive mutation that results in peach or pink flowers, but if it is also 'split' for yellow it is likely to produce some yellow offspring. Thus we have 'the trouble with yellow!' This is of particular importance when buying or selling seeds or seedlings of peach or pink flowering *Clivia*. A test cross back to known Group 1 and Group 2 yellows can be used to determine if a pink or peach (other than a Group 1 peach), is also 'split' for these yellow groups. If the test cross is not carried out, it should not be assumed that a true breeding line has been achieved before practical results verify that it is so.

Sincere thanks to Aart van Voorst for his advice and confirmation of this article. Eds.

Photo: Mick Dower



A Group One Yellow 'Sky Chase' - Grower Mick Dower

Photo: Auriel Batten



A Group Two - Auriel Batten's 'Dwesa Transkei Yellow'

Selecting Striata Variegated *Clivia* for Breeding

John Craigie, Australia

There has been a lot written about variegation by more learned *Clivia* enthusiasts in past *Clivia* Year Books and I encourage readers to go back and review these articles, particularly “Variegation in *Clivia*” by Ben J.M. Zonneveld in CLIVIA 8. This article is about optimising variegated seedlings from striata (longitudinal) variegation in *Clivia*.

Variegated foliage plants usually attract more interest than plain green ones. One retailer, in expressing a preference for variegated foliage, said he can sell variegated *Clivia* all year round whereas sales of green foliage ones tend to occur best when in flower. But variegated foliage is not for everyone. Whilst very appealing to some, other people may be indifferent or actually dislike variegated foliage. My wife Gail observes that men tend to prefer variegation in *Clivia* more than women. I will leave it up to you as the reader to consider whether this is so.

Chimeral variegation

A plant is said to be a chimera when it comprises normal and mutant cells growing adjacent to each other, for example, green and white variegation in a leaf has cells with normal chloroplasts and mutant cells with defective chloroplasts.

Looking more closely at a shoot apex there is an apical dome or meristem consisting of three layers - L.I is the outer layer or epidermis, L.II is the sporoderm and L.III is the core tissue. Striata variegation in leaves can occur when cells in one of more of these layers mutate. If the cell which mutates is located near the crest

of the growing point (apical dome), then all other cells which are produced by division from it will also be the mutated type. If the location of the mutated cell is in a region where little further cell division will occur, then the likelihood of detecting this mutation by visual inspection of the whole plant may be low. Hence some plants may appear to be visibly non-variegated but do contain mutated cells and some offsets and siblings from these plants may be variegated.

Chimeras have been classified into three types – sectorial, periclinal and mericlinal but through cellular displacement these types can be modified.

- In Sectorial chimeras a mutation occurs in multiple layers at the top of the growing point, usually a wedge-shaped segment of tissue extending from the epidermis inwards towards the centre of the leaf. Sectorial chimeras are unstable and can give rise to shoots and leaves which are not chimeras.
- In Periclinal chimeras a mutation occurs in one layer at the top of the growing point and typically produces mutated cells that cover the entire tissue layer. Periclinal chimeras are stable to very stable.
- Mericlinal chimeras are produced when the derivatives of the mutated cell do not entirely cover the apical dome. They are generally restricted to one cell layer. Many mericlinal chimeras involve such a limited number of cells that only a small portion of a leaf may be affected (variegated). Mericlinal chimeras are not stable.

In summary, the pattern of cell division, frequency of cell division, and layered organisation of the cells in the shoot apex interact in determining the type of chimera which is produced and the stability of the pattern which results. Since mericlinal and sectorial chimeras are unstable, the likelihood of vegetatively propagating plants with the same morphological pattern from these types is low. In all cases propagation by seed is unstable because all the cells of the chimera plant are not of the same genotype but contain both normal and mutated cells.

Optimising variegated seedling production

Breeding striata variegated *Clivia* is a long term activity with individual plants taking up to several years of age before they flower. As a general observation only about 30% of seed from variegated plants may yield variegated seedlings but individual plants can yield more or less. So it is important to strive to work out how to breed increasing percentages of high quality variegated foliage and flowers. Sometimes assumptions come under serious question, with new growth on a good quality variegated *Clivia* turning either green or albino. Reversion is not unique to *Clivia* and occurs with other variegated monocots, for example, variegated grasses. During micro-propagation of some variegated grasses about 10% of tissue cultured grasses may be discarded as being either green or albino in the flask stage and a similar percentage may be further discarded at hardening off stage. But it does not end there! An even higher percentage of plants tend to be discarded during the growing up stage as the new foliage on some reverts to either green or albino.

Chimeral rearrangement is an inherent fact of life and whilst it can result in many disappointments it can also result in surprises

like high quality variegated flowering size *Clivia* which were once, in the absence of a better description, “ugly ducklings” with barely visible variegation when seedlings.



Chimeral rearrangement is shown in the plants above. Note the “old” foliage has less variegation but the variegated pattern is now consuming larger areas of new foliage

Where all three layers in the epidermis are affected, rearrangement may lead to a more stable periclinal chimera where all cells in a single layer are genetically different from the rest of the plant. Ben Zonneveld pointed out in his article that we then have a green plant with a yellowish edge.

Another important consideration is uniformity of variegation of foliage on both sides of a plant. A *Clivia* with perfectly uniform variegation would be rare and may indicate that the variegation may be influenced more by nuclear than cytoplasmic inheritance. And if such variegation is nuclear-inherited then it would tend to come out in the seedlings irrespective of whether the maternal parent is variegated or not. But this has yet to be proved in *Clivia*.

The variegation in the majority of striata variegated *Clivia* is cytoplasmically inherited and is transmitted via the maternal parent. The range in instability can be great with some *Clivia* exhibiting good variegation down one side of the plant whilst the other side is either nearly green or albino. Whilst these *Clivia* may produce some good variegated seedlings, from a sustainable breeding program perspective, it may be better to exclude these and seek out *Clivia* that have more uniformity of variegation on either side of the plant.

The variegation can also be more or less stable on the underside of the leaves.



Leaf Underside

Leaf Topside



Leaf Underside

Leaf Topside



Above: Too Variable

Below: More Uniform



Another important consideration is the pattern of variegation in the foliage. It has been generally observed that there may be a correlation between this pattern and its extension carried up the peduncle, through the pedicels bearing the flowers, and eventually to the fruit. Apparently the strength of this correlation may influence the percentage of seedlings that may be variegated. I started to pay more attention to this relationship in 2008. And at the time of writing this article I inspected about 900 berries from 126 variegated plants.

