

The Cactus Explorer

The first free on-line Journal for Cactus and Succulent Enthusiasts

Number 13

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December 2014

1 *Schlumbergera opuntioides*

2 *Parodia mammulosa*

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4 Crassulaceae at Lyon B.G.

5 *Schlumbergera truncata*

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The No.1 source for on-line information about cacti and succulents is <http://www.cactus-mall.com>

Cover Picture *Schlumbergera opuntioides*. Photograph by Andreas Hofacker.
[See the article](#) about the plant on pages 52-59.

Invitation to Contributors

Please consider the Cactus Explorer as the place to publish your articles. We welcome contributions for any of the regular features or a longer article with pictures on any aspect of cacti and succulents. The editorial team is happy to help you with preparing your work. Please send your submissions as plain text in a 'Word' document together with jpeg or tiff images with the maximum resolution available.

A major advantage of this on-line format is the possibility of publishing contributions quickly and any issue is never full! We aim to publish your article within 4 months and the copy deadline is just a few days before the publication date. There will be three or four issues per year, published when sufficient material is available. Please note that **advertising and links are free** and provided for the benefit of readers. Adverts are placed at the discretion of the editorial team, based on their relevance to the readership.

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This issue published on
December 30th 2014

INTRODUCTION

Reflection

As another year comes to an end, I again find myself thinking of all the plans I had made which failed to materialise. However, it has been an enjoyable year with many good cactus events. The Cactus Explorers Club meeting in September was really excellent with great talks from visiting speakers Boris Schlumpberger and Massimo Meregalli, as well as our own members who continue the exploration of cactus habitats and make the effort to share their adventures with us.

The theme of this year's meeting turned out to be technology with our first 3D presentation by Jonathan Clark, the use of Google Earth for researching habitats and revelations about plant relationships thanks to molecular studies. I am very grateful to Roland Tebbenham for taking so much trouble over writing the account of the event that is published in this issue.

One of our guest speakers next year will be Andreas Hofacker, President of the German Cactus Society. He has had a long interest in the cacti of Brazil and has travelled there many times to see them. In this issue of the **Cactus Explorer**, he tells us about *Schlumbergera opuntioides*, a plant that few enthusiasts have seen in habitat. Next year, he will recount more of his Brazilian adventures at our meeting.

Another very enjoyable event was the BCSS Convention, enhanced this time by the newly refurbished Leicester Conference Centre. I am really pleased to see the encouragement given to delegates to propagate their plants by the offer of free sales tables. This approach also provides an extensive selection of plants for sale at the event.

My second year as the editor of the BCSS Yearbook, *Bradleya*, turned out to be more time-consuming than the first. I am indebted to many regular contributors without whose papers we would be struggling to produce

Bradleya annually. It is always difficult to attract enough articles about cacti to achieve a reasonable balance of subjects which will interest our subscribers on whom *Bradleya* depends for its existence. I urge those of you who visit succulent habitats and discover new information to consider submitting a paper to *Bradleya*.

As I write this, I am looking out of my window at the snow lying in the garden and looking forward to the day when the sun feels warm on my face again. So far, it has been a mild winter and the lower price of the oil I use to heat my glasshouse has been a welcome relief. I sometimes think it would be wonderful to live in a warmer climate where I could grow my cacti outside in the garden, particularly the larger growing species which cannot reach maturity in my glasshouse.

The winter gives me a chance to catch up on all the things I didn't find time for in the summer. As the last journal issues of the year arrive, I can collate them in preparation for binding and the annual ritual of trying to find space on the bookshelves to accommodate the ever-growing set. I hope that you can find time to write a piece for the **Cactus Explorer**.

I am encouraged to see that the **Cactus Explorer** is downloaded by an increasing number of people around the world. I still get emails from enthusiasts who have just discovered it and want to be on the reminder list. There are now plenty of on-line journals to enjoy and *they* don't take space on a book shelf!

Best wishes for a healthy and plant-filled year in 2015!

Graham Charles

If you have not already told me and would like to be advised when the next issue of the **Cactus Explorer** is available for download, please send [me](#) your E-mail address to be added to the distribution list.

NEWS AND EVENTS

Cactáceas y Suculentas Mexicanas



Mexican cacti are popular in Mexico as well as around the world. The journal of the Sociedad Mexicana de Cactología has been published four times a year since 1955.

Since 2009 when I got my last printed copies, I have been unable to find out if the journal is still being published. I recently discovered that you can [download](#) recent issues as PDF files. The resolution of the files is variable but is adequate for reading online.

If anyone reading this knows if printed copies are still produced, I would appreciate an [email](#) letting me know so that I can share the information with our readers.

GC

An Index for *Bradleya*

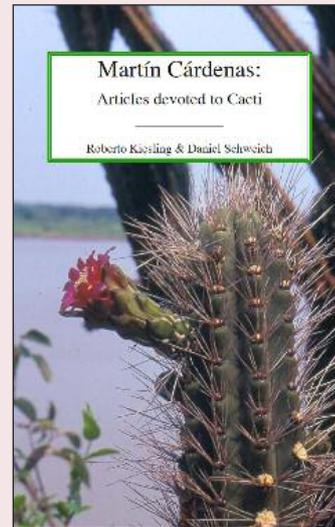
Following the publication of Volume 32, Roy Mottram has created a cumulative index for *Bradleya*, The Yearbook of the British Cactus and Succulent Society.

It is frustrating when you remember reading an article in a journal but you cannot remember in which issue it was published. An index like this is extremely valuable and can be download from The **Cactus Explorer** server [here](#).

Thank you Roy!

GC

Martín Cárdenas Compendium



Serious research into any cactus topic requires access to the original publications of names and contemporary articles by the describing authors. For Bolivian cacti, the publications of Martín Cárdenas are an important source. He published his work in many places and in various languages, some of which are difficult to find.

In a similar way to his useful compilation of Spegazzini's publications, Roberto Kiesling has teamed up with Daniel Schweich to bring us a compendium of the work of Martín Cárdenas in the form of an e-book that comprises 592 pages. It is published by Au Cactus Francophone and available on the cactuspro website.

A brief introduction presents the life of Cárdenas and the structure of the e-book. His articles contain errors and raise questions that remains unanswered and these are discussed in an appendix. Nomenclatural and tentative synonyms proposed for Cárdenas' plant names, references to original articles and an index are also provided.

You can download the e-book, without charge, in English, French or Spanish from http://www.cactuspro.com/biblio/en:kiesling_dsw

GC

11th Spalding Cactus Mart



Saturday 25th April 2015
10.00 am until 3.00 pm

Holbeach Community Centre,
Fishpond Lane, Holbeach, Lincs,
PE12 7DE
United Kingdom

15 leading nurseries and growers:
Bob & Beryl Potter, Toobees Exotics
Ralph Northcott, Cactus Shop
Richard & Wendy Edginton
Lily Cartier & Philip Greswell

Jeff & Diane Capel, Northants/Milton Keynes Branch
Gordon & Joan Foster, Oak Dene Nurseries
Bryan & Linda Goodey, Southfield Nurseries
Rob Stevenson
Derek Bowdery, Eau Brink Cacti
Shaun Biggadyke
Stuart Riley, Plantlife Nursery
Doug Sizmur, Kent Cacti
Tim & Mink Wilson, The Plant Lovers
Keith Larkin, Keith's Cactus Books
Spalding Branch – sale of Tom Jenkins' plants

Ample **free** parking and **free** admission
Refreshments available all day
Contact: Gerry Blacoe 01778 393226
or email: gerald@blacoegb.plus.com

International Euphorbia Convention

16th & 17th May 2015
Botanic Garden Meise/Brussels (BE)
Details at:
www.euphorbia-international.org



11-12-13 sept. 2015

duinse polders / blankenberge / belgium

europaean cactus & succulents convention

**lectures
plant sales**

free admission

**info: www.elkcactus.eu
info@elkcactus.eu**



Baja Pictures

The BCSS are planning to publish John Pilbeam's next book about the cacti and succulents of Baja California.

John is looking for photographs of the following plants in habitat and in flower to complete the book. High resolution digital images are preferred but good transparencies may be acceptable. Please contact him direct at jpilbeam@tiscali.co.uk

Mammilarias albicans and/or *slevinii*,
capensis, *hutchisoniana*, *insularis*, *schumannii*,
and var. *globosa*, *petrophila* ssp. *petrophila*,
Echinocereus ferreirianus ssp. *ferreirianus*,
sciurus, *brandegeei*, *Ferocactus chrysacanthus*
ssp. *chrysacanthus*, *santa-maria*, and
johnstonianus, and habitat or cultivated plants,
in flower or not, of *Dudleya anomala*, *candida*,
guadalupensis, *nubigena* var. *cerralvensis*, *rigida*.
Also, any shots of *jatrophas* with a locality if possible.

Plant Sale in Austria

In May 2012, 2013 and 2014, the research team of *Gymnocalycium* held an international exhibition of cacti and succulents in the sports hall of Eugendorf near Salzburg, Austria. It was a big success with 40 growers from 9 nations who presented and sold 50,000 plants. Nearly 3,000 visitors came and many newspapers, radio stations and television teams made reports about this big event.

Because of the positive feedback from our visitors and exhibitors we will again organize the **Kaktus** exhibition on Saturday 30th and Sunday 31st May 2015.

The plants will be presented and sold (with sundries) in a 1000m² hall. Next to the hall are plenty of parking places and a restaurant. The locality is close to the motorway north of Salzburg.

There are also several very big furniture stores near to the sports hall, from where we also expect customers who will be informed with flyers and posters. Of course cactus friends from Austria's cactus club and cactus friends from Germany will also be invited.

To help the organisation for this event, we ask you for your feedback as soon as possible. For this feedback we request you tell us how many meters you will need for the presentation of your plants. Our tables are 2.2 x 0.5m and cost €16.- each for the whole weekend. (A square meter for sundries from you costs €12.-)

Duration of the exhibition:

Saturday 30th May from 9.00 till 18.00.

Sunday 31st May from 9.00 till 17.00.

Contact for feedback, questions and information:

Helmut Amerhauser

Bahnweg 12

A-5301 Eugendorf

Tel. & Fax: 0043 (0) 6225-7222

e-mail: dha.gymno@aon.at

We shall be pleased to receive your reservation.

Kaktus 2015
Eugendorf

5. Ausstellung mit Verkauf

Kakteen, Sukkulente und Orchideen aus aller Welt

tägl. ab 9 Uhr geöffnet.

Sa. 30. Mai - So. 31. Mai

Sportzentrum Eugendorf bei Salzburg

Anmeldungen und Auskunft bei:

Helmut Amerhauser
Bahnweg 12, A-5301 Eugendorf
Tel.: 0043 (0) 6225 7222
e-mail: dha.gymno@aon.at

Franz Berger
Buchenweg 10, A-4860 Lenzing
Tel.: 0043 (0) 7672 93072
e-mail: franz.berger@cabetelevision.at

Hammermühlstraße 7
5301 Eugendorf

BCSS Zone 9 Convention

Zone 9 is holding its Annual Convention on Sunday 19th April 2015 at

Hardwicke Village Hall, Green Lane,
Hardwicke, Gloucestershire GL2 4QA UK
10:00am – 5:00pm

Prof. Len Newton

Succulent Plant Discoveries in East Africa,
Past, Present & Future

Graham Charles

Matucana in Habitat & Culture

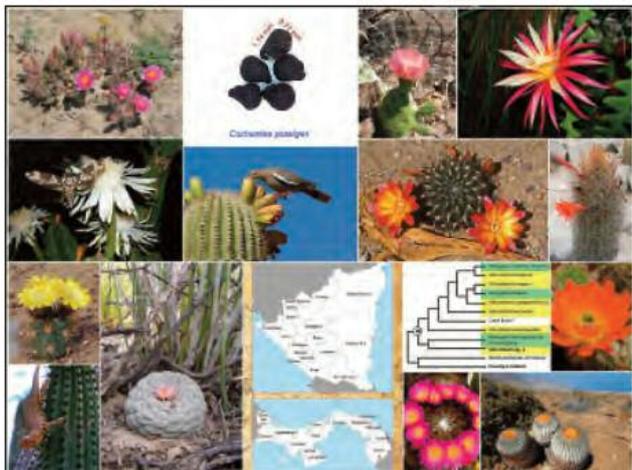
Stuart Riley

The U.S. National Shows &
New ISI Plant Introductions

There will be the usual range of Plant Sales plus refreshments on arrival, Buffet Lunch and Afternoon Tea.

Tickets are £15 each (food inc.) and are available from all Zone 9 Branch Secretaries or the Zone Rep.

Full details on our Zone website at
www.zone9.bcss.org.uk



e-mail: joel@cactus-aventures.com

Cactus-Adventures, Aptdo Postal 11
04610 Cuevas del Almanzora (AL) SPAIN
information and online payments: cactus-aventures.com

Cactus-Adventures ed.



NEW! available in Spring 2015
TAXONOMY of the CACTACEAE

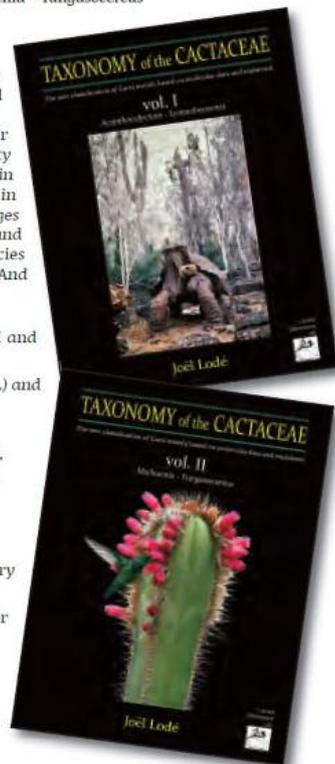
The new classification of Cacti based on molecular data and explained

In two volumes:

Vol. I : Acanthocalycium - Lymanbensonia
Vol. II : Maihuenia - Yungasocereus

First classification of cacti genera based essentially (but not uniquely) on molecular genetics (DNA) and explained.
No book on cacti has never gone this far with illustrations, both in quantity (+7000 photos) and quality, but also in diversity, with plants photographed in habitat and collection at different stages of growth, also with flowers, fruits and even seeds (more than 360 species photographed on digital microscope)! And of course, all the latest discoveries!

- 177 genera recognized, all described and explained.
- Approx. 2360 listed taxa (sp. + subsp.) and photographed in alphabetical order,
- +1300 pages A4 size,
- Pollinators and dispersers illustrated,
- Graphs of min. / maximum altitudes,
- Illustrated etymology of genera,
- 177 distribution maps,
- Seeds illustrated for every genus,
- Description of habitats for every genus,
- Precise geographical distribution for each genus,
- 22 country maps,
- Glossary,
- Bibliography (500 citations),
- Index and synonyms.



Two volumes, A4 size, 1400 pages, +7000 photographs
Price of the two volumes: **189.00€** including postage
pre-publication: **169.00€** until 28th of February 2015 (after: 189.00€)
165.00€ for the 2015 Cactus-Adventures subscribers
http://cactus-aventures.com/Taxonomy_of_the_Cactaceae_ENG.html

Invitation

to the 27th International Gymno-Day
from 27th to 29th March 2015.
Eugendorf, Austria
Gasthof Holznerwirt

Theme of the meeting:
Gymnocalycium catamarcense
and related species (German language).

Applications and room reservations from:
Helmut Amerhauser,
Bahnweg 12, A-5301 Eugendorf
Tel & Fax: ++43 (0) 6225/7222
E-mail: dha.gymno@aon.at

The 11th annual Cactus Explorers Club Meeting September 18th - 20th 2015 Beaumont Hall, Leicester University

You are invited to attend the Cactus Explorers Club Meeting during the weekend of 18th – 20th September 2015 (1 week after ELK). Many lectures, plant and book sales.

Total Cost: £215 including VAT, all meals, en-suite overnight accommodation and wine with dinners.

Previous attendees will be given first chance to book the spaces available early in 2015.
graham.charles@btinternet.com
<http://www.cactusexplorers.org.uk/meeting11.htm>

70 years!

BCSS Bradford Branch Anniversary

1945 – 2015

Saturday, 25th April, 2015
Wilsden Village Hall, Townfield, Wilsden,
Bradford BD15 0HT U.K.
Doors open 09:30

Dr. Colin Walker: Agaves through the ages
Graham Charles: Highlights of Brazil
Dorothy Minors: Flora of the Canary Isles

Raffle, plants and books sales,
Buffet lunch

Tickets £15 from Joan & Brian Thornton,
1 Badgergate Avenue, Wilsden.
Bradford, BD15 0LJ .
Phone: 01535 274755.

E.mail: jebthornton@btinternet.com

BCSS Annual General Meeting 11th April 2015

Winstanley High School and Community
Centre, Braunstone, Leicester, U.K.

As well as the business meeting,
attendees can enjoy the
Hampshire Memorial Lecture

Information from the BCSS Secretary:
eaharris49@googlemail.com

CSSA Biennial Convention 14th - 19th June 2015

Pitzer College, Claremont, California

June 2nd - 13th

Pre-Convention tour of east-central Mexico

June 20th - 24th

Post-Convention tour of the Mojave Desert of
California and Nevada

<http://cssa2015.com>

Zone 15

Annual Mini-Convention

Sunday 22 March 2015

Capel Manor College, Bullsmoor Lane
Enfield EN1 4RQ U.K.

12.00noon to 5.00pm

Grounds open at 10.00am

Graham Charles: Gymnocalycium
David Neville: Highlights of South Africa
and Namibia

Both our speakers will bring sales plants

Those attending the Convention will have
free admission to the extensive and varied
gardens of Capel Manor, including the
greenhouse display of mature cacti and
succulents

Tickets £13 to include refreshments and
entrance to Capel Manor Gardens

from Eddy Harris, 49, Chestnut Glen,
Hornchurch, Essex RM12 4HL U.K.
Tel 01708 447778
or email eaharris49@googlemail.com

BCSS Judges' Course

4th - 6th September 2015

Moulton College, Moulton,
Northampton, U.K.

BCSS members may book the weekend for
£140 including all meals and accommodation
in en-suite single rooms.

Contact Mal Weobley, 48, Rowan Drive,
Billingshurst, West Sussex RH15 9NF
Tel: 01403 782004

email: malvalweobley@talktalk.net

BCSS Calendar of Events

You can see a comprehensive list of
Cactus & Succulent events in the UK at
<http://www.bcsc.org.uk/events.php>

The Cactician

Two more articles are ready for downloading from Roy Mottram's on-line journal at:

<http://www.crassulaceae.ch/de/publications-the-cactician>

6: Curt Backeberg: A history and evaluation of his work on cacti.

HQ version (168MB):

[https://www.dropbox.com/s/m8vvpfi1gv6i01g0/Cactician 6 HQ.pdf?dl=0](https://www.dropbox.com/s/m8vvpfi1gv6i01g0/Cactician%206%20HQ.pdf?dl=0)

The life and work of Max Ferdinand Heinrich Curt Backeberg (1894-1966) is presented.

b. Lüneburg, 2 Aug 1894; d. Volksdorf, 14 Jan 1966.

With the fiftieth anniversary of the death of Curt Backeberg only a year away, now is an appropriate time to evaluate his significant contributions with the benefit of hindsight. In common with many other cactus specialists of his time, his very characteristic style caused him to be regarded with both admiration and revulsion in almost equal measure. Nevertheless, his unique legacy was a body of work that was energetic and informative and, as a student and classifier of cacti, he dominated the popular press on the subject for almost forty years until his sudden death in 1966, just when he was about to witness the publication and reap the rewards of what proved to be his most popular work.

7: Reinstatement of *Cactus kagenekii* C.C. Gmel.

This contribution outlines a history of the name of a *Haageocereus* species that used to be common in the environs of Lima and inland up the valley of the Rio Rimac as far as Chosica. Indeed, it was so common that it would have been obvious to any early visitor to Peru's capital city, and the earliest known botanical explorer happens to have been Joseph Dombey in 1777-78. Today the plant is less common, reduced severely in numbers by the expansion of the city of Lima up the valley. The earliest name for this plant was *Cactus kagenekii* C.C.Gmel., which is reinstated here with a new combination in *Haageocereus*, and type selections are made wherever appropriate.

Studies in Cactaceae

One of our readers, Vlad Andrenkov, wrote to me recently and told me that he had obtained an original of an article written by Britton & Rose and published in *Contributions from the United States National Herbarium* Vol.16 Part 7 (1913).

He made a really good quality scan of it and thought he would share it with readers of the **Cactus Explorer**. It contains some important first descriptions including *Echinocactus* (now *Ferocactus*) *alamosanus*, *Echinocereus luteus*, *Hylocereus minutiflorus* and *Nyctocereus guatamalensis* with B&W photographs. There are also some new combinations.

You can download the PDF [here](#).

Thank you Vlad!

GC

Oxford Branch Show

with the Haworthia Society
(Joyce Coccozza Memorial)

NEW VENUE

Old Mill Hall, School Lane,
Grove nr Wantage OX12 7LB U.K.
Open at 11am

Nurseries: Plantlife, Daniel Jackson,
Toobees and Rene Geissler

Show followed by

Lecture by **Alan Rollason**,
Chairman of the Haworthia Society (4.45pm)

Details from Bill Darbon: 01993 881926
or e-mail william.darbon77@btinternet.com

2015 Dates for your diary

CACTUS 2015 : Saturday 2nd and Sunday
3rd May at Tiercé, near Angers, France
— a big sale of plants in a very pleasant
location in western France:

<http://www.arides.info/cactus.html>

Zone 6 Show at Cambridge: 7th June

Zone 19 Symposium, Manchester: 20th June

RECENT NEW DESCRIPTIONS

Graham Charles recounts the discovery of *Espostoa cremnophila* which has just been described in *Bradleya* 32 as a new species by Paul Hoxey. It grows on steep cliff faces in Dept. La Libertad, Peru. It is thought to be related to *Espostoa calva* Ritter and *Espostoa utcubambensis* Charles.

Photographs by the author



Fig.1 *Espostoa cremnophila* in the valley of the Río Chivane, Dept. La Libertad, Peru, 2100m

It was in November 2013 that Paul Hoxey, Chris Pugh and I visited the Departments of Cajamarca, Amazonas, La Libertad and Ancash in northern Peru. We wanted to further explore the Río Marañón and its tributaries where the deep valleys are surrounded by high Andean mountains making exploration quite difficult. The area is rich in cactus species and the ever improving infrastructure of roads has helped explorers recently to find a number of new species from there and subsequently describe them.

There is something really exciting about discovering a new species and I have been quite lucky to be with friends when we have found an unknown plant. Sometimes,

however, explorers find a new plant but don't get around to describing it. This happened with two species that I described from the Río Utcubamba, a tributary of the Río Marañón. *Borzicactus hutchisonii* and *Espostoa utcubambensis* had both been observed and recorded years before they were formally named.

Also from this region, I described *Matucana rebutiflora* and *Matucana hoxeyi* which were both found by friends when I was not, regrettably, present. Fortunately, I was there when we found *Matucana oreodoxa* ssp. *roseiflorus* yet another new taxon endemic to valleys within the drainage system of the Río Marañón.



Fig.2 The holotype specimen of *Espostoa cremnophila* flowering prior to preservation

The discovery of *Espostoa cremnophila* was rather lucky, like new discoveries so often are. Our plans for the day had been thwarted by roadworks on the road we had planned to use, so we decided to explore another road which goes to Bolivar from San Vicente village, our overnight stop. Soon after leaving our simple hotel, we took a wrong turn and ended up on a good dirt road which descended into a valley.

The vegetation was quite dense and lush with occasional large plants of *Espostoa lanata*, characterised by its fastigiate habit. After a short distance, vertical conglomerate cliffs came into view on the left, beyond the river and near the village of San Francisco. We could see columnar cacti growing on the cliffs which we first took to be *Espostoa* (*Thrixanthocereus*) *senilis* which we now know is widespread in the area.

Looking through binoculars, Chris and Paul could see that the columnar cactus had a distinctive bent stem resulting in a downward-facing cephalium. We could not identify the plant but it was clearly an *espostoa* with a true lateral cephalium. We saw it on several more cliff faces throughout the valley, always with the same distinctive appearance.

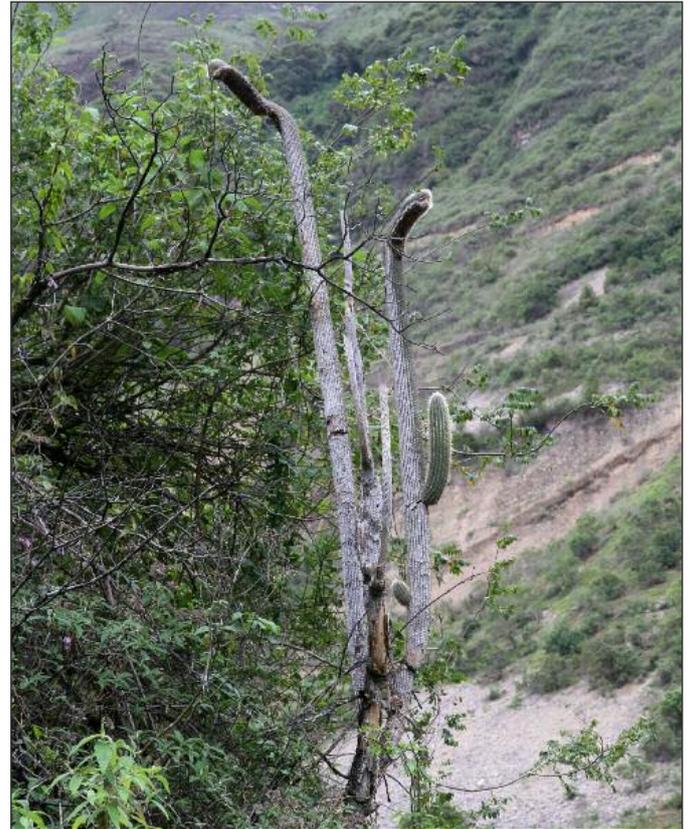


Fig.3 *E. cremnophila* at the top of a vertical cliff, showing its stems with their characteristic bent-over cephalia.

We spent the remainder of the day trying to get near a plant, a tricky task because of its inaccessible habitat. There was a mature plant on a rocky outcrop at the edge of a field above the road so we were able to get near to it [Fig.1]. Another plant near the top of a cliff, and accessible from above, provided the herbarium specimen which we designated as the holotype. This cutting flowered from the cephalium after we collected it [Fig.2].

Paul Hoxey described the plant in *Bradleya* 32 (2014) as *Espostoa cremnophila* where he compared it with *E. calva* and *E. utcubambensis*. All three species are easily distinguished and occur in isolated valley locations to the east of the Río Marañón and within 50km of each other.

We did not observe the fruit nor the seeds so we hope that these can be added to the description in the future. It would also be good to cultivate seedlings of this new addition to the beautiful columnar cactus genus *Espostoa*.

HOXEY, P. (2014). A new cliff dwelling species of *Espostoa* Br. & R. from northern Peru. *Bradleya* 32: 36–43

[Graham Charles](#)

IN THE GLASSHOUSE

Graham Charles looks at *Schlumbergera truncata*, a cactus that is frequently grown as a house plant. There is a long history of hybrids but the original wild species is a real beauty as seen here.

Photograph by the author



Fig.1 *Schlumbergera truncata* from near Teresópolis in the Serra dos Orgãos north of Rio den Janeiro, Brazil.

Often referred to as the 'Christmas Cactus', *S. truncata* responds well to being grown on a windowsill. Large impressive plants are often grown by people who have no particular interest in cacti, and may not realise that their plant is a true cactus.

I have not personally grown one for very many years but my expanding interest in epiphytic cacti and the offer of a cutting from a wild clone, persuaded me to give it a try. I'm glad I did because, after just a year, my little cutting in a 8cm pot produced a number of exotic flowers early in December [Fig.1]. The shape of the flowers suggests that in nature it is pollinated by humming birds.

An article by Adda Abendroth, published in *Epiphytes* (1971) tabulates the characteristics of *Schlumbergera truncata* in the neighbourhood

of Teresópolis showing that the plants are variable, perhaps due to hybridisation with *S. russelliana*.

The plant has a complicated history which I summarise here, but if you want to know the full story, I suggest you read Moran (1953), Hunt (1969) and McMillan & Horobin (1995).

It was first described by Adrian Haworth in 1819 as *Epiphyllum truncatum*, making it the earliest description of a species that was to become a *Schlumbergera*. It is also the most widespread *Schlumbergera* in habitat where it grows epiphytically and lithophytically in the Serra do Mar and the Atlantic forest of Rio de Janeiro, Brazil from 100-1500m.

Haworth states that the plant was flourishing at Kew in 1818 but he did not describe the flower. A more detailed description was then



Fig.2 The illustration of *Cactus truncatus* from Hooker: *Exotic Flora* 1 (1822), designated as the neotype illustration by Barthlott and Taylor.



Fig.3 The illustration of *Epiphyllum truncatum* as plate 696 in the *Botanical Register* (1823)

published by Hooker in 1922 with an illustration showing the flowers which had appeared in October 1821 [Fig.2]. Hooker, who was professor of botany at the University of Glasgow at the time, explained that he had received his plant in spring 1821 from Aiton at Kew so it is likely that this was the clone described by Haworth. The illustration was designated as the neotype of the species by Barthlott and Taylor in 1995.

In the following year, an illustration of a plant said to have been grown from seed from Brazil and in the collection of a Mr. Hood was published in the *Botanical Register* as Plate 696 [Fig.3].

The genus *Schlumbergera* is named after Frédéric Schlumberger, a French cactus enthusiast who kept his collection near Rouen. Charles Lemaire erected the genus in 1858, in the journal he edited; *L'Illustration Horticole* for the single species *S. epiphyllodes* nom. illegit., a synonym of *Epiphyllum russellianum* Hooker published in 1839.

Although clearly a close relative of *S. epiphyllodes*, *Epiphyllum truncatum* was not included in *Schlumbergera* by Lemaire and his new genus failed to gain acceptance. It was not until 1953 that *E. truncatum* was transferred to *Schlumbergera* by Moran.

The plant is still well-known under the name *Zygocactus*, a genus created by Schumann (1890) with *Z. truncatus* at the type species. He explains that he raised this new genus because he considered this species (and *E. altensteinii*) to be sufficiently different from the other species of *Epiphyllum* to warrant a separate genus.

However, by the time of the publication of his *Gesamtbeschreibung der Kakteen*, he had changed his mind and abandoned *Zygocactus* as well as treating *Z. altensteinii* as a synonym of *E. truncatum*. This opinion is repeated in the text to the fine illustration in *Blühende Kakteen* [Fig.7]

Although Schumann created a key in his *Nachträg* (1903) which shows *E. russellianum* as a close relative of *E. truncatum*, he did not acknowledge the genus *Schlumbergera*.

Britton & Rose (1923) maintained *Zygocactus* and *Schlumbergera* as distinct genera based on the rather weak character of the flower regularity. This treatment was a major reason for *Zygocactus* becoming accepted as the correct name for so long, a situation supported by Backeberg.

The beauty of the plant and its suitability for culture made it very popular in the 19th century, resulting in many fine illustrations being published [Figs.4–6]

Recent treatments of the Cactaceae have accepted *Schlumbergera* as the correct genus for *E. truncatum* Haworth, following its placement in that genus by Reid Moran (1953). It continues to be a popular house plant and hybridization has produced a wide range of flower colours.

References

- ABENDROTH, A. (1971). *Schlumbergera truncata* in Teresópolis, Brazil. *Epiphytes* 3(11): 44.
- BARTHLOTT, W. & TAYLOR, N.P. (1995). Notes towards a monograph of Rhipsalideae (Cactaceae). *Bradleya* 13: 75.
- BRITTON, N.L. & ROSE, J.N. (1923) *The Cactaceae* Vol.4. p.177–185.
- HAWORTH, A.H. (1819). *Epiphyllum truncatum*. *Supplementum Plantarum Succulentarum* p.85.
- HUNT, D.R. (1969). Synopsis of *Schlumbergera* Lem. (Cactaceae). *Kew Bulletin* 23(2): 255–263
- HOOKE, W.J. (1822). *Exotic Flora* 1: Taf.20.
- LEMAIRE, C. (1858). *Schlumbergera*. *L'Illustration Horticole* 5: 24–25.
- MCMILLAN & HOROBIN, J.F. (1995). *Christmas Cacti. The genus Schlumbergera and its hybrids*. *Succulent Plant Research* 4.
- MORAN, R. (1953). Taxonomic studies in the Cactaceae: II, Notes on *Schlumbergera*, *Rhipsalidopsis* and allied genera. *Gentes Herbarium* 8: 185.
- RIDGWAY, J. (1823). *Cactus truncatus*. *The Botanical Register* 9: Taf.696.
- SCHUMANN, C. (1890). *Zygocactus* in Cactaceae. *Martius Flora Brasiliensis* 4 (2): 223.
- SCHUMANN, C. (1903). Gattung *Epiphyllum*. *Gesamtbeschreibung der Kakteen. Nachtrag 1898 bis 1902* p.73–77.

