LITHOPS

by

Brian Fearn

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Cover picture: Lithops verruculosa in the collection of the author.

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LITHOPS

an introduction to a fascinating group of plants

by

Brian Fearn

To the late Dr H. W. de Boer, whose enthusiasm for the genus and encouragement for me to continue his work has brought this task to fruition, this work is respectfully dedicated.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>1</td>
</tr>
<tr>
<td>Introduction</td>
<td>3</td>
</tr>
<tr>
<td>The genus Lithops</td>
<td>5</td>
</tr>
<tr>
<td>The cultivation of Lithops</td>
<td>9</td>
</tr>
<tr>
<td>The propagation of Lithops from seed</td>
<td>10</td>
</tr>
<tr>
<td>A revised analytical key to the genus Lithops</td>
<td>12</td>
</tr>
<tr>
<td>Descriptions and photographs of the Lithops species</td>
<td>16</td>
</tr>
<tr>
<td>Glossary</td>
<td>63</td>
</tr>
<tr>
<td>References</td>
<td>65</td>
</tr>
<tr>
<td>Postscript</td>
<td>67</td>
</tr>
<tr>
<td>Index</td>
<td>68</td>
</tr>
</tbody>
</table>
Preface

Advice was offered by the periodical Punch many years ago which is pertinent to those who wish to write a book. It was a ‘letter of advice to those about to be married’ and applicants received the single word—don’t.

Fifteen years ago when I started research on aspects of the water relations of the Lithopinae I found that the taxonomy of the genus Lithops was in some confusion and decided to study that first. Professor G. C. Nel’s superb monograph is now 30 years out of date. Much of the work by the late H. W. de Boer, who was the world’s leading authority, is unpublished and the new English translation of Das Sukkulentenlexikon by Hermann Jacobsen, although it contains my analytical key, is rather more a recapitulation than a reappraisal of the genus Lithops. A book was published in 1970 by D. L. Sprechman et al on Lithops at a cost of over £25, but this is beyond the reach of most people. I therefore decided to produce a new booklet on Lithops.

I wish to express my sincere appreciation to all those who so generously have given invaluable help, assistance and encouragement in the preparation of this booklet. In particular I would like to thank the late Dr H. W. de Boer and his wife of Haren (Gn) Netherlands for freely given hospitality on the many occasions that I have had the pleasure of staying in their household, for the hours of enjoyment gained from just talking Lithops, but above all for access to the finest collection of Lithops in cultivation, enabling a detailed study and photographic record to be made. It was de Boer’s enthusiasm for the genus and his encouragement for me to continue his work that has brought this task to fruition.

Acknowledgements are also due to the following people and institutions: Professor A. R. Clapham of Sheffield University, formerly head of the Department of Botany, for the use of facilities and for comments and suggestions; Professor A. J. Willis, head of the Department of Botany, Sheffield University for help and constructive criticism; the Director of the Royal Botanic Gardens, Kew, and members of staff, particularly S. W. Rawlings, for permission to use the library and for a detailed examination of the living collection of succulents; Professor D. T. Cole of the University of Witwatersrand, Johannesburg, for comments and habitat information; Dr T. T. Elkington of the Department of Botany, Sheffield University for help and constructive criticism; Professor D. J. Anderson of the University of Sydney, Australia, and formerly lecturer in the Department of Botany, Sheffield University for his interest in the project prior to his emigration; G. D. Rowley of the
Department of Agricultural Botany, Reading University for advice and interest in the project and help with the bibliography; also to Mr G. Woods for photographic assistance and to Miss Wells of Sheffield University Library, for her skill in tracking down and obtaining obscure journals.

Finally to R.F. and G.M.F. without whose help and encouragement in the last 15 years this work would never have come to fruition.

B. Fearn

Matlock 1980

Fig. 1: A flowering plant of LITHOPS AUCAMPIAE. As can be seen, the diameter of the Lithops flower often exceeds that of the body.

Photo: C. van de Wouw
Introduction

The fascinating genus Lithops belongs to the family of plants called the Aizoaceae, better known under the popular name of Mesembryanthema. The huge single genus Mesembryanthemum L., which in the widest sense could contain over 2500 species, has been split into a large number of separate genera (Herre, 1973). It was Dr N. E. Brown, working at Kew, who first discovered that the genus could be conveniently reclassified according to the structure of the seed capsule (see figs. 2 and 3). This work was later continued by Professor M. H. G. Schwantes and Dr H. M. L. Bolus working in Germany and South Africa respectively. The unbelievable variety in the shape and form of the leaves, the often strikingly beautiful flowers and the fascinating structure of the seed capsule makes the Mesembryanthema one of the most interesting groups of all succulent plants. They are of great horticultural interest and are widely cultivated.
Fig. 3: Capsule structure of LITHOPS VILLETII.
A Membraneous valve wings
B Expanding keel
C Rudimentary cell lid attached to the seed chamber dividing membrane
D Seed chamber
E Valve.
The genus Lithops

The name *Lithops* is derived from the Greek words *lithos*—a stone, and *ops*—a face. The name was given to these plants in 1922 by Dr N. E. Brown on account of their resemblance in colour and appearance to the stones and pebbles among which they grew. William J. Burchell in his *Travels in the interior of Southern Africa* (1822-24) describes in the following words the discovery of the first *Lithops*, originally described by Haworth as *Mesembryanthemum turbiniforme*, which a century later became the first described member of Brown’s genus *Lithops*.

‘On picking up from the stony ground what was supposed a curiously shaped pebble, it proved to be a plant . . . but in colour and appearance bore the closest resemblance to the stones between which it was growing.’

The discovery was made in 1811 at Zand Vlei, in the Prieska district of South Africa. More than 100 years elapsed before *Lithops* was rediscovered in 1918 by Dr Pole Evans in the same area—after he had searched a whole week for it.

Cole (1971) raises many interesting problems concerning the identity of Burchell’s *Lithops* and has made a field study of the area in which W. J. Burchell first discovered a *Lithops* species in 1811. Burchell did not introduce the plant into cultivation, but collected two herbarium specimens which unfortunately are no longer to be found.

Haworth’s description was prepared from a drawing that Burchell made in South Africa (Haworth, 1821). Cole now raises serious doubts as to whether Burchell originally collected what we now call *L. turbiniformis*. In Cole’s opinion Burchell’s drawing definitely does not represent what we know as *L. turbiniformis* (Haw.) N.E. Br., neither is it *L. hallii* nor *L. verruculosa*. All these three plants grow in the general area where the original plant was discovered. Burchell’s precise locality, ‘Zand Valley’, has still not been satisfactorily relocated. Dr I. B. Pole-Evans, as previously noted, found a *Lithops* in this area in 1918. As Cole has now pointed out, although he found *L. turbiniformis*, he might just as easily have found *L. hallii* or *L. verruculosa* when he made his search in 1918, in which case one of these could have been proclaimed to be Burchell’s *Lithops*.

The next species to be discovered was found by Professor K. Dinter near Windhoek in Great Namaqualand and was named by Berger in 1908 as *Mesembryanthemum pseudotruncatellum*. Between 1920 and 1930 a great many species were discovered, largely on the
numerous and often arduous journeys made by Dinter. It is fitting that a distinctive and rare species was named by Schwantes in his honour. *L. dinteri* Schwant. was found in 1926 by Ernst Rusch at Wittsand, north of the Orange River in South West Africa. Rusch, himself commemorated by the name *L. ruschiorum* (Dint. & Schwant.) N.E. Br., was another active collector. Since 1950, and particularly since 1960, very many new species and varieties have been named by Dr H. W. de Boer working in the Netherlands. In addition many new localities have been discovered for existing species. This is due to the field work of Professor D. T. Cole, Dr Geyer and Messrs Hall, Littlewood, Gebser, Roux and others.

Species of *Lithops* are widely distributed in Southern Africa, some being quite rare, others relatively plentiful, and they are often found in remote areas to which access is difficult (Fearn, 1968 and 1969). Each species, with the exception of one or two, is very localised in distribution and is often widely separated from another species. One of the possible reasons for this is that we may have incomplete information about the distribution of the species concerned. In the literature very few of the geographical distributions for different species are reported as being overlapping. A few species are confined to a single locality, others occur in several places, often many kilometres apart. *Lithops leslei*, named in 1912 by N. E. Brown after its discoverer who found it near Vereeniging, has so far been collected in at least 25 separate localities. Professor Cole suggests that there are many more localities although he has not yet been able to confirm all the reports which he has heard. The most northern locality for *L. leslei* is at Pietersburg in the Transvaal and the most southern is near Fourteen Streams in the Orange Free State. The distance between these two localities is 640 km. A distribution map is shown in fig. 4.

In the wild, the plants are often completely buried in sand and gravel with just the surface of the leaves visible. This is especially true of species which rarely occur as multiple heads, for example varieties of *L. pseudotruncatella* (Bgr.) N.E. Br. Clump-forming species, for example *L. marmorata* (N.E. Br.) N.E. Br., will obviously expose more leaf surface. In *Lithops*, the leaf colouring varies and ‘mimics’ the rock and soil in which they grow (Fearn, 1965).

It is often wondered just how long these plants can live. Dinter once counted 50-75 shrivelled leaf bases on each head of a 7-headed clump of *L. optica*, four heads of which were still living. It can be surmised that a single pair of leaves is produced each year, although in very dry years the plants probably do not grow at all. This plant would then be at least 50-75 years old. Dr R. Stopp (1954) also
Fig. 4 The distribution of Lithops in Southern Africa.
examined plants of *L. optica* and counted pairs of shrivelled leaves and remains of flower stalks. He discovered that between 1929 and 1951 one plant had flowered on only nine occasions. It is surprising that the plants do not flower every year in the wild let alone in cultivation. One plant was calculated to be 95 years old. *L. ruschiorum* also appears to live to a great age. Clumps have been found in which 150 pairs of dried leaves remained. *Lithops* are thus far longer-living than had at first seemed possible.

It is difficult for a practised eye to find *L. pseudotruncatella* in the dry period, and is practically an impossibility for the novice. Professor Nel and several other botanists were taken by Ernst Rusch to a hill where there was a large number of these plants. Although they crept around on all fours they did not find a single specimen. Even when Ernst Rusch described a circle with his stick round one, they still could not see the plant (Schwantes, 1957). The situation changes during the short rainy season. The plant body swells and so is more easily seen. The plants also flower at this time and although the colour is either white or a shade of yellow, this does make them more conspicuous. The flowers open during the day and many specimens have been discovered because the plants happened to be in flower when the area was being searched. The rainy season is often very short and in some areas, notably S.W. Africa, there may be no rain at all for several years in succession.

A *Lithops* plant consists of a pair of leaves fused together and attached to a corky tap root. There is a meristematic region situated at the base of an enclosed fissure. A single pair of leaves is produced each year. During the resting period, i.e. dry season, this new pair of leaves, at right angles to the existing pair, is produced by the meristem. Sometimes, but not every year, the meristem produces a flower. When a flower is produced, adventitious buds are produced in the axil of the flower and the existing leaves. After flowering, two new pairs of leaves or heads can be produced, the plant eventually becoming a large clump. This is not always true, as one or other of the leaf buds may fail to develop. Many plants e.g. *L. pseudotruncatella* var. *gracilidelineata* rarely produce more than a single ‘head’.