The variegated pattern up the peduncle, through the pedicels may extend into the buds as shown below.



This variegation pattern in the pedicels and buds may or may not be reflected in the berries as shown in the same *Clivia* plant left and right below.



Thinly striped peduncles tend to produce more variegated pedicels and berries with a greater percentage of stripes than berries with higher percentages of yellow/white or green in them as shown below. These striped peduncles usually arise from striata types with relatively uniform variegation in the foliage.

(See six images below)





But there is one form of striata variegation where there is perfect correlation between the variegated patterns in the foliage, peduncle, pedicels, buds and berries and that is the Mandarin Duck form where the pattern is identical.

In 2007 I undertook an experiment on a Mandarin Duck form with a view to determining whether variegation in seedlings can be predicted from berry colouration. The outcome was as follows:

- The 100% white berries produced either albino or LOB variegates but over time the LOB types also died;
- The 50:50 white/green berries produced all albino;
- The 25:75 white/green berries produced one variegated *Clivia*, some albino and green types; and
- The 100% green berries produced all green seedlings.



The Mandarin Duck experiment added a further dimension to understanding the inheritance of striata variegation with 100% green berries always having 100% green pedicels extending out of a 100% green section of the peduncle. And it is the same with 100% albino berries which have 100% albino pedicels extending out of the white section on the peduncle. It is expected that this relationship and flower outcome may be expected with striata variegated plants. However, from my population of berries from striata variegated plants there are further possible combinations that confound the possible seedling outcomes.

These further combinations include some 100% green berries can be associated with variegated pedicels and some 100% green pedicels can be associated with variegated berries. In the latter case, on closer examination there is variegation running up the peduncle to the base of each pedicel. Also 100% albino pedicels can be associated with variegated berries. Again, on closer examination it can be seen that there is variegation running up the peduncle to the base of the pedicel. Just like the foliage in striata variegated plants, the pattern of variegation in the pedicels can be variable and may be correlated to some and not other patterns in berries. Hence some green berries and albino berries can produce variegated seedlings.



Clivia that have relatively uniform variegation in each pedicel may produce more uniform variegated berries.



One surprising outcome of the Mandarin Duck experiment relates to the 50:50 variegated: green berry. This berry produced all albino seedlings. On inspection there was less non-mutated material in the

pedicel. Furthermore all seeds in the berry were either fully positioned under or partially under albino peel.

John van der Linde in an article on *The Importance of the Flower Pedicels in Selective Breeding of Variegated Clivia* investigated the proposition by Harold Koopowitz that the degree of variegation in the pedicels of the flowers of variegated *Clivia* may be the best guide for pollinating them to produce desirable variegated progeny with few albinos. Some of the results of that experiment are detailed below:

- Non-variegated fruit on a variegated pedicel produced nine seedlings of which 4 had “good” variegation, 2 had slight striping, 2 had no stripes and one was albino;

- Lightly variegated fruit on variegated pedicels gave 17 seedlings, 11 of which had leaves with “good” variegation, 2 were slightly striped at 6 months, one had no stripes, and 3 were albinos.
- Heavily variegated fruit was borne on pedicels which were also heavily variegated. There were 22 seedlings, 5 of which had “good” variegation, one slight striping, and - significantly - 16 were albinos.

Whilst the sample size was small, the results are consistent with his proposition and in line with views of other notable *Clivia* personalities.

Shigetaka Sasaki in his article “Variegated *Clivia* in Japan”, in *CLIVIA* 5, noted that when Mr Yoshi Nakamura harvests the seeds named “best variegated” he chooses only the seeds that are covered by peel with lots of thin stripes. Shige also suggests selecting flowering size plants that have well balanced striped foliage with about 30% of the leaf surface covered in stripes.

Based upon discussions above, *Clivia* that have relatively uniform striata variegation may have more uniform variegation in the peduncle, the pedicels and the berries than other variegated forms. These *Clivia* may yield

more lightly variegated berries, with or without lightly variegated pedicels, and therefore potentially yield more quality variegated seedlings and/or less albino seedlings than other plants. **However, leaf variegation on its own is not a sufficient predictor to optimise variegation in seedlings.**

An alternate view is that variegation in seedlings is unstable and random because all the cells of the chimera plant are not of the same genotype but contain both normal and mutated cells and the presence of both these cell types may not be detected visually. The fact that variegated berries on 100% green pedicels or 100% albino pedicels can occur when positioned directly above variegated peduncles may lend support to this view.

This year I will undertake a fairly large experiment on variegation involving the germination of many thousands of seed. The berries will be graded based upon the presence or absence of variegation in peduncles, pedicels and the berries. I will also commence an experiment on the contribution of pollen from various forms of variegated *Clivia* to improving variegation in seedlings.

Selection of *Clivia* seedlings

If the preferred striata variegated *Clivia* for breeding purposes is one that has relatively uniform variegation and with no more than 30% of foliage area yellow or white stripes, then these plants would be scarce and rarely available. Most enthusiasts would need to rely on selection from seedlings but which variegated seedlings should be selected as potential breeding stock?

Whilst some variegated seedlings may appear to have relatively stable variegation up to flowering size, the majority may not due to chimeral rearrangement. It is very difficult to make such

a selection of seedlings until some “preferred” trend in variegation becomes obvious, which may take a couple of years. Even when the trend does become obvious the re-assortment process in new foliage is ongoing and can result in some seedlings being discarded and some previously discarded seedlings becoming preferred.

Preferred seedlings may exhibit little to no variegation in the older four to six leaves and slightly increasing variegation in newer leaves. But even when these preferred seedlings grow up, the proof in selection only becomes evident by assessing the uniformity of variegation in the peduncle, the pedicels and the berries. And this can change from year to year!



This seedling would be unsuitable due to the rapid increase in variegation



This seedling has potential but note the dramatic increase in variegated foliage at a young age. If the trend continues this plant may be unsuitable



This flowering size plant shows little variegation in the older leaves and moderate increases in variegated new foliage but is the level of variegation adequate to optimise variegated seedling production

Some new striata types?