GC



Fig.4 *Epiphyllum truncatum* var. *violaceum* from Paxton's Magazine of Botany Volume 8: 79 (1841)



Fig.6 *Epiphyllum truncatum*, Plate 118 from Step, E. & Bois, D. Favourite Flowers of Garden and Greenhouse Volume 2 (1897)

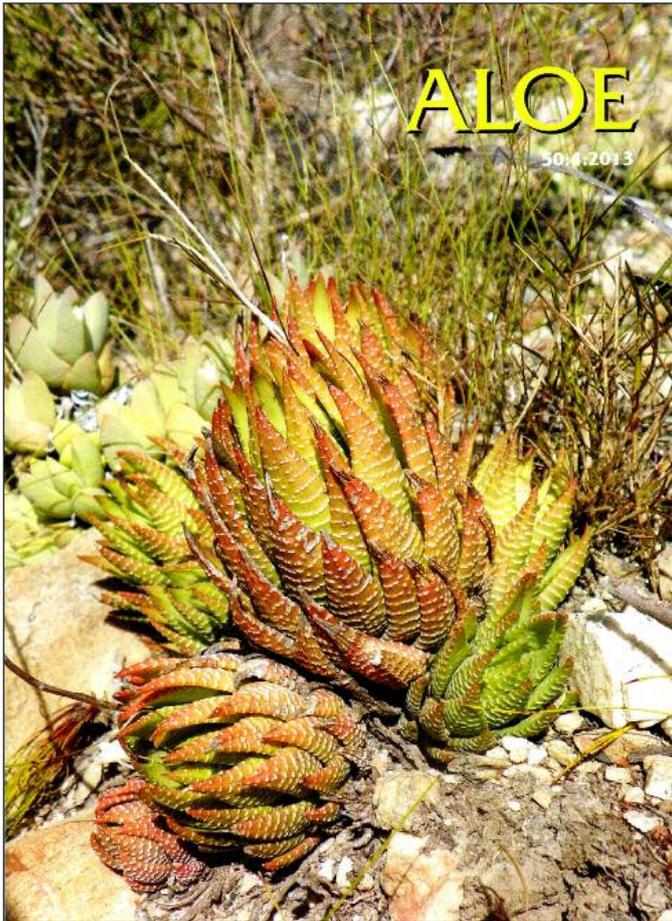


Fig.5 The illustration of *Epiphyllum Altensteinii*, Plate 28 from Pfeiffer & Otto Abbildung und Beschreibung Blühender Cacteen 1 (1843).



Fig.7 The illustration of *Epiphyllum truncatum*, Plate 25 from Schumann Blühende Kakteen 3 (1903).

JOURNAL ROUNDUP

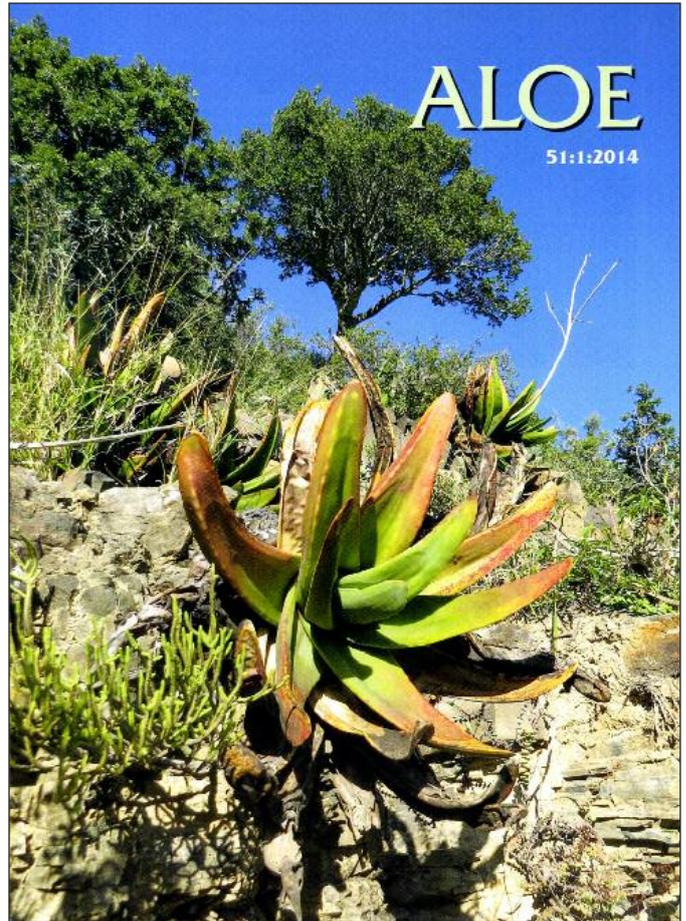


Aloe

Journal of the Succulent Society of South Africa

At the end of 2013, Volume 50 of this prestigious journal was complete. South Africa is the home of a huge number of succulent plants and this large format journal effectively conveys the spectacular flora of the region. The quality of the contents and the excellent print production is a credit to the editorial team.

The first issue of the journal was published in December 1963, a simple production slightly smaller than A5. This format only existed until Volume 3 (1965). Volume 4 onwards were produced at a larger (if rather variable) size, later with the introduction of pictorial covers. Then, from Volume 19 (1982), the current large format was adopted. Although most articles are about 'other succulents', there are also some about cacti.



The new large format allowed the inclusion of full page pictures which are still a feature of *Aloe* today, as are the excellent watercolour illustrations. There are four issues per year, although more than one are often combined to make a bumper issue.

Many UK members will remember Keith Grantham and his love for succulents. I was able to buy the issues of *Aloe* from his library and at the same time, I joined the Society so continuing his membership.

If you are interested in 'other' succulents, especially those from South Africa, I hope you will support this excellent publication by becoming a member of the Succulent Society of South Africa:

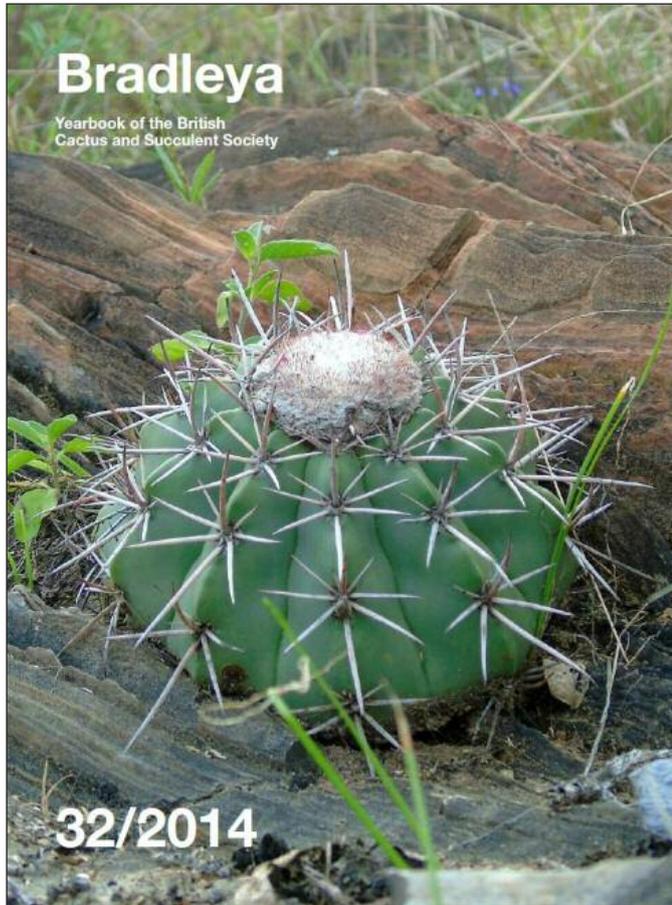
South Africa: R225 (ZAR)

All other countries: \$58 (USD); €42 (EUR)

You can pay by credit card online at their

[website](#).

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Bradleya 32 (2014)

- A remarkable new *Rhipsalis* from eastern Brazil
- Notes on the reproductive morphology and phenology of *Agave felgeri* Gentry
- *Chlorophytum cremnophilum*, a new caulescent succulent cliff-hanger from the Eastern Cape (RSA)
- Typification of the names *Agave ×peacockii* Croucher and *A. warelliana* Hort. ex Baker
- *Aloe liliputana*, a new grass aloe from Pondoland, Eastern Cape, RSA
- A new cliff-dwelling species of *Espositoa* Br. & R. from northern Peru
- *Gasteria loedolffiae*, a new cliff-dwelling species from the Eastern Cape, South Africa
- Two new subgenera and one new species in the genus *Drosanthemum*

- Out with the old, in with the new? Historical names recorded in *Agave* L.
- Reinstatement of *Aloe barbertoniae* Pole- Evans from north-eastern South Africa
- A review of *Agave ellemeetiana* K.Koch
- *Drimia intricata* var. *visagieae*, a new cliff-dwelling variety from south-western Angola
- A preliminary assessment of the conservation status of the genus *Aloe* L. in Madagascar
- *Tephrocactus verschaffeltii* – A surprising addition to the cactus flora of Peru
- A new *Melocactus* from the Brazilian state of Sergipe
- A new combination and the description of a new species in the section *Avonia* of the genus *Anacampteros*
- *Aloe andersonii*, a new cliff-dwelling aloe from Mpumalanga, South Africa
- *Piarranthus* and *Huerniopsis* – investigating the taxonomy of a controversial complex
- Typification of the name *Gymnocalyxium valnicekianum* var. *bicolor* including historical and taxonomic notes and a new combination
- An assessment of CBOL plant DNA barcodes in the genus *Manfreda* Salisb. for utility in species identification and phylogenetic studies

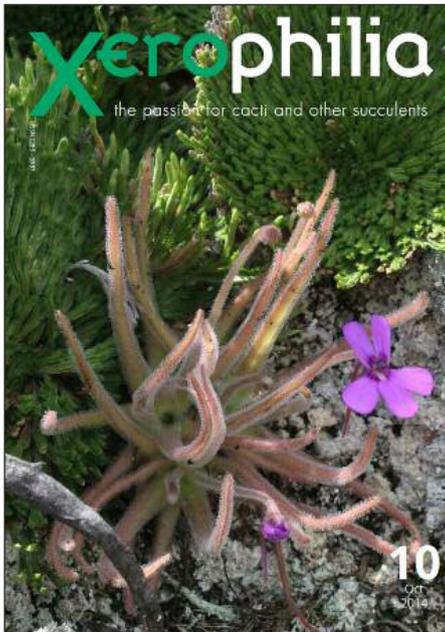
Soft cover, 180 pages, 248 x 184mm.

To order your copy, send payment of £21 (£23 overseas) including post & packing (payable to BCSS) to the BCSS Publications Manager, Brenfield, Bolney Road, Ansty, West Sussex, RH17 5AW. (Credit card payment is accepted for orders from outside the UK.)

ON-LINE JOURNALS

On-line Journals for you to download free

Publishing journals on the web is becoming more popular and the number is increasing. Here are some links for you to download and enjoy.



Xerophilia

The tenth issue of Xerophilia appeared in November 2014. It is published in Romania but most of the content is in English as well as Romanian. It is intended to focus on cultivation with articles about growing and propagating our plants.

Full of interesting material, topics include Carnivorous xeric flora in San Luis Potosi, Mexico; Iconography of *Agave univittata* Haw. and *Agave lechuguilla* Torr.; Three weeks in Mexico; *Agave potatorum* and other xerophytes in Tepanco de López, Puebla; *Mammillaria theresae* Cutak and *Mammillaria deherdtiana* Farwig; Touring some *Lithops* in the wild; A new fantastic plant: *Mammillaria bertholdii* Linzen; When succulents attack! A peninsula under threat; *Aztekium valdezii* The step forward.

The magazine may be downloaded as a pdf from

<http://xerophilia.ro>

Contact: xerophilia@xerophilia.ro

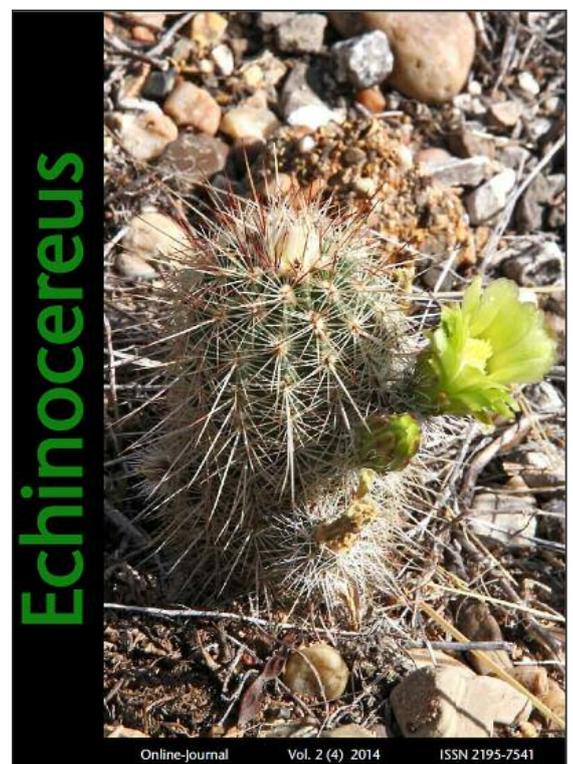
ECHINOCEREUS Online-Journal

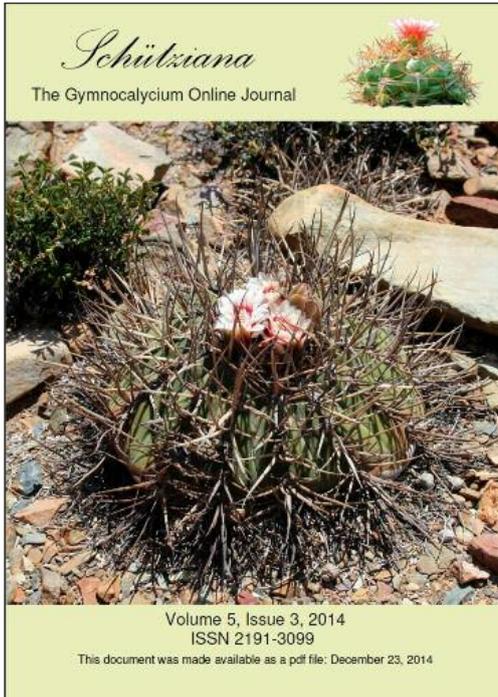
The German language on-line journal for Echinocereus lovers. The goals of this journal are to study the genus *Echinocereus*, to publish articles about the continuous research on these plants (classification, morphology, evolution) as well as to protect the genus *Echinocereus* by reproduction from seeds and distribution of the seedlings.

In this issue there are well-illustrated articles: *Echinocereus milleri* - Some critical remarks about species conservation at locations in Texas; *Echinocereus schmollii* surprising findings at a location in the Mexican state of Queretaro and at home in the greenhouse; Hybrids, mutations, and more ...; Extraordinary flowering behavior! - Observations in greenhouse culture and a discussion about Trichomes.

The downloaded pdf file allows printing, but does not permit copying of the content. For those of us who do not understand German very well, the publishers also provide a downloadable an MS Word document of the text making it possible to copy and paste it into a translation program. This is a major benefit of online journals and I thank them for this useful feature.

See website: www.echinocereus.eu





Schütziana

The latest issue of Schütziana, the specialist on-line journal for *Gymnocalycium* enthusiasts, has the report of the 30th International Gymnocalycium Meeting, held in Radebeul (Germany); Seedlings morphology of *Gymnocalycium* and a well-illustrated review of *Gymnocalycium cardenasianum* Ritter.

The text of this valuable publication is in English and the pictures and distribution maps give a clear insight into the plants found in habitat and culture.

You can download free all the issues from:

www.schuetziana.org

Avonia-News

Free German language on-line newsletter of "Avonia", the quarterly journal of the German Society for other Succulents.

From 2015, the on-line journal will be called "Sukkulenten"

See website: www.fgas-sukkulenten.de

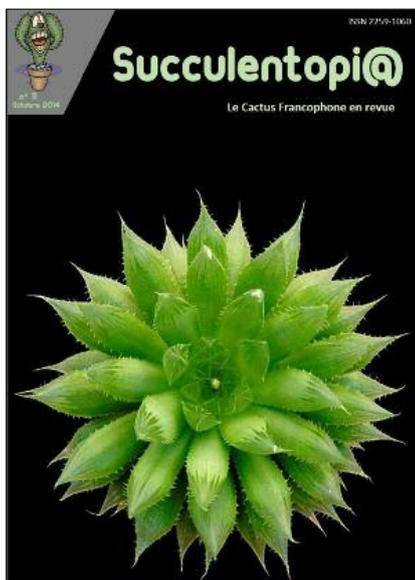
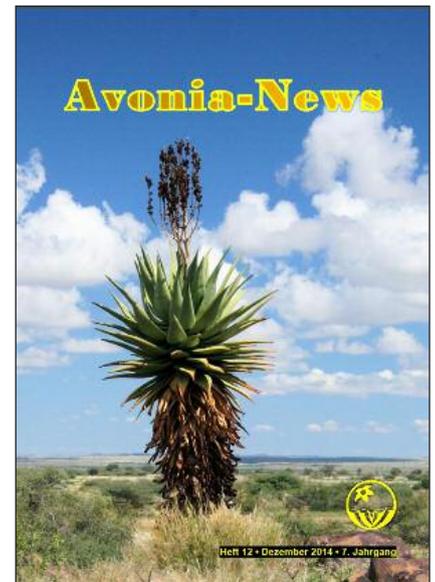
Annual seed list for members and much more.

Special interest groups for *Aloe* (incl. *Haworthia* etc.), *Ascleps*, *Euphorbia*, *Mesemb*s and *Yucca*/winter-hardy Succulents.

For membership and further information contact:

Dr. Jörg Ettelt: Morgenstr. 72, D-59423 Unna,
praesident@fgas.sukkulenten.de or

Wilfried Burwitz: Postfach 100206, D-03002 Cottbus,
geschaeftsstelle@fgas.sukkulenten.de



Succulentopi@

The 11th issue of this free online journal has recently appeared. This was the first online journal published in French. The quality is excellent in every respect.

It is available as a free PDF download from:

<http://www.cactuspro.com/succulentopia>

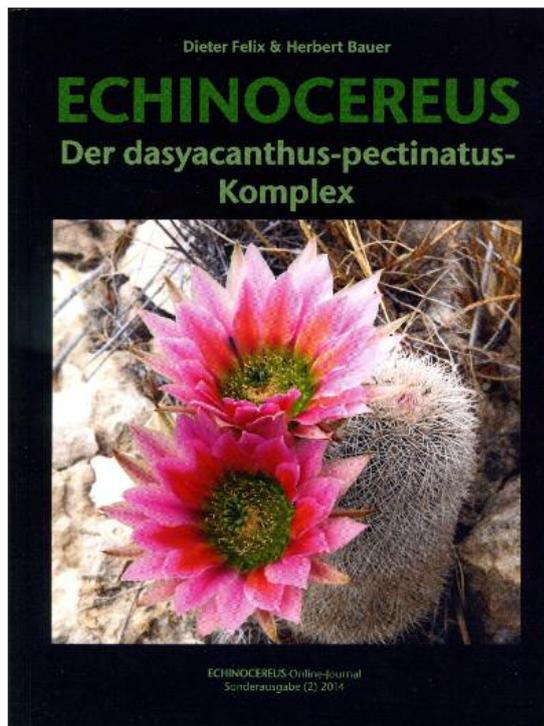
This issue includes a Photo Gallery; *Austrocylindropuntia*; *Punotia*; *Lophophora fricii* -The story of a mysterious plant; Overwintering cacti and succulents in a glasshouse.

As usual, very interesting material and many great pictures.

THE LOVE OF BOOKS

News of Recent Publications. A Reminder of Old Favourites.

Many cactophiles enjoy reading about their plants, particularly in the winter when our collections are less demanding. This feature aims to provide you with inspiration.



The Echinocereus dasyacanthus - pectinatus group

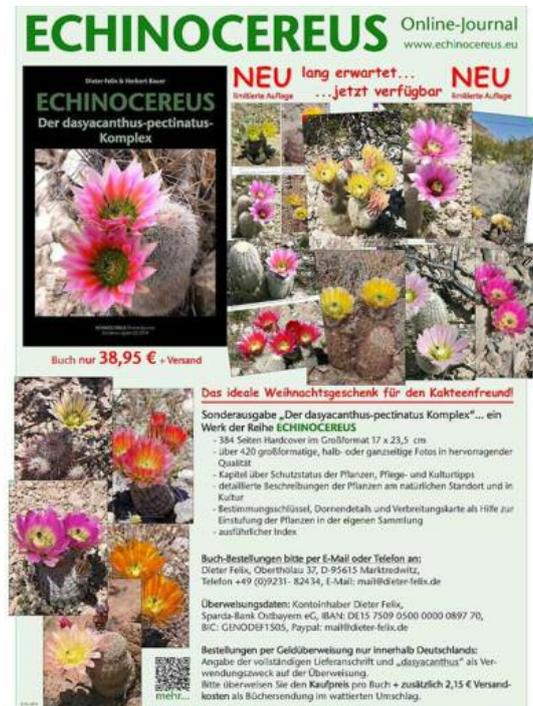
Dieter Felix & Herbert Bauer

This is the fifth book in the series about Echinocereus and the second published as an Echinocereus Online Journal special issue. It has 384 pages, 235 x 170mm, hardbound.

As a special service to readers who do not understand German, the text is available as a Word file suitable for processing in translation programs.

The book is another example of the high quality of the series so far. It is illustrated with a very large number of excellent habitat shots. Fans of the genus are fortunate to have books of this quality to enhance their interest.

As well as the excellent pictures, the text is very informative and covers technical aspects of the plants in detail. As always, such studies tend to look for minor differences that result in



a splitter's approach and hence too many names. But, even if you think there are only two good taxa in the book, it is a valuable source of data.

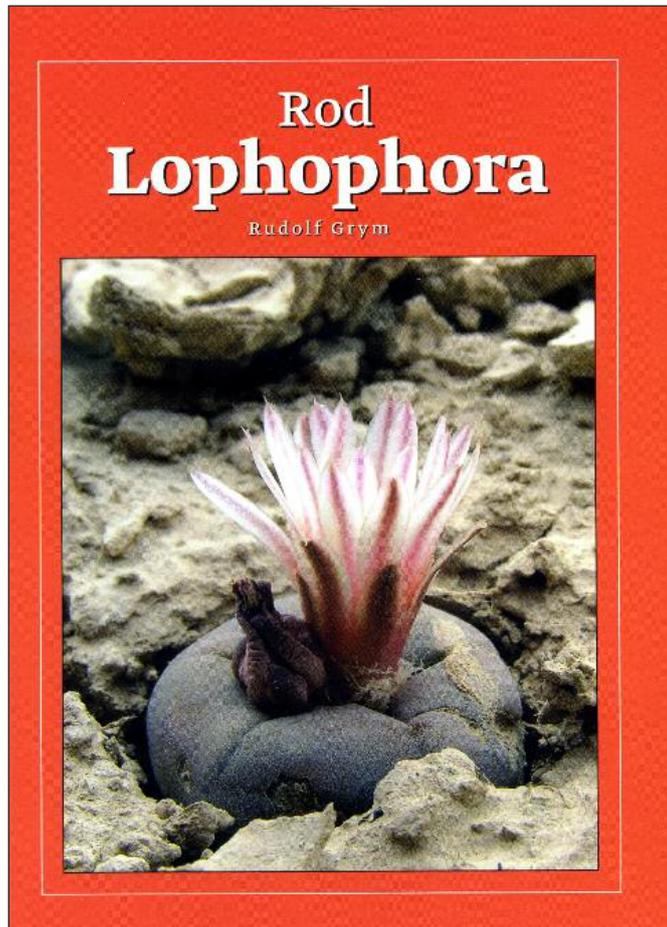
The authors publish the results of 20 years of field research at the localities of:

- E. dasyacanthus*
- E. dasyacanthus* subsp. *rectispinus*
- E. dasyacanthus* subsp. *crockettianus*
- E. dasyacanthus* subsp. *multispinosus*
- E. ctenoides*
- E. felixianus*
- E. ×lloydii*
- E. ×roetteri*
- E. pectinatus*
- E. pectinatus* subsp. *rutowii*
- E. pectinatus* subsp. *wenigeri*

How to Order

The book is distributed by [Dieter Felix](http://www.echinocereus.eu). Price 38.95€ plus carriage.

More information can be found on the website www.echinocereus.eu



The genus *Lophophora* Rudolf Grym

There will always be something mysterious and fascinating about the genus *Lophophora*. This well-produced book appears to present a thorough review of the genus. I say 'appears' since most of the text is in the Czech language which I cannot understand. There is an English text summary which deals with the five accepted species:

Lophophora williamsii
Lophophora diffusa
Lophophora fricii
Lophophora koehresii
Lophophora alberto-vojtechii

The illustrations of plants in habitat and cultivation are of a consistently high standard and show many amazing plants.

A well-known specialist on the genus *Lophophora*, Czech author Rudolf Grym, has written this new book dedicated entirely to the genus. His first book from 1997 is long out of print. Many things have changed in regard to

the knowledge of the genus since those times, including the description of a new *Lophophora* species.

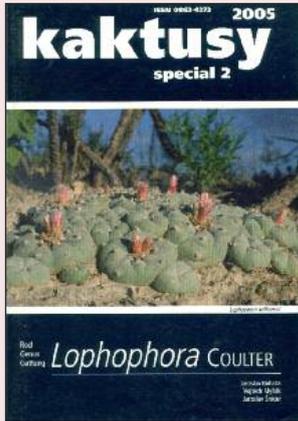
This new book is not a supplement nor a correction to the earlier version, but it is an entirely new piece of work. It will become essential reading for growers of this sought-after genus for many years to come. Published in Czech, with an extensive English summary.

The contents include: Introduction; History of the genus *Lophophora*; Introduction to individual species; Unidentified species, The genus *Lophophora* in habitat; A.V. Fric and the genus *Lophophora*; Invalid names; List of published names and Literature references.

The book has 120 pages in A4 format and is hardbound. It is printed on good quality matt art paper and is in full colour (except for the historic photographs). The text is complimented with over 250 photographs, mainly from nature, however, it also contains unique historic reprints, pen drawings and an extensive listing of recommended reading. The authors of the photographs are well-known European travellers.

Price per copy in the UK is £19 + £4.30 for postage and packaging (Royal Mail), or outside the UK (Europe only): £19 + £11.60 p&p. All orders will be confirmed by email, with payment information contained within.

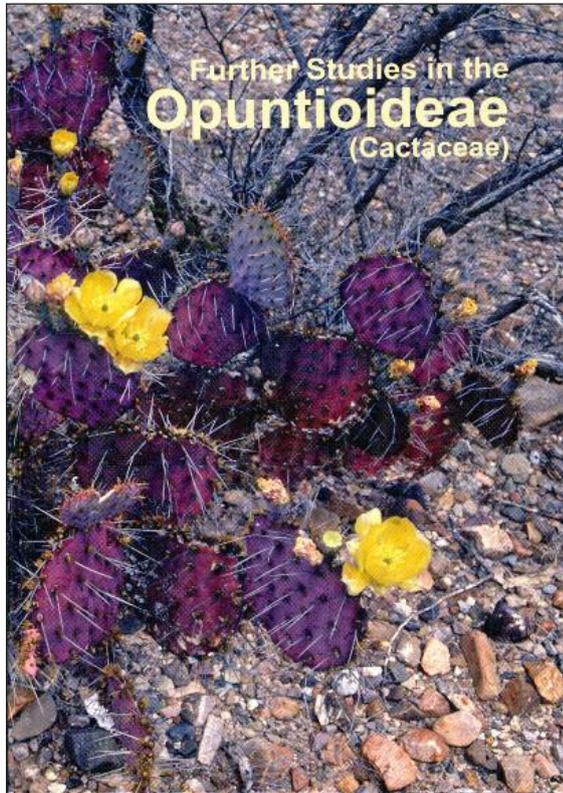
To order, or for more information, please email: igor.drab@gmail.com



Another useful book about *Lophophora* was published as a Kaktusy Special in 2005. It is also well illustrated and has the benefit of an English language edition also being available.

You may be able to find a second hand copy if you search the book dealers' lists.

GC



Further Studies in the Opuntioideae

Volume eight in the *Succulent Plant Research* series, published by David Hunt, returns to a subject close to the publisher's heart, opuntias. Volume six has become a vital reference on the subject, not least because of the excellent article by James Iliff on the Andean opuntias.

So, it was with surprise and sadness that I read of James's death on July 11th this year. As well as his comprehensive article on Andean opuntias, many will remember James for his collaboration with the late Gilbert Leighton-Boyce when they co-authored *The Subgenus Tephrocactus* in 1973. Still in demand, this was a groundbreaking publication in its day and at a time when there was so little documented material in cultivation available for study.

It is appropriate that this new book is dedicated to James who will be remembered as a pioneering student of these fascinating plants. The contents comprise nine papers and offer the reader a diverse and detailed series of studies:

1. Phylogenetic relationships and morphological evolution in *Opuntia* s. str. and closely related members of tribe Opuntieae.

2. Cytogenetic characterization of southern South American species of *Opuntia* (Cactaceae-Opuntioideae).

3. A revision of *Opuntia* series *Armatae* K. Schum. (*Opuntia* ser. *Elatae* Britton & Rose) (Cactaceae-Opuntioideae)

4. Northern hemisphere *Opuntia* and *Cylindropuntia* species (Cactaceae) naturalized in Argentina - and the riddle of *Opuntia penicilligera*

5. Further observations on the Andean Opuntioideae

6. Mapping the Andean Opuntioideae

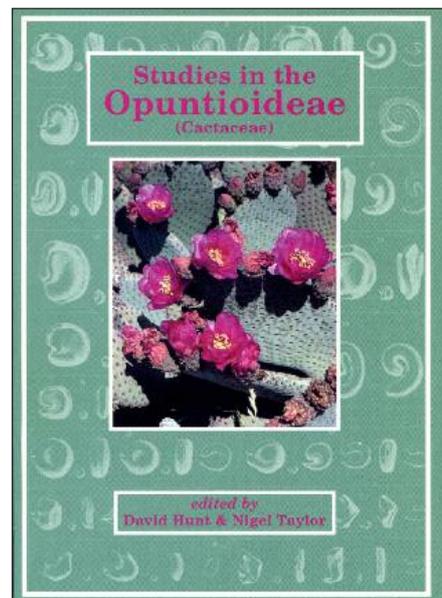
7. Illustrations and observations on the Chilean Opuntioideae

8. A checklist of the subfamily Opuntioideae (Cactaceae) in North and Central America

9. A checklist of subfamily Opuntioideae (Cactaceae) in South America and the Caribbean region

This is a very well produced book with many good quality illustrations. 224 pages, 245 x 170mm, softbound.

Available from [Keith's Cactus Books](#) for £27.50.



Studies in the Opuntioideae, Succulent Plant Research Volume 6 is [still available](#). 255 pages softbound, very good value at just £20.00.

GC

CACTUS PEOPLE HISTORIES

Charles Staples continues his series of articles about personalities in the world of succulents. This time he introduces Dr. Truman George Yuncker, a botanist specialising in the family Piperaceae.

The following brief biography touches mainly on the aspects of the life and career of Dr. Truman George Yuncker as relates to his contributions to the cactus and succulent plant world. This person made wider contributions than have been included here, but I hope that for interested succulentists, this will provide a sufficient introduction to the achievements of the individual.

Prof. Dr. Truman George Yuncker (1891–1964) became a bacteriologist and taxonomic botanist who later in life worked with the family Piperaceae; especially the *Peperomia* and *Piper* genera. Truman was born 20 March 1891 on a farm near Carson City, Michigan and moved with his family to Lansing, Michigan at the age of 13. Due to family finance difficulties when his father became ill, Truman had to work instead of attending High School. However, he took night courses in a business college studying stenography and secretarial courses.

By 1914, Truman had earned a Bachelor of Science degree in botany, horticulture and bacteriology at Michigan State University, Lansing, under the leadership of botanist Prof Dr Ernst Athearn Bessey (1877–1957). In 1915 Truman became a graduate assistant in botany at the University of Nebraska, Lincoln, working with the father of Ernst Bessey, the famous botanist Prof Dr Charles Edwin Bessey (1845–1915), and Prof Dr Raymond John Pool (1882–1967), receiving a Master of Arts degree in 1915.

During the 1915–1916 school year, Truman taught Botany at a high school in Indianapolis, Indiana. During that school year he married Ethel Burnett Claflin (1891–1981), whose interest in Truman's work as well as her own developed a teamwork in the herbarium, in research and in the field for the rest of his life.



Truman received his PhD on the genus *Cuscuta* at the University of Illinois, Urbana in 1919. In that same year he became an assistant professor of biology and bacteriology, and later a full professor and head of department at DePauw University, Greencastle, Indiana, until his retirement in 1956. He was curator of the DePauw University Herbarium from 1919–1964—renamed the 'T.G. Yuncker Herbarium' after his death in 1964.

Upon the death of another famous botanist and taxonomist, Prof Dr William Trelease (1857–1945), Truman was invited to the University of Illinois to complete Trelease's unfinished work of the family Piperaceae of Northern South America. The work became a classic.

After a 1939 family vacation in Hawaii, Truman continued on to the Island of Samoa to study its flora. After World War II his explorations took him to Tonga Island 1953–54,

to Jamaica, and the study of Piperaceae in Brazil 1957–62.

Truman's last major work, the Piperaceae of Brazil (1972-1975) was completed, published and distributed to the scientific community by his spouse, Ethel Yuncker.

Of primary interest to the succulentophile, are the succulent species of *Peperomia* that Truman described, including the following the following:

Peperomia carnifolia (from Bolivia) in 1953 (discovered by José Steinback [born Joseph Steinback Kemmerich in Germany (1875–1930)]).

Peperomia ferreyra (from Peru) in 1956 (discovered by Dr Ramón Alejandro Ferreyra [1910–2005] and named in his honor).

Peperomia hadrostachya (from Argentina) in 1955 (discovered by Serafin A Pierotti [fl. 1944–48]).

Peperomia hutchisonii (from Peru) in 1961 (discovered by Paul Clifford Hutchison [1924–1997] and named in his honor).

Truman George Yuncker died in his sleep on 8th January 1964, caused by conditions



from a coronary heart attack on 6th February 1963.

