

CHAPTER 8: SYNOPSIS

8.1 Introduction

In 1789, Jussieu described the Nyctaginaceae as a family, and publications by Meisner (1841), Choisy (1849) and Bentham and Hooker (1880) established an outline for the tribal classification with the recognition of four tribes, namely the Mirabileae Meisner, Pisonieae Meisner, Bougainvilleae Choisy and Leucastereae Benth. & Hook. According to Douglas and Manos (2007), most of the currently recognized genera had already been described by 1931 and Heimerl (1934) grouped these genera into five tribes, namely the Mirabileae, Pisonieae, Colignonieae Standl., Boldoeae Heimerl and Leucastereae. The family classification was then not revised for 60 years until Bittrich and Kühn (1993) updated Heimerl's 1934 treatment by adjusting ranks and incorporating the new genera and species that were described after 1934. Molecular studies in recent years (Levin, 2000; Levin 2002; Douglas & Manos, 2007) led to the recognition of seven monophyletic tribes (Douglas & Spellenberg, 2010), namely the Leucastereae, Boldoeae, Colignonieae, Bougainvilleae, Pisonieae, Nyctagineae Horan and Caribeeae Douglas & Spellenberg.

In the Nyctagineae, the taxonomic history of *Boerhavia* L. and *Commicarpus* Standl. is intertwined. Four species of *Boerhavia* were already known to Linnaeus (1753) and the genus was used unchanged until Standley (1909) separated *Commicarpus* from *Boerhavia*.

Heimerl (1889) initially divided *Boerhavia* into four sections and placed *Commicarpus* in *Boerhavia* section *Adenophorae* Heimerl. As stated above, this placement was followed until 1909 when Standley separated the genus *Commicarpus* from *Boerhavia* due to differences in the habit, structure of the fruit and shape of the perianth. This placement was recognized until 1931 when Standley felt pressured to reduce *Commicarpus* back to *Boerhavia* "in order to aid in reducing the increasing number of genera", but stated that he still believed in the validity of *Commicarpus* as a separate genus (Standley, 1931). Heimerl (1934), however, still recognized *Commicarpus* as a genus separate from *Boerhavia*. Fosberg (1978) reduced *Commicarpus* to a subgenus of *Boerhavia*, but it was not formally made and

therefore invalid (Harriman, 1999). Recent molecular studies (Douglas & Manos, 2007) have provided further evidence that *Boerhavia* and *Commicarpus* are two separate genera.

Boerhavia coccinea Mill. var. *coccinea*, *B. diffusa* L. var. *diffusa*, *B. erecta* L. and *B. repens* L. subsp. *repens* are widely distributed weeds throughout the world (Codd, 1966; Stannard, 1988) and were described morphologically in various publications concerning the Floras of those parts of the world (Standley, 1918; Woodson, 1961; Stemmerik, 1964; Thulin, 1993; Whitehouse, 1996; Duquan & Gilbert, 2003; Spellenberg, 2004; Chen & Wu, 2007; Diggs *et al*, 2008). Codd (1966) described the *Boerhavia* species of southern Africa but treated *B. coccinea* var. *coccinea* under its synonyms of *B. diffusa* L. var. *hirsuta* Heimerl and *B. diffusa* L. var. *viscosa* (Lag. & Rodr.) Heimerl, and gave *B. cordobensis* Kuntze the incorrect name of *B. pterocarpa* S.Wats. (a species which is not a cosmopolitan weed and only occurs in the Americas). The most recent description for the *Boerhavia* species of southern Africa is that of Stannard (1988) in *Flora Zambesiaca*, although he only treated *B. coccinea* var. *coccinea*, *B. diffusa* var. *diffusa*, *B. erecta* and *B. repens* subsp. *repens*. Stannard (1988) treated five [namely *C. chinensis* (L.) Heimerl subsp. *natalensis* Meikle, *C. helenae* (Roem. & Schult.) Meikle var. *helenae*, *C. pentandrus* (Burch.) Heimerl, *C. pilosus* (Heimerl) Meikle and *C. plumbagineus* (Cav.) Standl.] of the eight *Commicarpus* species which occur in southern Africa. *Commicarpus helenae* var. *helenae*, *C. pentandrus* and *C. plumbagineus* were also treated in the *Flora of Tropical East Africa* (Whitehouse, 1996) and the *Flora of Somalia* (Thulin, 1993).

8.2 Aim

To contribute to the *Flora of Southern Africa* by providing a comprehensive taxonomic account of the *Boerhavia* and *Commicarpus* species of southern Africa.

8.3 Taxonomic treatment

8.3.1. *Boerhavia* L., in Sp. Pl. 1: 3 (1753). — Type: *Boerhavia erecta* L. Locality: Mexico: Veracruz, Herb. Linn. No. 9.1 (LINN, lectotype designated by Standley in Contr. U.S. Natl. Herb. 12: 375 (1909)).

Annual or perennial herbs, viscid. **Stems** long, slender, erect, decumbent, diffuse or prostrate, woody towards the base, glabrate to pubescent; hairs glandular. **Leaves** opposite; petiolate, petioles (3–) 13 (–38) mm long; leaves deltoid, elliptic, lanceolate, linear, orbicular, obovate, oblong, oval or ovate, (10–) 29 (–61) x (5–) 17 (–46) mm; apex acute, apiculate, acuminate, obtuse or rounded; base shortly attenuate, rounded, obtuse or truncate; margins entire, sometimes undulate; green above, paler green below; glabrous to pubescent. **Inflorescence** terminal or axillary, pedunculate, primary peduncles (20–) 87 (–150) mm long, secondary peduncles (5–) 34 (–65) mm long; compound cyme, much branched; glabrous to puberulent; bracteate. **Flowers** pedicellate, pedicels 1–2 mm long; flowers (1–) 3 (–5) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part 1–2 mm long, green, sometimes reddish, coriaceous, constricted above ovary, elliptic, clavate, oval or elliptic-clavate, 3–5-ribbed, glabrous or with glandular hairs, persistent; upper part (1–) 2 (–4) mm long, campanulate, petaloid, pink, purple maroon or white; sometimes with a basal tube; caduceous after anthesis. **Stamens** 1–5, exserted; filaments filiform, connate at the base into short sheath around ovary; anthers dithecous. **Ovary** ellipsoid, stipitate, 1-ovulate; style filiform, exserted; stigma capitate. **Anthocarp** (3–) 4 (–5) x 1–3 mm; 5-ribbed or 3–5-winged; elliptic-clavate or clavate; apex rounded or truncate; glabrous or covered with glandular hairs; hygroscopic mucoid secretions. **Seed**: endosperm scanty; embryo hooked.

Distribution: In southern Africa, *Boerhavia* is distributed throughout Namibia, Botswana, South Africa and Swaziland (Fig. 8.1).

Habitat: Well-drained, stony, sandy or loamy soil in dry watercourses or riverbeds and on mountain- or hill slopes in full sun; 5–2000 m altitude.

Flower and fruiting time: All seasons, January to December.

Common names: Spiderlings (due to the resemblance of the long, slender peduncles to a spider's web); *Kleefbossies* in Afrikaans (due to the stickiness of the plant and especially the anthocarp).

Etymology: *Boerhavia* was named after Hermann Boerhaave (1668-1738), an eighteenth century Dutch botanist, humanist and physician working at the University of Leiden.

8.3.1.2. Key to the species of southern African *Boerhavia*

- 1a Growth form erect; leaves elongated, elliptic-lanceolate ...2
1b Growth form prostrate, decumbent or procumbent; leaves roundish (oblong, obovate, orbicular, ovate, oval) ...3
- 2a Lower, coriaceous part of the flower and the anthocarp covered by long, glandular hairs; growth form diffuse, branches \pm 40 cm long ... *B. hereroensis*
2b Lower, coriaceous part of the flower and the anthocarp glabrous; long stems (\pm 1 m) from basal rosette ... *B. deserticola*
- 3a Anthocarp and lower, coriaceous part of the flower glabrous ...4
3b Anthocarp and lower, coriaceous part of the flower covered with glandular hairs ...5
- 4a Lower coriaceous part of the flower clavate, 3–4-ribbed with the apexes of the ribs expanded; anthocarps clavate, 3–4-winged, apex broadly truncate ... *B. cordobensis*
4b Lower coriaceous part of the flower clavate, 5-ribbed; anthocarps clavate, 5-winged, wings undulate, apex truncate ... *B. erecta*
- 5a Anthocarp elliptic-clavate, 5-ribbed, with an indentation near the apex, apex ends in a pointed tip; lower part of the flower elliptic-clavate, 5-ribbed, glandular hairs on the ribs ... *B. diffusa* var. *diffusa*
5b. Anthocarp elliptic-clavate, 5-ribbed, with rounded apex; lower part of the flower elliptic-clavate, 5-ribbed, glandular hairs in the area between the ribs ... 6
- 6a Growth form decumbent or prostrate, leaves more than 30 mm long; anthocarps narrowly elliptic-clavate, 3–5 mm long ... *B. coccinea* var. *coccinea*
6b Growth form prostrate, leaves less than 30 mm long; anthocarps elliptic-clavate, 3–4 mm long ... *B. repens* subsp. *repens*

8.3.1.3 *Boerhavia coccinea* Mill., in Gard. Dict. ed. 8, *Boerhavia* no. 4 (1768). — Type: Jamaica, *Houston s.n.* (BM, neotype chosen by Hewson & Meikle in Flora of Australia 4:318 (1984)) (Fig. 8.2).

Boerhavia hirsuta Jacq., in Hort. Vindob. 1:3, t7 (1770), *nom. superfl.* Based on same description as *B. coccinea*.

Boerhavia caribea Jacq., in Obs. Bot. 4:5, t84 (1771). — Type: Martinique.

Boerhaavia viscosa Lag. & Rodr., in Anal. Cienc. Nat. 4:256 (1801). — Type: originally from Peru, flowered during June and July in Real Jardin Botanico de Madrid (M).

Boerhavia diffusa Sw. in Obs. Bot. 10 (1791).

Boerhavia decumbens Vahl, in Enum. Pl. 1:284 (1804).

Boerhaavia viscosa Jacq., in Fragm. Bot. 41,t46/2 (1804), *nom illegit*, non Lag. & Rodr. — Type: t46/2 in Jacq., Fragm. Bot. (1804).

Boerhaavia laxa Pers. in Syn. Pl. 1:36 (1805).

Boerhavia repens var. *viscosa* Choisy in DC. Prodr. 13(2):453 (1849).

Boerhavia diffusa L. var. *hirsuta* Heimerl in E.J. 10:9 (1888). — Type: South Africa, Cape Province, Kuruman, *Marloth 1102* (B, holotype; PRE, isotype).

Boerhaavia diffusa var. *paniculata* Kuntze in Rev. Gen. 533 (1891).

Boerhaavia diffusa var. *viscosa* (Lag. & Rodr.) Heimerl. in Beitr. Syst. Nyct. 27 (1897).

Boerhavia repens L. var. *diffusa* sensu Baker & C.H. Wright in F.T.A. 6(1):5 (1909), pro parte, excl. syn.

Boerhavia bracteata Cooke in K.B. 1909:421 (1909). — Type: South Africa, Transvaal, Avoca near Barberton, *Galpin 1240* (K, lectotype; PRE, isotype. Lectotype chosen by Whitehouse in F.T.E.A.: 6 (1996)).

Boerhaavia coccinea f. *parcehirsuta* Heimerl in Symb. Ant. 7:212 (1912).

B. diffusa sensu F.W.T.A. 1:152 (1927), *non* L.

Boerhavia coccinea Miller. var. *viscosa* (Lag. & Rodr.) Moscosa in Cat. Fl. Doming. 1:180 (1943).

Boerhavia coccinea Mill. var. α sensu Meikle in F.W.T.A. 2(1):178, fig 66 (1954).

Boerhavia marlothii Heimerl in E.J. 10:10 (1888).

Boerhavia coccinea* Mill. var. *coccinea

Description:

Annual or perennial herbs, viscid. **Stems** long, slender, decumbent or prostrate, woody at the base, glabrate to densely pubescent, often with long septate hairs. **Leaves** opposite; petiolate, petioles (3–) 9 (–25) mm long; leaves elliptic, oblong, ovate, lanceolate or oval, (11–) 27 (–42) x (9–) 18 (–33) mm; apex acute, apiculate or rounded; base shortly attenuate or rounded; margins entire; green above, paler green below; glabrous to puberulous, often with long septate hairs along the veins and margins. **Inflorescence** terminal and axillary; pedunculate, primary peduncles (54–) 91 (–118) mm long, secondary peduncles (32–) 38 (–43) mm long; compound cyme; glabrous to puberulent; bracteate. **Flowers** 3–many per cluster; pedicellate, pedicels 1 mm long; flowers (1–) 2.5 (–4) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part (1–) 1.3 (–1.5) mm long, green, coriaceous, constricted above ovary, elliptic, 5-ribbed, glandular hairs present, persistent; upper part (1–) 1.6 (–3) mm long, campanulate, petaloid, pink or white, caduceus after anthesis. **Stamens** 1–5, exserted, 1.5–4.5 mm long; filaments filiform, connate at base forming a short sheath around ovary; anthers ditheous. **Ovary** 0.4–0.6 mm long, ellipsoid, stipitate; single ovule, style 1.3–4.0 mm long, filiform, exserted; stigma capitate. **Anthocarp** (3–) 4.1 (–5) x (1–) 1.4 (–2) mm; 5-ribbed; narrowly elliptic-clavate; glandular hairs present in area between ribs.

Distribution: Namibia, Botswana, Swaziland and South Africa in the KwaZulu-Natal, Limpopo, Mpumalanga and Northern Cape Provinces (Fig. 8.3).

Habitat: Well-drained stony, sandy soil on riverbanks, hills or mountains and on ridges, often along roadsides; quartzite, dolomite or dolerite; shade to full sun; 350–2000 m altitude.

Flower and fruiting time: Spring, summer and early autumn, September to April.

Common names: Scarlet Spiderling; *Perskleeftossie* (A).

Etymology: The specific epithet, *coccinea*, means scarlet.

Uses: In Namibia the roots are used to treat gastroenteric conditions and a prolapsed uterus, and the roots and the leaves are eaten as a vegetable (Von Koenen, 2001). In Nigeria the plant is eaten as a vegetable and is used as fodder for animals. It is also used to treat convulsions, asthma, scabies, skin rashes and small pox. The are specifically used to treat yaws, jaundice, heart and kidney diseases and dropsy (Edeoga & Ikem, 2002). In Tanzania the leaves and roots are used to treat oral candidiasis and aphthous ulcers (Maregesi *et al.*, 2007), as well as liver problems and toothache (Neuwinger, 2000). The whole plant is used to treat gastrointestinal infections (Tapia-Perez *et al.*, 2003).

Red list assessment: Least concern (Raimondo *et al.*, 2009).

Notes: *Boerhavia coccinea* is considered a native to the neotropics (Chen & Wu, 2007) and is a common pantropical weed. As it is easily confused with *B. diffusa* in regional floras, its origin is difficult to confirm. *B. coccinea* is a polymorphic species which may well include more than one taxon (Stannard, 1988). In Africa, two varieties occur, *B. coccinea* var. *coccinea* which occurs in both tropical and southern Africa, and *B. coccinea* Mill. var. *pubescens* (Choisy) Cufod. which only occurs in tropical Africa (Klopper *et al.*, 2006). In southern Africa two taxa occur which are currently treated as *B. coccinea*, the typically crimson-flowered neotropical taxon and a pink- or cream-flowered taxon with larger fruit, which is often pubescent. From literature it is unclear whether *B. coccinea* var. *coccinea* is indigenous to southern Africa (Codd, 1966), but in the molecular studies (Chapter 7) it forms a clade with the indigenous *B. deserticola* and *B. hereroensis*, and not the alien *B. cordobensis*, *B. diffusa* or *B. erecta*.

Specimens examined:

Namibia

–**1916** (Gobaub): Otjiwarongo, C39, Outjo road, (–DB), 10-02-2009, *Struwig M. 75* (PRE, WIND).

–**2016** (Otjiwarongo): Otjiwarongo, Kudubos, at camping site. Road right behind Camp 1, (–DA), 12-02-2009, *Struwig M. 77* (PRE, WIND).

–**2116** (Okahandja): Kalkfeld, Otjiwarongo, at junction of D2404 and D2414, next to the road, (–AB), 12-02-2009, *Struwig M. 81* (PRE, WIND); Karibib, on road to

Otjimbingwe, next to the road, (–CD), 03-02-2009, *Struwig M. 67* (PUC, WIND); Okahandja, D2110, first dry streambank after entrance to farm Okatjiho, (–DD), 12-02-2009, *Struwig M. 55* (PUC, WIND).

–**2216** (Otjimbingwe): Karibib, on road to Otjimbingwe, (–AA), 03-02-2009, *Struwig M. 68* (PUC, WIND).

–**2416** (Maltahöhe): North of Maltehöhe, south of Naukluft, Kyffhausen Farm, (–AD), 12-03-1995, *Burgoyne P.M. 3499* (PRE, WIND).

Botswana

–**1923** (Maun): Northern Botswana, Okavango Delta, Dead Tree Island, near no. 8 HATAB camping site, (–AB), 24-02-1997, *Roodt V. 313* (PRE).

Limpopo

–**2229** (Waterpoort): Messina District, Geefswaldt, (–AB), 08-01-1974, *Theron G.K. 2795* (PRE); 9 km on Waterpoort-Alldays road, (–DC), 17-11-2009, *Struwig M. 110* (PRE, PUC); Wyllie's Poort, just before Hendrik Verwoerd tunnel coming from Louis Trichardt (Makhado) next to the road, (–DD), 17-11-2009, *Struwig M. 108* (PRE, PUC).

–**2230** (Messina): R572, ±500m before N1 from Mapungubwe on side of road, (–AC), 19-11-2009, *Struwig M. 120* (PRE, PUC).

Northern Cape

–**2922** (Prieska): Hay, Magoras, (–BD), 01-03-1937, *Acocks J.P.H. 1985* (KMG).

8.3.1.4 *Boerhavia cordobensis* Kuntze, in *Revis. Gen. Pl.* 3(3):264 (1898). — Type: Argentina, Cordoba, *Lorentz 403* (F; B) (Fig. 8.4).

Description:

Annual or perennial herbs. **Stems** long, slender, decumbent or prostrate, woody at the base, puberulent, with scattered long septate hairs. **Leaves** opposite; petiolate, petioles (3–) 10 (–25) mm long; leaves deltoid, oblong, lanceolate, elliptic or ovate, (14–) 25 (–47) x (8–) 16 (–34) mm; apex obtuse, acute, acuminate or apiculate; base obtuse or truncate; margins entire, sometimes undulate; green above, paler green below; glabrous, with long septate hairs along the veins and margins. **Inflorescence**

pedunculate, primary peduncles (60–) 105 (–130) mm long, secondary peduncles (20–) 27 (–35) mm long; compound cyme; glabrous to puberulous; bracteate. **Flowers** pedicellate, pedicels 1 mm long; flowers 3 mm long, bisexual. **Perianth** divided into lower and upper parts; lower part (1–) 1.4 (–1.5) mm long, green, coriaceous, constricted above ovary, clavate, 3- or 4-ribbed with apexes of ribs expanded, glabrous, persistent; upper part (1.5–) 1.6 (–2) mm long, campanulate, petaloid, purple; caduceus after anthesis. **Stamens** 2 or 3, exserted; filaments filiform, connate at the base into short sheath around ovary; anthers ditheous. **Ovary** ellipsoid, stipitate; style filiform, exserted; stigma capitate. **Anthocarp** (3–) 3.5 (–4) x (2–) 2.3 (–3) mm; 3- or 4-winged, broadly truncate at the apex, apex ends in a pointed tip; clavate; glabrous.

