ALSTERWORTHIA INTERNATIONAL

Aloe (Aloidendron, Kumara, Aloiampelos, Aristaloe, Gonialoe), Gasteria, Haworthia (Haworthiopis, Tulista), Astroloba, Chortolirion & cultivars.

Haworthia badia var. *jolenae* IB18992

Contents.

Volume 16 **Issue 2. July 2016 distributed 25 June 2016** **ISSN: 1474-4635**

Some new Combinations
in
Haworthia. Haworthiopsis.Tulista

by

Ingo Breuer.

Graf-von-Galen-Str. 105,

52525 Heinsburg,

Germany,

This *mew*, 24 A4 page, soft cover book revises Ingo Breuer's classification of the genus *Haworthia, sensu lato* into three genera *sensu stricto,* It takes into account recent DNA studies, which gives rise to the three genera. Each species is shown in colour, 20 to an A4 page.

Non-members, including non–subscribing members, should apply **Direct to Ingo Breuer** for copies of this book

Price €15.00 including postage.

Exceptionally, copies may also be purchased from Alsterworthia International for £13.00 including postage.

Date of publication: 25 June, 2016

Published by Alsterworthia International

Editor: Harry Mays, BSc. BA Hons

Woodsleigh, Moss Lane, St Michaels on Wyre, Preston, PR3 0TY, UK

hmays@freenetname.co.uk

Alsterworthia is a non-profit organisation publishing material impartially.

All authors are welcome to use our facilities.

Three printed journals per year, March, July and November.

Back Issues are eventually made available to non--members free-of-charge via

https//Alsterworthia.wordpress.com

Click on "journals" at the head of the opening page for full details of the back issue currently on line for down-loading.

Some new combinations in *Haworthia*, *Haworthiopsis* and *Tulista*

Ingo Breuer

Introduction.

In 2010 the author published his classification treatment for the Genus Haworthia. Since then the results of some important DNA research [Ramdhani et al. (2011); Daru et al. (2013); Manning et al. (2014)] for the subfamily Alooideae has been published, which effected the classification of the subfamily significantly. The details of the research can be read in published papers - please see References page xxx - but the important changes in classification (among others) was splitting the genus Haworthia into 3 new genera: *Haworthia*, *Haworthiopsis* and *Tulista*. This concept is accepted by the author too. Fortunately, the members of the new genera are the members of the subgenera of the old genus *Haworthia.* Based on the DNA research publications, Rowley (2013) made the new combinations with the taxa based on the one he accepted in the former genus *Haworthia.* But not all of them could be accepted, especially in the new genus *Tulista*, where he includes the former members of Astroloba, as well as three members of formerly subgenus Hexangulares: *H. koelmaniorum*, *H. pungens* and *H. viscosa*. Later in their publication Manning et al. (2014) made the necessary combination of the three taxa and pointed out that *Astroloba* has to be a separate genus as well. Unfortunately, Rowley made also two invalid combinations which were based on a wrong basionym citation: *H. attenuata* and *H. limifolia* var. *glaucophylla*. Because of the invalid combination of *H. attenuata*, the combinations of its varieties *H. attenuata* var. *glabrata* and *H. attenuata* var. *radula*, were also invalid. This will be corrected in this paper.

The other important classification work about the genus *Haworthia* was published by Bayer and Manning in 2012. Up to that point Bayer had used 'lower names' as informal names for taxa below the rank of species which could be subspecies, varieties or forma. But the problem with such naming was that it does not conform with the ICBN and therefore, is not accepted in scientific publications. This is the reason why Bayer decided in his new classification to use most of his informal names as varieties, which resulted in a couple of new combinations. At the time of his publication he already knew about the results of the DNA research in which Manning was involved, nevertheless Bayer upheld *Haworthia* as the genus retaining the three subgenera *Haworthia*, *Hexangulares* and *Robustipedenculares*!

In his concept of 2010 Breuer used the 'informal rank' of 'aggregates' to group closer related taxa together, consequently the rank of all taxa below species level were changed into species rank, which of course enlarged the number of species within Haworthia. Both Bayer's and Breuer's classifications were based on analogical reasons, but in different ways, for their classifications, (But Breuer's naming at species level did comply with the ICBN.) The author therefore also took the decision to change his species concept too to comply with the ICBN. In general, with a few exceptions, the former aggregates where changed to species and many of the species were changed to variety rank, or in a couple of cases, their old variety level were reinstated. But in this paper are published only the names, which are necessary for the new concept. In a forthcoming publication all names will be published, the accepted ones as well as all the synonyms.

The role of DNA analysis for classification of Haworthia taxa.

