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Haworthia 'Nioumon'

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SOUTH AFRICAN GRASS ALOE SPECIES WHICH FREQUENT CLIFF FACES AND AN EVALUATION OF THE NEWLY DESCRIBED *ALOE CHALLISII*.

CHARLES CRAIB

Photographs. Connall Oosterbroek and Philip Nel

SUMMARY.

There are no described South African grass aloe species confined entirely to cliff faces. These habitats represent a variable proportion of the niches occupied by *Aloe fouriei*, *Aloe nubigena*, *Aloe soutpansbergensis*, *Aloe thompsonii* and *Aloe woolliana*. The concept of cremnophytes (cliff dwellers) with respect to South African grass aloes is critically examined with specific reference to *Aloe challisii*.

It is demonstrated that *A. challisii* (van Jaarsveld and van Wyk, 2006) is no more than a pendant ecotype of *A. woolliana* that does not merit specific rank. It is also unlikely that the concepts of subspecies and variety could be applied to this entity if the totality of habitat occupied by these plants on the Steenkampsberg (type locality area) is correctly defined and assessed.

AN EVALUATION OF CREMNOPHYTIC GRASS ALOES.

The concept of cremnophytic plants needs to be approached with caution. Cliff faces in the case of grass aloes are one of several possible niches in the greater habitat which a species can occupy. This matter has been dealt with in some detail with respect to *Aloe fouriei* (Craib 2005:53–56), *Aloe nubigena* (Craib 2005:98–100), *Aloe soutpansbergensis* (Craib 2005:107–110), *Aloe thompsonii* (Craib 2005:111–122) and *Aloe woolliana* (Craib 2005:123–126). All these species occur on cliff faces, as well as the rocky mountain summits, just above these precipices. *A. soutpansbergensis* is commonest at Letjume, the type locality and highest point of the Soutpansberg, on the rocky mountain summit, but is not plentiful on the vertical precipices. In contrast, on other parts of the Soutpansberg such as the cliffs above Schoemansdal, *A. soutpansbergensis* is largely a cliff dweller as the available cliff top habitat is largely occupied by dense, shrubby plants.

The concept of the cliff face abstracted from the general environment for the purposes of analysis, leads to an impoverished understanding of some plant communities. It also has the potential for proliferating errors in the case of grass aloes and misidentifying them at species, subspecies and varietal levels. The preferred perspective with respect to these plants is to view the cliff face as a niche which some grass aloe species are able to effectively utilise in the total environment which they frequent. This shift away from a focus on the cliff face as a unit for analysis permits a composite understanding of how grass aloe species live in all the various niches in their mountain top environments.

ALOE WOOLLIANA AND *ALOE CHALLISII* ON THE STEENKAMPSBERG.

Aloe woolliana was made a variety of *Aloe chortolirioides* by Glen and Hardy (2000:121–13). As

no reasons were provided for this decision, the knowledge construction process dictates that concept of *A. woolliana* as originally defined must remain (Reynolds:1696:129, Craib 2006:10–12). This is however at variance with conventional taxonomic practice and *A. woolliana* should be formally reinstated. This ought however to be done at a time when other problems in grass aloe taxonomy are examined, for example the fact that plants and flowers of *A. fouriei*, *Aloe verecunda* and *Aloe vossii* are virtually indistinguishable from one another at certain localities. As pointed out (Craib 2006:53) *A. fouriei* and *A. vossii* may be merely ecotypes of *A. verecunda*.

The complexities and problems in grass aloe taxonomy will have to be resolved with reference to competent and detailed fieldwork. This is made all the more difficult in that many species occur in remote, often inaccessible, mountainous regions. In addition the populations of the majority of species have become so fragmented by exotic afforestation that it may not be possible to provide an authentic modern sample of many species on which to base a revision.

The Steenkampsberg is probably the only modern environment where the status of *Aloe woolliana*, including its ecotypes, can be surveyed and assessed. The mountain is free from exotic afforestation on the whole although there are parts where invasive Australian trees have become established.

A. woolliana is widely distributed across the southern Steenkampsberg occurring on the western and south western slopes. Plants here conform mostly to the typical concept of *A. woolliana* as originally described. Aloes from south and south east-facing cliffs and rocky terrain above them conform to the description for *A. challisii* (cliff faces) and *A. woolliana* (rocky terrain above the cliffs). The ecotype of *A. woolliana* known at present as *A. challisii* frequents mostly the southern and eastern parts of the mountain where the most rock face habitat is found. The typical *A. woolliana* and a few examples of the ecotype *A. challisii* occur on the western slopes of the Steenkampsberg, in the mist belt. Very few parts of this habitat have any cliff faces that face south or east. Where such habitat is encountered the ecotype *A. challisii* is occasionally encountered. The ecotype *A. challisii* is frequent at one locality less than a kilometre away from a large population of the typical *A. woolliana*.

The *A. woolliana* populations on the western slopes of the Steenkampsberg flower mostly in late September and the first two weeks of October, earlier in years when the clumps of individual stems are burnt in grass fires. The ecotype *A. challisii* often has plants with well formed buds by mid-October, but the flowering season is mainly the second half of October extending

(Continued on page 5)



into November. The western slopes of the Steenkampsberg receive much more direct sunlight than the south and south eastern cliff faces and rocky summits, hence the slightly later flowering season of the ecotype.

THE DISTRIBUTION OF *ALOE WOOLLIANA* AND ITS ECOTYPES ON THE STEENKAMPSBERG.

A. woolliana and its ecotypes is, as far as present data indicates, entirely confined to the mist belt on the Steenkampsberg. This is in keeping with the distribution of these plants everywhere else where they occur for example along the Drakensberg escarpment south east of Lydenburg and near Sabie.

Mist falls as soft penetrating rain and this is one of the most important reasons that the ecotype *A. challsii* is able to utilise cracks in cliff faces as a habitat niche. Were it not for mist the ecotype would be confined to areas of shallow soil and moss on the cliffs which absorb water like sponges after rainfall.

A series of cliff faces was examined to have a look at the distribution of the plants from the top to the bottom of these precipices. Plants in mossy swards near the bases of the cliffs had numerous individual stems and long leaves. This is related to far better irrigation from the rock faces above the usually deep swards of soil. After rainfall the spongy moss clumps drip water for days ensuring that the plants are damp for long periods during the summer growing season. Higher up the cliff faces the clumps of aloes are much smaller with few stems and shorter leaves where they grow in rock cracks. This habitat is periodically very wet and very dry. Up on top of the cliffs and at their edges the plants were found to be virtually indistinguishable from the large colonies of *A. woolliana* on the more arid western mist belt rocky slopes of the Steenkampsberg.

The *A. woolliana* populations from the southern and south western parts of the Steenkampsberg are well known but a survey of plants in the north eastern and north western parts is required to ascertain if there are any further ecotypes there. Apart from the practical difficulties of the relative inaccessibility of the habitat a large area now lies within the boundaries of a

Fig. 1. *Aloe woolliana*, photographed on 24 October 2006, growing amongst rocks on the summit of the Steenkampsberg, Mpumalanga. This is the typical rocky outcrop habitat frequented by *A. woolliana* on the western summit slopes of the Steenkampsberg.

Fig. 2. *Aloe woolliana* growing on a small east-facing cliff some 3 metres away from the plant in fig. 8. The plants here have some of the characteristics of the *A. woolliana* ecotype *A. challsii*, such as curved flower stems and long leaves.

Figs. 3. *A. woolliana* (*A. challsii*) on the sheer precipices of the southern Steenkampsberg photographed on 24 October 2006. Some plants in these heavily shaded positions flower a little later than those exposed to more sunlight on the same cliffs higher up.

Fig. 4. *A. woolliana* on broad ledges of the broken cliffs above the vertical rock wall habitat on the southern Steenkampsberg. Plants here, about 30 metres away from those on the rock walls, are indistinguishable from aloes that conform to the conventional concept of *A. woolliana*.

platinum mine to which access is strictly controlled.

TOWARDS A TAXONOMIC REVISION OF GRASS ALOES.

It became evident during the 20 or so years that I was researching grass aloes for the book *Grass Aloes in the South African Veld* (Craib, 2005)* that this group of plants was in need of revision. In the case of *A. woolliana* it needs to be removed from *Aloe chortolirioides* and reinstated as a species on its own. A decision then needs to be made as how to recognise the ecotypes such as *A. challsii*. This is made very difficult by the fact that conventional botanical concepts for classifications are based on distinctions and not usually variations across a population at one locality such as in this case the variations in plants from the bottom to the top of one cliff face, and its associated rocky summit.

There are also further problems. The *A. woolliana* along the Drakensberg escarpment near Lydenburg match the type description of the ecotype *A. challsii* in most respects. They are almost entirely confined to a variable number of niches on the cliffs but rarely encountered in cliff top habitat. This is related to the fact that most rocky areas above the cliffs are covered in eucalyptus and pine plantations, that is to say there is not enough habitat left to make a correct assessment. Perhaps the most interesting problem is that *A. woolliana* has adopted the peculiar habit of growing in shallow soil pockets on sheets of exposed rock near the Brook in Mpumalanga. These plants conform in most respects to the ecotype *A. challsii*, but have much shorter leaves. This is to be expected as the majority of aloes are exposed to direct sunlight for much of the day and they grow in thin soil. The habitat is often swathed in mist during the summer and very moist during much of the spring and summer growing period. Plants which occur amongst boulder outcrops on these sheets of exposed rock, in deep soil in south and south east-facing positions often have very long leaves, indistinguishable from those of the cliff dwelling ecotype.

The horizontal rock sheet in the mist belt area has an equivalent function to vertical cliff faces and this cannot be neglected if grass aloes are revised.

