



Hypoxis (Hypoxidaceae) in southern Africa: Taxonomic notes

Y. Singh *

South African National Biodiversity Institute, KwaZulu-Natal Herbarium, Botanic Gardens Road, Durban 4001, South Africa

Received 20 July 2006; received in revised form 31 January 2007; accepted 2 February 2007

Abstract

Several *Hypoxis* species and infraspecific taxa in southern Africa were found to be conspecific with the taxa described earlier. In this paper, thirteen validly published names are reduced to synonyms. Nine currently recognized taxa out of about 30 species in the Flora of southern Africa region are listed together with their new synonyms and important literature, and a brief discussion is given for each change in name status. The nine taxa discussed (with synonyms) are: *Hypoxis angustifolia* var. *buchananii* Baker (= *H. obliqua* var. *woodii* (Baker) Nel); *Hypoxis argentea* var. *sericea* Baker (= *H. argentea* var. *flaccida* Baker, *H. dinteri* Nel); *H. colchicifolia* Baker (= *H. distachya* Nel, *H. gilgiana* Nel); *H. floccosa* Baker (= *H. ecklonii* Nel); *H. hemerocallidea* Fisch., C.A.Mey. & Ave-Lall. (= *H. obconica* Nel, *H. patula* Nel, *H. rooperi* var. *forbesii* Baker); *H. longifolia* Baker ex Hook.f. (= *H. longifolia* var. *thunbergii* Baker); *H. obtusa* Ker Gawl. (= *H. obtusa* var. *chrysotricha* Nel); *H. rigidula* var. *rigidula* Baker (= *H. cordata* Nel); *H. rigidula* var. *pilosissima* Baker (= *H. arnotii* Baker).

© 2007 SAAB. Published by Elsevier B.V. All rights reserved.

Keywords: *Hypoxis*; Hypoxidaceae; Nomenclature; Southern Africa; Synonymy; Taxonomy

Hypoxis L. is the largest genus of the Hypoxidaceae, a family of 'lower' Asparagales (Nordal, 1998; Fay et al., 2000). The genus comprises about 90 species and is distributed on all the continents except Europe. In the Flora of southern Africa (FSA) region that includes South Africa, Namibia, Botswana, Lesotho and Swaziland, and hereafter referred to as southern Africa, there are about 30 species, the majority confined to the eastern parts of the subcontinent. The taxonomy of the genus has always presented a challenge due to a lack of distinct diagnostic characters that readily define species and infraspecific taxa.

Over a period of 30 years, Baker (1874, 1877, 1878a,b, 1889, 1894, 1896, 1901, 1904) described 38 species of *Hypoxis* in Africa, 21 being endemic to southern Africa. For species demarcation he used mainly leaf characters and inflorescence type. The next major revision of *Hypoxis* in southern Africa was by Nel (1914) as part of a taxonomic treatment of the Hypoxidaceae in Africa. Nel recognized 83 species of *Hypoxis* in Africa, no less than 45 being newly described by him. Nel's work is valuable in that it provides much insight into floral characters and leaf venation patterns and their use in grouping species into sections. However, Nel attributed

inordinate taxonomic significance to two characters, namely the anther tips and leaf venation. Based mainly on these two characters, Nel (1914) described 14 new species from southern Africa. Although Nel provided the descriptions for the newly proposed sections and species, he omitted descriptions of previously described species and this makes it difficult to fully understand his species concepts. There is therefore much reliance on studying the herbarium specimens cited by Nel to interpret his concept of the various species.

Hilliard and Burt (1983) and Burt (1986, 1988) provided useful comments on the status and nomenclature of individual species of *Hypoxis* based on their extensive field knowledge of the group in South Africa and Lesotho. Recent studies by Nordal (1997), Nordal and Zimudzi (2001) and Wiland-Szymańska (2001) have partially resolved the infrageneric taxonomy of *Hypoxis* in tropical Africa. A new revision of the genus in Africa, which is the primary centre of diversity for the genus, is very desirable. Such a study will help to reveal species complexes, especially those that are in special need of resolution.

Until recently (Wiland, 1997), there has been much reluctance among taxonomists to describe further new species in *Hypoxis* due largely to a lack of understanding of the seemingly chaotic patterns of morphological variation that tend

* Department of Botany, University of Pretoria, Pretoria 0002, South Africa.
E-mail address: singh@sanbi.org.

to obscure species limits. In fact, most regional treatments of the genus in Africa indicate a reduction to synonymy of published taxa. Work on *Hypoxis* in tropical Africa by Hepper (1968), Geerinck (1971), Nordal et al. (1985), Nordal and Iversen (1987) and more recently Zimudzi (1996), Nordal and Zimudzi (2001) and Wiland-Szymańska (2001) have reduced 15 of Nel's (1914) species to synonymy (see also Singh, 2006). Snijman and Singh (2003) provide a synopsis of the *Hypoxis* taxa recognized in southern Africa in recent years.

