

ASTERACEAE

VERNONIA (TRIBE VERNONIEAE) AND RELATED GENERA IN SOUTHERN AFRICA: UPDATES AND CORRECTIONS

INTRODUCTION

When we compiled the Asteraceae account for *Strelitzia* 10 (Herman *et al.* 2000), *Strelitzia* 14 (Herman *et al.* 2003) and the *Southern African Botanical Diversity Network Report* No. 41 (Herman *et al.* 2006), the publication of Robinson (1999) on research and changes in the classification of the large genus *Vernonia* Schreb., was not available to us. This reclassification resulted in numerous name changes. A list of names of new genera and new combinations relevant to southern African *Vernonia sens. lat.* is presented here. The format followed in this article is based on that of Germishuizen & Meyer (2003), Germishuizen *et al.* (2006) and Herman (2008): the number(s) after the synonyms refer to the literature reference(s) where the synonymy was published, and the ^E indicates whether the taxon is endemic to South Africa. A key to the subtribes and genera can be found in Robinson (2007).

BACKGROUND

Since the early classification by Bentham in 1873, the tribe Vernonieae contained a large core genus, *Vernonia* Schreb., and various satellite genera based mostly on variations in morphological characters (Robinson 1996, 2007). This classification was followed for most of the previous century. It was only from the 1970s that revisional studies included pollen, chromosome numbers and chemistry, together with the traditional morphological characters, which led to the changing of the genus and species delimitations, and the genera were split off from the large, heterogeneous core genus (Robinson 1996).

The study by Isawumi (1996) showed that the genus *Vernonia* is paraphyletic and has two centres of origin: one in South America and the second in Africa and southeastern Asia. Many scientists have found that *Vernonia* species from the eastern and western hemispheres are different and should be placed in different genera (Isawumi 1996; Robinson 1996). The following arguments support these views:

1. The eastern hemisphere or the Old World is where almost all the Vernonieae with chromosome numbers $x = 9$ or 10 occur, whereas the American or the New World Vernonieae have chromosome numbers $x = 16$ or 17 (Isawumi 1996; Robinson 1996). Recent studies showed that it is not always the case but the chromosome numbers in the Old World species showed much less variation than those in the New World (Keeley & Robinson 2009).

2. The flavonoids of American Vernonieae species are more complex and consist of flavones or flavonols or both (Isawumi 1996; Robinson 1996), whereas the Vernonieae in the eastern hemisphere or Old World produce only flavones (Isawumi 1996).

3. There are differences in the pollen of the *Vernonia* species occurring in the eastern and western hemispheres. Robinson (1996) reported pollen type A in *Vernonia* in the western hemisphere (North America, the Bahamas, south to central Mexico and temperate South America) while Keeley & Jones (1979) reported pollen type D only in the western hemisphere *Vernonia* and pollen types E and F exclusively in the eastern hemisphere *Vernonia*.

4. DNA evidence presented in the phyletic tree by Keeley & Robinson (2009), shows a definite gap between the Vernonieae of the eastern and western hemispheres.

However, members of the genus *Vernonia* cannot simply be divided into two genera, one for each hemisphere. Many segregates are needed for each hemisphere (Robinson 1990, 1996, 1999). In an attempt to refine the genus *Vernonia sens. lat.* from both the Old and New Worlds by segregating new genera, Robinson (1990) resurrected the genera *Baccharoides* Moench and *Cyanthillium* Blume, and Robinson & Kahn (1986) resurrected and made some transfers into the genus *Distephanus* Cass. from the Old World *Vernonia*. Pollen, style bases, raphids, inflorescence form, involucre, anther appendage, chromosome numbers, geography and chemistry were some of the additional characters used in the reclassification of the genus *Vernonia* (Robinson 1996).