One of several reasons for reinstating *A. woolliana* as a separate species from *A. chortolirioides* is that *A. chortolirioides* was not found to be a cremnophyte. There is extensive cliff face habitat where *A. chortolirioides* occurs between Barberton and the Swaziland border. This has not been utilised in as far as could be established despite the fact that the aloes occur in large colonies in rocky grassland above cliff tops, in several areas.

A significant factor in any revision of grass aloes will be how best to place these ecotypes. Where these occur together it will be hard, if not impossible, to apply concepts such as subspecies or variety. In other cases such judgements may be easier to make. *A. fouriei* for example occurs in large clumps in valleys of the Dwars River area of Mpumalanga. It is also found

* Available from Umdaus. Go to www.succulents.net & click on Umdaus for prices in Rands. Also from the editor, address page 2. Member's price £65.00 inclusive of *uninsured surface mail postage*.



as a low clump forming plant in shallow soil over sheets of exposed rock. The large aloes are valley and hillside plants whereas the others are confined to rock sheets on mountain tops. These forms are usually separated from one another by about 600 metres to a kilometre or more.

It seems pointless at this stage to sink *A. challisii* under a reinstated *A. woolliana*. These sorts of problems should be addressed during a thorough revision of grass aloe by a competent taxonomist with extensive



Figs. 5. *A. woolliana* (*A. challisii*) on the sheer precipices of the southern Steenkampsberg photographed on 24 October 2006. Some plants in these heavily shaded positions flower a little later than those exposed to more sunlight on the same cliffs higher up.

experience of grass aloes in the field.

A. CHALLISII AND THE SOCIOLOGY OF BOTANICAL KNOWLEDGE.

The process of constructing botanical knowledge with respect to grass aloes has been dealt with in some detail (Craib 2005:10–12). All that is provided here is a short account of some of the key aspects in as far as they relate to *A. challisii*.

Family, genus, species, and lower level classifications are concepts for organising botanical knowledge. They cannot be demonstrated empirically. The taxonomist who describes a new species is therefore free to preselect any characters that are deemed to be significant as has been done with *A. challisii*. All that is required is that the description is validly published, but not that any thorough research is conducted as a prerequisite on which to base this description.

The authenticity of a newly published species is entirely another matter. This is determined by the acceptance of the new name based on the evaluations of experienced workers. In this instance it is patently clear that *A. challisii* is but an ecotype of *A. woolliana*.

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 Glen, H.F. and Hardy, D.S. 2000. Aloaceae (First part) : Flora of Southern Africa 5, 1, 1:1–167. National Botanical Institute, Pretoria.

Fig. 6. *A. woolliana* on broad ledges of the broken cliffs above the vertical rock wall habitat on the southern Steenkampsberg. Plants here, about 30 metres away from those on the rock walls, are indistinguishable from aloes that conform to the conventional concept of *A. woolliana*.



Figs. 7 & 8. *Aloe challisii* growing amongst rocks on a cliff face at the type locality. This is the typical growth habit adopted by *Aloe woolliana* when it grows on cliff faces on the Steenkampsberg and Transvaal (Mpumalanga) Drakensberg.

Fig. 9. *Aloe challisii* (cliff dwelling *Aloe woolliana*) often have many stems in a clump tightly packed into grassy swards or rocky fissures. The stems may become numerous where space permits. Stems in contact with soil may re-root to form additional clumps, space permitting.

(Continued from page 6)

Reynolds, G.W. 1969. The Aloes of South Africa.

Van Jaarsveld, E.J. and van Wyk, A.E. 2006. *Aloe challsii*, a new cliff dwelling aloe from Mpumalanga, and a check list of the obligate cliff dwelling aloes in South Africa and Namibia. *Aloe* 43:2 and 3:36–41.

Additional photograph back page.

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Figs. 10 & 11. *Aloe woolliana* (*A. challsii*) habitat at the type locality.



Verification of Cultivar Descriptions

We should like verify the names of the following prior to including them in the special issue on cultivars. In order to verify the names we need to trace the original descriptions. Attempts so far have met with no success. Can you help please? If you can supply details of where an original description was published that would be ideal, but, if you cannot, you might have other information which might enable the original description to be traced. For example, details of who produced a particular cultivar, or details of a nursery which has been propagating it could lead to a description being traced.

Please send whatever information you might have to
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Your help is very much appreciated. Many, many thanks.



Haworthia 'Black Major'



Haworthia 'Sugar Candy'



Gasteria 'Pearl'



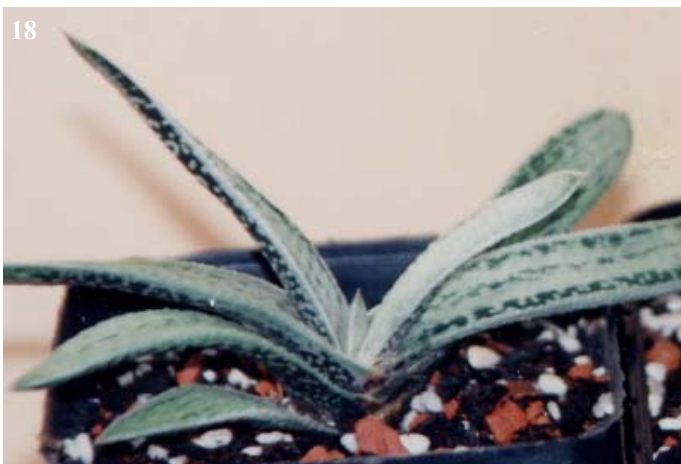
xGasteraloe 'Helen Hagyi'



xGasterhaworthia 'Morgan'



Haworthia 'Korizato'



Gasteria 'Hummel's Grey'



Aloe 'Tanya'

International Crassulaceae Network
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There is an International Hoya Association, an International Asclepiad Society, an International Succulent Asphodelaceae Group, a Mesemb Study Group etc, but if you are searching for an International Crassulaceae Society you are searching in vain. Except for the Sedum Society and a group for Sempervivum, Crassulaceae are not discussed in a particular group.

The International Crassulaceae Network (ICN) has been created to fill this gap. The principal aim is to help preserve plants of the Crassulaceae family now existing in private as well as in public collections – most important at a time when plant imports have become almost impossible. This aim is best achieved by distributing plants and seeds among as many people as possible, by exchanging information on cultivation, origin, taxonomy etc. as well as by offering help in identifying plants.

The ICN is not a society, participants do not pay a membership fee. Though we have representatives for French, Italian, German and English speaking people, participants of the ICN in principle communicate directly with one another.

Participation is open to anybody interested in Crassulaceae – private persons as well as Botanical Gardens, nurseries etc.

If you are interested in joining this ex situ conservation project and in getting to know like-minded people please contact me for further information.

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Editor's note. Whilst some members do specialise many have general collections. The International Crassulaceae Network may well appeal to those who have an interest in the Crassulaceae as well as the Asphodelaceae. To counteract the disastrous effects that "conservation" measures have on the hobby it is necessary that legitimate counter measures, particularly those such as this which are excellent conservation measure in themselves, should prosper.

#### **Haworthia Update 4**

Close to Closure was the title of one of Bruce Bayer's recent articles, an indication that he feels that his work on Haworthia must soon come to a close. His extensive field work has been reported in his Updates of which Update 4, to be published in the spring of 2008, will be the last. Given his intensive and extensive interests in haworthias it is difficult to envisage the world of haworthias without him. However, he hopes to write an occasional article thereafter. Let us hope that he will be able to do more than that.

Full details for Update 4 will be given in the March 2008 journal.

#### **Haworthia Study Subscription.**

Annual subscription for A.I. members is £17 (non-members £20) from 2005 (Japanese Haworthia Society membership about £50). Back issues sent from Japan direct to subscribers are priced:  
1-8 (Issue No. 8 December 2002) = £50.  
9-12 (Issue No. 12 December 2004) = £30.  
13 onwards = £17 each per year for two journals.  
Please see page 2 for payment methods.

Current year journals are sent in bulk to Harry Mays for distribution with the next *Alsterworthia International*. Thus A. I. members who have subscribed to *Haworthia Study* for 2007 will receive the December issue with the March 2008 journal.

#### **Species and Cultivars**

Readers may be aware that there is some difference of opinion about the classification of haworthias! Bruce Bayer's species concept, which has received much publicity, is at one end of the spectrum. Dr Hayashi's, which will be found on pages 11-13, 16-18 of this issue, is at the other. In-between, species are more or less defined as interbreeding groups which are unable to breed with other groups, but in practice little testing is done to prove breeding capabilities. Assessments are done on the basis of similar features. Then of course we have DNA studies of a small number of genes from which relationships over past and present time are deduced, now progressing to more comprehensive DNA studies. All this leads to many new names being produced on the one hand and to many reductions with lists of synonymy on the other, with different shades of opinion in between.

The International Code of Botanical Nomenclature makes no attempt to define species. It lays down only the rules for naming them once they have been determined. The International Code for Nomenclature of Cultivate Plants lays down the rules for naming cultivars. Using the provisions of both codes Gordon Rowley has produced a system for preserving botanical names as cultivar names for haworthias which should, he suggest, remove these names from the battle field of taxonomy. Full details will be published in the March 2008 journal.

#### **Haworthia Duval. A revised species list.**

Published in *Alsterworthia International* Volume 7, Issue 2.

Please note that this list applies only to the Eastern Cape, not to the genus as a whole.

Species indicated by "E" are endemic to the area concerned.

Bruce Bayer hopes to provide a map of the floral regions of the RSA and corresponding *Haworthia* lists for those regions.