Chuck Staples, Des Moines, Iowa USA,
charlesjstaples@msn.com

Max Ferdinand Heinrich Curt Backeberg (1894-1966)

The life of Backeberg is ready to download from Roy Mottram's on-line journal at:

<http://www.crassulaceae.ch/de/publications-the-cactician>

6: Curt Backeberg: A history and evaluation of his work on cacti.

High Quality version (168MB):

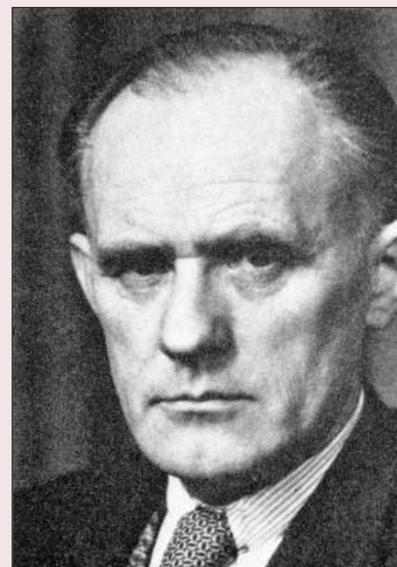
https://www.dropbox.com/s/m8vpfi1gv6i01g0/Cactician_6_HQ.pdf?dl=0

b. Lüneburg, 2 Aug 1894; d. Volksdorf, 14 Jan 1966.

With the fiftieth anniversary of the death of Curt Backeberg only a year away, now is an appropriate time to evaluate his significant contributions with the benefit of hindsight.

In common with many other cactus specialists of his time, his very characteristic style caused him to be regarded with both admiration and revulsion in almost equal measure. Nevertheless, his unique legacy was a body of work that was energetic and informative and, as a student and classifier of cacti, he dominated the popular press on the subject for almost forty years until his sudden death in 1966, just when he was about to witness the publication and reap the rewards of what proved to be his most popular work.

Roy Mottram



THE CACTUS EXPLORERS WEEKEND

19-21 SEPTEMBER 2014

‘Living things, of course, were never designed on drawing boards.’ †

The tenth Explorers Club weekend was organised by Graham Charles and supported by fifty-six enthusiasts, including guest speakers and delegates from Germany, Italy, Sweden and many parts of the UK. The programme comprised sixteen presentations spanning history, science, adventure, discovery, technology, survival and very many plants. Here I attempt to convey the lively atmosphere and the themes that emerged during the gathering, enhanced by snippets of personal feedback from fellow explorers.

Roland Tebbenham

† [Dawkins, R (2006) ‘The Selfish Gene’ OUP 30th-anniversary edition, chapter-13]

Many delegates suffered severe traffic delays en route to Beaumont Hall, Leicester on a cloudy September afternoon, but gradually the enthusiasts assembled and a terrific selection of choice plants, books and literature appeared in the sales room. After greeting old friends and testing the Old Speckled Hen in the bar, the Explorers sat down for a dinner of Roasted Artichoke, Tomato and Rocket followed by Roast Lamb Noisettes, then Warm Treacle Pudding with Clotted Cream, all lubricated with ample supplies of Chilean wine. Thus the scene was set in fine style with good food and lively conversation.

After dinner our evening Session was chaired by Graham Charles, who welcomed newcomers to the Explorers meeting and our two overseas speakers Massimo Meregalli and Boris Schlumpberger. The recent newlyweds Paul & Ericka Hoxey were applauded warmly by the audience. As this was the tenth anniversary meeting I requested feedback from delegates to enhance this report. I thank those who contributed; elements of their contributions have been woven into my story.

Formalities completed, Graham introduced our first speaker: the veteran explorer Martin Lowry, whom he described as “Having a keen interest in *Lobivia*; ... well ... someone has to.” Martin presented an interesting programme on *Lobivia cinnabarina*, which he titled ‘The Second Lobivia?’ Described in 1847 by W J Hooker from plants collected near Sucre by Bridges,

this taxon is easy to recognise and has never been confused with others. His first images were from various publications and stimulated the first debate as to whether one author had ‘redrawn’ an image by another; then the audience concurred with Martin on the quality of Mary Eaton’s painting used in *The Cactaceae* (1922) by Britton & Rose. Lower taxa have been erected, but Martin excluded many, leaving only the subspecies/varieties: *walterspielii*, *zudanensis*, *prestoana* and *draxleriana*. Martin commented he had seen considerable variations in eighty-eight locations around Sucre in his eighteen years exploring Bolivia and showed examples in habitat and cultivation [Fig.1/Fig.2].

He showed maps showing locations for ‘*draxleriana*’ north of the Rio Grande, clustered in the south of Cochabamba Department into the west of Santa Cruz Department; including collections HS50 (from Campero, Cochabamba) and Lau352 (from Vallegrande, Santa Cruz), both of which many delegates confirmed that they grow. Variations in tubercle shape and flower colour were evident, including a longer-tubed, white-flowered plant [Fig.3] from a population on one hillside around 2033m near Mizque, Cochabamba, Bolivia. Martin confirmed it is self-fertile, but the progeny have not flowered yet; he added if you look hard enough you can find white-flowered plants of all *Lobivia* species. He advised that they dislike very long, hot, summer days and,

Photo: Martin Lowry



Fig.1 *L. cinnabarina* LM0764.03 [form 'var. *walterspielii*] 3947m near Mina Maria Carmen, Potosi, Bolivia



Fig.2 *L. cinnabarina* VZ72 from seed collected by Johan de Vries, location as in Fig.1

Photo: Martin Lowry

Photo: Martin Lowry



Fig.3 *L. cinnabarina* var. *draxleriana* LM0477.03 unusual white-flowered variant from a population near Mizque, Cochabamba, Bolivia, at 2033m

for him, flower twice in UK in May/June then again in August/September. Looking further south there is another interesting variant from the south-western edge of Chuquisaca Department with hairy-tubed flowers [Fig.4].

Martin concluded his programme with a summary of modelling results he used to identify the most favourable habitats for the plants, describing *Lobivia cinnabarina* as an 'in-between plant' based on diagrams demonstrating the climatic data for its known range at 3,000 ± 200m (9,200-10,500ft) altitude, with moderate temperatures, moderate rainfall and a few dryer, but not completely arid, months. He used a Geographic Information System modelling application 'DIVA' (Dynamic Interactive Vulnerability Assessment) with a downloadable climate database comprising nineteen parametric data sets. The outputs are



Fig.4 *Lobivia cinnabarina* LM0633.01 a potentially new subspecies discovered in 1997 at 3522m near Muyuquiri, Chuquisaca, Bolivia

statistical, exclude outliers and were based on a 10km (6.2mile) grid. The correlation with his observed 88 localities was remarkably good and furthermore it could be used to predict where else particular species might be found.

His parting exhortation to the assembled company was to record exactly where any plant observations or collections originated. Massimo Meregalli concurred, praising Martin's results and saying that one could also consider recent climatic history, geology and land-use changes that might affect species migration and evolution. Martin added that the application could also be used to identify the most limiting climatic factor affecting species distribution. He reported he had some 40,000 records of Cactaceae in his location database and welcomed further contributions to advance these studies.

Photo: Martin Lowry

Photo: Paul Hoxey



Fig.5 *Haageocereus acranthus* PH1032.04 with terrestrial *Tillandsia* sp. Lomas Hills N of Huacho, Lima 420m

Photo: Paul Hoxey



Fig.7 *Peperomia majeri* PH1061.03 North of Tayabamba, La Libertad, Peru 2580m

Graham thanked Martin for delivering a most interesting programme that stimulated lively debate: "Your scientific approach and diligent study in habitat are much appreciated – thank-you." He went on to introduce Paul Hoxey who was to show us some interesting aspects of his latest three-week trip to the Rio Marañon valley in northern Peru with Chris and Graham.

Paul began the first part of his programme with: "First a mystery solved thanks to Boris, eight years after I first found this plant near the El Tatio geysers." He showed us a low-growing, tufted plant growing at altitudes between 4,000 & 4,500m (13,100-14,800ft). This was *Sarcocornia pulvinata*, a member of the subfamily Salicornioideae (Samphires, Glassworts or Saltworts) of the Amaranthaceae (formerly Chenopodiaceae) family. It is endemic to saline substrates in the Andean

Photo: Paul Hoxey



Fig.6 *Echeveria eurychlamys* PH1041.01 east of Celendin on road to Balsas, Cajamarca, Peru 3040m

Photo: Paul Hoxey



Fig.8 *Matucana oreodoxa* subsp. *roseiflora* PH1065.01 La Libertad, Peru 2530m

altiplano and beside salt lagoons. Brendan chimed in: "Doesn't that prove Paul that all the interesting plants are in Chile?"

Paul explained the location of the Rio Marañon, one tributary of the mighty Amazon River. The Marañon valley covers a huge range of altitude and habitat types and many very familiar plants are found there. The region has been opened up recently with new paved roads, which divide opinion, but do make exploration easier. Paul travelled through areas of intensive agriculture developed during the past decade (for asparagus and sugarcane) on his way to Lomas hills south of Patavilca, where *Loxanthocereus pullatus* and four *Haageocereus* grow [Fig.5], some of which might be undescribed or part of a cline. We saw a statuesque *Melocactus peruvianus*, plentiful *Neoraimondia arequipensis* and *Weberbauerocereus winterianus* (*johnstonii*)

with bristly pseudocephalia. They were followed by *Borzicactus plagiostoma* and *B. sammensis*, both with striking pink tubular flowers, but the plants remain only on rocky slopes unsuitable for agriculture. San Pablo is the type locality for *Matucana aurantiaca* (e.g. Lau177), still growing though now amongst eucalyptus groves; further on and 1,000m (3,300ft) lower espostoas and haageocerei graced the views.

Paul found *Echeveria eurychlamys* [Fig.6] and *Peperomia* species on the valley slopes. The environment became hotter and dryer as he journeyed lower down into the valley and more cacti were evident south of the Balsas crossing; beautiful clusters of *Espostoa mirabilis*, chunky *Matucana formosa* and *M. krahnii* amongst bromeliads, *Calymmanthium substerile* (an isolated relict species), *Lasiocereus fulvus* with bat-pollinated flowers and *Matucana weberbaueri* 'flammea'.

Exploration of the Rio Chivane revealed more *Espostoa lanata* and other espostoa plants growing on impenetrable limestone cliffs looking like an intermediate between *E calva* and *E lanata*. The explorers managed, by acrobatic means, to 'capture' a piece that flowered later, when they realised it was new. It has now been described in Bradleya 32 (2014) as *E. cremnophila*. Moving further south to Carrizal they found *Matucana myriacantha* and *M. weberbaueri* at their type localities; and above San Marcos neat, large, solitary plants of *M. aureiflora*.

Further on at El Pallar more road-building was in progress and Paul compared a scene with a picture he took twelve years earlier, when he visited with Alfred Lau. Views of large *Armatocereus laetus* with spiny fruits and *Thrixanthocereus senilis* preceded beautiful globular *Matucana pallarensis* plants. Mature *Browningia pilleifera* trees dominated the view at El Chagual; then more espostoa and *Pereskia horrida* with its small flowers and black seeds. Large *Melocactus bellavistensis* with gaudy fruits and *Peperomia wolfgang-krahnii* near its type locality reflected the rich flora of the valley before this segment concluded with *Armatocereus rauhii* subsp. *balsasensis*.

Further on at El Chagual more matucanas grew close to the river; further up



Photo: John Cox

Fig.9 Roy Mottram, Brendan Burke & Roger Ferryman conversing in the bar

Thrixanthocereus cullmannianus with small flowers and dry fruits, *Peperomia dolabriformis* and large, colourful rosette vriesias (Bromeliaceae) grew on the rocks. Much of the area, including the narrow side valleys, has been disturbed by mining and its infrastructure and the workforce do not welcome strangers.

Paul concluded the first part of his Marañon journey in the Tayabamba valley with images of beautiful stands of *Peperomia maijeri* [Fig.7], *P. samainiae* (?) and thin-stemmed, brilliant orange-flowered *Corryocactus apiciflorus* (?). But a particular highlight for Paul (and the audience) was seeing wonderful clusters of the beautiful *Matucana oreodoxa* subsp. *roseiflora* [Fig.8], which has neat, scented, actinomorphic flowers of a unique colour for matucana.

Graham thanked Paul for his intrepid searches in habitat and his acute observational capability. He forecast he expects Paul to discover more new plants in Peru. Following an intensive evening of tales of science and exploration, the discussions continued in the bar [Fig.9]. Steven commented "Best quality talks from those at the cutting edge of cactus study, great banter from top practitioners of that art, very choice plants with data on sale and a fine selection of books to buy. All this, plus good food and drink and plenty of time for socialising equals another superb Explorers weekend!"

Saturday morning dawned fair, and a generous breakfast was on offer. Some delegates strolled in the Botanic Garden; others



Fig.10 A view of the Arid House at Leicester Botanic Garden, adjacent to the meeting venue

inspected the Arid House [Fig.10], which was looking very tidy thanks to the efforts of Gardener Rachel Benskin and BCSS Leicester Branch members. Then we reassembled for a session chaired by Paul Hoxey, who introduced another Explorers regular Ivor Crook [Fig.11].

Ivor said he had prepared “A little, light-hearted start to the day”, a programme called ‘Survival in the Internet Age’. This was to be a compendium of ideas of how we might harness new technologies to benefit our hobby and its special interest groups. “We have already moved from slides to digital presentations; then we added plant names and maps to the projected images. But have we stagnated? The hobby needs to consider change, yet any changes need to reflect what people want.” Ivor looked at two particular examples: the Tephrocactus Study Group (TSG) and a local BCSS Branch.

Ivor explained how the TSG has re-energised itself using a Facebook page to generate a following and propagate news, coupled with a website to garner material for in-depth discussion and publishing articles as they became available. Ivor has developed skills to maintain the website, much as he developed cultivation techniques to grow new plants. Other volunteers provide editorial support and, despite teething problems, the contributors have devised ways of working to sustain the group. They plan to generate income by TSG bulletin back-issue sales on CD and possibly hardcopies of their journal.



Fig.11 Ivor Crook ready for action. (Graham is lurking in the background)

The TSG Facebook page has garnered more than six hundred followers worldwide; an identification quiz was used to stimulate interest; also in the first three months five articles were submitted involving twelve contributors, seven of whom were new to the group. More material is now available and articles are being developed by those with habitat and cultivation experience and photographic expertise. Maps have been added so rough habitat information can be related to particular species. Overall the new ideas are bearing fruit.

Ivor moved on to consider local BCSS Branch meetings, where higher costs and reduced attendances are experienced by many groups. Manchester Branch experimented by using two digital projectors in a member’s home, one running Skype to connect with a speaker and the second displaying images from a file transferred by the speaker using Dropbox. With the images numbered, both ends remain synchronised and modern miniature cameras and microphones enable all to see and hear one other. This approach requires good internet connections, but the speaker does not need to leave home.

This arrangement means no personal chat or speaker’s plant-sales, but there can still be questions and discussion between the speaker and the group. (See: Bint & Crook 2014). This approach could be invaluable to groups with only few members or limited funds. Ivor concluded saying that we need to embrace newer technologies to encourage people to join our groups and participate; these are two



Fig.12 Stock plants in 1936, *Espositoa lanata*, *E. sericata* & borzicacti

examples where he has had personal experience and seen positive outcomes. Paul thanked him for a great start to the day and food for thought.

Paul introduced Roy Mottram to give one of his scholarly programmes 'Curt Backeberg (1894-1966): A history and evaluation of his work on cacti'. Roy said Backeberg divided opinions owing to his particular style and very strongly expressed opinions. He left a body of work, both energetic and informative, and as a student and classifier of cacti he dominated the popular press on the subject for almost forty years until his sudden death in 1966. He regarded photographic records as most important because they could be distributed widely and showed living plants in habitat and in detail, rather than the dried specimens lodged in herbaria. He did preserve some specimens from his collections, but these were lost during bombing in 1944. Roy showed one example: *Mammillaria dixanthocentron* validated by images in *Das Kakteenlexicon* 1966 following the late issue of the 1961 ICBN.

Backeberg was interested in cacti from his early years in Hamburg and in 1927 set up his own cactus nursery; but in common with many greenhouse owners, he soon moved to larger premises and stocked many large plants [Fig.12]. He visited the Hamburg Botanic Garden and corresponded with notable explorers and nurserymen including Alwin Berger, Alberto Frič, Walter Haage and Erich Werdermann. Between 1928 and 1938 he undertook explorations to habitats in Mexico, the Caribbean Islands and South America. He

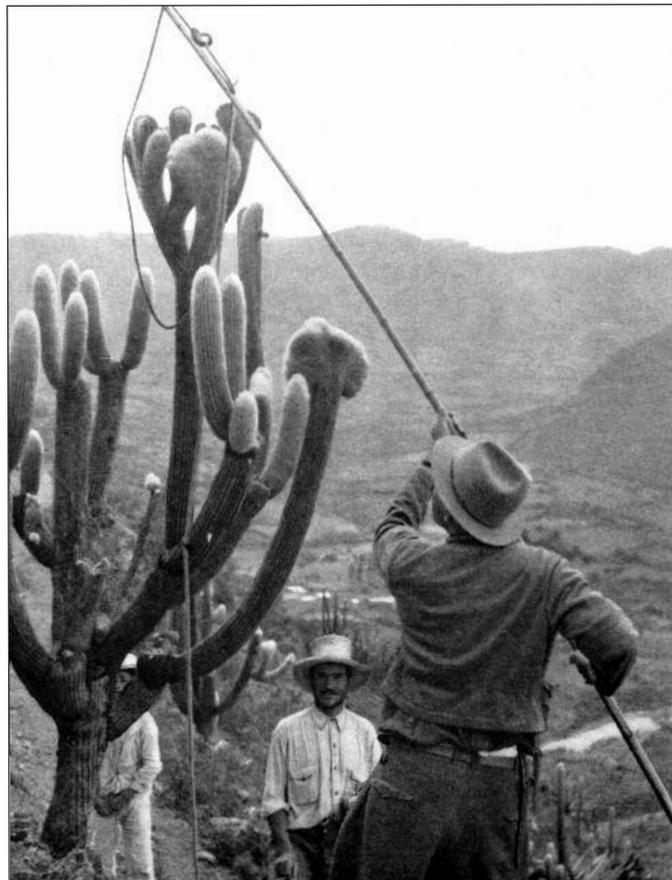


Fig.13 *Espositoa lanata* crest, Huancabamba, Peru 1931

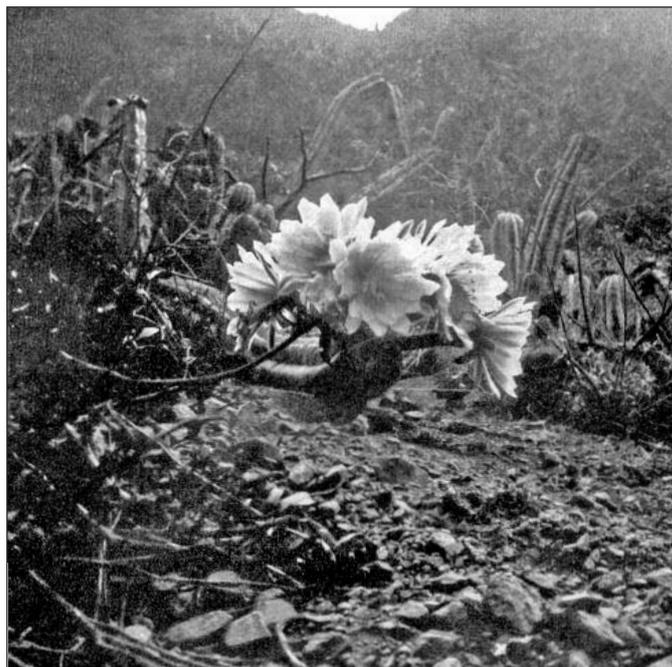


Fig.14 *Echinopsis peruviana*, Matucana, Rimac Valley, Peru 2100m 1931

collaborated with notable cactophiles and began to take photographs, possibly stimulated by working for a time at the Rolleiflex factory. He amassed 200 boxes of plants, 600 photographs and 1,000m (3,300ft) of movie film from his seven expeditions. He described 140 new taxa and published



Fig.15 Gordon Rowley, Cyril Parr, Curt Backeberg & Len Newton in Gordon's garden at 'Cactusville' in 1965

accounts of his travels, which generated good financial rewards and he took every opportunity to keep something in print throughout his career. Roy commented wryly: "Those were the days when you got decent royalties!"

Backeberg found many cerei on his travels and was keen on cristate specimens. He is seen in Fig.13 using his technique of lassoing branches he wanted to collect. One of the longest and most productive expeditions comprised a number of inland journeys from Peruvian and Chilean ports, there being no Pan-American highway in the 1930s! He collected the three recognised species of *Haageocereus* in the Rio Rimac drainage system: *Haageocereus kagenekii* at Cajamarquilla ruins, c.450m (1,500ft) called *Haageocereus pseudo-melanostele* by Backeberg; *Haageocereus acranthus* at the same locality as *H. kagenekii*, and *Haageocereus chosicensis* in the upper Rimac valley just south of Chosica at c.900m (3,000ft). He also found fine, flowering *Echinopsis peruviana* [Fig.14], *Echinopsis mistiensis*, *Opuntia floccosa*, and *Oroya neoperuviana*. He continued through Bolivia into Argentina and really appreciated the sights of mighty columns of *Echinopsis pasacana*. He crossed the Andes into Chile and saw *Eulychnia iquiquensis* after a brief El Niño, so they looked to be in fine fettle.

Backeberg made further journeys to South America between 1933 and 1938, carrying a cine camera and seeing many more cerei. He described *Trichocereus werdermannianus* in honour of his friend and mentor. Some later expeditions were financed by Viktor Morawetz, a wealthy New York lawyer who, in his later years, built Fenwick Hall Castle and

garden where the drive was lined with saguaros. His last expedition in 1938 was commissioned by Hamburg City Council to supervise collection of large, impressive-looking cacti to mount an exhibit scheduled to take place at the Planten & Blomen (plants & flowers) Garden in Hamburg on April 28th 1939. The City was very impressed by Backeberg's large exhibit covering five halls that he had created for them in 1935, and wanted to make an even bigger and better show! He delivered it in fine style, but afterwards never returned to habitat.

World War II ended Backeberg's career as an explorer, but he continued as a nurseryman, writer, lecturer and student of cacti, with the first edition of his second autobiographical travelogue appearing in 1942. In 1944, a bomb blast took all the glass out of his glasshouses, but thanks to the income from his home-grown tobacco trading he was able to repair them quickly! After the war he earned a living from selling cacti and guest speaking and relied heavily on his wife, Emma, to maintain his plant collection while he was absent. He and Emma were married in 1919, but had no descendents.

In 1949 Backeberg visited the French Riviera to make a study of the large plant collections there. It was here that Louis Vatrican, Director of the Jardin Exotique, introduced Backeberg to Julien Marnier-Lapostolle, son of the founder of the Grand Marnier company, and for the period 1951 to 1955 Backeberg became the Curator of the private Botanical Garden at 'Les Cèdres', originally established in 1924. In 1951 he successfully transferred his own collection of several thousand plants from Hamburg to Les Cèdres, where they had agreed to house them. He returned to Hamburg in 1955. During this period, he also continued to maintain and trade with cacti propagated from his private collection and made countless lecture tours. In 1956, Backeberg sold his private collection (housed at Les Cèdres since 1951) to the Jardin Exotique in Monaco, but in the years that followed he slowly rebuilt another.

From 1953, he made contact with Prof. Werner Rauh of Heidelberg University, which led to intense correspondence and

Photo: John Carr

Fig.16 *Sulcorebutia glomeriseta* at type locality JC03-12

collaboration to evaluate the cactus material gathered during two Peru expeditions made by Rauh in 1954 and 1956. Living material of the type collections from Rauh's 1954 expedition was kept at Les Cèdres, while that of the 1956 expedition was grown in the Heidelberg Botanical Garden and when they died they were deposited in the Heidelberg herbarium, now transferred to Zürich.

In 1955 he began intensive work on the first volume of his monograph *Die Cactaceae*, and for some time he stayed in a health spa in order to be able to work undisturbed. The manuscript of Volume 1 was completed by mid-1956 and published in Jan-1958. The work had been intended to comprise three volumes, but it became more extensive as it proceeded. The volumes of 'Die Cactaceae' appeared in rapid succession with the final Vol.6 appearing in June-1962.

In 1964 he began to write a new autobiography; never completed or published. At the beginning of 1965, the Deutsche Forschungsgemeinschaft (DFG: German Research Foundation) honoured Backeberg with their Distinguished Service Cross for his life's contribution to cactus studies. Like the British Royal Society, they are also members of the International Council for Science and had contributed funds for two of Backeberg's expeditions. A lecture tour to England took place in May-1965 [Fig.15] during which he spoke to audiences in seven cities. Also that year he fortuitously negotiated the sale of his rebuilt private collection, again to the Jardin Exotique in Monaco, to come into effect upon

Photo: John Carr

Fig.17 *Sulcorebutia candiae* subsp. *kamiensis* near Kami JC06-13

his death. On 14 Jan 1966 Backeberg unexpectedly died from a heart attack, even before *Das Kakteenlexikon*, his most popular work, had come off the press.

Paul and the audience thanked Roy for another of his well-researched, detailed historical programmes.

Following a short refreshment break Paul introduced another regular contributor, John Carr and his programme 'Bolivia, the search goes on'. This was an amalgamation of several trips seeking a group of yellow-flowered sulcorebutias and started with some arresting images of an isolated shepherd's hut at over 4,000m (13,100ft) and intense snowfall during a thunderstorm. At that altitude potatoes grow well, despite roughly 200 frosty nights per year. Some cacti at Inca ruin sites have been collected out, but John and his colleagues found plants at altitudes between 1,500m & 2,500m (4,900-8,200ft) in mostly open places [Fig.16], some not far from the edge of the Amazon rain forest. One characteristic is they flower earlier than other species and set seed quickly to benefit from fogs and rain. John Pilbeam commented "I had problems with them until Nigel Taylor suggested misting them when in flower to encourage seed-set; and it works".

John showed us evidence of mining in the narrow valleys; and barriers to protect the local villages. Neat plants of *Sulcorebutia candiae* subsp. *kamiensis* with pectinate spines and orange to yellow flowers had been ploughed up by farmers. A fine cristate plant [Fig.17]



Fig.18 *Sulcorebutia* aff *langerii* near Pasarapa JC26-13

found at a lower altitude (2,500m/8,200ft) shared its habitat with a bronze-leafed echeveria. John explained that the area seemed to be an echeveria 'hot-spot'. He had brought large bowls of some echeveria plants to show to delegates.

John commented "Plants from every hill are different; the whole genus is baffling." There was much debate about species' identities; with some plants drawn into the substrate in dry periods, others in bud or flower. Some were solitary, others in large clumps [Fig.18]. Moving further south and crossing the Rio Grande, passing a desolate landscape, John showed us more sulcorebutias [Fig.19], *Tigridia* species, and diminutive alpine plants.

Close to the Rio Pilcomayo there were more sulcorebutias, mediolobivias, *Weingartia lanata*, and more dramatic scenery. John appended images of echeverias for 'The Expert (John Pilbeam)' to identify, but without success. JP commented "I am an expert at knowing what I don't know." Paul brought proceedings to a close by thanking John for an interesting mixture of sulcorebutia, echeveria and some wonderful habitat views.

Paul introduced the final speaker of our Saturday morning programme: Dr Boris Schlumpberger the Curator of Herrenhäuser Gärten, Hannover, Germany. Boris's research interests include evolution of floral syndromes, floral scent, insect-plant interactions, pollination ecology, and Cactaceae. He is the author of many publications and has a Bolivian, solitary 'cactus specialist' bee *Brachyglossula schlumpbergeri* named in his



Fig.19 *Sulcorebutia trojapampensis* at type locality JC19-13

honour (Compagnucci *et al* 2012). His programme was titled 'Phylogenetics, evolution and taxonomic implications of the *Echinopsis* alliance'. Some readers will be familiar with his publication outlining the details (Schlumpberger & Renner 2012). Boris explained how his interests began with pollination ecology and the evolution of floral characteristics and developed to molecular phylogenetics. Early work was stimulated by seeing *Echinopsis ancistrophora* [Fig-20] and its subspecies in habitat. "The flowers vary in shape; what pollinates them and how are they related?"

Boris highlighted many well-known plants in *Echinopsis*, *Lobivia* and *Trichocereus* showing images of their body forms and flowers to emphasise that, as currently circumscribed, *Echinopsis* s.l. is one of the largest and morphologically most diverse genera of Cactaceae. He highlighted a quotation from Britton & Rose (1920) '*Lobivia*: It is made to include various anomalous species which cannot properly be referred to any described genus, and it is questionable whether they are all congeneric'. Predictably this generated amused audience reactions. However as he said: "That was the easy part!"

Boris outlined briefly the steps he had taken to analyse the plant DNA samples, looking for single nucleotide polymorphisms in 3,800 nucleotides of chloroplast-DNA. These data can be used to infer relationships, common ancestry and evolutionary age. He had sampled 144 species and subspecies including the type species of the genera close to or within

Photo: Boris Schlumberger



Fig.20 *Echinopsis ancistrophora*, Campo Alegre, Argentina

Echinopsis s.l. as well as some potential outgroup genera. Applying standard statistical methods the results indicate a maximum likelihood phylogram that can be linked with chromosome counts, pollination modes and growth habits. The results showed that, to fit the data, either *Echinopsis* would need to be a massive genus encompassing many existing genera; or it could be divided into smaller, more homogeneous units requiring resurrection of generic names and transfer of species epithets.

Using colour codes to highlight pollination syndromes and growth habits in his phylogeny, Boris described the principal clades as *Echinopsis*, *E. atacamensis* (the Chilean trichocerei), *Harrisia*, *Cleistocactus* s.str., *Arthroocereus*, *Lobivia*, *E. bridgesii*, *Helianthocereus*, *Trichocereus* s.str., and *Denmoza*. There are some unresolved taxa; as Boris said: "We cannot infer all the evolutionary relationships as some plants may have become extinct, be undiscovered, or have

Photo: Boris Schlumberger

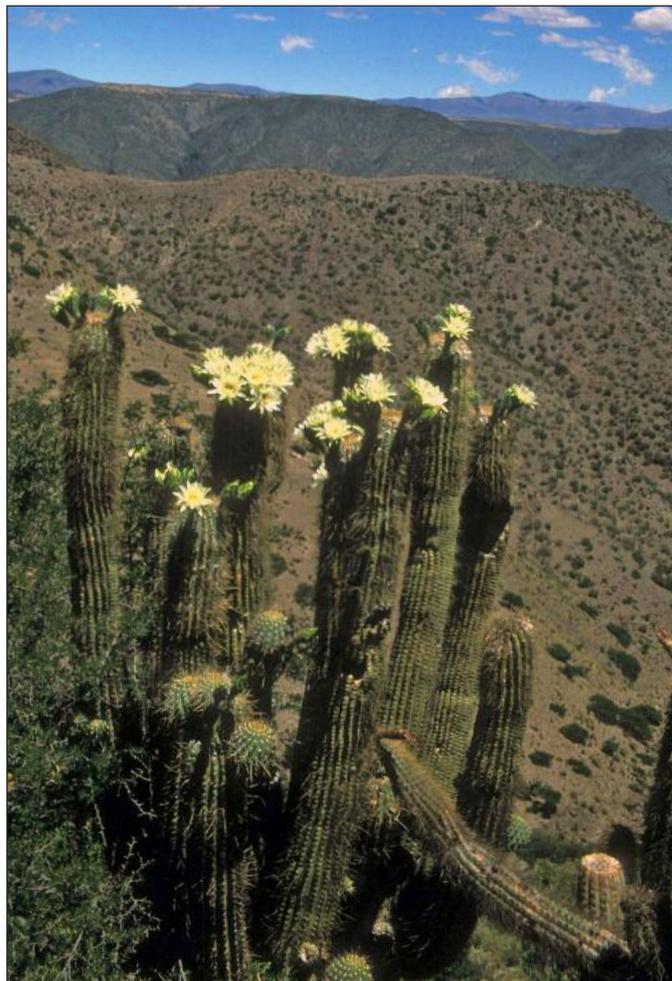


Fig.21 *Trichocereus tacaquirensis*, Villazon, Bolivia

not yet been sequenced. The phylograms are snapshots; we really need time on them as a third dimension." Chromosome counts included in the phylograms showed polyploidy is infrequent amongst the group and consequently hybridisation has not been significant in their evolution.

Inevitably the results stimulated extensive discussion on the implications of the phylogeny, evolution of columnar and globose forms, relationship of plant life-form to pollination syndrome, actinomorphic and zygomorphic flower shapes, and the independent evolution of similar characteristics. These factors have led to non-natural classification based on superficial morphology and Boris's work has striven to unravel this puzzle.

Boris moved on to summarize his principal findings and compare them to other work that had examined the morphology of *Trichocereus* [Fig.21], including seed characteristics. He concluded with comments on *Vatricania* and



Photo: Jonathan Clark

Fig.22 Landscape with *Echinopsis skottsbergii* near Fray Jorge National Park, Chile



Photo: Jonathan Clark

Fig.23 *Copiapoa dealbata* at Quebrada Mala, Chile

These three images are also available in 3D. To download the 3D version, click on the image and view with suitable glasses like the ones distributed with the BCSS CD of the 2012 National Show.



Photo: Jonathan Clark

Fig.24 *Tristerix aphyllus* with fruits

some convergent features of the floral structures of *Acanthocalycium*, *Echinopsis leucantha*, *Denmoza*, and *Setiechinopsis*. Paul thanked Boris for a really absorbing programme that had stimulated interest and participation and the audience applauded generously.