This is a critical comment concerning one aspect of the DNA research for classification purposes in *Haworthia.* It is doubtless, that the methods of DNA investigations will solve classification problems, especially when the results lead to a better interpretation of the meaning of the important morphological characters used. I am afraid that the conclusion which was made within *Haworthia* subgenus *Haworthia* are based on insufficient sample selection, because of lack of knowledge of their naturally occurrances. This was claimed in Bayer's publication (2012)too!

The DNA investigations says the elements of genus *Haworthia* are monophyletic in origin. The big problem is the meaning of morphologic characters at species level. In *Haworthia* we have a couple of very unique items, which could be recognized very easily like *H. maughani* or *H. truncata*, and also some more recently described

species like *H. springbokvlakensis* or *H. marxi*, or *H. blackburniae* with its 'grasslike' leaves. But most of the other taxa share their characters in variation ranges which group them in such way that you would recognize them like the 'retuse-type' items or 'setose-type' etc. For classification of these taxa you need good knowledge of their natural environment as well as their observation under controlled growing conditions. I expect much better results from DNA investigation in the new genus *Haworthia,* when the selection of samples is better correlated with their natural distribution and not based only on the selections by names from samples from university gardens or nurseries.

The taxa in the new genus *Tulista* should also be from monophyletic origins, easy to recognize, and need no further intensive new investigation.

The taxa in the new genus *Haworthiopsis*, which should be polyphyletic in origin, are also relatively easy to recognize, but they need more investigation to check. You can build some groups of related items within this genus, like attenuata-type or limifolia-type etc., but these groups are quite distinct in their morphological features from each other. Only because of the 'flower-type' they are member of the same genus, but the role of this feature needs to be checked more carefully. The question is, why do taxa, which originated from different ancestors, have the same type of floral characters?

The meaning of floral features for classification purposes.

The author made morphological investigations of floral characters of many taxa of the former genus *Haworthia* (the details will be shown in a forthcoming publication with complete treatment of *Haworthia*). As a summary of the results, one can say that the groupings you can make, correspond with the new genera, as well as on infrageneric levels. In general, the flower type plays only an important role at genus level; within the genus there is not much variation. This is also valid for the seed types. In *Haworthia* and *Haworthiopsis* you have similar shapes, but the colour of the testa is different. In *Haworthia* it is a grey coloured and in *Haworthiopsis* it is a black coloured. The variation is in the size of the seeds and possibly in the testa structure, which REM photos shows. How the testa structures correspond with the infrageneric grouping was not investigated. The shape of seeds from the *Tulista* taxa differs a lot from that of *Haworthia* and *Haworthiopsis* and can be recognized quite easily. But there are a couple of further characters which correspond with the subgroups. These are from the peduncle itself, the number of sterile bracts, the number of flowers, the size of pedicel and fertile bracts, the shape and size of flowers (from very narrow zygomorphic to nearly radial) and the colour of the petals (in some groups).

It is of great interest for further investigation to check if there is a correlation of floral characters (not only the flower type) and the relationship based on DNA analysis. If there is none, you must think about the usability of floral features for classification purposes at all.

There is one special case in the new genus *Haworthia*, where the taxa do have quite a different flower shape from all others. The shape is nearly globose, the petals are short but broad and the colour of the petals is green or brownish, except a small whitish stripe at the margins. The names of these taxa, which belongs to the section *Haworthia*, are: *H. globosiflora*, *H. pehlemanniae, H. albispina* and *H. devriesii*. The areas of their occurrence are along to the boarder to the Great Karoo, but with quite larger distances from each other (except between *H. pehlemanniae* and *H. albispina*). The features of their leaf characters are also distinct. The question is, concerning the taxonomy of these items, are they genetically closely related and could build a common group, or is the 'globose shape' only an adaption to their pollinators with their origin based on different ancestors! Based on the polyphyletic origin of the taxa in the genus *Haworthiopsis*, the author's theory is that the development of a unique flower type results from a long-term adaptation to their pollinators. If there are new results from DNA investigation which shows their close relationship, the author is willing to handle them as an entity, but till then, they are placed in three different groups.

Acknowledgments.

I am very grateful to Harry Mays, editor of Alsterworthia, for his support and making this publication possible. For discussion on the matter of classification the author has to thank Frantisek Vesely and Jakub Jilemicky, *Haworthia* enthusiasts, from the Czech Republic, Sebastian Schramm from Germany, George Borg-Marks from Malta and especially Gerhard Marx from South Africa. I thank also Prof. Gideon Smith, South Africa, for his helpful comments on the classification.

Haworthia blackbeardiana var. *calaensis* IB12513

Haworthia maculate var. *livida* IDV88.31

Haworthiopsis fasciata var. *browniana* ISI1664

Haworthiopsis reinwardtii var. *brevicula* IB525

Tulista opalina var. *zenigata* MH81-122

Tulista pumila var. *pumila* IB8809