# Species standard for *Haworthia*

Dr. M. Hayashi

## Introduction - Species concept and species standard.

More than 20 species concepts have been published to date. Though they were proposed from several different points of view, two common elements are found in most of them as shown in Table 1. One is the lump concept to unite demes into a species, and another is the split standard to separate a species from a group. In the Biological species concept, for example, “groups of potentially interbreeding populations” is the lump concept and “reproductively isolated from such other groups” is the split standard. The former is essentially an abstract concept because, in practice, verification is difficult or not even attempted. The latter is a practical, verifiable method because it can be verified by field examination and observation.

People may have thought that the former is the core definition of a species and the latter a supplementary explanation of the former. It should be emphasized, however, that the former is no use without the latter in real classification, while the latter can be effectively used without the former. The latter is far more important for practical use. Some species concepts, such as the Evolutionary Species Concept, lack the latter and are actually useless for practical classification.

The principle of science by K. Popper, “possibility of counterevidence”, indicates the requirement of precision in supporting evidence in scientific statements. Most of (perhaps all) discussions about species concepts have overlooked this problem. They were, therefore, not scientific, but actually metaphysical. This is the reason why long discussion on the species concept was nearly fruitless except those with clear split standard like Biological species concept.

Discussion on species concepts should, therefore, focus on the split standard. The “Species standard” should be the independent split standard without any involvement of the lumping concept. It is a practical and precise method useable in real classification. To start such practical discussion is the main purpose of this article and this is the first attempt to propose a precise standard to separate a species, by which I am going to revise many species of *Haworthia*.

This article has been prepared for *Haworthia* species, but it may well be applied to other genera.

### 1. Origin of species concept.

There are many forms of organisms (plants and animals) in nature. Although they differ from each other, people have recognized that, within them, different groups, each consisting of similar individuals, may be recognized. That is variation among organisms is not continuous, but discontinuous, resulting in the formation of clusters. The recognition of such clusters is the primitive and basic concept of “species”. It should be strongly noted that the primitive concept of species

**Table 1. Structure of species concept.**

**Species concept = lump concept + split standard**

| Role                                  | concept to unite demes into a species             | standard to separate a species from others       |
|---------------------------------------|---------------------------------------------------|--------------------------------------------------|
| Methodological nature                 | symbolic slogan                                   | practical method                                 |
|                                       | ideal, conceptual                                 | real, empirical                                  |
|                                       | abstract                                          | concrete                                         |
| Philosophical nature                  | connotative (intensive)                           | denotative (extensive)                           |
|                                       | answer for “What”                                 | answer for “How”                                 |
|                                       | metaphysical                                      | scientific                                       |
| Example in Biological species concept | “groups of potentially interbreeding populations” | “reproductively isolated from such other groups” |

is essentially morphological and phenomenal, not genetic or phylogenetic.

In addition, people have also recognized that such clusters can be arranged into larger groups according to degrees of similarity, which also result in discontinuities. The recognition of discontinuities in organisms’ morphologies and in hierarchical arrangements is the basis of the classification system. Several taxonomic ranks have been given to this such as variety, species, series, section, genus, and family etc., as shown in Table 2. (“Subspecies” is generally used in animal taxonomy instead of “variety”, but only the term “variety” will be used in this paper.)

The reason “why the variation among organisms is discontinuous” was not clear until the 20<sup>th</sup> century. Now we can explain it in two ways.

- a. Individuals in a cluster share a common gene pool by genetic interaction (interbreeding). The individuals produced from such a common gene pool may have similar form. Different clusters may have different gene pools each producing differences between their progeny.
- b. Clusters may have originated from a common ancestor; consequently progeny may have some morphological continuity and some discontinuity. As for the reason for the hierarchical structure of such clusters, it was thought to be repeated speciation over time, like the branching cluster structure of buds in a cauliflower.

**Table 2. Hierarchy and nature of natural group.**

| Hierarchy of natural group |                      | Taxonomic rank          | Morphological difference from others | Genetic cohesion in the group |
|----------------------------|----------------------|-------------------------|--------------------------------------|-------------------------------|
| Level                      | Name                 |                         |                                      |                               |
| 1                          | Deme                 | variety                 | insufficient                         | present                       |
| 2                          | Topodeme/<br>Ecodeme | variety<br>(subspecies) | insufficient                         | present                       |
| 3                          | Hologamodeme         | <b>species</b>          | significant                          | present                       |
| 4                          | 4th group            | series                  | significant                          | absent                        |
| 5                          | 5th group            | section                 | significant                          | absent                        |
| 6                          | 6th group            | subgenus                | significant                          | absent                        |

## 2. Deme and species.

Taxonomy is a science dealing with groups of organisms, local populations. Such a group is often called a “Mendel population”, “gamodeme” or simply “deme”. As “population” is a general term with many meanings, the term “deme” will be used hereafter. Deme is defined as “A local interbreeding group” (Lincoln et. al. 1982).

Topodeme and ecodeme are basically terms used to express the nature of a deme; topodeme does not necessarily mean “a group” of demes, however, it is often used to indicate “a group” of demes in a particular area. Such demes often co-own certain distinctions slightly different from other such groups, and are classified as varieties. An ecodeme is one deme in a particular habitat. In this paper “topodeme” and “ecodeme” are used to indicate a group of demes and single respectively.

Hologamodeme is defined as “A local interbreeding population comprising all those individuals which are able to interbreed with a high level of freedom under a given set of conditions” (Lincoln & al. 1982). It generally is equal to a species, but not always so. For example, a seed may be transported by a strong wind to a distant area to settle and form a new deme by accidental self-fertilization. The new deme may have different characters from neighbouring demes, but may have gene interaction with them in due course. Both the new deme and neighbouring may develop by cross pollination side by side. In this situation, all the demes in this area comprise a hologamodeme, but they may be different “species” till they completely merge genetically in the remote future.

Other examples of genetically merging demes are possible in which a hologamodeme is not equal to a species, but usually and conceptually, a hologamodeme is a species.

## 3. Genetic interaction in a species.

“Genetic interaction (interbreeding)” means frequent and interactive gene flow. It is different from accidental gene flow where, for example, some genetic material becomes isolated to interact on its own. The latter may be very important to produce a new species, but it never results in genetic cohesion between a new deme and its mother deme. Genetic cohesion is one of the main causes of morphological similarity of a species and the only mechanism to maintain it.

Individuals in a deme have strong genetic cohesion with each other by interbreeding. Demes in a hologamodeme are also connected with other demes by genetic interaction, though the level of interaction may be lower. But there is no genetic interaction among groups above (larger than) hologamodeme (Table 2). However, there are many cases of hologamodeme in *Haworthia* in which several different species with different morphologies co-exist. They are ‘transit species’ and may eventually become one species in the remote future.

There is a decisive difference, therefore, between species (including infra-specific taxa) and above-species groups. They are not of the same nature. Genetic cohesion of species may be the key concept to express the difference between species and above-species groups. A species can be definitively determined by the presence of genetic cohesion, while an above-species group cannot be determined definitively. The latter can be determined only comparatively by the degree of similarity. Their relationship is only a phylogenetic one, by their origin from a common ancestor (ancestor-descendants lineage).

Bayer seems to ignore the difference between above-species groups and infra-specific groups. Many of his “species” have very wide distribution ranges including distantly

isolated demes. How can these distantly isolated demes have genetic interaction with other demes in the “same species”? The existence of a close genetic relationship cannot be the evidence for them being the same species. A close genetic relationship may be the result of a common ancestor or of accidental gene flow. But, of course, having a common ancestor does not mean one species - accidental gene flow cannot result in genetic cohesion. Furthermore, how does he measure the degree of relationship or closeness? Personal judgments can make for a very arbitrary system.

## 4. Why is “species” a special unit in taxonomy?

A species was originally defined as the minimum identifiable unit of classification. Intraspecific groups (subspecies, variety) are not sufficiently different from each other to qualify as species. A species, therefore, is the minimum identifiable unit, which has significantly identifiable differences from other such units. Also shown in Table 2, a species is the largest group having genetic cohesion (= hologamodeme). Genetic cohesion (by genetic interaction) is the cause of morphological similarity of a species.

A species, therefore, is the minimum, morphologically-identifiable unit and also the largest genetic-cohesive group in classification. No other unit has these attributes. This is the real reason why a species is thought to be a special unit in taxonomy.

## 5. Types of species

It has recently become clear that:

(1) There are many “species” without significant differences in morphology, but with clear genetic isolation from others. Sibling species are a well known classic case of such “species”.

(2) Many “species” within the simple morphology of ferns, mosses and fungi have been identified recently by DNA analysis. They are well isolated by genetic (post-mating) isolation mechanism, but with no morphological differences (Masuyama & al. Cryptic species in the fern *Ceratopteris thalictroides* (L.) Brongen. (Parkeriaceae). 1. Molecular analyses and crossing tests. J. Plant Res. (2002) 115: 87-97. Yatabe & al. Molecular systematics of the *Asplenium nidus* complex from Mt. Halimun National Park, Indonesia: Evidence for reproductive isolation among three sympatric rbcL sequence types. American J. Bot. 2001 88: 1517-1522).

(3) Many plant species, such as in many succulents, have no genetic isolation-mechanisms, but have large morphological differences.

(4) Great arguments have evolved as to whether a cluster which has vocal or other mating behaviour different from other clusters, as in some insects or frogs, is a separate species or not (Orthoptera of the Japanese Archipelago in Color, Hokkaido University Press, 2006, Sapporo. Matsui M. National History of the Amphibia. University of Tokyo, Tokyo 1996).

All these cases may indicate that there may be several types of species besides the classic one. As discussed above, the existence of morphological difference and the type of reproductive isolation mechanism may be two basic standards to identify a species. Table 3 is a 2 x 2 matrix showing types of species based on these standards.