New striata variegated types are emerging and each flowering season provides an opportunity to further progress the development of new types, including yellow leaf



Striata Variegation

Single Flowers



Single Flower Photo: Joubert van Wyk



Single Flower
Photo:
Helen Marriott

Breeding:
C. miniata (Orange)
x Tango



Photo: Rina van der Merwe



Photo: Sue Kay



Photo: Sue Kay



Photo: Helen Marriott



Photo: Rina van der Merwe



Photo: Felicity Weeden



Above: Photo: Claude Felbert



Left: Photo: Claude Felbert



Photo: Felicity Weedon

Clivia Rendezvous in Japan

Felicity Weeden, South Africa

I was privileged indeed to be invited on a tour of Clivia Breeders in Japan. The group included Marilyn Paskert (organiser) and Rashid Qureshi both from the US, Ian Coates from the UK, Joubert van Wyk and myself from South Africa with Shige Sasaki as our guide, interpreter and driver. I must say at this point, that Shige went far beyond the call of duty and had everything arranged to perfection for us. There is no way we could have found our way as quickly and efficiently without him - always pleasant, always on hand to sort out problems, queries or requests. He did a great job! After traveling by train from Narita Airport, we connected with the Bullet Train (Shinkansen) to Nagoya, where we collected our mini bus.

Our first stop was Mr. & Mrs. Hattori's nursery. A most striking feature was the wall of his office/reception, which was covered with enlarged photos of his special *Clivia*. Here were quite outstanding flowers. Palest Appleblossom-type colouring, others with cream white inners and blushed reverse, others just touched with pink or pastel on the extremities of the inner petals (Sakibeni), and



A delicate pink edged flower from Mr Hattori

many other delicate variations. There were also very compact bronze green throats. Among them was an amazing flower with pale green tufting that looked as if had been applied like oil paint with a pallet knife (Crystal). Quite extraordinary. Another exceptional flower was a would-be bronze, but was in fact a lovely wine pink. Again, quite extraordinary! There were also plenty of compact broad leaf oranges in his local dispatch department. Good enough, in fact, to tempt anyone. The plants here were all either really dwarf with broad leaves, or nice compact plants.

I enquired about the potting material used and was informed that it is made up of soil from the rice paddies, gravel and bark. Mr. Hattori also stressed that excellent drainage was essential. His plants were all on expanded wire tables (as were most that we saw) about 2-21/2 feet (77cm) high. Plants were watered by overhead irrigation about ever 10 days and they expect bloom in 3 -31/2 years. (See CLIVIA 10, pages 62-63.)

Next we arrived at Toshio Koike's greenhouse. Here I was privileged to view a veritable sea of 'Hirao Green' *Clivia*, and



Mr and Mrs Hattori's Greenhouse - estimated to contain over one million plants



A close-up of Toshio Koike's 'Hirao Green' Clivias

high quality green throat yellows, short broad leaf yellows, variegated yellows and at least one truly bright yellow (Shade 66 on the new colour chart). I have subsequently made enquiries about the feeding of 'Hirao Green', because it is claimed that these plants need special food in order to enhance the green. I am reliably informed that they do not require anything special, but DO need to be regularly fed, with perhaps a little extra towards flowering season. It may be of interest that there are at least two forms of 'Hirao Green'. The one form is very green with a dark green midrib, and the flowers are perhaps a little smaller with pointed tepals. The second form is a distinctly larger bloom with wider rounded petals, and a smooth,



An interesting multi-colour with near white splashed on the tips Breeder: Toshio Koike

all over light green colour - in fact very lovely. Besides the yellows and greens were very fine picotees and bronze green throats, TK original bronze and some lovely pink interspecifics, which were unfortunately not for sale.

Back to Tokyo by the two trains and then on again in Shige's mini bus. The next stop was the highlight among highlights of the trip for me. This was Nakamura's Clivia Plantation. For years I have of course heard of "Yoshi" and if there are special flowers mentioned, invariably, they have Nakamura breeding. I was not lucky enough to receive any of his early seed gifts to the Clivia Club, because I was not yet involved, so I had this huge need to get some plants from him personally and also to meet him! Nestled at the bottom of the bamboo and tree-clad mountains, his house commands a view over the farm lands and rice paddies. In front of and next to the house are the shade houses and low seedling growing tunnels.



Shigetaka Sasaki with Yoshikazu Nakamura

Yoshi Nakamura was sitting in the sun, waiting for us, wearing a woolen cap and nose mask. As time progressed and the day warmed up, the cap etc disappeared, to be replaced by a 'Toowoomba' peaked cap and a big smile. Because of the diversity of plants

and crosses, Mr. Nakamura started looking round for interesting things for us to consider. Shige, poor man, was inundated with queries, so help was definitely in order!

There were not too many plants in bloom here, but we did see a very lovely deep orange red multipetal, a beautiful pastel, a lovely ghost as well as a very lovely pastel with Akebono variegation. Very fine variegated plants were also there, among them

Plantation plant labels and Marilyn was specially favoured with a small bottle of sake with “Clivia” written on it (in Japanese of course!), which he duly signed for her.

From there to Shige’s greenhouses. Once again a host of dainty daffodils to greet us! Here we were treated to viewing some of his fine collection. Very lovely pastels, bronzes, Hiraos, yellows, interspecifics. They were all there.



A Yoshikazu Nakamura 10 tepal multipetal
An Interspecific from Yoshikazu Nakamura



Shigetaka Sasaki's outstanding pastel
Shige with the two different flower shapes of Hiraos



excellent broad leaf Akebono and tiger variegateds. And dear little green frogs basking in the warmth! Behind the house were delightful violets clinging to the sheer cliff sides, in the lawn daffodils danced in the breeze and here were the only known pale creamy dandelions in Japan. Mr. Nakamura was his usual generous self and kept bringing us gifts including fridge magnets, T Shirts, books, Clivia

The next day was very busy. Leaving the hotel at 06:30 we traveled first to Mr. Miyazaki. Here were very fine short broad leaf variegateds, mostly Akebono, as well as normal green *Clivia* with very broad short leaves. Here were some of the finest bright yellows I have seen to date. Unfortunately not for sale!



An example of Mr. Miyazaki's intensely yellow flowers



Mr Mitsuhashi's extraordinarily large yellow flower

On to Mr. Tsuruoka - here was a wonderland of variegateds, mainly Akebono and a few superior Negishi. This was a very large, very full green house, with beautiful plants on at least two levels and hardly room to walk in the aisles. Mr. & Mrs. Tsuruoka hosted us to lunch at a delightful restaurant (watch out for those arthritic knees!) serving excellent food, after having served us tea and snacks and sweets in their lovely warm office - It was a COLD day.

yellow on display in his show room. Here was a variety of quality plants. Beautiful dwarf pastel Akebono, intense golden yellows, beautiful interspecifics, the biggest multitepal I have ever seen, plants exhibiting both longitudinal variegation as well as Tiger. Of course there were groups of Hirao, peaches etc. Besides *Clivia* Mr. Mitsuhashi has an amazing range of unusual variegated plants including *Haworthia* and numerous dwarf aloes, as well as other rare and unusual zygocactus. Something that really drew my attention was the fact that I saw mature flowering plants growing in 4 inch pots!



