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Chortolirion & cultivars.**



Haworthia badia var. *joleneae* IB18992

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Some new Combinations
in
Haworthia. Haworthiopsis.Tulista
by
Ingo Breuer.
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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**
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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 *Robustipedunculares*!

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 occurrences. 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 border 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.

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New names in Haworthia, Haworthiopsis and Tulista

- Haworthia arachnoidea* var. *angiras*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia angiras* M.Hayashi in Haworthia Study 14: 13 (2005).
- Haworthia arachnoidea* var. *calitzdorpensis*** (Breuer) Breuer comb. nov. Basionym: *Haworthia mucronata* var. *calitzdorpensis* Breuer in Avonia 21(3): 50 (2003).
- Haworthia arachnoidea* var. *joubertiae*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia joubertiae* M.Hayashi in Haworthia Study 14: 16 (2005).
- Haworthia arachnoidea* var. *laxa*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia laxa* M.Hayashi in Haworthia Study 14: 14 (2005).
- Haworthia arachnoidea* var. *limbata*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia limbata* M.Hayashi in Haworthia Study 14: 16 (2005).
- Haworthia aranea* var. *candida*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia candida* M.Hayashi in Haworthia Study 16: 16 (2006).
- Haworthia atrofusca* var. *enigma*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia enigma* M.Hayashi in Haworthia Study 7: 14 (2002).
- Haworthia badia* var. *bobii*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia bobii* M.Hayashi in Haworthia Study 29: 4. (2014).
- Haworthia badia* var. *joleneae*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia joleneae* M.Hayashi in Haworthia Study 29: 4. (2014).
- Haworthia batesiana* var. *lepidia*** (G.G.Sm.) Breuer comb. et stat. nov. Basionym: *Haworthia lepida* G.G.Sm. in J. S. African Bot. 10: 21 (1944).
- Haworthia batesiana* var. *reddii*** (C.L.Scott) Breuer comb. et stat. nov. Basionym: *Haworthia reddii* C.L.Scott in Cact. Succ. J. (US) 66: 182 (1994).
- Haworthia bayeri* var. *hayashii*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia hayashii* M.Hayashi in Haworthia Study 7: 14 (2002).
- Haworthia bayeri* var. *jadea*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia jadea* M.Hayashi in Haworthia Study 12: 13 (2004).
- Haworthia blackbeardiana* var. *calaensis*** (Breuer) Breuer comb. et stat. nov. Basionym: *Haworthia calaensis* Breuer in Alsterworthia Int. Special Issue 7: 5 (2004).
- Haworthia blackbeardiana* var. *specksii*** (Breuer) Breuer comb. et stat. nov. Basionym: *Haworthia specksii* Breuer in Alsterworthia Int. Special Issue 7: 8 (2004).
- Haworthia bolusii* var. *floccosa*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia floccosa* M.Hayashi in Haworthia Study 10: 13 (2003).
- Haworthia caerulea* var. *pallens*** (Breuer et M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia pallens* Breuer et M.Hayashi in Alsterworthia Int. Special Issue 7: 7 (2004).
- Haworthia caespitosa* var. *consanguinea*** (M.B.Bayer) Breuer comb. nov. Basionym: *Haworthia mirabilis* var. *consanguinea* M.B.Bayer in Haworthia Revisited: 111 (1999).
- Haworthia cangoensis* var. *kogmanensis*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia kogmanensis* M.Hayashi in Haworthia Study 14: 14 (2005).
- Haworthia cangoensis* var. *royalis*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia royalis* M.Hayashi in Haworthia Study 14: 1 (2005).
- Haworthia cangoensis* var. *tradouwensis*** (Breuer) Breuer comb. et stat. nov. Basionym: *Haworthia tradouwensis* Breuer in Avonia 21: 57 (2003).
- Haworthia cooperi* var. *hisui*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia hisui* M.Hayashi in Haworthia Study 12: 10 (2004).
- Haworthia cyanea* var. *amethysta*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia amethysta* M.Hayashi in Haworthia Study 10: 1 (2003).
- Haworthia cyanea* var. *ianthina*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia ianthina* M.Hayashi in Haworthia Study 14: 12 (2005).
- Haworthia cyanea* var. *succinea*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia succinea* M.Hayashi in Haworthia Study 10: 14 (2003).
- Haworthia decipiens* var. *exilis*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia exilis* M.Hayashi in Haworthia Study 10: 12 (2003).
- Haworthia decipiens* var. *incrassa*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia incrassa* M.Hayashi in Haworthia Study 14: 12 (2005).
- Haworthia graminifolia* var. *derustensis*** (M.B.Bayer) Breuer comb. nov. Basionym: *Haworthia blackburniae* var. *derustensis* M.B.Bayer in Haworthia Revisited: 41 (1997).
- Haworthia hamata* var. *subhamata*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia subhamata* M.Hayashi in Haworthia Study 12: 11 (2004).
- Haworthia inconfusa* var. *crystallina*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia crystallina* M.Hayashi in Haworthia Study 15: 16 (2006).
- Haworthia inconfusa* var. *lockwoodii*** (Archibald) Breuer comb. et stat. nov. Basionym: *Haworthia lockwoodii* Archibald in Fl. Pl. Africa 20: f.792 (1940).
- Haworthia indigoa* var. *truterorum*** (Breuer et Marx) Breuer comb. et stat. nov. Basionym: *Haworthia truterorum* Breuer et Marx in Aloe 48: 54 (2011).
- Haworthia isabellae* var. *arabesqua*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia arabesqua* M.Hayashi in Haworthia Study 12: 7 (2004).
- Haworthia isabellae* var. *bella*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia bella* M.Hayashi in Haworthia Study 12: 8 (2004).
- Haworthia isabellae* var. *ligulata*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia ligulata* M.Hayashi in Haworthia Study 12: 6 (2004).
- Haworthia jansenvillensis* var. *crinita*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia crinita* M.Hayashi in Haworthia Study 10: 13 (2003).
- Haworthia jansenvillensis* var. *eminens*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia eminens* M.Hayashi in Haworthia Study 10: 13 (2003).
- Haworthia jansenvillensis* var. *flavida*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia flavida* M.Hayashi in Haworthia Study 10: 13 (2003).
- Haworthia jansenvillensis* var. *fluffa*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia fluffa* M.Hayashi in Haworthia Study 12: 9 (2004).
- Haworthia jansenvillensis* var. *mollis*** (M.Hayashi) Breuer