Ivor Crook chaired the Saturday afternoon session, but we had time to stretch our legs in the sales room and on the terrace while Jonathan Clark set up a Sony Playstation-3, two projectors and a silvered polarisation-maintaining screen and then as we took our seats he issued us with cross-polarised glasses.

We were to marvel at the first 3-D films shown at an Explorers Club meeting; a notable technology milestone. Three images are reproduced here in both 2-D and 3-D versions. The reader can appreciate 3-D detail by using red/cyan glasses. This is a lower-quality

approach than the full 3-D (cinema quality) colour which Jonathan used for his programme, but these simple glasses enable users without 3-D monitors to see the effect. [Note: UK readers who purchased the BCSS 2012 National Show DVD received suitable glasses]. The coding used for the stereoscopic colour anaglyphs reproduced here preserves the colours and reduces crosstalk and optical perception difficulties. Please look at the full-size 3-D images linked behind the 2-D figures; also you can print them on satin photographic paper to appreciate the full effect.

Ivor explained that the afternoon programme was to be revised; Brendan Burke had offered to stand down to allow extra time for this programme (more on this below). So Jonathan embarked on his tale called 'Chile in depth'; the record of a three-week trip made to Chile with Paul Klaassen and others during November-2013. He started with a sequence showing landscape near the Fray Jorge National Park with globose and columnar plants [Fig.22A/B]. The latter were swaying in the gusty wind and the synchronised soundtrack emphasised the harsh conditions there. Spontaneous applause broke out! The next sequence was a zoom shot into the apex of an *Eriosyce* and the audience shrank back in their seats as they perceived their eyeballs to be threatened by an advancing array of spines of ever-increasing length! Other shots with no audio track appeared surreal, as if the

landscape was suspended in space. Jonathan explained that the intensity of the 3-D effect varies according to the range of the subjects in shot; he used 3-D camera equipment with a fixed lens-separation set to be slightly less than the human inter-pupillary distance to work best at moderate ranges.

Paul Klaassen likes to revisit particular plants from year-to-year; some audience members were familiar with individual plants such as 'Smiler'. Jonathan also sought to replicate a notable view published in a 2006 book and challenged the audience to identify his error. He had managed to laterally invert the image, so the plants pointed the 'wrong' way. Ham acting on film brought tears to the eyes of some and groans from others. More shots taken from the moving vehicle emphasised the landscapes as well as the dubious choice of musical accompaniment to their journey. Some wildlife was featured, as well as ocean vistas with the sounds of waves breaking on the Pacific shore; these all added to our vicarious pleasure.

Jonathan's principal objective was to see as many *Copiapoa* species as possible in his limited time in Chile and he managed to capture many on film. We enjoyed 3D images of fine *Copiapoa coquimbana*, *C. cinerascens*, *C. dealbata* [Fig.23A/B], *C. desertorum*, and *C. ahremephiana*, together with various *Eriosyce* species and some parasitic *Tristerix* plants.

Jonathan explained there is an 'arms race' between cactus and parasite: the parasite's seeds need to produce long radicles to reach the host's plant body to penetrate the epidermis. Consequently one reason for long spines on many Chilean cacti might be to confer protection from this parasitic species. Jonathan also recorded *Tristerix aphyllus* parasitizing an *Eriosyce*. This hemi-parasite has no true leaves (hence 'aphyllus') and the showy red or yellow, humming-bird pollinated flowers develop from its endophyte (see: Heide-Jørgenson 2008); the seeds are of various colours [Fig.24A/B].

The tour group were stuck in Vallenar for car repairs and all alcohol was banned on the day of an election while they were there. They took a taxi trip to make best use of the time. The film sequences included a lethal *Puya* ...



Photo: Massimo Meregalli

Fig.25 *Gymnocalycium hyptiacanthum* north of Rosario, Cerro Campana, Colonia, Uruguay 95m

that is 'lethal in 3-D'! The time passed all too quickly and the audience applauded Jonathan for his daring experiment; it was a worthy venture and everyone enjoyed the plants too.

We were to enjoy two more regional presentations before dinner; on quite contrasting environments in Uruguay and Mexico. First Ivor introduced our second overseas speaker: Massimo Meregalli from Turin, Italy, who has a special interest in *gymnocalyciums*. He posed a question: 'Uruguay – a boring country, or not?' Some people might have recalled Dorothy Minors' presentation during the 2011 meeting when she introduced us to *Parodia sellowii* and its 58 synonyms; amongst many other cactus and succulent plants. Massimo was to focus on plants from his favourite genus. He began with relief maps to explain the country's general character as undulating hills with wooded areas adjacent to rivers, and plains in the south. There are two prominent low ridges: the Cuchilla de Haedo to the north-west and the Cuchilla Grande to the south-east. Between them is the valley of the Rio Negro that flows into the Rio Uruguay thence to Rio de la Plate. Massimo explained it is essential to have good transport when exploring and he punctuated his programme with views of some fine but ancient cars.

He began in the south of Uruguay in the Cerros Mosquitos (well named!) and a first view of *Gymnocalycium hyptiacanthum*. There are many forms, mostly small to medium plants, some with twisted spines [Fig.25]. Many can be found in shallow, stony soils near



Photo: Massimo Merigalli

Fig.26 *G. hyptiacanthum* subsp. *uruguayense* Paso de los Toros, Tacuarembó, Uruguay on dry, stony pasture



Photo: Massimo Merigalli

Fig.27 *Notocactus scopa* Sierra Yerbaito, Treinta y Tres, Uruguay, on a low grassy hill with rocky outcrops



Photo: Massimo Merigalli

Fig.28 *Cereus xanthocarpus* with ripening fruits, Cuchilla de Haedo, Salto, Uruguay. Large columnar plants on a hillside

streams and some were described with subspecies names including *G. hyptiacanthum* subsp. *netrelianum* and *uruguayense*. Moving north of the Rio Negro more, larger *G. hyptiacanthum* subsp. *uruguayense* grew amongst smallish rocks [Fig-26]. Going north into Brazil there are other forms with pinkish flowers. Massimo conjectured that there might be a relationship with *Gymnocalycium denudatum*, but the two species are never found growing sympatrically.

Turning to other plants Massimo showed us notocacti including *N. mammulosus*, *N. crassigibbus*, *N. ottonis*, *N. tabularis* and *N. scopa* [Fig.27]. Though Uruguay has nothing large like ferocacti it does have some large globular *Wigginsia* generally growing in dryer places, frequently on rocky outcrops. By contrast diminutive *Frailea* plants grow in humid

places, sheltered by rocks, grass and mosses. There are a few bushy opuntias in the north and some tree-like *Cereus xanthocarpus* with long flowers and coloured fruits [Fig.28]. Their ripe fruits provided a tasty lunch for Massimo and his fellow explorers.

He drew his story to a close with images of some non-cactus native flora: the bulbs *Zephyranthes candida* and a hippeastrum, a datura (family Solanaceae), also scenes of large pine plantations obliterating cactus habitats. The final images were of massive wigginsias growing near the Rio Negro and going 'full circle' large clumps of *Gymnocalycium uruguayensis* subsp. *melanocarpum* before signing off with armadillos, spiders and a *Crotalus* snake. Ivor thanked Massimo for his insights into Uruguayan habitats and we retired for tea.

After the short break Ivor introduced a well-known explorer 'double-act' Aldo and Daina Delladdio, who were to show us 'More Mexico'. Aldo's photography is first class and he showed two hundred views of landscapes, plants, flowers and other facets of selected journeys. Having whetted our appetites with a fine *Ariocarpus scaphirostris* in flower he went on to show a scintillating mix of white-spined cacti including *Echinocereus niveosus*, *Escobaria laredoi* [Fig.29], and *Epithelantha micromeris*. The 'very common *Thelocactus bicolor*' looked well with bright flowers and drew admiring gasps; then coryphanthas, echinocerei, mammillarias and turbinicarpus reflected the diversity of Mexican cacti. The target of one particular journey was *Turbinicarpus*

Photo: A&D Delladdio



Fig.30 *Escobaria laredoi* General Cepeda, Coahuila, Mexico



Fig.30 *Turbinicarpus mandragora* Sierra de Parras, Coahuila, Mexico

Photo: A&D Delladdio

Photo: A&D Delladdio

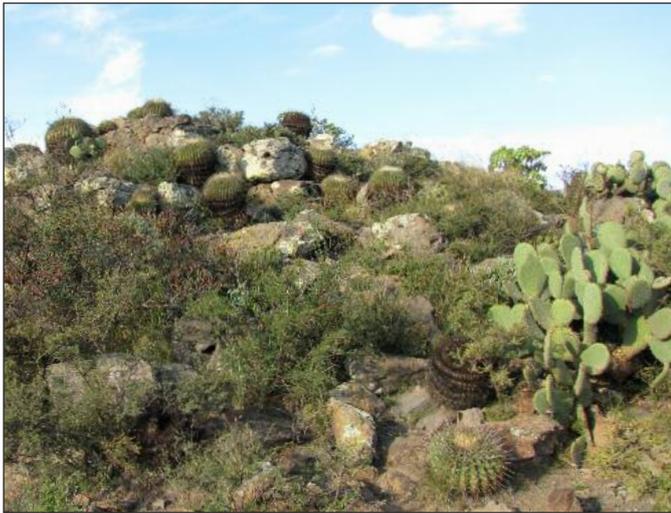


Fig.31 Hillside with *Ferocactus histrix* & opuntias, Salinas de Hidalgo, San Luis Potosi, Mexico



Fig.32 *Epithelantha ilariae* Bustamante, Nuevo León, Mexico

Photo: A&D Delladdio

(*Gymnocactus*) *mandragora* [Fig.30] and there was a healthy population at one site. On the return journey Aldo showed pictures crossing a dry 'lagoon' that was hampered by large cracks in the ground!

Then to San Luis Potosi to see more ariocarpus plants, *Coryphantha macromeris*, the recently discovered, diminutive *Lophophora alberto-vojtechii*, which grows with ariocarpus in dry clay, and *Echinomastus unguispinus* subsp. *loui*. Near Tula in Tamaulipas we saw sites with many more ariocarpus plants; obvious and cryptic, large and tiny, in and out of flower; also some hybrids, but all beautiful in their own quite restrained way. Then Hidalgo beckoned with an unusual cristate *Turbinicarpus krainzianus minimus* that drew varied reactions. I appreciate a nice cristate, but this one did look odd, possibly owing to its small stature. Low hillsides were dotted with

large *Ferocactus histrix* and other cacti [Fig.31] and, no doubt, other smaller cacti nestling beneath shrubs and rocks. Finally on this journey Aldo found *Echinocereus pulchellus* in an *Agave* plantation because it was bearing its large, bright flowers.

Some non-cacti made appearances in the Barranca de Meztlán, Hidalgo: echeverias, *Bombax ellipticum*, ocotillo, bromeliads, but cacti soon re-asserted their presence with sights of beautiful *Turbinicarpus horripilus* plants. Nuevo León was the next destination to see *Gymnocactus beguinii* and *Turbinicarpus booleanus* growing in almost pure gypsum. Further journeys revealed acharagmas, mature *Astrophytum asterias* and *Astrophytum capricorne*, ancistrocacti, epithelanthas, and more escobarias; all traditional Mexican gems that many growers appreciate. Another highlight was a fine pale-yellow flowering



Fig.33 *Gymnocalycium ragonesei*, south of Recreo, Catamarca, Argentina

Epithelantha ilariae [Fig.32], another one of Aldo's 'targets' that looked similar to *E. bokei* and was named by Davide Donati, who spoke at our 2012 Explorers weekend.

Periodically Aldo fails to locate his target plants. One such journey was to find *Mammillaria luethyi*, during which he 'enjoyed' a puncture as well; all part of the explorer's experience. Further trips revealed more Mexican favourites including *Turbincarpus hoferi* at Aramberi, *Neolloydia conoidea*, *Mammillaria albicoma*, *Leuchtenbergia principis*, *Echeveria unguiculata*; and Aldo completed his programme with, inevitably, with another massive *Ariocarpus* accompanied by sustained applause.

After a very intensive day the explorers sat down for an excellent dinner. The menu was a mushroom and brie tartlet, chicken breast with Mediterranean vegetables, and chocolate torte all partnered with many bottles of Chilean nectar. This would sustain us for the evening programme, the well-established traditional appearance of Trevor Wray. He said to me before the weekend "I am not sure I can keep this up – I will just have to keep travelling." We had nothing to fear, since Trevor had only said a little about his last Andean trip when we enjoyed his 'Spanish lesson' last year. There was another tradition to observe: the evening session was to be chaired by Martin Lowry, who quietened the rowdier elements so Trevor could tell us more about his 'Andean Antics'.

Trevor began by showing an *Anacampteros* in a teapot followed by a few slides from his



Fig.34 *Gymnocalycium spegazzini* ring crest at the Quebrada del Toro, Salta, Argentina

Explorers-9 programme (see 2013 report) to orientate the audience. Then he explained the unique selling point of a trip with ten people, led by Guillermo Rivera: "Two Andes crossings for the geology and scenery, 111 stops, 138 'species' – what was not to like?" "Each species cost me about £28 and I took 5,000 pictures." The first few Argentinian plants included *Gymnocalycium ragonesei* [Fig.33], another parasitic *Tristerix* sp. (with true leaves, possibly *T. penduliflorus*), lots of bromeliads and two epiphytes – *Lepismium* and *Pfeiffera*. A large *Gymnocalycium spegazzini* with blue fruits drew admiring reactions before we were shown fields of *Echinopsis pasacana* in the Quebrada del Toro and more longer-spined gymnocalyciums. An unusual ring cristate plant of *G. spegazzini* was a talking point [Fig.34], as were the *Eriosyce* (*Pyrrhocactus*) *umadeave* and *Blossfeldia liliputana* nestling in rocky cracks.

Trevor recounted some on-line feedback concerning a hotel visited before the Andes crossing that was quite clear: "We had nothing to eat, the coffee machine did not work. Worst, when we entered the room, the heating did not work, we got a quartz heater, we die of cold. Place to forget."

Going into Chile we appreciated the fantastic geology and scenery of the Valle de la Luna, San Pedro de Atacama. The El Tatio geysers locality featured *Cumulopuntia boliviana ignescens* amongst the tufts of grass at 4.300m (14,100ft) together with the rare *Azorella compacta*. Thence to Copiapo country, where all the species Trevor saw were bearing



Photo: Trevor Wray

Fig.35 *Copiapoa cinerea* subsp. *krainziana* Quebrada San Ramon, Chile (note the mist rolling in)

flowers. Memorable shots of large, ancient *Copiapoa cinerea* clumps in the Quebrada San Ramon were followed by yet more large clusters of copiapos, including *C. cinerea krainziana* [Fig.35], and a diminutive *Calandrinia*. More gasps of pleasure greeted eriosyce plants and general amusement followed at images of explorers climbing rocks prompting the question “Do you have another shirt?” Trev’s riposte was “They are all the same pattern!” Further discussion of the precise identity of particular plants led to a put-down from the back of the room “You can’t have hybrids of one species, you fool.” Suggestions about a fly pollinating a large copiapoa prompted more heckling “No, its just sitting around”; and a cristate was compared to Jonathan’s images of ‘Smiler’ by “No it’s the brother ‘Misery’, or maybe it was upside down?” The evening session is always exuberant.

The ‘camanchacas’ or cloud banks roll in from the Pacific Ocean [see Fig.35] and reduce visibility very quickly. Interesting road signs were translated with our elementary knowledge of Spanish gained last year! Many more copiapos followed including *C. hypogea* and *C. laui* and various species growing



Photo: Trevor Wray

Fig.36 *Tephrocactus bonnieae* west of Fiambalá, Catamarca, Argentina

sympatrically. Then a magnitude 6.8 earthquake, 45km (28miles) deep, hit northern Chile some 100km (60miles) south of Copiapo. Trevor eventually realised that it wasn’t a train or the hotel lift and went outside to buy a toothbrush. When he reached the shops their stock was all on the floor, including the wine in the supermarket. Then his tour re-crossed the Andes back into Argentina with sights of snow-clad peaks and a remote border post close to 4,390m (14,400ft). Trev turned to opuntoids, notably *Tephrocactus bonnieae* [Fig.36], with its peculiar surface texture and

Photo: Andrew Gdaniec



Fig.37 *Escobaria vivipara*, Weir Bridge, Milk River, Alberta, Canada

Photo: Andrew Gdaniec



Fig.39 *Opuntia humifusa*, Point Pelee National Park, Ontario, Canada

subterranean areoles. *Tephrocactus geometricus* plants with pink and white flowers, *T articulatus*, *T. weberi* continued this theme.

Finally Trevor reached the end of his tour in spiny 'chaco' vegetation with *Stetsonia coryne*, *Cleistocactus baumannii*, and many Tillandsias. Martin thanked Trevor for a most instructive and entertaining programme.

Hazel and John sent me relevant feedback. One said: "I had been looking forward to Trevor's Saturday evening session and as usual he delivered even better than I hoped. His presentations are going from strength to strength." The other added: "The accompanying 'Greek chorus' to some talks got out of hand a few times, but was noticeably and thankfully less intrusive when the more technical talks were given. Perhaps a limit of interruptions per-person, per-talk to half a dozen ought to be imposed, with an ejection

Photo: Andrew Gdaniec



Fig.38 *Opuntia xcolumbiana*, Lytton, British Columbia, Canada (on the hill behind the petrol station)

seat implemented when exceeded." Hmm, maybe it should be excused on Saturday evening after a good dinner?

Brendan contacted me to say: "My daytime slot was cancelled due to time constraints, but I gave my talk after normal proceedings had finished on Sat night. Half the audience came back in and an interesting drink-fuelled debate took the talk well over the half hour it should have taken." I am sorry to have missed it, but I am certain it was great fun. The breaks and the bar are key parts of the event that encourage informal conversations. This was evident in the feedback to me from Terry "I also enjoyed meeting several cactus enthusiasts for the first time; it was a great weekend"; and from Hazel: "I was delighted to meet quite a few new people who I hadn't had the chance to get to know before and to learn a lot from them."

The Sunday morning session was chaired by Pete Arthurs who welcomed a regular Explorers attendee, Dr Mats Hjertson from Uppsala University in Sweden, to give his programme 'A Cactus trip to Canada'. Mats explained he travelled with Andrew Gdaniec for three weeks in May/June-2012 to seek populations of the five (or maybe six) taxa known from Canadian habitats. They visited three provinces: British Columbia and Alberta in the west and Ontario in the east. Some results of this journey were reported in the RHS Plantsman magazine (Gdaniec 2014). The first views were of regions near Fort St. John at 56°N, the northernmost recorded cactus habitat in the world. Views of boreal forest

and hills did not suggest suitable habitat, but on more open, grassy slopes they found *Opuntia fragilis* in a number of south-facing locations. The Royal Botanic Garden in Vancouver featured a rock garden with cacti and herbarium specimens of *O. fragilis*.

Mats travelled east of Vancouver to the Thompson-Nicola district, but local signs were of limited value: 'Local Hazards: be cautious of strong currents in the Thompson River; watch for cactus when out walking; wasps; remember to be sun safe.' The explorers found *O. xcolombiana*, and Mats showed us images showing the variety of the flowers. Finally a 'pink-flowered opuntia' was revealed to be the delightful, semi-deciduous *Lewisia rediviva*: one explorer's joke on another! Journeying further east to Alberta to see *Escobaria vivipara* they crossed the Rockies to reach flat, featureless landscapes en route for more the broken terrain of Dinosaur Park. There *Opuntia polyacantha* grows at the northern bound of its range as well as *Escobaria vivipara* [Fig.37].

Driving back towards British Columbia a tornado warning signalled an intense thunderstorm and later they were stuck in traffic hampered by the deep snowfall. Mats commented "It was no problem whatsoever; you have to know how to drive in snow, like in summer in Sweden!" Cue much laughter and the question "So what's the winter like there?" They investigated an area to check a reported location of *Pediocactus robustior* (= *simpsonii*) in the Midway Mountains foothills, near Christina Lake. However this proved fruitless and, having seen more *O. fragilis*, the poor weather forced abandonment of that particular quest. Explorers have to cope with disappointment too. However they did find some other nice plants on a hill behind a petrol station that might have been *O. xcolombiana* [Fig.38].

The final part of the trip was in Ontario province, eastern Canada. Images of neat lawns at the Toronto Botanical Gardens, the majestic Niagara Falls, local birdlife and butterflies preceded Point Pelee, the southernmost tip of mainland Canada. This, and Pelee Island, are the only known Canadian localities for *Opuntia humifusa* [Fig.39]. Further east we saw another locality for a small-



Photo: Thomas Linzen

Fig.40 *Mammillaria bertholdii*, Oaxaca, Mexico

bodied, sterile (or male) clone of *O. fragilis*, from a quite rocky habitat. This eastern form of *O. fragilis* appeared quite different from those plants we saw from the western habitats earlier in Mats' excellent introduction to the cacti of Canada.

Peter thanked Mats for showing us plants from an area seldom reported. Then the technological magic carpet moved from the cool north to warmer climes of Mexico with the ever reliable Explorer Chris Davies. His programme was to be 'Other genera in Mexico', but Chris commenced with details of three 'new' Mammillarias: *M. huntiana* from west of Ciudad Victoria, *M. bertholdii* from Oaxaca with pectinate aeroles [Fig-40], and *M. hermosana* from Zacatecas, all three reported in 2014. Detailed discussions followed, on the relationships to other species, ranks and habitat details.

Then Chris moved on to his main subject: "*Coryphantha*, a genus often overlooked, complex to identify and with many variable species." He has seen roughly half the 54 species and subspecies on his explorations to date. Chris commented he knew of few good generic collections in UK and since some plants' spination changes between juvenile and adult they can be misidentified very easily. He traversed the genus alphabetically from *C. clavata* to *C. vaupeliana*. He said plants from this genus generally prefer quite open habitats amongst sparse grasses, not the more rocky places where he hunts for mammillarias. A number of *C. cornifera* featured, with and without central spines of various colours.



Fig.41 *Coryphantha cornifera*, Peñamiller, Queretaro, Mexico, growing with *Lophophora diffusa* & *Mammillaria parkinsonii*



Fig.42 *Coryphantha erecta*, a form lacking central spines

Chris found a neat example on an open, rocky slope at Peñamiller, Queretaro [Fig-41] growing with *Lophophora diffusa* and *Mammillaria parkinsonii*. The widespread *C. delicata* was extremely variable and the audience agreed with Chris when he said: "It is not surprising that names have been given to these plants in the past, which really are quite confusing. If you look at the synonymy lists in *Coryphantha* there are armfuls; it is even worse than in *Mammillaria*!" In fact people were unusually quiet when challenged to offer identifications for some of the plants in Chris's programme. JP quipped: "After a while they become bl***y coryphanthas." However larger plants of *C. difficilis* and nice clumps of *C. durangensis* were appreciated, as were smaller *C. echinoidea* and *C. echinus* plants. By contrast large, chunky *C. erecta* clumps at Metztitlan, Hidalgo were very green, but Chris showed a

different form lacking central spines growing amongst rocks in Queretaro [Fig.42].

Large *C. georgii* plants in San Luis Potosi bore a few characteristically striped flowers. Chris apologised for the paucity of flowers in his photographs; he had not visited at the best time for coryphanthas. He continued through the species, highlighting neat young plants of *C. nickelsae*, the long, narrow tubercles of mature *C. octacantha*, and two different forms of *C. pallida* growing in very gritty soils. *C. recurvata* and its subspecies were variable, the nicest form extending into southern Arizona. Chris completed his tour with *C. salinensis* and *C. vaupeliana*, followed by four 'unknowns', all of which the assembled company failed to identify. He vowed to spend time seeking the other twenty-seven species next time he visits Mexico. Peter thanked Chris for showing us some interesting plants that many growers ignore.

Following a group photograph on the terrace and morning coffee, John Arnold embarked on more tales from the trip he, Trevor, Don and others took with Guillermo Rivera in early 2013. 'Aspects of Argentina' was to encompass complementary views to those Trevor showed after dinner on Saturday. He promised "Plenty of gymnos because it was a great thrill to see in habitat plants that I grow in the greenhouse." True to his word John started with *G. capillaense*, *mostii*, *bruchii*, *monvillei*, *amerhauseri* all amongst grasses and rocks close to Cordoba. *Echinopsis aurea* and *Parodia mammulosa* looked very healthy; there had been considerable rainfall during their tour. Many images of *Gymnocalycium calochlorum* were accompanied by John commenting "I love calochlorum." One wag at the back responded: "We can tell."

Opuntia quimilo and *Stetsonia coryne*, both in flower, grew beside the road, with yet more gymnos including *G robustum*. "Why would you call it robustum?" "Because it is robustum." Then to *G. ragonesei*, which we saw in Trevor's programme, though people did enjoy seeing them again. Massive clumps of large *Echinopsis bruchii* [Fig.43] and *E. formosa* were very sculptural and obviously thriving. *Acanthocalycium variiflorum* preceded the first of many *G. spegazzinii*. John had

searched for seeds without success. This stimulated Massimo to comment that he had gathered unripe fruits, grafted them and successfully produced viable seed. Dramatic hillsides with *Echinopsis atacamensis pasacana* plants [Fig.44] were always appreciated and provided contexts for the closer views of the plants.

More *Eriogyne*, *Parodia* and *Echeveria* plants surrounded by rocks were followed by a variegated *Echinopsis terscheckii*. More *Tunilla*, *Cumulopuntia* and *Tephrocactus* plants caused debate on identities before John showed a photograph of him sitting, gazing appreciatively at a fine *Eriogyne umadeave*: I believe he would have wished still to be there! Views of *Denmoza rhodacantha* drew a memorable programme to a close and those present applauded warmly.

Paul Hoxey was our last speaker of the morning. He set forth to complete the story of his three-week Peruvian trip to that most interesting area, the Rio Marañon valley. He started with a scree-fall following heavy rain, blocking the road completely. They spent a

night in the car, inspecting the cliffs above “anxiously”. The following morning like true explorers, while waiting for the road-clearance gang, they investigated the local cacti. Paul compared a spiny *Browningia* seedling with the naked adult plants bearing nocturnal, bat-pollinated flowers. They were still open in the morning and attracted carpenter bees. His eye was attracted to an apparently dwarf form of

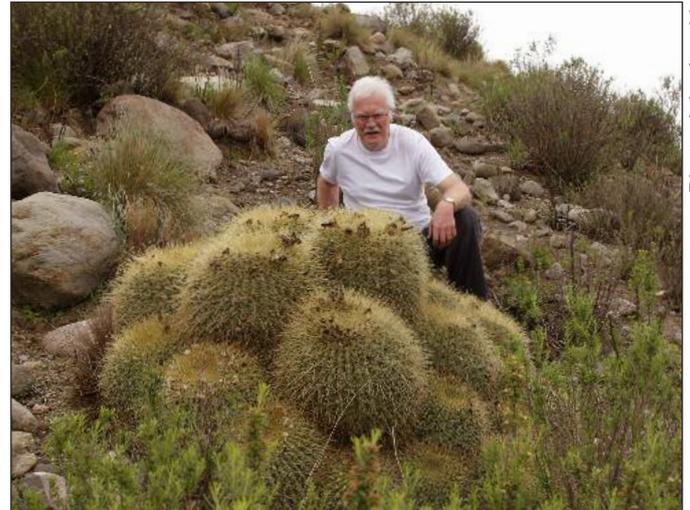


Photo: John Arnold

Fig.43 *Echinopsis bruchii* 'amaichensis' JLA13030.02 north of Tafi de Valle, Tucuman, Argentina, on the dry side of pass at 2919m



Photo: John Arnold

Fig.44 *Echinopsis atacamensis pasacana*, JLA13440.02 north of Puerta Tastil, Salta, Argentina 2794m

Photo: Paul Hoxey



Fig.45 *Espostoa* aff. *ruficeps* PH1074.01. Road to Huacrachuco, Huánaco, Peru 2240m

Photo: Paul Hoxey



Fig.46 *Matucana rebutiiflora* PH1078.01. Near Sihuas, Ancash, Peru 3100m (type locality)

Espostoa ruficeps, less than 2m tall and with extensive brownish cephalaria [Fig.45]. Later on they found *Matucana hoxeyi*, which Paul warned us, is somewhat cold-sensitive, preferring a minimum temperature of 10°C (50°F). Flowering grafts of this were snapped up eagerly from the sales table.

The following day they saw *Matucana rebutiiflora* at its type locality [Fig.46] with its red, bee-pollinated, actinomorphic flowers,

unusual for this genus. They found many more plants on the slopes near the road, easy to spot with their vibrant, scarlet flowers.

Further along the road they found large clumps of *Thrixanthocereus senilis* and possible hybrids of *T. senilis* x *Espostoa ruficeps*. There was evidence of flowering, but no evidence of pollination, indicating possible sterility. Paul showed details of the cephalia and stem transverse sections to compare the two species with the hybrid. More hybrids followed, this time *Thrixanthocereus senilis* x *Matucana comacephala* plants with rings of flower remains on imposing 2m (6ft 6in) tall stems. Moving on to Pomabamba stands of bright, pink-flowered bulbs (probably of family Amaryllidaceae) echoed the hues of the *Matucana comacephala* flowers. Beyond the village they found more matucana plants, which Paul has flowered in UK and bears lustrous orange flowers. Maurice commented: "I have grown plants from seed collected nearby and the plants bear red, orange or yellow flowers."

Moving to the Rahuapampa valley Paul showed the rugose-leaved *Peperomia maijeri*

(named for Robert Maijer), *Matucana paucicostata*, more *Espostoa ruficeps*, *Thrixanthocereus cullmannianus*, and many probable hybrids. There is considerable variability of appearance in many of these species: which causes conundrums for aspiring taxonomists! Near the small village of Llamellin, on low hills, some 400-500m (1,300-1,600ft) above the river there were nice, hirsute, flowering *Matucana comacephala* plants over 0.5m (1ft 6in) tall [Fig.47]. Further on “The doorways in the ‘no star’ hotel were about 4ft (1.2m) tall and even Chris had to duck!” The following morning any discomfort was soon forgotten by the distant sight of Huascarán in the Cordillera Blanca, which is Peru’s highest point [Fig.48]. Paul brought his intriguing account to a close with views of *Matucana oreodoxa* plants showing different flower colours and two views of the same plant group in habitat twelve years apart: the plants had changed only slightly. An inquisitive camelid was the cue for more well-earned applause.

Graham Charles chaired our final session; he welcomed Massimo Meregalli from Turin and his second programme, which he forecast would feature advice on how to go about finding where to explore for plants in habitat:

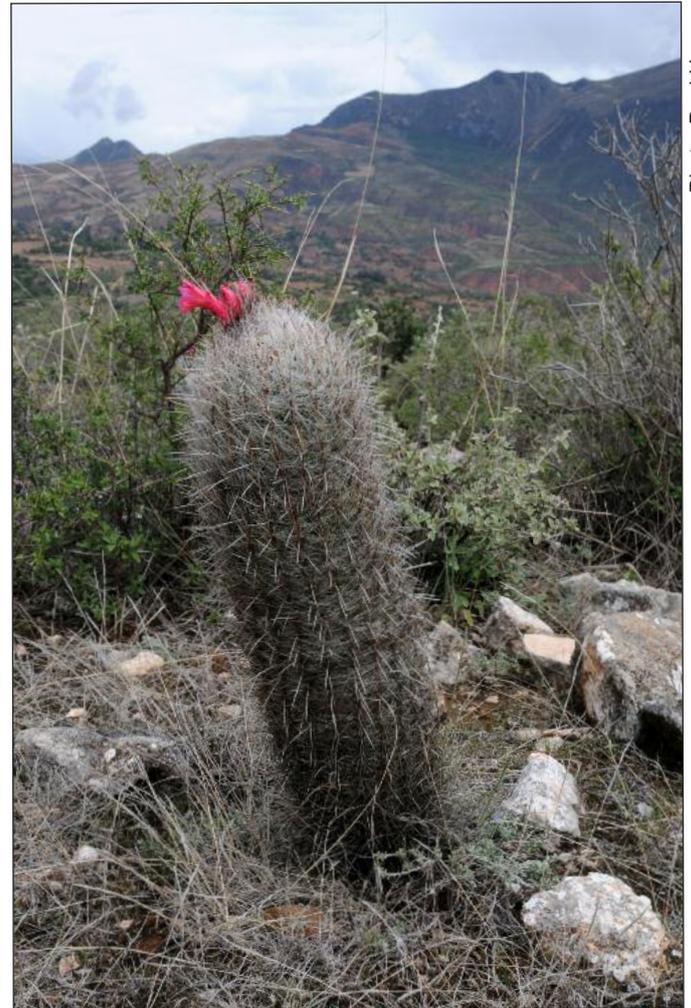


Photo: Paul Hoxey

Fig.47 *Matucana comacephala* PH1096.01. Road to Llamellin, Ancash, Peru 2800m



Photo: Paul Hoxey

Fig.48 The view up the Rio Puccha towards Huascarán in the Cordillera Blanca, Peru



Fig.49 *Gymnocalycium schmidianum* subsp. nov. 5km W Taton > Rio Grande, N. Fiambalá, Catamarca, Argentina 2010m, on dry mountain slope among scattered shrubs

and so it proved. Massimo began by explaining his interest in *Gymnocalycium* and explained the Schütziana website and free online journal, picking up the theme that Ivor expounded the previous day. He said an essential enhancement will be to develop the information in various languages. This is vital owing to the growing interest in cacti in many South American countries.

