SUMMARY

The vertical cliff-face habitat is renowned for many specifically adapted plant species and exhibits a high degree of local endemism. Over the past nine years, only the succulent and bulbous succulent plants on cliff faces in South Africa and Namibia were systematically surveyed and documented. Distinction was made between succulent plants growing on cliffs as part of a wider habitat and those that are found only on cliffs (obligate cremnophytes). Most major cliff-face habitats were visited and all plants on cliffs throughout the study area were documented. A check list of the 220 obligate cremnophytes is provided as well as a description (including adaptive traits) of every succulent cremnophilous taxon encountered.

During the course of this study about 45 new cremnophilous succulent taxa were named, representing almost 20% of the total and proving that cliff habitats are one of the least studied regions, not only in southern Africa but globally. Among the newly described cremnophilous taxa (also see Appendix 1) is the genus *Dewinteria*. New taxa were also named in the following genera: *Adromischus* (2 taxa), *Aeollanthus* (1 taxon), *Albuca* (2 taxa), *Aloe* (4 taxa), *Bulbine* (7 taxa), *Cotyledon* (3 taxa), *Crassula* (4 taxa), *Drimia* (2 taxa), *Drosanthemum* (1 taxon), *Esterhuysenia* (1 taxon), *Gasteria* (3 taxa), *Ornithogalum* (1 taxon), *Plectranthus* (1 taxon), *Senecio* (1 taxon), *Tetradenia* (1 taxon) and *Tylecodon* (4 taxa). A surprising rediscovery was that of *Crassula cymbiformis* [117] in the Limpopo Province. After this species was first collected by Dave Hardy from Ränkins Pass in the Waterberg, it could not be found again in spite of several expeditions to the region. It was, however, recently rediscovered in the nearby Kransberg (Marakele National Park) where large numbers of the plants occur on south-facing cliffs.

Observations made during the present project fully support earlier statements that cliffs are among the most poorly explored and least known habitats on earth. Exploration of the cliffs of the Baynes and Otjihipa Mountains in Namibia revealed *Aloe catengiana* [14] and *Schizostephanus gossweileri*, first records of these plants for Namibia. South Africa and Namibia have a rich and unique cliff-face flora and distribution records of many cremnophilous plants have been extended by the study.

The various cliff-adapted growth forms are also described, discussed and compared to closely related facultative cremnophytes. Using stem length, three basic cliff-face growth forms have been identified: compact or cluster-forming plants (‘cliff huggers’), cliff shrublets (‘cliff squatters’) and pendent plants (‘cliff hangers’). The compact growth (often tight clusters or mats) is mainly associated with the winter-rainfall Succulent Karoo and Thicket regions and especially Namaqualand. However, further north the same compact growth forms are associated with an increase in altitude such as the Drakensberg Escarpment and other northern mountains. Most pendent growth forms are associated with the eastern and southeastern summer-rainfall regions; there are also a number of smaller pendent shrublets from the high quartzitic sandstone mountains of the Western Cape.

The degree of specialisation varies from highly adapted (smaller percentage) to less specialist (often eco-forms), while some taxa have no obvious adaptations. This study revealed a general increase in succulence in most obligate cremnophilous succulent plant species (compared to closely related species in other habitats), a reflection of their xeric habitat. The plants furthermore tend to be more compact (leaves crowded or in a tight rosette).

Owing to an absence of larger herbivores that can cause disturbances on cliffs, cremnophytes display a relaxation in defence mechanisms. There is a general decrease in mechanical, chemical and camouflage defence mechanisms, but with a few exceptions.

There is furthermore a shift in reproductive output, including an increase in vegetative reproduction (backup), wind-dispersed seed and rich flowering associated with certain species. Most obligate cremnophilous succulent plants in the study area have cliff-adapted features (morphology and reproductive output) that ensure their long-term survival.

Compared to the rich variety of obligate cremnophilous succulents (and succulent bulbous plants) found on cliffs in South Africa and Namibia, there are relatively few non-succulent obligate cremnophytes. The extreme run-off in this environment makes it necessary for plants to store water. This is virtually impossible for non-succulent plants and without some additional adaptation, they cannot survive in the cliff habitat. Poikilohydric plants such as lichens, ferns and mosses, on the other hand, are often found on cliffs. Lithophytic members of *Ficus* are well adapted, starting off as a succulent lithophyte but their wandering roots ensuring a normal tree in adulthood.

