



## Haworthia The problem child of taxonomy

by Bruce Bayer

**W spans** nearly 70 years of continuous observation. My interest was only able to properly manifest when I began work at the Karoo National Botanical Garden in 1969 and it has since been through many phases. I wrote a formal taxonomic revision of the genus in 1999 and have spent a good bit of the last nine years adding to and verifying what I wrote.

Haworthia has always been regarded as a problem child of botany, to be avoided by professional taxonomists for various reasons including an apparent phobia of the many amateur collectors peering over the shoulder while at work. This has puzzled me because it seemed to me that if the need for good classification and identification was so strong there was an obligation for botanists to provide the service. So my involvement has been largely by default.

I was trained in an agricultural and entomological tradition with a totally different and unsophisticated approach to things like taxonomy, systematics and nomenclature. In the infant science that agriculture was in South Africa then, I can barely claim that my MSc is much more than an indication that I tried to learn something beyond normal schooling. Trained as an agricultural entomologist, my leaning was to plants and I eventually came to the Karoo garden to do what I liked best – explore plants. The route to knowledge of plants is via identification and names and so I have walked a long road through the minefield that this is.

Was this only in respect of *Haworthia*? No! This is a persistent misconception. *Haworthia* is only different because it has attracted such close and sustained amateur interest by so many for so long. I experienced failing classification in many other genera. To be fair, I think the real reason is the lack of importance attached to the whole function of plant classification. It even seems as if many modern botanists pursue the study of plant relationship under the guise of systematics that is not committed to providing formal names and identifications.

## A muddle

The problem in the genus *Haworthia* begins with weak botany from the moment Linnaeus decided that there were four small plants that belonged together as one species in the genus *Aloe*. This alone generated a nomenclatural problem the dust of which is still to settle. A worse, and obscured, fact is that because of their small flowers these plants were and are still treated as one genus – one set. This is not true. The allied TOP LEFT and RIGHT: Species show variability among populations as these two *Haworthia retusa* 'turgida' plants from Slangriver Heidelberg demonstrate. BELOW RIGHT: *Haworthia retusa* 'turgida' from Albertinia. BELOW LEFT: *Haworthia retusa* 'retusa' from Riversdale.



genera of the Alooideae (a sub-family) of the Asphodelaceae (the aloe family) are not comfortably classified and the three sets of plants that constitute the genus *Haworthia* are not only florally distinctive, they are also phytogeographically and behaviourally different. Thus while there is this huge flaw at the generic level, can sense ever reign at the species level? The proliferation and confusion of names, coupled with the associated arguments, has led me to doubt my sanity, or even lose it as my critics will happily claim.

My impression now as a non-botanist is that taxonomic botany somehow lost sight of the requirement that a biological classification should mirror and reflect the evolutionary processes or phylogeny that underlies our view of species and their origins. Worse, is the actual absence of a clear and unsullied definition of what a species is and hence what a Latin binomial as a supposedly formal scientific term of reference actually means. Cladistic methodology in plant taxonomy is nothing more than a belated attempt to arrive at some semblance of scientific truth. Molecular biology is now desperately being seen as a holy grail that will correct failures of the past.

There is no doubt that the mess in the classification of *Haworthia* is the product of non-botanists, but it is incorrect to exculpate the contributory role of taxonomic botany and professional botanists. My interest has by no means been confined to *Haworthia* and the need for names has largely been driven by a perpetual curiosity about plants. I am, by the route my life has taken me, unusually experienced in the relationship between botany, botanists and the interested layman as it is reflected in the names we give our plants. Consequently I think that I am now qualified to express some opinions on what *Haworthia* can teach us quite apart from what the hostilities that wage across the whole taxonomic front suggest.

## **Differentiating** Haworthia

I pointed out rather timorously that in *Oxalis*, morphological characters were not as indicative of species as revisions and identification keys generally seem to imply. The dramatic changes in our classification systems that the results of molecular biology now seem to threaten, is a manifestation of this simple fact rather than any great new understanding of what really goes on in the plant kingdom. My fear is that molecular biology will not live up to its promise because the basic tenets of classification, the mistakes of the past and the reality of the field, are still not properly appreciated. This is what I think *Haworthia* has to tell us.

Haworthia is composed of elements that reflect the nature of the habitats and environments where they are found. They do not have an array of characters by which species can be arrived at whereas Oxalis has a plethora of such apparent (taxonomically bewitching, tempting, and misleading) means. The few facts that differentiate Haworthia into three groups (sub-genera as presently constituted) have been lost and confounded in the broader classification of the sub-family Alooideae, and there is not much else to help verbally define the species. Both cladistic and molecular studies have also been done, but the results are flawed by weak hypotheses and perhaps just weak science too.