During the dry season, plants of *L. pseudotruncatella* are pulled down into the soil by means of contractile roots (Schmid, 1925). This ensures that only the top surface of the pair of leaves is exposed. Gaseous exchange, via the stomata, can still take place when the plants are buried in the soil, as many of these plants normally grow in very sandy, gravelly soils which contain a large number of air spaces. In many species the whole plant is encased in the dried papery remains of the previous season’s pair of leaves. These are
shed at the beginning of the next growing season. This is an additional protection to cut down water loss by transpiration during the dry season.

The distribution of photosynthetic tissue in *Lithops* is very characteristic. When the plants are buried in soil, light cannot enter the leaves through that part of the epidermis which is below the surface. The plants have evolved a ‘window’ or translucent area, the cells beneath which are very large, water-filled and colourless. The light passes through the translucent area and diffuses through these water-filled cells to reach the light-receptive cells or chlorenchyma which line the inside of the epidermis. The amount of light reaching these cells is governed by the size and transparency of the window area. In some species there is a clear window e.g. *L. marmorata*, in others there is no window at all e.g. *L. turbiniformis*. In some species the window area is reduced in size by opaque islands and marginal ingrowths. There are in addition special cells, e.g. idioblasts and pellucid dots, which help or hinder the entry and internal diffusion of light (Fearn, 1977).

**The cultivation of Lithops**

In Europe it is essential for *Lithops* to remain dormant during the winter months. From the end of October until March no water should be given. During this period the old pair of leaves shrivels and a new pair is produced between them. In the spring the old pair is often reduced greatly in size: this is particularly so in *Lithops pseudotruncatella*. When water is given in the spring the new pair of leaves swells and bursts through the old leaves, which die away. As a general rule there should never be more than two pairs of leaves on a plant at any one time. If there are more than two, it suggests either that too much water is being given or that the plants are not receiving enough light. Watering once or twice a week should be sufficient in the growing season, which lasts from March to September. If during this time the epidermis shows signs of wrinkling, it indicates that not enough water is being given. Another indication as to water requirements is given by those species which should have a flat top surface to the leaves. If these appear to be convex, then too much water is being given.

*Lithops* species vary in their water requirement. Some species, particularly those which originate from the Transvaal and Orange Free State, grow in areas that have a relatively high annual rainfall—sometimes as much as 750 mm (30 inches) a year. This is particularly true of *L. leslei* and *L. aucampiae*. Other species, particularly those from Little Namaqualand and S.W. Africa, grow in very arid areas which often receive less than 125 mm (5 inches) of
rain a year. Sometimes there may be no measurable quantity of rain for several years. Species from this area, e.g. *L. francisci*, *L. erniana*, *L. comptonii* var. *divergens* and *L. otzeniana*, are very sensitive to excess water.

It is interesting to note that some species, e.g. *L. localis* and *L. comptonii* var. *comptonii*, both grow, like the genus *Conophytum*, in winter rain areas of South Africa. Whereas it is impossible to grow *Conophytums* in the summer months, these two species of *Lithops* have a growing period which is the same as that of the rest of the species. It appears therefore that the growing period is not under the control of availability of water, but of day-length. Species of *Conophytum* are short-day plants and *Lithops* are long-day plants.

*Lithops* flower at the end of the growing period and *Conophytums* flower at the start of the growing period. In Europe most species of *Lithops* flower in the autumn, particularly in September, but *L. pseudotruncatella* and its relatives flower in July. The last species to flower is *L. optica* forma *rubra*, which can flower as late as December. It is advisable for this species to be watered and kept warm up to this time. It is also beneficial for it to be given artificial light so as to extend the day-length. This can be done by the use of warm white fluorescent tubes under the control of a time clock.

The finest European cultivator of *Lithops* was probably the late Dr H. W. de Boer. He grew his collection in square earthenware pans about 100 mm (4 inches) deep. A very sandy compost was used.

The minimum winter temperature should be 4—7°C (40—45°F). There is no maximum summer temperature but adequate ventilation must be given in hot sunny weather so that the plants do not scorch. Although it is possible to grow *Lithops* on the window-sill, a greater degree of success, particularly for flowering, will be achieved if they are grown in a greenhouse.

The propagation of Lithops from seed

Species of *Lithops*, like most stemless members of the *Aizoaceae*, are quite easy to grow from seed, provided that one or two simple instructions are followed. In Europe it is best to sow *Lithops* seed in September or October. Elsewhere in the world the seed should be sown at the end of the normal growing season. Shallow pans, about 60-80 mm (2½-3 inches) deep, in the bottom of which there must be a drainage hole, are used.
When making up a compost for *Lithops* it is most important to add coarse sand or grit so that the mixture is porous. Fine sand like silver sand is not suitable; builders’ sand should be avoided because it contains lime. A suitable soil mixture for seed sowing and general Lithops cultivation can readily be made up as follows:

(a) $\frac{1}{2}$ part coarse sand or grit,
(b) $\frac{1}{4}$ part medium grade peat or well rotted leafmould.
(c) $\frac{1}{4}$ part of garden soil.

Garden soil is an extremely variable material, but fortunately *Lithops* are fairly tolerant of soil conditions. As a general guide I recommend a friable and sandy loam which is slightly acidic in reaction. *Lithops* can also be grown successfully in a ‘no soil’ mixture consisting of equal parts of a nutrient-rich peat such as Fison’s Levington potting compost and coarse sand. In the wild *Lithops* are found growing in alkaline soils, often on the tops of low limestone hills. Cole (1969) has published an extensive list of the soil types and the species found growing on them. Many species are also found growing in soils containing high concentrations of common salt (sodium chloride). In cultivation I have found that *Lithops* grow best in a neutral to slightly acid soil. Stemless members of the *Aizoaceae* have very low mineral requirements and it is not necessary to add fertilisers to the compost. In England one of the most successful growers of *Lithops* and *Conophytum* was the late J. T. Bates, who grew his plants in nothing but burnt clay, but I do not recommend this practice.

Fill the pans to within 5 mm (¼ inch) of the rim with the compost and lightly level the soil. Then place a thin layer of sand on the surface. Scatter the seeds thinly and do not cover them with any material. Keep the pans moist but not soaking wet. Spraying overhead with a fine mist is beneficial before germination occurs, as there are soluble germination inhibitors in *Lithops* capsules which may also be on the seeds themselves. These have to be washed away before germination can proceed. *Lithops* seed needs light for germination, so place the pans in a light position at about 15-20°C. Germination is quite rapid, signs usually being visible after 7-10 days. *Lithops* seed remains viable for a considerable length of time which varies with the size of the seeds, the largest remaining viable for a longer period than the smallest. Fearn (1978).

Grow the seedlings for one complete year without withholding water. They should be the size of small peas by this time. They can be transplanted in the first spring or at about 6 months old. In the second winter the plants should be treated as mature plants and in Europe kept dormant from the end of October or beginning of November until the end of April.
A revised analytical key for the genus Lithops

*Lithops* plants are difficult to identify because there are few key characters (Fearn, 1966—Cole, 1969). There have been only two published keys for identification prior to the key by B. Fearn in the *Journal of the Cactus & Succulent Society of America, 42*; pp. 90, 91, of which this is a revision. The key published by Nel (1947) is now unsuitable as many new plants have since been discovered. The key published by de Boer and Boom (1964) I consider to be unworkable as it attempts to identify not only the species, but all the varieties and forms as well, a list of over 90 names. The following key has also been published by H. Jacobsen (*Lexicon of Succulent Plants*: 511-513, 1975).

I attempted to make a species key using vegetative characters only. It is based on a critical examination of over 20,000 adult plants (over 3 or 4 years old) in the growing season. When the plants are resting the bodies shrivel and the colours are not characteristic. Size of the plants has not been used as this is a very variable feature, largely dependent upon environmental conditions. This is not to say that differences do not exist. For example single heads of *L. aucampiae* grow to more than 40 mm across whilst *L. werneri* rarely achieves half this size and collected plants are nearly always less than 10 mm across (Schwantes 1957). My new key is not infallible but is believed to be a considerable advance on the two previous attempts.

In the following key:

1 A window is a transparent part of the top surface which is sometimes obscured by opaque islands and marginal ingrowths, e.g. *L. marmorata* (N.E. Br.) N.E. Br. (See Plate 20). It is sometimes difficult to decide whether a window is present or absent, e.g. *Lithops elisae* de Boer (Plate 9).

2 Pellucid dots are miniature windows up to 1 mm in diameter, usually greenish or bluish in colour and scattered over the top surface, e.g. *L. localis* var. *localis* (Plate 19).

3 The key uses the curvature of the top of the leaves as a character. This is based on plants grown under good conditions. Obviously plants which have been over-watered will present difficulties. In this case both options would be used and the descriptions of the alternatives checked.
Please consult the glossary for an explanation of the other terms used in the identification and description of *Lithops*.

To use the key

Starting at the beginning of the key, progressively select which of the pair of contradicting statements fits the plant being identified. Then proceed to the next pair of statements indicated by the number on the right. Continue to do this until you arrive at a name. Then check the plant being identified with the detailed description.