Classic species are species of the classic concept having morphological difference and post-mating (= genetical) isolation mechanism. Most species may belong to this type of species.

Pheno species are species with morphological differences but without post-mating isolation mechanism. They are separated from each other by pre-mating isolation mechanism, mostly by geographical distance. Most succulents may belong to this type of species, as the

**Table 3. Types of species.**

|                                  |             | Morphological difference       |                                          |
|----------------------------------|-------------|--------------------------------|------------------------------------------|
|                                  |             | present                        | absent                                   |
| Reproductive isolation mechanism | post-mating | <b>classic species</b>         | <b>sibling species</b>                   |
|                                  |             | (most animals and plants)      | (some insects, fern, moss, fungi)        |
|                                  | pre-mating  | <b>pheno species</b>           | <b>eco species*</b>                      |
|                                  |             | (some plants i.e. succulents)  | (birds, frogs, insects, some succulents) |
|                                  |             | * including <b>geo species</b> |                                          |

as a bee for many plants. The activity range of a honey bee is said to be a radius of ca. 4 Km (Visser and Seeley. 1982. Ecology 63(6): 1790-1801). Activity area of a horsefly or other flies is smaller than that of a honey bee (J.L. Osborne, S.J. Clark, R.J. Morris, I.H. Williams, J.R. Riley, A.D. Smith, D.R. Reynolds, A.S. Edwards (1999) A landscape-scale study of bumble bee foraging range and constancy, using harmonic radar. Journal of Applied Ecology 36 (4), 519-533), but some of them need not return to their nests and may transport pollens for more than 10 Km. A small butterfly (*Plebejus argus* L.) is reported to fly for more than 10 Km (An informal report by a bioenvironmental

succulent demes are well separated by arid surroundings from each other.

Sibling species are species with post-mating isolation mechanism but with no (or very little) morphological differences. Many cases have been found in insects and some are going to be recognized in fern, moss and fungi, which have very simple morphology, as a result of DNA analysis

Eco species are species without both morphological differences and post-mating isolation mechanisms. They are only isolated (and identified) by some ecological differences, such as geographical distance, flowering time, pollinator, activity time (season) or site, mating behaviour, vocal pattern, host etc. Of these differences, geographic distance is one of the most basic and easiest to recognize for identifying a species. Species identified by geographical distance, therefore, are called "geo species" separate from "eco species"; however they are a type of eco species.

### 6. Species standard 1. Morphology.

Morphological difference is the most basic standard for identifying a species together with the nature of its reproductive isolation. Morphological differences among demes are visible or observable and can be judged as "significant" (different) or "not significant" (if necessary by statistics, especially by Analysis of Variance). The rate of identifiable clones in two demes (identifiable rate) can be used as the morphological standard to separate a species whatever the type of characters used.

Simply put, if more than 80% of the clones in a deme can be recognized as different from those in other demes, the deme can be recognized as significant, a different species.

If more than 50%, but less than 80%, clones are different from those in other demes, the deme can be recognized as a variety from the morphological aspect.

If only less than 50% of clones in a deme can be recognized as different, then the deme may be the same species as the others, unless it is isolated reproductively by some other isolation mechanism.

These values are tentative and empirical. The value is different for groups of different organism, 80% is only for variable plants like succulents. See additional note (1) & (2), page 17.

### 7. Actual geographical size of a plant species.

As plants cannot move, locality data is more important and precisely identified in plant taxonomy than in that of animals. Kind and activity range of the pollinator are the most essential element to determine the actual geographical size of a plant species.

The commonest pollinators are small flying insects such

inspector in Japan). Taking the influence of wind into consideration, those small flying insects may deliver pollen frequently within a radius of ca. 10 Km around.

On the other hand, seed also transports genes and seed dispersal range is another important element to determine the geographical species size. It should be also noted that an accidental dispersion of a seed to a distant area does not result in genetic interaction between the demes. It may result in hybridization with other demes or become an isolated deme, but it never brings about genetic cohesion with the original deme. Only a frequent dispersal range can be considered to determine a geographical species size. (Frequent seed dispersion range of *Haworthia* may be smaller than that of interbreeding area.)

The value, 20-30 km in diameter at maximum, therefore, can be considered to be the actual geographical size of a plant species pollinated by a small insect, unless frequent seeds dispersion occurs more widely. Demes within this range may be able to exchange genes and they are connected genetically (cohesive). If demes settle subsequently within a radius of a few 10 Km, the total distribution range of a species may become larger. In general, however, if a deme locates at a distance of ca. 30 Km or more from its closest allies, the deme may be a different species.

### 8. Species standard 2. Geographical standard.

Locality is one of the most basic data to identify a species. From the above discussion, many plant species may have a range of ca. 20-30 km in diameter to exchange genes. If a deme locates more than 30 km distant from the nearest deme of the group (to the outside of interbreeding area), the deme may be a different species. Even if the deme has similar morphology as others and cannot be identified from them, the deme may not be able to exchange genes with them. They may have considerable differences in DNA sequences and the differences may become larger with the process of time.

A species is also the unit of evolution. The evolutionary destination of such a deme is clearly different from that of other demes. To identify a deme as a different species is particularly important and useful, so as to trace its evolutionary processes and conserve the diversity of nature. See additional note (3), page 17.

A deme located in 20-30 km distant from other demes seems to settle just within the border of the interbreeding area of a species. It may be an intermediate geographical area in reproductive isolation. The deme can be considered to be a variety unless it has some other isolation mechanisms from the original species.

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*italics* = scientific names; normal type = common and cultivar; **bold** type page nos. = colour photographs

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(Continued from page 13)

A deme settled within 20 km distant from its nearest allies may have frequent and interactive gene flow with other demes in the group. They are connected genetically (cohesive) and may be the same species unless the deme has a different morphology or is reproductively isolated from the others.

It should be noted that the value for a species, 30 km in diameter, is a case for those pollinated by small flying insects. It varies with the kind of a pollinator and seed dispersion mechanism. If it is pollinated by other kinds of animals, or seed is dispersed by wind (like *Aloe*), the geographical size of a species may become far larger. (But Humming birds have a very high energy requirement/output and would be unable to travel far.)

**9. Species standard 3. Combined condition.**

Table 4 is the combined standard for a morphological and geographical standard for a species, variety or same species. The standard for a species is absolute, but that for a variety or same species must take into account whether or not they have any other reproductive isolation mechanisms.

**10. Specialty of a *Haworthia* species.**

Though it is not indicated previously, a *Haworthia* deme has very special characteristics in contrast to most other plant groups. *Haworthia* forms a very compact and dense deme; many clones grow in a very small geographical site only. The deme is usually very small, mostly a few 10 square meters with very clear deme borders. Most clones in a deme bloom simultaneously, in a short period and usually once a year. Furthermore, each deme is usually located very distantly from others, usually by a few kilometres. No clones will be found in the intermediate area of demes.

This is one of the reasons why *Haworthia* is one of the most difficult plants to find in the field. Most other plants form much looser demes, widely and sparsely spread and the border of a deme is not necessarily clear. Persons who have experienced walking around the Karoo area may know well that other succulents such as Crassulaceae or Aizoaceae (*Lithops* etc.) can be easily found but no *Haworthia* plants (except *H. viscosa*).

This deme condition may result as follows. A pollinator of *Haworthia* (small insect like bee or moth) may pollinate mostly within a deme, but seldom fly to the next *Haworthia* deme. As there are no clones in intermediate areas among each deme, a *Haworthia* deme may be well isolated genetically even if they settle a few kilometres from each

others. Furthermore, simultaneous, short-period and limited-season flowering may well separate demes genetically, even if two demes settle side by side. This may be the reason why many species of *Haworthia* can be settled and kept separate in a small area like Zuurberg or Hankey-Patensie areas.

The species concept of each *Haworthia* species should be re-examined from the view point of whether or not the deme freely interbreeds with other demes in the “same species”.

**11. Defect of Bayer’s species concept.**

Bayer (1999 p. 20) outlined his concept of species and developed his species definition as follows in *Alsterworthia* Int. Special Issue No. 4 p. 40 (2003).

“A species is a group or groups of interbreeding or potentially interbreeding individuals. A dynamic, living system of organisms, which is morphologically and genetically continuous in space and time, which vary continuously, morphologically, and genetically in both space and time. The spatial element is observed in geographical distribution. The one of time is conjectural.”

This is a very vague “definition” of a species without, therefore, any practical meaning. Nobody can classify subject groups using this “definition”. A definition should not be an imprecise slogan or a short essay lacking precision. It must have precise standards and be applicable for practical classification. This is the original purpose for defining a species.

Bayer’s concept is obviously a variation of the “Biological species concept” which is currently accepted widely. But Bayer only upheld the first half of the Biological species concept and omitted the latter half which is a standard to separate a species, as “reproductively isolated from such other groups”. This omission clearly suggests that Bayer did not understand the problems of defining species. A standard to separate species (the latter half of Biological species concept) is more important than one to unite them (the former half). The latter half of the Biological species concept is more important for practical use.

Bayer’s “species” is actually based on geographical distribution as stated in the latter part of his species definition. The species concept based on distribution range sounds scientific, but there are no precise standards to divide, or define the borders of, distribution ranges. How are demes which are distributed in a certain area identified as the same species? How can the borders of a distribution range be recognized before demes are identified as the same species? Which should we decide first, the distribution range or the species?