An ongoing taxonomic revision of *Hypoxis* in southern Africa by the author (Singh, in preparation) has shown several taxa to be synonymous with the other already published species. The present paper provides notes on the change in status of thirteen validly published names. Nine of the newly proposed synonyms were first described by Nel (1914). Note that in the present paper the full synonymy is not supplied for each of the recognized taxa, but names newly placed in synonymy and those synonyms referred to for comparison are listed. Full synonymy for species will appear in the taxonomic treatment of the genus for southern Africa (Singh, in preparation).

Hypoxis angustifolia* var. *buchananii Baker in Journal of the Linnean Society 17: 111 (1878b); Durand and Schinz: 231 (1895); Baker in Thiselton-Dyer: 180 (1896); Wood: 132 (1907); Bews: 64 (1921); Wood, S.E.: 88 (1976). Type: South Africa, without exact locality, *Buchanan s.n.* (K!, holo.).

H. obliqua var. *woodii* (Baker) Nel: 309 (1914), syn. nov., Bews: 64 (1921); Ross: 132 (1972). *H. woodii* Baker: 3 (1889); Durand and Schinz: 236 (1895); Baker in Thiselton-Dyer: 183 (1896); Wood: 132 (1907), Type: South Africa, [KwaZulu-Natal], Inanda, *Medley Wood*, 426a (K!, image).

Baker (1889) described *H. woodii* based on a specimen *Medley Wood* 426a in Kew. In his treatment of *Hypoxis* in Flora Capensis, Baker (1896) correctly cited another sheet in Kew, *Medley Wood* 426, under *H. angustifolia* var. *buchananii*. In an unpublished thesis, Ms S.E. Wood pointed out that both *Medley Wood* 426 and 426a are conspecific, making the name *H. woodii* a synonym of *H. angustifolia* var. *buchananii*. Examination of the two sheets in Kew confirms Ms Wood's observation.

Based on *Medley Wood* 426a and *Pegler* 690 (BOL, PRE), Nel (1914) reduced *H. woodii* as a variety of *H. obliqua*. Both *Medley Wood* 426a and *Pegler* 690 are determined as *H. angustifolia* var. *buchananii*. *H. obliqua* var. *woodii* is therefore placed in synonymy under *H. angustifolia* var. *buchananii*.

Hypoxis argentea* var. *sericea (Baker) Baker in Thiselton-Dyer, Flora Capensis 6: 182 (1896). *H. sericea* Baker in Journal of the Linnean Society 17: 112 (1878b). Type: South Africa, [Eastern Cape], Uitenhage, *Zeyher* 950 (K!, lecto., selected here, image; BM!, isolecto.).

H. sericea var. *dregei* Baker: 112 (1878b). Type: South Africa, [Eastern Cape], Stockenström Division, Katberg, *Drège* 8525 (K!, lecto., selected here, image; BM!, isolecto.).

H. argentea var. *flaccida* (Baker) Baker: 182 (1896), syn. nov., Durand and Schinz: 234 (1895). *H. sericea* var. *flaccida* Baker: 112 (1878b); Durand and Schinz: 234 (1895). Syntypes: South Africa, [Eastern Cape], Albany, *Williamson s.n.* (K); South Africa, [Free State], 'Seven Fountains', *Burke s.n.* (K!).

H. dinteri Nel: 302 (1914), syn. nov. Type: Namibia, Otavital, *Dinter* 634 (B!, SAM!, isolecto.).

Hypoxis dinteri is known only from the type specimens. In this study, the specimens are identified as *H. argentea* var. *sericea*. The leaves in *H. argentea* are usually folded lengthwise in pressed specimens. In *Dinteri* 634, the leaves are pressed flat and it is unusual to see the leaves pressed in this way. The distinct long, fine, silky bifurcate hairs of *H. argentea* are present in the specimens. *Dinter* 634 also bears a single flower per inflorescence, but with two bracts. This arrangement has been observed in other specimens of *H. argentea*.

A study of specimens in the East African Herbarium [EA], Nairobi, indicates that *Guebson* 947 from Nachingwea and *Robertson* 374A from the Nguru Mountains, both in Tanzania, match *H. argentea* var. *sericea*. Wiland-Szymańska (2001) recorded for the first time that *H. dinteri* also occurs in the Democratic Republic of Congo and Zambia. Unfortunately, the specimens cited by Wiland-Szymańska from BR and MO were not seen by me and it is therefore not possible to confirm if these central African specimens are conspecific with *H. argentea* var. *sericea*, although this is expected based on the presence of the latter in East Africa.