The few remaining herbaceous elements are highly specialised. They include the three chasmophytes *Dewinteria petrophila* [221], *Colpias mollis* and *Stemodiopsis rivae* [222]. *Dewinteria petrophila* (Kaokoveld) is a semisucculent annual or a weak perennial, depending on follow-up rains. It has a unique amphicarpic seed dispersal strategy (backup). The *in situ* self-sown, larger seed (from cleistogamous flowers and protected until germination) together with its dispersal of normal smaller aerial seed (smaller size but larger numbers) is an effective survival strategy. *Stemodiopsis rivae* (Limpopo Province) and *Colpias mollis* (Namaqualand) have peduncles that bend towards the dark crevices (where seeds are deposited) after fertilisation (local dispersal). Although not very succulent, *Dewinteria petrophila* and *Stemodiopsis rivae* were included in this study to demonstrate that without succulence (or additional vegetative backup dispersal), some form of reproductive specialisation is necessary for the long-term survival of non-succulent species in the cliff habitat.

OPSOMMING

Die vertikale krans-habitat is bekend vir talle spesifiek aangepaste plantsoorte en vertoon ’n hoë graad van endemisme. Oor die afgelope nege jaar is slegs die sukkulente en bolplant-sukkulente kremnofiete van Suid-Afrika en Namibië sistematies ondersoek en gedokumenteer. Onderskeiding is gemaak tussen sukkulente wat op kranse groei as deel van ’n groter habitat, en dié wat kransgebonde is en slegs op kranse groei. Die meeste belangrike krans-habitats in die studiegebied is besoek en alle plante wat daar groei, is gedokumenteer. ’n Kontrolelys van die 220 kransgebonde taksons asook ’n beskrywing (ook aanpassingskenmerke) van elke sukkulente kremnofiele takson word verskaf.

Gedurende die studie is sowat 45 nuwe kranstaksons benaam, wat om en by 20% van die totaal insluit, ’n bewys dat krans-habitats een van die onbekendste studieterreine verteenwoordig, nie net in Suid-Afrika nie maar wêreldwyd. Onder die nuut beskrewe kranstaksons (sien ook Appendix 1) is die genus *Dewinteria*. Nuwe taksons is ook in die volgende genusse benaam: *Adromischus* (2 taksons), *Aeollanthus* (1 takson), *Albuca* (2 taksons), *Aloe* (4 taksons), *Bulbine* (7 taksons), *Cotyledon* (3 taksons), *Crassula* (4 taksons), *Drimia* (2 taksons), *Drosanthemum* (1 takson), *Esterhuysenia* (1 takson), *Gasteria* (3 taksons), *Ornithogalum* (1 takson), *Plectranthus* (1 takson), *Senecio* (1 takson), *Tetradenia* (1 takson) en *Tylecodon* (4 taksons). ’n Verrassende herontdekking was dié van *Crassula cymbiformis* [117] in die Limpopo Provinsie. Nadat dit vir die eerste keer in Ränkinspas in die Waterberg deur Dave Hardy versamel is, is dit nie weer gevind is nie, ten spyte van verskeie soektogte. ’n Groot populasie egter is onlangs op die nabygeleë Kransberg (Marakele Nasionale Park) ontdek, waar groot getalle van hierdie plante teen kranse met ’n suidelike aansig voorkom.

Waarnemings wat tydens die huidige studie gedoen is, ondersteun vroeëre verklarings dat kranse van die mees verwaarloosde habitats op aarde verteenwoordig. Ontdekkingstogte in die Baynes- en Otjihipa-gebergtes in Namibië het *Aloe catengiana* [14] en *Schizostephanus gossweileri* opgelewer, die eerste keer dat hierdie plante in Namibië aangeteken is. Suid-Afrika en Namibië het ’n ryk en unieke kransflora en nuwe inligting oor die verspreiding van talle kransplante het met die studie aan die lig gekom.