How then do I think sense can be made of *Haworthia*? It is firstly by defining the species as dynamic fractal systems that illustrate the responses of plants to their habitats. Furthermore, there is an obvious correlation to be made with vegetation and other biological systems both plant and animal. I cannot pretend to know much about these things but also suggest that nothing more is needed other than awareness that this is what biological diversity and species are essentially about.

It has taken me nearly 40 years to arrive at the big picture of Haworthia. It is as a non-taxonomist that I say categorically that the three main elements in the present genus need to be seen and registered as 'different'. Then we can focus on the sub-genus Haworthia where the greater difficulty lies and which I believe offers the greatest insight into what plant species are and what the difficulties are in recognizing and defining them. For this I am going to take just two species systems and ignore some of the peripheral facts that confuse the issue. I take Haworthia retusa and H. mirabilis (and bypass even my own conservative classification by considering H. turgida and its many variants to be the riverine and cliff-dwelling version of H. retusa). H. mirabilis is more complex and I have to include three other species - H. maraisii, H. magnifica and H. heidelbergensis for which spatial and geological factors are the prime differentiators. Both my selected species are highly variable within and between populations. Growing plants from field-collected seed can result in a hundred or more individual plants that are all different in appearance.

The two species share the same distribution range – with an extension of *H. mirabilis* into the Worcester/Robertson Karoo and of *H. retusa* further east from Albertinia to Great Brak. *H. mirabilis* flowers in late summer and *H. retusa* flowers in spring. However, they never grow in direct association! The populations of each are highly localized and when in proximity, are usually separated by hundreds of metres. There is evidence, however, of interaction between these two clearly defined systems. In addition, somehow or other, the species *H. pygmaea* emerges as discrete in the eastern Mossel Bay area, while *H. mutica* sits on an island between Swellendam and Riviersonderend in the west.

What is most striking is the variability within each system and this is where the crunch comes and what the photographs here illustrate. They are but a small sample of many hundreds. Not only do they illustrate the variability within species, but also within a population. Sometimes plants that look similar come from two quite different species systems. Taken individually from the morphological extremes between and within populations, it would stretch the credibility of the most ardent taxonomic lumper to claim that any two of these are representatives of the same species. It is an unpalatable truth that things that look different are the same just as the converse is that things that look the same are different. When this reality is properly conceded by the professional taxonomist, perhaps we will succeed in de-mystifying the Latin binomial. Botanists who are not taxonomists will arrive at a better understanding of their plant world and consequently we who look to them for understanding will be better served. We need to be more realistic about plant description and identification and also correspondingly more conscious of the real nature of diversity. Conservation is not to be seen as maintaining a list of names for which there is a use. It is to be seen as maintaining the options for change and the conservation of a far greater diversity than any list of names can hold. Donald Levin in The origin, expansion and demise of plant species, (OUP, 2000) says, 'our system of names appears to achieve a reality which it does not in fact actually possess'. I think this implies that even the Latin names we so modestly, reluctantly or even portentously use do not convey what they should; but rather the product of our individual limited experience, knowledge and perception. My feeling is that species do have a reality and for Latin names to have any sense, they need to be more circumspectly applied.



TOP LEFT: *Haworthia mirabilis* 'badia' from Napier. TOP RIGHT: *Haworthia mirabilis* 'pilosa' from Lower Breede River.



ABOVE LEFT: *Haworthia retusa* 'nigra' from Heidelberg. ABOVE RIGHT: *Haworthia mirabilis* 'toonesis' from Heidelberg. Note that the author chooses to put the Latin epithets in quotes to emphasize the unrealilty of the Latin derivations.

## WHAT DOES THAT MEAN?

**Binomial** All plants are given a Latin name in two parts, the genus is the first part and the species the other half.

**Cladistics** The method used to reconstruct genealogies of these species, and to construct natural classifications based on ancestry. **Discrete** Isolated.

**Fractal** Displaying self-similar structures over an extended, but finite, scale range. Examples include clouds, broccoli and fern fronds. **Morphology** Shape and form – physical characteristics.

**Phylogeny** The pattern of evolutionary history among species. **Phytogeography** Geographical distribution of plants.

**Systematics** The study and description of the variation in living organisms and the relationships that exist between them.

**Taxonomy** The study of the principles and practices of the classification of the natural world, which includes the practice of systematic classification.