In 1878, Baker described *H. argentea* and *H. sericea* as separate species. He separated *H. sericea* from *H. argentea* by its many more leaves that are longer and wider, in having distinct veins, and with the lower surface of leaves covered in sericeous, appressed hairs. In the same publication, Baker also established two varieties in addition to the typical variety in *H. sericea*, namely var. *dregei* and var. *flaccida*. In 1896, Baker himself reduced *H. sericea* as a variety under *H. argentea*. He placed *H. sericea* var. *sericea* and *H. sericea* var. *dregei* under *H. argentea* var. *sericea*. He also created the combination *H. argentea* var. *flaccida* as a third variety and sank *H. sericea* var. *flaccida* into this. In an unpublished thesis, Wood, S.E. (1976) found *Burke s.n.*, syntype of *H. argentea* var. *flaccida* to be synonymous with *H. argentea* var. *sericea*. The present study confirms Ms Wood's observation and *H. argentea* var. *flaccida* is therefore formally reduced to *H. argentea* var. *sericea*.

In the protologue, Baker cites five different gatherings for *H. sericea*, with no indication that one of them has a better claim to type status than the others. All of them may therefore be regarded as syntypes, and it becomes necessary to choose a lectotype. One of these specimens, namely *Zeyher* 950, has been annotated with the word 'type' in N.E. Brown's handwriting. Brown's reason for selecting this specimen is not entirely clear (he left no notes on the question), and it appears that this choice was never formally published. The specimen is entirely typical of the species, and there is no reason to disagree with Brown's implicit lectotypification. This publication therefore formalises the choice of *Zeyher* 950 as lectotype of this taxon. In consequence of this choice, the specimens *Ecklon & Zeyher* 6, *Barber* 708, *MacOwan* 1593b and *Bolus* 176 become lectoparatypes.

Hypoxis sericea var. *dregei* was based on the syntypes *Cooper* 1811 (TCD) and *Drège* 8525 (K) (Baker 1878b). Nel (1914) raised *H. sericea* var. *dregei* to full species as *H. dregei*

based on *Cooper 1811*. Burt (1988) clarifies the use of the name *H. dregei* and comments on the lectotype *Cooper 1811* chosen by Nel. Based on *Cooper 1811* as the lectotype for *H. sericea* var. *dregei* and *H. dregei*, these two taxa were correctly reduced to synonymy under *H. filiformis* by Nordal and Zimudzi (2001). The lectoparatype specimen, *Drège 8525* represents *H. argentea* var. *sericea*, and is therefore excluded from this species.

Hypoxis colchicifolia Baker in *Journal of Botany*: 3 (1889); Durand and Schinz: 231 (1895); Baker in *Thiselton-Dyer*: 186 (1896); Burt: 201 (1986). Type: South Africa, Cape, without exact locality, hort. *Bull s.n.* Nov. 1884 (K!, holo.).

H. oligotricha Baker: 3 (1889); Durand and Schinz: 233 (1895); Baker in *Thiselton-Dyer*: 187 (1896); Nel: 321. Type: South Africa, [KwaZulu-Natal], Inanda, *Medley Wood 1170* (K!).

H. distachya Nel: 322 (1914), syn. nov. Type: South Africa, [KwaZulu-Natal], Pinetown, *Thode s.n.* August 1893 (B!).

H. gilgiana Nel: 322 (1914), syn. nov. Type: South Africa, without exact locality, *Ecklon? 4529* (B!).

Nel (1914) listed *H. colchicifolia* as one of the species for which he did not see any original material. He classified *H. distachya* and *H. gilgiana* with *H. oligotricha* in Section *Oligotrichae* Nel. *H. distachya* and *H. gilgiana* were separated from *H. oligotricha* by their villous ovaries in comparison to a glabrous ovary in *H. oligotricha*. Burt (1986), however, reduced *H. oligotricha* to *H. colchicifolia*, a decision subsequently widely accepted by taxonomists and supported by the present study. The ovaries in *H. colchicifolia* are variable in hair density. Nel (1914) considered the leaves of *H. distachya* to be ovate-lanceolate and ± 80 mm long in comparison to oblong-lanceolate leaves, 300–400 mm long in *H. gilgiana*. These leaf dimensions are within the range for *H. colchicifolia* where the leaves are (80–) 200–500 mm long. *H. distachya* and *H. gilgiana* are therefore considered synonyms of *H. colchicifolia*.

Hypoxis floccosa Baker in *Kew Bulletin*: 357 (1894); Baker in *Thiselton-Dyer*: 181 (1896); Nel: 303 (1914). Type: South Africa, [Western Cape], Swellendam, *Bolus 7469* (BOL!, holo., K!, isolecto).

H. ecklonii Baker: 859 (1901) [as *eckloni*], syn. nov., Nel: 307 (1914). Type: South Africa, [Eastern Cape], Zwarteberg, *Ecklon & Zeyher 4136* (K!, image, B!, Z!).