Die onderskeie kransaangepaste groeivorms word ook beskryf, bespreek en met verwante nie-kransgebonde plante vergelyk. Drie basiese kransgroeivorms kon op grond van stingellengte, geïdentifiseer word: kompakte of polvormende plante (‘kransomhelsers’), kransstruikies (‘kransplakkers’) en hangende groeivorms (‘kranshangers’). Die kompakte groeivorms (dikwels digte polle of matte) word meestal met winterreënstreke in Sukkulente Karoo en Ruigte, en veral Namakwaland, geassosieer. Verder noord kom dieselfde kompakte groeivorms voor, maar hier met groter hoogtes bo seespieël geassosieer, soos die Drakensberg Platorand en ander noordelike bergreekse. Die meeste hangende groeivorms word met die oostelike en suidoostelike somerreëngebiede geassosieer; daar is ook ’n aantal kleiner hangende struikies van die hoë kwartsitiese sandsteenberge van die Wes-Kaap.

Die graad van spesialisasie varieer van hoogs aangepas (kleiner persentasie) tot minder gespesialiseerd (dikwels ekotipes), met sommige taksons sonder enige noemenswaardige aanpassings. Hierdie studie dui op ’n algemene toename in sukkulensie by die meeste kransgebonde sukkulente kremnofiete (in vergelyking met naby verwante soorte in ander habitats), ’n weerspieëling van hulle dor habitat. Die plante toon verder ’n meer kompakte groeiwyse (blare gedronge of in digte rosette).

Weens die afwesigheid van groter roofvyande wat versteuring op kranse kan veroorsaak, is daar ’n verslapping in verdedigingsmeganismes. Daar is ’n algemene afname in meganiese, chemiese en kamoefleringsaanpassings by kransgebonde sukkulente kremnofiete, alhoewel met enkele uitsonderings.

Daar is verder ’n verskuiwing in voortplantingstrategieë, waaronder ’n verhoging in vegetatiewe voortplanting (rugsteun), windverspreide saad en die vorming van groot blomme (‘*rich flowering*’) wat met sommige soorte geassosieer word. Die meeste kransgebonde sukkulente in die studiegebied toon kransaangepaste eienskappe (morfologies en voortplantingsvermoë) wat oorlewing oor die lang termyn verseker.

In vergelyking met die ryk verskeidenheid kransgebonde kremnofiete (en bolsukkulente) wat in Suid-Afrika en Namibië aangetref word, is daar betreklik min nie-sukkulente kransgebonde plante. Die ekstreme vertikale terrein en afloop vereis dat plante water berg, maar dit is feitlik onmoontlik vir ’n nie-sukkulent en sonder ’n vorm van bykomende aanpassing kan so ’n plant nie in die krans-habitat oorleef nie. Poikilohidriese plante soos

korsmosse, varings en mosse, aan die ander kant, word dikwels op kranse aangetref. Litofitiese lede van *Ficus* is baie goed by kranse aangepas, aanvanklik met ’n vlesige stingel maar die dwalende wortels verseker ’n normale boom in die volwasse stadium.

Die paar oorblywende kruidagtige elemente op kranse is hoogs gespesialiseerd. Onder hulle is die drie chasmofiete *Dewinteria petrophila* [221], *Colpias mollis* en *Stemodiopsis rivae* [222]. *Dewinteria petrophila* (Kaokoveld) is ’n halfsukkulente eenjarige of ’n swak meerjarige, afhangend van opvolgreën. Dit het ’n unieke amfikarpiese saadverspreidingstrategie (rugsteun). Die *in situ*-selfgesaaide groter saad (van kleistogame blomme en beskerm totdat dit ontkiem) tesame met die verspreiding van normale kleiner bogrondse saad (kleiner maar groter hoeveelhede) is ’n doeltreffende oorlewingstrategie. *Stemodiopsis rivae* (Limpopo Provinsie) en *Colpias mollis* (Namakwaland) het bloeistele wat ná bevrugting na die donker klipskeure groei waar die saad dan neergelê word (plaaslike verspreiding). Hoewel nie baie sukkulent nie, is *Dewinteria petrophila* en *Stemodiopsis rivae* by hierdie studie ingesluit om te toon dat sonder sukkulensie (of bykomende vegetatiewe voortplanting as rugsteun), een of ander vorm van voortplantingspesialisasie nodig is vir die langtermynoorlewing van nie-sukkulente plante in die krans-habitat.