- comb. et stat. nov. Basionym: *Haworthia mollis* M.Hayashi in Haworthia Study 10: 14 (2003).
- Haworthia jansenvillensis* var. *regina*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia regina* M.Hayashi in Haworthia Study 10: 14 (2003).
- Haworthia lapis* var. *rava*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia rava* M.Hayashi in Haworthia Study 14: 11 (2005).
- Haworthia magnifica* var. *asperula*** (Haw.) Breuer comb. et stat. nov. Basionym: *Haworthia asperula* Haw. in Phil. Mag. 1824 :300 (1824).
- Haworthia magnifica* var. *obserata*** (Marx) Breuer comb. et stat. nov. Basionym: *Haworthia obserata* Marx in Alsterworthia Int. 14: 17 (2014).
- Haworthia maraisii* var. *schuldtiana*** (V.Poelln.) Breuer comb. et stat. nov. Basionym: *Haworthia schuldtiana* V.Poelln. in Repert. Spec. Nov. Regni Veg. 41: 211 (1937).
- Haworthia marumiana* var. *marmorata*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia marmorata* M.Hayashi in Haworthia Study 15: 14 (2006).
- Haworthia mirabilis* var. *depauperata*** (V.Poelln.) Breuer comb. nov. Basionym: *Haworthia triebneriana* var. *depauperata* V.Poelln. in Repert. Spec. Nov. Regni Veg. 43: 94 (1938).
- Haworthia monticola* var. *bronkhorstii*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia bronkhorstii* M.Hayashi in Haworthiad 15: 16 (2001).
- Haworthia multifolia* var. *breueri*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia breueri* M.Hayashi in Haworthia Study 7: 14 (2002).
- Haworthia multifolia* var. *major*** (G.G.Sm.) Breuer comb. nov. Basionym: *Haworthia schuldtiana* var. *major* G.G.Sm. in J. S. African Bot. 12: 1 (1946).
- Haworthia mundula* var. *calcarea*** (Bayer) Breuer comb. nov. Basionym: *Haworthia mirabilis* var. *calcarea* M.B.Bayer in Haworthia Revisited: 110 (1999).
- Haworthia nortieri* var. *agnis*** (Battista) Breuer comb. et stat. nov. Basionym: *Haworthia agnis* Battista in Alsterworthia Int. 2: 9 (2002).
- Haworthia nortieri* var. *montana*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia montana* M.Hayashi in Haworthia Study 14: 14 (2005).
- Haworthia notabilis* var. *diversicolor*** (Triebner et V.Poelln.) comb. nov. Basionym: *Haworthia triebneriana* var. *diversicolor* Triebner et V.Poelln. in Feddes Repert. 47: 9 (1939).
- Haworthia odetteae* var. *odyssei*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia odyssei* M.Hayashi in Haworthia Study 14: 11 (2005).
- Haworthia paradoxa* var. *jakubii*** (Breuer) Breuer comb. et stat. nov. Basionym: *Haworthia jakubii* Breuer in Alsterworthia Int. Special Issue 7: 10 (2004).
- Haworthia parksiana* var. *dentata*** (M.B.Bayer) Breuer comb. nov. Basionym: *Haworthia floribunda* var. *dentata* M.B.Bayer Haworthia Revisited 73 (1999).
- Haworthia pehlemanniae* var. *albispina*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia albispina* M.Hayashi in Haworthia Study 8: 1 (2002).
- Haworthia picta* var. *comptoniana*** (G.G.Sm.) Breuer comb. et stat. nov. Basionym: *Haworthia comptoniana* G.G.Sm. in J. S. African Bot. 11: 76 (1945).
- Haworthia picturata* var. *pusilla*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia pusilla* M.Hayashi in Haworthia Study 12: 10 (2004).
- Haworthia pilosa* var. *ciliata*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia ciliata* M.Hayashi in Haworthia Study 14: 11 (2005).
- Haworthia pilosa* var. *lachnosa*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia lachnosa* M.Hayashi in Haworthia Study 16: 16 (2006).
- Haworthia pringlei* var. *hastata*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia hastata* M.Hayashi in Haworthia Study 12: 9 (2004).
- Haworthia pygmaea* var. *esterhuizenii*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia esterhuizenii* M. Hayashi in Haworthia Study 7: 14 (2002).
- Haworthia retusa* var. *fouchei*** (V.Poelln.) Breuer comb. et stat. nov. Basionym: *Haworthia fouchei* V.Poelln. in Succulenta (Netherlands) 22: 28 (1940).
- Haworthia retusa* var. *fusca*** (Breuer) Breuer comb. et stat. nov. Basionym: *Haworthia fusca* Breuer in Alsterworthia Int. Special Issue 7: 9 (2004).
- Haworthia rooibergensis* var. *erii*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia erii* M.Hayashi in Haworthia Study 14: 11 (2005).
- Haworthia rossouwii* var. *scabra*** (Bayer) Breuer comb. nov. Basionym: *Haworthia heidelbergensis* var. *scabra* M.B.Bayer in Haworthia Revisited: 82 (1999).
- Haworthia rossouwii* var. *serrata*** (Bayer) Breuer comb. et stat. nov. Basionym: *Haworthia serrata* M.B.Bayer in Jl. S. Afr. Bot. 39: 249 (1973).
- Haworthia salina* var. *venusta*** (C.L.Scott) Breuer comb. et stat. nov. Basionym: *Haworthia venusta* C.L.Scott in Bradleya 14: 87 (1996).
- Haworthia suberecta* var. *pallidifolia*** (G.G.Sm.) Breuer comb. nov. Basionym: *Haworthia turgida* var. *pallidifolia* G.G.Sm. in J. S. African Bot. 12: 10 (1946).
- Haworthia tenera* var. *cummingii*** (Breuer et M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia cummingii* Breuer et M.Hayashi in Haworthia Study 10: 4 (2003).
- Haworthia tenera* var. *doldii*** (M.B.Bayer) Breuer comb. nov. Basionym: *Haworthia cooperi* var. *doldii* M.B.Bayer in Haworthiad 16: 65 (2002).
- Haworthia transiens* var. *florens*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia florens* M.Hayashi in Haworthia Study 12: 11 (2004).
- Haworthia tretyrensis* var. *pectinis*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia pectinis* M.Hayashi in Haworthia Study 10: 13 (2003).
- Haworthia umbraticola* var. *obesa*** (V.Poelln.) Breuer comb. nov. Basionym: *Haworthia cymbiformis* var. *obesa* V.Poelln. in Repert. Spec. Nov. Regni Veg. 45: 166 (1938).
- Haworthia venetia* var. *calva*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia calva* M.Hayashi in Haworthia Study 12: 8 (2004).
- Haworthia venetia* var. *jeffreis*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia jeffreis* M.Hayashi in Haworthia Study 12: 10 (2004).
- Haworthia venetia* var. *teres*** (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia teres* M.Hayashi in Haworthia Study 12: 7 (2004).
- Haworthiopsis attenuata*** (Haw.) Breuer comb. nov. Basionym: *Aloe attenuata* Haw. in Trans. Linn. Soc. London 7: 11 (1804).
- Haworthiopsis attenuata* var. *glabrata*** (Salm Dyck) Breuer comb. et stat. nov. Basionym: *Aloe glabrata* Salm Dyck in Hort.Dyck.: 325 (1834).
- Haworthiopsis attenuata* var. *radula*** (Jacq.) Breuer comb. et stat. nov. Basionym: *Aloe radula* Jacq. in Pl. Rar. Hort. Schoenbr. 4: 11,

t.422 (1804).

Haworthiopsis fasciata var. browniana (V.Poelln.) Breuer comb. et stat. nov. Basionym: *Haworthia browniana* V.Poelln. in Desert Pl. Life 9: 102 (1937).

Haworthiopsis granulata var. schoemanii (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia schoemanii* M.Hayashi in Haworthia Study 9: 14 (2003).

Haworthiopsis koelmaniorum var. mcmurtryi (C.L.Scott) Breuer comb. et stat. nov. Basionym: *Haworthiopsis mcmurtryi* C.L.Scott in Cact. Succ. J. (Los Angeles) 56(2): 69. (1984).

Haworthiopsis limifolia var. glaucophylla (M.B.Bayer) Breuer comb. nov. Basionym: *Haworthia limifolia* var. *glaucophylla* M.B.Bayer in Aloe 40(2): 50 2003.

Haworthiopsis limifolia var. striata (Pilbeam) Breuer comb. nov. Basionym: *Haworthia limifolia* var. *striata* Pilbeam in Haworthia & Astroloba :87 (1983).

Haworthiopsis reinwardtii var. coarctata (Haw.) Breuer comb. et stat. nov. Basionym: *Haworthia coarctata* Haw. in Philos.Mag. 64: 301 (1824).

Haworthiopsis reinwardtii var. greenii (Baker) Baker comb. et stat. nov. Basionym: *Haworthia greenii* Baker in J. Linn. Soc. Bot. 18: 202 (1880).