A broad leaved Akebono from Mr Tsuruoka

Then on to Mr. Mitsuhashi's property, driving on the really narrow roads between rice paddies. Mr. Mitsuhashi is Chairman of the Japanese Clivia Society and Mr. Tsuruoka is Vice Chairman. We were treated to a close-up view of a yellow multitepal and an enormous

Our last 'Clivia' call was Mr and Mrs Nakayama who specialise in multitepals. Here was dream material for the multitepal lovers! On a farm nestled between the tree-clad mountains the greenhouses were set above a series of dams which led to the rice paddies below (This is a working farm). Mr and Mrs. Nakayama are both over 70 and both are very active people. Mrs. Nakayama is fully involved with the care and maintenance of the plants. In fact, when it came to time to remove plants from pots, she was down on her knees, bashing away at the pots in order to release the roots. Great Lady! There was a very wide range of multitepal forms, very

beautiful. Mr Nakayama also allowed us to photograph him with his prize-winning plants (See also CLIVIA 10 pg 57).



An outstanding multipetal from Mr Nakayama

As has been mentioned before, Mr. Nakayama started breeding *Clivia* 50 years ago. The feeding programme he follows is quite simple: He feeds after the blooming season and then again in the autumn. No feeding during the summer as it is too hot and humid. A single feeding of an organic fertiliser is applied per year. He maintains that the pots we use are too big and we use too much potting mix. This certainly seems to hold true as his mature plants were grown in 15cm pots, and when the pot was removed, it was a solid mass of roots that emerged. He only applies a small amount of water at any one time, and stresses the fact that the water must run straight through the potting medium. AND all this work is done by Mr. & Mrs. Nakayama themselves!

Mr. and Mrs. Nakayama hosted us to lunch at a country restaurant where we had a

private room to ourselves. Once again, arthritic knees were in trouble. However the food and the company were great. That afternoon we viewed the spectacular rice paddies that “flow” down a rather steep mountainside. At the top of the mountain was a small tea room where Mr. Nakayama ordered Dandelion Coffee for us. Very refreshing and not like coffee at all. That evening we were entertained by Shige’s friend Binshu. It was such a delightful evening with singing, dancing, traditional ceremonies, drumming and lovely music. Shige also sang his ‘Clivia’ song for us. It was a really emotional ending to a very happy trip.

The last day was spent cleaning and preparing all our plants for the phytosanitary inspection. Shige kindly made his greenhouse and all facilities including a pressure hose available to us. This also provided a little more time to enjoy some of his lovely plants. And so the end came to a fairytale week in Japan. I could have spent a bit longer I think, but, starting at 6:00 or 6:30 most mornings and being on the go till up to 01:00 every day certainly took its toll, and some rest was in order!



Mr Nakayama’s prize winning plants

The Welcome Predator

James Haxton, South Africa

A ball of fluff found in the house suddenly started moving about. When it was examined closely under the magnifying glass, the body and a pair of pincers were visible.



The ball of fluff

Several months later one was seen on a clivia leaf having a good go at some eggs of the Amaryllis Moth that had been laid on the leaf. The clivia was taken into the studio for a photo session. The insect was identified as the larva of a Green Lacewing, Order **Neuroptera**, family **Chrysopidae**. The larva is known to prey on small insects like gnats and aphids. The fluff on its back is part of its camouflage and is a collection of the remains of its prey, hence the name 'trash carriers'.



The larva feeding on eggs



Puncturing the egg

These particular eggs were fresh; laid the night before by the Amaryllis Moth. The insect tried older eggs as well but it is not known whether it can feed on the young larvae inside the eggs.



Sucking the egg dry



Very few viable eggs left after a feeding session

The larva emptied an egg in less than a minute and then moved on to the next egg.



Feeding on older eggs



Brown Lacewing (**Hemerobiidae**) on a very ripe peach in spring

Would enough of these insects keep the Worm at bay?

Credits:

Thanks to Prof. Hannes Robbertse and Dr. At Schoeman for identifying the larva.

Reference used to identify the adults: <http://BugGuide.net>



Ventral view of a Green Lacewing on a sheet of glass

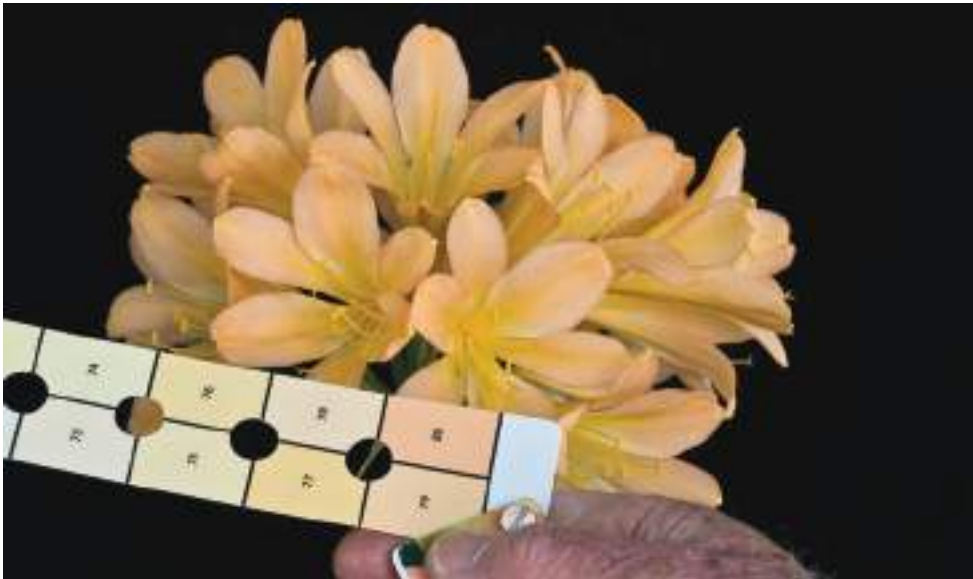


Photo: Claude Felbert

Use the Colour Chart II with this picture to see if the colour matches on your equivalent colour chart

Kiwi Clivia 2008

Kenneth Smith, Australia

Photographs in this article were taken by Ian Coates

During October 2008 I had the good fortune to be part of the KiwiClivia2008 Tour, organised by the New Zealand Clivia Club. What a fantastic trip it was - great company, great *Clivia*, great scenery and great gardens. Yes, it rained some of the time but that in no way dampened our spirits. The whole adventure was stimulating from start to finish.