Comparison of the types of *H. floccosa* and *H. ecklonii* indicates that there is similarity in leaf shape, leaf indumentum and the inflorescences, and there are no consistent differences. Plants of the type specimens of both species have leaves 50–75 mm long and are floccose on one or both surfaces with hairs in tufts. Moreover, on the type sheets of both species, plants have inflorescences that are single-flowered (rarely two-flowered). It is concluded that *H. floccosa* and *H. ecklonii* are conspecific and the latter name is placed in synonymy under the older *H. floccosa*.

Hypoxis hemerocallidea Fisch., C.A.Mey. & Avé-Lall. in *Index Seminum quae Hortus Botanicus Imperialis Petropolitani* 8: 64 (1842); Baker: 119 (1878b); Durand and Schinz.: 232 (1895); Baker in *Thiselton-Dyer*: 188 (1896); Nel: 316 (1914); Burt: 202 (1986). Type: South Africa, Cape of Good Hope, cult. in Hort. Bot. Petrop. (LE!, image).

H. obconica Nel: 330 (1914), syn. nov. Syntypes: South Africa, [KwaZulu-Natal], Verulam, *Schlechter 2898* (B!, BOL!, ZT!); [KwaZulu-Natal], Pinetown, *Thode s.n.* July 1893 (B!); *Medley Wood 184* (K!).

H. patula Nel: 333 (1914), syn. nov. Type: South Africa, [Mpumalanga], Barberton, Saddleback Range, *Galpin 1100* (K!, holo. image; PRE!, isolecto).

H. rooperi var. *forbesii* Baker: 118 (1878b), syn. nov., Durand and Schinz: 234 (1895); Baker in *Thiselton-Dyer*: 189 (1996). Type: Mozambique, Delagoa Bay, *Forbes s.n.* (1822) (K!, image).

H. rooperi T. Moore: 65 cum icone (1852); Baker in *Thiselton-Dyer*: 188 (1897); Nel: 337 (1914); Type: cult. by T. Rooper October 1850 from a plant collected in the Eastern Cape in July 1837 (K, scan!).

Hypoxis obconica is known only from the syntypes collected by Schlechter, Thode and Medley Wood in KwaZulu-Natal. The collections are morphologically similar to *H. hemerocallidea* except the plants are smaller in stature and bear only two flowers per inflorescence. Nel (1914) considered *H. obconica* to be closer to *H. rigidula* and placed it in Section *Rigidulae* Nel. He described the two-flowered inflorescences in *H. obconica* as subumbellate and the many-flowered inflorescences of *H. rigidula* as racemose. Field observations of *H. hemerocallidea* in South Africa indicate that young plants in a population may bear two flowers on short or long pedicels, and inflorescences in these plants appear delicate. In older plants of the same population, flower numbers vary from 4 to 12, pedicel lengths are variable and scapes and pedicels are firm. The two-flowered inflorescence state has also been noted in other species with racemose inflorescences, including *H. rigidula*. Leaves of *H. obconica* are linear-lanceolate, soft and recurved as in *H. hemerocallidea* in comparison to the linear, rigid and erect or bending leaves of *H. rigidula*. The distribution and type of hairs on leaves in *H. obconica* also match those in *H. hemerocallidea*. In both species, the leaf blades have an even distribution of long weak hairs that are mostly bifurcate. Due to these similarities in leaf and indumentum characters with *H. hemerocallidea*, and the observed age-related variation in inflorescence morphology, *H. obconica* is placed in synonymy under the latter species.

Hypoxis patula is known only from the type specimen. Nel (1914) considered *H. patula* to be closely related to *H. rooperi* as he placed both species in section *Obtusae* Nel. He considered *H. patula* to have subspicate inflorescences and flowers with short pedicels, 5–6 mm long. *H. rooperi* and five other species in the same section were described as being pedicellate and with pedicels 10 mm long. *H. rooperi* was subsequently reduced to *H. hemerocallidea* by Burt (1986), a decision supported by the present study. Observations of the populations of *H. hemerocallidea* in South Africa indicate that the first few inflorescences of the new season bear two flowers with short or long pedicels [e.g. *Codd 1822* (PRE); *Hutchings 620* (KEI); *Bourquin 458* (NU); *Clark 1* (NU); *Wylie s.n.* BH 22372 (BOL); *Palmer 2647* (GRA)]. Subsequent inflorescences in the same season on the same plants develop racemes with many flowers

on long pedicels. The subspicate state in *H. hemerocallidea* commonly varies from the usual racemose state in the species. *H. patula* matches *H. hemerocallidea* in leaf characters and shares the subspicate state of inflorescence. *H. patula* is therefore reduced to synonymy under *H. hemerocallidea*.