Haworthiopsis reinwardtii var. olivacea (G.G.Sm.) Breuer comb. et stat. nov. Basionym: *Haworthia reinwardtii* var. *olivacea* G.G.Sm. in J. S. African Bot. 10: 142 (1944).

Haworthiopsis reinwardtii var. tenuis (G.G.Sm.) Breuer comb. nov. Basionym: *Haworthia reinwardtii* var. *tenuis* G.G.Sm. in J. S. African Bot. 14: 51 (1948).

Haworthiopsis scabra var. johannii (M.Hayashi) Breuer comb. nov. Basionym: *Haworthia scabra* var. *johannii* M.Hayashi in Haworthiad 15: 16 (2001).

Haworthiopsis scabra var. smitii (V.Poelln.) Breuer comb. et stat. nov. Basionym: *Haworthia smitii* V.Poelln. in Desert Pl. Life 10: 186 (1938).

Haworthiopsis sordida var. agavoides (Zant. et V.Poelln.)

Breuer comb. et stat. nov. Basionym: *Haworthia agavoides* Zant. et V.Poelln. in Repert. Spec. Nov. Regni Veg. 43: 232 (1938).

Haworthiopsis tessellata var. crousii (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia crousii* [spahlm. crousii] M.Hayashi in Haworthiad 15: 16 (2001).

Haworthiopsis venosa var. woolleyi (V.Poelln.) Breuer comb. et stat. nov. Basionym: *Haworthia woolleyi* V.Poelln. in Repert. Spec. Nov. Regni Veg. 42: 269 (1937).

Haworthiopsis viscosa (L.) Breuer comb. nov. Basionym: *Aloe viscosa* L. in Sp. Pl. 1: 322 (1753).

Haworthiopsis viscosa var. asperiuscula (Haw.) Breuer comb. et stat. nov. Basionym: *Haworthia asperiuscula* Haw. in Suppl. Pl. Succ.: 60 (1819).

Haworthiopsis viscosa var. beanii (G.G.Sm.) Breuer comb. et stat. nov. Basionym: *Haworthia beanii* G.G.Sm. in J. S. African Bot. 10: 137 (1944).

Tulista kingiana (V.Poelln.) Breuer comb. nov. Basionym: *Haworthia kingiana* V.Poelln. in Cact. J. 5:31 (1936).

Tulista marginata var. mortonii (Breuer) Breuer comb. et stat. nov. Basionym: *Haworthia mortonii* Breuer in Alsterworthia Int. 7: 22 (2007).

Tulista minima var. poellnitzianna (Uitew.) Breuer comb. et stat. nov. Basionym: *Haworthia poellnitzianna* Uitew. in Cactuss. en Vetpl. 5: 137. (1939).

Tulista opalina (M.Hayashi) Breuer comb. nov. Basionym: *Haworthia opalina* M.Hayashi in Haworthiad 15: 17 (2001).

Tulista opalina var. zenigata (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia zenigata* M.Hayashi in Haworthiad 15: 20 (2001).

Tulista pumila var. okhuwae (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia okhuwae* M.Hayashi in Haworthia Study 16: 13 (2006).

Tulista pumila var. sparsa (M.Hayashi) Breuer comb. et stat. nov. Basionym: *Haworthia sparsa* M.Hayashi in Haworthia Study 16: 13 (2006).

Accepted Names in Haworthia, Haworthiopsis and Tulista

Genus	Species	Status	Representative Specimen		
			Collector's No.	Location	Site location Ref.
Haworthia	angustifolia		IB6984	SE of Bloukrans	3326BC
Haworthia	angustifolia var. altissima		SS1034	N of Riebeek East	3326AA
Haworthia	angustifolia var. baylissii		IB3590	Oudekraal	3325BC
Haworthia	angustifolia var. paucifolia		DMC8213	Fish River	3326BD
Haworthia	aquamarina		IB13683	Rossouwspoort	3225CC
Haworthia	arachnoidea		IB8877	Langevallei	3319DC
Haworthia	arachnoidea var. angiras	comb. et stat. nov.	IB6591	Calitzdorp	3321BC
Haworthia	arachnoidea var. calitzdorpensis	comb. nov.	IB6595	ENE of Calitzdorp	3321BD
Haworthia	arachnoidea var. joubertiae	comb. et stat. nov.	IB7140	SE of Laingsburg	3321AC
Haworthia	arachnoidea var. laxa	comb. et stat. nov.	IB7143	Ouberg	3320CB
Haworthia	arachnoidea var. limbata	comb. et stat. nov.	JDV97-87	Osplaas	3319BC
Haworthia	arachnoidea var. scabrispina		IB3752	Floriskraal Dam	3320BD
Haworthia	aranea		DMC3994	Moerasrivier	3322CB
Haworthia	aranea var. candida	comb. et stat. nov.	GM494	SW of Ladismith	3321CA
Haworthia	archeri		IB597	Laingsburg	3320BB
Haworthia	asema		IB6619	Buffelskloof	3321DB
Haworthia	atrofusca		IB371	SW of Riversdale	3421AA
Haworthia	atrofusca var. enigma	comb. et stat. nov.	IB511	N of Riversdale	3421AA
Haworthia	azurea		DMC8583	Grootpoort	3325AC
Haworthia	badia		IB6460	W of Napier	3419BD
Haworthia	badia var. bobii	comb. et stat. nov.	MBB7248	Ballyfar, Infanta	3420BC
Haworthia	badia var. joleneae	comb. et stat. nov.	IB18992	SE of Malgas	3420BC