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CURRICULUM VITAE

Ernst Jacobus van Jaarsveld

Ernst Jacobus van Jaarsveld was born in 1953 in Johannesburg, South Africa. He matriculated at Hoërskool Linden in 1971 and then studied at the Pretoria Technikon where he received his National Diploma in Horticulture in 1975. In 1988 he enrolled as M.Sc. student (Systematics) at Natal University and successfully completed the course in March 1990.

Employed by the National Botanic Gardens (today the South African National Biodiversity Institute), he initially spent two years at the Lowveld National Botanical Garden in Nelspruit and then in 1976 took op the position of Horticulturist at Kirstenbosch National Botanical Garden where he is still employed. His experience includes ornamental horticulture, botany and botanical exploration.

The horticultural component is mainly by way of ecological gardening with and promotion of South African plants, especially drought-resistant (xerophytic) flora, with the emphasis on succulent plants, both in the Kirstenbosch Conservatory and Matthews Rockery. At Kirstenbosch he specialises mainly in succulents and other xerophytic plants. He is in charge of the Botanical Society Conservatory (opened in September 1996) and has planned it to represent all the major arid biomes of South Africa and Namibia. For a holistic approach, he also introduced the various geological formations, with the emphasis on the great diversity of succulents in the region, their adaptations and ethnic uses. He received a Chairman's Award from his employer in recognition of these undertakings.

Ernst has travelled widely and has collected plants with potential ornamental use throughout Southern Africa, many of which have been successfully introduced into cultivation. He has been invited abroad several times to address various congresses and meetings on the subject of succulent plants. He is a member of the International Organization of Succulent Plant Study (IOS) and has also served as Co-ordinator of the Aloaceae section of the IOS.

Botanical exploration has been conducted in various parts of southern Africa (South Africa, Namibia, Lesotho and Swaziland). An expedition to Madagascar was undertaken on invitation of President Marc Ravalomanana. Apart from general collecting and exploration of succulent plants, his investigations also include expeditions in search of cremnophilous bulbous and succulent plants.

Ernst van Jaarsveld is the author or co-author of more than 200 popular, semi-scientific or scientific articles and various books, which include the following:

- *A revision of the genus* Gasteria (Fernwood, 1994).
- *Flowers of southern Africa: the Sappi selection* by Thalia Lincoln (co-authors J.P. Rourke & G. Duncan) (Sappi, 1995).
- *List of southern African succulent plants* (participated as co-author with various others) (Umdaus, 1997).
- *Mesembs of the world* (participated as co-author with various others) (Briza, 1998).
- *Succulents of South Africa, a guide to their regional diversity* (co-authors B-E. van Wyk & G.F. Smith) (Tafelberg, 2000).
- *Vygies, gems of the veld* (co-author U. de V. Pienaar) (Cactus & Co. Libri, 2000).
- *Wonderful waterwise gardening* (Tafelberg, 2000).
- *Gerhard Dreyer's Wild flowers* (Sunbird, 2003).
- Cotyledon *and* Tylecodon (co-author D. Koutnik) (Umdaus, 2004).
- Plectranthus *in South Africa and Namibia and the art of turning shade into glade* (Fernwood, 2006).
- *Waterwise gardening* (Struik, 2010).

Ernst is also the author of two soft-cover booklets, *Plectranthus Handbook* (National Botanic Gardens, 1984) and *Eastern Transvaal splendour* (Caltex South Africa, 1995). In 1995 he gave a series of 45 radio talks on invitation of the South African Broadcasting Corporation.

He has written parts of three volumes of the *IOS Illustrated handbook of succulent plants* (editor U. Eggli): *Monocotyledons* (Springer, 2001), *Dicotyledons* (Springer, 2002) and *Crassulaceae* (Springer, 2003).

Ernst van Jaarsveld is the author or co-author of the names of more than 95 plant taxa described as new to science, three of them with distributions that extend into Namibia and one in Angola.