In a study by Robinson (1999), fourteen palaeotropical (eastern hemisphere) genera have been described, raised from lower rank, resurrected, enlarged or reduced with 110 new combinations. *Hilliardiella* H.Rob., *Orbivestus* H.Rob. and *Vernoniastrum* H.Rob. are some of the newly described genera. Some of the resurrected genera are *Centrapalus* Cass., *Linzia* Sch.Bip. ex Walp. and *Polydora* Fenzl. Some species were transferred to *Cyanthillium* and *Gymnanthemum* Cass. Recent publications support this new classification (Robinson 2007; Keeley & Robinson 2009). More combinations were made by Isawumi (2008). The genus *Vernonella* Sond. is also in the process of being reinstated by Robinson & Skvarla (in press).

Half the tribe in the western hemisphere has been delimited into workable and phylogenetically acceptable genera. The members in the eastern hemisphere, however, need more work (revision) as the paraphyletic core genus *Vernonia sens. lat.* and paraphyletic or polyphyletic segregates are not congeneric with *Vernonia sens. str.* (Robinson 1999). There are no species of *Vernonia sens. str.* in the eastern hemisphere (Isawumi 1996). Some *Vernonia* species names are still used in Africa and the continued use of the name *Vernonia* for species in this area, is simply there until further revisions have been completed.