Haworthia	batesiana		IB377	SW of Graaff Reinet	3224AB
Haworthia	batesiana var. lepida	comb. et stat. nov.	GGS5066	W of Fort Brown	3326AB
Haworthia	batesiana var. reddii	comb. et stat. nov.	JDV92-113	Waterdown Dam	3226BB
Haworthia	batteniae		SS1046	S of Cradock	3225BA
Haworthia	bayeri		IB7095	Uniondale	3323CA
Haworthia	bayeri var. hayashii	comb. et stat. nov.	MH81-122	S of Oudtshoorn	3322CA
Haworthia	bayeri var. jadea	comb. et stat. nov.	GM261	Kammanassie Dam	3322CB
Haworthia	blackbeardiana		DMC5400	SE of Queenstown	3126DD
Haworthia	blackbeardiana var. calaensis	comb. et stat. nov.	IB12513	SW of Cala	3127DA
Haworthia	blackbeardiana var. specksii	comb. et stat. nov.	VDV42	S of Queenstown	3126DD
Haworthia	blackburniae		VDV34	SW of Ladismith	3321CA
Haworthia	bolusii		IB7002	Graaff Reinet	3224BC
Haworthia	bolusii var. floccosa	comb. et stat. nov.	IB12579	NE of Fullarton	3323AB
Haworthia	bolusii var. semiviva		JDV91-48	Beaufort West	3222BC
Haworthia	caerulea		SS1036	Helpsvoort	3326AB
Haworthia	caerulea var. pallens	comb. et stat. nov.	IB6537	Glen Craig	3326BC
Haworthia	caespitosa		IB2869	Tradouw Pass	3320DC
Haworthia	caespitosa var. consanguinea	comb. nov.	IB54	McGregor	3319DD
Haworthia	cangoensis		IB6643	N of Oudtshoorn	3322AC
Haworthia	cangoensis var. kogmanensis	comb. et stat. nov.	IB7157	Kogmanskloof	3320CC
Haworthia	cangoensis var. royalis	comb. et stat. nov.	VDV1672	N of Volmoed	3321CA
Haworthia	cangoensis var. tradouwensis	comb. et stat. nov.	IB7171	Tradouw Pass	3320DC
Haworthia	chloracantha		IB6650	Herbertsdale	3421BB
Haworthia	chloracantha var. denticulifera		IB37	Mossel Bay	3422AA
Haworthia	chloracantha var. subglauca		IB315	Great Brakrivier	3422AA
Haworthia	cooperi		SS1031	NW of Grahamstown	3326AB
Haworthia	cooperi var. dielsiana		MBB6565	W of Somerset East	3225DA
Haworthia	cooperi var. hisui	comb. et stat. nov.	DMC8249	Cookhouse	3225DB
Haworthia	cooperi var. pilifera		IB8576	E of Fort Beaufort	3326DC
Haworthia	cyanea		IB6655	NE of Prince Albert	3322AB
Haworthia	cyanea var. amethysta	comb. et stat. nov.	JDV97-74	Damplaas	3323AC
Haworthia	cyanea var. ianthina	comb. et stat. nov.	IB6576	N of Uniondale	3323CA
Haworthia	cyanea var. succinea	comb. et stat. nov.	MH03-267	Perdepoort, Willowmore	3323AB
Haworthia	cymbiformis		IB4507	Settlers Park, P.E.	3325DC
Haworthia	cymbiformis var. ramosa		GGS3168	Wooldridge	3327AB
Haworthia	cymbiformis var. setulifera		JDV91-91	NE of East London	3327BB
Haworthia	decipiens		IB206	Willowmore	3323AD
Haworthia	decipiens var. exilis	comb. et stat. nov.	MBB6587	Die Bordjie	3324BC
Haworthia	decipiens var. incrassa	comb. et stat. nov.	PVB7052	NE of Willowmore	3323CB
Haworthia	devriesii		VDV643	Prince Albert	3322AA
Haworthia	dimorpha		GM646	W of Konstable	3320AD
Haworthia	elizeae		VDV563	W of Swellendam	3420AA
Haworthia	emeralda		MBB6925	Kok-se-pad, N of Kirkwood	3325AD
Haworthia	floribunda		JDV89-22	N of Heidelberg	3420BB
Haworthia	floribunda var. major		JDV91-3	S of Swellendam	3420AB
Haworthia	globifera		PVB7338	Touwsberg	3320DB
Haworthia	gordoniana		DMC11040	Zuurbron	3324DD
Haworthia	graminifolia		IB11671	Schoemanspoort	3322AC
Haworthia	graminifolia var. derustensis	comb. nov.	JDV93-24	W of De Rust	3322CB
Haworthia	groenewaldii		DMC13222	Buffeljagsrivier	3420BA
Haworthia	habdomadis		VDV83	Seweweeksport	3321AD
Haworthia	hamata		MBB6600	Perdepoort	3325AC
Haworthia	hamata var. subhamata	comb. et stat. nov.	MBB6935	De Plaat, NE of Kabouga	3325AD
Haworthia	harryi		DMC8246	Uniondale Poort	3323CA
Haworthia	heidelbergensis		JDV87-1	Heidelberg	3420BB
Haworthia	heidelbergensis var. toonensis		JDV87-3	SW of Heidelberg	3420BB
Haworthia	herbacea		IB8888	Ribbokkop, Worcester	3319DC
Haworthia	herbacea var. flaccida		JDV96-31	Rooiberg, Robertson	3319DD
Haworthia	herbacea var. lupula		JDV94-36	Villiersdorp	3319CD
Haworthia	herbacea var. paynei		IB8848	McGregor	3319DD
Haworthia	ikra		ISI1762	Stutterheim	3227BC
Haworthia	inconfluens		IB5394	Ladismith	3321AD
Haworthia	inconfluens var. crystallina	comb. et stat. nov.	IB12419	Kleinfontein	3321DA
Haworthia	inconfluens var. lockwoodii	comb. et stat. nov.	IB6739	S of Laingsburg	3320BB
Haworthia	inconfluens var. morrisiae		VDV87	SW of Oudtshoorn	3322CA
Haworthia	incurvula		IB6539	Pluto's Vale	3326BB
Haworthia	indigoa		VDV445	NE of George	3322DA
Haworthia	indigoa var. truterorum	comb. et stat. nov.	GM676	Heimersrivier	3322CD

Haworthia	integra	IB6651	Herbertsdale	3321BC
Haworthia	integra var. standeri	JME1-98	NW of Calitzdorp	3321BC
Haworthia	intermedia	JDV87-203	N of Klaas Voogds	3319DD
Haworthia	isabellae	MBB6801	SW of Hankey	3324DD
Haworthia	isabellae var. arabesqua	comb. et stat. nov.	SS1009	3324DD
Haworthia	isabellae var. bella	comb. et stat. nov.	JDV92-136	3324DB
Haworthia	isabellae var. ligulata	comb. et stat. nov.	IB12439	3325CC
Haworthia	jansenvillensis		IB6996	3224DC
Haworthia	jansenvillensis var. crinita	comb. et stat. nov.	DMC5157	3323BB
Haworthia	jansenvillensis var. eminens	comb. et stat. nov.	MH03-287	3225CA
Haworthia	jansenvillensis var. flavida	comb. et stat. nov.	IB12611	3325AA
Haworthia	jansenvillensis var. fluffa	comb. et stat. nov.	MBB6910	3325AD
Haworthia	jansenvillensis var. mollis	comb. et stat. nov.	IB6995	3325AB
Haworthia	jansenvillensis var. regina	comb. et stat. nov.	IB6575	3324AB
Haworthia	joeyae		DMC6682	3225DB
Haworthia	lapis		DMC8600	3325BB
Haworthia	lapis var. rava	comb. et stat. nov.	MBB6899	3325AB
Haworthia	lazulis		MBB6852	3325AB
Haworthia	leightonii		IB4735	3327BA
Haworthia	leightonii var. davidii		IB6970	3327BA
Haworthia	longibracteata		LAV26913	3421AD
Haworthia	luri		IB13694	3325DA
Haworthia	maculata		JDV88-29	3319CB
Haworthia	maculata var. livida		JDV88-31	3319CD
Haworthia	magnifica		JDV87-181	3421AA
Haworthia	magnifica var. asperula	comb. et stat. nov.	JDV94-6	3421AA
Haworthia	magnifica var. obserata	comb. et stat. nov.	GM718	3321CC
Haworthia	magnifica var. splendens		JDV93-59	3421BC
Haworthia	maraissii		ISI93-38	3420AB
Haworthia	maraissii var. schuldtiana	comb. et stat. nov.	ISI1763	3420AA
Haworthia	marumiana		IB123	3124DC
Haworthia	marumiana var. marmorata	comb. et stat. nov.	MH03-205	3221DD
Haworthia	marumiana var. viridis		MBB3620	3322AC
Haworthia	marxii		GM623	3320BC
Haworthia	maughanii		IB4820	3321DA
Haworthia	meiringii		KGW224-70	3320CC
Haworthia	mirabilis		IB2850	3419BA
Haworthia	mirabilis var. depauperata	comb. nov.	IB8788	3420AA
Haworthia	mirabilis var. sublineata		IB8795	3420CA
Haworthia	monticola		IB4554	3323CA
Haworthia	monticola var. bronkhorstii	comb. et stat. nov.	JME18-94	3323AC
Haworthia	multifolia		IB133	3321CC
Haworthia	multifolia var. breueri	comb. et stat. nov.	JDV90-22	3321CD
Haworthia	multifolia var. major	comb. nov.	IB5539	3321CC
Haworthia	mundula		MBB6631	3419DB
Haworthia	mundula var. calcarea	comb. nov.	JDV84-65	3420CA
Haworthia	namaquensis		MBB1674	3119BD
Haworthia	nortieri		IB12823	3119AC
Haworthia	nortieri var. agnis	comb. et stat. nov.	IB12805	3119AC
Haworthia	nortieri var. giftbergensis		LAV26669	3118DC
Haworthia	nortieri var. globosiflora		IB5461	3119CD
Haworthia	nortieri var. montana	comb. et stat. nov.	IB676	3220AD
Haworthia	notabilis		JDV87-197	3319DD
Haworthia	notabilis var. diversicolor	comb. nov.	MBB6757	3319DD
Haworthia	oculata		SS1084	3324DA
Haworthia	odetteae		DMC8604	3224DD
Haworthia	odetteae var. odyssei	comb. et stat. nov.	IB12597	3225CD
Haworthia	outeniquensis		IB6645	3322CC
Haworthia	paradoxa		DMC9247	3421AC
Haworthia	paradoxa var. jakubii	comb. et stat. nov.	IB13757	3421AD
Haworthia	parksiana		GM284	3422AA
Haworthia	parksiana var. dentata	comb. nov.	MBB5460	3421BD
Haworthia	pehlemanniae		IB7125	3320BB
Haworthia	pehlemanniae var. albispina	comb. et stat. nov.	IB11766	3321AB
Haworthia	pellucida		IB8929	3324AB
Haworthia	picta		IB6209	3322CA
Haworthia	picta var. comptoniana	comb. et stat. nov.	IB6779	3323AD
Haworthia	picta var. janvlokii		IB7111	3322BA