He has been a member of the *Species Survival Commission* of the IUCN. In this capacity he was involved in drawing up a strategic succulent conservation plan for the Aloaceae, South African subregion, and provided guidance on the conservation of the following threatened species: *Saphesia flaccida, Freylinia visseri* (became extinct in habitat but was replanted), *Jordaaniella anemoniflora* and *Gasteria baylissiana*.

In September 1996 he was made a fellow of the American Succulent and Cactus Society. In October 2003 he was awarded three medals: the Senior Captain Scott Medal by the Suid-Afrikaanse Akademie vir Wetenskap en Kuns for his research on South African plants, the Dudley D'Ewes Medal by the Botanical Society for the promotion of South African plants, and the Hans Herre Medal by the Succulent Society of South Africa.

He has written a series of monthly articles on indigenous plants for various magazines such as *Sarie, SA Gardening* and *Vrouekeur*, and publishes regularly in *Veld & Flora, Aloe* and other succulent journals (American and British). He has had a weekly column, *Vra vir Ernst*, in the *Buite Burger* (formerly *Kultuurkroniek*) (*Die Burger*, Western Cape Region, Tuesdays) and in *Huisgids* (*Die Beeld*, Gauteng Region, Fridays) since 1996. Since 2010 the column appears weekly in *By* (*Beeld*, *Die Burger*).

Positions held

- 1974–1976: Horticulturist, Lowveld Botanical Garden (National Botanic Gardens).
- 1976–currently: Horticulturist, Kirstenbosch National Botanical Garden (National Botanical Gardens, National Botanical Institute and South African National Biodiversity Institute).

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VAN JAARSVELD, E.J. & VAN WYK, A.E. 2005c. *Gasteria tukhelensis*, a new species from KwaZulu-Natal, South Africa. *Bothalia* 35: 164–166.

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VAN JAARSVELD, E.J. & VAN WYK, A.E. 2005e. *Ornithogalum juncifolium* var. *emsii*, a new cliff-dwelling *Ornithogalum* from Eastern Cape, South Africa. *Bothalia* 35: 82–84.

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APPENDIX 1

DISCOVERY OF OBLIGATE CREMNOPHYTES NEW TO SCIENCE ON EXPEDITIONS BY THE AUTHOR AND COLLEAGUES

Collaborators on expeditions: Steven Carrs (Windhoek), Anton Cilliers, James Deacon, Paul Ems (SANBI), Adam Harrower (SANBI), Tielman Haumann, Gregory Nicolson, Wessel Swanepoel (Windhoek), Werner Voigt (SANBI), Rob Welsch and Phakhamani Xaba.

28 taxa new to science
Aeollanthus rydingianus [166]
Albuca cremnophila [64]
Albuca thermarum [68]
Aloe omavandae [25]
Anacampseros scopata [220]
Bulbine cremnophila [31]
Bulbine pendens [35]
Bulbine thomasiae [40]
Bulbine retinens [37]
Bulbine suurbergensis [39]
Conophytum ernstii [179]
Conophytum taylorianum subsp. *rosynense* [193]
Crassula badspoortense [113]
Cyrtanthus flammosus [3]
Drimia cremnophila [69]
Drimia mzimvubuensis [72]
Drosanthemum anemophilum [206]
Gasteria glauca [45]
Gasteria glomerata [46]
Gasteria tukhelensis [49]
Ornithogalum pendens [79]
Othonna cremnophila [88]
Plectranthus dolomiticus [167]
Plectranthus ernstii [168]
Plectranthus mzimvubuensis [170]
Tetradenia kaokoensis [173]
Tylecodon longipes [156]
Tylecodon petrophilus [157]

One new record for Namibia
Aloe catengiana [14] (formerly known only from southern Angola)

Two new records for Angola
Tetradenia kaokoensis [173]
Aloe omavandae [25]

APPENDIX 2

NEW CREMNOPHILOUS PLANT TAXA IN SOUTH AFRICA AND NAMIBIA DESCRIBED BY THE AUTHOR OR IN COLLABORATION WITH OTHER AUTHORS

(55 taxa described and one awaiting formal description. *Plants named before 2000.)