He went on to explain how global mapping applications can assist in determining “Where to go?” If you plot known *Gymnocalycium* habitats there is a close correlation with the road network. So how can you look for other, similar, but unexplored habitats? Massimo took us on some trips starting with satellite images on Google Earth, identifying ‘potentially interesting’ areas, moving through the local scrub, finding new plants and completing the story with publication of a new taxon via the website. Recent enhancements in satellite mapping resolution have helped detailed analysis of target areas in the Sierra de los Quinteros north of Sierra de Malanzan. When on the ground, knowledge of the geology helped Massimo locate and, after study, publish *Gymnocalycium kroenleinii* subsp. *funettae*. A similar story followed in the Sierra Comechingones, between La Cruz and Merlo in Córdoba, using a road improved specially for a car rally! The result of their explorations was that one of Massimo’s colleagues named *Gymnocalycium meregalli* in his honour.



Fig.50 *Gymnocalycium tillianum* 10km E Rosario de Colana, Catamarca, Argentina 2350m on western slope of the Sierra de Ambato

Journeying to Taton, a rugged area of dunes in Catamarca in the Andean north-west, Massimo followed a road to an Estancia at 3,400m (11,150ft) to the east of the flatter area. The plants he found there appear to be related to *Gymnocalycium schmidianum* [Fig.49]. Changes in soil type can also be discerned on satellite maps, this can be another indicator of places to explore, or not! He went on to show a number of plants initially considered to be *Gymnocalycium capillense*, but differences in seed morphology suggested otherwise in some cases. The approach can also be used to attempt re-discovery of taxa described long ago, rare, or thought lost owing to habitat damage. He searched for Rausch’s *Gymnocalycium tillianum* (now considered a synonym of *G. oenanthemum*) at the appropriate altitude around 2,500m (8,200ft) in the Sierra Ambato. He found quite a few plants, including some in flower [Fig.50]. Massimo explained some new project ideas in Argentina that await funding. Graham thanked him for his most enthusiastic and thoughtful presentation, embracing the use of modern technology to help us understand species variation and distribution.

Our final exploration was another South American: ‘From the Chaco to the Puna: cactus habitats in north-western Argentina’. First Boris showed us a few views of his workplace, the Herrenhausen Gardens in Hannover, Germany. Then, after the essential orientation maps and images of travel hazards, he embarked on an overview of interesting

Photo: Boris Schlumberger



Fig.51 *Gymnocalycium saglionis*, Quebrada de Las Conchas, Salta, Argentina

habitats and plants. He headed for the Chaco, a vast area generally covered in low, scrubby vegetation and short trees. It is characterised by low-altitude, modest rainfall and moderate temperatures with clearly discernable seasons; warmer, wetter summers and cool, dry winters. Attractive acacia, mimosa and bougainvillea flowers were followed by *Ceiba* (*Chorisia*) and *Pereskia sacharosa* trees. Then various echinopsis and gymnocalyciums plants in dryer places, including *Gymnocalycium saglionis* with ripe fruits [Fig.51] in the Quebrada de Las Conchas, north of Cafayate, Salta. More flowers and fruits followed on *Cleistocactus baumannii* and *Parodia setifera* from further north.

Boris has very sharp eyes for interesting flowers and showed us bromeliads, bulbs, orchids, oxalis and shrubby apocynads. The odd root-parasite *Prosopanche americana* (family Hydnoraceae, see Heide-Jørgenson 2008) parasitizes *Prosopis*, a type of Mesquite in the family Fabaceae. There are also most interesting habitats where the Chaco meets the foothills of the Andes.

The Sierras generally have more annual rainfall than the surrounding Chaco (>500mm/20inch) and have their 'own' species and forms, for example different flower colours of *Gymnocalycium monvillei*, *Echinopsis aurea* and variable *Dyckia* & *Tillandsia* species. The Sierra Ancaste featured *Trichocereus terscheckii* and *Parodia mammulosa* with deep red flowers and *Soehrensia pumila*.



Fig.52 *Rebutia senillis* Quebrada Escoipe, Salta, Argentina

Moving to dryer Monte habitats with annual rainfall of 30-200mm (1-8in), Boris explained they are characterised by *Larrea* (creosote bush). We saw very cryptic *Gymnocalycium ferrarii* in a gravelly substrate and also *Soehrensia angelesiae* growing with terrestrial bromeliads. A number of taxa found here also grow in the Sonoran desert. Habitat destruction by local people harvesting firewood expose the cacti, that die exposed to the sun and wind. The locals have planted olives and vines that further affect the indigenous flora. Closer to the Andes there are east-west oriented 'interandean' valleys, each of which has a particular flora. Frequently the north- and south-facing valley sides have different characteristics and plants. One nice example was *Rebutia minuscula* [Fig.52] from rocky walls in the Quebrada Escoipe, Salta. More echinopsis, opuntias and tephrocactus complemented by wildflowers of many other families completed this part of the overview.

The wetter (annual rainfall up to 2000mm /80in) Yungas habitats were next, with many epiphytes, fuchsias, peperomias, podocarps and orchids. By contrast the dry Prepuna, with less than 200mm (8inch) rainfall, is characterised by open, treeless plains, except for *Echinopsis atacamensis* and *Echinopsis pasacana*. Smaller plants also grow there including *Echinopsis haematantha* [Fig-53] beside a 'nurse bush' and small bulbs that can withstand cold, dry periods. We were warned never to touch *Caiphora* species, rosette to low-growing plants of the family Loasaceae.

Photo: Boris Schlumberger

Photo: Boris Schlumpberger



Fig.53 *Echinopsis haematantha* with flower detail inserted on left

Photo: Boris Schlumpberger



Fig.54 *Soehrensia formosa* subsp. *korethroides* Cerro Negro, Catamarca, Argentina with Boris Schlumpberger

They have stinging hairs that cause discomfort for many days! Thence to Puna, the Altiplano in Salta, up to higher altitudes (4,000m /13,100ft) where the cold, dry conditions favour short or part-buried plants like *Maihueñosis subterranea* and other small opuntoids. Boris concluded his wonderful overview with high-altitude wildflowers and fine *Soehrensia formosa* subsp. *korethroides* [Fig.54], before winding up with some images of the local fauna.

Graham thanked Boris for showing us many ‘other’ plants and for saying: “That looked nice, but I don’t know what it is.” He went on “So thanks to all our speakers, especially Massimo and Boris for making this weekend special for everyone.” “Thank you all in the audience for your continued support; I hope you will be able to come again next year.”

Following my request on Friday evening, one explorer wrote to me: “The talks were excellent, especially the opportunity to hear Boris Schlumpberger discuss his *Echinopsis* group research. Overall the journey took us from British Columbia to Argentina with stops in Mexico, Peru, Chile and unusually, Uruguay. Brilliant! The company was great,

the food was excellent and the beer and wine most welcome! In short, the best cactus event I have ever attended."

Another summed up some highlights: "The weekend was fun and I particularly enjoyed Massimo Meregalli's infectious enthusiasm and obvious deep knowledge as well as Boris Schlumpberger, who I thought was an outstanding speaker. Closer to home, Ivor's presentation was most thought-provoking and merits further thought and work in the BCSS. For sheer entertainment it would be hard to beat Jonathan Clark's 3D adventure in Chile."

One (printable) anecdote I received was: "The funniest thing was another lady attendee saying to me when I arrived "Oh, I am so pleased to see you here!" I was delighted to be so welcomed – and then she added "Because it sometimes seems like a men's club here and it is really good to have another lady present!" That was certainly interesting and I can see what she means. There's a certain 'blokeiness' to the weekend and macho competitiveness around the naming of plants: do any of them really know?" Boom, boom... I expect that there are still some explorers on the lawn below the terrace [Fig.55 (Blumenfeld 2011)] deep in a debate about phylogeny; will we see them next year at the eleventh meeting?

Graham our 'benevolent dictator' also sent me a message after the weekend. He wrote: "My own thoughts are really about how the Explorers weekend provides something that the mainstream Society events do not. How do we keep our interest when over fifty years of experiences reduce the opportunity for the thrill of something new? For me, it is widening the scope, new places, unusual plants, scientific investigations, evolution, ecology, geology, travel, history and literature; also the use of new technologies this year including the internet, website resources, DNA-analysis, 3D-photography and Google Earth mapping. Thanks to the speakers who took the time to put together and present their talks, we certainly had the boundaries pushed out."

I agree with Graham and thank all Explorers who sent me feedback and photographs. I am indebted to the speakers, who agreed I could use pictures from their



Photo: Roland Tebbenham

Fig.55 Explorers deep in conversation?

programmes to illustrate this piece. Their observational and photographic skills allowed the audience to appreciate the finer points of two thousand pictures and unforgettable 3D-film of plants, wildlife, people and landscapes. I have been privileged to remind myself of an intensive weekend and assemble this summary.

[Roland Tebbenham](#)

Literature/References:

1. BINT, P. & CROOK, I. (2014) Innovation in Branch meetings using new technology. *CactusWorld* **32**(2): N12 [ISSN 1751-1429]
2. BLUMENFELD, H. (2011) 'The Space Within' Patinated Bronze. *Leicester University Sculpture Exhibition 2014*
3. COMPAGNUCCI, L.A. & ALSINA, A.R. (2012) A new species of *Brachyglossia*. *Rev. Mus. Argentino Cienc. Nat.*, n.s. **14**(2): 357-362 [ISSN 1514-5158 (print) ISSN 1853-0400 (on line)]
4. GDANIEC, A. (2014) Hardy Cacti of Canada. *The Plantsman* (New Series) **RHS 13**[3]: 158-163 [ISSN 1352-4186]
5. HEIDE-JØRGENSEN, H.S. (2008) *Parasitic Flowering Plants*. Brill p.61 – *Tristerix* & p.239 – *Prosopanche* [ISBN 9789004 167506]
6. SCHLUMPBERGER, B.O. & RENNER, S.S. (2012) 'Molecular Phylogenetics of *Echinopsis* (Cactaceae): Polyphyly at all levels and convergent evolution of pollination modes and growth forms. *American Journal of Botany* **99**(8): 1335-1349

AN OPUNTIA-LIKE EPIPHYTE: *Schlumbergera opuntioides*

It is not often we hear about epiphytic cacti in their natural environment. Andreas Hofacker tells us about his observations in habitat of a species we rarely see in culture

Photographs by the author unless otherwise stated

Photo: Rebecca Hofacker



Fig.1 Campos de Altitude with gallery forest at the Gruta do Cruzeiro, location of *Schlumbergera opuntioides* at Ibitipoca at 1656m.

Schlumbergera is a genus of small to medium sized epiphytic or lithophytic cacti with six (Hunt, 2006; Korotkova et al., 2011) or respectively eight (Calvente, 2011) recognized taxa. The occurrence of the genus is restricted to the southeastern part of Brazil in and around the mountain range of the Serra do Mar in the states of São Paulo, Rio de Janeiro, Minas Gerais and Espírito Santo. The Serra do Mar runs parallel to the Atlantic Ocean coast with a length of about 1500km from the coastline up to about 2800m. It was covered by tropical rain forest, called Mata Atlântica (Atlantic Forest). Due to urbanization and

deforestation, most of the forest cover is destroyed today and replaced by agricultural land. Only in few parts, mostly difficult to access or not usable for any form of cultivation, are parts of the original vegetation preserved. In this vegetation many epiphytic cacti are found such as *Schlumbergera opuntioides*. This species was described in 1905 by A. Löfgren and P. Dusén as *Epiphyllum opuntioides*. The location where it was collected is not indicated. But because it was described in a paper about the Flora of the Serra de Itatiaia (in 1905 written 'Itatiaya'), it is to be assumed that the plants were collected in the Serra de Itatiaia.



Fig.2 In full bloom, *Schlumbergera opuntioides* in the Serra de Itatiaia (2298m).



Fig.3 Only few spines on the stem segments, *Schlumbergera opuntioides* in the Serra de Itatiaia (2298m).



Fig.4 *Schlumbergera opuntioides* in the Serra de Itatiaia (2298m).



Fig.5 An unripe fruit of *Schlumbergera opuntioides* in the Serra de Itatiaia (2298m).

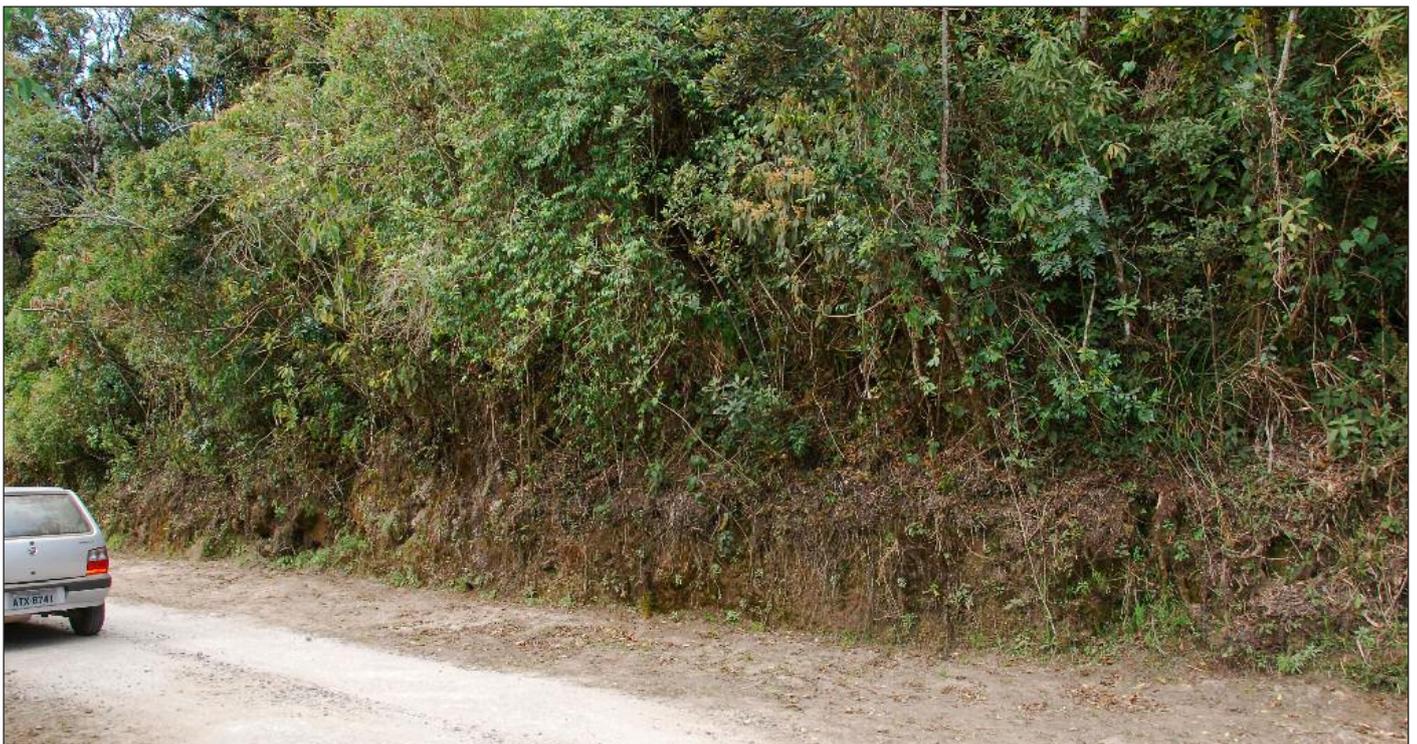


Fig.6 View in the Floresta Ombrófila Densa Altomontana, location of *Schlumbergera opuntioides* in the Serra de Itatiaia at 2218m.



Fig.7 *Schlumbergera opuntiooides* on the base of a tree in the Serra de Itatiaia at 2298m.

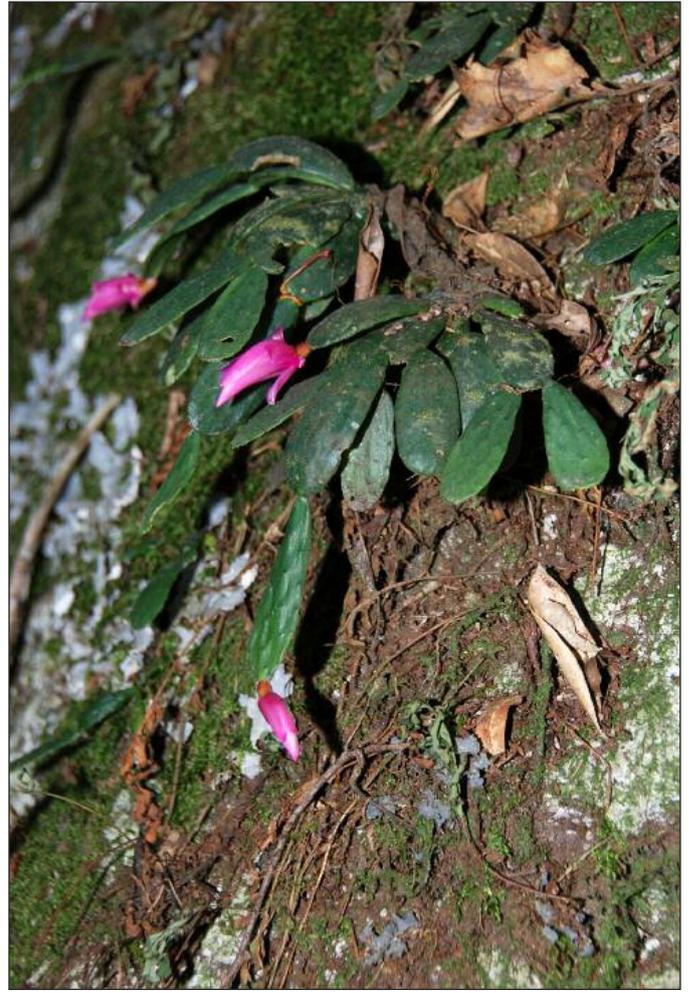


Fig. 9 Flowering even though it grows in the shade, *Schlumbergera opuntiooides* in the Serra de Itatiaia at 2210m.



Fig.8 *Schlumbergera opuntiooides* growing lithophytically in the Serra de Itatiaia at 2210m.

This mountain range is located on the border between the states of Rio de Janeiro and Minas Gerais. Today, most parts of this range are a National Park, the Parque Nacional de Itatiaia, which was already founded in 1937. The highest peak is the Pico das Agulhas Negras (2787m), the 6th highest peak of Brazil.

At altitudes above 2200m begins the vegetation type of the Campos de Altitude, which is characterized by a savanna-like, more or less high grass and bush vegetation. At altitudes between 1600m and 2400m there is the Floresta Densa Ombrófila Alto Montana (Ferreira dos Santos, 2000), part of the Mata Atlântica. This vegetation type is characterized by trees up to 20m high with abundant undergrowth of different height levels and relatively high humidity. The cover is greater than 90%. The temperatures in the range of Floresta Densa Ombrófila Alto Montana can approach freezing during the entire winter. In



Fig.10 Often growing terrestrially, *Schlumbergera opuntiooides* at Campos do Jordão (1961m).

the Campos de Altitude, frost is regularly observed during winter in the morning, rarely even snow, but it usually melts again during the day. The temperatures during the day then again reach 20°C. In Floresta Densa Ombrófila Alto Montana, temperatures should, however, not undergo such a deep decline as the forest and the dense vegetation also form a certain heat storage and protection. Minimum temperatures of 5°C are nevertheless reached. The rainy season is in the South American summer (during the months of December to March), in winter there is only little or no rainfall.

In this cloud forest is found *Schlumbergera opuntiooides*.

At altitudes between 2210m and 2298m, four populations were observed by the author on the western edge of the National Park over a distance of about 3km, but probably it is a single larger population. *Schlumbergera opuntiooides* growing here is terrestrial, as well as lithophytic and epiphytic. At the end of August all plants were in full bloom. In European culture, *Schlumbergera opuntiooides* is flowering from January to March (Tismer, Höller & Barthlott, 1999). Remarkable are the large, almost completely spineless stem segments. Only on the old segments, which quasi form the stem of the plant, are there spines. Frequently, individual segments are covered with moss, algae or lichens due to the high humidity. All the plants grow in shade and are reached by direct sunlight only for a short part of the day. Even plants that are



Fig.11 Growing in the Floresta Densa Ombrófila Alto Montana, *Schlumbergera opuntiooides* at Campos do Jordão (1961m).



Fig.12 Growing epiphytically together with *Hatiora herminiae*, *Schlumbergera opuntiooides* at Campos do Jordão (1795m).

completely in the shade open their flowers. The epiphytic and lithophytic plants usually grow in moss beds. Obviously the seeds find good germination conditions here. The terrestrial plants grow in a humus substrate, a layer comprising leaves, occasionally together with mosses and grasses.



Fig.13 The Floresta Ombrófila Densa Altomontana at Ibitipoca (Gruta dos Três Arcos) at 1674m.



Fig.14 A short-spined form of *Schlumbergera opuntioides* at Ibitipoca (Gruta do Cruzeiro).

Schlumbergera opuntioides grows here solitarily, but in larger groups.

The southern-most part of the distribution area (about 80km south of the Serra de Itatiaia) is the region around Campos do Jordão, a city in the state of São Paulo. Here there are also remnants of the Floresta Densa Ombrófila Alto

Montana to be found where *Schlumbergera opuntioides* occurs. Over a distance of about 9km, three localities at altitudes of 1795m, 1801m and 1961m were visited which perfectly match the ones in the region around Itatiaia. Also in Campos do Jordão, *Schlumbergera opuntioides* grows as a terrestrial, epiphytic and lithophytic plant. Again, larger populations could be found.

A third area where *Schlumbergera opuntioides* can be observed is the Parque Estadual do Ibitipoca in the south of the state of Minas Gerais in the municipalities of Lima Duarte and Santa Rita do Ibitipoca, about 120km northeast of Itatiaia. This State Park was already visited in 1822 by the French botanist Auguste de Saint-Hilaire (1779–1853) and is part of the Serra do Mantiqueira. The actual reserve is 1923 hectares in size and is located at altitudes of 1200–1784m. The dominant vegetation type is, at least in higher parts,

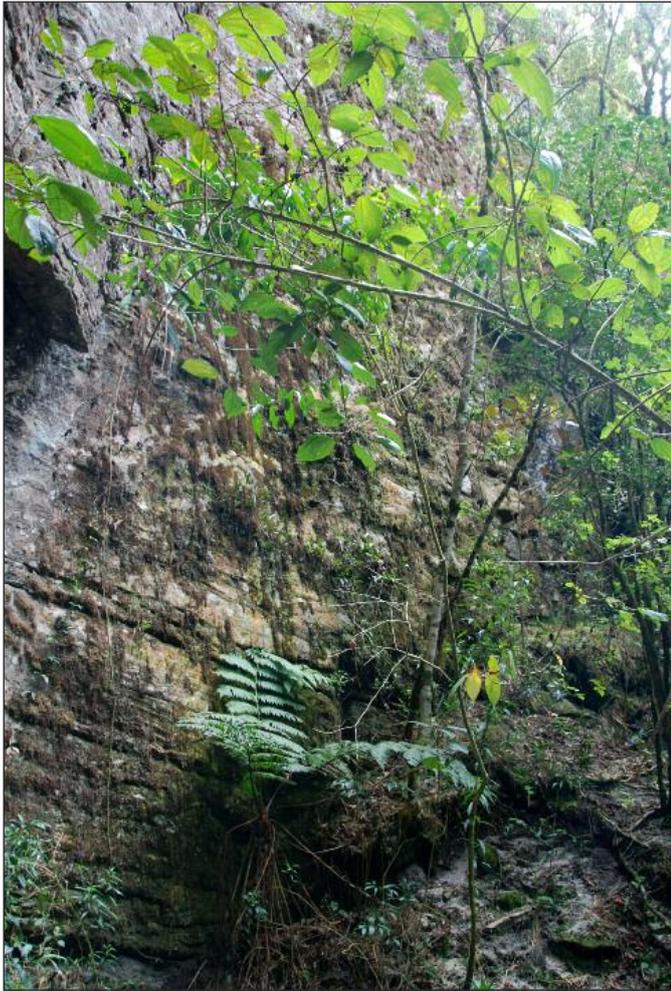


Fig.15 The mentioned stone wall at Gruta dos Três Arcos, Ibitipoca, location of *Schlumbergera opuntiooides* at Ibitipoca at 1656m.

Campo Rupestre or Campo de Altitude. Here we find occasionally gallery forests which are often assigned to the Floresta Densa Ombrófila Alto Montana (Rodela, 1998).

In the western and northern part of the park *Schlumbergera opuntiooides* grows in two places (Gruta do Cruzeiro and Gruta dos Fugitivos or Gruta dos Três Arcos).

Schlumbergera opuntiooides grows in the Parque Estadual do Ibitipoca epiphytically and lithophytically at altitudes of approximately 1650m. In contrast to the localities to Itatiaia and Campos do Jordão, only a few plants have been found so far. The plants are also much smaller and more spiny than the ones which grow on the further southwest locations. Particularly noteworthy is the locality Gruta dos Três Arcos. This is, as the name suggests, three side by side or one behind the other arches, sunk into the landscape with a height of about 20m. The area around the arches is



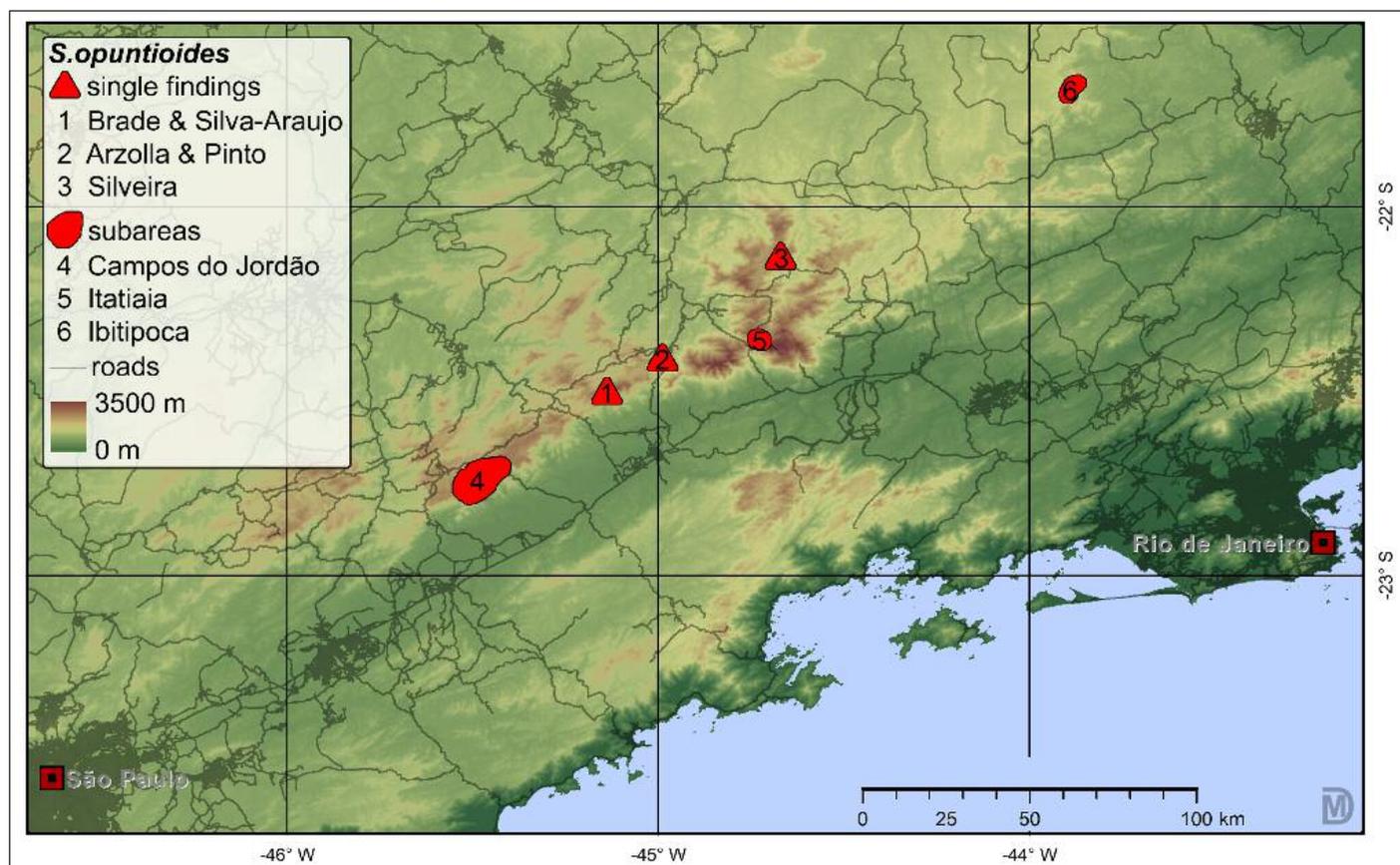
Fig. 16 *Schlumbergera opuntiooides* on a stone wall at the Gruta dos Três Arcos, Ibitipoca.

densely forested. The walls of the rocks are covered here with ferns and mosses. On one of these cliffs is also growing *Schlumbergera opuntiooides*. The plants will only receive direct sunlight extremely rarely and are also very dark. Nevertheless, they are small, compact and dense spined.

The climatic conditions are very similar to Itatiaia and Campos do Jordão despite the slightly lower position.

Beside these three larger areas where *Schlumbergera opuntiooides* was found, there are single collections between these areas (Hofacker, 2012).

Schlumbergera opuntiooides is a remarkable species but unfortunately rarely seen in cultivation. It first grows upright and starts hanging after the development of 3–4 stem segments. The largest plants which have been seen by the author were about 60cm long. The segments themselves are oval to ovate, olive-

Fig.17 Distribution map of *Schlumbergera opuntiooides*.

Created by Dr. Detlev Metzger

green to dark green and up to 8cm long, 4cm wide and 0.75cm thick. On the segments are sometimes weak wooly areoles bearing up to 80 whitish to yellowish, sticky spines. Occasionally, these spines are missing completely. The older segments are rounded in diameter and become woody. These are always spiny. The flowers are purple, zygomorphic and appear at the end of the shoot segments. They reach a length of 6cm and about 4.5cm in diameter. The pericarpel is five to seven edged, as well as the greenish fruits.

The conditions in habitat show us how to grow *Schlumbergera opuntiooides*.

The substrate should be relatively rich in humus, but very permeable to water. Standing water must be avoided. Cultivation should take place in an airy place (in summer, best outside). Prolonged heat and temperatures above 30°C should be avoided. Greenhouse culture in summer is therefore only partly recommendable. As with almost all other species of the genus *Schlumbergera*, the grower will have problems with culture if the plants are kept too warm. In summer, the plants feel

very comfortable in a hanging basket in a tree on the north side of a house. Direct sunlight should be avoided, but morning or evening sun is tolerated.

Watering should be done regularly so that the substrate never dries out completely. Regular fertilizer applications in not too high concentration promote growth. In a relatively short time one stem segment will then develop into a sizeable plant.

Propagation is quickest and easiest done by cuttings, either rooted or grafted. A cutting is relatively easily rooted on Seramis® (Bockemühl, 2010). Propagation by seed is also easily possible, but unfortunately these are rarely available because *Schlumbergera opuntiooides* itself is not self-fertile.

The author thanks Dr. Detlev Metzger for making the distribution map and Graham Charles for checking the English translation.

Literature

BOCKEMÜHL, J. (2010): Bewurzelung von Stecklingen in Seramis® – eine einfache und effektive Methode zur Anzucht

- epiphytischer Kakteen und anderer Pflanzen. – *EPIG* **65**: 16–18.
- CALVENTE, A., *ET AL.* (2011). Molecular phylogeny of tribe Rhipsalideae (Cactaceae) and taxonomic implications for *Schlumbergera* and *Hatiora*. *Molecular Phylogenetics and Evolution* **58**: 456–468.
- FERREIRA DOS SANTOS, R. (2000). Mapeamentos Temáticos, Vegetação, uso e ocupação da terra – in Fundação Brasileira para o Desenvolvimento Sustentável: O Parque Nacional do Itatiaia – *Cadernos FBDS* **3**: 40–47.
- HOFACKER, A. (2012): *Schlumbergera opuntiooides* – Beobachtungen am natürlichen Standort. – *EPIG* **70**: 5–18.
- HUNT, D.R., TAYLOR, N.P. & CHARLES, G. (2006): *The new cactus lexicon*. – dh books, Milborne Port.
- KOROTKOVA, N. *ET AL.* (2011): What does it take to resolve relationships and to identify species with molecular markers? An example from the epiphytic Rhipsalideae (Cactaceae). – *Am. J. Bot.* **98**: 1549–1572.
- LÖFGREN, A. & DUSÉN, P. (1905): *Epiphyllum opuntiooides* Loefgren et Dus. n. sp. In DUSÉN, P.: Sur la Flore de la Serra de Itatiaia. – *Archivos do Museu Nacional do Rio de Janeiro* **13**: 49–50.
- RODELA, L.C. (1998): Cerrados de altitude e campos rupestres do Parque Estadual do Ibitipoca, sudeste de Minas Gerais: distribuição e florística por subfisionomias da vegetação. *Revista do Departamento de Geografia* **12**: 163–189.
- TISMER, G., HÖLLER, W. & BARTHLOTT, W. (1999): Ein Blühkalender der Rhipsalideen. – *Kakt. and. Sukk.* **50**: 241–248.

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Andreas will be one of our guest speakers at the 2015 meeting of the Cactus Explorers Club.