The Key

<table>
<thead>
<tr>
<th>0</th>
<th>Top of leaves green, greyish-green, whitish-green, olive-green or purplish-green</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0'</td>
<td>Top of leaves not so coloured</td>
<td>17</td>
</tr>
<tr>
<td>1</td>
<td>Pellucid dots present</td>
<td>2</td>
</tr>
<tr>
<td>1'</td>
<td>Pellucid dots absent</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Top of leaves strongly convex, leaves not tightly pressed together, fissure slightly gaping</td>
<td>3</td>
</tr>
<tr>
<td>2'</td>
<td>Top of leaves not strongly convex, leaves tightly pressed together, fissure not gaping</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Pellucid dots regularly scattered over the top surface</td>
<td><em>localis</em></td>
</tr>
<tr>
<td>3'</td>
<td>Pellucid dots aggregated into indistinct lines</td>
<td><em>francisci</em></td>
</tr>
<tr>
<td>4</td>
<td>Red or brown lines present, often joined up to form dendritic markings</td>
<td><em>pseudotruncatella</em></td>
</tr>
<tr>
<td>4'</td>
<td>Red or brown lines absent</td>
<td><em>lesliei</em></td>
</tr>
<tr>
<td>5</td>
<td>Top of leaves strongly convex</td>
<td>6</td>
</tr>
<tr>
<td>5'</td>
<td>Top of leaves not strongly convex</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>Leaves tightly pressed together, fissure not gaping</td>
<td><em>olivacea</em></td>
</tr>
<tr>
<td>6'</td>
<td>Leaves not tightly pressed together, fissure gaping</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>Fissure less than 8 mm deep</td>
<td><em>optica</em></td>
</tr>
<tr>
<td>7'</td>
<td>Fissure greater than 8 mm deep</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>Flowers white, 6-merous. (number of stigma lobes, sepals, etc.)</td>
<td>9</td>
</tr>
<tr>
<td>8'</td>
<td>Flowers yellow 5-merous</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>Window large, islands small, few or absent</td>
<td><em>marmorata</em></td>
</tr>
<tr>
<td>9'</td>
<td>Window absent or obscured by islands and marginal ingrowths</td>
<td><em>elisae</em></td>
</tr>
<tr>
<td>10</td>
<td>Plants always greyish-green, window large, sometimes reduced by islands and marginal ingrowths</td>
<td><em>helmutii</em></td>
</tr>
<tr>
<td>10'</td>
<td>Plants sometimes brownish or purplish-green, window large with a few small islands</td>
<td><em>comptonii</em></td>
</tr>
</tbody>
</table>
11 Red clots and/or brown lines present
11' Red dots and/or red or brown lines absent
12 Top with small raised red dots
12' Not as above
13 Window present, flowers white
13' Window absent, flowers yellow
14 Flowers white, 6-merous (number of stigma lobes, sepals, etc.)
14' Flowers yellow, 5-merous
15 Window large and distinct, with a few large islands
15' Window obscured by many small islands and marginal ingrowths
16 Window not distinct, with vague islands
16' Window with distinct islands
17 Top of leaves white or pinkish-white
17' Top of leaves not so coloured
18 Top of leaves strongly convex
18' Top of leaves not strongly convex
19 Window absent. Flowers yellow
19' Window obscured by islands and marginal ingrowths, flowers white
20 Pellucid dots present
20' Pellucid dots absent
21 Top of leaves wrinkled with very fine chalky ridges
21' Not as above
22 Window present
22' Window absent
23 Top of leaves flat
23' Top of leaves slightly convex
24 Leaves entirely purplish-red coloured
24' Top of leaves not so coloured
25 Top of leaves brownish
25' Top of leaves not so coloured
26 Pellucid dots present
26' Pellucid dots absent
27 Window present
27' Window absent
28 Top of leaves flat
28' Not as above
29 Red or brown lines present
29' Red or brown lines absent
30 Pellucid dots numerous, regularly scattered over the top surface. Window small
30' Pellucid dots few, window often large
|   | 31 Red or brown lines absent | 32 Top of leaves flat | 33 Lines joined up to form dendritic markings | 34 Top of leaves flat | 35 Flowering time July (in Europe) | 36 Top of leaves strongly convex | 37 Lines and markings impressed so that the top of leaves appear bullate (puckered) | 38 Not as above | 39 Window present | 40 Red dots and lines present | 41 Lines and markings impressed so that the top is bullate (puckered) | 42 Top with small raised red dots | 43 Top of leaves flat | 44 Window large, islands few if any | 45 Flowers yellow, 6-merous | 46 Top of leaves flat | 47 Pellucid dots absent, flowers white | 48 Red dots present | 49 Window present | 50 Window absent |
|---|-----------------------------|----------------------|-----------------------------------------------|----------------------|-----------------------------------|-----------------------------|-----------------------------------------------------------------|-----------------------------|-------------------|--------------------------|-----------------------------|----------------------|-------------------|-------------------------|--------------------------|----------------------|-------------------|
|   | 31' Red or brown lines present | 32' Top of leaves convex | 33' Not as above | 34' Top of leaves convex | 35' Flowering time September—October (in Europe) | 36' Top of leaves not strongly convex | 37' Not as above | 38' Pellucid dots inconspicuous | 39' Window absent | 40' Red dots and lines absent | 41' Lines and markings not impressed, top smooth | 42' Not as above | 43' Top of leaves slightly convex | 44' Window obscured by islands and marginal ingrowths | 45' Flowers white, 5-merous | 46' Top of leaves convex | 47' Pellucid dots present, flowers yellow | 48' Red dots absent | 49' Window absent | 50' Window absent |
|   | aucampiae                   | localis              | schwantesii                                    | steineckeana         | pseudotruncatella               | schwantesii                 | glaudinae                                                     | fulviceps                   | villetii          | verruculosa             | julii                        | bella                | salicola            | dorotheae               | turbiniformis            | karasmontana         | erniana           | deboeri             | werneri              | schwantesii          |
Descriptions and photographs of the Lithops species arranged in alphabetical order
Plate 1 Lithops archerae de Boer Succulenta 1967b, 46: 122.

Size 29mm long and 22mm wide at the fissure.

Fissure Immature plants exhibit the typical narrow fissure of Series A, but mature plants have a slightly gaping fissure reminiscent of L. vallis-mariae. Fissure 2.5—3.5mm deep.

Colour Greenish-grey, tinged with yellow.

Top Windowless, flat, slightly concave with 4-5 indistinct, slightly impressed dendritic lines incompletely joined together.

Flowers Yellow, ?-merous, seed group 2 (see p.64).

Collected by Mrs A. Archer of Tsams West in 1966 and named in her honour.

Type locality Naukloofbergen, near Zaris, S.W. Africa.

Notes This is an extremely interesting species as it is an intermediate link between three complex species—L. schwantesii, L. pseudotruncatella and L. vallis-mariae. Cole (1973) has proposed the combination L. pseudotruncatella var. archerae (de Boer) Cole. At the present time I prefer to leave it as a separate species.
Lithops aucampiae var. aucampiae.

Size Up to 40mm long and 20mm wide at the fissure. Forms large clumps up to 200mm in diameter.

Fissure Very narrow.

Colour Reddish-brown. The top surface is variable in both colour and markings; some plants have a distinct window, others have the window occluded by irregular, somewhat raised islands. These latter plants are very like L. lesliei var. hornii.

Window Dark olive-green to reddish brown with numerous antler-like branches in the outer margin. Top surface strikingly flat. Pellucid dots are occasionally present but certainly not in all specimens.
**Flowers** Yellow, 25mm in diameter, 6-merous, produced in September, seed group 1.

**Collected by** Miss Aucamp and D. McCormick in 1931.

**Type locality** North of Portmasburg, Griqualand West, Cape Province.

**Notes** The name *L. loganae* L. Bol. refers to a variant with bright markings, having a distinct window not occluded by islands. This variant is not true breeding and the name is excluded. This species and its varieties are widely distributed. De Boer has named two varieties and Cole another one. *L. lesliei* var. *hornii* appears to be related, so much so that it could well be a link between two otherwise distinct species. It is often difficult for amateurs to distinguish between them.

**Varieties** *Lithops aucampiae* var. *euniceae* de Boer

*Lithops aucampiae* var. *fluminalis* Cole

*Lithops aucampiae* var. *koelemanii* de Boer ex Cole

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**Plate 3 Lithops bella** N.E. Br. *Gard. Chron*. 1922 Ser. 3 71; 80

*Lithops bella* var. *bella*.

**Size** Up to 35mm long and 25mm wide at the fissure.

**Window** Large, dark greenish or brownish, broken up by the raised light yellow, pinkish-yellow or light brownish-yellow islands which make the top surface very rugose.

**Flowers** Pure white, scented, 25mm in diameter, produced from September to October, (4-)5-6-merous. Seed group 3.

**Collected by** E. C. Phillips in 1922.

**Type locality** Near Aus-Gubub in granite mountains, S.W. Africa.

**Notes** Another locality, the first south of the Orange River, was found by Dr H. Andreae at Jakhalswater about 64km south of Vioolsdrift, Cape Province in May 1950. *L. marmorata* has also been recorded from this area.

**Varieties** *Lithops bella* var. *eberlanzii* (Dint. & Schwant.)

*de Boer & Boom*

*Lithops bella* var. *lericheana* (Dint. & Schwant.)

*de Boer & Boom* (See note on p39)
LITHOPS BELLA N.E. Br. The name, meaning beautiful, is very appropriate for such an attractive species.


*Lithops bromfieldii* var. *bromfieldii*

**Size** up to 3.0cm long and 1.8cm wide at the fissure, but usually much smaller than this. For example Harry Hall has collected a 24-headed plant which was only 5.0cm in diameter overall.

**Colour** characteristically yellowish-red-brown from a distance.

**Top** flat or slightly convex, usually strongly rugose being irregularly furrowed.

**Window** reduced to strips, dark green with deep rust-red lines. Outer margin with 6-10 bifurcations of the window.

**Islands** present, strongly bullate, yellowish, sometimes reddish-brown.

**Flowers** yellow. 5-merous. Seed group 3.

**Collected by** H. Bromfield in September 1933.

**Type locality** 20 miles South West of Upington near the Orange River.

**Varieties** *Lithops bromfieldii* var. *insularis* (L. Bol.) Fearn

*Lithops bromfieldii* var. *mennellii* (L. Bol.) Fearn

Lithops comptonii var. comptonii

Size Rather small, being up to 25mm long and 15mm wide at the fissure, rarely more than 2-headed but Nel (1947) records clumps of 15 heads.

Fissure Deep, the leaves often gaping.

Colour dark green, purplish-green or reddish, sometimes greyish-purple or brownish.

Window Large dark grey-green sometimes tinged purple, often with many islands but occasionally some specimens are without islands.

Flowers Yellow, 15-25mm in diameter, 5-merous. Seed group 4.

Collected by Professor R. H. Compton and named in his honour.
LITHOPS COMPTONII L. Bol. The new pairs of leaves may be seen emerging as the old leaves begin to dry off.

**Type locality** This is erroneously given in the type description and later in Nel’s ‘Lithops’ (1947) as Matjesfontein and Karroo Poort. Professor R. H. Compton states that he originally made the collection midway between these two localities near the farm Sterkfontein to the north of the Bonteberg.

**Notes** This species with its widely divergent leaves is one of the most primitive of the genus and, as it grows in the south-west Cape region, is considered to be a species from which many others in the genus have evolved. It is rarely found in cultivation.

**Varieties**

*Lithops comptonii* var. *divergens* (L. Bol.) Feara

*Lithops comptonii* var. *divergens* forma *amethystina* (de Boer) Feara

*Lithops comptonii* var. *viridis* (Luckh.) Feara
LITHOPS DEBOERI Schwant. Note the amount of variation in the window among this group of young plants. These plants have been grown from seed produced from Dr de Boer’s original two plants.


**Size** Up to 40mm long and 25mm wide at the fissure, rarely forms more than 2 heads. Leaves equal in size.

**Fissure** Deep with a conspicuous pink blister at the base of the leaves.

**Colour** Sides bluish-grey, top bluish-grey or brownish.

**Window** Large, very dark bluish-grey or brownish-grey often reduced to reticulate lines by the many brown or reddish islands. Some plants have few or no islands in the centre of the window which is then large and prominent.

**Flowers** White, 6-merous, seed group 5.

**Collector** Unknown. Sent to Dr H. W. de Boer by Professor G. C. Nel.

**Type locality** Stafvlei, Cape Province.
Notes This species was named by Professor M. H. G. Schwantes in honour of Dr H. W. de Boer, one of the world authorities of the genus. De Boer writes of its origin as follows—

“Shortly after the war (1940-45) I received two plants from Professor G. C. Nel, with the name L. verruculosa. Neither by its description nor by the illustration in Nel (1947) does this name fit this plant. One might call it a white-flowering variety of L. weberi, but this likeness applies only to the form of the window and islands, thecolouring being entirely different.”