Haworthia	picta var. tricolor		GM256	Rooiberg Pass	3321DA
Haworthia	picturata		JDV90-76	Andrieskraal	3324DA
Haworthia	picturata var. pusilla	comb. et stat. nov.	MBB6928	E of Andrieskraal	3324DC
Haworthia	pilosa		MBB6826	Rooihook, Baviaanskloof	3324CA
Haworthia	pilosa var. ciliata	comb. et stat. nov.	MBB6905	W of Kaboega	3325AD
Haworthia	pilosa var. lachnosa	comb. et stat. nov.	PVB7128	Holrivier	3324DC
Haworthia	pringlei		IB6472	SW of Adelaide	3225CC
Haworthia	pringlei var. hastata	comb. et stat. nov.	MBB6561	Baviaanskranz	3225DD
Haworthia	pubescens		IB499	SE of Worcester	3319DC
Haworthia	pulchella		IB8901	NE of Touws River	3320AC
Haworthia	pygmaea		JDV84-15	Great Brakrivier	3422AA
Haworthia	pygmaea var. acuminata		JDV91-31	N of Gouritzmond	3421BD
Haworthia	pygmaea var. argenteo-maculosa		VDV249	Humor, W of Mossel Bay	3421BB
Haworthia	pygmaea var. esterhuizenii	comb. et stat. nov.	GM320	E of Albertinia	3421BA
Haworthia	pygmaea var. vincentii		VDV71	NE of Albertinia	3421BA
Haworthia	reticulata		SS1202	Wolfkloof	3319DC
Haworthia	reticulata var. attenuata		MBB6515	Aurora, Bonnievale	3320CC
Haworthia	reticulata var. hurlingii		JDV87-191	Goudmyn	3320CC
Haworthia	reticulata var. subregularis		MBB6693	NE of Worcester	3319DA
Haworthia	retusa		JDV92-124	SE of Riversdale	3421AB
Haworthia	retusa var. dekenahii		GGS5489	N of Albertinia	3421BA
Haworthia	retusa var. fouchei	comb. et stat. nov.	JDV87-5	E of Riversdale	3421AB
Haworthia	retusa var. fusca	comb. et stat. nov.	IB8971	W of Paulsfontein	3421BA
Haworthia	retusa var. mutica		IB6328	Stormsvlei	3420AA
Haworthia	retusa var. nigra		JDV86-16	SW of Heidelberg	3420BB
Haworthia	retusa var. quimutica		JDV90-1	SE of Heidelberg	3420BB
Haworthia	rooibergensis		JME7-97	Vanwyksdorp	3321DA
Haworthia	rooibergensis var. erii	comb. et stat. nov.	VDV443	ESE of De Rust	3322DA
Haworthia	rossouwii		DMC13215	Soutkloof, NW of Bredasdorp	3420AC
Haworthia	rossouwii var. minor		JDV86-5	Rooivlei, N of Bredasdorp	3420AC
Haworthia	rossouwii var. scabra	comb. nov.	JDV87-4	E of Drew	3320CC
Haworthia	rossouwii var. serrata	comb. et stat. nov.	IB7159	SW of Heidelberg	3420BA
Haworthia	salina		IB15454	Stillwell	3325DA
Haworthia	salina var. venusta	comb. et stat. nov.	JDV94-5	Alexandria	3326DA
Haworthia	scottii		IB6617	SE of Calitzdorp	3321DA
Haworthia	springbokvlakensis		EA976	Springbokvlakte	3324BC
Haworthia	suberecta		IB7180	Brandwag	3422AA
Haworthia	suberecta var. pallidifolia	comb. nov.	KBG313/73	NW of Albertinia	3421BA
Haworthia	tenera		IB6667	Fish River	3326BB
Haworthia	tenera var. cummingii	comb. et stat. nov.	IB12447	SES of Committees Drift	3326BB
Haworthia	tenera var. doldii	comb. nov.	IB8547	Kwa Sandile, Chalumna	3327BA
Haworthia	transiens		IB4172	SSE of Uniondale	3323CA
Haworthia	transiens var. florens	comb. et stat. nov.	PVB7093	Skrikrievier	3323DB
Haworthia	tretyrensis		IB5372	Tretyre, Steytlerville	3324BC
Haworthia	tretyrensis var. pectinis	comb. et stat. nov.	IB12585	Noorspoort	3324AD
Haworthia	truncata		VDV472	N of Oudtshoorn	3322AC
Haworthia	truncata var. minor		IB5379	Dysseldorp	3322CB
Haworthia	turgida		IB8753	SW of Swellendam	3420AB
Haworthia	umbraticola		IB7023	Swartwater Poort	3325BB
Haworthia	umbraticola var. obesa	comb. nov.	ISI1856	E of Idutywa	3228AB
Haworthia	unicolor		IB7155	Sandlegte	3320DA
Haworthia	variegata		JDV89-6	NW of Stilbay	3421AD
Haworthia	variegata var. hemicypta		JDV86-11	N of Potberg	3420BC
Haworthia	variegata var. modesta		MBB2551	Kathoek	3420AD
Haworthia	variegata var. petrophila		IB8794	Karsrivier	3420AC
Haworthia	venetia		DMC8560	N of Hankey	3324DD
Haworthia	venetia var. calva	comb. et stat. nov.	MBB6904	W of Kaboega	3325AD
Haworthia	venetia var. jeffreis	comb. et stat. nov.	IB225	Jeffrey's Bay	3424BB
Haworthia	venetia var. teres	comb. et stat. nov.	MBB6940	E of De Plaat	3325AC
Haworthia	venteri		IB6582	SW of Ladismith	3321CA
Haworthia	vlokii		JDV91-2	E of Meiringspoort	3322BC
Haworthia	wittebergensis		DMC5075	Wittebergrievier	3320BD
Haworthia	xiphophylla		IB6517	N of Uitenhage	3325CB
Haworthia	zantneriana		IB6574	N of Kampherspoort	3324AB
Haworthia	zantneriana var. minor		JDV85-26	Miller	3323BB
Haworthiopsis	attenuata	comb. nov.	IB7199	Coega Kop	3325DC
Haworthiopsis	attenuata var. glabrata	comb. et stat. nov.	PVB4400	Bashee River	3228BA
Haworthiopsis	attenuata var. radula	comb. et stat. nov.	GM415	Hankey	3324DD
Haworthiopsis	bruynsii		IB5908	Springbokvlakte	3324BD