Distribution: Namibia, Botswana and widespread in South Africa, where it is only absent from the moister, eastern parts (eastern Free State, Gauteng, KwaZulu-Natal and Mpumalanga Provinces) (Fig. 8.5).

Habitat: Moist to well-drained stony, sand to sandy loam soil in dry riverbeds, on floodplains, plains, hill- or mountain slopes and ridges; semi-shade to full sun; 310–1775 m altitude.

Flower and fruiting time: Summer to early autumn, November to April.

Common names: Sticky Spiderling; *Kleefbossie* (A).

Etymology: The specific epithet, *cordobensis*, means from the Cordoba (Argentina).

Notes: *Boerhavia cordobensis* was first recorded as a weed in South Africa from the Kimberley District in 1919 (Codd, 1966), but it was incorrectly identified as *B. pterocarpa* (Stirton, 1982). *B. cordobensis* is native to central-western Argentina (López, 1998).

Specimens examined:

Namibia

–**2217**(Windhoek): Windhoek, D1463, at T-junction sign before entrance to Aris farm, (–CC), 13-02-2009, *Struwig M. 82* (PUC, WIND).

Limpopo

–**2229** (Waterpoort): Mapungubwe National Park, Maloutswa Bird Hide, in front of restrooms, between paving, (–AA), 18-11-2009, *Struwig M. 112* (PRE, PUC); Pont Drift, Breslau 2MS, dam wall area, (–AC), 28-07-1998, *Straub C.C. 499* (PRE); Pont Drift, Breslau 2MS, dam wall area, (–AC), 20-11-1998, *Straub C.C. 808* (PRE).

–**2230** (Messina): R525, 4 km after Tshipise, (–CA), 19-11-2009, *Struwig M. 122* (PRE, PUC).

North-West

–**2626** (Klerksdorp): Klerksdorp, Doringkruin, pavement on the corner of Moepel Avenue and Oleander Avenue, (–DC), 16-01-2010, *Struwig M. 132* (PRE, PUC).

–**2724** (Taung): Taung, ± 6 km SW of Manthestad, (–DB), 22-03-2009, *Gotze A.R. 146* (PUC).

Mpumalanga

–**2430** (Pilgrim's Rest): R36, just before the Shoe Cave sign next to road, (–DA), 20-11-2009, *Struwig M. 130*. (PRE, PUC).

Free State

–**2926** (Bloemfontein): Bloemfontein, showgrounds, (–AA), 04-02-2000, *Zietsman P.C. 4105* (PRE, PRU).

Northern Cape

–**2822** (Glen Lyon): Witsand Nature Reserve, 62.5 km SW of Postmasburg, farm Witsand 250. [0.5 km NE of Doornaar Homestead], (–CB), 17-04-1995, *Bosch M. 61* (KMG).

–**2824** (Kimberley): Kimberley, behind Kimberley theatre, (–DB), 17-11-1975, *Leistner A.O. 938* (PRE).

–**2920** (Boomrivier): Augrabies National Park, rest camp – green island in camp, (–CB), 01-04-2009, *Siebert S.J. 3962* (PUC).

–**3023** (Britstown): Britstown district, Volstruispoort farm, edge of Brinkspan, (–BC), 14-01-1986, *Retief E. & Germishuizen G. 27* (PRE).

Western Cape

–**3321** (Ladismith): Between Calitzdorp Spa and Rooiberg Pass, (–DB), 04-02-2001, *Meyer J.J. 3420* (PRE).

8.3.1.5 *Boerhavia deserticola* Codd, in *Bothalia* 9(1):119 (1966). — Type: Namibia, Kaokoveld Reserve, Orupembe Waterhole near Sanitatas, 5 May 1957, *De Winter & Leistner 5722* (PRE; K, M) (Fig. 8.6).

Description:

Perennial herb, viscid. **Stems** long, slender, woody at base, upright, with numerous 1 m long stems from a basal rosette, pubescent, with long septate hairs. **Leaves** opposite; petiolate, petioles (6–) 17 (–41) mm long; leaves elliptic, lanceolate or ovate, (15–) 31 (–55) x (5–) 15 (–34) mm; apex apiculate, acute or rounded; base shortly attenuate; margins undulate; green above, paler green below; densely pubescent with long septate hairs. **Inflorescence** pedunculate, primary peduncles 95–120 mm long, secondary peduncles 34–40 mm long; compound cyme; glabrate to pubescent; bracteate. **Flowers** pedicellate, pedicels 2 mm long; flowers (4–) 4.5 (–5) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part (1–) 1.3 (–2) mm long, green tinged pink, coriaceous, constricted above ovary, oval, 5-ribbed, glabrous, persistent; upper part (3–) 3.2 (–4) mm long, campanulate, with a basal tube, petaloid, white or pink; caduceus after anthesis. **Stamens** 4, exserted, 6 mm long; filaments filiform, connate at base forming a short sheath around ovary; anthers ditheous. **Ovary** ellipsoid, stipitate; style filiform, exserted; stigma capitate. **Anthocarp** (3–) 3.9 (–5) x (1–) 1.8 (–2) mm; 5-ribbed, ribs conspicuous; clavate; rounded at the apex; glabrous.

Distribution: Endemic to the Omaruru, Outjo, Welwitschia, Damaraland and Khorixas districts in Namibia (Fig. 8.7).

Habitat: Well-drained to dry stony, sandy, sandy-loam or gravel soil in gullies, riverbeds and -banks, on plains, or hill- or mountain slopes; full sun; 556–1029 m altitude.

Flower and fruiting time: Summer, January to December.

Common names: Desert Spiderling; *Woestynkleefbossie* (A).

Etymology: The specific epithet, *deserticola*, means a dweller in the desert.

Red list assessment: Not listed in Loots (2005), but assessed as Low risk-least concern in Craven & Loots (2002). The assessment below is in accordance with the latter as there has been no documented reduction in population size. Extent of occurrence is more than 20 000 km². However, the area of occupancy is less than 500 km², but confirmed records exist for more than 10 populations. No decline in population numbers and no fluctuations in area, sub-populations or individuals were evident. Population numbers more than 10 000 individuals. The species is restricted to the semi-desert part of Namibia, but these habitat types are currently not threatened. We propose Least concern as an appropriate assessment.

Specimens examined:

Namibia

–**1913** (Sesfontein): On road to Sesfontein, next to road in dry streambank, (–DB), 08-03-2009, *Struwig M. 43* (PUC, WIND); Kunene, on a plain in Barab river-valley, (–DA), 06-07-2000, *Gindrig T. & Henning Z. 60* (PRE, WIND).

–**2014** (Khorixas): Welwitchia, Bloemhof, old 484 Farm, (–BC), *Muller M.A.N. & Giess J.W.H. 387* (PRE); Twyfelfontein, village near Twyfelfontein Lodge, in dry streambed, (–CB), 08-02-2009, *Struwig M. 42* (PUC, WIND).

–**2016** (Otjiwarongo): Outjo District, Spaarwater, old 711 Farm, (–AA), 30-03-1974, *Merxmüller H. & Giess J.W.H. 30622* (PRE).

–**2114** (Uis): Brandberg, Numas Gorge, (–AA), 19-03-1977, *Muller M.A.N. & Giess J.W.H. 357* (PRE); Uis, Brandberg, near entrance to Tsisab gorge, (–AA), 06-02-2009, *Struwig M. 38* (PUC, WIND); Uis, Damaraland, Brandberg, on road to Witvrou, (–BA), 14-12-1974, *Van Wyk A.E. 692* (PUC); Uis, Brandberg, hillslope

near Witvrou rock painting, (–BA), 06-02-2009, *Struwig M. 37*. (PUC, WIND); Brandberg South, (–BC), 19-04-1990, *Baker L. 29* (PUC, WIND); Omaruru District, Brandberg, Tsisabschlucht, (–BC), 12-09-1967, *Urschler I. s.n.* (PRE).

8.3.1.6 *Boerhavia diffusa* L., in Sp. Pl. 1:3 (1953). — Type: Virgin Islands, St Coix, Teague Bay, West Indies laboratory, 30 May 1977, *Fosberg 56776* (BM; isotype B, BISH, GH, K, MO, NSW. Type conserved by Whitehouse in Taxon 47:873 (1998)) (Fig. 8.8).

Boerhavia africana Lour., in Fl. Cochinch. 1:16 (1790) — Type: Mozambique, Loureiro.

Boerhavia paniculata Rich., in Actes Soc. Hist. Nat. Paris 1:105 (1792). — Type: from Cayenne.

Boerhaavia adscendens Willd., in Sp. Pl. 1:19 (1797) — Type: from Guinea.

Boerhavia repens var. *diffusa* (L.) Hook.f in Fl. Brit. Indian 4(2):709 (1885) — Type: from South Africa.

Commicarpus africanus (Lour.) Dandy in F.P.S. 1:152 (1950), *excl. descr.*

Boerhavia diffusa* L. var. *diffusa

Description:

Annual or perennial herb, viscid. **Stems** long, slender, woody at base, decumbent, diffuse or prostrate, glabrate to puberulent. **Leaves** opposite; petiolate, petioles (8–) 17 (–33) mm long; leaves elliptic, lanceolate, ovate, oblong, orbicular or obovate, (18–) 35 (–61) x (11–) 25 (–46) mm; apex apiculate, acuminate, rounded or obtuse; base shortly attenuate or obtuse; margins entire, sometimes undulate; green above, paler green below; glabrous with long septate hairs along the margins and scattered along the veins. **Inflorescence** pedunculate, primary peduncles (60–) 105 (–150) mm long, secondary peduncles (25–) 42 (–60) mm long; compound cyme; glabrate; bracteate. **Flowers** 2–5 in a cluster; pedicellate, pedicels 1 mm long; flower (2–) 2.1 (–3) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part 1 mm long, green, coriaceous, constricted above ovary, elliptic-clavate, 5-ribbed, glandular hairs present, persistent; upper part (1–) 1.1 (–2) mm long, campanulate, petaloid, pink, purple or maroon; caduceus after anthesis. **Stamens** 2 or 3, slightly

exserted, 1.5–2.5 mm long; filaments filiform, connate at base forming a short sheath around ovary; anthers dithecos. **Ovary** ellipsoid, 0.5 mm long, stipitate; style 1–1.5 mm long, filiform, exserted; stigma capitate. **Anthocarp** (3–) 3.4 (–4) x (1–) 1.4 (–2) mm; 5-ribbed, elliptic-clavate; ribs indented near apex, apex ends in a pointed tip; glandular hairs present on the ribs.

Distribution: Namibia, Botswana and predominantly in the savanna region of South Africa, hence excluding the Eastern-, Western Cape and Free State Provinces (Fig. 8.9).

Habitat: Moist, well-drained to dry, stony, sand, loam or gravel soil on riverbanks, floodplains, plains or coastal dunes, often along roadsides; calcrete, limestone or basalt; shade to full sun; 5–1370 m altitude.

Flower and fruiting time: Summer, January to December.

Common names: Red Spiderling; *Rooikleeftossie* (A).

Etymology: The specific epithet, *diffusa*, means spreading or diffuse.

Uses: In Namibia the roots are used to treat gastroenteritic problems, a prolapsed uterus and the seeds are used to treat dysentery (Muzila, 2006). A herbarium specimen (*Codd 6883*) in PRE recorded the use of this plant as pig feed, a use which has not previously been documented in the literature. It is used extensively as a medicinal plant worldwide and is used to treat various ailments (Saikia *et al.*, 2006; De Albuquerque *et al.*, 2007; Lehman *et al.*, 2007; Ragupathy *et al.*, 2008). It is also regarded as a poisonous plant that can be harmful to people or animals (Neuwinger, 1996).

Notes: Five varieties of *Boerhavia* occur in Africa. *Boerhavia diffusa* L. var. *acuta* Balle, *B. diffusa* L. var. *ehrenbergerii* (Asch. & Graebn.) Cufod., *B. diffusa* L. var. *hirta* Balle and *B. diffusa* L. var. *undulata* (Asch. & Graebn.) Cufod only occur in tropical Africa while *B. diffusa* L. var. *diffusa* occurs in both tropical and southern Africa (Klopper *et al.*, 2006). *Boerhavia diffusa* var. *diffusa* is native to South

America and a weed in South Africa (Bromilow, 2010). The plant has an interesting habit of sometimes producing flowers and subsequent anthocarps on a short peduncle below the leaves, apart from the inflorescences as described in the description.

Specimens examined:

Namibia

–1917 (Tsumeb): Tsumeb, main street in front of Engen, (–BA), 10-02-2009, *Struwig M. 74* (PUC, WIND).

–1918 (Grootfontein): Near homestead on Taranaki Farm, 84 km from Grootfontein on road to Rundu, (–BA), 06-03-1995, *Germishuizen G. 7575* (PRE, WIND).

–2014 (Khorixas): Khorixas Rest Camp, in camping site in front of tree, (–BD), 08-02-2009, *Struwig M. 70* (PUC, WIND).

–2115 (Karibib): Omaruru, main street, in die middle of the road, (–BD), 11-04-2010, *Struwig M. 174* (PUC, WIND); Omaruru, Loskop Farm, (–BD), 11-04-2010, *Struwig M. 178* (PUC, WIND).

Botswana

–1923 (Maun): Okavango Delta, Moremi Game Reserve, North Gate, (–BA), 02-05-1995, *Roodt V. 228* (PRE).

–2221 (Okwa): Main road to Mmamuno at picknick spot, (–AA), 02-02-2009, *Struwig M. 66* (PUC).

Limpopo

–2229 (Waterpoort): Mapungubwe National Park, Rhodesdrift, garden of Section Ranger, (–AA), 18-11-2009, *Struwig M. 117* (PRE, PUC).

–2330 (Tzaneen): Tzaneen, Letaba River Eco Park Lodge, Chalet C3, lawn around chalet, (–CC), 19-11-2009, *Struwig M. 125* (PRE, PUC).

–2429 (Zebediela): Nebo District, Arabie, lawn in front of offices, next to the steps, (–CD), 01-11-1978, *Lessing P. 58* (PRE).

North-West

–2627 (Potchefstroom): Potchefstroom, Bailliepark, roadside, (–CA), 02-04-2008, *Siebert S.J. 3490* (PUC).

Mpumalanga

–2430 (Pilgrim’s Rest): R36, stalls opposite the Shoe Caves, (–DA), 20-11-2009, *Struwig M. 129* (PRE, PUC).

–2431 (Acornhoek): Kruger National Park, Satara day visitors site, next to path, (–BD), 09-03-2010, *Struwig M. 140* (KNP, PUC); Kruger National Park, Skukuza Rest Camp, along Sabie River, (–DC), 24-4-2009, *Siebert S.J. 3965* (PUC).

KwaZulu-Natal

–2831 (Nkandla): Richards Bay, Mtuzini Nature Reserve, next to road opposite entrance to Inkwazi Campsite, (–DD), 12-03-2009, *Struwig M. 88* (NH, PUC); Richards Bay, Mtuzini Nature Reserve, in Inkwanqi campsite, campsite 18 (–DD), 12-03-2009, *Struwig M. 89* (NH, PUC).

–2832 (Mtubatuba): Richards Bay, Small Crafts harbour, Naval Hill Island, (–CC), 12-03-2009, *Struwig M. 90* (NH, PUC).

–2931 (Stanger): Tugela Mouth, (–BA), 13-03-2009, *Struwig M. 91* (NH, PUC).

–3030 (Port Shepstone): Amanzimtoti, Winkelspruit lagoon, (–BB), 09-03-2009, *Struwig M. 85* (NH, PUC).

Northern Cape

–2824 (Kimberley): Kimberley Division, Leeuwpoort, N of E slopes of dolerite koppie, (–DA), 26-01-1938, *Acocks J.P.H. 8578* (BOL, PRE).

8.2.1.7 *Boerhavia erecta* L., in Sp. Pl. 1:3 (1953). — Type: Mexico, habitat in Vera Cruz, Herb. Linn. No. 9.1 (LINN; PRE photo. Neotype chosen by Fawcett & Rendle, Fl. Jamaica 3:148. (1914)) (Fig. 8.10).

Boerhaavia elongata Salisb. in Prodr. 56 (1796).

Boerhaavia virgata H.B.K. in Nov. Gen. & Sp. 2:215 (1817).

Boerhaavia discolor H.B.K. in Nov. Gen. & Sp. 2:215 (1817).

Boerhaavia atomaria Raf. in Aut. Bot. 40 (1840).

Valeriana latifolia Mart & Gal. in Bull. Acad. Brux. 11: 24 (1844).

Boerhavia paniculata var. *subacuta* Choisy in DC. Prodr. 13: 51 (1849).

Boerhaavia thornberi M.E. Jones in Contr. West. Bot. 12:72 (1908).

Boerhavia erecta var. *thornberi* (M.E. Jones) Standl. in Contr. U.S. Nat. Herb. 12:381 (1909).

Description:

Annual or perennial herbs. **Stems** long, slender, woody at base, decumbent or prostrate, puberulent, with scattered long septate hairs. **Leaves** opposite; petiolate, petioles (5–) 15 (–35) mm long; leaves oblong, lanceolate, elliptic, deltoid or ovate, (15–) 32 (–51) x (10–) 20 (–29) mm; apex apiculate, acuminate, acute or obtuse; base shortly attenuate, obtuse or truncate; margins entire, sometimes undulate; green above, paler green below; glabrous, sometimes with long septate hairs along the margins and the veins. **Inflorescence** pedunculate, primary peduncles ca. 115 mm long, secondary peduncles (55–) 60 (–65) mm long; compound cyme; glabrous to puberulent; bracteate. **Flowers** 4–10 in a cluster; pedicellate, pedicels 1 mm long; flowers (2–) 2.1 (–3) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part (1–) 1.1 (–2) mm long, green, coriaceous, constricted above the ovary, clavate, 5-ribbed, glabrous, persistent; upper part 1 mm long, campanulate, petaloid, pink, purple or white; caduceous after anthesis. **Stamens** 2, slightly exserted, 2–2.5 mm long; filaments filiform, connate at the base into short sheath around the ovary; anthers dithecal. **Ovary** 0.5mm, ellipsoid, stipitate; style 1–2 mm long, filiform, exserted; stigma capitate. **Anthocarp** (3–) 3.2 (–4) x (1–) 1.5 (–2) mm; 5-winged, wings slightly undulate along the margins, apex truncate, apex ends in pointed tip; glabrous.

Distribution: South Africa, mainly in the Eastern Cape, Gauteng, Limpopo, Mpumalanga and North-West Provinces (Fig. 8.11).

Habitat: Well-drained stony, gravel, sand, loam or clay soil in riverbeds, on plains, mountain- or hill slopes and ridges, often along roadsides; shade to full sun; 250–1250 m altitude.

Flower and fruiting time: Spring until late autumn, October to May.

Common names: Erect Spiderling; *Regop-kleefbossie* (A).

Etymology: The specific epithet, *erecta*, means erect or upright.

Uses: In South Africa the leaves are eaten as a traditional leafy vegetable (Ntuli *et al.* 2012). In Africa the plant is used to treat rheumatism, scabies, convulsion in children and arterial high blood pressure. The root is used to treat chest abscesses and dyspepsia and is added to local beers as an aphrodisiac (Neuwinger, 2000; Schmelzer, 2006).

Notes: *Boerhavia erecta* was first recorded in 1934 in the Bloemfontein District (Codd, 1966). It is a weedy species, originally introduced from tropical America (Chen & Wu, 2007).

Specimens examined:

Limpopo

–**2229** (Waterpoort): Waterpoort, Tshipise, 1 km N of Tshipise on the Madimbo road, (–DA), 09-12-1977, *Du Preez P. 125* (PRE).