Adromischus cristatus (Haw.) Lem. var. *mzimvubuensis* Van Jaarsv. [96]

Adromischus liebenbergii Hutchison subsp. *orientalis* Van Jaarsv. [102]

Adromischus schuldtianus (Poelln.) Poelln. subsp. *brandbergensis* B.Nord. & Van Jaarsv. [103]

Aeollanthus haumannii Van Jaarsv. [165]

Aeollanthus rydingianus Van Jaarsv. & A.E.van Wyk [166]

Albuca thermarum Van Jaarsv. [68]

Albuca cremnophila Van Jaarsv. & A.E.van Wyk [64]

Aloe arborescens Mill. subsp. *mzimnyati* Van Jaarsv. & A.E.van Wyk [13]

Aloe challisii Van Jaarsv. & A.E.van Wyk [15]

Aloe dabenorisana Van Jaarsv. [17]*

Aloe kouebokkeveldensis Van Jaarsv. & A.B.Low [21]

Aloe meyeri Van Jaarsv. [22]*

Aloe omavandae Van Jaarsv. [25]

Aloe pavelkae Van Jaarsv., Swanepoel, A.E.van Wyk & Lavranos [26]

Bulbine cremnophila Van Jaarsv. [31]

Bulbine latifolia (L.f.) Schult. & Schult.f. var. *curvata* Van Jaarsv. [32]

Bulbine meiringii Van Jaarsv. [33]

Bulbine ramosa Van Jaarsv. [36]

Bulbine suurbergensis Van Jaarsv. & A.E.van Wyk [39]

Bulbine thomasiae Van Jaarsv. [40]

Cotyledon elisae Van Jaarsv. [107]

Cotyledon pendens Van Jaarsv. [108]

Crassula badspoortense Van Jaarsv. [113]

Crassula cremnophila Van Jaarsv. & A.E.van Wyk [116]

Crassula foveata Van Jaarsv. [122]

Crassula smithii Van Jaarsv., D.G.A.Styles & G.McDonald [143]

Cyrtanthus flammosus Snijman & Van Jaarsv. [3]*

Drimia cremnophila Van Jaarsv. [69]

Drimia loedolffiae Van Jaarsv. [71]

Drimia mzimvubuensis Van Jaarsv. [72]

Drosanthemum anemophilum Van Jaarsv. & S.A.Hammer [206]

Drosanthemum sp. nov. (awaiting description)

Gasteria batesiana G.D.Rowley var. *dolomitica* Van Jaarsv. & A.E.van Wyk [42]

Gasteria croucheri (Hook.f.) Baker subsp. pendulifolia (Van Jaarsv.) Zonn. [43]

Gasteria doreeniae Van Jaarsv. & A.E.van Wyk [44]

Gasteria glauca Van Jaarsv. [45]*

Gasteria glomerata Van Jaarsv. [46]*

Gasteria tukhelensis Van Jaarsv. [49]

Ledebouria cremnophila S.Venter & Van Jaarsv. [75]

Ledebouria venteri Van Jaarsv. & A.E.van Wyk [76]

Ornithogalum juncifolium Jacq. var. *emsii* Van Jaarsv. & A.E.van Wyk [77]

Ornithogalum pendens Van Jaarsv. [79]

Oscularia cremnophila Van Jaarsv., Desmet & A.E.van Wyk [214]

Othonna armiana Van Jaarsv. [86]

Othonna cremnophila B.Nord. & Van Jaarsv. [88]

Pelargonium vanderwaltii Van Jaarsv. [163]

Plectranthus mzimvubuensis Van Jaarsv. [170]

Plectranthus saccatus Benth. subsp. *pondoensis* Van Jaarsv. & Milstein [172]

Senecio pondoensis Van Jaarsv. & A.E.van Wyk [92]

Tetradenia kaokoensis Van Jaarsv. & A.E.van Wyk [173]

Tylecodon bodleyae Van Jaarsv. [150]*

Tylecodon bruynsii Van Jaarsv. & S.A.Hammer [151]

Tylecodon ellaphieae Van Jaarsv. [155]*

Tylecodon longipes Van Jaarsv. & G.Will. [156]*

Tylecodon petrophilus Van Jaarsv. & A.E.van Wyk [157]

Tylecodon sulphureus (Toelken) Toelken var. *armianus* Van Jaarsv. [159]*

APPENDIX 3

LIST OF PUBLICATIONS ON SUCCULENT AND BULBOUS SUCCULENT CREMNOPHYTES AS WELL AS ON OTHER SUCCULENT PLANT TAXA BY THE AUTHOR OR IN COLLABORATION WITH OTHER AUTHORS

1. Articles

MOLL, E. & VAN JAARSVELD, E.J. 2007. Table Mountain's cliff-face flora. *Veld & Flora* 93,4: 226–227.