LIST OF TAXA

- CYANTHILLIUM** Blume 8751050
(3) Robinson. 1999. *Proceedings of the Biological Society of Washington* 112: 220–247.
- vernonioides** (Muschl.) H.Rob.
Erlangea vernonioides Muschl. not *Vernonia vernonioides* (A.Gray) Bacigalupo, 1931 (3)
Vernonia meiostephana C.Jeffrey (3)
Annual. Herb. Ht 0.6–1.5 m. Alt. 350–850 m. LIM, M, S
- GYMNANTHEMUM** Cass. 8751130
(1) Robinson. 1999. *Proceedings of the Biological Society of Washington* 112: 220–247.
- amygdalinum** (Delile) Sch.Bip. ex Walp.
G. abyssinicum Sch.Bip. ex Walp. (1)
Vernonia amygdalina Delile (1)
V. randii S.Moore (1)
Perennial. Tree or shrub. Ht up to 8 m. Alt. 130–1 065 m. B, LIM, M, S, KZN
- coloratum** (Willd.) H.Rob. & B.Kahn *sens. lat.*
Baccharis senegalensis Pers. (1)
Decaneurum senegalense (Pers.) DC. (1)
Eupatorium coloratum Willd. (1)
G. cupulare Cass. (1)
G. senegalense (Pers.) Sch.Bip. ex Walp. (1)
Vernonia colorata (Willd.) Drake subsp. *colorata* (1)
V. senegalensis (Pers.) Less. (1)
Perennial. Tree or shrub. Ht 0.9–9 m. Alt. 20–975 m. B, LIM, M, S, KZN
- corymbosum** (L.f.) H.Rob.
Cacalia corymbosa (L.f.) Kuntze (1)
Plectreca corymbosa (Thunb.) Raf. (1)
Staelhelia corymbosa L.f. (1)
Vernonia corymbosa (L.f.) Less. (1)
V. neocorymbosa Hilliard (1)
V. tigna Klatt (1)
Perennial. Shrub. Ht 0.5–3 m. Alt. 0–2 000 m. LIM, M, S, FS, KZN, EC
- crataegifolium** (Hutch.) H.Rob.
Vernonia crataegifolia Hutch. (1)
V. mespilifolia Less. var. *subcanescens* DC. (1)
V. pseudo-corymbosa Thell. (1)
Perennial. Shrub. Ht 0.6–2 m. Alt. 60–2 000 m. LIM, M, S, KZN, EC
- mespilifolium** (Less.) H.Rob.
Cacalia mespilifolia (Less.) Kuntze (1)
Vernonia mespilifolia Less. (1)
Perennial. Shrub, climber or scrambler. Ht 0.6–9 m. Alt. 0–1 830 m. LIM, M, S, KZN, WC, EC
- myrianthum** (Hook.f.) H.Rob.
Vernonia ampla O.Hoffm. (1)
V. myriantha Hook.f. (1)
V. podocoma Sch.Bip. ex Vatke (1)
V. stipulacea Klatt (1)
Perennial. Shrub. Ht 1.2–7 m. Alt. 430–1 920 m. LIM, M, S, KZN
- HILLIARDIELLA** H.Rob. 8751070
(1) Robinson. 1999. *Proceedings of the Biological Society of Washington* 112: 220–247.
- aristata** (DC.) H.Rob.
Cacalia aristata (DC.) Kuntze (1)
Vernonia aristata (DC.) Sch.Bip. (1)
V. natalensis Sch.Bip. ex Walp. (1)
V. pseudonatalensis Wild (1)
Webbia aristata DC. (1)
Perennial. Herb. Ht 0.1–1.2 m. Alt. 5–2 200 m. LIM, NW, G, M, S, FS, KZN, L, EC
- hirsuta** (DC.) H.Rob.
Vernonia hirsuta (DC.) Sch.Bip. ex Walp. (1)
V. hirsuta (DC.) Sch.Bip. ex Walp. var. *obtusifolia* Harv. (1)
Webbia hirsuta DC. (1)
Perennial. Herb. Ht 0.3–1.5 m. Alt. 5–2 285 m. LIM, NW, G, M, S, FS, KZN, L, EC
- nudicaulis** (DC.) H.Rob.
Cacalia nudicaulis (DC.) Kuntze (1)
Vernonia dregeana Sch.Bip. (1)
Webbia nudicaulis DC. (1)
Perennial. Herb, geophyte. Ht 0.3–0.8 m. Alt. 0–1 920 m. M, KZN, EC
- oligocephala** (DC.) H.Rob.
Cacalia elaeagnoides (DC.) Kuntze (1)
Vernonia elaeagnoides (DC.) Sch.Bip. (1)
V. kraussii Sch.Bip. ex Walp. (1)
V. oligocephala (DC.) Sch.Bip. ex Walp. (1)
Webbia elaeagnoides DC. (1)
W. oligocephala DC. (1)
Perennial. Herb. Ht 0.08–1 m. Alt. 15–2 338 m. N, B, LIM, NW, G, M, S, FS, KZN, L, NC, EC
- pinifolia** (Lam.) H.Rob.
Cacalia capensis (Houtt.) Kuntze (1)
Conyza canescens L.f. (1)
C. pinifolia Lam. (1)
Erigeron capense Houtt. (1)
Vernonia capensis (Houtt.) Druce (1)
V. pinifolia (Lam.) Less. (1)
Webbia pinifolia (Lam.) DC. (1)
Perennial. Herb, geophyte. Ht 0.2–1 m. Alt. 15–2 100 m. M, S, FS, KZN, L, WC, EC
- LINZIA** Sch.Bip. ex Walp. 8751030
(1) Robinson. 1999. *Proceedings of the Biological Society of Washington* 112: 220–247.
(2) Isawumi. 2008. *Compositae Newsletter* 46: 38–40.
- gerberiformis** (Oliv. & Hiern) H.Rob. subsp. **macrocyanus** (O.Hoffm.) Isawumi
Vernonia gerberiformis Oliv. & Hiern subsp. *macrocyanus* (O.Hoffm.) C.Jeffrey (2)
V. macrocyanus O.Hoffm. (1, 2)
V. primulina O.Hoffm. (1, 2)
Perennial. Herb. Ht 0.04–0.75 m. Alt. ± 700 m. N, B, LIM
- glabra** Steetz *sens. lat.*
L. glabra Steetz var. *glabra* (1)
L. glabra Steetz var. *laxa* Steetz (1)
Vernonia glabra (Steetz) Vatke *sens. lat.* (1)
V. obconica Oliv. & Hiern (1)
V. ondongensis Klatt (1)
Perennial. Herb. Ht 1.2–3 m. Alt. 900–1 158 m. N, B, LIM
- melleri** (Oliv. & Hiern) H.Rob. *sens. lat.*
Vernonia melleri Oliv. & Hiern *sens. lat.* (1)
Perennial. Herb. Ht 0.3–1.5 m. Alt.? B
- ORBIVESTUS** H.Rob. 8751080
(1) Robinson. 1999. *Proceedings of the Biological Society of Washington* 112: 220–247.
(2) Robinson. 2009. *Phytologia* 91,3: 482–492.
- cinerascens** (Sch.Bip.) H.Rob.
Vernonia cinerascens Sch.Bip. (1)
V. luederitziana O.Hoffm. (1)
V. porta-taurinae Dinter ex Merxm. (1)
V. squarrosa Dinter ex Merxm. (1)
Perennial. Shrub. Ht 0.5–3 m. Alt. 360–1 200 m. N, B, LIM, M?
- POLYDORA** Fenzl 8751090
(1) Robinson. 1999. *Proceedings of the Biological Society of Washington* 112: 220–247.
- angustifolia** (Steetz) H.Rob.
Crystallopollen angustifolium Steetz (1)
Vernonia erinacea Wild (1)
V. rhodanthoidea Muschl. (1)