Baker (1878b) separated *H. rooperi* from *H. hemerocallidea* on its corymbose inflorescences in contrast to that in *H. hemerocallidea* being racemose. Based on the smaller stature of the plant in *Forbes s.n.* (K) from Mozambique, Baker (1878b) proposed a var. *forbesii* under *H. rooperi*. Burt (1986) clarified the concept of *H. hemerocallidea* and reduced *H. rooperi* as a synonym of *H. hemerocallidea*. He also discussed the problems around Heideman's (1983) concept of *H. rigidula* and *H. hemerocallidea*. Heideman (1979, 1983) maintained the two varieties in *H. rooperi*, namely var. *rooperi* and var. *forbesii*. She interpreted the small plants represented by var. *forbesii* as those bearing new leaves in the growing season e.g. *Leisegang 46* (NU). During fieldwork in South Africa, plants of *H. hemerocallidea* were found to display considerable variation in leaf dimensions, numbers of flowers and dimensions of pedicels. It is extremely difficult to define limits for leaf dimensions to demarcate varieties in *H. hemerocallidea*. Younger plants of *H. hemerocallidea* appear different from older ones in a population and if collected independently, can easily be mistaken for a separate taxonomic entity. This type of infraspecific variation has also been observed in *H. rigidula*. Therefore, the approach in this study has been to broaden the limits of variability for a species to also accommodate the different facies due to developmental variation. Variety *forbesii* is considered to be well within the limits of *H. hemerocallidea*.

Hypoxis longifolia Baker ex Hook.f. in Curtis Botanical Magazine 26: t. 6035 (1873), non Baker (1904); Baker: 115 (1878b); Durand and Schinz: 231 (1895), Baker in Thiselton-Dyer: 185 (1896). Type: South Africa, [Free State], *Burke s.n.* Fat River (K!), lecto., selected here).

H. longifolia var. *thunbergii* Baker: 116 (1878b), syn. nov., Durand and Schinz: 231 (1895). Type: South Africa, Cape, *Thunberg s.n.* (UPS-THUNB!, image no. 8269) as *H. villosa* var. δ .

Hooker f. (1873) described *H. longifolia* in Curtis's Botanical Magazine using Baker's manuscript name and based his description on a *Cooper s.n.* specimen from Algoa Bay grown at Kew (specimen not yet located; not at K). He also cited a similar specimen *Burke s.n.* (K) collected at Fat River [Vet River or *Vetriver*] in the Free State. Further, he mentioned that Mr Baker had named this species. In 1904, Baker described four new species of *Hypoxis*, three closely allied to *H. obtusa* and one to *H. angustifolia*. He named the one *H. longifolia* based on the specimen *Junod 1445* (Z) but he made no mention of his manuscript name or Hooker's (1873) publication of this name. *Junod 1445* closely resembles *H. rigidula* var. *rigidula* and does not fit the description of *H. longifolia* by Hooker f. Since Baker (1904) used the identical epithet as in the younger Hooker's publication for a different plant, Baker's name is a later homonym and therefore invalid.

Nel (1914) described the specimen *Junod 1445* as a species separate from *H. longifolia* and called it *H. cordata*. In

the present study, *H. cordata* is regarded as a synonym of *H. rigidula* var. *rigidula*. See *H. rigidula* for details on *H. cordata*. Baker (1878b) described *H. longifolia* var. *thunbergii* based on a Thunberg specimen from the Cape Colony. He separated it from the typical variety by its leaves having simple white ascending hairs, 2–3 mm long. Among the specimens examined in the present study, no distinction into varieties could be made on differences in hairs. Baker indicated that the typical variety has a few short whitish hairs on the margins and keel of the lower leaf surface and cited *Burke s.n.* in support. The Burke specimen has many short stellate hairs on the margins and keel and a similar distribution and type of hair is found in *Moll 4740*, which Wood (1976) regarded as typical of the manuscript name *H. zululandensis* S.E.Wood. Baker (1896) did not mention var. *thunbergii* in his treatment of Hypoxidaceae in Flora Capensis.

Hypoxis obtusa Ker Gawl. in Botanical Register 2: tab. 159. (1816). Baker: 114 (1878b), Durand and Schinz: 233 (1895); Baker in Thiselton-Dyer: 184 (1896); Heideman: 892 (1983); Burt: 205 (1986); Nardal and Zimudzi: 13 (2001). *H. villosa* var. *obtusa* (Ker Gawl.) Durand and Schinz: 236 (1895). Type: Bot. Reg. tab. 159, icono.!

H. obtusa var. *chrysotricha* Nel in Bot. Jahrb.: 334 (1914), syn. nov. Type: South Africa, [KwaZulu-Natal], Newmarket, *Krook 405* (W)-type lost in World War II.

H. iridifolia Baker: 117 (1878b); Burt: 204 (1986); Nardal and Zimudzi: 13 (2001) Type: "Tropical South Africa", *Baines s.n.* Oct 1872, (K!, holo.).

In Durand and Schinz (1895), *H. obtusa* is listed as species number 31 on page 233 and as a variety of *H. villosa* on page 236. Under the variety, these authors indicate the reduction of *H. obtusa* to synonymy. It is most probable that this has come about through an error in transcribing the six varieties of *H. villosa* from Baker (1878b). In Baker (1878b), *H. obtusa* is listed as a species immediately below the varieties of *H. villosa* and in Durand and Schinz, it was possibly copied across as a variety.