<i>Haworthiopsis fasciata</i>		DMC8556	SE of Hankey	3324DD
<i>Haworthiopsis fasciata</i> var. <i>browniana</i>	comb. et stat. nov.	ISI1664	Hillwacht, N of Uitenhage	3325CB
<i>Haworthiopsis glauca</i>		IB8523	Weltevreden	3325AB
<i>Haworthiopsis glauca</i> var. <i>herrei</i>		ISI1568	Miller	3323BB
<i>Haworthiopsis granulata</i>		IB531	Verlatekloof	3220DA
<i>Haworthiopsis granulata</i> var. <i>schoemanii</i>	comb. et stat. nov.	MH03-309	Dwyka	3321BA
<i>Haworthiopsis koelmaniorum</i>		IB876	Groblersdal	2529AB
<i>Haworthiopsis koelmaniorum</i> var. <i>mcmurtryi</i>	comb. et stat. nov.	IB6664	SE of Verena	2529CA
<i>Haworthiopsis limifolia</i>		IB10840	Abercorn Drift	2632CC
<i>Haworthiopsis limifolia</i> var. <i>arcana</i>		IB6746	Hectorspruit	2531BC
<i>Haworthiopsis limifolia</i> var. <i>gigantea</i>		IB5652	Nongoma	2731DC
<i>Haworthiopsis limifolia</i> var. <i>glaucophylla</i>	comb. nov.	FV13700	3Sisters, Barberton	2531CB
<i>Haworthiopsis limifolia</i> var. <i>striata</i>	comb. nov.	MBB7137	Lebombo Mountains	2732CD
<i>Haworthiopsis limifolia</i> var. <i>ubomboensis</i>		IB634	Ubombo Mountains	2732CA
<i>Haworthiopsis longiana</i>		IB4180	SE of Patensie	3324DB
<i>Haworthiopsis nigra</i>		IB6556	Steytlerville	3324AD
<i>Haworthiopsis nigra</i> var. <i>diversifolia</i>		IB7121	W of Beaufort West	3221BD
<i>Haworthiopsis pungens</i>		MBB6380	Bramriver	3323DD
<i>Haworthiopsis reinwardtii</i>		IB8555	W of Wesley	3327AD
<i>Haworthiopsis reinwardtii</i> var. <i>brevicula</i>		IB525	E of Kaffirdrift	3327AC
<i>Haworthiopsis reinwardtii</i> var. <i>coarctata</i>	comb. et stat. nov.	IB7025	Blaukrans Stasie	3326BC
<i>Haworthiopsis reinwardtii</i> var. <i>greenii</i>	comb. et stat. nov.	JDV90-046	S of Grahamstown	3326AD
<i>Haworthiopsis reinwardtii</i> var. <i>olivacea</i>	comb. et stat. nov.	IB6976	Kaffirdrift Police Station	3327AC
<i>Haworthiopsis reinwardtii</i> var. <i>tenuis</i>	comb. nov.	IB6545	NE of Alexandria	3326DA
<i>Haworthiopsis scabra</i>		JDV86-93	Schoemanspoort	3322CA
<i>Haworthiopsis scabra</i> var. <i>johanii</i>	comb. nov.	IB7184	Prince Alfred Pass	3323CC
<i>Haworthiopsis scabra</i> var. <i>lateganiae</i>		VDV112	E of Klein Kruis	3322AD
<i>Haworthiopsis scabra</i> var. <i>smitii</i>	comb. et stat. nov.	JDV90-82	Schoemanspoort	3322CB
<i>Haworthiopsis scabra</i> var. <i>starkiana</i>		SS1166	Schoemanspoort	3322AC
<i>Haworthiopsis sordida</i>		IB4818	Steytlerville	3324AD
<i>Haworthiopsis sordida</i> var. <i>agavoidea</i>	comb. et stat. nov.	VDV518	Bluecliff, S of Kirkwood	3325AD
<i>Haworthiopsis sordida</i> var. <i>lavranii</i>		IB6501	SEE of Steytlerville	3324BC
<i>Haworthiopsis tessellata</i>		IB422	Lady Grey	3027CA
<i>Haworthiopsis tessellata</i> var. <i>crousii</i>	comb. et stat. nov.	MH97-001	Postmasburg	2823AC
<i>Haworthiopsis variabilis</i>		IB13743	Joubertina	3324CC
<i>Haworthiopsis venosa</i>		DMC12751	Breede River, Swellendam	3420AB
<i>Haworthiopsis venosa</i> var. <i>woolleyi</i>	comb. et stat. nov.	IB635	SW of Kleinpoort	3324BD
<i>Haworthiopsis viscosa</i>	comb. nov.	IB6633	SW of Kammanassie Dam	3322CB
<i>Haworthiopsis viscosa</i> var. <i>asperiuscula</i>	comb. et stat. nov.	VDV131	NWN of Prince Albert	3322AA
<i>Haworthiopsis viscosa</i> var. <i>beanii</i>	comb. et stat. nov.	IB284	NE of Patensie	3324DD
Tulista <i>kingiana</i>	comb. nov.	IB150	Mossel Bay	3422AA
Tulista <i>marginata</i>		IB7158	Heidelberg	3420BB
Tulista <i>marginata</i> var. <i>mortonii</i>	comb. et stat. nov.	DMC10485	N of Bredasdorp	3420CA
Tulista <i>minima</i>		IB8968	Zeegoegat, N of Riversdale	3421AB
Tulista <i>minima</i> var. <i>poellnitziana</i>	comb. et stat. nov.	IB344	Drew, NW of Swellendam	3320CC
Tulista <i>opalina</i>	comb. nov.	MBB215	Brandrivier	3321CC
Tulista <i>opalina</i> var. <i>zenigata</i>	comb. et stat. nov.	MH81-122	Moerasrivier	3322CC
Tulista <i>pumila</i>		IB8809	Robertson	3319CB
Tulista <i>pumila</i> var. <i>ohkuwae</i>	comb. et stat. nov.	GM600	SW of Laingsburg	3320BB
Tulista <i>pumila</i> var. <i>sparsa</i>	comb. et stat. nov.	MH95-036	Lemoenpoort	3319CD

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1. Genus Haworthia. Photographs of each species in alphabetical order.