Schlumbergera

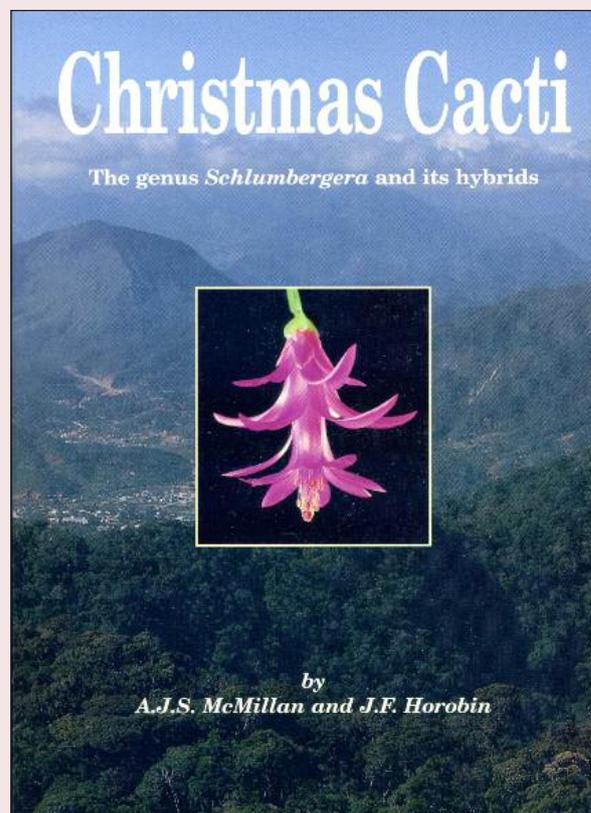
There are two articles concerning the cactus genus *Schlumbergera* in this issue of the **Cactus Explorer**. Whilst reading about these plants, I was fascinated by their habitat, not to mention their complicated taxonomic history.

The book *Christmas Cacti*, volume 4 in the Succulent Plant Research series (1995), is an interesting read and a good account of this popular genus. I say it is popular but actually it is best known as a hybrid house plant and is not often seen in specialist cactus collections.

I particularly enjoyed reading Appendix III of the book. It is an account by David Hunt of his adventures looking for *Schlumbergera* in 1966. It will be very interesting to hear from Andreas Hofacker at the Cactus Explorers Weekend in 2015 who has been exploring in the same region of Brazil.

The book is still available from [Keith's Plant Books](#) and I would suggest a good buy at £20.

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THE POSITION OF PARODIA TURECEKIANA IN THE PARODIA MAMMULOSA COMPLEX

In this article, Giovanna Anceschi & Alberto Magli discuss *Parodia turecekiana* R. Kiesling, part of the *Parodia mammulosa* (Lemaire) Taylor complex.

Photographs by the authors



Fig.1 *Parodia mammulosa* (*turecekiana* populations). Uruguay, Río Negro, Nuevo Berlin. 27 Jan 2014, A&M 966

During the seven months of our 2013/2014 journey, out of the 70 new taxa we investigated in habitat for a forthcoming classification in the Cactusinhabitat system, 11 belong to the genus *Parodia* Spegazzini (precisely, 10 are Andean taxa and one from the Pampa Biome). *Parodia* being one of our genera of preference, during our next journey we hope to find or deepen the knowledge of the last four taxa that will allow us to have a complete overview of *Parodia* s.l., based on study experience in the habitats of all its components.

Parodia turecekiana R. Kiesling was one of our “black sheep”. In fact, before this year’s happy discovery, we failed to find the above mentioned taxon of the Pampa Biome on three occasions. The first time was in November 2008, in Uruguay, Dpt. Río Negro, on Ruta 25, between Bellaco and Young, following the reference *R. Kiesling* 8368 (Kiesling 1995, 67: 18). The second time, again in November 2008, in Uruguay, Dpt. Río Negro, Young, northwest of Young, locality Paso Uleste, in the blanqueales of the Estancia Viejo Pablo. The

third time was in early March 2011, in Argentina, Dpt. Gualeguaychú, northwest of Gualeguaychú, the area where Ruta 14 crosses the Arroyo Gualeguaychú (the type locality), following a note that the late Omar Ferrari marked on our map in July 2007, when we went to La Plata to get to know him. We like to remember his hospitable kindness and contagious enthusiasm when he spoke of cactus populations. That survey, which was carried out in the early days of our third South American journey (2008-2009), was a complete disaster: we forgot the repellent, mosquitoes disfigured us, and we found no trace of the taxon.

This year, the little information available led us to a small town on the Río Uruguay, Nuevo Berlín, known amongst the fans of the genus *Gymnocalycium* Pfeiffer ex Mittler as the type locality of *Gymnocalycium schroederianum* Osten. (UY, Río Negro, nr Nueva Mehlem, Apr 1922, *Schroeder* s.n. in herb. Osten 16.873) (MVM?) (Hunt *et al.* 2006, text: 133). Nueva Mehlem was a large German agricultural colony and around 1865-68, in its surroundings, the village of Nuevo Berlín grew. The references in our possession were: Field Number JPR617: *Notocactus tureczekianus*, Ruta 20, km33, left towards Nuevo Berlín, Paysandú, Uruguay (Ralph Martin's Cacti and Succulent Field Number Finder); and an e-mail from Norbert Gerloff, dated 25/07/2013 who, in reply to our request for information, wrote about the remains of an Espinal on Ruta 20 [between Arroyo Grande and Nuevo Berlín], approximately at km30, where *Notocactus tureczekianus* grew, but where, at the time of his visit, he found only 4-5 plants.

Every taxon which is subject to our studies is important, but for the journey 2013/2014, the Andean parodias and *P. tureczekiana* obviously had the highest priority. So, going up from the Argentinian Pampas, where in January 2014 we worked on a group of taxa of the genus *Gymnocalycium*, before reaching the next taxon of the same genus in the South of Salta Province (i.e. *Gymnocalycium bayrianum* H. Till), we entered Uruguay, specifically looking for *P. tureczekiana*. We were determined to leave Nuevo Berlín only after having located the populations which taxonomically constituted the missing link for our deeper understanding of the relationships within the complex of taxa next to *P. mammulosa*.



Fig.2 Soya bean plantations. Uruguay, Río Negro, Nuevo Berlín. 31 Jan 2014



Fig.3 *Parodia mammulosa* (*tureczekiana* populations). Uruguay, Río Negro, Nuevo Berlín. 27 Jan 2014, A&M 966



Fig.4 Blanqueales in wooded savanna. Uruguay, Río Negro, Young. 16 Nov 2008

This taxon represents one of the five dominant species in *Parodia* Spegazzini. The other four are: *Parodia erinacea* (Haworth) N.P. Taylor (about this taxon, see Anceschi & Magli 2012, 6: 26-33), and *Parodia ottonis* (Lehemann)

N.P. Taylor in the Pampa Biome, as well as *Parodia microsperma* (Weber) Spegazzini and *Parodia maassii* (Heese) Berger, respectively, to the South and to the North of the range of *Parodia* in the Andean zone.

On the 26th of January 2014, we reached Nuevo Berlín during a period of intense subtropical rainfall, and we stayed there until the first of February. The help of two villagers, Mr. Hector Mari and Dr. Werner Folker (whom we warmly thank, together with his family, for having spoiled us so much), was crucial to find the taxon. Thanks to them, we got in touch with a local landowner who, like most of his colleagues, had practically given up cattle ranching to devote almost all of his land to soya bean plantations. It is impressive to see that what used to be grazing land is now covered as far as the horizon by the green seedlings of soya beans [Fig.2]. It is hard to believe that, in just ten years, we could see such big changes in the Uruguayan landscape, which was disfigured in the north mainly by pine and eucalyptus plantations, and in the south by soya beans. Argentine Pampas and those of Rio Grande do Sul in Brazil are unfortunately no less so, despite the agrottoxins which are generously used being universally recognized as very poisonous. However, the profit ratio between cattle and soya beans is 1 to 4: unbeatable. It will be hard for the beloved gaucho culture to survive.

On the 27th of January, after having discarded at a glance the places indicated by the Field Number and by Gerloff (as already exploited and degraded), we entered a plot of land accompanied by the owner himself. After getting completely bogged down with the owner's 4x4, we did not wait to be rescued by tractor but we continued walking attracted by a blanqueal where finally, when the rain paused, we detected a large population of *P. turecekiana* [Fig.3]. We were surprised that, after having failed three times, we could find the taxon that easily.

Along Uruguay's western coast, on the flood plains of the homonymous river, there are areas of wooded savanna [Fig.4] with allomorphic soil (Duran 1985, quoted from Fagúndez 2003: 5). The main characteristic of this kind of soil is the sodium interchangeably, that is sometimes higher than 15% (Dochafour 1984, *ibid.*). This soil composition causes the water absorption capacity to be very limited,

with a high loss of organic matter and clay and a consequent loss of structure that favours surface erosion. The residual sand has the typical white colour that gives these strips of lands their name: blanquelales. The basic material has a sedimentary origin and it generally dates from the Middle Pleistocene to the Holocene (Duran 1985, quoted from Fagúndez 2003: 6). The physicochemical properties of these soils induce the growth of a specific flora, consisting of species which are able to tolerate such a high salinity. Plants (halophytes) adapted in order to withstand the high salt concentration or to resist the toxic action of some of them (Ragonese & Covas 1947, *ibid.*). The forests that grow on these soils are characterized by the presence of tree species such as the "algarrobo" *Prosopis nigra* Hieron, the "ñandubay" *Prosopis affinis* Spreng., which are associated with the "quebracho blanco" *Aspidosperma quebracho-blanco* Schltldl, the "chañar" *Geoffroea decorticans* (Gillies ex Hook. & Arn.) Burkart, the palm "Caranday" *Trithrinax campestris* Drude & Griseb (Chebataroff 1980, quoted from Fagúndez 2003: 5). From a phytogeographical point of view, it should be noted that many of these species are also characteristic of the province of the Espinal (Cabrera 1971, quoted from Fagúndez 2003: 5). Eduardo Marchesi (2013) considers the blanqueales an extension of the Chaco Biome.

The cacti associated with the blanqueales of the Río Uruguay are: *Echinopsis oxygona* (Link & Otto) Pfeiffer & Otto, *Frailea schilinzkyana* (K. Schumann) Britton & Rose, *Gymnocalycium uruguayense* (Arechavaleta) Britton & Rose, *Opuntia elata* Salm-Dyck, *P. erinacea* and *P. turecekiana*. Saying that *P. turecekiana* prefers blanqueales does not absolutely mean that all the blanqueales of the Río Uruguay host the taxon.

This time we visited several blanqueales again, some of which are difficult to access, but the first population we encountered remained the only one. If, and we emphasize if, the taxon is to be distinguished from *P. mammulosa*, the assessment made by Duarte, W. & Kiesling, R. (2013) Vulnerable B1ab (iii, v) on *Parodia turecekiana* for The IUCN Red List of Threatened Species. Version 2014.2: www.iucnredlist.org. (Downloaded on 17/10/2014), and justified with a possible about 20,000km² extension of the taxon's presence, is a little soft. Since the taxon is rare, and since we know that the few



Fig.5 *Parodia mammulosa* (*turecekiana* populations). Uruguay, Rio Negro, Nuevo Berlin. 27 Jan 2014, A&M 966



Fig.6 *Parodia mammulosa* (*turecekiana* populations). Uruguay, Rio Negro, Nuevo Berlin. 27 Jan 2014, A&M 966



Fig.7 *Parodia mammulosa* (*turecekiana* populations). Uruguay, Rio Negro, Nuevo Berlin. 27 Jan 2014, A&M 966



Fig.8 *Parodia mammulosa* (*turecekiana* populations). Uruguay, Rio Negro, Nuevo Berlin. 27 Jan 2014, A&M 966

populations which are known are being stolen by collectors, using the B2 criterion of the Endangered category would have been at least more realistic: "Area of occupancy estimated to be less than 500km²...". In fact, these populations live isolated on some blanqueales which are not land at risk, as they are not cultivatable and therefore not suitable for exploitation. The elements of risk for these populations are rather the scarcity and isolation of the populations and the consequent lack of genetic variability, along with the aforementioned thefts.

Returning to our survey, the blanqueal hosted a large population of *P. turecekiana* (we counted up to 24 specimens in less than one square meter), consisting of individuals of all ages and in good health [Figs.5, 1 & 6]. The largest specimen [Fig.7] measured 8.8 x 10.8cm (h x d). On average, the population showed 13 ribs, 2 more evident and flatter central spines, the lower of which < 3.85cm, 7-10 radial spines,

sometimes acicular, all papyraceous and flexible. Already at a first glance, later confirmed by a subsequent more detailed analysis of the materials, the taxon appeared rather close to *Parodia submammulosa* (Lemaire) R. Kiesling. *P. submammulosa* is a vicariant (geographical race, subspecies, deme) of *P. mammulosa*, still considered as ssp. in the systems of Anderson (2001, 546) and Anderson & Egli (2011, 505), as *Parodia mammulosa* ssp. *submammulosa* (Lemaire) Hofacker, and assimilated among the synonyms of *P. mammulosa* in the system of Hunt *et al.* (2006, text: 221,309) and in our system (Anceschi & Magli 2010,

<http://www.cactusinhabitat.org/index.php?p=specie&id=96&l=en>).

In his publication of *P. turecekiana* (1995, 67: 17-19), Roberto Kiesling indicates that the taxon differs from *P. submammulosa* "in its more depressed body, very dark epidermis,

flexible, unequal and larger central spines, larger flowers of a darker yellow colour, and bell-shaped seeds. *P. submammulosa* inhabits rocky soils in low mountains or hills, whereas *P. turecekiana* lives in clay soil in low lands subjected to flooding." The range indicated for *P. turecekiana* is Uruguay (western part [Río Negro], Argentina (provinces of Corrientes and Entre Ríos) (ibid.: 19) [see Map 1]. Comparing the two taxa [see Table 1], the major differences are, from our point of view, those relating to the central spination and the habitat. The same considerations are made by Hunt *et al.* (2006, text: 224).

In relation to the two central spines, we stress that the semaphoront, i.e. a character present in a discrete and measurable stage in the ontogenetic process of a taxon (Hennig 1966: 6-7, 32-33, 63, 65-67), is evident in *P. turecekiana* especially in the juvenile phase [Fig.8], puberty and early adulthood [Figs.9-10], while older plants [Fig.11] look like *P. submammulosa* [Fig.12]. It should be added, moreover, that the phases where the evidence of central spines is more relevant can also be found in semaphoronts of *P. submammulosa* [Figs.13-14].

Regarding the habitat, for those who distinguish different ssp. within *P. mammulosa*, the ssp. *mammulosa* lives extensively on rocky outcrops in the south of Brazil (Rio Grande do Sul), Uruguay and Argentina [?] (Anderson 2001: 546; Anderson & Egli 2011: 505), at altitudes between 0 and 1500m. asl., and the ssp. *submammulosa* in Uruguay and Argentina (Anderson, 2001: 546) or Uruguay and Argentina (Catamarca, Córdoba, San Luís, Buenos Aires, La Pampa, Mendoza, Río Negro) <1000 m. (Anderson & Egli 2011: 505)[see Map 1].

Still on the subject of *P. submammulosa*, Kiesling, who divides the taxon into two ssp. (*submammulosa* and *minor*), tells us that the type ssp. "[is] Common in the mountains of Córdoba, San Luís, La Pampa and Buenos Aires; also in Río Negro and the Cordilleran foothills of Mendoza. Between 100 to 600m, in mineral-soil rich in organic material. Apparently restricted to a very old Precambrian geologic formation called the

Map 1 (opposite page) Distribution of *Parodia mammulosa* (*mammulosa*, *submammulosa* and *turecekiana* populations), *Parodia mueller-melchersii*, *Parodia maldonadensis* (*neoarechavaletae*), and A&M mentioned in the text. The data are gathered from: Anceschi & Magli's cactusinhabitat.org (downloaded on November 2014); Anderson & Egli (2011); Anderson (2001); Gerloff *et al.* (1995); Hunt *et al.* (2006); Kiesling (1995, 67: 14-22); [Ralph Martin's field number search](#); (downloaded on November 2014).

Sierras Pampeanas." (1995, 67: 14-15). Then he adds that the populations of the ssp. *minor* extend the range of *P. submammulosa* up to the southeast of Catamarca (ibid. 16-17).

Actually some semaphoronts that should characterize the ssp. *submammulosa*, also appear among the populations of *P. mammulosa* in northern Uruguay and Rio Grande do Sul (Brazil) [Figs.15-16], identifying all these populations as the internal vicariant of a single large dominant biological species (i.e. *P. mammulosa*), within which electing distinctive elements is a truly difficult enterprise.

It is true that *P. turecekiana* occupies a distinct habitat from the *mammulosa* and *submammulosa* populations, but we think that one of the characteristics of a dominant species is to expand itself, conquering new territories and adapting itself (if successful) to new environmental conditions. In fact, as we already expressed in relation to the distribution of *Parodia claviceps* (F. Ritter) F.H. Brandt, we think that there must be a spatial continuity between the different populations of a natural species, unless extinctions occurred in the course of its evolutionary history (Anceschi & Magli 2013, 7: 38). The idea is not new, and it is expressed as follows in Darwin's words: "...so in space, it certainly is the general rule that the area inhabited by a single species, or by a group of species, is continuous; and the exceptions, which are no rare, as I have attempted to show, be accounted for by migration at some former period under different conditions [and this is not our case] ... and by the species having become extinct in the intermediate tracts." (1859: 256).

In this context, *P. turecekiana* appears to be the natural transitional element along the coasts of the Río Uruguay, between the populations of *P. submammulosa* of the Sierras Pampeanas in Argentina and those of *P. mammulosa* of the rocky outcrops of the Pampa Biome in Uruguay and southern Brazil [see Map 1]. A west-east direction of the species expansion over time is suggested by the detection of the form *submammulosa* in Uruguay and southern Brazil (see also Gerloff *et al.* 1995: 123), and not vice versa, despite *P.*



Fig.9 *Parodia mammulosa* (*turecekiana* populations). Uruguay, Rio Negro, Nuevo Berlin. 27 Jan 2014, A&M 966



Fig.10 *Parodia mammulosa* (*turecekiana* populations). Uruguay, Rio Negro, Nuevo Berlin. 27 Jan 2014, A&M 966



Fig.11 *Parodia mammulosa* (*turecekiana* populations). Uruguay, Rio Negro, Nuevo Berlin. 27 Jan 2014, A&M 966



Fig.12 *Parodia mammulosa* (*submammulosa* populations). Argentina, San Luis, Inti Huasi. 23 Dec 2013, A&M 934



Fig.13 *Parodia mammulosa* (*submammulosa* populations). Argentina, Buenos Aires, Olavarria, NW of Olavarria. 11 Jan 2014, A&M 957



Fig.14 *Parodia mammulosa* (*submammulosa* populations) Argentina, Buenos Aires, Balcarce, Sierra Barrosa. 15 Jan 2014, A&M 965

mammulosa s.s. [Fig.17] being reported in Argentina (Anderson 2001: 546; Anderson & Eggli 2011: 505). In fact, the few F.N. of *P. mammulosa* (*Notocactus mammulosus* (Lemaire) A. Berger) in Argentina (see Ralph Martin's

Cacti and Succulent Field Number Finder), also indicate areas occupied by *P. submammulosa*, and are probably to be assessed as an attribution error.



Fig.15 *Parodia mammulosa* (*submammulosa* populations) Uruguay, Rivera, Rivera, Represa OSE. 27 Nov 2008, A&M 290 (cactusinhabitat.org 2010)

To be precise, *P. turecekiana* is a weak vicariant of the system, in the sense that, as already mentioned, its survival is at risk, even if our assessment on the conservation status of the populations of *P. mammulosa* to which the taxon belongs, as a whole, remains Least Concern, L.C.

Submammulosa and *turecekiana* populations are internal vicariants of the *P. mammulosa* complex. The first is a strong vicariant, because it does not highlight extinction risks; the second, as already mentioned, is rather weak. To better understand what the vicariance relationship means, we quote Hennig's definition of species: "The species would therefore be defined as a complex of spatially distributed reproductive communities, or if we call this relationship in space 'vicariance' as a complex of vicarying communities of reproduction." (1966: 47). Defining one or more taxa as geographical races, subspecies, demes or populations of a species is recognizing that at least potentially (Mayr 1942: 120) all these components might cross each other as part of the same biological unit. Who does not understand this, did not understand the concept of vicariance, nor the one of ssp. And that is why we do not recognize intraspecific ranks (Anceschi & Magli 2010: 13–14, 18–19; 2013: 35), since we cannot identify the same biological unit with more than one name.

After identifying the internal components of the *P. mammulosa* complex, we would now like to mention those which we consider close relatives of the taxon; i.e. the taxa probably belonging to the same ancestral line with



Fig.16 *Parodia mammulosa* (*submammulosa* populations) Brazil, Rio Grande do Sul, Santana do Livramento, between BR 293 and Cerros Verdes. 11 Nov 2011, A&M 817 (cactusinhabitat.org 2013)

which, despite the morphological and territorial proximity, a potential genetic flow is not evident, or it is not assumed. In our opinion, the taxa related this way are two: *Parodia mueller-melchersii* (Backeberg) N.P. Taylor and *Parodia maldonadensis* (Herter) Hofacker, a taxon we accepted instead of the perhaps best known *Parodia neoarechavaletae* (Havlicek) D.R. Hunt. For the case, see Hofacker (2012, 4: 26-34) and Anceschi & Magli (2013: 76).

The distribution areas for the first taxon are: Brazil (Rio Grande do Sul) and Uruguay (Hunt *et al.* 2006); for the second, Uruguay and neighbouring Argentina [?] (Anderson & Egli 2011). Some researchers located populations of *P. maldonadensis* (*neoarechavaletae*) in Brazil (Rio Grande do Sul) (Hofacker 2000, 10:12). Both taxa live on rocky outcrops similar to those of



Fig.17 *Parodia mammulosa* (*mammulosa* populations). Uruguay, Rivera, Tranqueras, Valle del Lunarejo. 23 Nov 2006, A&M 76 (cactusinhabitat.org 2010)



Fig.18 *Parodia mueller-melchersii*. Uruguay, Tacuarembó, Tambores. 22 Nov 2008, A&M 284 (cactusinhabitat.org 2010)



Fig.19 *Parodia mueller-melchersii*. Uruguay, Tacuarembó, Tambores. 22 Nov 2008, A&M 284 (cactusinhabitat.org 2010)



Fig.20 *Parodia mueller-melchersii*. Uruguay, Rivera, Tranqueras, Valle del Lunarejo, Mario Padern property. 21 Nov 2006, A&M 73 (cactusinhabitat.org 2010)



Fig.21 *Parodia mueller-melchersii*. Uruguay, Rivera, Tranqueras, Valle del Lunarejo, Mario Padern property. 21 Nov 2006, A&M 73 (cactusinhabitat.org 2010)

	<i>Parodia mammulosa</i> including			<i>Parodia mueller-melchersii</i> incl. <i>gutierrezii</i> , <i>rutilans</i> , <i>veeniana</i> and <i>winkleri</i> populations	<i>Parodia maldonadensis</i> (<i>neoarechavaletae</i>)
	<i>mammulosa</i> populations	<i>submammulosa</i> populations	<i>turecekiana</i> populations		
habit	simple	simple	simple	usually simple	simple
stem	globose to elongate [3-] 8 [-23] x 5-13 [-17.5]cm (h x Ø)	depressed-globose, to globose to elongate (4-) 8x5 -13cm (h x Ø)	depressed-globose, to globose 3-5 [-8,8] x 5-10 (-15)cm (h x Ø)	globose to cylindrical 5-8 (-24) x 5-6 (-11)cm (h x Ø)	globose 3-10 [-13.5] x 10 [-11]cm (h x Ø)
ribs	13-21 (-25), with large chin-like tubercles between the areolas	±13 with rounded prominent tubercles	12-13	(16-) 20-24, with small rounded tubercles	13-21 rounded and forming low tubercles
flowering areoles	very dense pale wool and few dark bristles	very dense pale wool and few dark bristles	[woolly at the stem apex]	round, white woolled, later becoming bare	densely woolly stem apex
spines	central 1-4, 2(-4)cm or more, straight, stout and stiff, usually 1 strongly flattened; radial [4-] 8-30, 0.5-1cm, acicular or stouter	central 1-2 (-3), ca 1.5-2.5cm wide, flattened, in part twisted; radial 5-10, ca. 0.7cm	central 1-2, 1-4cm, unequal, flexible, flattened, sometimes twisted; radial 6-9 [-10], 1-3cm, unequal, flexible	central 1-3, 1.5-2 [-2,3]cm, straight, subulate to acicular, not flattened; radial 12-18 or more, < 1cm, slender-acicular	central 1-4, < 3cm, stout, porrect, subulate, flattened; radial 5-9, 1-2cm, thinner
flower	subapically, ca. 3.5-5.5cm long, pale to golden yellow, rarely pale pink	subapically, 4cm long, yellow	subapically, 3-4 x 4.5cm (h x Ø), yellow	subapically, ca. 3 (-4) x 4.5-5 (-6)cm (h x Ø), pale golden yellow to citron yellow, to reddish, to rose, to carmine red	3-4 x 3-4cm (h x Ø), golden yellow
fruit	globose at first, elongating at maturity, thin-walled	fusiform, ca. 2x1cm (h x Ø), dry, dehiscent basally	globose, dry, ca. 1.6 x 1.4cm (h x Ø)	elongating at maturity, 1.5-2 (-3) x 0.7cm (h x Ø), thin walled, dehiscent basally	partly immersed in the densely woolly stem apex, fleshy at first, later drying and becoming hollow, partly naked, 2 x 0.5cm (h x Ø), white
habitat & distribution	Rocky outcrops of the Pampa Biome at elevations from 0 to 1500m asl. Native: Argentina [?], Brazil (Rio Grande do Sul), Uruguay	A very old Precambrian geological formation, part of the Pampa Biome, called the Sierras Pampeanas, in mineral soil rich of organic material, at elevations from 100 to 1000m asl. Native: Argentina (Buenos Aires, Catamarca, Chubut, Córdoba, La Pampa, Mendoza, Rio Negro, San Luis), Brazil (Rio Grande do Sul), Uruguay	Extension of the Chaco Biome. Blanqueales in wooded savanna, on floodplains with allomorphic soil, at elevations from 0 to 50m asl. The basic materials has a sedimentary origin dated from the Middle Pleistocene to the Olocene. Native: Argentina (Corrientes, Entre Ríos), Uruguay (Río Negro)	Rocky outcrops of the Pampa Biome at elevations from 150 to 300m asl. Native: Brazil (Rio Grande do Sul), Uruguay (Artigas, Maldonado, Paisandú, Rivera, Salto, Tacuarembó)	Rocky outcrops of the Pampa Biome (mainly in the costal area of southeast Uruguay), at elevations from 0 to 250m asl. Native: Argentina [?], Brazil (Rio Grande do Sul), Uruguay (Maldonado, Rocha)

Table 1. Comparative scheme of taxa.

The data are gathered from: Anceschi & Magli Field Notes 2006, 2008, 2011, 2014, unpubl. data [data on square brackets]; Anderson & Egli (2011); Anderson (2001); Backeberg (1966); Hunt *et al.* (2006); Kiesling (1995, 67: 14-22); Van Vliet (1974, 53 (9): 171), (1975, 54 (7): 136). Internet sources: [Ralph Martin's Cacti and Succulent Field Number Finder](#) (Downloaded on 24/10/2014); The IUCN Red List of Threatened Species. Version 2014.2. <www.iucnredlist.org> (Downloaded on 17/10/2014).

P. mammulosa: the first, at elevations between 150 and 300m asl.; the second, between 0 and 250m asl (Map 1). Both are considered “weak” in the risk assessments made for the IUCN Red List of Threatened Species. Version 2014.2.

Parodia mueller-melchersii is considered Endangered A4ac by Larocca, J. *et al.*; *Parodia maldonadensis (neoarechavaletae)* Vulnerable B1ab (i, iii, v) by Larocca, J. & Duarte, W. <www.iucnredlist.org>. Downloaded on 17 October 2014. We observed cases of sympatry of *P. mammulosa* with the first taxon, but none with the second. Our taxonomic understanding of *P. mueller-melchersii* matches with that of Hunt *et al.* (2006), that considers synonyms of the taxon to be *Parodia mueller-melchersii* ssp. *winkleri* (Vliet) Hofacker, *Parodia mueller-melchersii* ssp. *gutierrezii* (W.R. Abraham) Hofacker, *Parodia rutilans* (Däniker & Krainz) N.P. Taylor, and *Parodia rutilans* ssp. *veeniana* (Vliet) Hofacker, a group of taxa still accepted in the systems of Anderson (2001) and Anderson & Eggli (2011). As already pointed out in a comment on the topic in our first booklet (Anceschi & Magli 2010: 26-28), we consider the group of mentioned taxa to be identifiers of different ontogenetic stages of *P. mueller-melchersii*. In this regard, we also noted how Backeberg’s description (1936: 254, 415) which is almost unchanged with respect to the sizes in Hunt *et al.* (2006, text: 221) and describes a taxon of about 8cm in height, 6 in diameter, with a pale yellow central spine with dark edges, [Fig.18] should be expanded to include populations with specimens reaching 20cm and more in height [Fig.19]; specimens with a completely red central spine [Fig.20]; and other specimens showing both characters [Fig.21].

In the same comment (*ibid.*), we stressed that populations of *P. mueller-melchersii* sometimes live in sympatry with those of *P. mammulosa*, like for instance in 2006 in Uruguay, Dpt. Tacuarembó, in the area between Valle Edén and Tambores, A&M 280. We also found that some forms of the two taxa are very similar to each other, so that in these forms the differences that should identify *P. mueller-melchersii* [Fig.22] from *P. mammulosa* [Fig.23], i.e. the larger number of ribs of the first taxon (21-24 vs. 13-21), in addition to the not flattened central spines and the thinner radial spines, cannot always be considered distinctive elements. Now we might ask ourselves how, apart from the alleged

potential of crossing (or not), it would possible to distinguish between all the populations in question, an internal vicariant of a species from a close relative of the same species (external from this).

In this and other cases highlighted in our latest booklet (Anceschi & Magli, 2013b: 31–32), if molecular tests are missing or insufficient, to investigate such low levels of genetic relationships, comparative holomorphy between semaphoronts (Hennig 1966: 66–67) can be used as an accessory science to recognize genetic relationships that are to be presented in the taxonomic system. In the case of *P. mammulosa*, we are led to assess the populations *submammulosa* and *turecekiana* as internal vicariants of the system because, as already mentioned, the semaphoronts which are identifiers of the two groups are actually found even among populations of the type species. In the case of *P. mueller-melchersii* and *P. maldonadensis*, however, increased genetic autonomy is inferred by the fact that some semaphoronts which are identifiers of the taxa are not found in *P. mammulosa* (i.e. the *winkleri* and *veeniana* forms of *P. mueller-melchersii*, and the woolly crown of *P. maldonadensis*). We arrive now to the other taxon that we consider to be close to *P. mammulosa*, namely *P. maldonadensis*. The question that arises spontaneously is: why a *Wigginsia* among the closest relatives of *P. mammulosa*? The answer is: because it is a *mammulosa* s.l. with a very woolly stem apex [Figs.24–25; 26–27] [Table 1].

Now that we reached the conclusion, let us go back to the beginning. To date, probably the most comprehensive study of molecular analyses carried out on the higher taxa (genera, subtribes, tribes and subfamilies) of Cactaceae by Nyffeler & Eggli appeared in Schumannia (2010, 6: 109-149). Its results substantially confirm the positions of the previous literature (Anderson 2001, 2005; Hunt *et al.* 2006) about the formation of certain macro-genera, i.e. *Echinopsis* Zuccharini s.l., *Eriosyce* Philippi s.l., *Parodia* Spegazzini s.l. Among these, in the tribe Notocactae Buxbaum, in particular the authors confirm that *Parodia* Spegazzini s.l. (Nyffeler 1999: 7: 6-8) is a well-supported monophyletic clade, which includes the previous segregated genera *Brasilicactus* Backeberg, *Brasiliparodia* F. Ritter, *Eriocactus* Backeberg, *Notocactus* (K. Schumann) Frič, and *Wigginsia* D.M. Porter (*ibid.*).



Fig.22 *Parodia mueller-melchersii*. Uruguay, Tacuarembó, old road between Valle Eden and Tambores. 22 Nov 2008, A&M 280 (cactusinhabitat.org 2010)



Fig.23 *Parodia mammulosa* (*mammulosa* populations) Uruguay, Tacuarembó, old road between Valle Eden and Tambores. 22 Nov 2008, A&M 281 (cactusinhabitat.org 2010)



Fig.24 *Parodia maldonadensis* (*neoarchavaletae*). Uruguay, Rocha, P. N. Santa Teresa. 19 Dec 2006, A&M 97 (cactusinhabitat.org 2010)



Fig.25 *Parodia mammulosa* (*mammulosa* populations). Brazil, Rio Grande do Sul, Lavras do Sul, RS 630. 5 Nov 2011, A&M 802 (cactusinhabitat.org 2013)



Fig.26 *Parodia maldonadensis* (*neoarchavaletae*). Uruguay, Maldonado, Piriapolis, Cerro del Toro. 18 Nov 2011, A&M 832 (cactusinhabitat.org 2013)



Fig.27 *Parodia mammulosa* (*submammulosa* populations). Argentina, San Luis, El Volcan, Campo la Sierra. 06 Jan 2014, A&M 949

In addition, the authors point out again what was already expressed by Nyffeler in Cactaceae Consensus Initiatives (ibid.), namely that "A strongly supported subclade consisting of *Notocactus* s.s., *Parodia* s.s. and *Wigginsia* (subclade 7) supports the hypotheses that the Pampa taxa of *Notocactus* s.s. and *Wigginsia* might be more closely related to *Parodia* s.s. from the eastern slopes of the Andes than they are to the other Pampa taxa of the former genera *Brasilicactus* and *Eriocactus*..." (Nyffeler & Eggli 2010).