Hypoxis obtusa is very distinct in leaf characters, making it an easy species to identify. Its leaves are coriaceous with many evenly spaced prominent veins. The lamina is glabrous, except at the bases. Leaf hairs form a white conspicuous band along the margins and midrib beneath. The species is also very floriferous, producing mostly 5–11 flowers per inflorescence.

Burt (1986) discussed the differences between Burchell's and Ker Gawler's concepts of *H. obtusa* and concluded that the Burchell specimen named *H. obtusa* represents *H. iridifolia* and not *H. obtusa* Ker Gawl. I follow Burt (1986) in accepting the type of *H. obtusa* as Ker Gawler's illustration. Nardal and Zimudzi (2001) reduced *H. iridifolia* to synonymy under *H. obtusa*. The present study confirms that there are difficulties in maintaining *H. iridifolia* as a species distinct from *H. obtusa*. Since the character of the hairs forming a band on the margins and midrib is distinct in both *H. iridifolia* and *H. obtusa*, and that the width of leaves were found to be variable in the species as well as in the related species *H. hemerocallidea* and *H. rigidula*, it is proposed that *H. iridifolia* be accepted as a synonym of *H. obtusa* as proposed by Nardal and Zimudzi (2001).

Nel (1914) did not mention *H. iridifolia* in his treatment, but he described *H. obtusa* var. *chrysotichya*. He considered the longer leaves and tepals covered with golden hairs, to be distinct from the typical variety. Unfortunately, the type specimen of var. *chrysotichya* formed part of the collection at W that was destroyed in World War II (Dr Bruno Wallnöfer, Curator of Vascular Collections, W, pers. comm., 2005). From the vague description provided by Nel, var. *chrysotichya* appears to be the same as *H. obtusa*, a species for which no infraspecific taxa are formally recognized in the present study.

Hypoxis rigidula Baker in Journal of the Linnean Society, Botany 17: 116 (1878b); Durand and Schinz.: 233 (1895); Baker in Thiselton-Dyer: 186 (1896); Nel: 331 (1914); Zimudzi: 16 (1996) pro parte; Nordal and Zimudzi: 12 (2001). Type: South Africa, [Free State], Cooper 883 (K!, lecto., selected here).

H. cordata Nel: 331 (1914), syn. nov. Type: South Africa, [Limpopo Province], Shiluvane, Junod 1445 (Z!, holo.).

H. elliptica Nel: 332 (1914); Ross: 132 (1972). Syntypes: South Africa, [Eastern Cape], Alexandria, Rudatis 688 (B!); South Africa, [KwaZulu-Natal], Pietermaritzburg, Schlechter 3303 (B!).

Nel (1914) placed *H. rigidula*-like plants with broad leaves, 16–18 mm wide into a new species called *H. cordata*. In contrast, he defined *H. rigidula* as having leaves up to 15 mm broad. Except for leaf width, *H. cordata* is similar to *H. rigidula* in all characters and is best accommodated in a slightly wider concept of *H. rigidula*.

Zimudzi (1996) reduced *H. elliptica* to *H. rigidula*. The present study supports this decision.

H. rigidula var. ***pilosissima*** Baker in Journal of the Linnean Society, Botany 17: 117 (1878b), Durand and Schinz: 234 (1895), Baker in Thiselton-Dyer: 186 (1896), Nel: 331 (1914). Type: South Africa, [Gauteng], Magalies Berg [Magliesberg], Burke 156 (K!, lecto., selected here).

H. arnottii Baker: 552 (1877), syn. nov., Baker: 112 (1878b); Baker in Thiselton-Dyer: 182 (1896) Type: South Africa, [Eastern Cape], Colesberg, Arnott s.n. (not yet traced, seemingly not at K), June 1870, Hort. Kew.

A group of specimens collected by Rehmann, namely his numbers 4312, 4313, 4768 and 5809, all housed at the Herbarium der Universität (Z) were determined in an unknown handwriting as *H. arnottii* Baker. In trying to resolve the concept of *H. arnottii*, these specimens were examined by the present author. Nel (1914) cited Rehmann 4312 and 5809 as *H. rigidula* var. *pilosissima*. On the sheet of Rehmann 5809, Nel wrote that this specimen of *H. arnottii* is found with *H. elliptica* on the sheet of Schlechter 3303 (Z) and that this specimen is *H. rigidula* var. *pilosissima*. Nel also determined Rehmann 4313 and 4768 (Z) as *H. rigidula* var. *pilosissima* in the form of hand written notes on the specimens. The present study concurs with Nel's determination of these specimens. From the description, *H. arnottii* matches *H. rigidula* var. *pilosissima* especially in the leaves clasping at the base for up to 300 mm when flowering, and in the long, soft, ascending hairs. It is therefore proposed that the name *H. arnottii* be reduced to a synonym of *H. rigidula* var. *pilosissima*. The type specimen of *H. arnottii*, however, remains unseen.