The locality of this species has been found only very recently and all the thousands of plants in cultivation have been grown from seed produced by de Boer’s original two plants and their progeny. Cole (1973) has proposed the combination L. villetii var. deboeri (Schwant.) Cole. At the present time I prefer to leave it as a separate species. See Cole (1972).


Size Up to 22mm long and 15mm broad at the fissure. Lobes nearly always equal in size. Forms clumps of 8 or more heads.

Colour Light brownish-green, sometimes suffused with red.

Window Always present, surface flat or slightly convex, bordered irregularly with brownish-yellow. Red dots always present varying 3—15 in number and up to 0.5mm in diameter. Red lines sometimes present, up to 3mm long. Other dots present, sometimes indistinct, light bluish to very dark blue.

Islands Absent or many, light brownish-yellow, sometimes coloured.

Flowers Yellow, 6-merous, Seed group 5.

Collected by Ernst Rusch in 1926.

Type locality Wittsand, South of Warmbad, which lies north of the Orange River. Found growing in quartz.

Notes This is a rare species not often cultivated. Many of the plants in cultivation as this species are L. dinteri var. brevis.

Varieties Lithops dinteri var. brevis (L. Bol.) Fearn
Lithops dinteri var. frederici Cole
Lithops dinteri var. marthae (Loesch. & Tisch.) Fearn
Lithops dinteri var. multipunctata de Boer
LITHOPS DINTERI Schwant. Compare this photograph with that of L. comptonii on page 22. Here the old leaves have dried completely to leave only a shell.

I consider var. marthae to be a link between L. dinteri and the L. schwantesii complex. Among the plants examined were specimens which were practically identical with L. schwantesii, L. dinteri var. dinteri and L. dinteri var. brevis. Plants with red dots are often like var. dinteri and others without dots often like var. brevis. Cole (1973) has published the combination L. schwantesii var. marthae (Loesch. & Tisch.) Cole. After examining large numbers of plants I believe that it is closer to L. dinteri than to L. schwantesii. In the future a union of both species may be preferred.
LITHOPS DOROTHEAE Nel. This is generally considered to be one of the most attractive species.


Size Up to 30mm long and 20mm wide at the fissure, very rarely forming clumps of more than 2 heads. A flowering clump at Kew had 5 heads.

Colour Light brownish-yellow, the window strongly contrasted against the islands and margins.

Window Slightly convex, smooth to the touch, dark grey with red dots and red, sometimes branched, lines. The window is nearly occluded in some plants by the light buff coloured islands.

Flowers Yellow, 5-merous, seed group 3.

Notes There has been much confusion concerning the type locality, the collector and the identity of the person after whom Nel named this plant. Professor D. T. Cole (1970), by an admirable piece of
detective work, has clarified the situation. He concluded that—

1. The type locality of *L. dorotheae* Nel is near Pofadder, Bushmanland, C.P. not Pella as stated by Professor G. C. Nel and reiterated by other authors.

2. The species was originally discovered and collected by Mrs Aletta Helena Ekstein, presumably in 1935.

3. *L. dorotheae* Nel was named after Dr Dorothea van Hyssteen not van Huysteen as stated by G. C. Nel and not after Mrs Dorothea Eksteen as stated by Schwantes (1957).

*L. dorotheae* is probably closely related to *L. dinteri*. They appear to be completely interfertile. I have produced F₁ hybrids which look very like *L. dinteri* var. *multipunctata*.


**Size** Up to 40mm long and 20mm wide at the fissure.

**Fissure** In large specimens up to 20mm deep.

**Colour** The plants have an overall bluish-yellow-grey colour often suffused with amethyst.

**Window** Occluded by the islands and reduced to narrow strips.

**Islands** Large and irregular in size.

**Flower** White, 6-merous, seed group 5.

**Collected by** Dr A. L. Geyer and others in May 1961.

**Type locality** Between Steinkopf and Vioolsdrift in Little Namaqualand.

**Notes** This species is similar to *L. marmorata*, but differs in the occluded window, which is reduced to narrow strips. The plants also look very like *L. herrei* or perhaps *L. meyeri* but differ in the large islands and of course white flowers, both *L. herrei* and *L. meyeri* having yellow flowers. Cole (1973b) has proposed the combination *L. marmorata* v. *elisae* (de Boer) Cole. At the present time I prefer to leave it as a separate species.

Plate 10 *Lithops erniana* Tisch. ex Jacobsen *Die Sukkulenten* 1933: 145.

*Lithops erniana* var. *erniana*.

**Size** Up to 30mm long and 15mm wide at the fissure.
LITHOPS ELISAE de Boer. In this species the leaves stand apart, producing a deep and open fissure.

LITHOPS ERNIANA Tisch. ex Jacobsen.
**Colour** Sides bluish-grey, top light greyish-yellow, brownish-yellow occasionally suffused with pink.

**Top** Slightly rugose, markings are often distinctly contrasting with top, usually reddish-brown, occasionally greyish. Lines often star-shaped and ending in the outer margin with three branched lines.

**Flowers** White, 5-merous, seed group 3.

**Collected by** H. Erni.

**Type locality** near Pockenbank S.W. Africa.

**Varieties** *Lithops erniana* var. *aiaisensis* de Boer.

*Lithops erniana* var. *witputzensis* de Boer.

**Notes** The validity of this species and its varieties may be questioned. *L. erniana* might be a geographical variant of *L. karas-montana*. *L. erniana* var. *witputzensis* is very similar to *L. karas-montana*. Professor Cole believes that *L. erniana* var. *aiaisensis* may be related to *L. karas-montana* rather than *L. erniana*. I have found that some of the F₁ progeny of *L. bella* var. *bella ♀ x L. karasmontana ♂ are similar to *L. erniana* var. *aiaisensis* and var. *witputzensis*. Further field work and crossing experiments are necessary before this question can be resolved.

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*Lithops francisci* var. *francisci*.

**Size** Up to 40mm long and 20mm wide at the fissure. Fissure up to 15mm deep. Forms clumps of 6 or more heads.

**Colour** Variable, bluish-grey-green to greyish-yellow-brown.

**Top** Surface set with many pellucid dots, some of which occasionally coalesce to form larger transparent areas forming the beginnings of a window. Other dots and idioblasts are occasionally present, reddish, brownish or bluish.

**Flower** Yellow 15mm in diameter, 5-merous, seed group 3.

**Collected by** Professor Kurt Dinter.

**Type locality** Halenberg, 40 km east of Luderitz Bay, S.W. Africa.

**Notes.** This species has also been found by Messrs Eberlanz and Stober in the Kovisbergen on 9th August, 1924. I have found that this is one of the most difficult species of *Lithops* to grow successfully in cultivation. It grows naturally in an extremely arid region and a very well drained soil is essential.

**Varieties** *Lithops francisci* var. *annae* (de Boer) Fearn

*Lithops francisci* var. *gesinae* (de Boer) Fearn
Size Up to 25mm long and 15mm wide at the fissure. Forms clumps of up to 4 heads, but rarely forming more than two.
Colour Reddish-ochre-brown, pinkish, occasionally dull greenish.
Top Without a window, flat, slightly convex, fissure very narrow the leaves being closely adpressed. This species is characterised by the enormous circular dark green dots up to 0.5mm in diameter. These dots are slightly raised, making the surface rough to touch.
LITHOPS FULVICEPS (N.E. Br.) N.E. Br. The photograph clearly shows the characteristic raised dots which make this species instantly recognisable.

Amongst the green dots there are often several thin red lines and dots.

Flowers Yellow, 5-merous, occasionally 4 and 6-merous, seed group 3.

Collected by Professor Pearson.

Type locality Grunau Farm at South Narudas at 4,300 ft Great Karas mountains S.W. Africa.

Notes This is one of the easiest species of Lithops to identify correctly. The enormous circular dark green dots are very characteristic and occur in no other species. Cole (1973b) has published a new variety *L. fulviceps* var. *lactinea* Cole. The plants that I have seen appear to be only a little paler in colour than the type form, otherwise the markings were exactly the same. There is another very pinkish form of *L. fulviceps* in de Boer’s collection but this has never been described.
Plate 13 Lithops glaudinae de Boer. Succulenta, 1960d, 39: 129

Size Up to 30mm long and 20mm wide at the fissure. Forms clumps of 4 or more heads. Leaves often unequal in size and closely adpressed, the fissure being very narrow.

Colour Dark brown at a distance.

Window Greenish-grey, broken up with many raised reddish-brown islands. Red, sometimes greyish green lines between the islands. This species is characterised by the large number of large glossy pellucid dots which are especially distinct if they are seen against the light.

Flowers Yellow, 6-merous, seed group 2.

Type locality West of Griquatown, Haydistrict, Cape Province.

Notes Mrs Glaudina Venter was talking to Professor D. T. Cole and another man in Johannesburg and the subject of Lithops was raised. Mrs Venter said on her father’s farm was a species of Lithops, This was later found and collected and proved to be a new species. The affinities of this species are interesting. If it
were not for the presence of the large glossy pellucid dots it might be linked with *L. bromfieldii* var. *bromfieldii* or var. *insularis*, or with one of the *L. turbiniformis* varieties. Cole (1973) has proposed the combination *L. bromfieldii* var. *glaudinae* (de Boer) Cole. At the present time I prefer to leave it as a separate species.

**Plate 14 Lithops helmutii** L. Bol. *S. Afr. Gard.* 1933 23: 218

**Size** Up to 25mm long and 15mm wide at the fissure. Forms large clumps with 17 or more heads.

**Fissure** Very deep with the leaves gaping.

**Colour** Sides greyish green. Top light olive green.

**Window** Large with many small islands.

**Flowers** Yellow, 5-merous, seed group 5.

**Collected by** G. Meyer in June 1933.

**Type locality** Between Steinkopf and Arrabies, Namaqualand.

**Notes** Some specimens are without islands and these resemble *L. comptonii* or var. *divergens* which both have yellow flowers. It may also resemble *L. marmorata* which has white flowers. It is also similar in many ways to *L. herrei* and to *L. naureeniae* (see Postscript).

**Plate 15 Lithops herrei** L. Bol. *Notes Mesemb.* 1932 2: 346

**Size** Up to 30mm long and 20mm wide at the fissure, forms large clumps with up to 15 heads.

**Colour** Light grey, sometimes greenish, sometimes suffused with amethyst.

**Window** Greyish-green, nearly absent in many specimens being occluded by the many islands which are sometimes joined together leaving the window as dots or small lines.

**Flowers** Yellow, 5-merous, seed group 3-4.

**Collected by** H. Herre in October 1930.

**Type locality** Swartwater 20 km south-east of Hohen-fels, Little Namaqualand, Cape Province.
LITHOPS HELMUTII L. Bol. The flowers of this species are said to have a scent reminiscent of orchids.