The close relationship between *Notocactus* s.s. and *Wigginsia* is pointed out again in Anderson & Eggli (2011: 495). Regarding what we are interested to note in this article, this means that *P. maldonadensis*, despite its prominent apical woolliness, can be considered a close relative of *P. mammulosa*. Following this line, we also know that more recent molecular analysis of *Echinopsis* (Schlumpberger & Renner 2012), clearly demonstrated that a cladistically correct interpretation of the molecular data in the direction of a monophyletic genus *Echinopsis* (Anceschi & Magli 2013b: 20-29; 2013c, 31: 24-27), leads to the assimilation in *Echinopsis* s.l. as currently conceived (Anderson 2001; Hunt *et al.* 2006; Anderson & Eggli 2011), of *Cleistocactus* Lemaire, *Denmoza* Britton & Rose, *Haageocereus* Backeberg, *Weberbauerocereus* Backeberg and 12 other genera of the tribe Trichocereae (Anderson 2001, 2005; Hunt *et al.* 2006; Anderson & Eggli 2011) or sub-tribe Trichocereinae (Nyffeler & Eggli 2010). Among these, *Espostoa* Britton & Rose and *Vatricania* Backeberg show a lateral cephalium, a character that in the past was considered distinctive at a genus level. Now, if cephalia, as well as as floral characters and pollination syndromes, are no longer indicative to define genera (Nyffeler & Eggli 2010; Schlumpberger & Renner 2012), having already found the molecular proximity of *Notocactus* s.s. and *Wigginsia*, why should we be surprised by the idea of a parental proximity between *P. mammulosa* and *P. maldonadensis*? The holomorphic proximity (i.e. morphological, ecological, chorological and genetical) (Hennig 1966: 7,32) of the two taxa must also be taken into account.

In their attempt to give new life to the genus and distinguish it from the other parodias, Albesiano & Kiesling (2009) defined pseudocephalium as a character of *Wigginsia*

that other authors identify as dense apical woolliness or woolly crown (Backeberg 1966; Anderson 2001; Hunt *et al.* 2006; Anderson & Eggli 2011). The pseudocephalium putatively protect buds, flowers and fruits, etc., but as we have already seen, the compared holomorphic morphology between *P. mammulosa* and *P. maldonadensis*, together with the results of 15 years of molecular analysis, lead us in another direction.

Implications of this article for the genus *Parodia* Spegazzini

To be transferred to the synonymy of *Parodia mammulosa*:
Parodia turecekiana
Notocactus turecekianus
Notocactus mammulosus ssp. *turecekianus*

Bibliography

- ALBESIANO, S. & KIESLING, R. (2009). Rehabilitation and synonymy of *Wigginsia corynodes* (Cactaceae). *Haseltonia* 15: 33-40.
- ANCESCHI, G. & MAGLI, A. (2010). *South America 2005/2010*. Bologna. MODO infoshop.
- ANCESCHI, G. & MAGLI, A. (2012). *Parodia turbinata* (Arechavaleta) Hofacker: a confused taxon. *The Cactus Explorer* 6: 26-33. [epublished].
- ANCESCHI, G. & MAGLI, A. (2013a) Observations concerning *Parodia* (*Eriocactus*). *The Cactus Explorer* 7: 27-39. [epublished].
- ANCESCHI, G. & MAGLI, A. (2013b). *South America 2011/2013*. Bologna. MODO infoshop.
- ANCESCHI, G. & MAGLI, A. (2013c). The new monophyletic macrogenus *Echinopsis*. No risk of paraphyly, and the most convincing hypothesis in phylogenetic terms. *Cactaceae Systematics Initiatives* 31: 24-27.
- ANDERSON, E.F. (2001). *The Cactus Family*. Portland, Oregon: Timber Press.
- ANDERSON, E.F. (2001). *The Cactus Family*. trs. EGGELI, U. (2005). *Das grosse Kakteen-Lexikon*. Stuttgart: Eugen Ulmer KG.
- ANDERSON, E.F. (2001). *The Cactus Family*. trs. EGGELI, U. (2011). *Das grosse Kakteen-Lexikon*. Stuttgart: Eugen Ulmer KG.
- BACKEBERG, C. & KNUTH, F.M. (1936). *Kaktus - ABC*. Copenhagen: Nordisk Forlag.
- BACKEBERG, C. (1966). *Kakteenlexikon*. trs. GLASS, L. (1977). *Cactus Lexicon*. Poole: Blandford Press.
- CABRERA, A.L. (1971). Fitogeografía de la Republica Argentina. *Bol. De la Soc. Arg. Botánica*. Vol. XIV, Nº 1-2. Bs. As.
- CHEBATAROFF, J. (1980). La vegetación del

- algarrobal, monte espinoso del litoral, I. Divisiones de la Provincia fitogeografica Uruguayense. *Res.Jorn.C.Nat.1*, Montevideo. Pág. 77-78.
- DARWIN, C.R. (1859). *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*. Mineola, New York: Dover Publications, INC. (2006).
- DOUCHAFOUR. (1984). *Edafogenesis y clasificación*. Ed. Masson, Barcelona.
- DURÁN, A. (1985). *Los Suelos del Uruguay. Editorial Hemisferio Sur*. Pág. 257-273. Mdeo.
- FAGÚNDEZ, C. (2003). La Vegetación de un Blanqueal en el Litoral Oeste del Uruguay: Efectos de la Hormiga *Atta vollenweideri* Forel. *Licciatura en Ciencias Biológicas, opción Botánica*. Departamento de Ecología, Facultad de Ciencias, UDELAR [internet source].
- GERLOFF, N., NEDUCHAL, J. & STUHLIK, S. (1995). *Notokakteen. Gesamtdarstellung aller Notokakteen*. Ludwigsburg: Kveten Verlag.
- HENNIG, W. (1966). *Phylogenetic Systematics*. trs DAVIS, D. D. & ZANGLER, R. Urbana: University Illinois Press.
- HOFACKER, A. (2000). Distribution records for various *Parodia* taxa: some corrections and additions. *Cactaceae Systematics Initiatives* 10: 12.
- HOFACKER, A. (2012). Some notes on *Wigginsia corynodes*. *The Cactus Explorer* 4: 26-34. [epublished].
- HUNT, D.R. ET AL. (2006). *The New Cactus Lexicon*. Milborne Port: DH Books.
- Kiesling, R. (1995). Argentine notocacti of the genus *Parodia*. *Cactus and Succulent Journal (U.S.)* 67: 14-22.
- MARCHESI, E. (2013). *Flora y vegetación del Uruguay*. (internet source).
- MAYR, E. (1942). *Systematics and the Origin of Species*. New York: Columbia University Press.
- NYFFELER, R. (1999). *Notocactus* versus *Parodia* — the search for a generic classification of the subtribe Notocactinae. *Cactaceae Consensus Initiatives* 7: 6-8.
- NYFFELER, R. & EGGI, U. (2010). A farewell to dated ideas and concepts: molecular phylogenetics and a revised suprageneric classification of the family Cactaceae. *Schumannia* 6: 109-149.
- SCHLUMBERGER, B. O. & RENNER, S. S. (2012). Molecular phylogenetics of *Echinopsis* (Cactaceae): Polyphyly at all levels and convergent evolution of pollination modes and growth forms. *American Journal of Botany* 99(8): 1335-1349.
- RAGONESE, A. & COVAS, G. (1947). La Flora Halófila del Sur de la Provincia de Santa Fe. *Rev. Darwiniana*, t.7, n° 3. Rep. Argentina.
- VAN VLIET, D. J. (1974). *Notocactus veenianus*. *Succulenta (Nederlands)* 53(9): 171-173.
- VAN VLIET, D. J. (1975). *Notocactus winkleri*. *Succulenta (Nederlands)* 54(7): 136-139.

Websites

<http://www.cactusinhabitat.org>

www.iucnredlist.org

Ralph Martin's Cacti and Succulent Field Number Finder

<http://ralph.cs.cf.ac.uk/Cacti/finder.html>



TRAVEL WITH THE CACTUS EXPERT (12)

Zlatko Janeba continues his journey through the American South West with spectacular scenery and wonderful plants.

Photographs by the author, desert-flora@seznam.cz



Fig.1 Habitat with *Yucca harrimaniae*, north of Torrey, Utah.

Early in the morning (on 8th May 2006) we decided to explore the vicinity of Torrey. Torrey is a pleasant little town that was settled in the 1880's by Mormon pioneers. It is located in the beautiful landscape of the high desert (known as Colorado Plateau) and is often called the gateway to popular Capitol Reef National Park.

In Torrey we turned north on N Central Street which later becomes County Road. We stopped at an open area (N 38.18.289, W 111.25.704, 2050m) just north of the town, actually not too far from the house of Eberhard Lutz whom we visited the night before. The landscape there was formed by reddish sediments and the reddish sandy soil was

decorated with large black igneous rocks and green yuccas [Fig.1]. Beautiful rosettes of *Yucca harrimaniae* bearing white curly hairs were quite common there [Figs.1 & 2]. This species often forms groups of plants, as it typically reproduces by thick underground rhizomes [Fig.3] like many other *Yucca* species

We also could admire a superb form of *Pediocactus simpsonii* with an especially attractive combination of white and black spines [Fig.4]. Although I found several late buds, the flowering period there was clearly over. This *Pediocactus* species is very common in the whole area, being widespread mostly at higher elevations and cooler locations in the nearby mountain ranges. At such places I had



Fig.2 Detail of a young *Yucca harrimaniae* plant, north of Torrey, Utah.



Fig.3 *Yucca harrimaniae*, as many other yucca species, often makes new offsets through the underground rhizomes, north of Torrey, Utah.

often seen snow even during the months of April or May. But the plants I saw with Josef Busek down in the Torrey area seemed to be much bigger, presumably due to the lower elevation and favourable warmer climate. Another fact that could also make a substantial contribution to the overall body size of cacti near Torrey is that the sandy soil there was heavily fertilized by excrements from the ever



Fig.4 A nice form of *Pediocactus simpsonii* with the attractive combination of white and black spines, north of Torrey, Utah.

abundant cattle.

We also encountered several *Sclerocactus parviflorus* ssp. *terrae-canyonae* there. To our disappointment, the plants were bearing only flower buds [Fig.5], so we could not observe the yellow flowers of this interesting taxon. The population of the sclerocactus was rich and healthy, with numerous seedlings found around [Fig.6]. Some plants were evidently



Fig.5 A young specimen of *Sclerocactus parviflorus* ssp. *terrae-canyonae* with a flower bud, north of Torrey, Utah.

damaged by cattle and were forming new offsets from otherwise solitary bodies. Finally, we saw various opuntias with variable spination, namely *O. phaeacantha* v. *juniperina* and *O. aff. pinkavae*.

The whole area just north of Torrey resembled a building site prepared for the construction of new houses and it is quite possible that the town has by now expanded far beyond this point. The area may not be



Fig.6 Seedlings of *Sclerocactus parviflorus* ssp. *terrae-canyonae*, North of Torrey, Utah. When the old sclerocactus plant dies and falls apart, the new generation replaces it quite quickly.

freely accessible anymore and it is quite possible that the original flora has been completely eliminated due to human activities.

At 10am the air temperature reached some 20°C, the soil at the surface 28°C, and 5cm deep 18°C.

We made our next stop just east of Torrey, near the intersection of S.R. 12 and S.R. 24,



Fig.7 Finally! We encountered a single flowering specimen of *Sclerocactus parviflorus* ssp. *terrae-canyonae*, east of Torrey, Utah.



Fig.8 This *Yucca harrimaniae* was near to flowering at Capitol Reef National Park, Utah.



Fig.9 *Sclerocactus wrightiae* plants in full flower, Capitol Reef National Park, Utah.



Fig.10 A large specimen of *Sclerocactus wrightiae* loaded with copious flowers, along S.R. 24, east of the Capitol Reef National Park, Utah.



Fig.11 A specimen of *Sclerocactus wrightiae* with pink flowers at the same place as in Fig.10.

where the Wonderland Inn and RV park were located. A Chevron gas station used to be at the intersection and just behind it, on steep hills with juniper and pine trees, we found another population of *Sclerocactus parviflorus* ssp. *terrae-canyonae*. And finally, to our

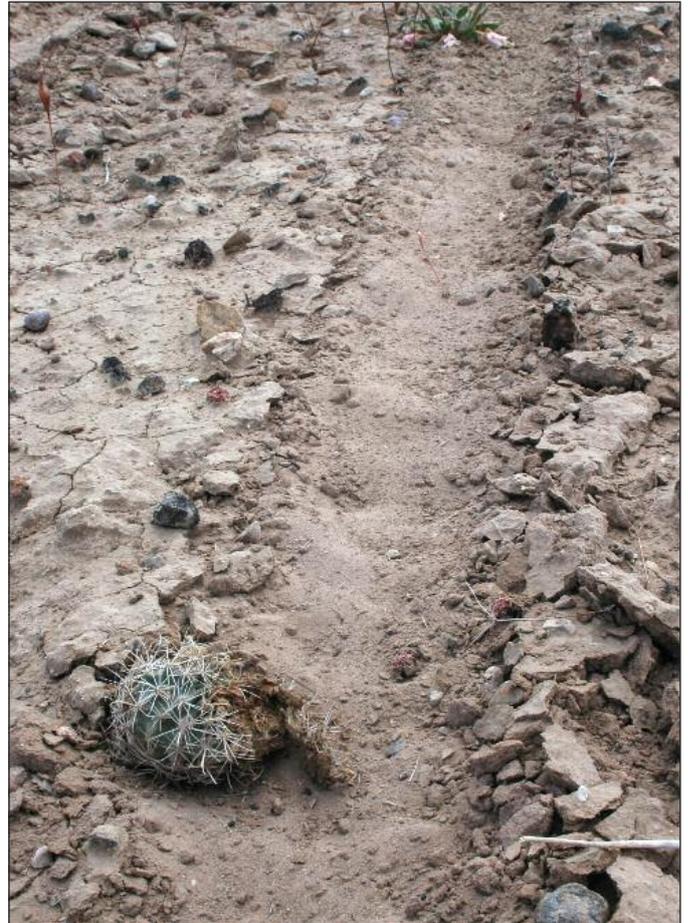


Fig.12 The popularity of off-road driving is killing many cacti in the SW of USA. This picture, taken along S.R. 24 just east of Capitol Reef National Park (Utah), shows a damaged plant of *Sclerocactus wrightiae*.

photographic satisfaction, we discovered a single plant with a freshly open yellowish flower [Fig.7], so typical for this subspecies. All other plants were only bearing numerous flower buds. We saw only three specimens of *Pediocactus simpsonii* there. It was very windy and at about 11am the air temperature reached some 20°C while the soil at the surface already 41°C. Again, the flat hilltops in that area seemed to have been commandeered for construction developments.

We headed along S.R. 24 eastwards and entered the Capitol Reef National Park. This very popular park is filled with vividly coloured sandstone cliffs, towers, arches, domes and valleys. We made a stop still within the park, near milestone 85. There was a sandy slope at the elevation of 1580 to 1590m, with scarce juniper trees and quite common *Yucca harrimaniae*. Many yuccas were just forming an inflorescence right from the middle of their rosettes [Fig.8]. Furthermore, we observed



Fig.13 The gorgeous landscape in the mountains above the Goblin Valley, Utah.



Fig.14 Tiny and attractive form of *Yucca harrimaniae* above the Goblin Valley, Utah.

several *Sclerocactus wrightiae* plants in full flower, armed with long whitish spination and decorated with white to pinkish flowers [Fig.9]. Even when in full growth, many smaller sclerocactus specimen were almost burried into the redish sandy soil.

Heading further towards Hanksville we passed the exit to Notom (where we had seen *Pediocactus winkleri* and *Sclerocactus wrightiae* the day before) and then we stopped near



Fig.15 A long-awaited encountered with my friend Marta in Moab, Utah.

milestone 96 (elevation of some 1420m). The soil there was greyish and we hoped to find some more *P. winkleri* there. Instead, we saw a numerous and prosperous population of *S. wrightiae* again. There were plants of all sizes, from small seedlings to old and huge plants reaching some 18cm in diameter [Fig.10]. All the cacti were loaded with buds and flowers at various stages of development and some specimens had nicely pink flowers [Fig.11].

The sclerocacti were widespread on both sides of the road. As in many other places of the marvelous Southwest, we noticed extensive off-road activities (very popular pastime in the desert areas of USA) and we could observe many damaged and dying cacti lying down in the tyre tracks [Fig.12].

Later that day we passed Hanksville, a small town in Wayne County (Utah) well-known as being a supply post for Butch Cassidy and the Wild Bunch hiding in the deserts southeast of the town. We continued further north on S.R. 24 towards Goblin Valley. Goblin Valley State Park is famous for thousands of photogenic hoodoos or "goblins", which are formations of mushroom-shaped pinnacles made of reddish sandstone. But this time we were not interested in the evil stoned dwarfs. We tried to look for *Opuntia pinkavae* in that area but we only found *O. polyacantha* v. *hystricina* and flowering *Oenothera* sp. (family Onagraceae). We took the dirt road winding up in the mountains, towards Reds Canyon where *Pediocactus despainii* had been occasionally reported. The landscape up there

was just gorgeous, formed by red coloured sediments dotted with the green spots of juniper trees [Fig.13]. We drove further and after some 13 miles from S.R. 24 we stopped at beautiful scenery with scarce juniper and pine trees (2020m, N 38.42.110, W 110.44.476). A very attractive dwarf form of *Yucca harrimaniae* grew there [Fig.14]. These yuccas belong to the smallest I have ever seen, much smaller and more compact than "*Yucca nana*" from the Moab area [*Y. nana* Hochstätter (1998) was described from the mountains above Moab but is currently considered to be only a synonym to *Y. harrimaniae*]. While driving back towards S.R. 24, I could see the tiny form of *Y. harrimaniae* along the road as far down as to the elevation of some 1600m.

Later we finally arrived to Moab (Utah) where I met with my friend Marta [Fig.15], who I had known from Salt Lake City. We went with her to Castle Valley where we stayed in their house overnight.

[Zlatko Janeba](#)

Landmark Publications on Peruvian Cacti

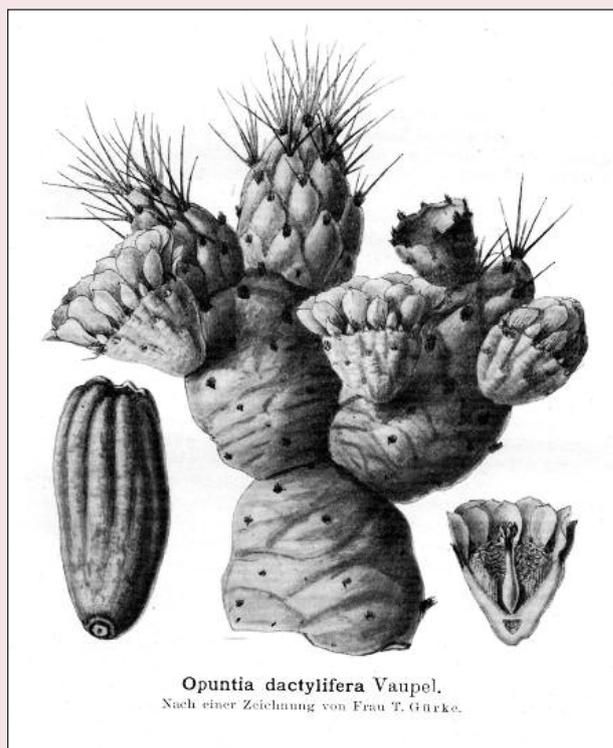
Augusto Weberbauer (1871–1948) was a German naturalist and botanist who carried out extensive explorations in Peru starting in 1901. A report of his travels was published, in German, in *Die Vegetation der Erde XII* (1911) which is [available online](#).

The new cacti found by Weberbauer were described by Vaupel in Engler's *Botanische Jahrbücher* **50(2/3)**: 12–31 (1913), also available to [download](#).

Many of the species we know so well today can be found in the list of 19 taxa that Vaupel included, 18 of which are still generally accepted as distinct species. The detailed descriptions include location data but no illustrations.

Vaupel later repeated most of the cactus descriptions in [MfK 24\(12\)](#):161-177 (1914) and included illustrations of *Cereus plagiostoma* and *Opuntia dactylifera* (reproduced here).

GC



THE BOTANIC GARDEN OF LYON

Marco Cristini recounts his visit to this little-known botanical garden where he found some of his favourite Crassulaceae.

Photographs by the author

Lyon, the Roman Lugdunum, is the second largest metropolitan area in France after Paris. It's a city rich in culture, traditions and monuments; the Basilica of Notre-Dame de Fourvière and the Gallo-Roman Museum are really unforgettable. But Lyon has also a very nice Botanical Garden, where all succulent-lovers, I think, would enjoy themselves. It's located in the middle of Parc de la Tête d'Or, a very big public garden in the city's heart, where the inhabitants of Lyon go jogging every morning.

The Jardin botanique de Lyon covers a surface area of 8 hectares and it's free to visit.

Right after the entrance there are huge greenhouses full of tropical plants and cacti. I visited the garden in August 2014 and I was very satisfied with it. I am, as a matter of fact, an enthusiast of the family Crassulaceae and there I found lots of healthy, good-looking species. The first impression (which, as we usually say in Italy, is the most important) was immediately good; at a crossroad of paths shortly after the garden gate I saw a nice bed made up of (among others) *Echeveria elegans* [Fig.1]. I took a few photos and then I went straight to the Alpine Garden (it closes at 11:30, so one cannot sleep in...).



Fig.1 The bed of *Echeveria elegans*



Fig.2 Flowers of *Phedimus takesimensis*



Fig.3 *Kalanchoe delagoensis*



Fig.4 *Hylotelephium anacampseros*



Fig.5 *Kalanchoe* 'Fang'



Fig.6 *Hylotelephium* 'Autumn Joy'



Fig.7 *Petrosedum amplexicaule*



Fig.8 *Phedimus spurius*



Fig.9 *Sedum palmeri*



Fig.10 *Phedimus takesimensis*



Fig.11 *Sempervivum xfunckii*



Fig.12 *Sedum multiceps*



Fig.13 *Crassula ovata* 'Gollum'



Fig.14 The Mexican Garden



Fig.15 The Serre de Madagascar et des milieux arides



Fig.16 A close-up of *Sedum brevifolium*



Fig.17 A wooden turtle in the Serre de Madagascar et des milieux arides



Fig.18 *Euphorbia milii*



Fig.19 *Kalanchoe arborescens*

It was a wonderful visit: I was there alone with two gardeners, who were busy weeding out (and chatting). The first succulents I saw were two petrosedums: *P. sediforme* and *P. amplexicaule* [Fig.7]. Then I spotted a nice *Sempervivum calcareum* in flower on a huge cliff (unfortunately too far away for a good photo) and a hummock of *Sempervivum xfunckii* [Fig.11], together with a few *Hylotelephium anacampseros* [Fig.4]. I have been trying to grow this stonecrop from seed for two years, but the results have been poor until now, so I felt a bit envious when I saw such a good-looking plant! The genus *Sempervivum* is represented by *S. arachnoideum* (also growing further from my camera than I would have wished), *S. montanum* and *S. tectorum*, while the genus *Sedum* is more widespread: I observed *S. album* (not in great shape), *S. dasyphyllum* var. *glanduliferum*, *S. multiceps* [Fig.12] (a nice plant, not often seen in

botanical gardens) and *S. brevifolium* [Fig.16] (as the name suggests, it's very minute). The arctic *Rhodiola rosea* was the last plant I photographed here, but I looked almost only for Crassulaceae: there was plenty of other succulent genera, all well labelled.

In the meantime the sun had climbed higher in the sky, the temperature had risen and I hastened towards the greenhouses (I don't like being baked!). The most interesting hothouse



Fig.20 A funny road sign in the Serre de Madagascar et des milieux arides



Fig.21 A puzzled moai watching over the Mexican Garden

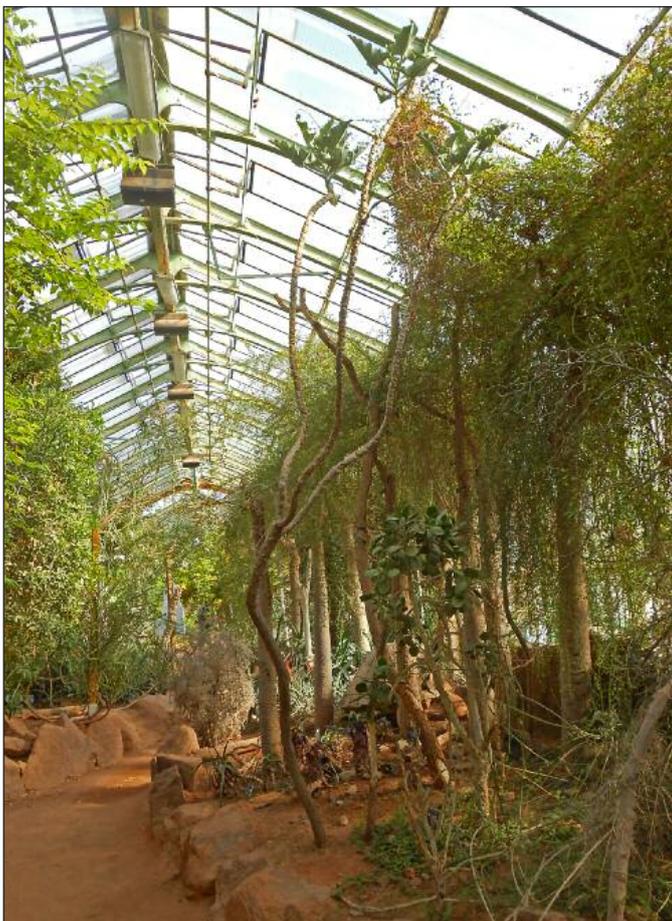


Fig.22 A tall *Kalanchoe beharensis* aiming at the sky



Fig.23 *Agave desmettiana* 'Variegata'



Fig.24 A bed of unlabelled hylotelephiums

for the succulent-lover is surely the Serre de Madagascar et des milieux arides [Fig.15], full of species from Africa. There I saw a beautiful *Kalanchoe beharensis* 'Fang' [Fig.5], a crowded group of *K. delagoensis* [Fig.3], *K. rosei* and *K. millotii*. Among them grows *Euphorbia milii* [Fig.18] in great quantities.

Then I'd like to mention two tree kalanchoe: *K. arborescens* [Fig.19] and *K. beharensis* [Fig.22]. The latter is quite common in botanical gardens, but I must confess that I have never seen such a tall plant. Under its stem I spotted a wooden turtle, adding a little folklore to the greenhouse. The mainland-African plants are introduced by a huge *Euphorbia abyssinica*, surrounded by *Crassula ovata* 'Gollum' [Fig.13]. *Agave desmettiana* 'variegata' [Fig.23] and *Cereus jamacaru* at once catch the eye, but one should not forget a nice shrub of *Crassula ovata* and a carpet of *Sedum stahlii* (a Mexican intruder). Going back to the greenhouse entrance I noted a fun road sign, similar to those of South Polar scientific stations.

Once I left the Serre de Madagascar, I walked toward the Serre des plantes carnivores et d'Afrique du Sud, but I had a sad surprise: the

greenhouse was closed due to renovation works. A bit disappointed, I went to the rose garden. There I was happy to find lots of hylotelephiums planted among the queens of flowers, but, shamefully, with no names. Here I must protest against this flagrant discrimination: the most wretched, aphid-stricken rose had its clean plastic label, but, alas, not even the biggest hylotelephium was labelled!

Thinking about this unfairness I returned to the main greenhouses. Near them there is the Mexican Garden [Fig.14], a wide bed full of agave pots. Around this small corner of Mexico there are a few beds with hardy succulents like *Phedimus spurius* [Fig.8], *Phedimus takesimensis* [Figs.2&10], *Petrosedum rupestre*, *Sedum album* and, at last, a labelled hylotelephium: *H. 'Autumn Joy'* [Fig.6]. While photographing these plants I was constantly observed by a puzzled wooden moai [Fig.21] (a copy of Easter Island's famous statues). Finally I saluted this mute guardian and I left the Botanical Garden through a gate adorned with two pots of *Sedum palmeri* [Fig.9], a worthy farewell for a place so beautiful and so rich in succulents.

[Marco Cristini](#)

STRANGE STEM ARCHITECTURE OF PACHYCAULOUS MORNING GLORIES

Root Gorelick tells us about the stem architecture in *Ipomoea*, speculating that weird stem architectures may tell us about the evolution of succulence.

Dan Mahr (2012) highlighted the wonderful Mexican succulent trees in the morning glory genus *Ipomoea* in the family Convolvulaceae. Only some members of the genus are included in the Illustrated Handbook of Succulent Plants (Eggle 2002), namely the tuberous rooted southern African species. This list of succulent *Ipomoea* species probably simply reflects the expertise of Ernst van Jaarsveld, who compiled that section of the Handbook. Instead of trying to extend this list of succulent *Ipomoea* species, which I honestly could not do, I will highlight the weird stem architecture of Mexican *Ipomoea* species, focusing on the giant of the genus *Ipomoea arborescens* Sweet.

Most trees of either flowering plants or conifers grow taller via apical meristems and simultaneously grow wider by producing new tissue from a cylindrical vascular cambium. Vascular cambia produce xylem to the inside (centripetal), which transports water. Vascular cambia produce phloem to the outside (centrifugal), which transports the products of photosynthesis. Horticulturists know that when grafting it is important that two stems being joined have some overlap in their vascular cambia so that the scion can continue growing. Many plant stems have a single vascular cambium throughout their entire lives, albeit a cambium that branches when the stem branches. Note use of the adjective 'vascular' because there also exist cork cambia, which form a cylinder that only produces tough water-resistant cells, so-called cork cells, that form outer bark.

Pachycaulous species of *Ipomoea*, however, do things a little differently. *I. arborescens* has multiple concentric vascular cambia (Terrazas *et al.* 2011). A cross section of such a plant would look reminiscent of a leek or onion but, unlike leeks or onions, the concentric layers of *Ipomoea arborescens* stems continue growing for

years, producing not only fleshy storage tissue (as do leeks and onions), but also concentric layers of wood and inner bark. While unusual, concentric vascular cambia are found in several plant families (Carlquist 2007), including some semi-succulent members of the genus *Cycas* L. (albeit none of the western hemisphere cycads; Norstog and Nicholls 1997), and are often associated with succulent or semi-succulent stems. Liannas are also renowned for successive cambia, such as in *Gnetum scandens* Roxb. (Chamberlain 1935) and *Santaloidella gillettii* G. Schellenb. (Isnard and Silk 2009). Many mesembs, family Aizoaceae, have concentric vascular cambia (Carlquist 2007). See the online Xylem Database (Schweingruber and Landol 2005; <http://www.wsl.ch/dendropro/xylemdb/>) for beautiful images of stem cross sections, including of concentric vascular cambia in Aizoaceae, such as in *Aptenia cordifolia*. (L. f.) Schwantes. Even stranger, some, but not all, of the concentric vascular cambia of *Ipomoea arborescens* produce xylem to the outside (centrifugal) and phloem to the inside (centripetal) of the cambium, which is known as a 'reverse cambium' (Terrazas *et al.* 2011). *I. arborescens* sometimes even produces cambia from pith, which is somewhat unusual. Plus, these vascular cambia that arise in pith only produce phloem.

Vascular cambia produce more than simply xylem and phloem, i.e. wood and inner bark include more than just xylem and phloem cells. Vascular cambia also produce unspecialized thin-walled cells (parenchyma) that form rays between the spokes of xylem cells in wood and between the spokes of phloem cells in inner bark. When splitting wood, these rays are where you place an axe because the thin-walled ray parenchyma cells offer little resistance, at least compared with the thick-

walled and heavily-lignified xylem cells that form wood. Ray cells are used in transporting and storing water and products of photosynthesis, as well as other plant metabolites. Thus, a plant with multiple concentric vascular cambia should, all else being equal, produce more storage tissue and be more succulent. Concentric cambia may help in storing water if the vascular cambia produce disproportionately more rays than wood. One of the best common examples of concentric vascular cambia, sometimes known as 'successive cambia', is in beets, *Beta vulgaris*. Cut one open and look at the fleshy concentric rings. In addition to concentric vascular cambia, *Ipomoea arborescens* also produces many short segments of vascular cambium from undifferentiated parenchyma cells in the rays, usually only producing phloem and phloem rays, which are called 'included phloem'. Included phloem is fairly common in semi-succulent plants, e.g. jojoba (*Simmondsia chinensis* C.K. Schneid.). If a stem has multiple concentric vascular cambia, then its evolutionary lineage may possibly have had the freedom to experiment with a subset of these cambia and produce xylem and phloem in the opposite directions, especially if these reverse cambia primarily are used for storage vis-à-vis rays, and not for water or sugar transport vis-à-vis xylem and phloem. There are indeed lots of interesting ways that nature created succulent plants, including adding extra layers of mitotically dividing cambial cells (Robert *et al.* 2011) and maybe even having some reverse cambia, as in the pachycaulous *Ipomoea arborescens*.

The peculiar stem architecture of producing concentric vascular cambia and reverse cambia, however, is not unique to pachycaulous *Ipomoea* species. These are also found in annual vining members of the genus, such as in *I. hederifolia* L. (Lowell & Lucansky 1986; Rajput *et al.* 2008). Liannas are not hugely constrained in having to build orderly wooden scaffolds the way self-supporting upright trees and shrubs are. Thus vines and liannas almost always have peculiar stem anatomy (Isnard & Silk 2009). If I might speculate, succulence may have originated from liannas, which have vastly more variation in stem architecture than

do self-standing upright trees and shrubs. Weird stem architectures may tell us about the evolution of succulence.