–**2431** (Acornhoek): Phalaborwa district, Phalaborwa Water Board, 14 km S of Phalaborwa works area. Farm Sheila 10 KU, (–AA), 24-03-1987, *Retief I.M. 567* (PRE); Kruger National Park, Satara, road to staff village, (–BD), 03-09-2010, *Struwig M. 135* (KNP, PUC).

North-West

–**2527** (Rustenburg): Rustenburg District, Rustenburg Platinum, AMPLATS. Rustenburg Base Metals Refinery, south of chimney stack, (–CB), 21-01-1999, *Balkwill K., McCallum D.A. & Campbell-Young G. 10840* (J).

–**2627** (Potchefstroom): Potchefstroom, N12 Johannesburg road at Alpha Fruit and Veggie, Plot 283, next to road, (–CA), 04-12-2008, *Struwig M. 23* (PRE, PUC); Potchefstroom, Miederpark, (–CA), 01-02-2009, *La Grange M. & Lubbe R. 11* (PUC); Potchefstroom, Bailliepark, 108 Steyn Street, (–CA), 02-02-2010, *Struwig M. 133* (PRE, PUC); Potchefstroom, industrial area, next to TX Scrap Yard, Ross Street, (–CA), 26-04-1995, *Cilliers S.S. s.n.* (PUC).

Mpumalanga

–2430 (Pilgrim’s Rest): Lydenburg District, Burgersfort, Potlake Nature Reserve, about 2 km from entrance to Potlake Nature Reserve, Jaglust, (–CA), 05-11-2009, *Van Wyk, A.E. & Siebert S.J. 1341* (J, PRU).

–2431 (Acornhoek): Kruger National Park, Satara, road to staff village, (–BD), 09-03-2010, *Struwig M. 135*. (KNP, PUC) Kruger National Park, in Skukuza Research Camp, behind tents and bungalows underneath trees, (–DC), 16-03-2010, *Struwig M. 143* (KNP, PUC); Kruger National Park, Skukuza Rest Camp, along Sabie River, (–DC), 23-04-2009, *Siebert S.J. 3964* (PUC).

Free State

–2926 (Bloemfontein): Bloemfontein District, Tempe, Tempe farm, (–AA), 01-12-1934, *Motsami J. 4958* (PRE).

8.2.1.8 *Boerhavia hereroensis* Heimerl in Bot. Jahrb. 10:9 (1889). — Type: Namibia, Otjimbingwe, *Marloth 1403* (L, holotype; PRE, isotype) (Fig. 8.12).

Description:

Perennial herbs, viscid. **Stems** long, slender, woody at base, branches upright, diffuse, densely pubescent with long septate hairs. **Leaves** opposite; petiolate, petioles (7–) 16 (–38) mm long; leaves elliptic, lanceolate, linear, or ovate, (18–) 31 (–41) x (5–) 12 (–34) mm; apex apiculate; base shortly attenuate or rounded; margins entire, sometimes undulate; green above, paler green below; pubescent with long septate hairs. **Inflorescence** pedunculate, primary peduncles ca. 65 mm long, secondary peduncles ca 27 mm long; compound cyme; pubescent; bracteate. **Flowers** 2–4 in a cluster, pedicellate, pedicels 1 mm long; flowers (2–) 3.2 (–4) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part 1 mm long, green, coriaceous, constricted above ovary, oval, 5-ribbed, long septate hairs present, persistent; upper part (1–) 2.2 (–3) mm long, campanulate, with a basal tube, petaloid, purple; caduceus after anthesis. **Stamens** 2 or 3, 2–2.5 mm long, included; filaments filiform, connate at the base into short sheath around the ovary; anthers dithecal. **Ovary** ellipsoid, stipitate; style filiform, exserted; stigma capitate. **Anthocarp** (3–) 3.5 (–4) x (1–) 1.7 (–2) mm; 5-ribbed, rounded at the apex; pubescent with long septate hairs.

Distribution: It is endemic to southern Africa, especially prevalent in Namibia, but also with outlier populations in the Northern Cape Province of South Africa (Fig. 8.13).

Habitat: Well-drained stony, gravel, sand or loamy soil in dry watercourses, riverbanks and on mountain- or hill slopes; granite; in shade to full sun; 500–1700 m altitude.

Flower and fruiting time: Summer to late autumn, December to May.

Common names: Herero Spiderling; *Herero-kleefbossie* (A).

Etymology: The specific epithet, *hereroensis*, means from Hereroland (Namibia).

Red list assessment: Least concern (Raimondo *et al.*, 2009).

Notes: *Boerhavia hereroensis* is very similar to *B. deserticola*, but differs from *B. deserticola* in having extremely, glandular hairy anthocarps, smaller, dark pink flowers and a diffuse habit.

Specimens examined:

Namibia

–**2014** (Khorixas): Twyfelfontein Lodge, hills behind lodge, SW of main building (–CB), 07-02-2009, *Struwig M. 40* (PUC, WIND).

–**2114** (Uis): Uis, Brandberg, Hunganob valley area, (–AB), 04-03-1978, *Craven P. 718* (PUC).

–**2115** (Trekopje): Omaruru District, Daksberge, deep shade along riverbank, (–BD), 20-03-1965, *Hardy D.S. 2025* (PRE); Usakos, Klein Spitzkuppe, against mountain slope amongst rocks, (–CC), 05-02-2009, *Struwig M. 35* (PUC, WIND); Karibib, Klippenberg Country Club, rocky hill behind restaurant, (–DD), 04-02-2009, *Struwig M. 34* (PUC, WIND).

–**2116** (Okahandja): Omaruru District, Okasongoro Farm, between Omaruru and Kalkfeld, Farm dam, (–AA), 03-03-1983, *Germishuizen G. 2527* (PRE).

–**2216** (Otjimbingwe): Otjimbingwe (–AC), 01-01-1886, *Marloth R. 1403* (BOL).

–2217 (Windhoek): Windhoek Municipality Area, (–CA), 17-12-1962, *Hanekom W.J.* 354 (PRE, WIND).

–2718 (Grünau): Great Karasberg-slopes of Wasserfall Alt Ravine, 22-01-1913, *Pearson H.H.W.* 8474 (BOL).

Northern Cape

–2824 (Kimberley): Gordonia, Riemvasmaak, 7.5 miles S by E of Riemvasmaak, (–BA), 22-05-1952, *Seydel R.* 1436 (PRE).

–2919 (Pofadder): Prieska, N, Stofbakkies, (–CA), 01-03-1934, *Wilman M.* s.n. (KMG).

8.2.1.9 *Boerhavia repens* L. in Sp. Pl. 1:3 (1953). — Type: Egypt, Herb. Linn. No. 9.8 (LINN; PRE, photo. Lectotype chosen by Codd in *Bothalia* 9:121 (1966)) (Fig. 8.14).

Boerhavia vulvarifolia Poir., in Encycl. Méth. Bot. 5:55 (1804). — Type: Egypt, *Delile* (P)

Boerhavia repens var. *minor* Del., in Descr. Egypt. Hist. Nat. 2:146 (1813).

Boerhavia diffusa var. *minor* (Del.) Cuf. in Bull. Jard. Bot. Brux. 23 (Suppl.):77 (1953).

Boerhavia repens L. var. *glabra* Choisy in DC. Prodr. 13(2):453 (1849). — Type: as for *B. vulvarifolia*

Boerhavia repens* L. subsp. *repens

Description:

Annual herbs, viscid. **Stems** long, slender, prostrate, puberulent. **Leaves** opposite; petiolate, petioles (3–) 9 (–20) mm long; leaves lanceolate, elliptic, ovate or oblong, (10–) 20 (–30) x (6–) 11 (–16) mm; apex apiculate, acuminate or rounded; base obtuse; margins entire, sometimes undulate; green above, paler green below; leaf pairs at the nodes differ in size with one leaf bigger than the other; glabrate. **Inflorescence** pedunculate, primary peduncles (20–) 22 (–24) mm long, secondary peduncles (5–) 10 (–20) mm long; compound cyme; glabrate to puberulent; bracteate. **Flowers** 2–4 in a cluster; pedicellate, pedicels 1 mm long; flowers (2–) 2.3(–3) mm

long, bisexual. **Perianth** divided into a lower and upper part; lower part (1–) 1.3 (–2) mm long, green, coriaceous, constricted above the ovary, elliptic, 5-ribbed, glandular hairs present in the grooves between the ribs; upper part 1 mm long, campanulate, petaloid, pink, caduceus after anthesis. **Stamens** 1 or 2, included, 0.6–0.8 mm long; filaments filiform, connate at the base into short sheath around the ovary; anthers ditheous. **Ovary** 0.3–0.5 mm long, ellipsoid, stipitate; style 0.6–1.2 mm long, filiform, exserted; stigma capitate. **Anthocarp** (3–) 3.3 (–4) x (1–) 1.2 (–2) mm; 5-ribbed, rounded at apex, glandular hairs present in area between ribs.

Distribution: Namibia, Botswana and arid parts (Northern Cape and Limpopo Provinces) of South Africa (Fig. 8.15).

Habitat: Moist to well-drained stony, sand, clay, gravel, loam or alluvial soil in pans or depressions, riverbeds, plains or hill slopes, often along roadsides; in full sun; 557–1370 m altitude.

Flower and fruiting time: Summer to late autumn, November to May.

Common names: Alena Spiderling; *Alena-kleefbossie* (A).

Etymology: The specific epithet, *repens*, means creeping.

Uses: There are no recorded uses for *B. repens* subsp. *repens* in southern Africa, but this plant is used elsewhere in Africa to treat various ailments such as stomach-aches, yaws, jaundice, gonorrhoea, dropsy, asthma, scabies, skin rashes and small pox (Muzila, 2006). The plant is also eaten as a vegetable and is used as fodder for animals (Muzila, 2006).

Red list assessment: Least concern (Raimondo *et al.*, 2009) and Low risk-least concern (Craven & Loots, 2002).

Notes: *Boerhavia repens* subsp. *repens* is an African species with a wide distribution and also occurs naturally in Asia (Codd, 1966; Chen & Wu, 2007). Two subspecies occur in Africa, namely *Boerhavia repens* L. subsp. *diandra* (L.) Maire & Wieller in

tropical Africa and subsp. *repens* in both tropical and southern Africa (Klopper *et al.*, 2006).

Specimens examined:

Namibia

–1714 (Ruacana Falls): Kunene, Mahenene Research Station fields, (–DB), 15-12-1999, *Kolberg H.H. HK1006* (PRE, WIND).

–2014 (Khorixas): Twyfelfontein lodge, at visitors parking, (–CB), 07-02-2009, *Struwig M. 69* (PUC, WIND).

–2016 (Otjiwarongo): Outjo district, Franzfontein, beneath dolomite mountain in rock cave, gate to the north, (–BA), 13-03-1974, *Merxmüller H. & Giess J.W.H. 30306* (PRE, WIND).

–2416 (Maltahöhe): M47, Capricorn Rest, camping site, (–BA), 08-04-2010, *Struwig M. 161* (PUC, WIND); Camp left of barthroom behind chairs. Maltahöhe, D850, next to road, (–DA), 09-04-2010, *Struwig M. 170* (PUC, WIND); Maltahöhe, D850, next to road, (–DB), 09-04-2010, *Struwig M. 168* (PUC, WIND).

–2417 (Mariental): Mariental District, 70 km from Mariental, farm Voigtsgrund, (–CD), 12-3-1983, *Immelmann K.L. 588* (PRE).

Limpopo

–2229 (Waterpoort): Messina, Waterpoort, Greefswaldt, against west-facing slope, (–AB), 08-01-1974, *Theron G.K. 2797* (GRA, PRE); Breslau 2MS Farm (near Pontdrift), (–AC), *Straub C.C. 833* (PRE).

Northern Cape

–2520 (Mata Mata): Kalahari Gemsbok National Park, Kousaunt, (–AC), 07-04-1997, *Mucina L. s.n.* (PRE).

–2720 (Noenieput): Gordonia, Obobogorap, 120 miles NW of Upington, (–CC), 08-04-1960, *Leistner O.A. 1783* (KMG, PRE).

–2820 (Kakamas): Keimoes district, (–AD), 06-04-1950, *Theron G.C. 772* (PRE).

–2824 (Kimberley): Hay division, 11-03-1937, *Acocks J.P.H. 1978* (KMG, PRE).

–2921 (Kenhardt): Kenhardt division, 25.8 miles SW by W of Kenhardt, (–AC), 04-02-1961, *Acocks J.P.H. 21788* (PRE).

8.3.2 *Commicarpus* Standl., in Contr. U.S. Nat. Herb. 12:373 (1909). — Type: *Commicarpus scandens* (L.) Standl. (*Boerhavia scandens* L.). Locality: *Jamaica ad urbem jago de la vega* (Type: BM-SL 98: 51, top left specimen).

Boerhavia L., in Sp. Pl. 1: 3 (1753), in part.

Perennial herbs or subshrubs. **Stems** long, slender, erect, climbing or reclining, often much branched, often woody towards the base. **Leaves** opposite; petiolate, petioles (4–) 12 (–38) mm long; leaves cordate, deltoid, lanceolate, orbicular, ovate, (10–) 32 (–87) x (–8) 24 (–68) mm; apex acute, apiculate, acuminate, rarely rounded or retuse; base cordate to subcordate, shortly attenuate, rounded, obtuse, truncate; margins entire, sometimes repand; often fleshy; glabrous to puberulous. **Inflorescence** pedunculate, peduncles (20–) 57 (–150) mm long; umbellate, sometimes verticillate; glabrous to puberulous; bracteate. **Flowers** pedicellate, pedicels (1–) 9 (–26) mm long; flowers (5–) 11 (–14) mm long, bisexual. **Perianth** divided into lower and upper parts; lower part 2–3 mm long, green, sometimes reddish, coriaceous, constricted above ovary, cylindrical, clavate or broadly clavate, glabrous or with glandular hairs, with ten narrow, longitudinal grooves, five to ten prominent glands around the apex and less prominent glands scattered over the surface further below, persistent; upper part (3–) 8 (–11) mm long, infundibuliform, petaloid, pink, purple or white, sometimes with distinct basal tube, caduceous after anthesis. **Stamens** 2–4, exserted; filaments filiform, connate at the base, forming short sheath around the ovary; anthers ditheous. **Ovary** ellipsoid, stipitate, one ovule; style filiform, exserted; stigma capitate. **Anthocarp** (5–) 7 (–10) x 2–3 mm; 10-ribbed; clavate, cylindrical, elliptic-clavate or fusiform; apex surrounded by sessile glands or ten stalked glands or five stalked glands alternating with five sessile glands; sessile wart-like glands scattered over the surface below the apex; glabrous or covered with glandular hairs; mucoid substance secreted, especially when wetted. **Seed**: endosperm scanty; embryo hooked.

Distribution: Widespread in southern Africa occurring in Botswana, Lesotho, Namibia, South Africa and Swaziland (Fig. 8.16).

Habitat: Stony, sandy, loamy soil on riverbanks and hill slopes in full sun to partial shade; 5–1775 m altitude.

Flower and fruiting time: Summer to late autumn, November to May, although as early as September (spring) and late as July (winter). *C. plumbagineus* is the exception, having flowers and fruit throughout the year.

Common name: Hyrax Bushes (*Dassiebosse* in Afrikaans) is the vernacular for *Commicarpus* species occurring mainly on hills (*C. fallacissimus* and *C. squarrosus*), where they share the habitat with said mammal. The rest of the *Commicarpus* species are named Stars, but the Afrikaans names distinguish between those with mainly a climbing habit with bright white or pink star-shaped flowers (*C. chinensis* subsp. *natalensis*, *C. decipiens*, *C. plumbagineus*) called *Sterretjies* (from Stars), and those with a procumbent and decumbent habit and a fleshy taproot (*C. helenae* var. *helenae*, *C. pentandrus*, *C. pilosus*), called *Veldpatats* (meaning sweet potato of the veldt).

Etymology: The generic name, *Commicarpus*, refers to the sticky anthocarp. It is Greek for *Commi*, meaning gum, and *carpus*, meaning fruit.

8.3.2.1 Key to the species of southern African *Commicarpus* (adapted from Struwig *et al.*, 2011):

1a Growth form subshrub ...2

1b Growth form herbaceous ...4

2a Flower base elliptic, five prominent sessile glands around the apex; anthocarp elliptic-clavate tapering to both ends, five shortly stalked glands around the apex ...*C. pilosus*

2b Flower base cylindrical or elliptic-clavate; anthocarp fusiform ...3

3a Apex of the anthocarp surrounded by ten stalked glands; base of the flower cylindrical with ten shortly stalked, prominent glands around the apex ... *C. fallacissimus*

3b Apex of the anthocarp surrounded by five stalked glands alternating with five sessile glands; base of the flower broadly elliptic with five shortly stalked, prominent glands alternating with five sessile, less prominent glands around the apex ...*C. squarrosus*

4a Flower base cylindrical; anthocarp cylindrical or fusiform ...5

4a Flower base elliptic or clavate; anthocarps clavate ...6

5a Anthocarp cylindrical with sessile glands around the apex and prominent glands scattered over the surface below the apex; sessile glands scattered over the surface of the flower base, flower pink ...*C. chinensis* subsp. *natalensis*

5b Anthocarp fusiform with a ring of ten stalked glands around the apex and a few shortly stalked glands below the apex grouped together; ten prominent, sessile glands around the apex of the flower base with a few glands scattered on the surface below, flower white ...*C. plumbagineus*

6a Flower base elliptic with five shortly stalked, prominent glands around the apex; anthocarp clavate, tapering noticeably from apex to base, apex surrounded by five thin, long stalked (1–2 mm long) glands alternating with five sessile glands, 1 or 2 rings of sessile glands on the surface below the apex ...*C. helenae* var. *helenae*

6b Flower base clavate; anthocarp clavate ...7

7a Anthocarp broadly clavate with five shortly stalked glands around the apex, surface covered with prominent glandular hairs; surface of flower base covered with glandular hairs and glands, flowers white ...*C. decipiens*

7b Anthocarp clavate with five thickly stalked glands alternating with five smaller, less prominent glands around the apex; one or two rows of five prominent sessile glands around the apex of the flower base, flowers purple or pink ...*C. pentandrus*

8.3.2.2 *Commicarpus chinensis* (L.) Heimerl in Engl. & Prantl, Pflanzenfam. ed. 2, 16C:117 (1934). — Type: China, *Osbeck* (LINN).

Valeriana chinensis L. in Sp. Pl. 1:33 (1753). — Type as above.

Boerhavia repanda Willd. in Sp. Pl. 4 ed. 1(1):22 (1797).

Boerhavia chinensis (L.) Aschers. & Schweinf., Beitr. Fl. Aethiop. 1:167 (1867). — Type as above.

Commicarpus repandus (Willd.) Standl., Contr. U.S. Nat. Herb. 18:101 (1916).

Commicarpus chinensis (L.) Heimerl subsp. *natalensis* Meikle in Notes Roy. Bot. Gard. Edinb. 36(2):243, 247 (1978). — Type: South Africa, *Haygarth 4495* (K; NH isotype) (Fig. 8.17).

Description:

Procumbent or scrambling perennial herbs; branches spreading up to 1 m; glabrous to puberulous. **Leaves** petiolate, petiole (8–) 19 (–38) mm long; leaves slightly fleshy, deltoid, ovate, cordate, (22–) 40 (–65) x (19–) 35 (–58) mm, apex acute or apiculate, base cordate, sometimes asymmetric; margin entire, sometimes slightly repand; puberulous (especially along the veins on both surfaces and the margins) to glabrate. **Inflorescence** pedunculate, peduncles (38–) 55 (–75) mm long; umbellate, sometimes with two whorls of umbels, 4–6 flowers per umbel; puberulous to glabrous; bracteate. **Flowers** pedicellate, pedicels (8–) 9 (–10) mm long, flowers (12–) 17 (–22) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part (2–) 2.7 (–6) mm long, cylindrical, greenish, coriaceous, constricted above the ovary, with ten narrow, longitudinal grooves, sessile glands scattered over the surface, persistent; upper part (10–) 13 (–17) mm long, infundibuliform, petaloid, pink, pinkish-purple, with a distinct greenish, basal tube, caduceus after anthesis. **Stamens** 2 or 3, long exserted, 14–24 mm long; anthers 0.5–0.6 x 0.8–0.9 mm, transversely elliptic. **Ovary** 0.8–1.2 mm long, elliptic, stipitate; style 20–28 mm long, long exserted. **Anthocarp** (8–) 9 (–10) x (1–) 2 (–3) mm, 10-ribbed; cylindrical; apex surrounded by sessile glands; sessile wart-like glands scattered over surface below apex; glabrous.