Haworthia angustifolia
IB6984



Haworthia angustifolia
var. altissima SS1034



Haworthia angustifolia
var. baylissii IB3590



Haworthia angustifolia
var. paucifolia DMC8213



Haworthia aquamarina
IB13683



Haworthia arachnoidea
IB8877



Haworthia arachnoidea
var. angiras IB6591



Haworthia arachnoidea
var. calitzdorpensis IB6595



Haworthia arachnoidea
var. joubertii IB7140



Haworthia arachnoidea
var. laxa B7143



Haworthia arachnoidea
var. limbata JV97-87



Haworthia arachnoidea
var. scabrispina IB3752



Haworthia aranea
DMC3994



Haworthia archeri
IB597



Haworthia asema
IB6619



Haworthia atrofusca
IB371



Haworthia atrofusca
var. enigma IB511



Haworthia azurea
DMC8583



Haworthia badia
IB6460



Haworthia badia
var. bobii MBB7248







Haworthia devriesii
VDV643



Haworthia dimorpha
GM646



Haworthia elizeae VDV563



Haworthia emeralda
MBB6925



Haworthia floribunda
JDV89-22



Haworthia floribunda
var. major JDV91-3



Haworthia globifera
PVB7338



Haworthia gordonianna
DMC11040



Haworthia graminifolia
IB11689



Haworthia graminifolia
var. derustensis JDV93-24



Haworthia groenewaldii
DMC13222



Haworthia habdomadis
VDV83



Haworthia hamata
MBB6600



Haworthia hamata
var. subhamata MBB6935



Haworthia harrii
DMC8246



Haworthia heidelbergensis
JDV87-1



Haworthia heidelbergensis
var. toonensis JDV87-3



Haworthia herbacea
IB8888



Haworthia herbacea
var. flaccida JDV96-31



Haworthia herbacea
var. lupula JDV94-36



Haworthia herbacea
var. *paynei* IB8848



Haworthia ikra
ISI1762



Haworthia inconfusa
IB5394



Haworthia inconfusa
var. *crystallina* IB12419



Haworthia inconfusa
var. *lockwoodii* IB6739



Haworthia inconfusa
var. *morrisiae* VDV87



Haworthia incurvula
IB6539



Haworthia indigoa
VDV445



Haworthia indigoa
var. *truterorum* GM676



Haworthia integrifolia
IB6651



Haworthia integrifolia
var. *standeri* JME1-98



Haworthia intermedia
JDV87-203



Haworthia isabellae
MBB6801



Haworthia isabellae
var. *arabesqua* SS1009



Haworthia isabellae
var. *bella* JDV92-136



Haworthia isabellae
var. *ligulata* IB12439



Haworthia jansenvillensis
IB6996



Haworthia jansenvillensis
var. *crinita* DMC5157



Haworthia jansenvillensis
var. *eminens* MH03-287



Haworthia jansenvillensis
var. *flavidula* IB12611



Haworthia jansenvillensis
var. fluffa MBB6910



Haworthia jansenvillensis
var. mollis IB6995



Haworthia jansenvillensis
var. regina IB6575



Haworthia joyae
DMC6682



Haworthia lapis
DMC8600



Haworthia lapis
var. rava MBB6899



Haworthia lazulis
MBB6852



Haworthia leightonii
IB4735



Haworthia leightonii
var. davidii IB6970



Haworthia longibracteata
LAV26913



Haworthia luri
IB13694



Haworthia maculata
JDV88-29



Haworthia maculata
var. livida IDV88.31



Haworthia magnifica
IB7172



Haworthia magnifica
var. asperula JDV94-6



Haworthia magnifica
var. obserata GM718



Haworthia magnifica
var. splendens JDV93-59



Haworthia maraisii
ISI93-38



Haworthia maraisii
var. schuldtiana ISI1763



Haworthia marumiana
IB123





Haworthia nortieri
var. montana IB676



Haworthia notabilis
JDV87-197



Haworthia notabilis
var. diversicolor MBB6757



Haworthia oculata
SS1084



Haworthia odetteae
DMC8604



Haworthia odetteae
var. odyssei IB12597



Haworthia outerquensis
IB6645



Haworthia paradoxa
DMC9247



Haworthia paradoxa
var. jakubii IB13757



Haworthia parksiana
GM284



Haworthia parksiana
var. dentata MBB5460



Haworthia pehlemanniae
IB7125



Haworthia pehlemanniae
var. albispina IB11766



Haworthia pellucida
IB8929



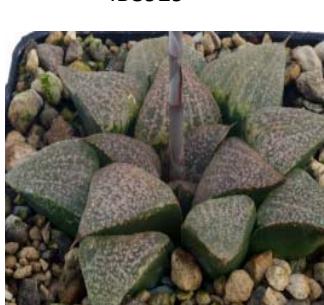
Haworthia picta