LITHOPS HERREI L. Bol. A group of young plants showing considerable variation.
Notes I am unsure of the taxonomic status of this species. In spite of the considered opinion of the late Dr H. W. de Boer that var. hillii and var. geyeri are good varieties I believe that we are dealing with a single variable species with geographical forms. I have found great difficulty in distinguishing de Boer’s varieties from L. herrei. Of the two, var. geyeri with islands which never completely occlude the window is perhaps the more distinctive. After examining the seed capsules I have found similarities with L. optica and L. marmorata, both these species having white flowers. On one occasion only, I have produced viable seed from a cross between L. herrei and L. marmorata. The $F_1$ hybrids looked like L. optica.


Synonyms
L. julii forma pallida Tisch.
L. julii var. pallida Tisch.
L. julii var. lactea Schick & Tisch.
L. julii var. typica Tisch.
L. julii forma reticulata (Dint. & Schwant.) Tisch.
L. julii var. reticulata (Dint. & Schwant.) N.E. Br.
L. julii var. littlewoodii de Boer
L. lactea Schick & Tisch.
Lithops julii var. julii.

Size Up to 25mm long and 18mm wide at the fissure.

Colour Variable, pinkish-grey to yellowish-brown-grey.

Top With a characteristic brown line or smudge on the margins of the fissure. This is very distinct in some plants, but indistinct in others, occurring only as a few dots. Top sometimes distinctly reticulate, but the window is nearly as light as the islands. Some plants are slightly rugose.

Flowers White, 20-30mm in diameter, 5-merous. seed group 5.

Collected by Professor K. Dinter and named after Dr Julius Derenberg of Hamburg.

Type locality Halfway between Vahldorn and Warmbad.

Varieties Lithops julii var. rouxii

Notes For a comprehensive review of this species see Fearn (1976b).
Plate 16B Lithops julii subspecies fulleri (N.E. Br.) Fearn.  

**Size** Up to 40mm long and 25mm wide at the fissure.

**Colour** Variable, sides light grey, sometimes tinged yellow. Plants at a distance look greyish.

**Window** Large, bluish-grey-purple to yellowish-brown. Lines always present in the window, predominantly red, but in some plants they are brown and are sometimes joined together to become reticulate. Outer margin characterised by distinct radiating lines, red, rarely brown, with a thin line of yellowish-grey-brown between the lines and the sides of the lobes. Top distinctly rugose.

**Islands** Few, only a little darker than the sides.

**Flowers** White, 30mm in diameter, 5-6-merous, seed group 5.

**Collected by** R. E. Fuller.

**Type locality** 20 km west-south-west of Kenhardt, between Kenhardt and Groot Riet, West of the Hartebeest River C.P.

**Notes** The relationship between _L. julii_ subspec. _fulleri_ and _L. salicola_ L. Bol. is very interesting. In 1960 de Boer published a
new variety which he called *L. salicola* var. *reticulata* which was found by Dr A. L. Geyer in June 1959. It was discovered 45 km to the south of Hopetown in the neighbourhood of Kraankuil, Cape Province. In the thesis by Fearn (1968) p. 286 it was suggested that this plant was rather similar to *L. fullerii* var. *ochracea*. In his review of *L. hallii* Professor D. T. Cole (1969) drew attention to several problems in the taxonomy of Lithops. He combined *L. salicola* var. *reticulata* de Boer with *L. hallii* de Boer and noted an affinity of this plant with *L. fullerii* var. *ochracea*. Cole (1973b) has since published the combination *L. hallii* var. *ochracea* (de Boer) Cole.

I have now synthesised *L. hallii* by crossing *L. salicola* with *L. julii* subsp. *fulleri*. I have found these species to be completely interfertile. Some of the F₁ hybrids are identical with de Boer's *L. salicola* var. *reticulata*, now regarded as *L. hallii*. All these plants are fertile and do not produce segregated offspring in the F₂ generation.

It now appears that the varieties of *L. fullerii*, var. *brunnea* de Boer, var. *ochracea* de Boer, and *L. hallii* de Boer, are very closely related. It seems that they are geographically isolated populations produced from hybridisation between *L. fullerii* and/or *L. julii* and *L. salicola*. Although I have not synthesised var. *brunnea* and var. *ochracea* I do not believe that these are any different from *L. hallii* in this characteristic.
Plate 17 Lithops karasmontana (Dint. & Schwant.) N.E. Br.  

**Size**  Up to 35mm long and 20mm wide at the fissure.

**Colour**  Extremely variable. The top is light grey, pinkish, yellowish, grey, brownish-grey, light yellowish-brown or reddish-brown. Sides grey sometimes tinged brown.

**Markings**  Very variable. The markings, often reticulate, may be nearly the same colour as the rest of the top surface and hence hardly visible. In other plants there are distinct short lines which are sometimes joined together and star-like. These may branch and become reticulate. The markings are usually light ochre-brown to dark reddish-brown. The markings may be surrounded by a bluish-grey area.

**Flowers**  White, 5-merous, seed group 5.

**Collected by**  Professor K. Dinter.

**Type locality**  Karas mountains, S.W. Africa.

**Notes**  
*Lithops karasmontana* is a very variable species and a number of varieties have been described (Fearn, 1975b). Cole (1973b) confirmed Nel's and my own suspicions that for the most part the varieties described, var. *opalina*, var. *mickbergensis* and var. *sum-
mitatum, are not geographically isolated but occur growing together at a single locality.

I have found this species to be completely interfertile with Lithops bella. Cole (1973b) has published a new variety L. karasmontana var. tischeri (Cole and a new combination L. karasmontana var. lericheana (Dint. & Schwant.) Cole. I have synthesised both of these plants. Two separate crosses between L. bella var. bella ♀ and L. karasmontana var. summitatum ♂ produced two different F₁ populations. One is the same as L. bella var. lericheana and the other is the same as L. karasmontana var. tischeri. There are no segregants in the F₂ generation.

It may be that L. erniana, particularly L. erniana var. witputsens and var. aiaisensis are either varieties or hybrids of L. karasmontana as well. In addition, the L. karasmontana complex may be related to the L. julii complex, as pure grey forms occur in both species. Further field work and crossing experiments are needed to elucidate the problems concerning the taxonomy of many of the Lithops from S.W. Africa.


Lithops lesliei var. lesliei.

Size Up to 30mm long and 18mm wide at the fissure. Usually 1 or 2 heads, occasionally with 4 heads.

Window Large, dark brownish-green in colour. Islands many, light yellowish or reddish-brown. Pellucid dots are numerous, covering the top surface and are present within the islands. The sides of the lobes are grey, tinged greenish or brownish.

Flowers Yellow, 5-merous, Seed group 1.

Collected by the youngest son of T. N. Leslie on August 9th, 1908.

Type locality Dwyka Conglomerate outcrop on the banks of the Vaal River at Vereeniging, Transvaal.

Notes Burtt Davy received the plant from Leslie and the following day, at the 4th meeting of the Transvaal Biological Society held in Pretoria, exhibited and described the plant but in the absence of flowers the description was never published until N. E. Brown did so in 1912.

Professor D. T. Cole probably knows more about the habitats and geographical distribution of this species than any other person. He has discovered many new localities and has found many new forms which he says intergrade with each other. Dr de Boer has
LITHOPS LESLIEI (N.E. Br.) N.E. Br. A light-coloured form of this variable species. One of the most interesting introductions of recent years is the white-flowered, green-bodied forma albinica.

named a number of these forms as varieties, against the better judgement of Professor Cole. These varieties are maintained at the present time until a decision has been made on their relative merits. I have found that in the main they are true breeding. If as Cole states, intermediates exist between them, it is of interest to speculate why these intermediates do not appear in seedling generations. This species has a wide distribution having so far been collected at 25 separate localities.

Varieties **Lithops leslei** var. *leslei* forma *albiflora* Cole  
*Lithops leslei* var. *leslei* forma *albinica* Cole  
*Lithops leslei* forma *minor* (de Boer) Fearn stat. nov.  
*Lithops leslei* var. *hornii* de Boer  
*Lithops leslei* var. *rubrobrunnea* de Boer  
*Lithops leslei* var. *venteri* (Nel) de Boer & Boom  
*Lithops leslei* var. *mariae* Cole
LITHOPS LOCALIS (N.E. Br.) Schwant. A distinctive species which is easily recognised.

Lithops localis var. localis

Size Up to 25mm long and 15mm wide at the fissure.

Colour Pinkish brown to fawn.

Window Nearly always absent, top surface marked with numerous, isolated pellucid dots. The var. localis is true breeding and the population in cultivation shows little variation.

Flowers Yellow, 5-merous. Seed group 3.

Collected by Mr Burke (in 1918?), recollected by Mr D. A. Cole in 1960.

Type locality Near the Gamka River in Beaufort West Division, Cape Province.

Notes De Boer maintained var. peersii and var. terricolor as varieties but in my experience, after examining many plants from these populations, the two varieties of de Boer can be distinguished from each other only by selecting a green or a purple plant and
LITHOPS MARMORATA (N.E. Br.) N.E. Br. A green species with white flowers from the coastal area just south of the Orange River.

ignoring the variation. Single plants cannot be selected at random and with certainty be assigned to one or other taxon.

The variety terricolor is the most widely distributed—Prince Albert, Beaufort West, 40 km from Aberdeen near the road, Miller Station, Steytlerville, Springbok Vlakte and near Uitenhage. Within the variation of var. terricolor there are plants which are purplish; the variation therefore overlaps into de Boer’s var. peersii. It is thus believed that they are one and the same variety and reduction of var. peersii into synonymy with the oldest of the varietal names, var. terricolor, is proposed. Cole (1973b) suggests that the Prince Albert population may be distinct but the plants I have seen do not justify separate status.

Size Up to 25mm long and 20mm wide at the fissure.

Fissure In adult plants generally deeper than 10mm.

Colour This species is characterised by the overall grey-green appearance and the few grey islands on the large window surface. Some specimens have no islands, but in others there are many.

Flower White, up to 30mm in diameter and slightly scented. 6-merous, seed group 5.

Collector Unknown.

Type locality In the hills to the north of Port Nolloth in little Namaqualand, C.P.

Notes In cultivation the colour of this species varies considerably. When plants are grown with little water and full sun they become more greyish or brownish, sometimes amethyst suffused or even a little greyish-yellow; these latter plants are like L. elisae (compare with Plate 9). Plants with brownish windows have been described as L. framesii L. Bol.


Size Up to 35mm long and 25mm wide at the fissure. This species has one of the deepest fissures in the genus, being up to 25mm deep. Forms clumps of 10 or more heads.

Colour Bluish-grey-green, sometimes a little yellowish.

Window Sometimes distinct, but mostly occluded by indistinct islands, the window being reduced to a few patches. Window area a little more bluish-green than the sides which are predominantly grey-green. Sometimes there is a pale yellowish-brown edge to the window area which may include a few greenish-blue dots.

Lobes In old plants sickle-shaped, caused by the curved inner margin; lobes distinctly divergent.