Distribution: KwaZulu-Natal in South Africa (Fig. 8.18), from where its distribution is extended north along the coast of Mozambique up to Maputo.

Habitat: Sandy soil on coastal dunes and on the edges of dune forests in partial shade to full sun; 7–150 m altitude.

Flower and fruiting time: Spring to winter, September to July.

Common names: Dune stars; *Duinsternetjies* (A).

Etymology: The specific epithet, *chinensis*, means from China and the subspecific name, *natalensis*, from Natal (now called KwaZulu-Natal).

Red list assessment: Least concern (Raimondo *et al.*, 2009).

Notes: *Commicarpus chinensis* subsp. *natalensis* also occurs in tropical Africa and differs from the typical subspecies in having fewer stamens (2 or 3) than subsp. *chinensis* (3 or 4), and the leaf margins are entire and not undulate as in subsp. *chinensis*. *Commicarpus chinensis* subsp. *chinensis* is an Asian species which occurs in southern China, India, Java, Lesser Sunda Island, Malay Peninsula, Moluccas, Pakistan, Thailand, Vietnam (Meikle, 1978).

Specimens examined:

KwaZulu-Natal

–**2732** (Ubombo): Lake Sibaya, road between dune and lake, (–BC), 24-04-1996, *Abbott A. 6966* (NH); Lake Sibaya, east of Sibaya, (–BC), 24-10-1994, *Lubbe R.A. 368* (PRU); Ubombo, North of Sodwana Bay on road to Drift-Sand Beach, (–BC), 24-04-1984, *Buthelezi C.N. 443* (NH); Ubombo, North Sodwana road to reclamation, (–DA), 24-04-1984, *Weisser P.J. 7956* (NH).

–**2832** (Mtubatuba): Maphelane Nature Reserve, (–AD), 02-07-1986, *MacDevette K. 162* (NH); Eastern Shores State Forest, Perrier's Rock Shack, (–AD), 18-05-1986, *Steyn E. 38* (NH); St Lucia, main beach, underneath pine trees behind restrooms, (–AD), 11-03-2009, *Struwig M. 86* (PUC, NH); St Lucia, Ingwe Beach, underneath trees right behind notice board next to the path leading to the beach, (–AD), 11-03-2009, *Struwig M. 87* (PUC, NH); Richardsbay, Naval Hill, (–CC), 12-03-2009, *Struwig M. 62* (PUC, NH); Richardsbay, Richardsbay Camping Site, Block E & F, in vegetation forming borders around campsites, (–CC), 12-03-2009, *Struwig M. 63*(PUC, NH).

–**2931** (Stanger): Lower Tugela district, Zinkwazi, (–AB), 18-01-1966, *Moll E.J. 2913* (NU, PRE); Lower Tugela District, Stanger Beach, (–AD), 27-04-1944, *Pentz & Acocks A10444* (NH); Tongaat Beach, on coastal dune, (–CA), 10-03-2009, *Struwig M. 60* (NH, PUC); Uhmlanga Rocks, trail past the bridge going over the lagoon, against dune slope facing the beach, (–CA), 10-03-2009, *Struwig M. 61* (NH, PUC).

8.3.2.3 *Commicarpus decipiens* Meikle in Notes Roy. Bot. Gard. Edinb. 36(2):246 (1978). — Type: Namibia, Okahandja, *Dinter 167* (K) (Fig. 8.19).

Boerhavia grandiflora (non A. Rich.) Heimerl. in Bull. Herb. Boissier 5, App. 3:67 (1897).

Description:

Perennial herbs up to 2 m high. **Stems** erect, decumbent or scrambling; woody towards base; pubescent. **Leaves** petiolate, petiole (5–) 8 (–14) mm long; ovate, elliptic, (20–) 32 (–57) x (10–) 18 (–37) mm, apex acute, acuminate or apiculate, base rounded to shortly attenuate; margin entire; pubescent. **Inflorescence** pedunculate, peduncles (23–) 38 (–70) mm long; umbellate, sometimes verticillate, up to 10 flowers per umbel; pubescent; bracteate. **Flowers** pedicellate, pedicels (2–) 6 (–8) mm long, flowers (11–) 15 (–21) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part (2–) 4 (–6) mm long, clavate, greenish, coriaceous, constricted above ovary, with ten narrow, longitudinal grooves, prominent, sessile glands and trichomes scattered over surface, persistent; upper part (8–) 11 (–16) mm long, infundibuliform, petaloid, white, with a distinct greenish, basal tube, caduceus after anthesis. **Stamens** 2 or 3, long exserted, 20 mm long; anthers 0.8 x 1 mm, kidney shaped. **Ovary** style long exserted. **Anthocarp** (5–) 6.8 (–8) x (2–) 2.8 (–7) mm, 10-ribbed; broadly clavate; apex surrounded by five shortly stalked glands; prominent sessile glands scattered over surface below apex; surface covered with prominent glandular hairs.

Distribution: Endemic to the Grootfontein, Kaokoveld, Karibib, Tsumeb, Okahandja, Omaruru, Otavi, Otjiwarongo, Waterberg and Windhoek districts of Namibia (Fig. 8.20).

Habitat: Stony soil or humus rich sandy loam in shade to full sun. Occurs on streambanks or hill- and mountain slopes, often underneath trees; 1449–1544 m.

Flower and fruiting time: Spring until early winter, October to June.

Common names: False Plumbago Stars; *Vals Plumbago-sterretjies* (A).

Etymology: The specific epithet, *decipiens*, means cheating or deceptive and refers to it being easily confused with other *Commicarpus* species.

Red list assessment: Listed as Least concern in Raimondo *et al.* (2009) despite it not occurring in South Africa. It is endemic to Namibia, but due to a lack of information, was listed as Data deficient by Craven & Loots (2002). The current study recorded no threats that could lead to a reduction in population size. Extent of occurrence is more than 20,000 km². However, the area of occupancy is less than 500 km², but confirmed records exist for more than 10 populations. No decline in population numbers and no fluctuations in area, sub-populations or individuals were evident or could be predicted. Population numbers more than 10,000 individuals. The species is restricted to the dry savanna of northern Namibia and these habitat types are currently not threatened. We propose Least concern as an appropriate assessment.

Notes: Many herbarium specimens collected in South Africa have been incorrectly named *C. decipiens*, as it is easily confused with *C. plumbagineus*, which is very similar in growth form and also has a white flower. It differs from *C. plumbagineus* morphologically, as it is more pubescent. The lower coriaceous part of the flower is clavate and covered with scattered sessile glands and hairs, while that of *C. plumbagineus* is cylindrical with ten glands around the apex and a few glands scattered over the surface below. The anthocarp of *C. decipiens* is clavate and the apex surrounded with shortly stalked glands, with prominent glands and hairs scattered over the surface below the apex. The anthocarp of *C. plumbagineus* is fusiform with a ring of ten stalked glands around the apex and a few stalked glands grouped below the apex.

Specimens examined:

Namibia

–1917 (Tsumeb): Tsumeb, at junction of D3022 and D2863, Otavi mountains (–BD), 10-02-2009, *Struwig M. 47* (PUC, WIND).

–2017 (Waterberg): Otjiwarongo District, road Waterberg-Otjiwarongo, Okosongomingo Farm 149, 55km south east of Otjiwarongo, (–CA), 03-04-1968, *Wanntorp H. & H.E. 605* (PRE); Otjiwarongo, Klein Waterberg, against mountain slope amongst rocks, (–CA), 11-02-2009, *Struwig M. 51* (PUC, WIND); Otjiwarongo,

Klein Waterberg, at foot of mountain in shade of trees, (–CA), 11-04-2010, *Struwig M. 181* (PUC, WIND).

–2115 (Karibib): Omaruru, Loskop farm, (–BD), 11-04-2010, *Struwig M. 176* (PUC, WIND).

–2116 (Okahandja): Omaruru district, Kalkfeld, farm Okozongoro, at farm dam, (–AA), 03-03-1983, *Immelman K.L. 453* (PRE); Okahandja, D2110, first dry streambank after entrance to Okatjiho farm, (–AB), 12-02-2009, *Struwig M. 54* (PUC, WIND).

–2217 (Windhoek): Windhoek, (–CA), 17-12-1962, *Hanekom W.J. 351* (PRE).

8.3.2.4 *Commicarpus fallacissimus* (Heimerl) Heimerl ex. Obermeyer, Schweickerdt & Verdoorn in *Bothalia*, 3:223 (1937). — Type: Namibia, Hereroland, *Lüderitz 171* (B, K) (Fig. 8.21).

Boerhavia fallacissima Heimerl ex. Schinz. in *Verh. Bot. Ver. Brandenb.* 31:223 (1890).

Boerhavia verticillata var. *fallacissima* Heimerl, in *Beitr. Syst. Nyctag.* Wien, 29 (1897).

Commicarpus fallacissimus (Heimerl.) Pohn. in *Mitt. Bot. Staatssamml. München* 8:337 (1953).

Description:

Perennial, herb to sub-shrub up to 1 m high, branches upright, decumbent; glabrous to pubescent. **Leaves** petiolate, petiole (5–) 10 (–20) mm long; ovate, elliptic or cordate, (24–) 36 (–48) x (8–) 20 (–28) mm, apex acute or apiculate, base shortly attenuate, obtuse, cordate or almost truncate; margin entire, sometimes repand; glabrous to sparsely pubescent. **Inflorescence** pedunculate, peduncles (28–) 46 (–70) mm long; umbellate, sometimes with three whorls of umbels, 5 or 6 flowers per umbel; glabrate; bracteate. **Flowers** pedicellate, pedicels (5–) 5.8 (–7) mm long, flowers (8–) 9.5 (–11) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part (3–) 4 (–5) mm long, cylindrical, greenish, coriaceous, constricted above ovary, with ten narrow, longitudinal grooves; ten shortly stalked, prominent glands around the apex and sessile, less prominent glands scattered on the surface below, persistent; upper part (5–) 5.5 (–6) mm long, infundibuliform, petaloid, pink or purple, with a distinct

greenish, basal tube, caduceus after anthesis. **Stamens** 2, long exserted. **Ovary** style long exserted. **Anthocarp** (8–) 8.6 (–9) x (1–) 2.3 (–3) mm, 10-ribbed; fusiform; apex surrounded by ten stalked glands, sessile glands scattered over surface below apex; glabrous.

Distribution: Endemic to the Kaokoveld, Karibib, Okahandja, Okumitundu, Otavi, Outjo, Rehoboth and Windhoek districts of Namibia (Fig. 8.22).

Habitat: Well-drained, loamy, gravel or stony soil on hill- or mountain slopes, shale, dolomite, granite or calcrete; in full sun or partial shade; 152–1651m.

Common names: False Hyrax Bush; *Vals Dassiebos* (A).

Flower and fruiting time: Summer to late autumn, November to May.

Etymology: The specific epithet, *fallacissimus*, means extremely deceptive, very deceptive or deceitful and refers to it being easily confused with other *Commicarpus* species.

Uses: In Namibia the bark, roots and leaves are used to treat sciatica (Neuwinger, 2000).

Red list assessment: No previous assessments exist for this species. The current study recorded no threats that could lead to a reduction in population size. Extent of occurrence is more than 20,000 km². However, the area of occupancy is less than 500 km², but confirmed records exist for more than 10 populations. No decline in population numbers and no fluctuations in area, sub-populations or individuals were evident or could be predicted. Population numbers more than 10,000 individuals. The species is restricted to the dry savanna of north-central Namibia and these habitat types are currently not threatened. Urbanization pressure is developing in the Windhoek district. Based on available information the category, Least concern, is most appropriate.

Notes: Many herbarium specimens of *Commicarpus* in South Africa have erroneously been identified as *C. fallacissimus*. Misidentifications of *C. pilosus* as *C. fallacissimus* are common and ascribable to the shared semisucculent leaves and growth form and poor herbarium management of a nomenclatural change. *C. pilosus* was previously known as *C. fallacissimus* (Heimerl) Heimerl forma *pilosus* and when it was instated as a species, all the specimens curated under the latter name were simply adopted into *C. fallacissimus*.

Specimens examined:

Namibia

–1813 (Opuwo): Joubertpass to Opuwo, against slope in stony/rocky soil, (–DD), 09-02-2009, *Struwig M. 46* (PUC, WIND).

–1916 (Gobaub): Near Merwe Farm, about 20 km west of Otavi on road to Outjo, mountain slope, (–DB), 09-03-1997, *Germishuizen G. 9553* (PRE).

–2125 (Lothlekane): Orapa, (–AD), 16-03-1975, *Kerfoot O. 7748* (PRE).

–2217 (Windhoek): Windhoek National Botanical Garden, Lily Walk, (–CA), 03-02-2009, *Struwig M. 33* (PUC, WIND).

–2316 (Nauchas): C24, after the crossing of the D2161 and C24, (–CD), 13-02-2009, *Struwig M. 58* (PUC, WIND).

–2416 (Maltahöhe): C14, Naukluft Mountains, mountain slope behind the river, (–AB), 08-04-2010, *Struwig M. 165* (PUC, WIND).

8.2.2.5 *Commicarpus helenae* (Roem. & Schult.) Meikle in Hook. Ic. Pl. 7,4: t.3694 (1971). — Type: St. Helena, Ladder Hill, *Burchell 1* (K, neotype designated by Whitehouse (1996)) (Fig 8.23).

Boerhavia helenae Roem. & Schult. in Syst. Veg. I, Mantissa 1:73 (1822) — Type as above.

Boerhavia stellata Wight, in Icones Pl. Ind. Orient. 3(2):6, t.875 (1843) *non B. stellata* Bojer, in Ann. Sci. Nat. Bot. sér. 2(18):188-189 (1842) *nom. illegit C. stellatus* (Wight) Berhaut, in Bull. Soc. Bot. Fr. 100:51 (1953) — Type from India.

Commicarpus verticillatus sensu Baker & Wright, in F.T.A. 6 (1909); sensu Hutchinson & Dalziel, in F.W.T.A. 1(1):153 (1927); sensu Heimerl, in Engl. & Prantl., Pflanzenfam. ed. 2, 16C:117 (1934); sensu Balle, in F.C.B. 2:86 t.7 (1951);

sensu Meikle, in F.W.T.A. 2(1):177 (1954); non Standl., in Contr. U.S. Nat. Herb. 18:101 (1916).

Commicarpus helenae* (Roem. & Schult.) Meikle var. *helenae

Description:

Perennial herbs, branches upright, procumbent; glabrous to pubescent. **Leaves** petiolate, petiole (4–) 10 (–22) mm long; deltoid, ovate, (18–) 28 (–58) x (13–) 22 (–38) mm, apex apiculate, rounded to acute or acuminate, base shortly attenuate, cordate, subcordate, obtuse or truncate; margin entire, sometimes repand; glabrous to sparsely pubescent; slightly fleshy. **Inflorescence** pedunculate, peduncles (35–) 69 (–120) mm long; umbellate, sometimes with 2–4 whorls of umbels, five flowers per umbel; pubescent; bracteate. **Flowers** pedicellate, pedicels (1–) 1.5 (–2) mm, flowers (4–) 5.5 (–7) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part (2–) 2.5 (–4) mm long, elliptic, greenish, coriaceous, constricted above ovary, with ten narrow, longitudinal grooves, five shortly stalked, prominent glands around the apex, smaller, less prominent glands scattered over the surface below, persistent; upper part (2–) 2.5 (–4) mm long, infundibuliform, petaloid, light pink to almost white, with a distinct greenish, basal tube, caduceus after anthesis. **Stamens** 2 or 3, long exserted filaments 2–6 mm long, anthers 0.3–0.5 mm long, transversely elliptic to round. **Ovary** 0.5–0.6 mm long, ellipsoid, shortly stipitate; style 3–3.5 mm long, long exserted. **Anthocarp** (5–) 5.3 (–6) x 2 mm, 10-ribbed; clavate, tapering noticeably from apex to base; apex surrounded by five thinly, long (1–2 mm long) stalked glands alternating with five sessile glands, 1 or 2 rings of sessile glands on surface below apex; glabrous.

Distribution: Namibia, Botswana and the Limpopo and Mpumalanga Provinces of South Africa (Fig. 8.24).

Habitat: Well-drained, stony soil or loam, sand or gravelly soil on riverbanks and floodplains or edges of pans and depressions; calcrete or sandstone; in partial shade to full sun; 200–1247m.

Flower and fruiting time: Summer to late autumn, November to May.

Common names: St Helena Stars; *St Helena Veldpatat* (A).

Etymology: The specific epithet, *helenae*, refers to the type locality which is St Helena Island.

Uses: There are no recorded uses of *C. helenae* var. *helenae* in southern Africa, but in Kenya the sap of the plant is used to heal wounds (Bussman, 2006).

Red list assessment: Least concern (Raimondo *et al.*, 2009).

Notes: *Commicarpus helenae* (Roem. & Schult.) Meikle var. *barbatus* Meikle differs from the typical variety in having remarkably hairy stems and leaves (Meikle, 1979; 1983). Its distribution is restricted to tropical Africa (Klopper *et al.* 2006; African Plant Database, 2010).

Specimens examined:

Namibia

–1913 (Sesfontein): Khowarib Rest Camp, behind the tents underneath *Acacia* and *Mopanie* trees, (–BD): 09-02-2009, *Struwig M. 44* (PUC, WIND).

–2216 (Otjimbingwe): Otjimbingwe, Okomitundu Farm, underneath *Acacia* trees on left hand side in front of gates to house, (–AB): 12-04-2010, *Struwig M. 183* (PUC, WIND).

Botswana

–2026 (Nata): Northern district, Sigara pan, 30 miles W of mouth of Nata River, (–AA), 26-04-1957, *Drummond R.B. & Seagrief S.C. 5247* (PRE).

Limpopo

–2229 (Waterpoort): Breslau Game Farm, (–AC), 30-05-2000, *Straub C.C. 831* (PRE).

–2331 (Phalaborwa): 150m west of cement drift over Shingwedzi River, upstream of Red Rocks, (–AA), 14-01-1994, *Zambatis N. 1954* (KNP, PRE); Kruger National Park, 50m west over Shingwedzi River, over cement drift on bank, (–AA), 11-03-2010, *Struwig M. 141* (PUC, KNP).

-2431 (Acornhoek): Kingfisherspruit, Timbavati, (-AD), 21-12-1962, *Biologiese Afdeling 4592* (KNP, PRE).

Mpumalanga

-2531 (Komatipoort): N'watinwambu firebreak about 1km from the S114, (-BA), 05-12-2005, *Maurin O. & Van der Bank M. OM348* (KNP).

8.3.2.6 *Commicarpus pentandrus* (Burch.) Heimerl in Engl. & Prantl, *Pflanzenfam.* ed 2, 16C:117 (1934). — Type: South Africa, along the Vaal River, Griqualand West, *Burchell 1765* (K) (Fig. 8.25).

Boerhavia pentandra Burch. in *Trav. Int. S. Afr.* 1:432 (1822) — Type as above.

Boerhavia burchellii Choisy, in *DC., Prodr.* 13(2):455 (1949), *nom. superfl.* Based on *B. pentandra* Burch. — Type from South Africa.