We started at Alpers Lodge in Auckland, which was to be the base for the first part of the tour. A walk around the local streets and taking in the Eden Gardens showed some of the established garden *Clivia* in bloom. We even got to see the planting in the old Government House. The opening night dinner at Alpers Lodge was a chance to meet up with old friends and share lots of *Clivia* stories. A good international group had arrived to be part of this tour, but it is fair to say that the Toowoomba Mob stood out!

Saturday was Show Day and we set off for the Auckland Botanic Gardens. The display of *Clivia* was set up and the coach offloaded people eager

to get in and view the plants. The whole scene was bustling with energy as plant sales activities coincided with lots of discussion about the merits of the many plants on display. A major attraction was the centre display of 'Vico Yellow' hybrids by David Brundell. Part of the program was a talk by Keith Hammett and people gathered to hear him speak about *Clivia* development.

Lunch was served and we were then treated to an introduction to the Gardens by the Curator, Jack Hobbs, who led a tour of the Gardens assisted by Terry Hatch. The weather was perfect and the plants and garden areas we viewed were beautiful. I found it very interesting as I am always keen to learn more about all plants so that I can pass on my knowledge as a horticulture teacher. The clump of *Watsonia* 'Pink Fairy' caught my attention and allowed me to focus on the visit to Joy Plants where I could view the *Watsonia* plant material developed by Terry. Jack and Terry have a wealth of knowledge and gave freely to the many questions put to them as the group wandered around the Gardens. The diversity of the plantings was interesting at every turn. We would use Terry's vast knowledge during the remainder of the tour many times over.



We travelled by Coach – showing David Brundell addressing the group from a stand



One of a selection of flowers seen in New Zealand

The following day was a visit to the large garden property of Keith Hammett. Our tour group stopped at the local school hall for a morning tea and a forum session to take advantage of the international participants on tour. The discussion was quite detailed and took in all perspectives so in that regard it was a valuable inclusion. The details of that session have been written up by Helen Marriott. Under cloudy skies the tour group made their way down the road to enter Keith's property. Well, to say that there is a wide range of material amassed in this garden is an understatement. Once people entered the drive there were group discussions starting up everywhere. Certainly not enough time to fully absorb all that was there but the darting back and forth by participants only went to show that choice blooms were to be found. Lots of photos were taken as well as lots of discussion about the plants set up outside Keith's study. The history of *Clivia* is well represented here. Plants and seeds were on sale and the ladies were kept busy during the afternoon.

Time caught up with us and we were soon on our way to the McLeman property - a smaller suburban block but no less an impressive



Alick McLeman facing the camera



One of a selection of flowers seen in New Zealand

array of plants. Every space was used to the maximum capacity and Alick was kept busy answering questions from the visitors. The table set up on the porch showcased the choice plants in flower grown by him. Refreshments were served and the delegates were asked to assemble for various group photos - lots of activities and lots of images. The shared enthusiasm for *Clivia* and the fellowship between the tour members was very evident during the lighthearted organising of the "group photo shoots".

Another rainy morning saw us head off on Monday to visit the garden of Bev and Murray Gow. I should comment here on the skill of our coach driver, Dave. He was to show us that he was most capable on many occasions during the tour. I think we even made a *Clivia* enthusiast out of him. The display of the 'Sir John Thouron' progeny grown by Murray started the garden visit and people made their way around the garden, single file, to view not only the pockets of *Clivia* but the associated harbour scene. Raincoats, umbrellas and shoes everywhere in evidence, but there was still much discussion of plants, flowers and seedlings. It did not seem like people wanted to get out of the rain but we had to press on so that we arrived at Joy Plants, the nursery operated by Terry & Pam Hatch and their

son Lindsay. More rain but again this did not stop the crowd walking through the plantings of *Clivia* and other plants established on the 24 acre property. The history of the various accessions was fascinating, particularly the paler form from Governor Grey's residence. Attention was also drawn to the fimbriated petals on one plant amongst the yellows. Whilst people continued to discuss the massed *Clivia* I ventured further along the path to see the clumps of dwarf *Watsonia* in flower in a back paddock. I am impressed with the development of these plants by Terry. The group then puddled their way back to the coach so we could continue to Ian and Shirley Baldick's house where a hot lunch was awaiting us. A well organised breakup of the groups saw some people meander through the wet garden under Ian's guidance, whilst the other group ate their fill. It is not sure that Ian got to eat anything as he was in constant demand to answer the many questions about the garden plants. I know that Irene Broadbent and I took up his time asking lots of questions about the magnolias, one of Ian's long time plant breeding passions.

Last stop of the day was at the property of David Brundell, where the plants developed by David using 'Vico Yellow' almost dwarfed us. These were huge plants, well grown, with

an amazing flower display. After walking through the plantings in the garden we made our way to the shade-house area. As David would say, "a garden work in progress". Seed sales and plants sales in the shade-house were brisk, to say the least. With each new set of eyes viewing the plants it was always possible to discuss future breeding ideas. It is also very interesting to be involved with different people as they scan the lines of plants for sale, each searching for the character in the flower or the plant that speaks to them. The plant that Allan secured will be worth watching as it develops in years to come. Where else did we see fimbriated petals? I think people could have stayed in the sales area for a longer time but as daylight was fading we joined David in another walk back to the house, where a meal was being prepared. This was an extremely restful place to end the busy day, situated on the waters edge, accompanied by the familiar discussions about *Clivia*.

All that was left for the day was to return to Alpers Lodge for the last night in Auckland. The coach was loaded in the morning so that the tour could commence the second part of the itinerary, the trip down south to Paeroa. We left the volcanic area of Auckland to travel



Typical of *Clivia* growing outdoors in New Zealand



Ken Smith seems to have found a prize *Clivia*

through the farmland area of the Waikato Plains. The long drive was punctuated by a stop to collect delegates from Pukekohe then on to Paeroa. It was a most interesting trip as there was plenty of commentary on the way from “the locals”.

Groups scattered in different directions once we reached the township of Paeroa as hungry travelers grabbed a bite to eat as well as finding time to do some shopping. I was not the last one back to the bus after looking through the antique shops along the main street. Off we went to our next *Clivia* stop. Dave carefully maneuvered the coach so that the group could make their way up the drive to Rex and Dee Williams’ property. Here we saw the result of planting the sloped site with palms and bromeliads, and of course, *Clivia*. Pathways and stonework with establishing trees and under-storey plants. At the top of the drive we gathered to hear the story of the move and the “special *Clivia* house” construction. The best was to come when we each had the opportunity to move through the greenhouse and view up close the *Clivia* in bloom. There were even more special plants to be seen here. I will have to ask Rex about ‘Fat Hen’ and ‘Fire Cracker’ and the peach with the fine edging of red to the tepals.