NORDENSTAM, B. & VAN JAARSVELD, E.J. 2005. *Othonna cremnophila*, a new species of the Asteraceae-Senecioneae from the Richtersveld, Northern Cape Province, South Africa. *Aloe* 42,1 & 2: 4–7.

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VAN JAARSVELD, E.J. 1980. Succulent Lamiaceae of South Africa. *Aloe* 18,1 & 2: 33.

VAN JAARSVELD, E.J. 1981. *Aloe meyeri* Van Jaarsveld—a new *Aloe* from the north-west Cape (RSA). *Journal of South African Botany* 47,3: 567–571.

VAN JAARSVELD, E.J. 1981. *Aloe meyeri*: 'n nuwe aalwyn van die Richtersveld (Noordwes-Kaap). *Veld & Flora* 67,2: 72–73.

VAN JAARSVELD, E.J. 1982. *Aloe dabenorisana*: 'n nuwe aalwyn van Boesmanland. *Aloe* 19,4: 101–103.

VAN JAARSVELD, E.J. 1982. *Aloe dabenorisana*: a new aloe from the north-west Cape (RSA). *Journal of South African Botany* 48,3: 419–424.

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VAN JAARSVELD, E.J. 1983. The cultivation and uses of South African figs. *Journal of the Tree Society of South Africa* 34,4: 63–78.

VAN JAARSVELD, E.J. 1983. *Bowiea gariepensis*: a new *Bowiea* species from the north-west Cape. *Journal of South African Botany* 49,4: 343–346.

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VAN JAARSVELD, E.J. 1987. *Othonna armiana*, a new dwarf caudiciform from the Richtersveld. *National Cactus and Succulent Journal (U.S.)* 61: 158–163.

VAN JAARSVELD, E.J. 1988. Kirstenbosch Botanical Gardens with specific reference to *Cotyledon tomentosa* and the succulent collection. *National Cactus and Succulent Journal (U.S.)* 60: 252–257.

VAN JAARSVELD, E.J. 1989. *Tylecodon ellaphieae*. *The Flowering Plants of Africa* 50: Plate 1983.

VAN JAARSVELD, E.J. 1989. *Tylecodon sulphureus* var. *armianus*. *The Flowering Plants of Africa* 50: Plate 1984.

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VAN JAARSVELD, E.J. 1991. The Blouberg Botanical Expedition. *Veld & Flora* 78,1: 27–29.

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VAN JAARSVELD, E.J. 1992. The genus *Gasteria*, a synoptic review. *Aloe* 29,1: 1–30.

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VAN JAARSVELD, E.J. 1993. The remarkable Namib Plakkie (*Tylecodon singularis*). *Veld & Flora* 79,2: 40–41.

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VAN JAARSVELD, E.J. 1994. Distribution of *Gasteria*. *Proceedings of the 13th AETFAT Congress*, Zomba, Malawi, 2–11 April, 2: 1153–1155.

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VAN JAARSVELD, E.J. 1997. A new *Cotyledon* and *Tylecodon* species (Crassulaceae) from the Cape Province. *Bradleya* 15: 65–72.

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VAN JAARSVELD, E.J. 2007. The remarkable Kaoko klipblom. *Veld & Flora* 93,1: 42–45.

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VAN JAARSVELD, E.J. 2011. *Ornithogalum lebaense*, a new cliff-dwelling *Ornithogalum* (Hyacinthaceae) from southwest Angola (Benguela Province). *Herbertia* 64: 91–99.

VAN JAARSVELD, E.J., DESMET, P. & VAN WYK, A.E. 2005. *Oscularia cremnophila*, a rare new species from Western Cape, South Africa. *Bothalia* 35: 160–163.

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