Boerhavia grandiflora sensu Oliv. in *Trans. Linn. Soc.* 29:142 (1875), *non* A. Rich.

Boerhavia plumbaginea var. *pentandra* (Burch.) Heimerl, in *Beitr. Syst. Nyctag.* Wien, 29 (1897).

Boerhavia transvaalensis Gand., in *Bull. Soc. Fr.* 66:221 (1919) — Type: South Africa, Transvaal, Marabastad. *Schlechter 4339* (LY, holotype; K, isotype).

Description:

Perennial herbs, prostrate or procumbent up to 1 m long, from a woody rootstock up to 30 mm thick and \pm 300 mm long. **Stems** sometimes tinged purple; pubescent. **Leaves** petiolate, petiole (4–) 8 (–12) mm long; ovate, elliptic, orbicular, deltoid, (13–) 27 (–39) x (13–) 20 (–29) mm, apex apiculate, rounded to acute, base cordate, truncate, cuneate, rounded, obtuse, subcordate or shortly attenuate, upper sides darker than undersides; margin entire; sparsely pubescent; slightly fleshy. **Inflorescence** pedunculate, peduncles (30–) 79 (–150) mm long; umbellate, sometimes up to three whorls of umbels, \pm six flowers per umbel; pubescent; bracteate. **Flowers** pedicellate, pedicels (2–) 7 (–18) mm, flowers (12–) 15 (–23) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part (2–) 4 (–6) mm long, clavate, greenish, coriaceous, constricted above ovary, with ten narrow, longitudinal grooves, one or two rows of five prominent sessile glands around the apex with smaller, less prominent glands scattered over the surface below, persistent; upper part (9–) 11

(–17) mm long, infundibuliform, petaloid, purple or pink, lobed, with a distinct greenish, basal tube, caduceus after anthesis. **Stamens** 4–6, long exserted, filaments 11–17 mm long, anthers 0.7–0.8 x 1.2–1.5 mm long, transversely elliptic. **Ovary** 0.75–1 mm long, ellipsoid, stipitate; style 14–20 mm long, long exserted. **Anthocarp** (7–) 8.4 (–9) x (2–) 2.1 (–3) mm, 10-ribbed; clavate, five thickly stalked glands alternating with five smaller, less prominent glands around the apex, sessile glands scattered over surface below apex; glabrous.

Distribution: Most common and widespread *Commicarpus* species in southern Africa, namely Namibia, Botswana, South Africa and Swaziland, and the borders of Lesotho (Fig. 8.26).

Habitat: Common in bare patches, in well-drained to moist, stony or gritty soil, gravel, sand, loam, clay or turf on floodplains, plains, depressions, valleys, hillslopes or outcrops; dolerite, granite, shale, limestone and calcrete; in full sun to partial shade; in grassland, savanna and bushveld; 5–1775 m.

Flower and fruiting time: October to May, but as early as August (late winter) and as late as July (mid winter).

Common names: Cerise Stars; *Veldpatat* (A).

Etymology: The specific epithet, *pentandrus*, means with five stamens.

Uses: A root decoction is used in Namibia and elsewhere in Africa to treat gonorrhoea (Neuwinger, 2000; Von Koenen, 2001) and the whole plant is used as fodder in South Africa (Cooke, 1912; Davy, 1926; Stannard, 1988). The plant is also used in Tswana traditional culture in a magical sense (Hedberg & Staugard, 1989).

Red list assessment: Least concern (Raimondo *et al.*, 2009).

Specimens examined:

Namibia

- 1916** (Gobaub): Outjo district, Etosha National Park, near Homob waterhole, (–AA), 02-11-1966, *Tinley K.L. 12856* (PRE, UNIN); Zwischen Outjo und Etosha, (–CC), 26-02-1959, *Wedermann E. & Oberdieck H.D. 2318* (PRE).
- 1917** (Tsumeb): Tsumeb, at junction of D3022 and D2863, Otavi mountains, (–BD), 10-02-2009, *Struwig M. 48* (PUC, WIND); At Farm Gaub on road to Grootfontein, (–BD), 03-03-1995, *Germishuizen G. 7431* (PRE).
- 2016** (Otjiwarongo): Otjiwarongo, 8 km S of Otjiwarongo, (–BC), 14-03-1973, *Giess W. 12612* (PRE); Otjiwarongo, Gobabis road, corner of C30 and C22, (–DB), 11-02-2009, *Struwig M. 52* (PUC, WIND).
- 2217** (Windhoek): Windhoek district, 46 miles east of Windhoek on road to Gobabis (–CA), 25-2-1955, *De Winter B. 2527* (PRE); D1463, at T-junction sign just before entrance to Aris Farm, (–CC), 13-02-2009, *Struwig M. 57* (PUC, WIND).

Botswana

- 2425** (Gaborone): South East District, Sebele, on disturbed ground, along the main road, (–DB), 20-12-1978, *Hansen O.J. 3555* (PRE).

Limpopo

- 2329** (Pietersburg): Pietersburg Nature Reserve, aalwyn koppie, (–CD), 08-01-1979, *Bredenkamp G.J. & Van Vuuren D.R.J. 9* (PRE).
- 2430** (Pilgrim's Rest): Cork 64, (–AA), 24-11-1985, *Raal P. 664* (PUC); Manyaka, ridge above Mashishi School, Driekop, grassland at base of ridge, (–AC), 21-11-2009, *Struwig M. 131* (PUC, PRE).
- 2431** (Acornhoek): Kruger National Park, Kingfisherblock, on gravel road from H7 that leads to Timbavati River, (–AD), 10-03-2010, *Struwig M. 138* (KNP, PUC)

North-West

- 2527** (Rustenburg): Impala Bafokeng Mine, Rustenburg, dirt road along norite koppies with some settlements, (–AD), 01-03-2009, *Kurzweg S. 7141* (PUC); Brits district, (–AD), 10-03-1936, *Dyer R.A. & Verdoorn I.C. 3422* (PRE); Brits district, (–AD), 10-03-1936, *Louw W.J. 1279* (PRE, PUC).

–2526 (Zeerust): Panfontein Game Reserve, (–DD), 29-03-1952, *Louw W.J. 2008* (PUC).

–2724 (Taung): Taung area, ± 3 km E of Upper Mayaekgoro, (–DC), 19-04-2009, *Gotze A.R. 247* (PUC).

Free State

–2827 (Senekal): Winburg, 5 km from Winburg on Excelsior road, (–CA), 25-03-1980, *Reid C. 108* (PRE).

–2926 (Bloemfontein): Bloemfontein, (–AA), 01-01-1935, *Moraile J. 4879* (BLFU).

Northern Cape

–2824 (Kimberley): Barkley West, Newlands, (–DA), 17-03-1939, *Lewis G.J. 363* (PRE).

–2826 (Brandfort): Erfenisdam, dust road to Erfenisdam, (–BD), 29-01-2002, *Klein R.G. 91* (PRE).

8.3.2.7 *Commicarpus pilosus* (Heimerl) Meikle in Notes Roy. Bot. Gard. Edinb. 36(2):249 (1978) — Type: South Africa, Transvaal, near Vivo, *Schweickerdt & Verdoorn 653* (PRE, K) (Fig. 8.27).

Commicarpus fallacissimus (Heimerl) Heimerl forma *pilosus* Heimerl, in *Bothalia* 3:233 (1937) — Type as above.

Description:

Perennial herbs to sub-shrubs up to 1 m high, woody toward base, older stems white, decumbent; pubescent. **Leaves** petiolate, petiole (7–) 10 (–20) mm long; cordate, ovate, oval, orbicular or oblong, (12–) 23 (–49) x (10–) 21 (–39) mm, apex apiculate, rounded or acute, base shortly attenuate to rounded, truncate or cuneate; margin entire, sometimes repand; pubescent; slightly fleshy. **Inflorescence** pedunculate, peduncles (20–) 60 (–105) mm long; umbellate, sometimes with three whorls of umbels, up to six flowers per umbel; pubescent; bracteate. **Flowers** pedicellate, pedicels (1–) 3.6 (–5) mm long, flowers (5–) 6.6 (–12) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part (2–) 2.6 (–3) mm long, elliptic, greenish, coriaceous, constricted above ovary, with ten narrow, longitudinal grooves,

five prominent sessile glands around the apex with smaller, less prominent glands scattered over the surface below, persistent; upper part (3–) 4 (–9) mm long, infundibuliform, petaloid, pink or purple, lobed, with a distinct greenish, basal tube, caduceus after anthesis. **Stamens** 2 or 3, long exserted, filaments 6–10 mm long, anthers 0.5–0.8 mm long, transversely elliptic to subcircular. **Ovary** 0.65–0.75 mm long, ellipsoid, stipitate; style 5–7 mm long, long exserted. **Anthocarp** (5–) 6 (–7) x (1–) 1.5 (–2) mm, 10-ribbed; elliptic-clavate tapering to both ends, five shortly stalked glands around apex, sessile glands scattered over surface below apex; glabrous.

Distribution: Namibia, Botswana and the Limpopo and Mpumalanga Provinces of South Africa (Fig. 8.28).

Habitat: Well-drained stony soil, gravel, clay or sand on plains or hill- or mountain slopes; calcrete, quartzite, sandstone or dolomite; in full sun; 200–1350 m.

Flower and fruiting time: Spring to autumn, October to May.

Common names: Bearded Stars; *Bebaarde Veldpatat* (A).

Etymology: The specific epithet, *pilosus*, means with long, soft hairs and refers to the hairy stems and leaves.

Uses: According to the label information of a specimen in PRE (*Barnard, 237*), the roots are boiled to prepare a tea or is burnt and the smoke inhaled to treat headaches. According to another specimen from PRE (*Jacobs, 5861*), the plant is browsed by goats. These uses have not previously been documented in the literature.

Red list assessment: Least concern (Raimondo *et al.*, 2009).

Notes: *Commicarpus pilosus* can be easily confused with *C. squarrosus* as both species are very similar in their subshrub growth form, white branches, roundish, fleshy leaves and purple flower. They differ however, noticeably in anthocarp shape (anthocarps of *C. pilosus* are elliptic-clavate and tapers to both ends while those of *C. squarrosus* are fusiform), and indumentum (anthocarps of *C. pilosus* have five shortly

stalked glands around the apex while those of *C. squarrosus* have five stalked glands alternating with five sessile glands around the apex). *C. pilosus* is also confused with *C. fallacissimus* and *C. pentandrus* due to the purple flower colour, or most probably due to a general misunderstanding of the species concepts and/or nomenclature.

Specimens examined:

Namibia

–**2216** (Otjimbingwe): Otjimbingwe, Omusema shore, farm Otjozondu, marble riff on the shore of Omusema, (–AA), 01-03-1967, *Seydel R.H.W. 4488* (PRE); Otjimbingwe, Otjozondu farm, on the mountain (–AA), 12-04-1965, *Seydel R.H.W. 4344* (PRE).

Botswana

–**2125** (Lothlekane): Central Botswana, Orapa, Mepipi dam, (–AD), 29-03-1975, *Allen A. X349* (J, PRE).

–**2227** (Palapye): Palapye, Selibe Pikwe, (–BB), 01-12-1977, *Kerfoot O. & Falconer 72* (J, PRE).

Limpopo Province

–**2229** (Waterpoort): Mapungubwe National Park, Mapungubwe Hill, on summit next to path between rocks (–AB), 18-11-2009, *Struwig M. 114* (PUC, PRE); Pont Drift, Breslau 2MS, NE base of Pyramid koppie, (–AC), 14-05-1997, *Straub C.C. 609* (PRE); Beitbridge, (–BB), 10-01-1961, *Leach L.C. 10664* (PRE); Zoutpansberg district, Zoutpan Farm near homestead, (–CD), 01-11-1932, *Obermeyer A.A., Schweickerdt H.G.W.J. & Verdoorn I.C. 103* (PUC); On Waterpoort-Alldays road, (–CD), 17-11-2009, *Struwig M. 111* (PRE, PUC); 9 km on Waterpoort-Alldays road (–DC), 17-11-2009, *Struwig M. 109* (PRE, PUC).

–**2430** (Pilgrim's Rest): Burgersfort, Alverton 274 KT, (–CB), 27-11-1985, *Raal P. & Raal G. 676* (PRE).

Mpumalanga

–**2430** (Pilgrim's Rest): Steelpoort River, between Burgersfort and Penge near the Steelpoort River, (–CB), 25-02-1982, *Kluge J.P. 2481* (NBG, SAM, PRE).

–2431 (Acornhoek): Bulule, road no S90, 4 km from Bulule, (–BA), 25-11-1978, Kruger P.R. 311 (PRE).

8.3.2.8 *Commicarpus plumbagineus* (Cav.) Standl. in Contr. U.S. Nat. Herb. 18:101 (1916) — Type: Spain, Orcellitani, at the foot of the mountain (Orihuela), *Cavanilles* (MA) (Fig. 8.29).

Boerhavia plumbaginea Cav., in Ic. Pl. 2:7, t.112 (1793) — Type as above.

Boerhavia dichotoma Vahl, in Enum. Pl. (1804) — Type: Arabia, *Forsskal* (C).

Boerhavia verticillata Poir., in Encycl. Meth. Bot. 5:56 (1804) — Type: Senegal, Roussillon (P, LA).

Boerhavia verticillata Poir. var. *glandulosa* Franch., in Sertum Somal 62 (1882).

Boerhavia commersonii Baill., in Bull. Soc. Linn. Paris 1:484 (1885) — Type: Northern Madagascar without precise locality, *Commerson* (P).

Commicarpus verticillatus (Poir.) Standl., in Contr. U.S. Nat. Herb. 18:101 (1916).

[*Boerhavia africana* sensu Mer., in Trans. Amer. Phil. Soc. 24(2):150 (1935) non Lour.]

[*Commicarpus africanus* sensu Dandy. E.P.S. 1:152 (1950), *quoad descr.*, non *C. africanus* (Lour.) Dandy]

Commicarpus commersonii (Baill.) Cavaco, in Bull. Soc. Bot. Fr. 100:297 (1953).

Commicarpus verticillatus (Poir.) Standl. var. *glandulosus* (Franch.) Cufod., in Enum. Pl. 39:22 (1969).

Boerhavia plumbaginea (Cav.) var. *trichocarpus* Heimerl, in Bull. Herb. Boiss. 5, App. 3:68 (1897) — Type: Namibia: Ombalambuenge, *Rautanen 155*: Between Ondonga and Uukuambi, 1894, *Rautanen 80* (Lectotypus K).

Commicarpus plumbagineus (Cav.) Standl. var. *trichocarpus* (Heimerl) Meikle, in Notes Roy. Bot. Gard. Edin., 36(2):244 (1978) — Type as *Boerhavia plumbaginea* (Cav.) var. *trichocarpus* Heimerl.

Description:

Perennial herbs, procumbent, prostrate or scrambling, up to 1 m long; pubescent to glabrescent. **Leaves** petiolate, petiole (7–) 15 (–31) mm long; cordate, elliptic, orbicular, ovate or lanceolate, (26–) 49 (–87) x (16–) 35 (–68) mm, apex apiculate, rounded or acute, base obtuse, almost truncate, subcordate, shortly attenuate or

cuneate; margin entire or repand; pubescent to glabrescent. **Inflorescence** pedunculate, peduncles (38–) 53 (–85) mm long; umbellate, sometimes with two whorls of umbels, up to 12 flowers per umbel; pubescent; bracteate. **Flowers** pedicellate, pedicels (3–) 5 (–6) mm long, flowers (10–) 13 (–20) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part (2–) 3 (–7) mm long, cylindrical, greenish, coriaceous, constricted above ovary, with ten narrow, longitudinal grooves, apex surrounded by ten prominent, sessile glands with a few glands scattered on the surface below, persistent; upper part (7–) 10 (–14) mm long, infundibuliform, petaloid, white, lobed, with a distinct greenish, basal tube, caduceus after anthesis. **Stamens** 3–5, long exserted filaments, 12–18.5 mm long, anthers 0.6–0.8 mm long. **Ovary** 0.75–1 mm long, ellipsoid, stipitate; style 15–18 mm long, long exserted. **Anthocarp** (8–) 8.5 (–9) x (1–) 1.8 (–2) mm, 10-ribbed; fusiform, with a ring of ten stalked glands around apex and few shortly stalked glands grouped below apex; pubescent.

Distribution: Namibia, Botswana, Swaziland, and the subtropical regions of the Limpopo, Mpumalanga and KwaZulu-Natal Provinces of South Africa (Fig. 8.30).

Habitat: Well-drained to moist stony soil, sand, loam, gravel or clay on streambanks, valleys, plains and on hill- or mountain slopes; granite, quartzite or dolorite; in partial shade to full sun; 50–1420 m.

Flower and fruiting time: All seasons, January to December.

Common names: Plumbago Stars; *Plumbago-sterretjies*, *Wit Veldpatat* (A).

Etymology: The specific epithet, *plumbagineus*, means to resemble the genus *Plumbago* in the Plumbaginaceae, or lead-coloured.

Uses: There are no recorded uses for *C. plumbagineus* in southern Africa but the whole plant, especially the leaves and roots, are used further north in Africa to treat jaundice, leprosy, yaws, asthma, burns and wounds and to prevent miscarriages (Neuwinger, 2000; Giday, 2001; Ojok *et al.*, 2007; De Ruijter, 2007). The plant is

used as poultices on ulcers and guinea worm sores, as expectorants, emetics and laxatives (Neuwinger, 2000; Giday, 2001; Ojok *et al.*, 2007; De Ruijter, 2007). The plant is also used as a veterinary medicine to treat skin diseases in cattle, as a laxative for cattle and as fodder (Giday, 2001; De Ruijter, 2007). In Kenya, *C. plumbagineus* is used as an insecticide for both humans and camels (De Ruijter, 2007).

Red list assessment: Least concern (Raimondo *et al.*, 2009).

Notes: Heimerl (1897) described *Boerhavia plumbagineus* var. *trichocarpa* that occurs in Botswana and Namibia (Meikle, 1978) and tropical Africa (Klopper *et al.*, 2006). It differs from the typical variety by having a sparse covering of very short, eglandular trichomes on the perianth, ovary and anthocarps as oppose to the glabrous perianth, ovary and anthocarp of the typical variety. Merxmüller (1969) reduced this variety to a synonym, but Meikle (1978) still recognized the variety based on “stems being pubescent or scabridulous as opposed to the glabrous or at most very sparsely scabridulous or puberulous stems of the type variety”. Stannard (1988), however, follows the view of Merxmüller (1969) and states that the differences are not clear-cut.

The synonym, *C. africanus* (Lour.) Dandy, is not recognized as a synonym for *C. plumbagineus*, as it is based on *Boerhavia africana*, described by Loureiro (1790) in Flora Cochinchinensis, which is recognized as a synonym for *Boerhavia diffusa* var. *diffusa* (Meikle, 1978; Klopper *et al.*, 2006).

Specimens examined:

Namibia

–**1821** (Andara): Popa Falls Rest Camp, all within the Popa Falls Rest Camp, (–BA), 21-02-1988, *Hines C.J.H. 953* (PRE).

Botswana

–**1824** (Panda-ma-tenga): North-western district, Kachikau, Shaile Government Camp, (–AA), 21-4-1975, *Edwards D. 4367* (PRE); Rakops, Toromoja School, S of Toromoja School in Botletle riverine fringe near Rakops, (–BA), 18-04-1971, *Pope G.V. 327* (PRE).

Limpopo

–**2229** (Waterpoort): Mapungubwe National Park. Denstaat, termite mount underneath *Xanthocersis zambesiaca*, (–AA), 18-11-2009, *Struwig M. 113* (PUC, PRE); Pont Drift. Breslau 2MS. on dam wall, (–AC), 14-05-1997, *Straub C.C. 611* (PRE); near Pont Drift, Breslau Farm MS. 2, (–AC), 15-10-1997, *Straub C.C. 679* (PRE); Louis Trichardt (Makhado), just after tunnel coming from Louis Trichardt on farm Klein Afrika, on riverbank, (–DD), 17-11-2009, *Struwig M. 106* (PUC, PRE).