POLYDORA Fenzl (cont.)**angustifolia** (Steetz) H.Rob. (cont.)

Annual. Herb. Ht 0.1–2 m. Alt. ± 1 000 m. LIM, NW, G

bainesii (Oliv. & Hiern) H.Rob. *sens. lat.*

Vernonia bainesii Oliv. & Hiern *sens. lat.* (1)

Perennial. Herb. Ht 0.6–1.2 m. Alt.? ‘Tv’?

poskeana (Vatke & Hildebr.) H.Rob. *sens. lat.*

Vernonia poskeana Vatke & Hildebr. *sens. lat.* excl. *V. poskeana* Vatke & Hildebr. var. *chlorolepis* (Steetz) O.Hoffm. (1)

Annual. Herb. Ht 0.1–1.5 m. Alt. 300–1 850 m. N, B, LIM, NW, G, M, S, FS

steetziana (Oliv. & Hiern) H.Rob.

Vernonia poskeana Vatke & Hildebr. var. *chlorolepis* (Steetz) O.Hoffm. (1)

V. steetziana Oliv. & Hiern (1)

Annual. Herb. Ht 0.2–1 m. Alt. 305–1 030 m. N, B, LIM, M, S, KZN

VERNONELLA Sond.

8751120

(1) Robinson & Skvarla. In press. *Proceedings of the Biological Society of Washington* 123,3.

^Eafricana Sond.

Centropus africanus (Sond.) H.Rob. (1)

Vernonia africana (Sond.) Druce (1)

V. vernonella Harv. (1)

Perennial. Herb, geophyte. Ht up to 0.5 m. Alt. 75–150 m. KZN

VERNONIASTRUM H.Rob.

8751100

(1) Robinson. 1999. *Proceedings of the Biological Society of Washington* 112: 220–247.

latifolium (Steetz) H.Rob.

Crystallopollen latifolium Steetz (1)

Vernonia petersii Oliv. & Hiern ex Oliv. (1)

Annual. Herb. Ht 0.1–1.2 m. Alt. up to 1 160 m. N, B

nestor (S.Moore) H.Rob.

Vernonia nestor S.Moore (1)