Flowers Yellow, 5-merous, seed group 5.

Collected by the missionary Mr G. Meyer in October 1931 and subsequently named in his honour by Louisa Bolus.

Type locality The neighbourhood of Brakfontein in the Richtersveld, Little Namaqualand, Cape Province.
LITHOPS MEYERI L. Bol. In this species the lobes are normally unequal in size and gape widely.

LITHOPS OLIVACEA L. Bol. Note the degree of variation in this group of young plants.
Plate 22 Lithops olivacea L. Bol. Notes Mesembr. 1929, 2: 84

Size Up to 25mm long and 18mm wide at the fissure. This species forms very large clumps, often with 30 or more heads.

Colour The window is olive-green or greyish green; sides are grey sometimes tinged greenish-yellow, sometimes distinctly purplish.

Window Characteristically smaller than the largest circumference of the heads. In collected plants the window is often flattened and dull brownish-green, but in cultivation the windows are invariably green and convex. In some plants islands are absent (var. maculata n.n.) but in others there may be up to 16 islands. The edge of the window is only a little denticulate in some plants, whilst in others the margin is distinctly denticulate.

Flowers Yellow up to 30mm in diameter, 5-merous, seed group 5.

Collected by Mr E. R. Fuller in 1928.

Type locality Near Kakamas in the Kenhardt district.

Notes Another locality for this species is a few km south west of Pofadder growing in close association with L. juli ssp. fulleri var. brunnea together with many other species of succulents, notably Dinteranthus vanzijlii and D. puberulus.

Dr N. E. Brown (Mesembryanthema, p. 251. 1931) suggested that this species was allied to L. fulleri. I believe that this species is not closely related to L. fulleri. It is not clear on what grounds this statement was made.

There is a plant of L. olivacea which has been growing at Kew since 1929 and in 1966 measured 125mm in diameter with 30 heads. This plant is growing in the S. African succulent house which was built at Kew from subscriptions raised in South Africa. It is probably one of the original plants sent with the bequest from S. Africa.


Size Up to 35mm long and 20mm wide at the fissure. The fissure is often deeper than 10mm. In cultivation it forms very large clumps 80mm in diameter with 16 or more heads. Nel (1946) records plants with up to 30 heads. In habitat it is much smaller—a plant calculated to be 95 years old was only 45mm high, the individual heads being 3.5mm in diameter.
LITHOPS OPTICA (Marl.) N.E. Br. The ‘poor relation’ of its forma rubra, this is nevertheless an attractive plant in its own right.

Colour Overall greyish-green, sometimes a little pinkish.

Window Large mostly without islands, only a little greener than the sides.

Flowers 15-20mm diameter, white, 5-merous, seed group 4. I have found a single seed capsule of this species which was 4-merous.

Collected by Professor Marloth.

Type locality Coastal desert between Luderitz Bay and Buntfeldschuk near Prince of Wales Bay, S.W. Africa. It was growing in sand-filled fissures of gneiss rocks.

Notes This species looks somewhat like L. meyeri but has white flowers. According to Oztig (1940), white leucoplasts occur instead of chromoplasts, and cause the dull glassy colour in the centre of the window. See also Cole (1978).

W. Triebner has found this species growing in quartz hills and flat quartz screes up to 16km north and 80 km south of Luderitz
Bay. It grows no further inland than 3-4 km and close to the sea shore in one locality. Further to the southern limits of its distribution, Triebner suggests that *L. optica* is merged into *L. herrei*. This is supported by my studies of the capsule structure of *L. optica* and *L. herrei*, species which also have affinity with *L. marmorata* and *L. helmutii*. I succeeded in hybridizing on one occasion *L. herrei* x *L. marmorata* and the F₁ hybrids resembled *L. optica*.

*L. optica* var. *minor* Jacobs is only a habitat variant which grows to normal size in cultivation.

**Plate 23B Lithops optica** forma **rubra** (Tisch.) Jacobs. This form is perhaps the most easily named of all *Lithops*. The colour is unmistakably reddish-purple from a distance. Sides greyish-purple, window deep reddish-purple. Otherwise the same as *Lithops optica*. Originally collected by W. Triebner and his son, 24 km south of Luderitz in quartz scree, S.W. Africa.

**Notes** This is perhaps the finest and most desirable of all the *Lithops*: certainly no collection of these plants should be without this form. In the wild it occurs always with *L. optica*, not in pure stands, at the edge of, and protected by, bushes of *Zygophyllum* and only in a belt 8-48 km south of Luderitz Bay in the Prohibited area No. 1 of the Consolidated Diamond Mine Company. De Boer first obtained seed of this distinctive form in 1946 from Wilhelm Triebner, 10 seeds of which cost him ten shillings (1946 prices). Triebner also sold plants at £5 each. De Boer managed to raise 8 plants from this seed and grew and flowered the seedlings. He obtained further quantities of seed by cross-pollination. He grew thousands of plants and it is due to de Boer’s skill as a cultivator that this most desirable of *Lithops* is widely distributed today.

De Boer has published two authoritative papers about this plant (de Boer, 1955 and de Boer, 1959).

In Europe it is the last of the *Lithops* to flower, usually in December, and additional artificial light is beneficial at this time. I have found that *L. optica* is the only Lithops species which increases the number of heads by means of adventitious buds formed at the junction of the leaf and the hypocotyl.
LITHOPS OPTICA f. RUBRA (Tisch.) Jacobs. This is the most sought-after of all Lithops. It continues growing a little later into the winter than other species.

Lithops otzeniana var. otzeniana.

Size Up to 30mm long and 15mm wide at the fissure. It forms large clumps 100mm in diameter with 15 or more heads.

Colour Top surface nearly always dark green, sometimes a little greyish, brownish or purplish. Sides light grey-green.

Window Large, only rarely with islands. The characteristic feature of this species is the outgrowth of the area surrounding the window to form distinctly denticulate markings. These are usually the same colour as the sides of the lobes but are sometimes yellowish or reddish. There may occasionally be plants without these markings. Professor G. C. Nel described one of these (Lithops, 1947, p. 128) but I have not seen such a plant in cultivation.

Flowers Yellow, 5-merous. Seed group 3.

Collected by Professor G. C. Nel on 30th April, 1937.
LITHOPS OTZENIANA Nel. The teeth-like markings of this species make it instantly recognisable. It is very popular with collectors.

LITHOPS PSEUDOTRUNCATELLA (Berger) N.E. Br. This is possibly the most frequently encountered species in cultivation.
Type locality Bushmanland, at Brakfontein 50 km from Loeriesfontein. It was found in weathered granite under bushes and in open spaces between stones.

Varieties Lithops otzeniana var. weberi (Nel) Fearn.

This is an extremely variable species with a large number of geographical forms. The taxonomic status of these many forms has long been in dispute. A reappraisal of all these suggests that some are sufficiently distinct to maintain as varieties, but others have been ‘sunk’ into synonymy. For example de Boer and Boom (1961) proposed the new combinations: var. pulmonuncula, var. edithae, var. elisabethae and var. mundtii. I find it impossible to identify the first three plants with certainty. Var. mundtii is a brown form which I have noticed occurs within the variation of var. pseudotruncatella. Lithops alpina is a brownish-grey form with pronounced markings. It is a smaller growing form of var. pseudotruncatella found on the summit of the Ruschberg at 2400 metres by E. and O. Rusch in 1925.

Lithops pseudotruncatella var. pseudotruncatella
Size Up to 40mm long and 25mm wide at the fissure. The size is very variable. The lobes are often unequal in size.

Colour Extremely variable, top brownish-grey, bluish-grey, greenish-grey or yellowish-brown, sometimes a little reddish-brown. Sides grey, tinged green or brown.

Top of leaves Flat or slightly convex. Markings extremely variable, but there are always some short brownish lines which are often dendritically arranged. These lines are usually bluish or greyish at the edges. Occasionally the lines are indistinct. Pellucid dots sometimes numerous and distinct, occasionally indistinct, and often border the dendritic lines.

Flowers Yellow, usually in July, 6-7-merous, seed group 1.

Collected by Professor Kurt Dinter in 1897.

Type locality Auas mountains near Windhoek, S.W. Africa.

Varieties Lithops pseudotruncatella var. brandbergensis de Boer
Lithops pseudotruncatella var. dendritica (Nel) de Boer
Lithops pseudotruncatella var. gracilidelineata (Dint.) Fearn
Lithops pseudotruncatella var. gracilidelineata forma waldronae (de Boer) Fearn
Lithops pseudotruncatella var. volkii (Schwant. ex Jacobs.) de Boer

Size Up to 40mm long and 20mm wide at the fissure. According to W. Triebner it forms clumps of up to 60 heads.

Colour Bluish-grey-white, sometimes yellowish or brownish. New growths are distinctly brownish.

Top distinctly convex and the lobes are sometimes divergent. Some plants have a distinct ridge on the top of the lobes which probably represent affinity with the genus Dinteranthus. A few red lines and dots are usually present, often very faint, sometimes distinct but occasionally absent. A few faint bluish dots may also be present.

Flower Yellow, 5-6-merous, seed group 5.

Collected by Ernst Rusch in 1923.

Type locality In the neighbourhood of Khan Cooper Mine, 10 km to the west of Rossing.

Notes Plants with distinct markings have been named L. lineata, others without markings and smaller in size have been called L. nelii. There is little difference between these two populations when compared with L. ruschiorum. De Boer and Boom regarded them as varieties but I believe they are synonymous. Cole (1973b) likewise believes lineata to be a variety.

I have produced hybrids by crossing this species with L. pseudotruncatella var. dendritica. Several plants from these crosses are like L. werneri, others are like L. pseudotruncatella var. gracilidelineata f. waldranae. As already noted earlier, isolated geographical populations produced by hybridization may again be involved here.


Size Up to 30mm long and 15mm wide at the fissure. It forms large clumps of 20 or more heads.

Window Large, dark olive green, sometimes brownish and often with a distinct pinkish border to the window. Islands absent to many, pinkish-brown to greyish-green. There are often dark green flecks in the window which are sometimes reticulate in arrangement. Short reddish-brown lines are sometimes present around the edge of the window.
LITHOPS RUSCHIORUM (Dint. & Schwant.) N.E. Br. A species with a very deep cleft between the leaves, the tops of which are distinctly convex.

LITHOPS SALICOLA L. Bol. In habitat the plants grow in salt ‘pans’ where they are often partly submerged during the rainy season.
Flowers White, 5-6-merous, seed group 3.

Collected by Mr I. C. Verdoom in October 1935.

Type locality Near Fauresmith, on the farm Rose Marie, growing in salt pans, Orange Free State.

Notes This species is interfertile with *L. julii* subsp. *fulleri* and some of the F<sub>1</sub> hybrids are the same as de Boer’s *L. salicola* var. *reticulata*. This is regarded by Cole (1969) as *L. hallii*. I believe it to be a natural hybrid.


*Lithops schwantesii* var. *schwantesii*.

Size Up to 40mm long and 25mm wide at the fissure; forms large clumps.

Colour Very variable, usually reddish-brown, sides amethyst or greenish-grey.