IB6209



Haworthia picta
var. comptoniana IB6779



Haworthia picta
var. janvlokii IB7111



Haworthia picta
var. tricolor GM256



Haworthia picturata
JDV90-76



Haworthia picturata
var. pusilla MBB6928



Haworthia pilosa
MBB6826



Haworthia pilosa
var. ciliata MBB6905



Haworthia pilosa
var. lachnosa. PVB7128



Haworthia pringlei
IB6472



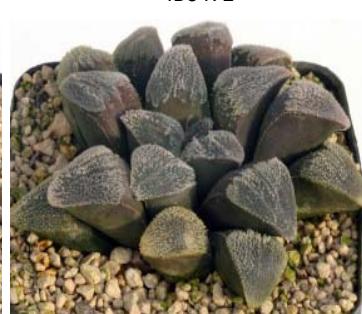
Haworthia pringlei
var. hastata MBB6561



Haworthia pubescens
IB499



Haworthia pulchella
IB8901



Haworthia pygmaea
JDV87-15



Haworthia pygmaea
var. acuminata JDV91-31



Haworthia pygmaea
var. argenteo-maculosa VDV249



Haworthia pygmaea
var. esterhuizenii GM320



Haworthia pygmaea
var. vincentii VDV71



Haworthia reticulata
SS1202



Haworthia reticulata
var. attenuata MBB6515



Haworthia reticulata
var. hurlingii J DV87-191



Haworthia reticulata
var. subregularis MBB6693



Haworthia retusa
JDV92-124



Haworthia retusa
var. dekenahii GGS5489



Haworthia retusa
var. fouchei J DV87-5



Haworthia retusa
var. fusca IB8971



Haworthia retusa
var. mutica IB6328



Haworthia retusa
var. nigra JDV86-16



Haworthia retusa
var. quimutica JDV90-1



Haworthia rooibergensis
JME7-97



Haworthia rooibergensis
var. erii VDV443



Haworthia rossouwii
DMC13215



Haworthia rossouwii
var. minor JDV86-5



Haworthia rossouwii
var. scabra JDV87-4



Haworthia rossouwii
var. serrata IB7159



Haworthia salina
var. salina IB15454



Haworthia salina
var. venusta JDV94-5



Haworthia scottii
IB6617



Haworthia springbokvlakensis
EA976



Haworthia suberecta
IB7180



Haworthia suberecta
var. pallidifolia KGB313-73



Haworthia tenera
IB6667



Haworthia tenera
var. cummingii IB12447



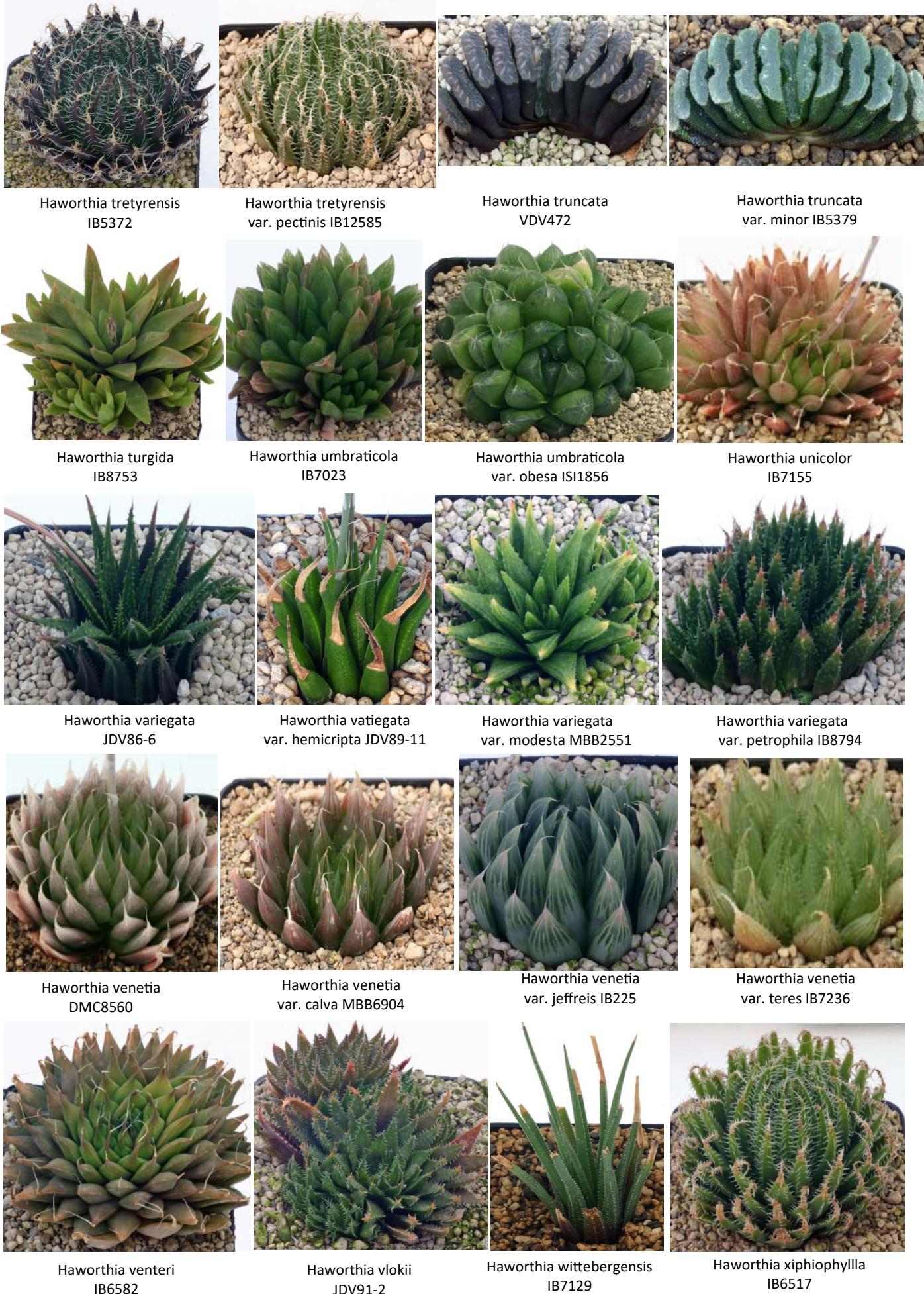
Haworthia tenera
var. doldii IB8547



Haworthia transiens
IB4172



Haworthia transiens
var. florens PVB7093





Haworthia zantneriana
var. minor JDV85-26



Haworthia zantneriana
IB6574



Haworthia araneav
var. candida GM415

2. Genus Haworthiopsis.

Photographs of each species in alphabetical order.



Haworthiopsis attenuata
IB7199



Haworthiopsis attenuata
var. glabrata PV4400



Haworthiopsis attenuata
var. radula GM415



Haworthiopsis bruynsii
IB5908



Haworthiopsis fasciata
DMC8556



Haworthiopsis fasciata
var. browniana ISI1664



Haworthiopsis glauca
IB8526



Haworthiopsis glauca
var. herrei ISI1568



Haworthiopsis granulata
IB531



Haworthiopsis granulata
var. schoemanii MH0309



Haworthiopsis koelmaniorum
IB876



Haworthiopsis koelmaniorum
var. mcmurtryi IB6664





Haworthiopsis scabra
var. *starkiana* SS1166

Haworthiopsis sordida
var. *sordida* IB4818

Haworthiopsis sordida
var. *lavranii* IB6501

Haworthiopsis sordida
var. *agavoidea* VDV518



Haworthiopsis tessellata
var. *crousii* MH97-001



Haworthiopsis tessellata
IB422



Haworthiopsis variabilis



Haworthiopsis venosa
DMC 12751



Haworthiopsis venosa
var. *woolleyi* IB635



Haworthiopsis viscosa
IB6633



Haworthiopsis viscosa
var. *asperiuscula* VDV131



Haworthiopsis viscosa
var. *beanii* IB284

3. Genus *Tulista*. Photographs of each species in alphabetical order.



Tulista kingiana
IB150



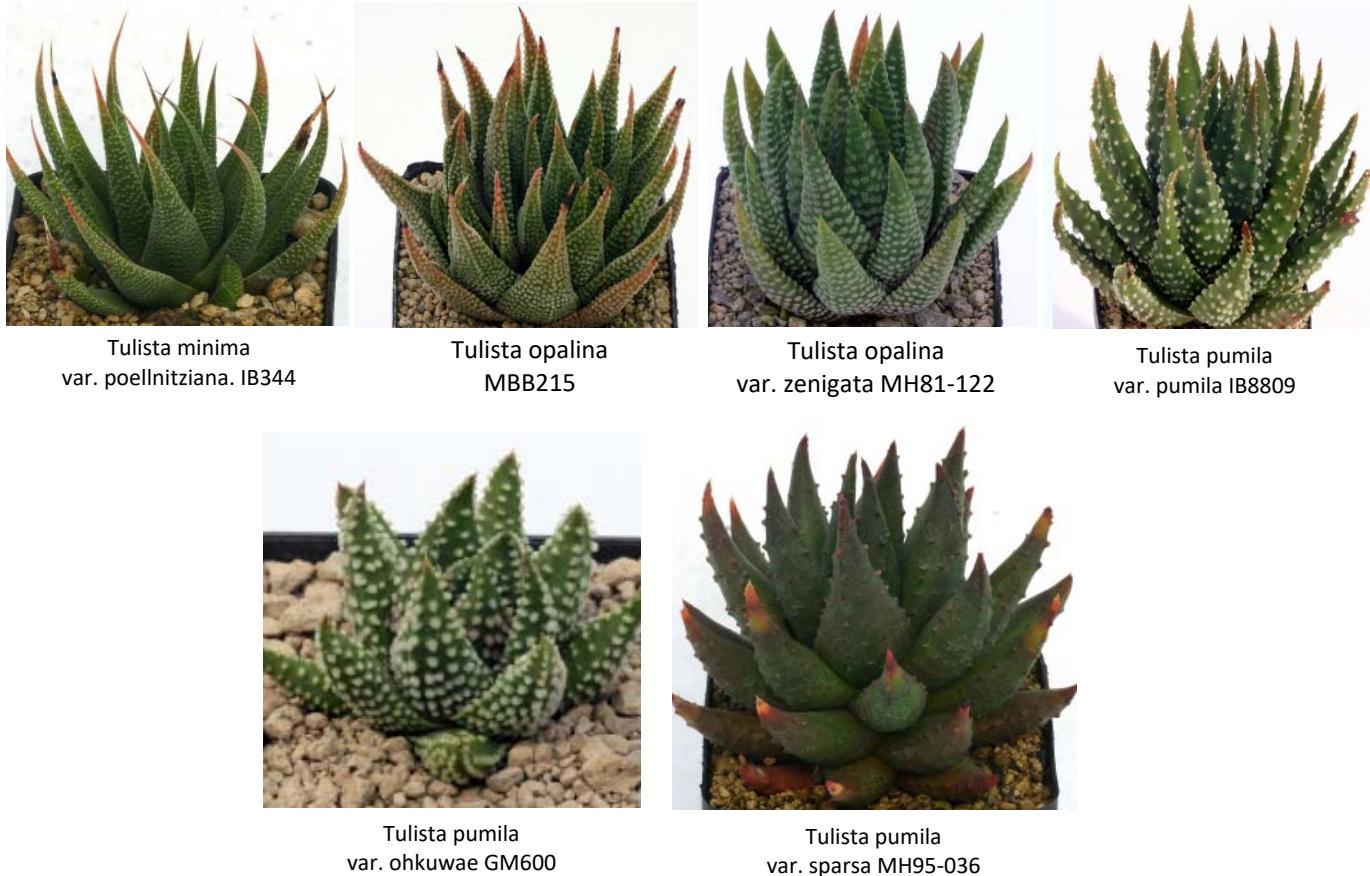
Tulista marginata
IB7158



Tulista marginata
var. *mortonii* DMC10485



Tulista minima
IB8968



Index of Plant Names

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Haworthia blackbeardiana var. *calaensis* IB12513



Haworthia maculate var. *livida* IDV88.31



Haworthiopsis fasciata var. *browniana* ISI1664



Haworthiopsis reinwardtii var. *brevicaula* IB525



Tulista opalina var. *zenigata* MH81-122



Tulista pumila var. *pumila* IB8809