**Table 4. Combined standard.**

|                                                                         |                                                | Morphological standard          |                          |                                 |
|-------------------------------------------------------------------------|------------------------------------------------|---------------------------------|--------------------------|---------------------------------|
|                                                                         |                                                | species                         | variety                  | same species                    |
|                                                                         |                                                | more than 80% clones identified | 50-79% clones identified | less than 50% clones identified |
| Geo-graphical standard                                                  | species<br>(deme more than 30 km distant)      | species                         | species                  | species                         |
|                                                                         | variety<br>(deme 20-30 km distant)             | species                         | variety*                 | variety*                        |
|                                                                         | same species<br>(deme less than 20 km distant) | species                         | variety*                 | same species*                   |
| * Only for the case without any other reproductive isolation mechanisms |                                                |                                 |                          |                                 |

Thus, the species concept based on geographical distribution range is actually circular reasoning and false. This may be the reason why the geographic species concept has not been published clearly, though it sounds very scientific. Distribution in an area cannot be evidence of one species. Similar objections may also be applied to species concepts based on habitat or ecological considerations.

Bayer emphasizes his field knowledge and field experience as justification for his classification. Experience alone is not the standard for classification, but a clear species standard is. Field



**Table 5. Types of standard and arbitrariness.**

| Type \ Nature    | Absolute standard                                                                        | Comparative standard                                                                                                                                       | Arbitrary standard                                  |
|------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Base of standard | theoretical/<br>experimental                                                             | agreement by experience                                                                                                                                    | personal preference                                 |
| Standard value   | absolute                                                                                 | comparative                                                                                                                                                | absent                                              |
| Scale            | mostly ratio scale                                                                       | mostly interval/ ordinal scale                                                                                                                             | absent                                              |
| Stability        | constant<br>(unchangeable)                                                               | constant<br>(changeable by agreement)                                                                                                                      | inconstant (arbitrary)<br>(often changed by favour) |
| Example (value)  | e (Napier's constant),<br>$\pi$ (pi),<br>acceleration of gravity,<br>absolute 0 (Kelvin) | 5% rule for "accident (error)" (statistics),<br>standard of hurricane (meteorology),<br>75% for subspecies (Mayr & al. 1953),<br>0°C (Celsius, centigrade) | Bayer's "species"                                   |

knowledge ought to give rise to a clear species standard. Thus, it is rather natural that a taxonomic system without a consistent species standard tends to be very arbitrary.

**Additional notes.**

**(1) Types of standard.**

Some people criticized that such value (80%) is arbitrarily chosen without any theoretical base. As shown in Table 5, however, there are 2 (?) types of standard in science. One is the absolute standard based on theory or experimental data. These values are absolute and constant. Another is the comparative standard based on agreement (consensus). Most values of this type have no theoretical base. It can be changed by agreement like the case of planet standard changed last year.

“Based on agreement” is the nature of a standard of this type. It doesn’t guarantee that people (scientists) agree a certain value, and it may actually be difficult to agree a value for a *Haworthia* species (at least at present). This situation, however, doesn’t mean the proposed value is arbitrary. According to the development of research, identifiable rate of a species may become clearer and the argument may converge into a certain range of value. Such argument to establish a standard is normal and a sound process of science.

Even if a value cannot ever be agreed, it is still a candidate for the standard. Anybody can propose other values or standard to separate a species in the open debate. The discussion which one is better or appropriate is indeed a process of science whereas an arbitrary standard is opinion based with no precision.

**(2) Standard value for a species.**

The standard value for a species is different by species group. *Haworthia* is a very variable group as well as most other succulents, and the standard value (identifiable rate) for such variable groups would be ca. 80%. This means 20% of clones in a species cannot be identified clearly as this species. Most species of trees and grasses seem to have smaller variability and the standard value would be ca. 90%. If they have genetic (post-mating) isolation mechanism, the value may become higher (95%?). In most animals, it seems nearly 100%. This value may also vary according to time by evolution.

The value 80% proposed here is a tentative rate based on the author’s experience. Some people may criticize that it is too low (or high). It is very good to criticize this value based on the evidence and such argument may well develop

*Haworthia* taxonomy. The importance is to discuss with concrete value or standard, not with abstract “concept” or metaphysical “definition”, to which any counter evidence (criticism) cannot be made.

**(3) Types of similarity and geo-species.**

Table 6, page 18, shows 4 types of similarity based on their causes. As mentioned previously in this paper, there are two causes of morphological similarity. One is genetic based on a common gene pool. Another is phylogenetic based on a common ancestor. The genetic similarity in Table 6 is based on both a common ancestor and gene pool (interaction). The phenetic similarity is based on a common ancestor only and lacks gene interaction. The introgressive similarity is based on gene interaction only and lacks common ancestor. The characters for introgressive similarity may change rapidly by introgression. Convergence is the superficial similarity without both a common ancestor and gene interaction.

Demes with genetic similarity are true same species. But demes with phenetic similarity are not the same species. They may have developed recently from a common ancestor but already lack genetic mechanisms to maintain their similarity. They are often arranged into the same species without checking whether there is frequent gene flow between them. This is particularly notable in an isolated deme with similar morphology to others. Usually it is arranged into the same species with other similar demes, but it is a false species and must be separated as a geo-species.

This treatment is rather different from that in the traditional classification, but is the logical and inevitable conclusion from the genetical aspect.

**(4) Continuity and its division.**

All observed characters among demes have two aspects; continuity and discontinuity. Some people seem to be afraid to divide chain continuity into parts on the grounds that such artificial divisions cannot express the true relationship in the chain. A famous taxonomist criticized the view of this paper indicating the problem that “we have a situation like a “chain” of populations, where neighbouring individuals interbreed, while the more distant ends of the populations don’t”. This is true and such “chain” structure of individuals or demes is well known and very common in many groups.

How then do we describe (express) the continuous chain (subject)? Do we leave it intact and only indicate it may be the best way to show the chain-like situation? Bayer’s “*Haworthia* Update” may be very close to this kind of work. But it is absolutely useless to solve the structure of continuous phenomenon. It is the basic method of science to

**Table 6. Types of similarity between 2 demes.**

| Phylogenetic cause              |                       | Common ancestor                        |                                               |
|---------------------------------|-----------------------|----------------------------------------|-----------------------------------------------|
|                                 |                       | present                                | absent (different ancestors)                  |
| Gene interaction<br>(gene pool) | present<br>(common)   | genetic similarity<br>(true species)   | introgressive similarity<br>(transit species) |
|                                 | absent<br>(different) | phenetic similarity<br>(false species) | convergence (analogical<br>species)           |

divide a continuous subject into several parts based on some discontinuity, and explain the phenomenon by the relationship of these parts. This division is more or less artificial and the descriptions for these parts may not be exactly correct. This means that there are no “natural” classifications but only several degrees of rational, consistent ones. We must strive to achieve by agreement “better” division and not rely on superficially plausible agnosticism to maintain non-division of an extensive variable subject.

The problem is, therefore, not to divide a chain of demes into parts but determine a precise standard to determine how to separate groups. Even if it is a “chain” like situation, we must divide it by some standard for a better understanding of its components. The discussion must be focused on a better or reasonable standard and its concrete value.

**(5)  $\alpha$ -taxonomy and  $\beta$ -taxonomy.**

It is well known that there are 3 stages of taxonomy (Mayr 1969);  $\alpha$ -taxonomy (description, classification),  $\beta$ -taxonomy (phylogenetic analysis, systematic) and  $\gamma$ -taxonomy (evolutionary study). Though they deeply relate to each others, their tasks and methods are clearly different. In  $\alpha$ -taxonomy, a researcher must check the difference (discontinuity) of a deme from other demes and identify it as different from or the same as other species. The clue of this process is “difference” (discontinuity), not relationship or continuity with others. Naturally enough, a deme has several relationships or continuity with other demes. The relationship, however, is the subject of  $\beta$ -taxonomy and should be solved by some phylogenetic analysis like cladistical analysis.

Identification of a deme is based on the difference from, not on the continuity with, others. Continuity is an explanation of its position in a taxonomic system and explanation should be strictly distinguished from identification. Classification based on relationships is obviously a confusion of  $\alpha$ -taxonomy and  $\beta$ -taxonomy, and this is the case of Bayer’s system. His “species” is based on relationships, not on strict identification. He presented no standard to show how he chose a combination (relationship) with certain species over other possible species. This is the second arbitrariness of his system.

Bayer criticized cladistical approach in his *Haworthia* Update 2 (p. 80), but it is based on misunderstanding and

poor experience of cladistical analysis. The full account to refute to this will appear in another paper in the near future.

**Journals and Seed List - 2008.**

The March journal will be sent to members who have renewed for 2008 to arrive in that month in all countries.

We expect to publish a seed list with the March 2008 journal.

This list will also be sent by e-mail, as soon as it is available, to members who have renewed their membership for 2008 and provided their e-mail addresses, so that they may have the earliest opportunity to sow seed.

**Please renew early to avoid not receiving the seed list by e-mail and not receiving the journal on time.**

# Haworthia Study

Journal of the Japanese Haworthia Society.  
Editor: Dr M. Hayashi. World agent: Harry Mays.

Haworthia Study is issued twice a year, June and December, 16 A 4 pages. This brief review covers numbers 16 & 17, Dec. 2006 and June 2007. Photos made available by Dr. Hayashi.

## No. 16.

The Photo Gallery contains 12 excellent photographs of *H. joubertii* 'White Spine', *H. gigas* variegated, *H. amethysta* (a rough spined form and a broad leaf form both with large windows), *H. picta* 'Grace Lady'; *H. truncata* 'Ina-Bauer' (leaf ends curved m-shape); *H. obtusa* (*pilifera*) variegated, *H. 'Yebisu-nishiki'*; *H. bolusii* hybrid variegated; *H. 'Yama-arasi'* (= porcupine. *H. multifolia* x *H. gigas*); *H. 'Nioumon'* (front cover); and *H. 'Yayoi'*.