–**2330** (Tzaneen): R81. Duiwelskloof-Pietersburg road, next to road at small stream, (–CA), 20-11-2009, *Struwig M. 126* (PUC, PRE).

Mpumalanga

–**2430** (Pilgrim's Rest): Olifants River, about 170 yards upstream on Drakensberg side of Olifants river bridge on Tzaneen, farm Spoelklip, riverine bush, (–BC), 05-04-1969, *Croeser P.M. 52* (PRE); Swadini Nature Reserve, along the road to the dam wall, (–DB), 29-02-1984, *Herman P.P.J. 753* (PRE).

–**2431** (Acornhoek): Kruger National Park, H4-1 from Skukuza to Nkuhlu, along Sabie River, (–DC), 21-04-2009, *Siebert S.J. 3970* (PUC).

–**2531** (Komatipoort): Kruger National Park, Berg-en-Dal Rest Camp, along the Matjulu River, (–AC), 25-04-2009, *Siebert S.J. 3696* (PUC).

Swaziland

–**2631** (Mbabane): Hlatikulu district, Ingwavuma poort, (–CD), 05-04-1962, *Compton R.H. 31467* (NBG, SAM, PRE).

–**2632** (Bela Vista): Mlawula Nature Reserve, NW end of airstrip, (–AA), 21-02-1987, *Alward R.D. 37* (PRE).

KwaZulu-Natal

–**2732** (Ubombo): Ingwavuma, 10 miles from Ingwavuma to Ndumo, (–AA), 20-11-1967, *Strey R.G. & Moll E.J. 3705* (PRE); Lebombo, Pongola River, bank of Pongola River near Mkhuze (–AC), 08-09-1932, *Galpin E.E. 13690* (PRE).

8.3.2.9 *Commicarpus squarrosus* (Heimerl.) Standl., in Contr. U.S. Nat. Herb. 18:101 (1916) — Type: Namibia, Gross-Namaland, Rehoboth, *Fleck 241A* (Z) (Fig. 8.31).

Boerhavia squarrosa Heimerl, in Bull. Herb. Bioss. 1. t4:813 (1869) — Type as above.

Commicarpus fruticosus Pohn., in Mitt. Bot. Staatssamml. München 1:337 (1941) — Type: Tsarisberge, *Walter 2095* (M).

Description:

Perennial sub-shrubs, much branched, young shoots purplish, older branches whitish, up to 1 m high; pubescent to glabrescent. **Leaves** petiolate, petiole (8–) 12 (–23) mm long; elliptic, ovate, orbicular, trullate, oval or lanceolate, (10–) 17 (–30) x (8–) 13 (–27) mm, apex apiculate, rounded, retuse or emarginate, base attenuate; margin entire, sometimes reddish; fleshy; pubescent. **Inflorescence** pedunculate, peduncles (30–) 48 (–90) mm long; umbellate, sometimes two whorls of umbels, up to five flowers per umbel; glabrescent; bracteate. **Flowers** pedicellate, pedicels (8–) 18.5 (–26) mm long, tinged purple; flowers (5–) 6 (–8) mm long, bisexual. **Perianth** divided into a lower and upper part; lower part 2 mm long, broadly elliptic, green-purplish, coriaceous, constricted above ovary, with ten narrow, longitudinal grooves, five shortly stalked, pink, prominent glands alternating with five sessile, less prominent glands around the apex; smaller, less prominent glands scattered over the surface below, persistent; upper part (3–) 4 (–6) mm long, infundibuliform, petaloid, purple to dark purple, lobed, with a distinct basal tube, caduceus after anthesis. **Stamens** 2 or 3, long exserted, filaments 5 mm long. **Ovary** and style 6 mm long, long exserted. **Anthocarp** (4–) 5 (–6) x (1–) 1.8 (–2) mm, 10-ribbed; fusiform, apex surrounded by five stalked glands alternating with five sessile glands, sessile glands scattered over surface below apex; glabrous.

Distribution: Endemic to Namibia and widespread in the north-central part of the country in the Karas, Karibib, Keetmanshoop, Rehoboth, Sesfontein, Swakopmund and Welwitchia districts (Fig. 8.32).

Habitat: Well-drained stony soil, gravel or sandy loam on hill- or mountain slopes; dolomite, granite; in partial shade to full sun; 655–1200 m.

Flower and fruiting time: Summer to late autumn, December to May.

Common names: Hyrax Bush; *Dassiebos* (A).

Etymology: The specific epithet, *squarrosus*, means rough or scurfy.

Red list assessment: No previous assessments exist for this species. The current study recorded no threats that could lead to a reduction in population size. Extent of occurrence is more than 20,000 km² and the area of occupancy is more than 500 km². Confirmed records exist for more than 10 populations. No decline in population numbers and no fluctuations in area, sub-populations or individuals were evident or could be predicted. Population numbers more than 10,000 individuals. The species is restricted to the semi-desert and desert of Namibia and these habitat types are currently not threatened. Based on the information an assessment as Least concern is most appropriate.

Notes: Merxmuller (1969) treated *C. fruticosus* as a synonym of *C. squarrosus*, but this change is not recognized by many authors (Nowicke, 1970; Germishuizen & Meyer, 2003; Klopper *et al.*, 2006; African Plant Database, 2011). Morphologically there are no differences between the two species except for flower colour. Heimerl first described *C. squarrosus* in 1896 and in 1953 Pohnert described *C. fruticosus*. The original species descriptions of *C. fruticosus* and *C. squarrosus* are noticeably similar. The morphological similarity of the two type specimens is even more noticeable. Molecular studies of the southern African *Commicarpus* species (Chapter 7) confirm the relatedness of the two taxa.

Specimens examined:

Namibia

–**1913** (Sesfontein): Khowarib Rest Camp, hills surrounding rest camp, (–BD), 09-02-2009, *Struwig M. 45* (PUC, WIND).

–**2014** (Khorixas): Twyfelfontein Lodge, hillslope behind lodge, SW of main building, high up on slope amongst big boulders, (–CB), 07-02-2009, *Struwig M. 41* (PUC, WIND).

–**2114** (Uis): Numas Gorge, high up in kloof, underneath *Acacia montis-usti* behind big boulders, (–BA), 06-02-2009, *Struwig M. 39* (PUC, WIND); Brandberg Mountain, on top, Baswald Rinne Area, (–BC): 19-05-1977, *Craven P. 490* (PUC, WIND).

- 2115** (Karibib): Klein Spitskoppe, against mountain slope amongst rocks, (–CC), 05-02-2009, *Struwig M. 36* (PUC, WIND).
- 2214** (Swakopmund): Namibia district, Swakopmund district, 63 miles SE of Walvis Bay, (–DA), 02-03-1965, *Barnard S.A. 85* (PRE, WIND).
- 2215** (Trekkoopje): Tsaobis Leopard Farm, south of Karibib, (–DD), 21-02-1990, *Hardy D.S. 7017* (PRE, WIND).
- 2416** (Maltahöhe): Naukloof Mountains at Büllspoort, (–AA), 16-12-1947, *Rodin R.J. 2833 & Stray R. 2132* (BOL); C 14, Naukluft Mountains, mountain slope behind the river, (–AA), 13-02-2009, 07-04-2010, 08-04-2010, *Struwig M. 59, 160, 163* (PUC, PRE, WIND); Tsais-Maltahöhe Farm, (–AB), 16-05-1978, *Müller M.A.N. & Tilson 894* (PRE, WIND); C 19. Tsaris Mountains, (–AB), 08-04-2010, *Struwig M. 164* (PUC, WIND); Maltahöhe, Farm Mooiriver MAL 160, on south facing slopes, (–CA), 11-04-1980, *Müller M.A.N. 1362* (PRE, WIND).
- 2616** (Aus): Kuibis, (–DD), 01-03-1912, *Range P. 1283* (BOL).

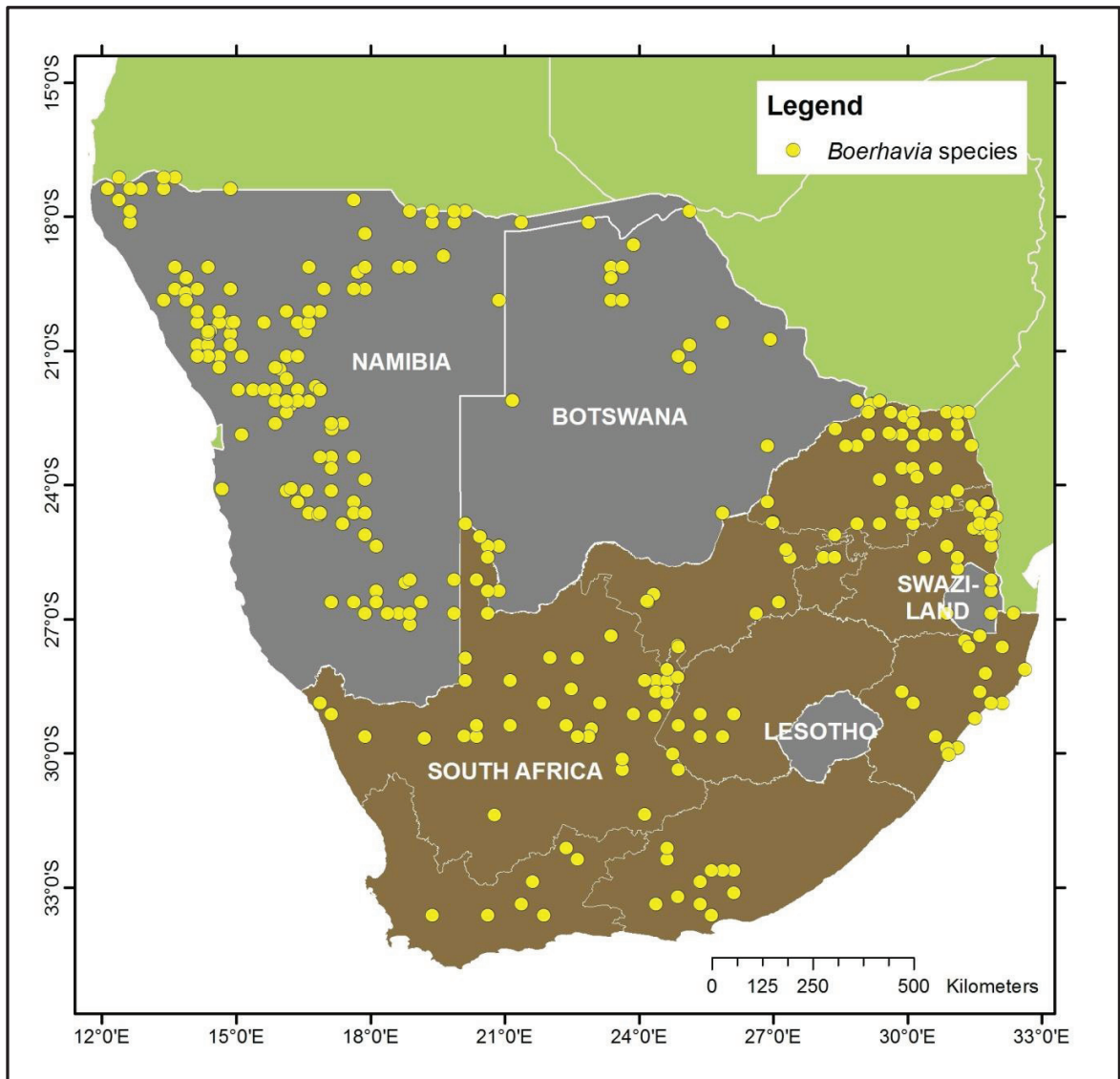


Figure 8.1: Known distribution of *Boerhavia* in southern Africa.



Figure 8.2: Type specimen of *Boerhavia coccinea* var. *coccinea* (Aluka, 2011).

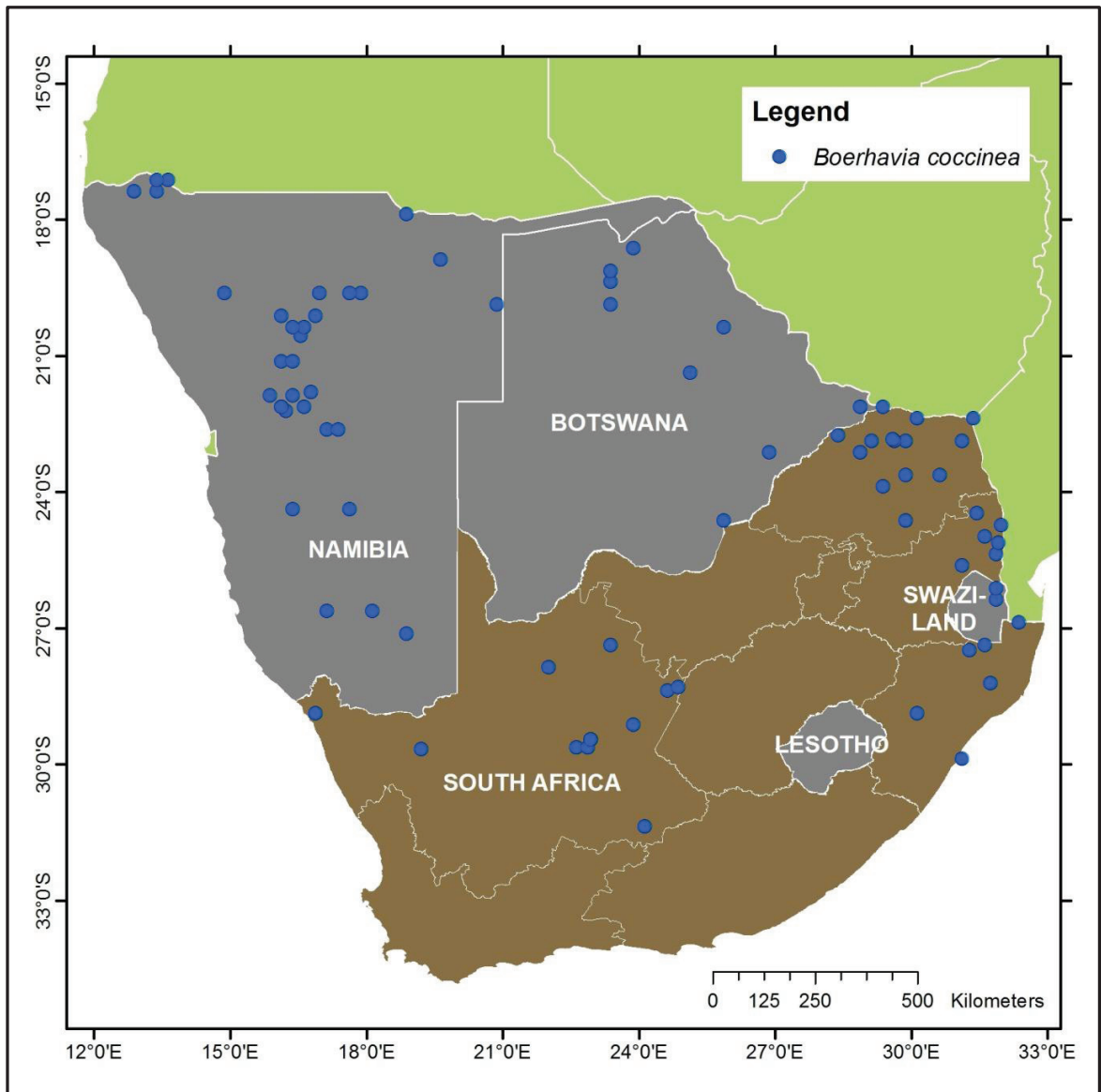


Figure 8.3: Known distribution of *Boerhavia coccinea* var. *coccinea* in southern Africa.

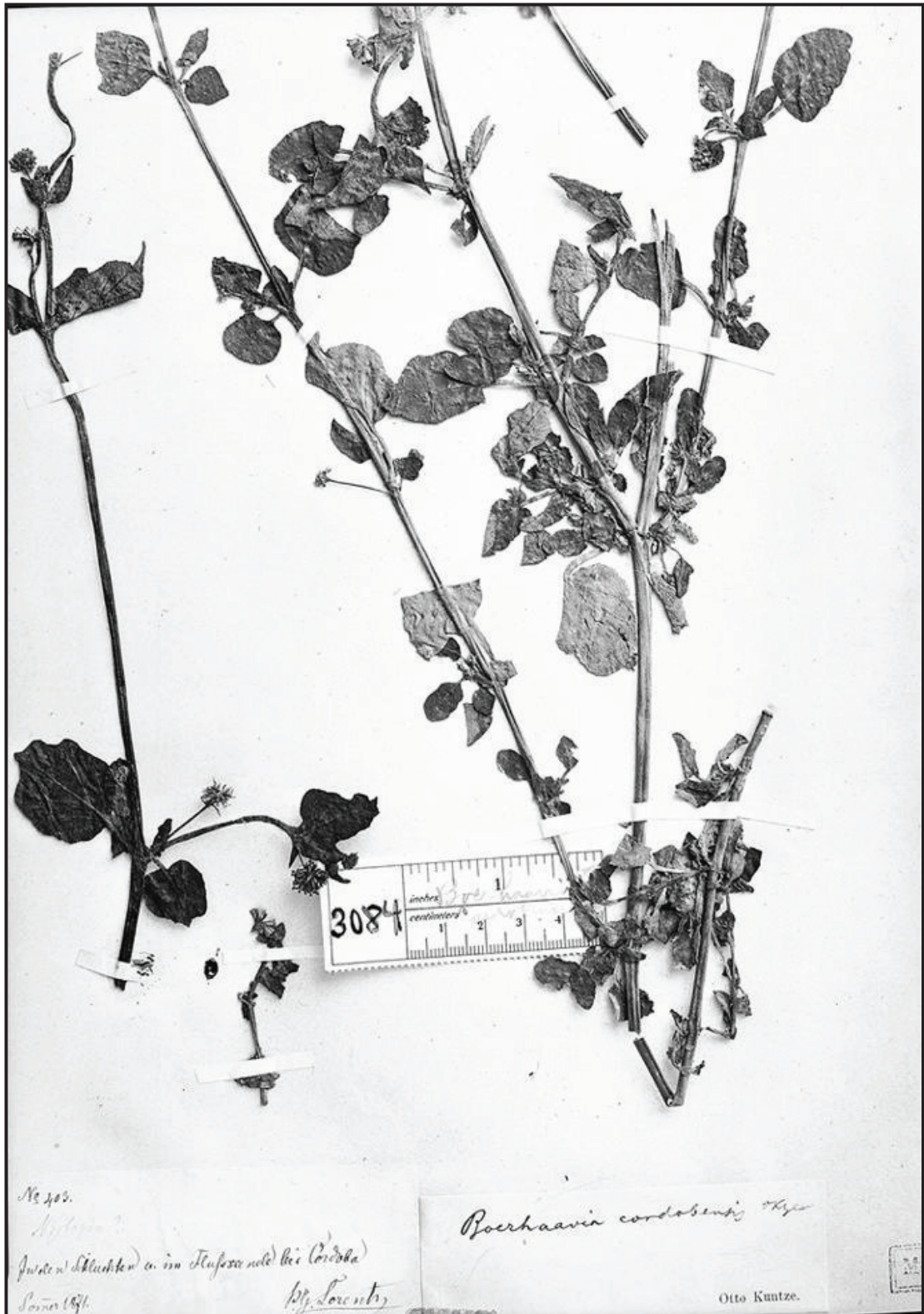


Figure 8.4: Type specimen of *Boerhavia cordobensis* (Aluka, 2011).