An attractive *Clivia* from the New Zealand selection

Back on the bus so we could reach the lunch venue prior to our stop at Ian Duncalf’s nursery at Te Puna where a mini show was benched for the delegates. I found this venue a very interesting one as there were batches of variegated plants as well as the *Clivia*. The variegated *Alstroemeria* was just stunning! In the large shed was a very welcome display of *Clivia* in bloom. In typical fashion, each plant was scrutinised by the delegates and lots of breeding scenarios were discussed. I am always on the lookout for unusual plants and this venue did not disappoint. Ian has been working with a most unusual *Clivia* mutation, one with yellow flowers but it has **white-striped yellow berries!** It will be interesting to learn about outcome of the berry colouration of the seedlings from this unique mutation. I also took advantage of walking around the well-established garden where the size of the trees was amazing. Some of the delegates also had



Careful inspection shows white stripes on these berries



More beautiful *Clivia* flowers

the opportunity to visit the nursery of a local, well known bulb grower, Bill Dijk. I went to see more watsonias, but also thoroughly enjoyed the chance to see how a specialist cultivates a wide range of bulbous plants. There were special treats at every turn.

It was to be a long day and it was getting dark when we arrived at the dinner venue Kiwi 360 at Taupo. Some shopping for the delegates and then a sit-down dinner, which was great, which was a good thing as it had to hold us out until we arrived at 9pm at the Quality Hotel Geysersland in Rotorua, which was to be base for the second part of the itinerary. Now there is something about Rotorua – the smell!

A new day dawned and the smell was still there, but we got used to that, after all, it was Rotorua. Garden visits were on the schedule and after a brief coach tour of the town we arrived at the garden of Jim and Juanita Elley, “Rhodohaven”. This was the long time family home where four children were raised and only in the past ten years has it been developed into a show garden full of choice plants. Delegates had a very pleasant ramble around the garden to view the main plantings of Rhododendrons, with all spare spaces filled with a wide array of plants, including a few *Clivia*. I was interested to see a double flower form of the Mollis Azalea

in bloom, and learned the cultivar name was ‘Pavlova’. Morning tea was served and then the group was back on the coach to our next stop. If you are going to visit Rotorua you have to see the Wai-O-Tapu Thermal Wonderland. Now here was some incredible landscape - a strange world full of sights and sounds and smells. Following the walkways around this amazing place was an education. I certainly benefited by walking with Pam and Terry Hatch. We saw colourful land formations and changing vegetation and birdlife at every turn. Quite some time was spent here and there was a lot to learn. A special evening back at Geysersland had been organised and after an afternoon rest, the group was treated to a Maori concert and a feast to end the day. Bubbling mud, can you get enough of it?

Today would see us depart early so that we could visit the Volcanic Activity Centre at Taupo and travel the Lost World Highway en route to New Plymouth. It was quite an education to see all the exhibits and the movie whilst at the Volcanic Centre. The new-found insight was appropriate as we traveled the countryside through the very land affected by the earth’s activity. We saw lakes, rivers, tussock pastureland and mountains. I told



Apricot or Peach?



The group enjoying some great New Zealand hospitality

you that Dave was a great coach driver, well, today would really show us his skill. The Lost World Highway, now that is an exciting way to see part of New Zealand.- rugged country, green pasture, huge trees and really narrow tunnels through mountains just wide enough for a coach to fit through. Well done Dave. And where did we end up by mid afternoon? Whangamomona Pub - quaint, quirky, old world. All of these but an absolute treat. After most of the day traveling the contents of the coach spewed out and headed straight for the refreshments on offer at this establishment. Nice drop of dark ale. To say we were entertained would be an understatement. Geoff Taylor is a publican extraordinaire and he had us all engaged in his banter when ordering beers, purchasing souvenirs and most of all, when having our Passports stamped. That's right; I am an official citizen of the Republic of Whangamomona. Now, the group picture outside the pub, well, that was a comedy of errors, but I am sure lots of images exist, no thanks to Geoff as a parting gesture. Did

everyone get their cameras back? Nothing to do but back on the coach and admire the scenery as we made our way to the Autolodge Motor Inn at New Plymouth, the third base of our tour. It was a long day traveling but an extremely enjoyable day none the less, viewing the changes in scenery, punctuated by the stop at the pub.

After a meal at the restaurant I bet everyone slept well that first night at the Autolodge. I woke to a bright, brisk day with a view

of Mt Taranaki from my hotel room window. Breakfast finished and we were on the coach again to explore the North Egmont Visitors Centre. Chilly little spot but we still walked the nature trail and viewed the monument. Stunning views from on the mountain, and of course, when the mist cleared, the mountain itself was amazing. Lots of images were taken from both on the mountain and from further away when other choice Mt Taranaki viewing sites were visited. Gardens were again on the schedule and a visit to "Tupare" was well worth it. This is a well laid out established garden from the 1930's that is now in the hands of the Taranaki Regional Council. To walk the



Mount Taranaki, tranquil and majestic

pathways and view the gardens and trees was a pleasure indeed, as was the house with the exposed heavy timber beams. I particularly liked the way that distant views seemed to be part of the garden and I was very taken by the walled garden and glasshouse - such a beautiful place. Another coach trip took us to another well established garden, the Jury Garden, "Tikorangi", where our hosts Mark and Abbie Jury took us on a tour of the grounds, an old garden full of character and hidden treasures. Hearing about the history of generations

Some time was allocated that afternoon to relax at the Autolodge and that evening the group had the opportunity to have a meal at the local Chinese Restaurant, The Golden Sun. A good night was had by all and who said that one table got too rowdy? It was just a chance to unwind.