Dr Hayashi publishes his "Revision of the Cymbiformis group" with flow charts showing relationships between complexes, series and species. 18 proposed new species are published as nom. nud. and illustrated. Dr Hayashi notes that the populations are isolated and do not interbreed.

In his "Revision of the *H. margaritifera* group" Dr Hayashi publishes four new species: *H. sparsa* (from Lemoenpoort), *H. ao-onii* (Dublin), *H. akaonii* (Rooiberg, Robertson) and *H. ohkuwai* (Laingsburg) - photographs page 20.

In "Cultivation based on physiological nature" Mr Kayiwara outlines his method using black soil rather than the commonly used red soil. The result is that haworthias can better withstand a dry rest period and give good growth when watered well in the growing season.

Six outstanding plants, *H. ciliata*, *H. ciliata* 'Day Dream', *H. villosa*, *H. odetteae* 'Okina' (= Old Man), *H. bella* 'Aoi-Yousei' and *Haworthia bella* 'Siroi-Yousei', are illustrated. The colour and spination are superb.

Dr Hayashi publishes two reviews. The short review of Bayer's Update 2 is a model of fact. He confines his classification comments to the use of the many large photos "Very useful to understand the variation of the deme", which is a term used in Dr. Hayashi's classification.

The brief review of "Beautiful Succulents: Haworthia" by Dr. Fukuya describes it as "...the first book of "Haworthia art". Many of the plants ... are very rare and difficult to culture" and their beauty "...is rather 'shocking' for many collectors". A table correcting some of the names in the book is published because of published cultivar names and differences in classification.

In the final article Dr. Hayashi publishes three new species with fine (referring to size) spines; *H. lachnosa*, *H. capillaris* and *H. candida*. They are also very beautiful plants.

## No. 17.

Twelve photographs are published of Haworthia cultivars: *H. 'Miho'* (a yellow variegated *H. maughanii* hybrid), *H. 'Passion'* (a maculate hybrid of *H. pallida*), a large form of *H. maughanii* with yellow and pink variegation, *H. maughanii* 'Hagoromo' (central white ring/oval with prominent radiating line), *H. truncata* "JJ-1" (Very difficult to cultivate, dark grey leaf ends with a few short red lines), *H. 'Karakusa'* (= arabesque markings of the windows. Middle size hybrid of *H. comptoniana*), *H. 'Blue Haze'* (nice glaucous colour), *H. 'Nikkou'* (large clone with fine reticulation), *H. picta* 'Odoriko' (thick white flecks on dark green window), *H. picta* 'Dali' (similar to 'Odoriko' but fewer dark green lines, white flecks stronger. Excellent contrast), *H. 'Gessekai'* (Looks like 'Daiginjoh', but more papillate), *H. 'Silky'* (Fine Cilia on whole leaf - unique).

The article on "Variations of *H. splendens*" is illustrated

with nine photographs: *H. splendens* 'Yoshiike'; *H. splendens* 'Silver King', *H. splendens* 'Murasaki-shikibu', *H. splendens* 'Laputa'; *H. splendens* 'Mellow'; *H. splendens* 'Yamato-nishiki'; *H. splendens* 'Bob's Red', *H. splendens* 'Marx' Red'.

In "Some topics in *Haworthia* horticulture" hybrids are discussed. "...many featureless or low-level hybrids will be produced.....People .. lose interest for such low-level hybrids". Problems of nomenclature, developments in China and breeders' resentment of tissue culture are discussed. Plant Variety Protection may be used to protect breeders rights.

Retusa hybrids are illustrated with six photographs: *H. retusa* hyb. 'Nebuta\*'; *H. retusa* hyb. 'Benitei' (photograph page 20); *H. 'Yasou-no-mori'*, *H. retusa* hyb. 'Grace'; *H. retusa* hyb. 'Hitomi' and species cultivars with six photographs: *H. retusa* 'Cascade' (photograph page 20), *H. retusa* 'Blue Dolphin'; *Haworthia retusa* 'Moe'; *H. retusa* 'Sensuji'; *H. retusa* 'Vivaldi'; *H. retusa* 'Shachi'.

The "Nortieri series" is illustrated with six photos: *H. giftbergensis* stat. nov. x 2 and *H. nortieri* x 4 showing differences between clones. The Globosiflora series with six: *H. globosiflora*; *H. agnis*; *H. latericia*; *H. habdomadis*; *H. devriesii* and *H. caesia*.

The Cyanea series has three photos: *H. amethysta*, *H. sapphaia* sp. nov. and *H. fukuyai* sp. nov.

Dr. Hayashi publishes an abstract in Japanese only of his species concept and announces that the full text will be published in English in an Alsterworthia Special issue\*\*.

Finally there are six excellent photographs by Kaksusen-en (info@kakusen.net) showing five cultivars "In propagation", two of which are on page 20. This is an excellent way of letting people know what is new, but it is, unfortunately, not commonly done. How many examples have you seen in journals through the world?\*\*\*

## Editors notes.

\*Under the ICNCP a cultivar name for a hybrid should not be attached to one species name. However, as the article was about retusa hybrids the names were given in the above form.

\*\* Details of the special issue will be included in the March 2008 journal. So that members can have a free copy, the full text of Dr Hayashi's species concept is included in this expanded issue.

\*\*\*Members would welcome seeing photographs and supporting notes of special/new plants being produced by nurseries and individuals for sale or exchange or just for interest. Alsterworthia International would like to publish them - NO CHARGE. Please send photos and notes to Harry Mays on disks (address page 2.) or contact hmays@freenetname.co.uk

To subscribe to Haworthia Study please see the details on pages 2 & 10.



Haworthia sparsa Lemoenpoort. MH 95-36 Type



*H. ao-onii* Dublin. MH 02-45 Type.



*Haworthia akaonii* Rooiberg. Robertson MH 02-16



*Haworthia ohkuwai* Laingsburg. Photo Martin Scott



*Haworthia retusa* 'Benitei'



*Haworthia retusa* 'Cascade'



*Haworthia* 'Dream Ball - 1'



*Haworthia* 'Dream Ball - 3'

# Worcester to Robertson

Russell Scott.

Common to many plant collectors - first comes the collecting. This pleasant obsession (for some, perhaps more of a mania) develops into collecting plants from various locations. Such plants with known habitat locations seem to be more valued.

However, the old, general semantic principle that the map is not the territory comes into play in a very pragmatic sense. After a while, simply looking at a map to see where they come from does not satisfactorily convey the situation or provide information about the habitat in which they grow. Therefore, the next step is to go visit them.

Stepping off the plane at Cape Town, the closest location for locality typed *Gasteria* is Worcester. Ernst Van Jaarsveld, in *Gasterias of Southern Africa* (1994, p23), shows the pattern of distribution for *G. disticha* as a funny 'bone' shape. This perhaps is simply a function of *disticha* observations along the major roads. The long shank of the bone approximates the route of the National highway (N1) from Worcester in the south until it reaches its northern limit at Beaufort West. The main southern/western distribution zone follows the 70-kilometre stretch of road from Worcester to Ashton along Route No. 60 (R60).

The R60 is a scenic drive through a variety of regions, including cultivated farmlands and undeveloped land possibly used for grazing. However, while is a scenic drive for tourists, for locals this is a high use road with at speed limit of 120 km/h. This makes it somewhat interesting to try to spot plants and then safely pull off to look at roadside things.

Many of the *G. disticha* (and *H. pumila*) in cultivation appear to have come from along this stretch of road. A drive along this road in spring when the *Gasteria* are in flower (easier to locate the plants due to spotting flower spikes), shows that they are very localised but have a continuous distribution along the roadside. In the non-farmed areas, the vegetation consists of low shrubs (renosterveld).

## Worcester and Karoo gardens

Both *Gasteria disticha* and *Gasteria carinata* are reported from Worcester. Driving along the N1 from Cape Town through the spectacular Hex river valley, Worcester is reached in about an hour. Moving one mountain range north, a change in the environment is obvious, being a bit more arid and perhaps one that is more favourable for the happy growing of succulents.

Worcester, named after the Marquis of Worcester, is situated in one of the biggest wine-producing districts in South Africa. Unfortunately, Worcester itself is quite a large town. Simply driving around the outskirts did not prove all that helpful in locating plants.

The closest sighting of *G. disticha* at Worcester was a couple of kilometres east of town along the R60. Here, there were a few widely isolated plants perhaps 50 meters in from the roadside in flat uncleared land possibly used for grazing and protected by barbed wire

fencing. Their presence was observed simply because of their flower stalks.

A short drive to the north/west, across the N1, is the Karoo National Botanical Garden. This is an outstanding succulent garden. During spring, the succulents and annuals form a riot of colour. There are many larger growing aloes too, in particular to be admired. There is also a sales area offering a large number of *Gasteria*, *Haworthia* and other succulents.

At the back of the Karoo gardens there are a number of short nature trails up into the foothills. There is a good diversity of succulents along these trails, which also offer spectacular views so this can be a pleasant way to spend an afternoon. It also would seem to be a good point to look for the 'Worcester' *Gasteria* in habitat. While a number of interesting plants were found, including a large form of *Haworthia herbacea* inhabiting shale outcrops along the walking track, *Gasteria* seemed notably absent.

## De Wet

About 10 kilometres north of Worcester is De Wet (the farm 'Orange Grove' is also located here). This farm is in a small river valley with steep mountains on either side. It is also one of the type localities for *Gasteria carinata* v. *retusa*. Just to the north of De Wet is the Keeromberg. It was on Keerom Buttress where *G. carinata* v. *retusa* was first collected in 1924. This is a significant location. *G. disticha* is also present at this location. *G. disticha* from De Wet are pictured at Fig 19 in *Aloe* (29)1, 1992.