Top Often with the beginnings of a window. There is often a distinct amethyst or pinkish-brown line bordering the top surface. The top has many green dots and also red dots and lines which are sometimes branched.

Flower Yellow, 5-merous, seed group 2.

Collected by Ernst Rusch in August 1926.

Type locality Barby and Krugersputz in S.W. Africa.

Notes Seven varieties have been named of this species, many of which I have great difficulty in identifying. The taxonomic status of many of them is uncertain.

Cole (1973b) reports that plants identical with var. *triebneri* also occur in populations of var. *schwantesii*. On this evidence it is reduced to synonymy. Cole also suggests that var. *nutups-driftensis* is identical with var. christinae but I am leaving these as good varieties for the time being, pending further research. He confirms my comments (Fearn, 1968) that these are closely related to var. *urikosensis*. Cole has also published the new combination *L. schwantesii* var. *marthae* (Loesch & Tisch.) Cole, but I still prefer my original combination with *L. dinteri*. (See note on p.25.
LITHOPS SCHWANTESII Dint. The old leaves on the four-headed clump have finished drying, but those on the other plants are still plump.

Varieties  *Lithops schwantesii* var. *christinae* (de Boer) Fearn
*Lithops schwantesii* var. *gebseri* de Boer
*Lithops schwantesii* var. *kunjasensis* (Dint.) de Boer & Boom
*Lithops schwantesii* var. *nutupsdriftensis* de Boer
*Lithops schwantesii* var. *rugosa* (Dint.) de Boer & Boom
*Lithops schwantesii* var. *urikosensis* (Dint.) de Boer & Boom
LITHOPS STEINECKEANA Tisch. The photograph shows mature plants in Dr de Boer’s collection.


Size Up to 20mm long and 15mm wide at the fissure, slowly forming clumps of two or three heads.

Colour Brownish-yellow, suffused with amethyst.

Top As strongly convex as L. ruschiorum. Some plants are without markings, but others have indistinct brownish lines and bluish-green dots.

Flowers Yellow-orange, 6- or 7-merous. One capsule from Dr de Boer’s plants had 12 segments. Seed group unknown.

Locality Unknown.

Notes This plant was originally raised in Steinecke’s nursery in Ludwigsburg near Stuttgart, from seed sent from S.W. Africa. The name should be spelt steineckeana as it was named by Dr Tischer after Steinecke. This taxon is closely related to L. ruschiorum which grows in the area around Walvis Bay in Damaraland, S.W. Africa. It is thought by de Boer and myself to be a hybrid. It produces large quantities of seed which germinates satisfactorily,
but the seedlings nearly always die after 2 or 3 months. It is thus rarely met with in collections.

Both de Boer and myself have tried to reproduce this plant by crossing *L. ruschiorum* x *L. pseudotruncatella* using both species as pollen donors. We have produced an interesting crop of hybrids but nothing as yet resembling *L. steineckiana*.


*Lithops turbiniformis* var. *turbiniformis*.

**Size** Up to 35mm long and 25mm wide at the fissure. Forms clumps usually 2-headed, occasionally with 4.

**Colour** Generally is reddish-brown, sometimes a little yellowish or purplish. Top surface is the same colour as the sides.

**Top** Strongly rugose with a distinct reticulation. There is no window. The reticulation is a darker brown. Top distinctly flattened with the lobes closely adpressed together, making the fissure very narrow.

**Flowers** Yellow, 6-merous, seed group 2.

**Collected by** William John Burchell on the 14th September 1811.

**Type locality** Zand Vlei near Soutput, which lies 21 km S.E. of Prieska.

**Notes** This plant was first described by Haworth as *Mesembryanthemum turbiniforme* in 1821 and figured by J. D. Hooker in 1874 as *M. truncatellum*, believing it to be Haworth’s plant of this name. (*Bot. Mag.* tab. 6077). In 1908 Alwin Berger showed that this illustration did not fit the description of the real *M. truncatellum* and named the plant *M. hookeri*. Then N. E. Brown discovered that Hooker’s figure really represented Burchell’s plant and restored its original name. Over a century later, from the time it was first described, it became the type species of N. E. Brown’s new genus *Lithops*.

Sir W. T. Thiselton-Dyer (1906) described W. J. Burchell’s find and published a photograph of plants raised from seed at Kew and plants which had been sent by N. S. Pillans in 1902. It was stated that these plants had been collected from the Laingsburg District in the same region as Burchell’s Zand Vlei. Burchell originally collected his *Lithops* species in the Prieska district which is many kilometres further north than Laingsburg. The problem
LITHOPS TURBINIFORMIS (Haw.) N.E. Br. A healthy crop of young plants jostle for position. Under these conditions the weaker and more sickly plants are liable to succumb.

is that the plants figured are of L. pseudotruncatella which had been found a few years earlier in 1897 by Professor K. Dinter near Windhoek in S.W. Africa. L. pseudotruncatella is only found in S.W. Africa and so there must be a mistake in the locational data supplied by Pillans. The true Burchell’s Lithops, i.e. L. turbiniformis, was not collected again until Dr I. B. Pole-Evans rediscovered it in 1918.

Jacobsen attributed L. hookeri to L. localis v. peersii, believing it to have been collected near the Hex river. De Boer (private communication) indicated that there appear to be two such rivers in Southern Africa, one near the Orange River and the other in the Karroo. L. turbiniformis has been collected near the Hex river in northern Cape Province and this may be one of the reasons for the confusion. Cole (1970) has published a very interesting
account of this species and put forward the suggestion that Burchell’s original collection could have been *L. hallii* rather than *L. turbiniformis*.

*L. turbiniformis* is a very variable species and de Boer has named three of the more distinct forms as separate taxa; in addition Cole has named another two forms. Cole (1970) has collected this species at thirty different localities.

The only difference between *L. turbiniformis* and *L. marginata* is the presence or absence of pellucid dots. These are absent in *L. turbiniformis* and its varieties but inconspicuously present in *L. marginata*. Whether this is a sufficiently good character to distinguish between two species is open to question. Both species have yellow flowers, are 6-merous and are in seed group 2. The geographical distribution is overlapping. Cole (1973b) has now reduced *L. marginata* to a variety of *L. turbiniformis*. This I accept. *L. dabneri* L. Bol., *turbiniformis* var. *dabneri* (L. Bol.) Cole, is, in the opinion of Dr de Boer and myself, merely a more distinctly marked form of *L. marginata*.

**Varieties**

- *Lithops turbiniformis* var. *brunneo-violacea* de Boer
- *Lithops turbiniformis* var. *elephina* Cole
- *Lithops turbiniformis* var. *lutea* de Boer
- *Lithops turbiniformis* var. *subfenestrata* de Boer
- *Lithops turbiniformis* var. *marginata* (Nel) Cole
- *Lithops turbiniformis* var. *susannae* Cole


*Lithops vallis-mariae* var. *vallis-mariae*.

**Size**

Up to 28mm long and 18mm wide at the fissure.

**Colour**

Variable, usually whitish, greyish or pinkish, sometimes yellowish or brownish.

**Markings**

Usually indistinct, pinkish or deep amethyst, sometimes pale reddish-brown. Markings consist of short unjoined lines or dots which are sometimes reticulate.

This species is characterised by the very fine vermiform wrinkles on the top surface.

**Flowers**

Yellow, 6-merous, seed group 2.

**Collected by** Dr Beetz in July 1923.

**Type locality** Near Mariental.

**Notes** This species is easily recognised.

**Varieties**

- *Lithops vallis-mariae* var. *groendraaiensis* (Jacobs.) de Boer
Lithops verruculosa var. verruculosa.

Size Up to 28mm long and 20mm wide at the fissure. The lobes are often unequal in size.

Fissure This is often of a different depth on each side of the same plant, e.g. 3mm and 8mm.

Colour Very variable, sides bluish-grey, pinkish-grey or brownish. Top reddish-brown, greenish or greyish-brown. Some plants have a distinct bluish-grey border to the window.

Window Sometimes reduced to very tiny areas between the numerous islands, but in other plants there are fewer islands, the window appearing larger. The top is often distinctly grooved. This species is characterised by the large raised dark red dots which do not occur in any other species of Lithops. They may be seen with the naked eye or with a x10 hand lens.

Flowers Yellow to brownish-orange, 5-merous, seed group 5.
LITHOPS VERRUCULOSA Nel. The raised spots within the area of the window can be seen in this photograph.

LITHOPS VILLETII L. Bol. This species is distinguished from the superficially similar L. otzeniana by the colour of its flowers.
Collected by Dr van der Westhuizen in September 1939.
Type locality Near Kenhardt in Bushmanland, C.P.
Notes According to Harry Hall this is an extremely rare plant at the type locality, an isolated farm near Kenhardt.
Varieties Lithops verruculosa var. glabra de Boer

Size Up to 30mm long and 18mm wide at the fissure.
Colour Sides greyish-yellow, top distinctly dark grey-green to brownish.
Window Large with a carinate margin. Islands are always present but the number is very variable; the edges of the islands are not always sharply defined and are usually yellowish-brown in colour.
Flowers White, 6-merous, seed group 3.
Collected by Mr C. T. Villet in 1939.
Type locality Near Loeriesfontein in the Calvinia district, C.P.
Notes The flowers of L. otzeniana var. otzeniana and L. otzeniana var. weberi are yellow and 5-merous, whilst those of L. villetii are white and 6-merous. These three plants are otherwise nearly the same and grow in the same general area in south-west Cape Province. In addition the capsule structure of the two species is also comparable. It seems reasonable to suppose that L. villetii was closely related in the past, the flower colour and leaf structure having arisen by mutation/hybridisation and subsequent isolation.

Size Up to 20mm long and 15mm wide at the fissure, but the majority of plants are smaller than this. Collected plants are usually only 10mm in diameter with one or rarely two heads. In cultivation the plants form large clumps with up to 25 heads. A plant in de Boer’s collection and sent to him by an unknown
LITHOPS WERNERI Schwant. ex Jacobs. In the habitat, during the resting period, the bodies of this species range in size from pinhead to that of a pea.

A person in England now resembles a tight ball measuring 40mm high.

**Colour** Bluish-grey often tinged yellow, brown or red. The top surface is usually the same colour as the sides.

**Top** Surface windowless, with very fine grooves, reticulate markings at right angles to the fissure. These markings are reddish to yellowish-brown. Blue pellucid dots are present in all specimens and are sometimes obscure and sometimes prominent. These latter plants are very similar to *L. francisci*, to which this plant is probably closely related.

**Flowers** Yellow, 6-merous, seed group 2.

**Collected by** Mr Werner Triebner and named in his honour.

**Type locality** 40 km S.E. of Usakos, growing in broken granite at the foot of the Erongo mountains, S.W. Africa.

**Notes** In addition to affinities with *L. francisci*, this species may well have arisen by hybridisation between *L. pseudotruncatella v. dendritica* and *L. ruschiorum*. Several plants that I have produced from this cross are like *L. werneri*. 