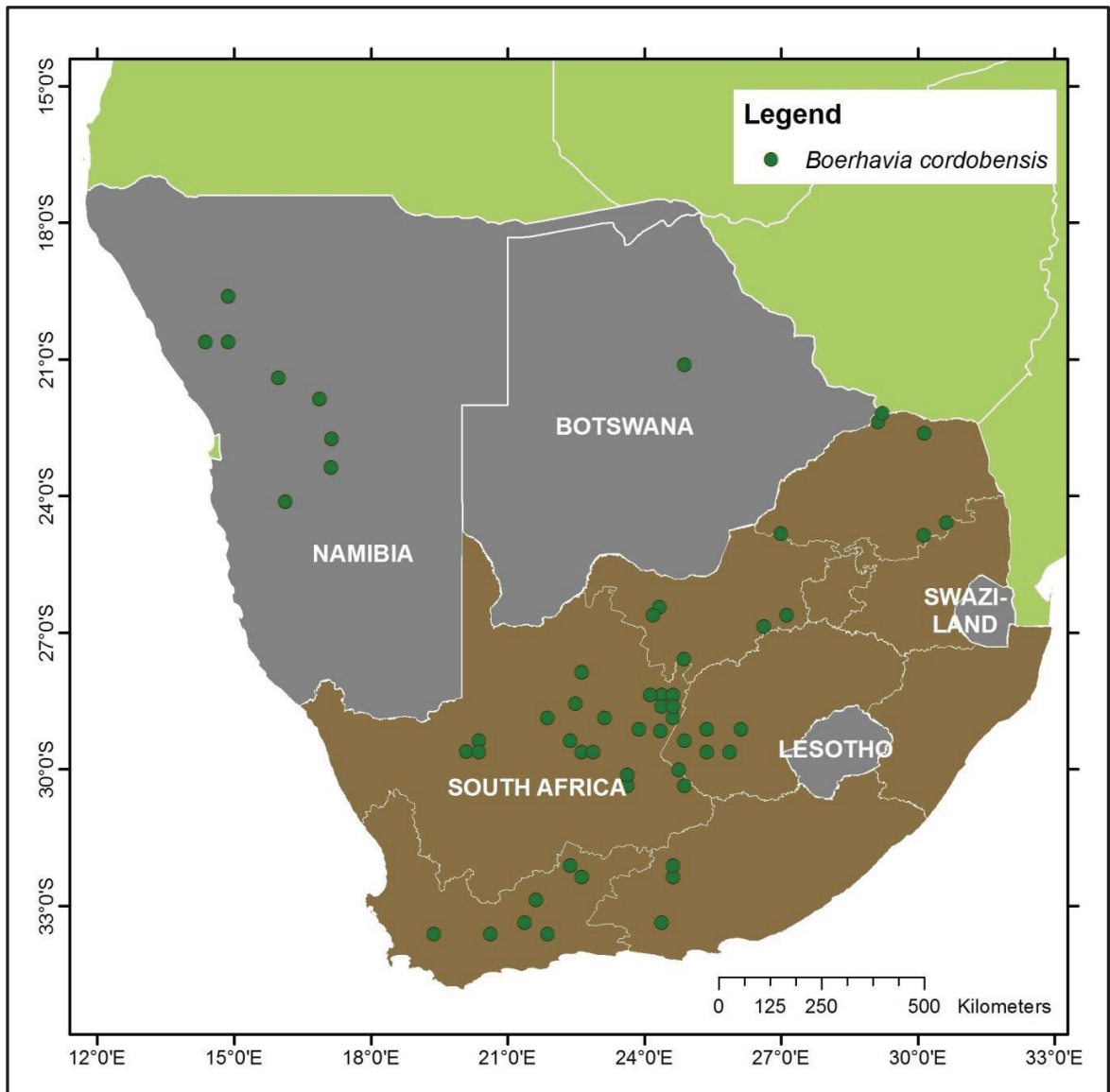


Figure 8.5: Known distribution of *Boerhavia cordobensis* in southern Africa.



Figure 8.6: Type specimen of *Boerhavia deserticola* (Aluka, 2011)

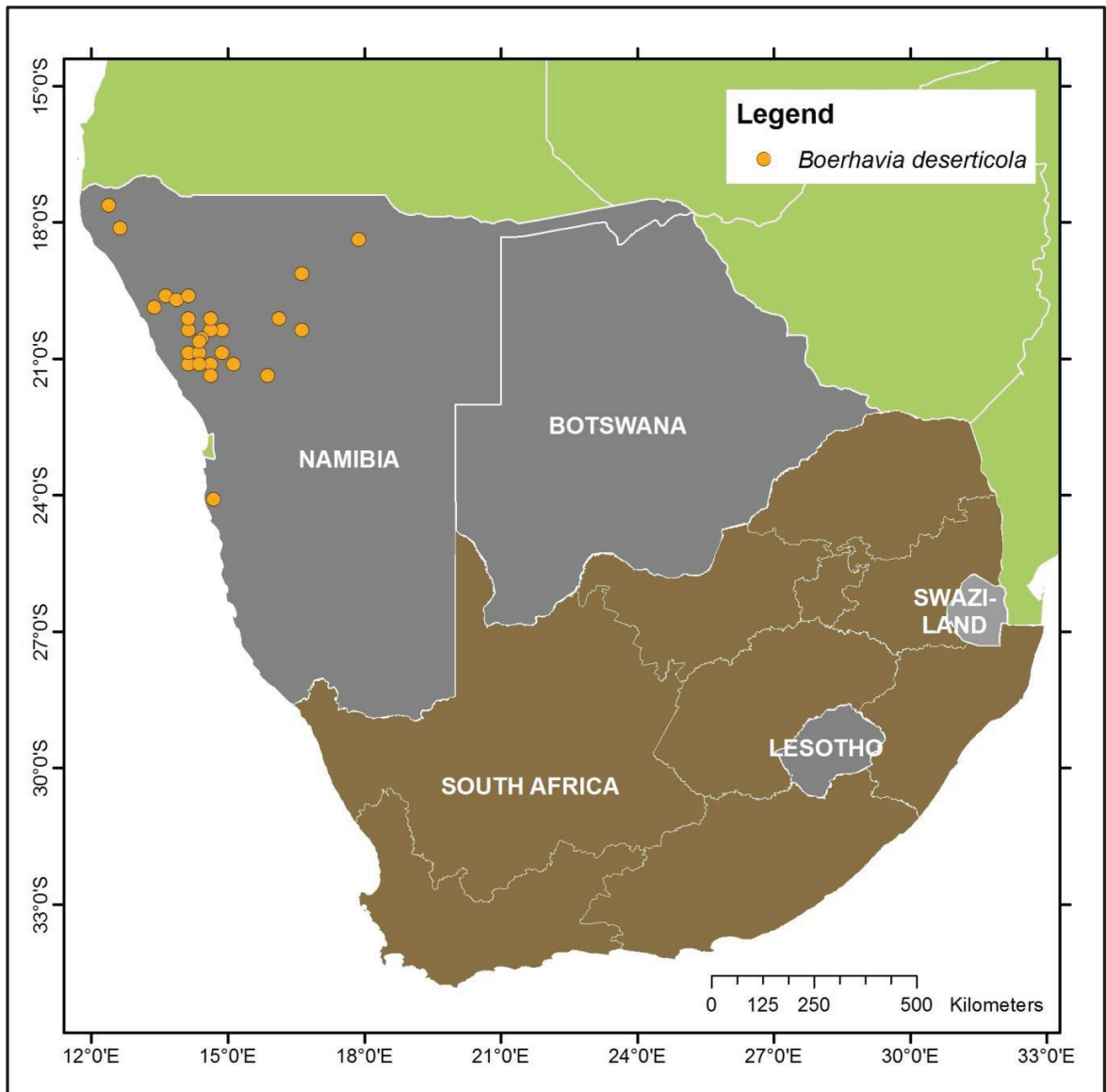


Figure 8.7: Known distribution of *Boerhavia deserticola* in southern Africa.



Figure 8.8: Type specimen of *Boerhavia diffusa* var. *diffusa* (Aluka, 2011).

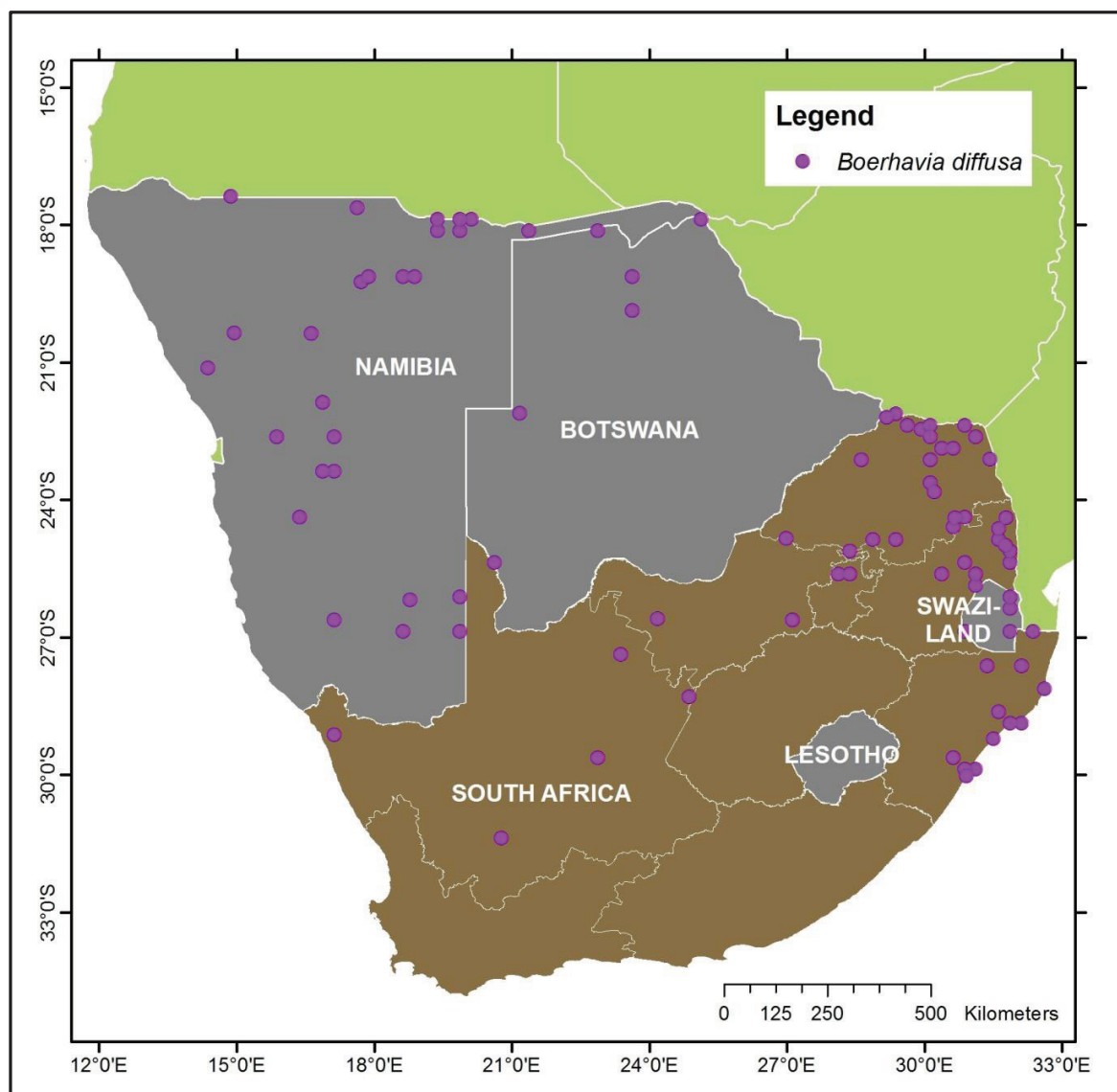


Figure 8.9: Known distribution of *Boerhavia diffusa* var. *diffusa* in southern Africa.

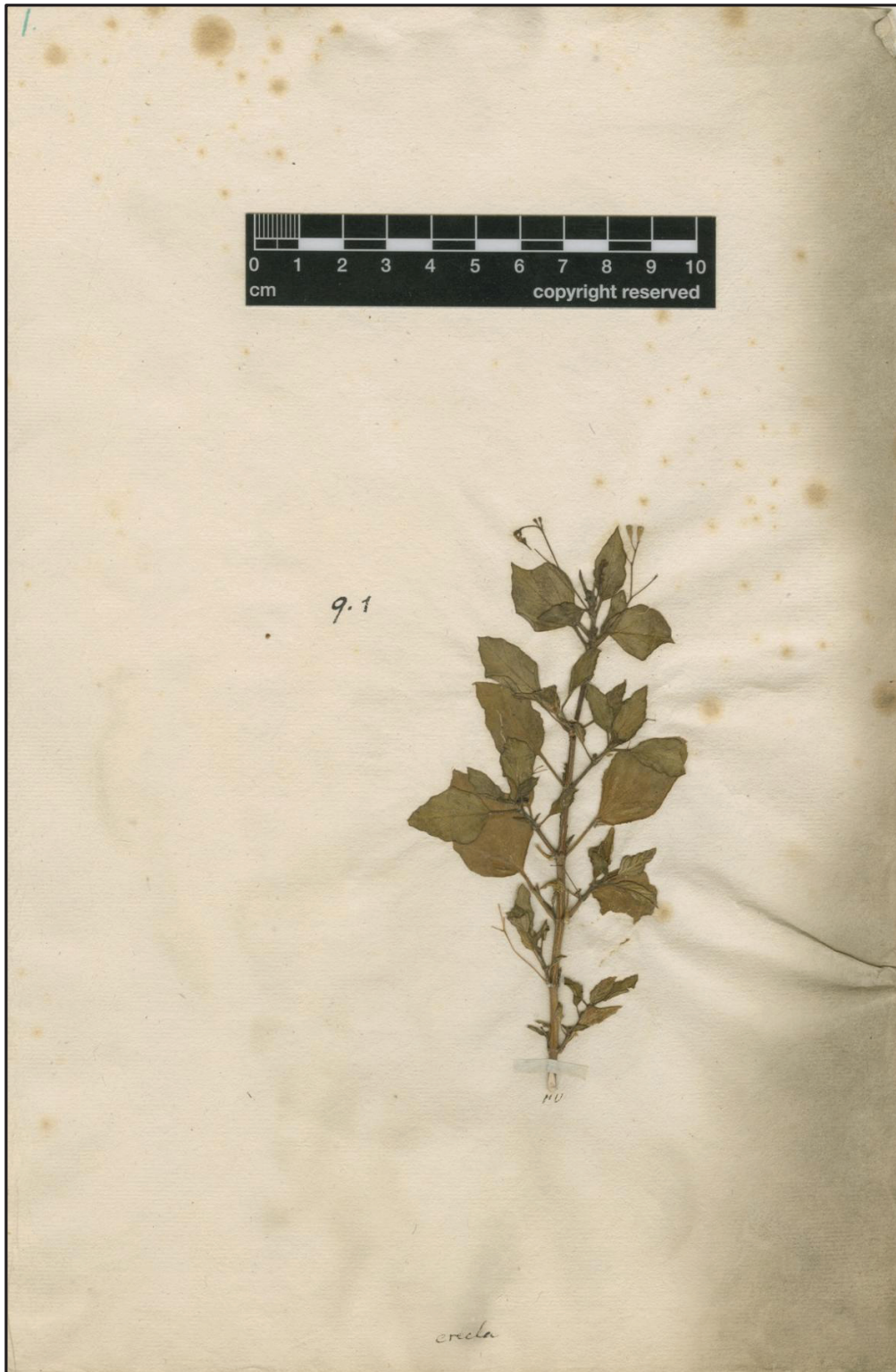


Figure 8.10: Type specimen of *Boerhavia erecta* (By permission of the Linnaean Society of London. Linnaean Herbarium: http://www.linnaean-online.org/view/plants_alpha/boerhaavia_erecta.html).

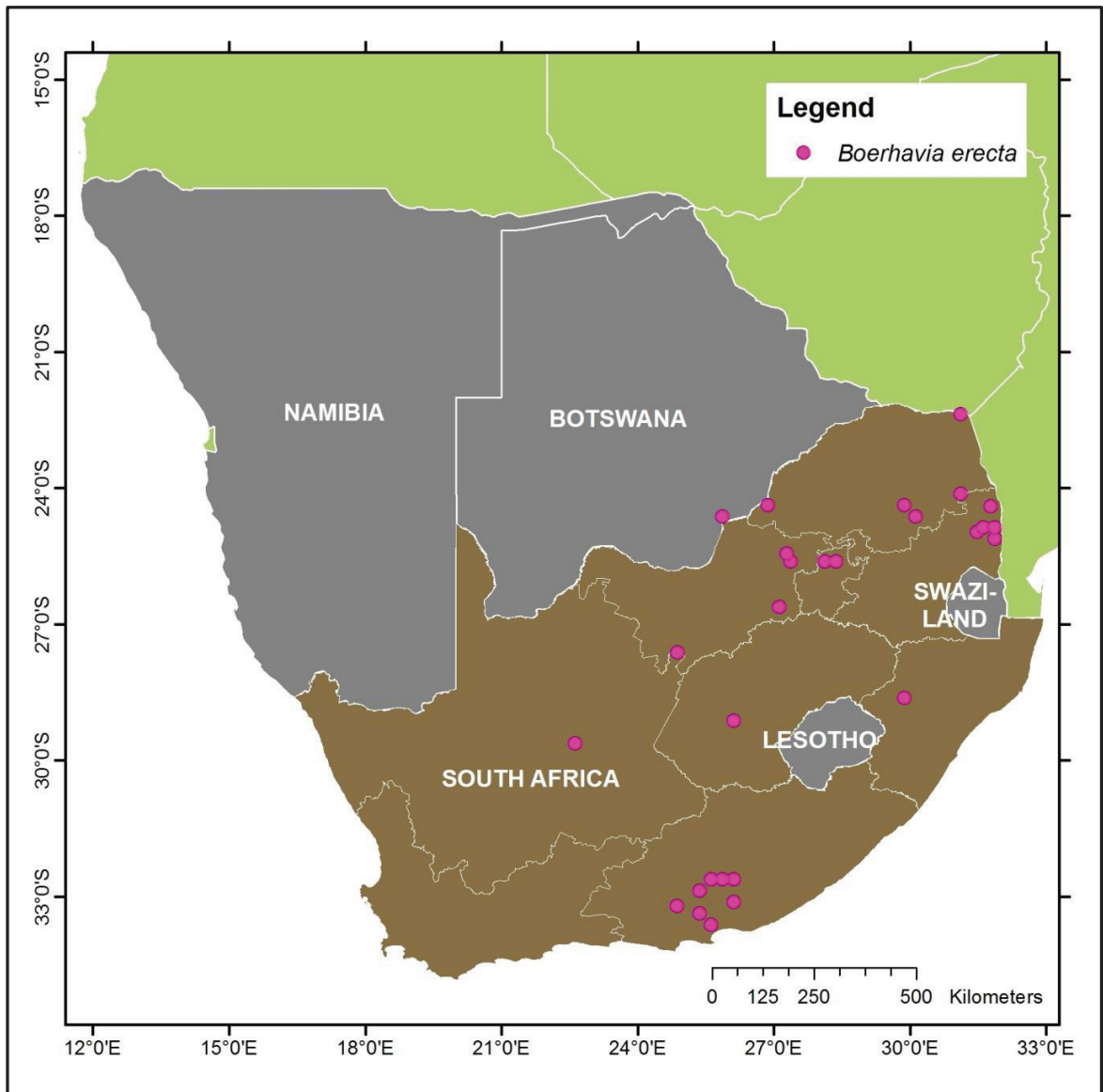


Figure 8.11: Known distribution of *Boerhavia erecta* in southern Africa.