At De Wet, a dirt road travels east. This road roughly parallels the R60, but around 5 km north. It runs along the lower edges of foothills, which are on the north side of the road. The vegetation on these foothills appears to be untouched so *G. disticha* and *H. pumila* could be found there. Unfortunately, these areas cannot be accessed as along most of this road access is prohibited by fencing, the road cutting is too steep to access, or it is too dangerous to stop safely. In contrast, the land on the south side of the road represents the Breede River valley and is flat and intensively farmed.

## Nonan

The first place to stop safely along this road is about a 15-20 minutes drive from De Wet. This location is Nonan. Here the mountain flattens out a bit and the bordering fence line disappears. Within 2-3 minutes of stopping here and looking along the vegetation bordering the road, plants of *Gasteria disticha* and *Haworthia pumila* were located. Nonan is a type location for both these plants.

## Nuy

The next type location for both *G. disticha* and *H. pumila* is Nuy. This is a further 10-15 minutes down this road. Like the Nonan location, the road offers a few places to stop. At Nuy, the road turns south and it

28



*Haworthia pumila* Nonan

29



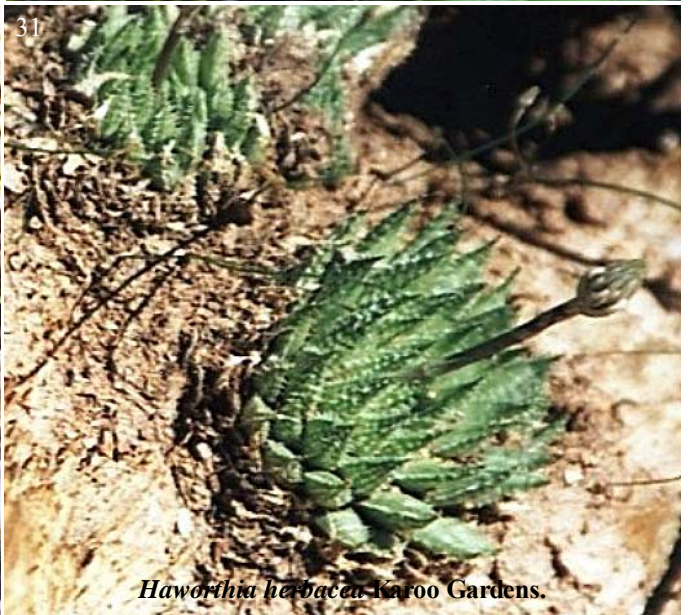
*Haworthia reticulata* Robertson.

30



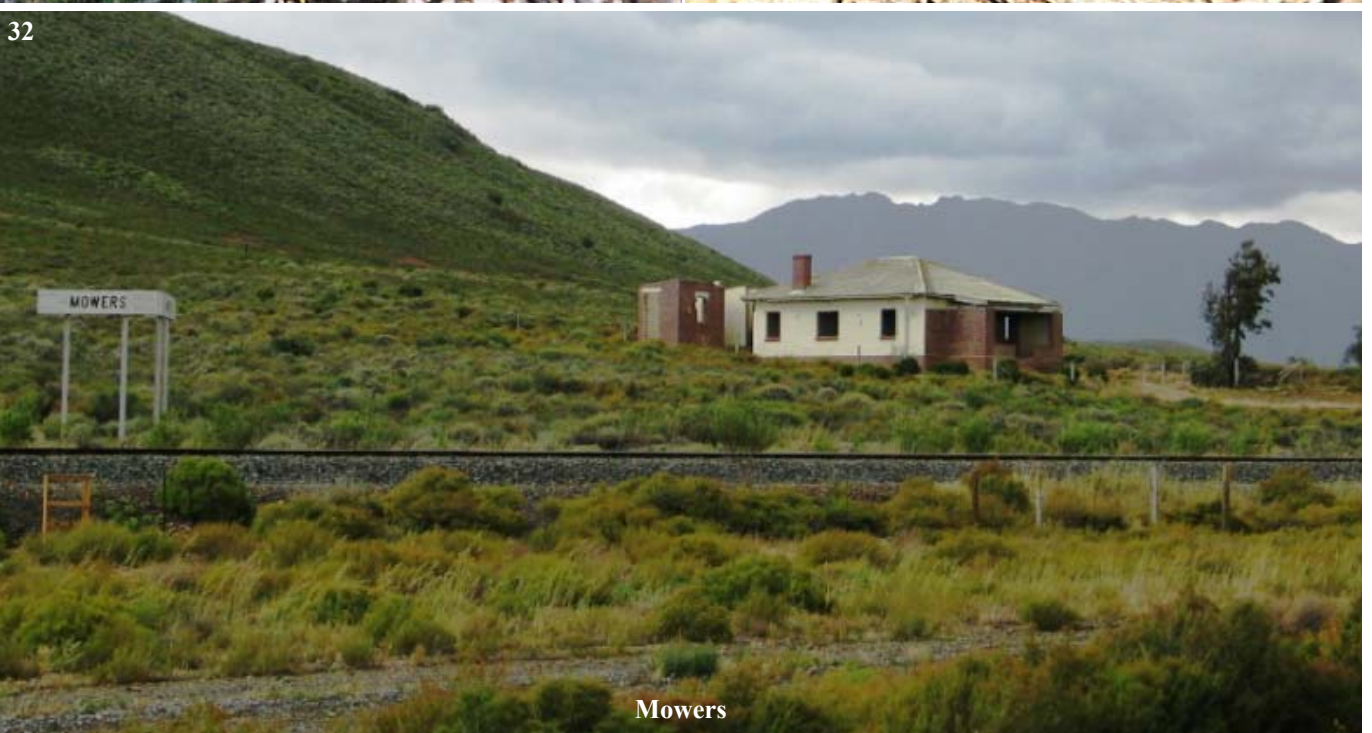
*Gasteria disticha* Nonan

31



*Haworthia herbacea* Karoo Gardens.

32



Mowers



Figs. 33-34. Sheilams Nursery.



is a 5 min drive through orchards and vine fields to join up with the R60. Flowering *G. disticha* were clearly visible from the road at the intersection of the Nuy turnoff on the R60.

### Mowers

A short drive along the R60 from the Nuy turnoff is 'Mowers'. This location is well known as a type location for a very nice form of *H. pumila* that has been in collections for quite some time. *H. herbacea* and *H. reticulata* also come from this location. A railway line parallels the R60, Mowers is a railway siding along this line.

### Robertson

Robertson is the centre of a number of *G. disticha* and *H. pumila* collections. Again, like much of the route from Worcester, *G. disticha* are visible along the roadside just a few kilometres outside (west) of Robertson. Known localities for *G. disticha* such as Tierberg, Rooiberg and Madeba are located a short drive to the west of Robertson.

*Haworthia reticulata* is also located at Robertson. So too are other interesting plants such as *Poellnitzia rubriflora*.

### Klaasvoogds

After a 5-10 min drive to the east of Robertson, the turn off to Klaasvoogds West is reached. For many years Sheilam nursery has sold plants labelled *G. disticha* "Klaasvoogds" (there have been various corrupted spellings of this). It is probably, not a difficult task for Sheilam to provide plants from this location, as Sheilam nursery is actually located at Klaasvoogds!

Photographs by the author.

## EUROPEAN UNION EXCHANGE GROUP FOR ISI PLANTS

Coordinator: Harry Mays  
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A simple system has been formed for the exchange and/or sale of previously distributed ISI plants. As plants may move freely within the EU without any documentation the Exchange Group may appeal to many in the EU who want to acquire ISI plants or who wish to dispose of surplus propagations. As plants moving into or out of the EU require CITES documentation for CITES listed plants and phyto certificates for all plants, the appeal to non-EU residents will be much more restricted, but if you are prepared to cope with the documentation please join.

### The modus operandi is as follows:

1. To join please send me your name and postal and e-mail address by e-mail. There is no joining fee. Individuals and nurseries are both welcome. Anyone interested in ISI plants may join.
2. I will forward members' wants lists and exchange/sale lists of ISI plants to all Exchange Group members by files attached to e-mail in April and September.
3. Members should send me their lists of ISI plants for exchange/sale by files attached to e-mail so that they reach me before April 1st and September 1st. Please include the ISI numbers and plant names, your name, postal and e-mail address and state whether your plants are for exchange only, for sale only, or both. If for sale state the price per plant. The lists will be forwarded to members exactly as you send them to me so please ensure all the information required is included.
3. Wants lists of ISI plants may also be sent to me by file attached to e-mail for forwarding to members in April and September.
4. Members wishing to exchange/buy should correspond direct with each other by e-mail, NOT through me.

This is probably all that is necessary for the group to be run successfully, but suggestions are welcome. If there is any demand for it, we could have an e-mail news sheet. I could produce it but you would be the authors! John Trager, Huntington Botanical Gardens, know about this exchange scheme and has welcomed it.

Details of ISI plants issued in *recent years* may be obtained free from the Huntington Botanical Gardens web pages. Details of *all* annual offerings of ISI plants may be found in the USA journal, normally March/April issues. Both with some photographs.

Comprehensive listing with full details and index can be found only in:  
Directory of Plants Distributed by International Succulent Introductions 1958-2001. Price £10.00  
Directory of Plants Distributed by International Succulent Introductions 2002-2007. Price £4.00  
Both ordered at the same time from me. £12.00.  
There are no photos in these two.



## Comments on *Haworthia mortonii* I.Breuer.

M.B. Bayer  
PO Box 960, 7579 Kuilsriver, RSA  
Photographs by the author.