Now if you think you have seen old gardens, you shown have been with us when we went to Pukekura Park. We entered the park at the Kaimata Street entrance where the



Picotee with frilly tepals reminiscent of a Carnation



A peach with deep green throat

that had planted the site and about the continued plans for new things was a bonus for me. I knew of the Jury legacy and to be on site was fulfilling indeed. The *Veltheimia* seedlings grown from the gifted seeds are doing very well at my place and I await the colour of the resultant blooms, hoping to have the same bicolour effect as seen in the Jury Garden flowers. Last stop was to view the garden of Allan and Lorraine Inch, "Pai Rawa Atu". Attention to detail was evident in this beautiful garden and it was so serene to stroll around the well laid out garden beds and mown lawns. Everything looked like it was in place just for our visit but, having had a glimpse inside Allan's garage, I can tell that this excellence is par for the course. Wow, you should have seen the cars.

sign said Brookland Park and from there on the plant material was amazing. Huge trees that just had to be hugged, specimen trees of known plants that were just so big, so much to see and so little time, so it seemed. Luckily for us we had as a guide, Ken Davey, who proved invaluable as we toured each part of the garden. There were old houses and Chinese Gardens and bridges. The drizzle that had set in was not enough to worry us as we went from one spectacular part to the next. It did not matter whether you looked high or low, there was some special plant to see, like the double flower form of a pink bluebell! Ken was able to give us detailed history of this wonderful garden as he knew it well, having worked there for many years. At one point we made our way into a plain



Clivia en mass

entrance in a hillside, only to come out into a packed enclosure full of bright foliage and flowers. What a unique glasshouse. We could have spent a lot more time exploring such a valuable piece of botanical history, but it was time to board the coach so that we could head for the seaside village of Oakura.

Groups went their different ways to partake of a meal in the various cafes and eateries, and while some made a good decision, others waited quite some time. A bonus for this stop was the closeness of a *Clivia* enthusiast's garden, that of Bruce Hookham. A short walk and a group of us were viewing the potted *Clivia* and seaside garden plants at Bruce's place. We had a discussion on *Clivia* over a cup of coffee, with the CD "Surrounded" by Laurence Elder playing in the background. A pleasant break in the day but we had to keep going as our next stop was the garden of Tony Barnes and John Sole, "Ngamamaku". We arrived mid-afternoon and walking up the drive to this garden showed that there would be many garden rooms to explore. Tony had a *Clivia* mini-show set up in a covered section and again the talk turned to *Clivia*. This was an

interesting garden to explore, and not only were there potted *Clivia* set up, there were drifts of *Clivia* in garden and the word got around that the greenhouse should be viewed as well. Of course I was looking at all the plants in the garden and spied a variegated *Lavatera arborescens*. Climbing shoes were required to reach the greenhouse but worth the effort as there is always a different *Clivia* to catch the eye of the enthusiast, such are our differing likes. Lots of images and plenty of discussion followed about the breeding of this and that. Now this is a cold site on some days and as the afternoon progressed, it turned out that this was to be one of those days. So, gather near the house, try some of the red wine, and be part of the discussion about the upcoming meal. Oh, did I mention the Japanese Garden? I stated earlier that the fellowship between the delegates was evident during this tour, well the meal and visit to "Ngamamaku" was a great example of that fellowship coming out again. What a fantastic time we had. They even organised one of the local milkmaids to come and entertain us, outstanding. I forget how late it was when we had to leave but I am sure a weary but satisfied group took the coach trip back to the Autolodge for a good nights rest.



A brilliant display of *Clivia* with differing colours

Last day, homeward bound. After a breakfast we all piled into the coach to head back to Auckland. Still a couple of stops planned and we had to see a Kiwi while on tour so the destination was the Otorohanga Kiwi House and Bird Park. A walk around the enclosures allowed us to see the native birds up close and of particular interest was the Kiwi House. These are strange birds and a great experience to see them so close. Lunch was to be in the town and a filling meal was consumed at The Hungry Weka, which held us until we arrived at Hamilton Botanic Gardens. The weather on this day was clear and bright and was a perfect ending to the gardens and shows that we had visited during the past ten days. As it turned out there was a Bonsai Exhibition and we all joined the crowd of people making the Gardens their venue for a day out. The interesting thing about the Hamilton Botanic Gardens is the themed garden room setup. We were able to

step out of a Persian Garden and into an English Garden. I am sure each group of tour members took in all that was to be seen, and the time flew. By mid-afternoon the coach was headed for Auckland with a scheduled stop in South Auckland to let some delegates off. It was a quiet trip back to the Alpers Lodge, where quite a few of us had booked an evening prior to going our separate ways back home.

The tour was so well planned and the variety of venues, with enough *Clivia* interspersed, was a credit to the team involved. Diana Holt was a prime mover and I know there were others, but to all, a big “Thank you” for making the KiwiClivia2008 such a memorable tour. There is so much more detail that could have been written about this tour but you will just have to visit New Zealand yourself to find out what a wonderful country it is!



Keith Hammett's Garden — a beautiful shady setting for the many *Clivia* he grows under the trees

Some New Zealand *Clivia* Growers

Tino Ferero, South Africa

Judy Shapland and Conrad Coenan have their *Clivia* collection in Apata, Katikati, New Zealand. The *Clivia* bug bit Judy in 2001, and since then she and Conrad, both landscape gardeners, have built up an excellent collection of beautiful *Clivias*. They have two plant houses and the material has already been acquired for the erection of a third plant house.

Tony Barnes is one of the Management Community members of the New Zealand *Clivia* Club and lives in Ngamamaku Gardens, New Plymouth, on a large property with a magnificently landscaped garden. Tony has built up a very good collection of top quality *Clivia* one of the best to be seen in New Zealand. The collection is housed in a plant house covered by plastic on a fairly steeply sloped part of the property.



Above and Below: Two flowers from the fine Coenan collection



Since Judy and Conrad are such enthusiastic *Clivia* growers, one can expect that much will still be heard of this collection in the future.



Above and Below: Colourful *Clivia* from Tony Barnes



Tino Ferero has produced an interesting and comprehensive photo record of his New Zealand visit — unfortunately space allows us to print only a small number of his pictures. Eds

Alick and Frances McLeman are ex-South Africans who emigrated to New Zealand several years ago and now reside in Glen Innes, Auckland. Alick took part of his *Clivia* collection with him to New Zealand, and has subsequently been building up his collection from seed from amongst others, the KwaZulu-Natal *Clivia* Club. He presently has one of the finest collections of *Clivia* that I have seen.



Alick's collection is housed in much the same way as most South African collections in pots on tables in plant houses under shade netting. All plants are neatly marked and labeled.

Alick also has a good Peach strain. Some bred from a crossing of a Christo Lotter yellow with Alick's Peach from the Chubb Peach Line.

Some of Alick's named plants include the following:

There was an attractive plant named 'Akebono Apricot' from the Cameron Peach strain.

David Brundell has a property that is situated in Waiuku to the south of Auckland. He has a beautiful home that is an architecturally designed dwelling with state of the art features to make maximum use of and blend in with the environment next to the lake that he created and where he runs his nursery, Gardenza. He is ably assisted by Shane who helps with the pollination, planting and maintenance of the large garden and nursery, and Fiona, who attends to most of the administration of this large undertaking.