References

- CARLQUIST, S. (2007). Successive cambia revisited: ontogeny, histology, diversity, and functional significance. *Journal of the Torrey Botanical Society* **134**: 301–332.
- CHAMBERLAIN, C.J. (1935). *Gymnosperms: structure and evolution*. University of Chicago Press, Chicago.
- EGGLI, U. (2002). *Illustrated handbook of succulent plants: Dicotyledons*. Springer-Verlag, Berlin & Heidelberg.
- ISNARD, S. & SILK, W.K. (2009). Moving with climbing plants from Charles Darwin's time into the 21st century. *American Journal of Botany* **96**: 1205–1221.
- LOWELL, C. & LUCANSKY, T.W. (1986). Vegetative anatomy and morphology of *Ipomoea hederifolia* (Convolvulaceae). *Bulletin of the Torrey Botanical Club* **113**: 382–397.
- MAHR, D. (2012). CSSA Tour 2010: the botanical riches of Oaxaca. *Cactus and Succulent Journal (US)* **84**: 168–186.
- NORSTOG, K.J. & NICHOLLS, T.J. (1997). *The biology of cycads*. Cornell University Press, Ithaca.
- RAJPUT, K.S., RAOLE, V.M., & GANDHI, D. (2008). Radial secondary growth and formation of successive cambia and their products in *Ipomoea hederifolia* L. (Convolvulaceae). *Botanical Journal of the Linnean Society* **158**: 30–40.
- ROBERT, E.M.R., SCHMITZ, N., BOEREN, I., DRIESSENS, T., HERREMANS, K., DE MEY, J., *ET AL.* (2011). Successive cambia: a developmental oddity or an adaptive structure? *PLoS One* **6**: e16558.
- SCHWEINGRUBER, F. & LANDOL, W. (2005). The xylem database. URL: <http://www.wsl.ch/dendropro/xylemdb/> [accessed 18 November 2014].
- TERRAZAS, T., AGUILAR-RODRÍGUEZ, S., & OJANGUREN, C.T. (2011). Development of successive cambia, cambial activity, and their relationship to physiological traits in *Ipomoea arborescens* (Convolvulaceae) seedlings. *American Journal of Botany* **98**: 765–774.

USING GOOGLE EARTH TO EXPLORE CACTUS HABITATS

Michael Douglas introduces us to the various Google on-line tools which can be so helpful in researching places we might be thinking of visiting. They can also provide information even without visiting. Images by the author and from Google.

Most of us are aware of Google, the Internet search engine that we use to find web pages of interest. A slightly smaller number of us use Google Maps and Google Images to help us plan our travels. Fewer still use Google Earth, which needs to be downloaded (for free) and installed on our computers. Here I want to show readers the value of using Google Earth for virtual travels to distant succulent plant habitats and to illustrate the benefits (and limitations) of what it can be used for. Perhaps most surprisingly, you can actually carry out meaningful research using Google Earth on your own computer.

Once you have Google Earth on your computer, you can do anything that Google Maps can do – plus more. However, Earth allows you to tilt the viewing angle – you don't always have to look straight down as in Google Maps. You can view three-dimensional relief, so that it becomes easy to visualize the terrain you plan to search. In addition,



Fig.1a Google Earth imagery of a paved trail in Saguardo National Park, west of Tucson, Arizona. Note the saguaro shadows (sunlight is coming from the left) and the plants in this somewhat oblique satellite image. This is about the best resolution to be expected from current satellite imagery. (The white arrows indicate a view shown in Fig.6.)

zooming is easier (can be done continuously) and you can rotate the view so that you can look from any direction.

There are some key advantages of using Google Earth to help you hunt for cactus in habitat. These are 1) the detailed satellite imagery available 2) being able to visualize the topography, 3) using Google Street view and 4) looking at Panoramio photos. We'll discuss each of these in turn.

Satellite imagery

Google has obtained satellite imagery from commercial satellite companies (e.g. <http://www.satimagingcorp.com>) for much of the world. The best such imagery can resolve features approximately one half-meter across. Atmospheric turbulence limits the sharpness of such imagery, but it is good enough to detect larger cacti under favorable conditions [Fig.1a]. Unfortunately, much of the world is not covered with the sharpest imagery because such imagery is expensive to obtain (and



Fig.1b Another area in Saguardo National Park, now east of Tucson. The sunlight is from the right now and the satellite view is nearly straight down. The shadows are easily identifiable but the actual saguaro's are almost invisible. Satellite imagery will be available only for sunny days so shadows are a useful tool in identifying larger plants.



Fig.2 Limestone terrain near Sonora, Texas, USA. Old oil prospecting roads are evident. Note that the vegetation parallels the layering - some layers have characteristics (composition, density?) that favour certain species more than others, resulting in the banding patterns.

therefore to buy). In remote locations of the globe there may not be sufficient motivation to obtain detailed imagery where few people live.

Satellite imagery alone cannot depict smaller cacti and even large cacti are difficult to discern except under some lighting conditions [look for the saguaros (not their shadows) in Fig.1b]. Despite this, there is much that can be done with the imagery to infer what might be found at a location. In fact, one of the best uses of the imagery is to identify suitable habitat to help you decide where to explore on foot. Satellite imagery gives clues as to the type of rock that is present. Is it granitic, sedimentary (e.g. limestone) or volcanic? Are there exposed rock faces or is it forest covered? Limestone strata is especially evident in desert regions [Fig.2] and many succulents (e.g. some *Ariocarpus*) are restricted to such rock.

Some examples of using Google Earth imagery to hunt for succulents that are restricted to specific surfaces are worth mentioning. In western South Africa many stone plants (e.g. *Argyroderma* and *Cheiridopsis* species) are nearly restricted to flats covered by quartz pebbles [Fig.3]. These can be easily identified from Google Earth imagery and navigated to in the field (with due respect to private property rights!) By looking for places where public roads cross such quartz flats it is possible to see from the roadside many of the species to be found in such specialized habitats.

Another example where Google Earth imagery is valuable comes from Brazil, where

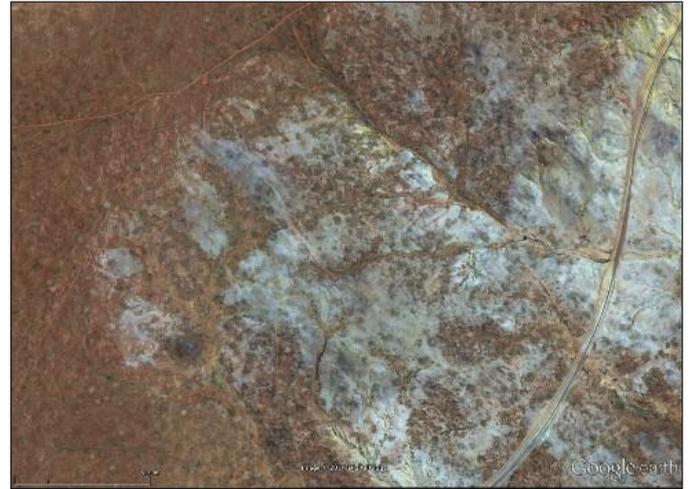


Fig.3a Satellite view of region containing a succulent plant trail, north of Vanrhynsdorp, Western Cape, South Africa. The white areas are covered with quartz pebbles, lying on top of sediments of a reddish colour. The quartz fields are habitat for stone plants of many different genera.



Fig.3a Trying to photograph a small stone plant - without lying down on the ground and crushing more of them! This was an overcast day, but on sunny days the reflection from the surface can be almost blinding. Location is along trail near center of Fig.3a.

we (as part of a succulent plant tour) were looking for the site of *Discocactus hortisii*. The tour leader had a GPS location for one of the few known localities. The very small plants are restricted to flats of quartz sand eroded from the surrounding sandstone hills. As far as is known, *D. hortisii* is restricted to 3 patches of quartz sands that are protected within the Grao Mogul National Park. However, as with the quartz patch flora in South Africa, it is very likely that other patches of quartz sand will have a certain probability of harbouring *D. hortisii*. Amateur "cactophiles" often prefer to revisit known sites of a rare species rather than spend their limited vacation time exploring

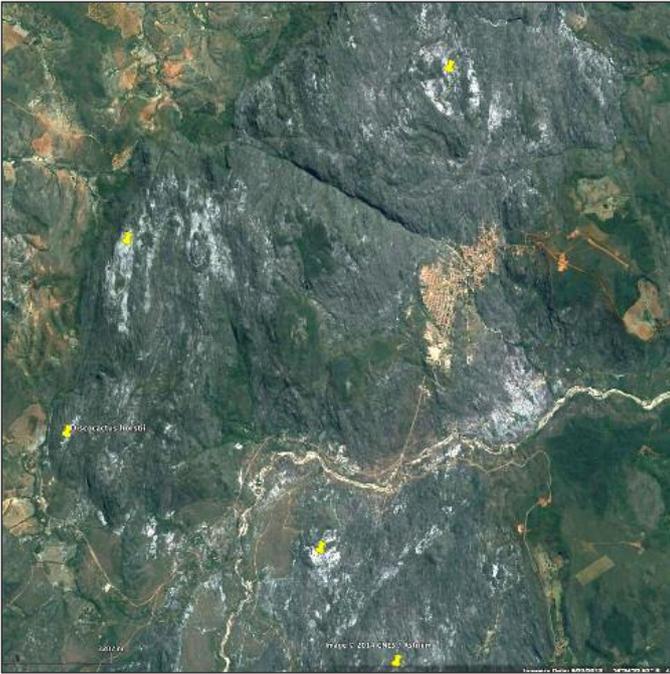


Fig.4a Area around Grao Mogol, Brazil, habitat of *Discocactus horstii* (marked on left). The plants grow on quartz gravel flats. Other areas that are suspicious (similar to the known locality) are marked with yellow pins

other possible localities that may reveal nothing. (There are many “explorer-type cactophiles” that are exceptions to this generalization, but South America is very large and most areas have yet to be explored in any detail by cactophiles with the special awareness to be looking for cryptic succulents.) Knowing that *D. horstii* seems to be restricted to quartz sands, Google Earth imagery can be used to identify such areas [Fig.4] — to guide future explorers. I have no idea if this has been done or not, but it is certainly feasible — much more feasible than walking across the dense and spiny Brazilian caatinga hoping to randomly come across such quartz patches.

Digital elevation data

Google Earth uses digital elevation data, available with near-global coverage, so that the steepness and orientation of the slope can be easily visualized [Fig.5]. Poleward-facing slopes are cooler than equatorward-facing slopes, with southwest-facing slopes (in the northern hemisphere) and northwestward-facing slopes (in the southern hemisphere) being the most arid, other factors being equal. Likewise, flat and silty landscapes can be distinguished in this manner from well-drained sloping terrain that might be preferred

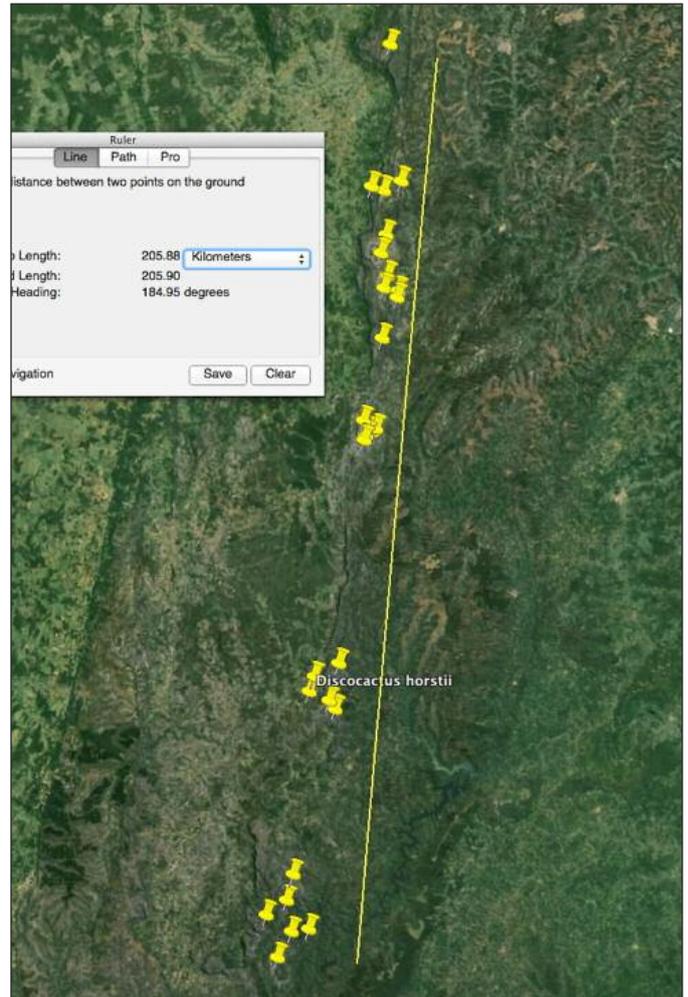


Fig.4b Areas that appear from satellite imagery like suspicious habitat of *Discocactus horstii* are plotted here (determined by zooming in to full resolution of satellite). More areas than shown here exist, I examined only along the north-south trending mountain range and selected only certain quartz patches (which derives from the sandstone mountain range). The possible north-south extent of favorable habitat is over 200km. Field exploration is needed to determine whether these apparently favorable habitats are indeed locations of *D. horstii*.

by most (though not all) cacti. In heavily cultivated areas the visualization of the relief can help to identify very steep areas where cattle, sheep or goats may have difficulty reaching. Of course, if goats cannot reach a cliff covered with succulents it will also be challenging (but not impossible!) for a succulentophile to do so!

Google Street view

Google actually equips cars to take photos as they drive down the road (<http://www.google.com/maps/about/behind-the-scenes/streetview/>). This is very useful to see the neighborhood you plan to visit — in



Fig.5a A near vertical view of Google Earth imagery of a hillside covered with large *Aloe dichotoma*, northeast of Nieuwoudtville, Northern Cape, South Africa. A dirt road is at bottom. Note that it is difficult to visualize whether the aloes are on a slope, or on the top or bottom of a hill.

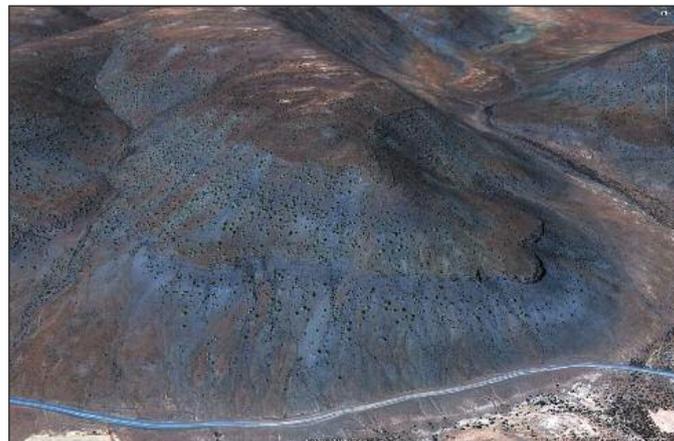


Fig.5b [left] By tilting the view in Google Earth you obtain an oblique perspective, from which it becomes clear that the aloes are found mostly on the slope, not at the top of the hill. This is one benefit of the digital elevation information in Google Earth.



Fig.6 This is the approximate view (shown by white arrows) in Fig.1a. The image is made by a backpack or cart version of the Google Street View camera; these can be used on trails. Comparison Fig.6 and Fig.1b shows what is, and isn't visible in the satellite imagery. The ocotillo in the right foreground is invisible, or at least unrecognizable, from the satellite perspective.

countries where it is allowed. Some countries have yet to allow Google to carry out such street-level photography, but some countries with very rich in succulents are covered. The USA, Mexico, Colombia, Peru, Chile and Brazil are well-covered (see link above for details) but not Argentina, Bolivia, Ecuador or Venezuela for example. In southern Africa, South Africa and Botswana have Google's Street View, but not Namibia. Sadly, Street View is not yet available for Madagascar, nor any parts of east Africa, the Middle East

including the Arabian Peninsula. Australia has excellent coverage – but it lacks larger succulents (except one baobab and some similar trees) that can be easily identified in Street View imagery.

Coupling Google Earth's satellite and Street View imagery can help you find what you are looking for. For example, by comparing Street View images with satellite imagery, we can identify what a particular species of large cactus looks like [see Fig.6, and compare with Fig.1]. Note we say large, because even large



Fig.7a Satellite view of three *Browningia candellaris* just off a highway (right) between Arica and Putre, northern Chile. Note the shape — like a dumbbell — one dark area is the actual plant and the other is the shadow. The shadow of the trunk connects the two dark areas. This shape of the shadow is distinctive — it allows us to distinguish browningia from other large plants (not many!) that might be found here.



Fig.7b A Google Street View image of the three browningias seen in Fig.7a. Street View can be used to verify your identification using satellite imagery - if it is available.

cacti are poorly depicted in satellite imagery. In Fig.7, it would be hard to distinguish an *Armatocereus* from a *Browningia* – it is mostly by the shadow structure that we can infer the *Browningia candellaris* shape.

Although perhaps not strictly a succulent, some terrestrial *Tillandsia* (bromeliad) species growing on sand dunes in the Atacama Desert of Peru and northern Chile, can be identified in the satellite imagery [Fig.8]. Although the individual plants cannot be resolved, the plants aggregate into characteristic bands that are approximately perpendicular to the surface winds, and are easily identified in the imagery. The identification of these bands can be verified by using Street View — though only a very few road stretches come close to such *Tillandsia* patches.

Panoramio photos

One can see photos taken all across the globe on Google's Panoramio [Fig.9]. These same photos are visible in either Google Earth or Google Maps. Be warned — about 90% of such photos, despite passing through a Google



Fig.8 Rows of *Tillandsia* sp. near Chicken Houses (white, at right), about 15km north of Chinchá Alta, Peru. These plants, though not strictly succulents, indicate favourable fog conditions and so might be associated with succulents. The tillandsia rows are approximately perpendicular to the mean surface winds.

selection procedure, are either sunsets or waterfalls, followed by too-distant landscapes (to see detail in the foreground). People like pretty sunsets and waterfalls. They don't like to photograph plants. Despite this reality there are enough photos from even relatively remote parts of the planet, such that you stand a fair chance of gathering useful information on the landscapes and plants you might see. Important - you need to zoom in to see all the Panoramio images that are available – only a small percentage of the photos available will be displayed if you look at the scale of an entire country.

Applied research possibilities (“citizen science”)

Anyone with access to Google Earth can contribute to our understanding of succulent plant distributions. IF (and this is a big IF) you can unambiguously identify a species of succulent in the satellite imagery then its distribution can be mapped [Fig.10]. This, in principle, requires a very small effort compared with field mapping, which for many remote locations is impractical. The problem is, of course, that our interpretation of the satellite imagery requires confidence in what we are identifying. And for that we need ground truth — we need to verify that what the satellite is seeing is indeed what we think it is. Street View can help with verification for larger

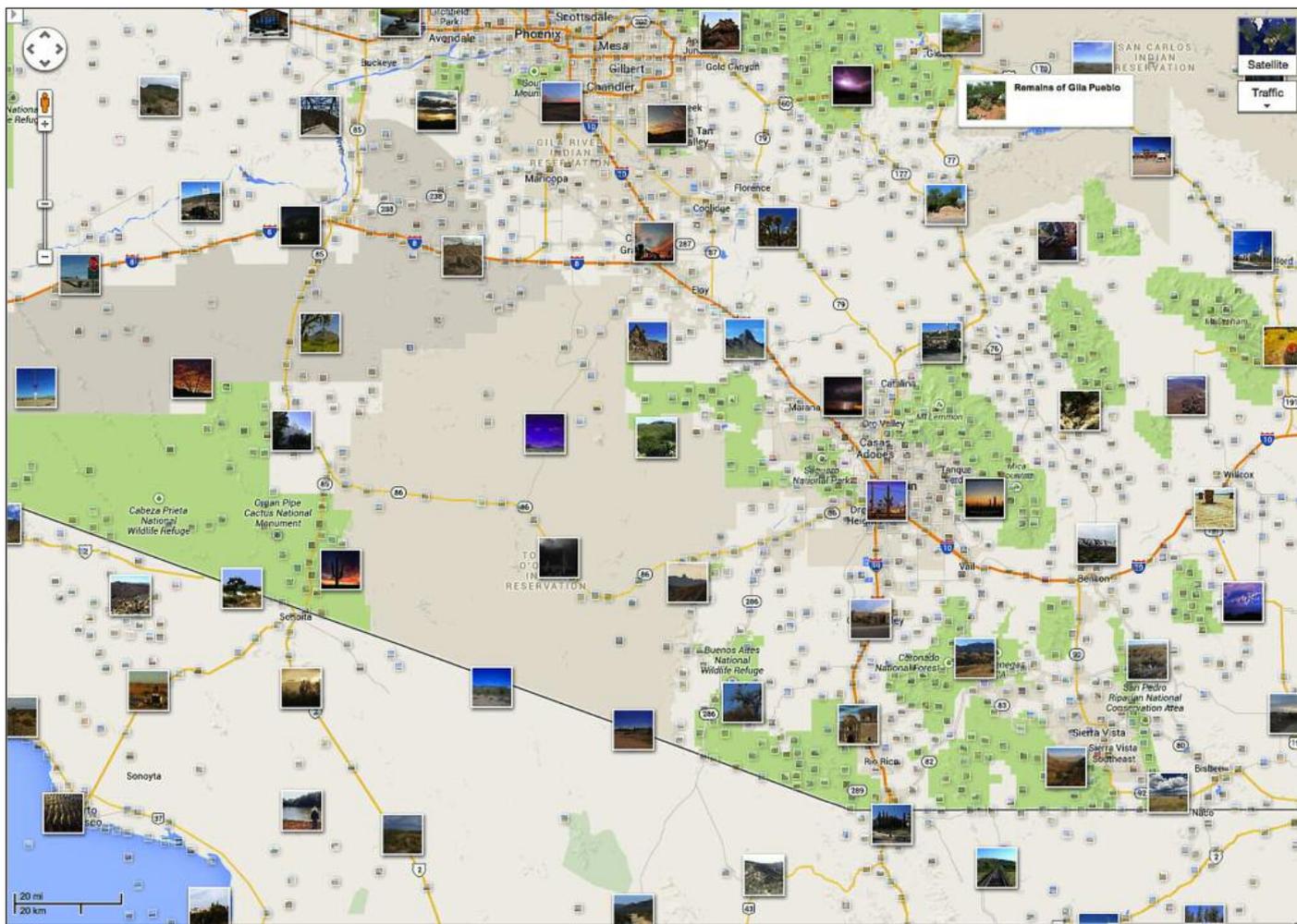


Fig.9 An example of Panoramio photos for the south Arizona area. Many images are not shown — if you zoom in much more you will see other images becoming available.

plants in areas where there is coverage, but for smaller plants, or where vegetation is on hillsides far from roads, we need other sources of information. Succulentophiles can help when they travel by taking photos with GPS-equipped cameras.

A more extensive powerpoint is being prepared on the subject of using Google Earth and its allied information; this will be available at: <https://sites.google.com/site/metforbio/slideshows/cssa-talks> where other succulent-related talks are available as well.

[Michael Douglas](#)

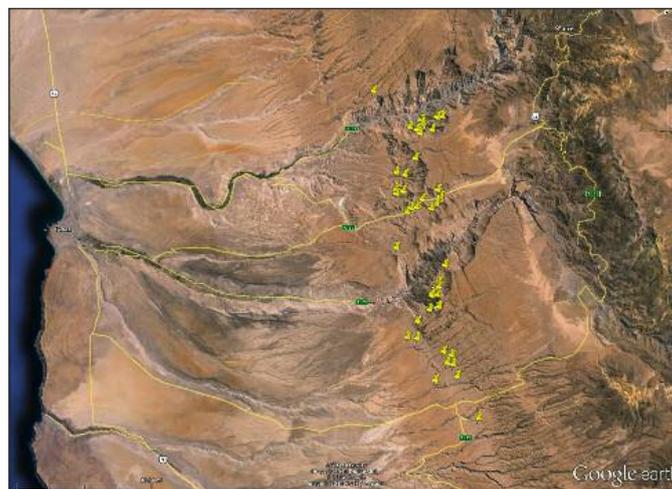
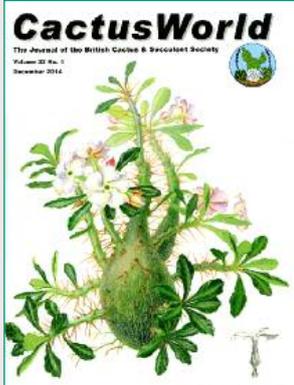


Fig.10 Distribution of *Browningia candelaris* in northern Chile from Google Earth satellite imagery. Not all locations are marked, but enough to see the range and altitudinal limits.

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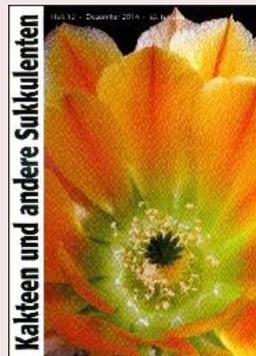
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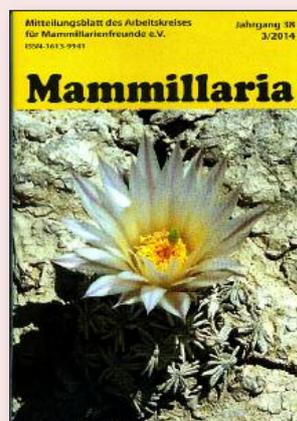
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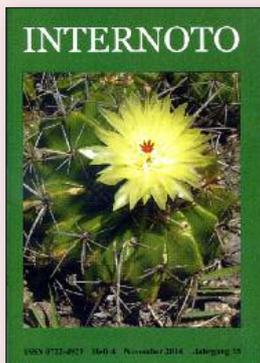
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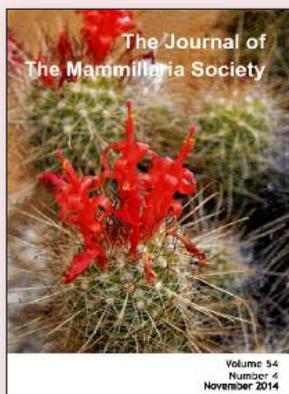
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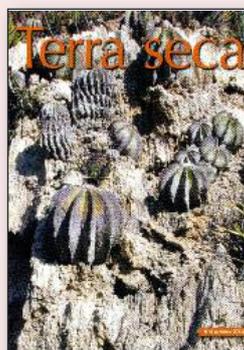
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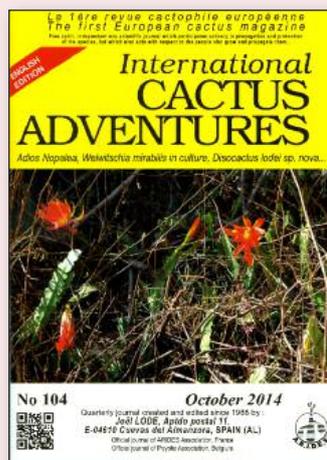
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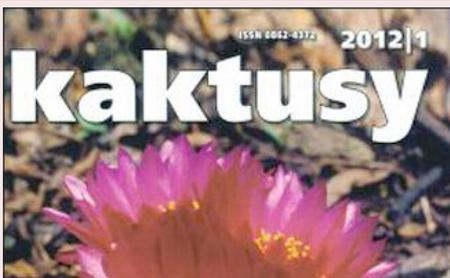
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A comprehensive list of seeds from the Czech Republic:

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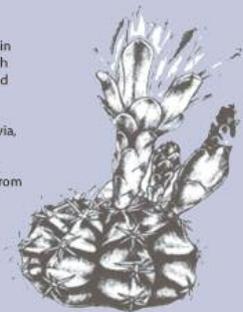
Already familiar to many of you, for others a voyage of discovery. Many seeds you are looking for, can be found in this seed list. A large number of the seeds is provided with well known and reliable habitat information or with a field number.

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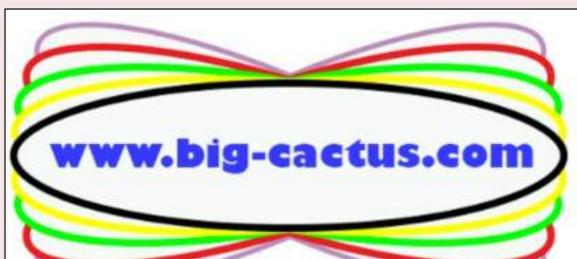


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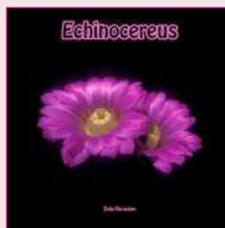
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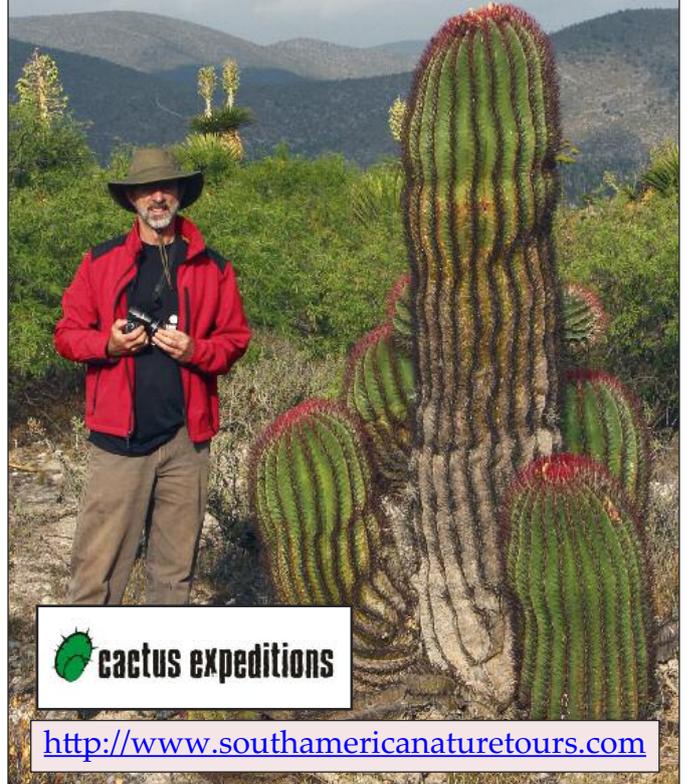
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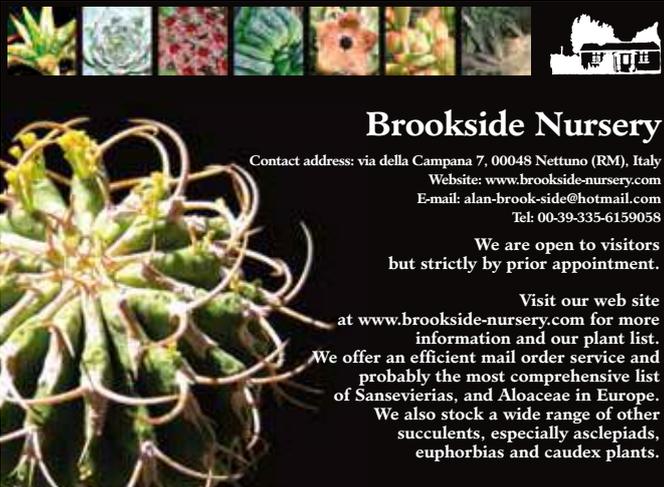
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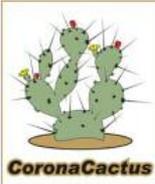
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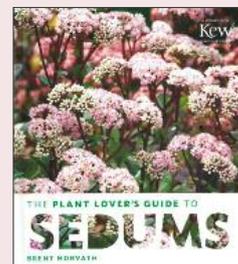
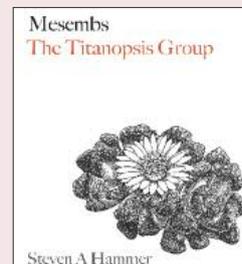
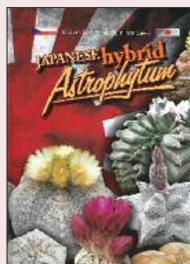
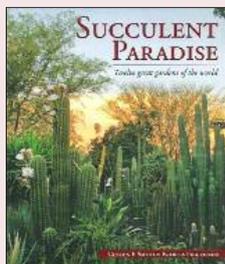
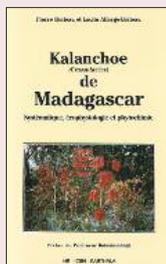
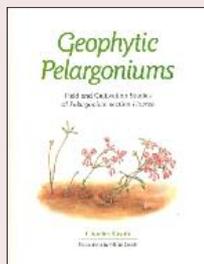
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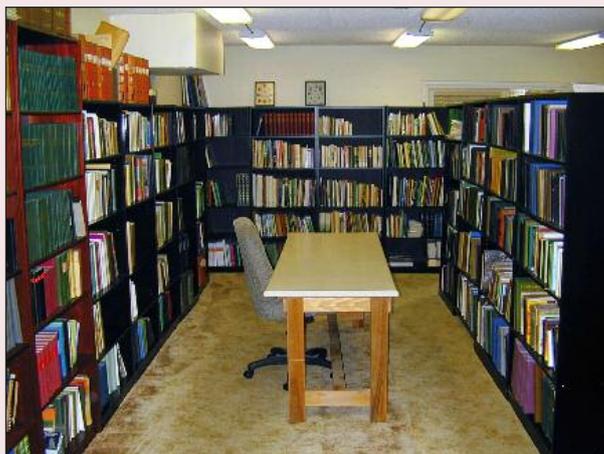
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