Zimudzi (1996) reduced variety *pilosissima* to *H. rigidula* and considered *H. rigidula* to have no infraspecific taxa. The present study recognizes var. *pilosissima* as a distinct and easily recognized taxon in southern Africa. The leaves of var. *pilosissima* are covered in a layer of dense hairs with no spaces between the hairs. In the typical variety, leaves are subglabrous to hairy, but not as dense as in var. *pilosissima*. Also in var. *pilosissima*, hairs are mostly ascending and give the leaf a felt-like texture; while those of var. *rigidula* are appressed.

List of names placed in synonymy in this paper. Accepted names are in bold face.

H. argentea var. *flaccida* Baker ***H. argentea*** var. ***sericea***
H. arnottii Baker ***H. rigidula*** var. ***pilosissima***
H. cordata Nel ***H. rigidula*** var. ***rigidula***
H. dinteri Nel ***H. argentea*** var. ***sericea***
H. distachya Nel ***H. colchicifolia***
H. ecklonii Nel ***H. floccosa***
H. gilgiana Nel ***H. colchicifolia***
H. longifolia var. *thunbergii* Baker ***H. longifolia***
H. obconica Nel ***H. hemerocallidea***
H. obliqua var. *woodii* (Baker) Nel ***H. angustifolia*** var. ***buchananii***
H. obtusa var. *chrysotricha* Nel ***H. obtusa***
H. patula Nel ***H. hemerocallidea***
H. rooperi var. *forbesii* Baker ***H. hemerocallidea***

Acknowledgements

The curators and staff of the following herbaria are thanked for the loan of specimens and/or for providing scan images of specimens: B, BM, BOL, EAH, GRA, K, NBG (including SAM), NU, P, PRE, PRU, TCD, UPS-THUNB, W, Z. Dr. Hugh Glen of the KwaZulu-Natal Herbarium is thanked for his valuable comments and discussion on an earlier draft. I am grateful to Professor Braam [A.E.] van Wyk, H.G.W.J. Schweickerdt Herbarium, University of Pretoria, whose guidance and comments greatly improved the manuscript.

References

- Baker, J.G., 1874. New garden plants: *Hypoxis pannosa* Baker. Gardener's Chronicle 2, 130–131.
 Baker, J.G., 1877. *Hypoxis arnottii*. Gardener's Chronicle ser. 2 (8), 552.
 Baker, J.G., 1878a. Report on the Liliaceae, Iridaceae, Hypoxidaceae and Haemodoraceae of Welwitsch's Angolan Herbarium. Transactions of the Linnean Society of London, Botany 1, 245–273.
 Baker, J.G., 1878b. A synopsis of Hypoxidaceae. Journal of the Linnean Society (Botany) 17, 93–126.
 Baker, J.G., 1889. New petaloid monocotyledons from the Cape Colony, Hypoxidaceae. Journal of Botany 27, 2–3.
 Baker, J.G., 1894. Decades Kewensis. Kew Bulletin 1894, 357.
 Baker, J.G., 1896. Amaryllidaceae. In: Thiselton-Dyer, W.T. (Ed.), Flora Capensis, vol. 6. Reeve, London, pp. 171–189.
 Baker, J.G., 1901. Amaryllidaceae. Bulletin de l'Herbier Boissier. Sér 2, 858–859.
 Baker, J.G., 1904. Amaryllidaceae. In: Schinz, H. (Ed.), Mitteilungen aus dem botan. Verteljahrsschrift der Naturforschenden Gesellschaft in Zürich, vol. 22. Museum der Universität Zürich, pp. 176–177.