In *Alsterworthia* 7(1)22 (2007) Breuer states “No records have been found to indicate that this plant has been discovered before and as it is distinctive I have decided to name it as a new taxon”. This population is in fact recorded in the old collecting record of G.G. Smith and I searched on the calcretes further to the east as far back as 1969. Unfortunately it never occurred to me then to even look at the remnant of rock in an area largely destroyed by road-building operations. Presently this small ravaged quartzitic outcrop is bisected by a meaningless road which is fenced and I did find the plants there in 2004 - name of the place SW Karsriver. Why I looked is because of the mindless destruction of a small valley habitat on the Karsriver about 3km further northeast where a magnificent form of *Aloe brevifolia* once grew with a population of *H. maraisii* that has gone with it. I was thus anxious to confirm a *maraisii* so close to Bredasdorp for reasons best explained elsewhere (Update 3 Chapter 1). Morton Cumming apparently found more than the three plants I saw there across the fence on the north side. I recognized the plants as *minima/marginata* hybrids and was also a bit nonplussed by the absence of putative parents. *Minima* was only known at Mierkraal far to the southwest and *marginata* is known about 10km further to the northeast. I was disturbed by the fact that I could only find the three plants and in February 2005 I visited the site again and collected seed under MBB7453. Cumming seems to have been at the site also early in 2005 and claims to have seen many plants, which surprised me\*. In the past the site has been grossly disturbed and a constant pain to me is that major road-

construction in the late 1960 era led to the use of rock outcrops as gravel sources. The *badia*-locality at Napier became a major gravel source and could be seen as a huge white scar on the landscape from afar a



Figs. 35-36. *Haworthia mortonii*



field as Swellendam. Thus this site at Bredasdorp suffered the same treatment and the land surface has been transformed with the removal of surface rock and gravel. Only the smallest fraction is left and I do hesitate to report the survival of “*maraisii*” on virtually a single quartz rock remaining on the south side of the road pictured in Alsterworthia. I cannot believe that I would have missed any plants in the area available to be searched. Farming in the area is not mainly devoted to “merino-sheep and grain crops”\*\*. Farming in the area has become highly commercialized and water is exported from afar as the Theewaterskloof Dam at Villiersdorp. Grain crops are unreliable and with this artificial supply of water, farmers have turned to ostriches and dairy cattle. The result of feed-supplementation has resulted in higher stocking densities and greater trampling and damage to natural vegetation. This has put tremendous pressure on pockets of surviving vegetation that is also exacerbated by a turn to dual purpose Dohne-Merino sheep breeds that graze more aggressively than the original Merino. Additional to this is the destruction of roadside vegetation in what appears to be a deliberate policy of road-engineering to clear verges to the farm fences, and the dreadful application of herbicides for the fear of weed-seeds contaminating crops from those road verges. The possibility that this herbicide application and disturbance of stable natural roadside vegetation will certainly lead to greater weed problems in the future, is left for that dark future.

If there were more plants there at SW Karsriver in 2005 there certainly are not now. When I revisited the site in 2006 one of the three plants had been dislodged presumably by grazing animals, and we replanted it across the fence. At a later visit we found that the plant had sadly died or else, having been in the fenced zone, may be the “small two plant” are now gracing a herbarium specimen? In February this year, 2007 I again visited the site in passing and saw that another plant had been broken off. The crown was re-sprouting and I removed the main body of the plant to grow on in cultivation. Together with this I can report that Sheilam has very successfully germinated the seed I collected and has given me about 20 seedlings for further cultivation and we will return these to the site in due course. Thus 1.5 specimens of *H. mertonii* represent the species and I hope Sheilam makes a fortune selling this now gravely endangered taxon!

Breuer in his article makes a reference to MBB6633 as “also this taxon” viz *H. mertonii*. I already have a problem in that I think professional botanists have reduced taxonomy to a playing field where “the most ignorant and uninformed parade as taxonomists”. Unfortunately the fragmentation of the literature and the existence of a privately operated journal exacerbate the situation enormously. Both fortunately and unfortunately, it also provides me with a public platform. This MBB6633 is simply *H. marginata* and what Breuer has observed in cultivation with respect to the two populations and his acquisition of material probably has as much to do with the disappearance of plants as do animals and road-building. Incidentally I periodically visit the *marginata* at Adoonskop as the

northerly population is known. Now in 2007 the plants are very severely grazed down to ground level and the landowner is contemplating turning that non-arable 140ha into a fenced game camp with accompanying ecotourist facilities. Curiously Cumming has reported (private communication) small *marginata* still further north.

Not over yet! A population of *H. mirabilis* (var *sublineata*) used to occur on the south bank of the river course (This river is named Dryriver because like a few “rivers” in the area it only holds water in winter) that runs west to east immediately north of Bredasdorp. In distress at the loss of this population I scoured the wider area to see if by chance it occurred elsewhere. By virtue of a minor miracle we found seven scruffy and bedraggled specimens surviving within a grove of gum trees, covered by a fallen litter of old gum seed capsules, leaves and branches. How they have managed to survive for what must be 50 years or more is very difficult to believe. The site is virtually the same as an historic laundry concretion dating from the 18<sup>th</sup> century. In searching for the plants we had to scratch and scrape among the litter, raising huge doubts and difficulties in respect of more disturbances and of conservation. Very curious was the additional discovery of a truly depauperate and chlorotic specimen of *H. minima* from the wreckage. Thus there is no doubt that *H. minima* was never far from the *mertonii* locality. It certainly was known a little further east and Breuer is again inaccurate in his reporting that the “coastal area areas from Bredasdorp and further to the south-west are not very well explored for haworthias”. The area is extremely well-known in general botany and has also been explored specifically for haworthias. A proper view from both these perspectives is that this is the southwestern boundary for the genus and it is unlikely that further exploration is going to yield anything new i.e. based on a rational opinion.

Here I want to point out something. I do not hold a collecting permit from nature Conservation anymore, and yet I have removed the plants from the gum-tree litter at Bredasdorp and also the broken specimen from the DMC10485 site, for which I am fairly confident no permit was issued for so-numbered specimens either. The reason that I do not apply for a permit is manifold. Primarily I suppose it is because I feel I am busy passing my sell-by date (comforted by the fact that some people never were saleable). Secondly I feel humiliated by the process and the scrutiny of people whom I do not think are knowledgeable or really interested. Thirdly by the challenges of conservation where my activities – however many plants I might remove – are as nothing compared to the mindless destruction of habitat by roadworkers, farmers, other landowners. There seems to be nothing in an environmental impact assessment which lists species by name, that draws anything from those names and bears on the fact that we have living things of different kinds in our living space and we should be very careful indeed that we call it that. The permit system seems to me to be a way of harassing interested people and worded solely to improve the probability of successful prosecution should officials be so lucky as to fall over

someone removing so much as a seed from the field without a long list of provenances. There are severe changes taking place in respect of our environment and I think that foolish taxonomy is doing nothing towards helping constructive engagement with conservation issues like this SW Karsriver site presents. Not to speak of proving information which can usefully be added to the knowledge-base we all should gainfully share.

Photographs by the author.

**\*A note by David Cumming.**

First, the site. On the NW side there was, or had been, a wheat field. I think that they were working on it when we were there or it might have been the time I was there previously. On the SW side there had been Ostriches grazing previously. I think, but I am not sure, that the area in question was fenced off from the wheat field which would have protected it from any livestock as, in its self, it was too small an area. Mostly the plants were growing more or less in the open as the plant photographed. Now to what seems to be a controversial point, the number of plants that were there. If I take as conservative view as possible there were a minimum of thirty 'clones' with a maximum of 50. Of these there were many that were more than just a single head, mostly varying up to five offsets with perhaps four or five with between five and ten. If one had dug up and divide all the plants, one would have had at a minimum one hundred plants for sale, with the actual number closer to 150 but certainly less than 200. If Bayer did not see these, then he must have visited the population after I had visited it and after whoever caused the plants to be removed.

Second, is *H. mertonii* a 'good' species or a hybrid, or for that matter a species of hybrid origin? All the hybrids in *Haworthia* that I have so far come across have been limited to one plant, usually in the midst of one if not both parents, see hybrid of *H. cummingii* and *H. cymbiformis*\*\*\*. The *H. mertonii* population had a breeding colony with fertile offspring, not that that is necessary surprising in this case, with no close population of either *marginata* nor *minima*. I would not have thought that ALL the parents would have disappeared, *minima* would be able to withstand more disturbance of whatever sort than would *marginata*. There is no apparent exchange of genes with any

population of *marginata* or *minima*, it would seem to me that pollinators would not travel all that far for a white flowers with a relative small reward. Thus the population did fulfil some of the criteria for a species.

Third, Bayer now states that he has no collecting permit, but indicates that he still collects. That the permit he had allowed him to collect only three plants, but he more or less says that he collected five. In Thoughts on *Haworthia* I remember reading somewhere that he liked to collect ten. Any plants collected in excess of three are as illegal as any collected by a person without a permit.

**\*\* A note by Harry Mays.**

Perhaps I should make it clear that I, not Breuer, inserted this remark in the photograph caption as relevant to the photo. I saw no cattle and no ostriches nor any traces of them, but I did see Marino sheep (or hybrids?) and rather brown grass and corn stubble. "Mainly" was used to indicate these usages were not exclusive.

**\*\*\* Alsterworthia International Special Issues No.**

7. New *Haworthia* Species/combinations published subsequent to *Haworthia Revisited*.

Available from the editor. Members discounted price £6.75. One copy per member.

**Saturday 5 April 2008. North West Cactus Mart 10.00 am - 3pm**

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My we suggest you organise a BRANCH OUTING as a major spring event?



CON 7584 MJP. The cliff dwelling ecotype of *Aloe woolliana* (*Aloes challisii*) growing on a cliff face of the southern Steenkampsberg.