Perennial. Herb. Ht up to 0.9 m. Alt.? KZN

REFERENCES

- BENTHAM, G. 1873. Compositae. In G. Bentham & J.D. Hooker, *Genera plantarum* 2. Reeve, London.
- GERMISHUIZEN, G. & MEYER, N.L. (eds). 2003. Plants of southern Africa: an annotated checklist. *Strelitzia* 14. National Botanical Institute, Pretoria.
- GERMISHUIZEN, G., MEYER, N.L., STEENKAMP, Y. & KEITH, M. (eds). 2006. *A checklist of South African plants*. Southern African Botanical Diversity Network Report No. 41. SABONET, Pretoria.
- HERMAN, P.P.J. 2008. Asteraceae in *Strelitzia* 14 (2003) and *South African Botanical Diversity Network Report* No. 41 (2006): updates and corrections. *Bothalia* 38: 125–129.
- HERMAN, P.P.J., RETIEF, E., KOEKEMOER, M. & WELMAN, W.G. 2000. Asteraceae. In O.A. Leistner, Seed plants of southern Africa: families and genera. *Strelitzia* 10: 101–170. National Botanical Institute, Pretoria.
- HERMAN, P.P.J., WELMAN, W.G., RETIEF, E., KOEKEMOER, M. & NETNOU, N. 2003. Asteraceae. In G. Germishuizen & N.L. Meyer, Plants of southern Africa: an annotated checklist. *Strelitzia* 14: 178–310. National Botanical Institute, Pretoria.
- HERMAN, P.P.J., WELMAN, W.G., RETIEF, E., KOEKEMOER, M. & NETNOU, N. 2006. Asteraceae. In G. Germishuizen, N.L. Meyer, Y. Steenkamp & M. Keith, *A checklist of South African plants*. Southern African Botanical Diversity Network Report No. 41: 155–277. SABONET, Pretoria.
- ISAWUMI, M.A. 1996. Infrageneric classification of *Vernonia* (Veroniceae: Compositae) in West Africa. In D.J.N. Hind & H.J. Beentje, *Compositae: systematics*. Proceedings of the International Compositae Conference, Kew, 1994, vol. 1: 531–544. Royal Botanic Gardens, Kew.
- ISAWUMI, M.A. 2008. The status of generic revision in the African Veroniceae (Asteraceae). *Compositae Newsletter* 46: 27–48.
- KEELEY, S.C. & JONES, S.B. 1979. Distribution of pollen types in *Vernonia* (Veroniceae: Compositae). *Systematic Botany* 4: 195–202.
- KEELEY, S.C. & ROBINSON, H. 2009. Veroniceae. In V.A. Funk, A. Susanna, T.F. Stuessy & R.J. Bayer, *Systematics, evolution and biogeography of Compositae*: 439–469. International Association for Plant Taxonomy, Vienna.
- ROBINSON, H. 1990. Six new combinations in *Baccharoides* Moench and *Cyanthillium* Blume (Veroniceae: Asteraceae). *Proceedings of the Biological Society of Washington* 103: 248–253.
- ROBINSON, H. 1996. The status of generic and subtribal revisions in the Veroniceae. In D.J.N. Hind & H.J. Beentje, *Compositae: systematics*. Proceedings of the International Compositae Conference, Kew, 1994, vol. 1: 511–529. Royal Botanic Gardens, Kew.
- ROBINSON, H. 1999. Revisions in paleotropical Veroniceae (Asteraceae). *Proceedings of the Biological Society of Washington* 112: 220–247.
- ROBINSON, H. 2007. VI. Tribe Veroniceae Cass. In K. Kubitzki, *The families and genera of vascular plants. VIII. Flowering plants—Eudicots, Asterales* (eds J.W. Kadereit & C. Jeffrey): 149–174. Springer, Berlin.
- ROBINSON, H. 2009. Additions to the genus *Orbivestus* H.Rob. (Asteraceae: Veroniceae) and neotypification of *Vernonia teitenisis* O.Hoffm. *Phytologia* 91,3: 482–492.
- ROBINSON, H. & KAHN, B. 1986. Trinervate leaves, yellow flowers, tailed anthers and pollen variation in *Distephanus* Cass. (Veroniceae: Asteraceae). *Proceedings of the Biological Society of Washington* 99: 493–501.
- ROBINSON, H. & SKVARLA, J.J. In press. The restoration of the genus *Vernonella* Sond. (Veroniceae: Asteraceae). *Proceedings of the Biological Society of Washington* 123,3.

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