- Bews, J.W., 1921. An introduction to the *Flora of Natal and Zululand*. City Printing Works, Pietermaritzburg, pp. 1–248.
- Burtt, B.L., 1986. Hypoxidaceae. In: Hilliard, O.M., Burtt, B.L. (Eds.), Notes on some plants of southern Africa chiefly from Natal: 12. Notes from the Royal Botanic Garden, Edinburgh, vol. 43, pp. 201–206.
- Burtt, B.L., 1988. Hypoxidaceae. In: Hilliard, O.M., Burtt, B.L. (Eds.), Notes on some plants of southern Africa chiefly from Natal: 15. Notes from the Royal Botanic Garden, vol. 45. Edinburgh, pp. 188–191.
- Durand, T., Schinz, H., 1895. Amaryllideae, Tribus 1-Hypoxidaceae. *Conspectus Florae Africae ou énumération des plantes D'Afrique* 5, 230–237.
- Fay, M.F., Rudall, P.J., Sullivan, S., Stobart, K.L., de Bruijn, A.Y., Reeves, G., Qamaruz-Zaman, F., Hong, W.-P., Joseph, J., Hahn, W.J., Conran, J.G., Chase, M.W., 2000. Phylogenetic studies of Asparagales based on four plastid DNA regions. In: Wilson, K.L., Morrison, D.A. (Eds.), *Monocots: Systematics and Evolution*. CSIRO, Collingwood, pp. 360–371.
- Fischer, F.E.L., Meyer, C.A., Avé-Lallemant, J.L.E., 1842. Index Seminum quae Hortus Botanicus Imperialis Petropolitanus pro mutua commutatione offert 8, 64.
- Geerinck, D.J.L., 1971. Hypoxidaceae. *Bulletin du Jardin botanique de L'Etat, à Bruxelles* 51, 1–9.
- Hepper, F.N., 1968. Hypoxidaceae. In: Hepper, F.N. (Ed.), *Flora of Tropical West Africa*, vol. 3. Ridgeway, London, pp. 170–174.
- Heideman, M.E., 1979. Taxonomic studies in the genus *Hypoxis* L. (Hypoxidaceae) on the Witwatersrand. MSc Thesis, University of the Witwatersrand, Johannesburg.
- Heideman, M.E., 1983. Studies of diagnostic features in the genus *Hypoxis* L. (Hypoxidaceae R.Br.) on the Witwatersrand. *Bothalia* 14, 889–893.
- Hilliard, O.M., Burtt, B.L., 1983. Notes on some plants of southern Africa chiefly from Natal: 10. Amaryllidaceae (incl. Hypoxidaceae). Notes from the Royal Botanic Garden, vol. 41. Edinburgh, pp. 299–319.
- Hooker, J.D., 1873. *Hypoxis longifolia*. *Botanical Magazine* 6035 (t.).
- Moore, T., 1852. *Hypoxis rooperii*. *The Garden Companion and Florists' Guide* 1, 65.
- Nel, G.C., 1914. Die afrikanischen Arten der Amaryllidaceae-Hypoxidaceae. In: Engler, A. (Ed.), *Beiträge zur Flora von Afrika*: 43. *Botanische Jahrbücher*, vol. 51, pp. 287–340.
- Nordal, I., 1997. Hypoxidaceae. In: Edwards, S., Demissew, S., Hedberg, I. (Eds.), *Flora of Ethiopia and Eritrea*, vol. 6. The Department of Systematic Botany, Uppsala University, Uppsala, pp. 86–87.
- Nordal, I., 1998. Hypoxidaceae. In: Kubitzki, K. (Ed.), *The Families and Genera of Vascular Plants. III. Flowering Plants. Monocotyledons. Liliaceae (except Orchidaceae)*. Springer, Berlin, pp. 286–294.
- Nordal, I., Iversen, I., 1987. Hypoxidaceae. In: Satabie, B., Morat, Ph. (Eds.), *Flore du Cameroun*, vol. 30. Ministère de l'Enseignement supérieur et de la Recherche Scientifique, Yaoundé, pp. 33–37.
- Nordal, I., Zimudzi, C., 2001. Hypoxidaceae. In: Pope, G. (Ed.), *Flora Zambesiaca*, vol. 12. Royal Botanic Gardens, Kew, pp. 1–18.
- Nordal, I., Laane, M.M., Holt, E., Staubo, I., 1985. Taxonomic studies of the genus *Hypoxis* in East Africa. *Nordic Journal of Botany* 5, 15–30.
- Ross, J.H., 1972. *Flora of Natal*. Botanical Survey Memoir, vol. 39. Government Printer, Pretoria, pp. 1–418.
- Singh, Y., 2006. *Hypoxis* (Hypoxidaceae) in Africa: list of species and infraspecific names. *Bothalia* 36, 13–23.
- Singh, Y., (in preparation) Unpublished data for PhD thesis to be submitted to the University of Pretoria.
- Snijman, D.A., Singh, Y., 2003. Hypoxidaceae. In: Germishuizen, G., Meyer, N.L. (Eds.), *Plants of southern Africa: an annotated checklist*. *Strelitzia*, vol. 14. National Botanical Institute, Pretoria, pp. 1071–1074.
- Wiland, J., 1997. New species of the genus *Hypoxis* in Central Africa (Zaire, Rwanda, Burundi). *Fragmenta Floristica et Geobotanica* 66, 411–422.
- Wiland-Szymańska, J., 2001. The genus *Hypoxis* (Hypoxidaceae) in Central Africa. *Annals of the Missouri Botanical Garden* 88, 302–350.
- Wood, J.M., 1907. *A Handbook to the Flora of Natal*. Bennett and Davis Printers, Durban, pp. 1–202.
- Wood, S.E., 1976. A contribution to knowledge of the genus *Hypoxis* L. (Hypoxidaceae) in Natal, South Africa. MSc Thesis, University of Natal, Pietermaritzburg.
- Zimudzi, C., 1996. A synopsis of the Hypoxidaceae in the Flora Zambesiaca area. *Kirkia* 16, 11–19.