62
Glossary

In the description of Lithops certain terms are used, the meaning of which may, at first sight, not be obvious. Some of the terms have a special meaning when used in connection with Lithops. It is because of this specific use that a list of these terms and their meaning has been included.

anther—the part of the stamen which contains pollen grains.
bifurcation—a division or forking into two.
bullate—a surface which is not smooth; puckered or blistered (rugose).
capsule—dehiscent fruit, having more than one carpel, with a dry pericarp. In the Mesembryanthema the fruit is divided into several compartments or ‘cells’ containing many seeds which are dispersed by a rain-splash mechanism (see figs. 2 and 3).
carinate—keeled or ridged, e.g. L. otzeniana (Plate 24) in which there are ingrowths into the window from the margin.
carpel—one of the compartments which composes the female part of the flower. It contains the ovules which after fertilisation develop into seeds.
chlorenchyma—cells containing chlorophyll; green tissue of the leaf or stem.
chloroplast—a chlorophyll-containing structure usually packed into palisade cells or chlorenchyma.
chromoplast—a cell structure which is pigmented with a substance other than chlorophyll (cf. idioblasts).
concave—a rounding inwards.
convex—a rounding outwards (see Plate 26).
cross-pollination—transfer of pollen from anthers of one flower to the stigma of another.
dendritic—having a structure joined together in such a way as to form a tree-like network.
dichotomy—equal branching by simple forking.
divergent—separating widely; applied to leaves which have separated leaving the fissure gaping.
ecology—the study of plants in relation to their habitat.
endemic—a plant restricted to one place or region and occurring nowhere else.
et al., et alii—and others.
ex—as in, for example, Lithops erniana Tisch. ex Jacobsen, indicates that a name proposed but not validly published by one author has been properly published by another author. In the example given the name was originally proposed by Tischer and later validly published by Jacobsen.
filament—stalk of the stamen.
fissure—gap between the two leaves. At the bottom of the fissure there is a meristem which produces new leaves or flowers.
forma—a category of plants differing from the species or variety usually by only a single conspicuous but minor character such as colour or size.
gaping—a widening of the fissure by lateral movement of the leaves.
grooved—a structure which is more or less impressed and contained in ‘channels’ (cf. bullate).
head—this refers to the plant body which consists of a pair of leaves.
hypocotyl—stem axis of the seedling just below the cotelydons or seed leaves.
idioblasts—these are specialised cells which show as pellucid dots, but they are opaque as they contain substances such as tannin and calcium oxalate. In incident light they appear dark because the light has been absorbed and not reflected.
island—an opaque area surrounded by a transparent area such as the window or a network of channels. (See Plate 20).
leucoplast—a colourless structure within a cell.
-merous—referring to the number of flower parts, e.g. stigmas, carpels or compartments within the fruit.
mutant—an organism which exhibits a sharp change in one or more characters from the parental characters and which can transmit such a changed character to its offspring.
nomen nudum—a name that has not been validly published according to the International Code of Botanical Nomenclature.
occluded—closed up; clouded, rendered opaque, referring to the window area.
pellucid dots—miniature ‘windows’ up to 1mm in diameter, usually greenish or bluish and scattered over the top surface. In incident light they appear dark because the light has been absorbed not reflected (cf. idioblasts) (See Plate 19).
phytogeography—the study of plant distribution, especially in relation to past and present climate and topography.
rugose—a surface that is not smooth; wrinkled (cf. bullate).
Seed group—Lithops seed varies in size. De Boer has made measurements and published a scale of seed size from 1—5 based on the number of seeds filling a standard volume.
Scale of seed size
   Seed group 1  1,500—2,000 seeds per cubic cm.
   Seed group 2  4,000—5,000 seeds per cubic cm.
   Seed group 3  7,000 seeds per cubic cm.
   Seed group 4  10,000 seeds per cubic cm.
   Seed group 5  15,000 seeds per cubic cm.
size—the measurements are taken along the line of fissure and across both lobes at right angles to the fissure.
species—a group of plants belonging to the same genus which have similar genetical and morphological constitution. Crosses between different species are usually but not always infertile.
stamen—the male part of the flower—a stalked structure producing pollen grains in the anther.
stigma—the part of the flower that is a receptor for pollen.
subspecies—a group of plants which is not sufficiently distinct from another species to warrant separate taxonomic status at the species level, but is too distinct to be merely a variety.
trifid—three-forked.
variety—a category of plants which show a minor variation within a species.
vegetative reproduction—multiplication by vegetative means; propagation by splitting a clump into pieces and their subsequent development as separate plants.
vermiform wrinkles—very small worm-like folds or ridges in the top surface. A distinctive character of *L. vallis-mariae* (See Plate 31).
window—a transparent area of the top surface. It usually appears darker as the light falling on it is absorbed, not reflected. (Contrast Plate 20 with Plate 26).
xerophyte—a plant which can flourish under conditions of poor water supply.

References


Postscript

Lithops naureeniae Cole

This a new species described by Professor D. T. Cole in 1980 (Nat. Cact. & Succ. J. 35: 74). It is a yellow flowered ‘green’ species related to the L. comptonii—L. helmitii—L. otzeniana complex. To the author this is a very interesting find of great significance. It supports the author’s view that the same factors which have acted on the Cape endemics have also had an influence on Lithops species.

The type locality for L. naureeniae is given as 60 km (37 miles) south-east of Sprinkbok in the Kamiesburg mountains. In 1969 the author predicted this find as follows (Fearn 1969):

“This north-western interval lies in an area between the Cedarburg and the Kamiesburg sub-centres, a distance north to south of about one hundred and sixty miles. Although there are at present no known Lithops growing in the Kamies mountains it is suggested that it would be a good locality in which to look for species of Lithops, as many of the Cape endemics grow here. This is feasible since Lithops comptonii var. divergens and forma amethystina occur adjacent to a direct line between the Kamiesburg sub-centre and the north-western centre. These are able to survive in the very arid region known as the Knersvlakte and probably represent a relic of a previously wider distribution. L. comptonii var. comptonii grows to the south, to the south-east lie L. comptonii var. viridis, L. otzeniana and var. weberi. North of the Kamies mountains grow L. meyeri, L. helmitii, L. herrei and its two varieties var. geyeri and var. hillii. All these species are ‘green’ with yellow flowers. Lithops villetii and L. marmorata also grow in the vicinity, these are again ‘green’ species but are the only two in the area with white flowers.”

Having now had one prediction come true it would be interesting to see if a further prediction should also prove positive. “It should prove rewarding to look for Lithops in the Sneeuwbergen area around Middleburg and also in the northern part of Basutoland bordering on the Orange Free State.” (Fearn 1969). I wonder what the future will bring.
Index to Lithops names in text

alpina 50
archerae 14, 17
aucampiae v. aucampiae 2, 9, 12, 14, 15, 18
... v. euniceae 19
... v. fluminalis 19
... v. keolemanii 19
bella v. bella 15, 19, 20, 29, 39
... v. eberlanzii 19
... v. lericheana 19, 39
bromfieldii v. bromfieldii 14, 20, 21, 33
... v. glaudiniae 33
... v. insularis 20
... v. mennisii 20
comptonii v. comptonii 10, 13, 21, 22, 25, 33, 67
... v. divergens 10, 22, 33, 67
... v. divergens f. amethystina 22, 67
... v. viridis 22, 67
dabneri 58
debleri 15, 25
dinteri v. brevis 24, 25
... v. dinteri 6, 15, 24, 25, 27
... v. frederici 24
... v. marthae 24, 25, 53
... v. multipunctata 24, 27
dorothaeae 15, 26, 27
elisae 12, 13, 14, 27, 28, 43
... v. erniana 29, 39
... v. erniana 10, 14, 15, 27, 28, 29, 39, 63
framesi 43
francisci v. annae 29
... v. francisci 10, 13, 14, 29, 30, 62
gesinae 29
fulleri 37, 45
... v. brunnea 37
... v. ochracea 37
fulviceps 15, 30, 31
... v. lactinea 31
glaudiniae 15, 32
hallii 5, 37, 53, 58
helmuitii 13, 33, 34, 47, 67
herrei 14, 27, 33, 34, 47, 67
... v. geyeri 35, 67
... v. hillii 35, 67
hookeri 57
julii ssp. fulleri 36, 37, 53
... ssp. fulleri v. brunnea 45
... v. julii 14, 15, 35, 36, 37, 39
... v. lactea 35
... v. littlewoodii 35
... f. pallida 35
... v. pallida 35
... f. reticulata 35
... v. reticulata 35
... v. rouxii 35
... v. typica 35
karasmontana 14, 15, 29, 38
... v. lericheana 39
... v. mickbergensis 38
... v. opalina 38
... v. summitatum 39
... v. tisseri 39
lactea 35
lesliei v. hornii 18, 59, 40
v. lesliei  6, 9, 13, 14, 39, 40
ev. lesliei f. albiflora  40
v. lesliei f. albinica  40
v. mariae  40
f. minor  40
v. minor  40
v. rubrobrunnea  40
v. venteri  40
lineata  51
localis v. localis  10, 12, 13, 14, 15, 41
v. peersii  41, 42, 57
terricolor  41, 42
loganae  19
marginata  6, 9, 12, 13, 19, 27, 33, 35, 42, 43, 47, 67
v. elisae  27
meyeri  14, 27, 43, 44, 46, 67
naureeniae  33, 67
nelii  13, 44, 45
olivacea  44, 45
optica  6, 8, 13, 35, 45, 46, 47
v. minor  47
f. rubra  10, 14, 47, 48
otzeniana v. otzeniana  10, 14, 48, 49, 60, 61, 63, 67
v. weberi  50, 61, 67
pseudotruncatella v. archerae  17
v. brandbergensis  50
v. dendritica  50, 62
v. edithae  50
v. elisabethae  50
v. gracilidelineata  8, 50, 51
v. gracilidelineata f. waldroneae  50, 51
v. mundtii  50
v. pseudotruncatella  5, 6, 8, 9, 10, 13, 14, 15, 17, 49, 50, 56, 57
v. volkii  50
ruschiorum  6, 8, 14, 51, 52, 55, 62
salicola  3, 14, 36, 37, 51, 52
v. reticulata  37, 53
schwantesii v. christinae  53, 54
v. gebseri  54
v. kunjasensis  54
v. marthae  25, 53
v. nutupsdriftensis  53, 54
v. rugosa  54
v. schwantesii  15, 17, 25, 53, 54
v. triebneri  53
v. urikosensis  53, 54
v. steineckeana  15, 55
turbiniformis v. brunnnea-violacea  58
v. dabneri  58
v. elephina  58
v. lutea  58
v. marginata  58
v. subfenestrata  58
v. susannae  58
v. turbiniformis  5, 9, 15, 33, 56, 57, 58
vallis-mariae v. groendraaiensis  58
v. vallis-mariae  14, 17, 58, 59, 65
verruculosa v. glabra  60
v. verruculosa  5, 14, 15, 24, 59, 60
villetii  4, 14, 15, 60, 61, 67
v. deboeri  24
weberi  12, 15, 51, 61, 62
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