'Olsen's Honey Puff' which was developed from the Vico Yellow line of David Brundell.

One of the most striking plants in the collection is the F2 Sir John Thouron that won best on show at the 2008 New Zealand *Clivia* Club show.



Alick's Pink Pastel, achieved by breeding to progressively reduce the anthocyanin levels (reg pigments) by crossing orange with yellow, is a very beautiful plant.

The beautiful large garden has been landscaped very professionally with indigenous trees, tree ferns and many other indigenous plants, but there are also many cycads, aloes, *Scadoxus* (including a rare white form), *Amaryllis*, and of course, large plantings of *Clivia*, including really top quality yellows, oranges and many other colours.

The main *Clivia* collection and *Clivia* nursery are housed under a plastic and shade cloth covering.

A very important part of the *Clivia* collection is 'Vico Yellow', an offset from the original clone obtained directly from Sir Peter Smithers and hybrids from the 'Vico Yellow'.



Some of the hybrids bred from the 'Vico Yellow' have been named. The following named clones were in flower:



Above: 'Full Moon'

Below: 'Lunar Impact'



From the 'Vico Yellow' line, David has also produced very good other colours. Some of the well known ones, such as 'Heaven Scent' and 'Honey Moon', were not in flower.

One of the most noticeable characteristics of the flowers is their very large size. David attributes this to genetic factors plus intensive feeding with a water soluble fertilizer high in potassium and low in nitrogen and phosphorous. A drip irrigation system has been installed and the plants are always watered with the fertiliser added, but at a much diluted rate. The pots are never allowed to dry. Once a month the pots are drenched with plain water to prevent the build-up of salts. It was a very rewarding experience to have visited David and to have shared his knowledge and experience and to have enjoyed his splendid hospitality.

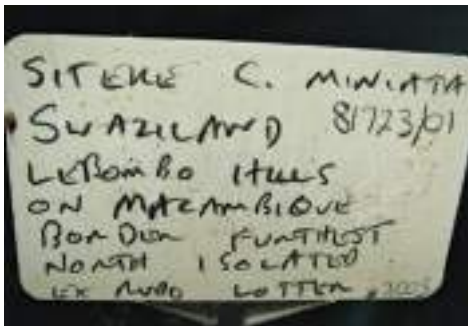
Keith Hammett lives on a 24 ha farm in Massey near to Auckland and has a beautifully landscaped garden with extensive plantings of *Clivia* under the most magnificent trees and tree ferns. Each group of *Clivia* in the garden is meticulously marked and coded. Keith is assisted by two ladies, Heather and Zi Hui Yu (Keith calls her Yuki), who help with the pollination, planting and maintenance of the garden and *Clivia* collection.



Keith Hammett with some of his garden *Clivia*

His plant houses contains his prize collection of very beautiful top quality plants of various colours, all meticulously coded and marked on the plant markers (and on computer).

Note: A full description of all information on the display markers would take up too much space. All descriptions have been abbreviated. There was a good broad leaf with a width of some 120mm with the following interesting inscription on the plant marker:



Dr Keith Hammett has some of the best *Clivia* material in New Zealand, and with his scientific background and disciplined approach to pollinating and growing *Clivia*, it is to be expected that some of the finest *Clivia* have and will still be produced from crossings made in this collection. A very attractive yellow green throat named 'Semper Augustus' ("without parallel"), is one of the striking plants in the collection. The green is retained throughout. (No photograph available)

He not only grows *Clivia*, but is regarded as one of the top plant experts in New Zealand, specialising in the hybridising of plants such as dahlias and sweet peas. During the visit by the tour group, seeds of sweet peas were available.



Keith Hammett's 'De Novo' a pale peach from a 'Chubb Peach' x Best Primach Yellow'

Rex and Dee Williams live on a farm at Paeroa, Waikato, and are very keen *Clivia* growers with a very beautiful landscaped garden full of cycads, agaves, succulents, dasyliroids, bromeliads and large plantings of very attractive *Clivia*.

The *Clivia* collection is housed in two specially designed plant houses under plastic covering where one of the sides is equipped with an electronic device that causes the side panel to roll up automatically when the inside temperature rises above 15°C.

In the plant house there are many beautiful *Clivia* of various colours.



Rex and Dee's plant house

Rex and Dee also have a very good line of Chinese darumas and variegated darumas, some of which were on sale at the New Zealand Clivia Club show.



A *Clivia* from Rex and Dee Williams top collection

Ian and Shirley Baldick: Ian is Chairman of the New Zealand Clivia Club. They live in Drury, South Auckland. Most of Ian's *Clivia* are grown in his large garden planted full of the most magnificent magnolias, rhododendrons and other plants imaginable. Ian is a renowned authority on the breeding of magnolias and some named magnolia varieties originate from his crosses and are used for breeding purposes in various countries.



A green throat *Clivia miniata* from Ian and Shirley Baldick's collection

Terry and Pam Hatch, and their son Lindsay have a large nursery specializing in indigenous trees and other local plants. Their property is situated in Pukekohe East, South Auckland. Terry is a recognised authority on the indigenous flora and was one of the tour guides during the bus tour. The Hatches have a very beautiful large landscaped garden with very large trees and vast plantings of *Clivia* under the trees.



Terry and his son Lindsay in their garden



A multicolour *Clivia* from Terry and Pam Hatch's collection

Murray and Beverley Gow have a lovely home with a stunning view overlooking the harbour. Their home is situated in Orakei, Auckland. Most of the *Clivia* collection is grown in shade under trees in the garden, but there are quite a number in pots as well.



Some *Clivia* Murray and Beverley's Garden



An attractive flower with pastel inner tepals

David Olsen is the editor of the newsletter of the New Zealand Clivia Club, and grows most of his *Clivia* in the garden.

Many beautiful plants were in flower in the garden, of which the following two were of particular interest. (See opposite column)

A special word of thanks to all the above *Clivia* growers for the warm-hearted welcome to their gardens and for their royal hospitality. It was a wonderful experience to have met these lovely people and to have visited their collections.



Near white with liberal red / orange splashes



If only I had a larger luggage allowance!

CLIVIA 10 ERRATA

The contributor to CLIVIA 10 should read as Paul Michael diMeglio (and not de Meglio) throughout.

On page 56, last paragraph in the left-hand column the grower is Nakayama and not Nakamura.

Our apologies for these oversights. Eds.



A B U S Y A U C K L A N D S H O W