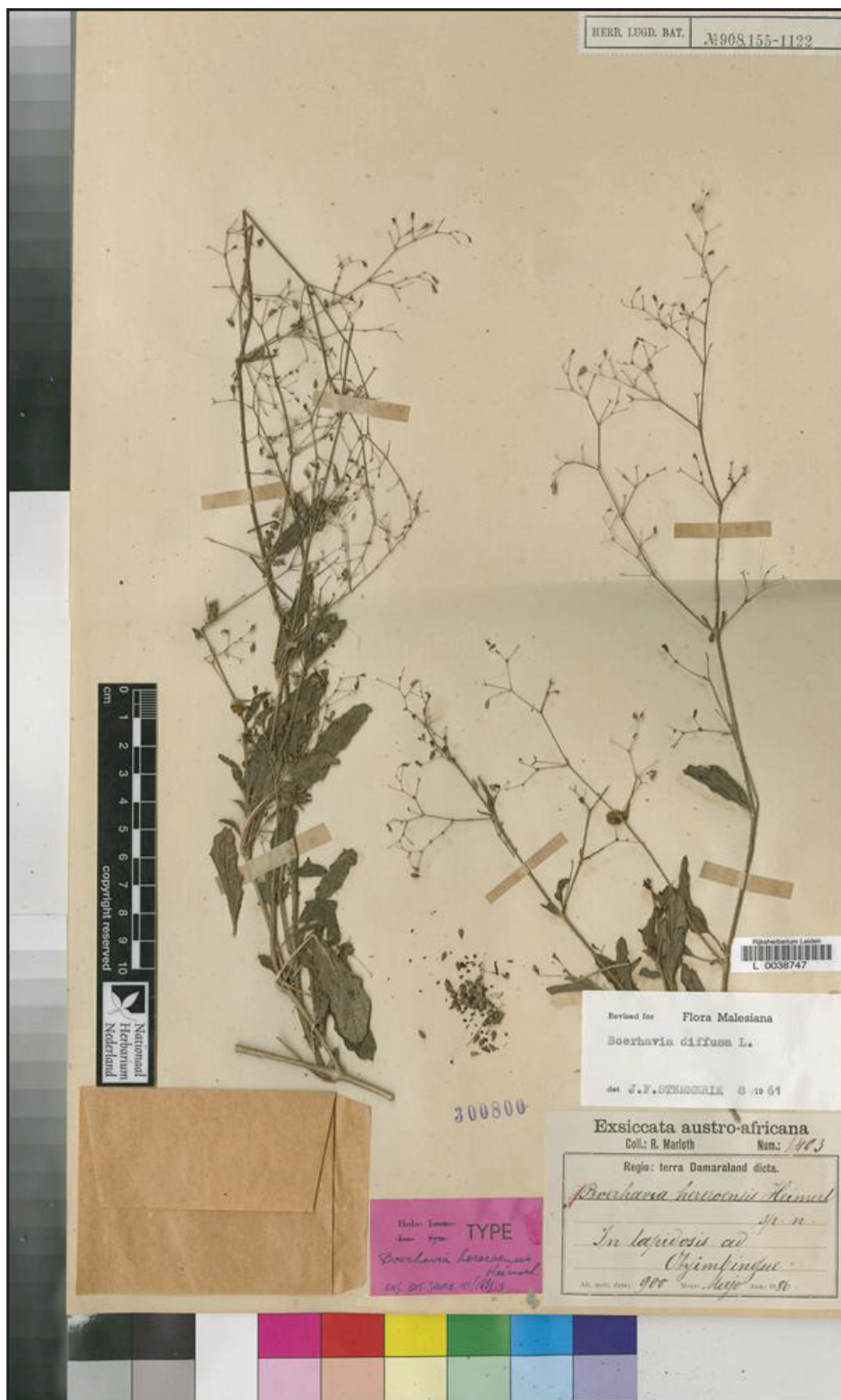


Figure 8.12: Type specimen of *Boerhavia hereroensis* (Aluka, 2011).

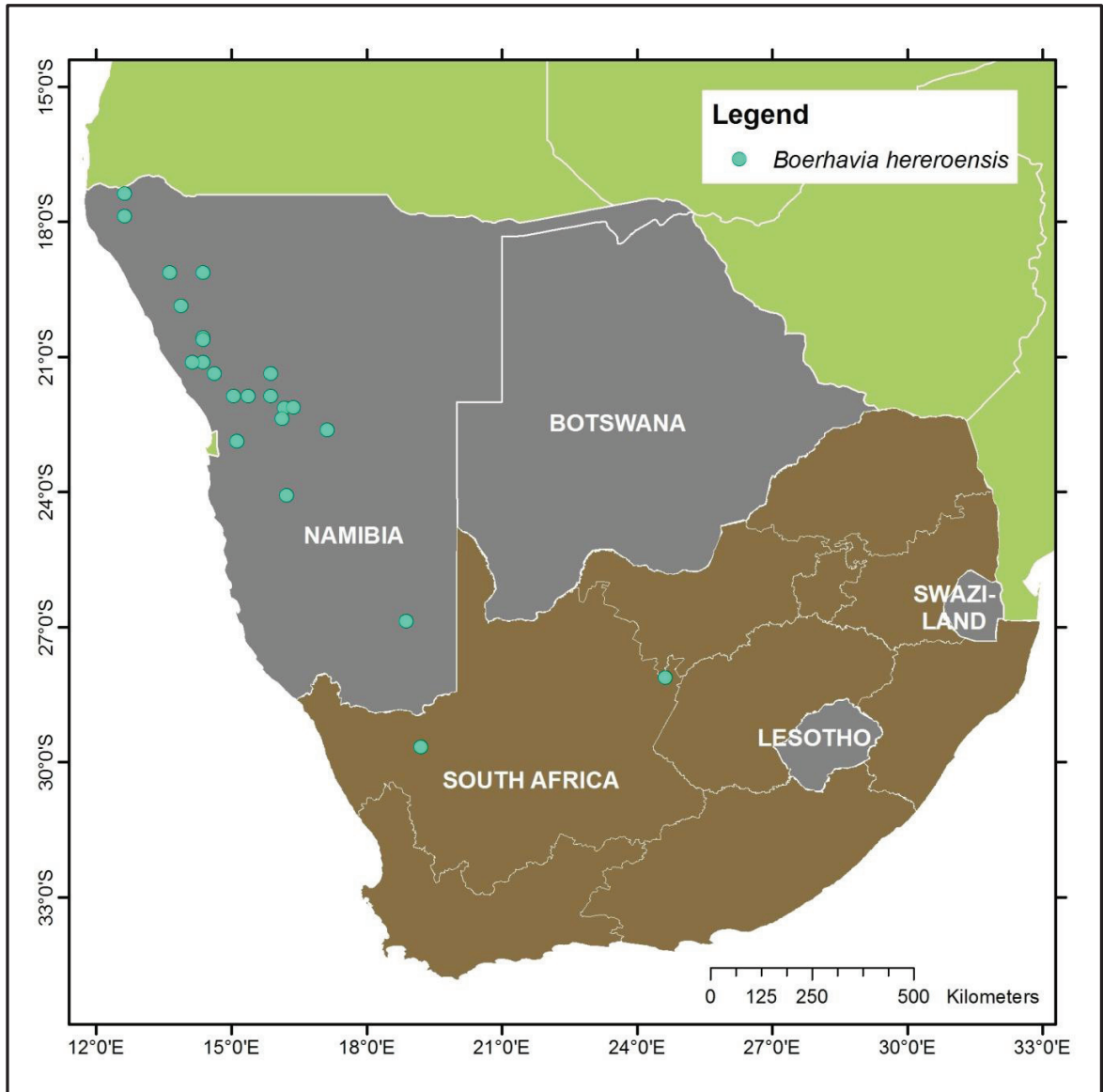


Figure 8.13: Known distribution of *Boerhavia hereroensis* in southern Africa.

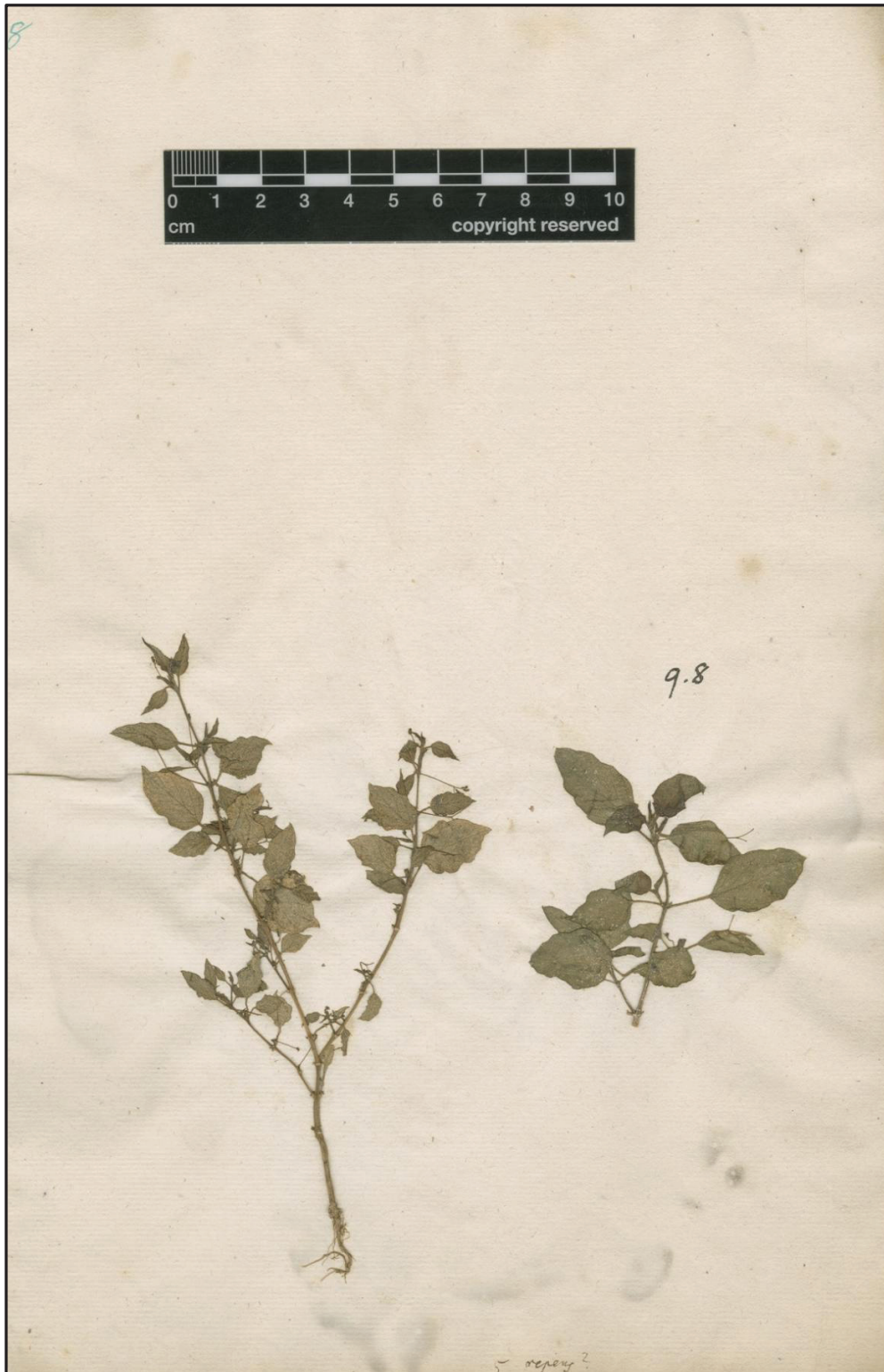


Figure 8:14: Type specimen of *Boerhavia repens* subsp. *repens* (By permission of the Linnaean Society of London. Linnaean Herbarium: http://www.linnean-online.org/view/plants_alpha/boerhaavia_repens.html).

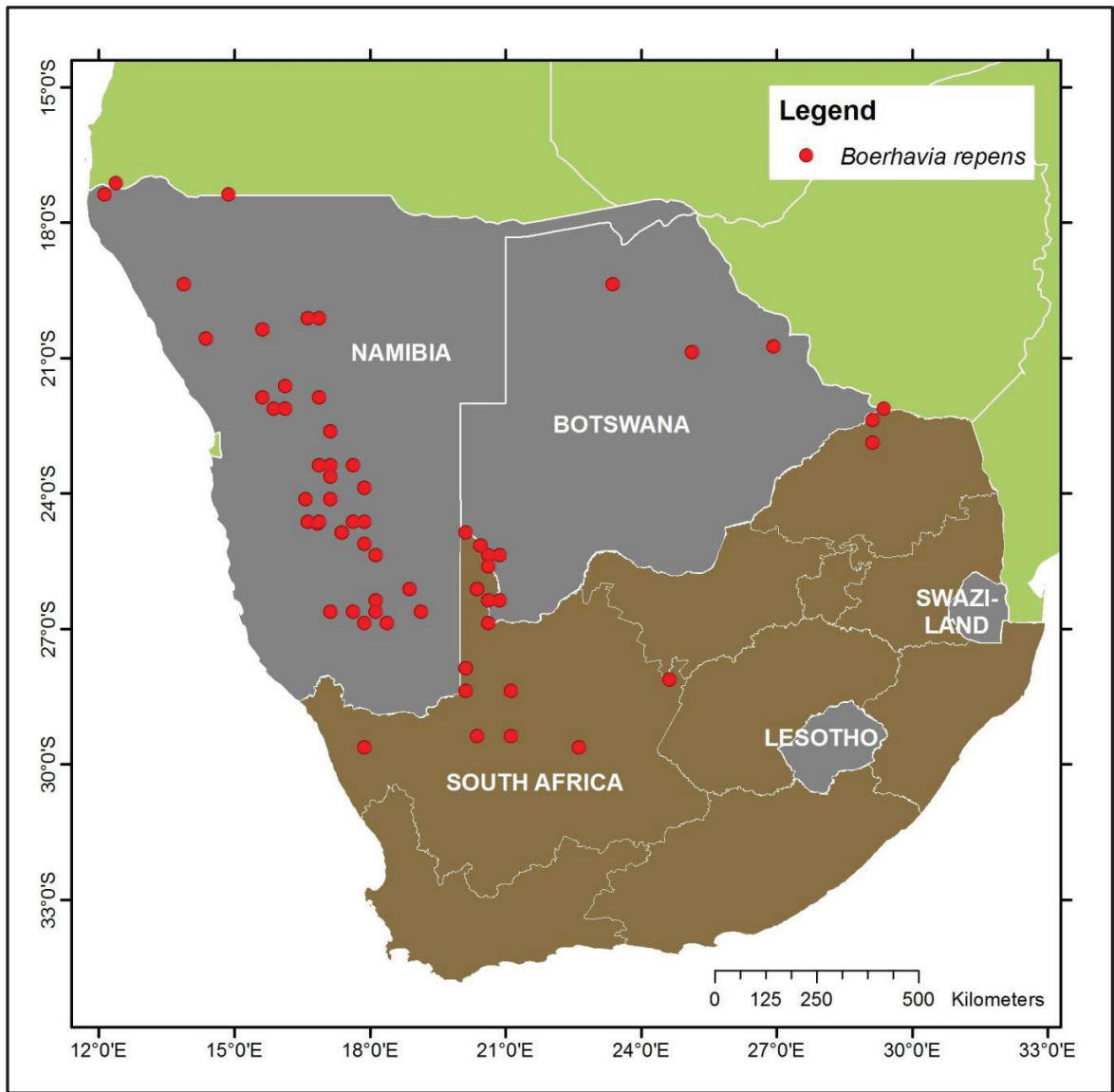


Figure 8.15: Known distribution of *Boerhavia repens* subsp. *repens* in southern Africa.

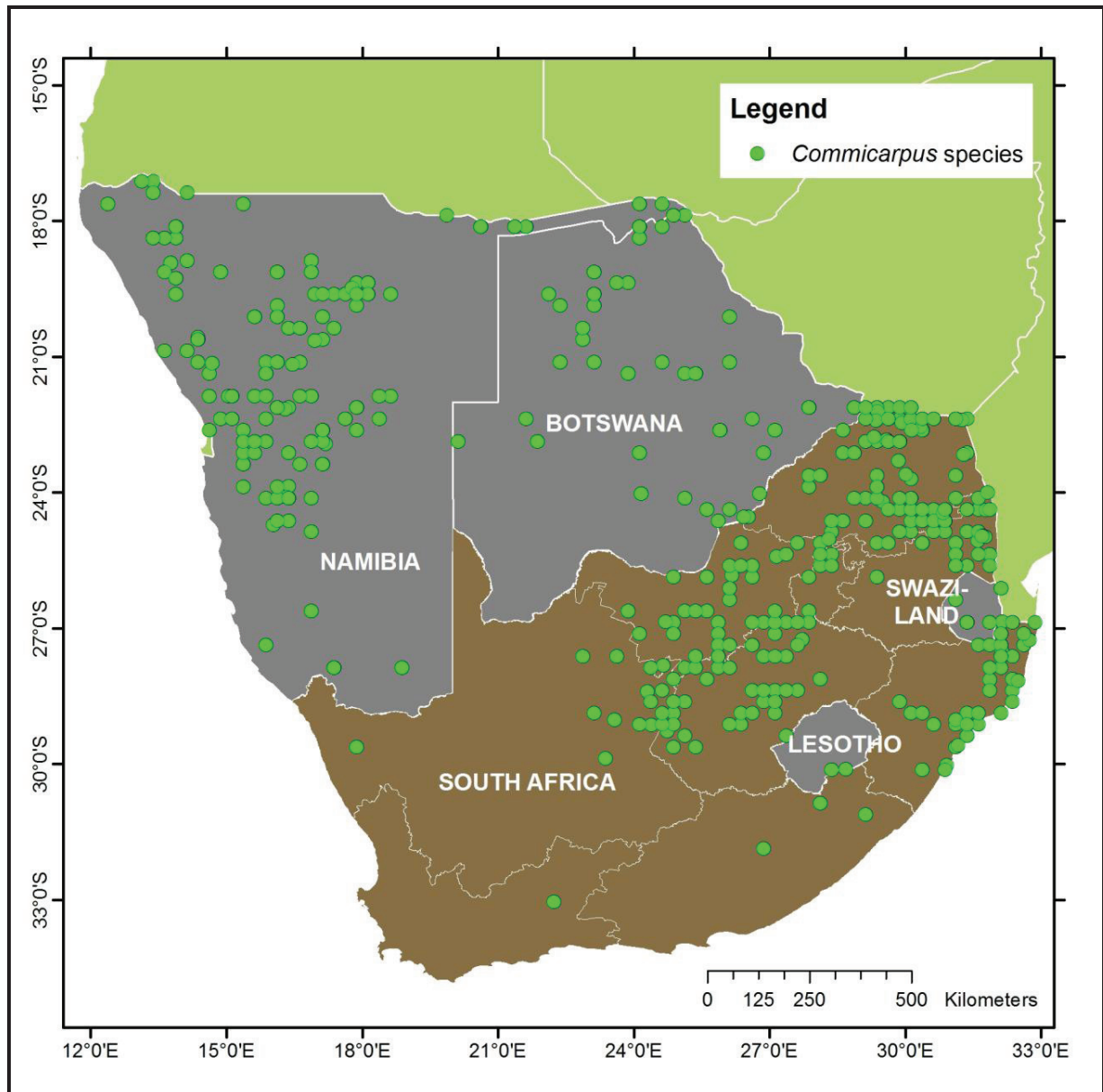


Figure 8.16: Known distribution of *Commicarpus* in southern Africa.



Figure 8.17: Type specimen of *Commicarpus chinensis* subsp. *natalensis* (Aluka, 2011).

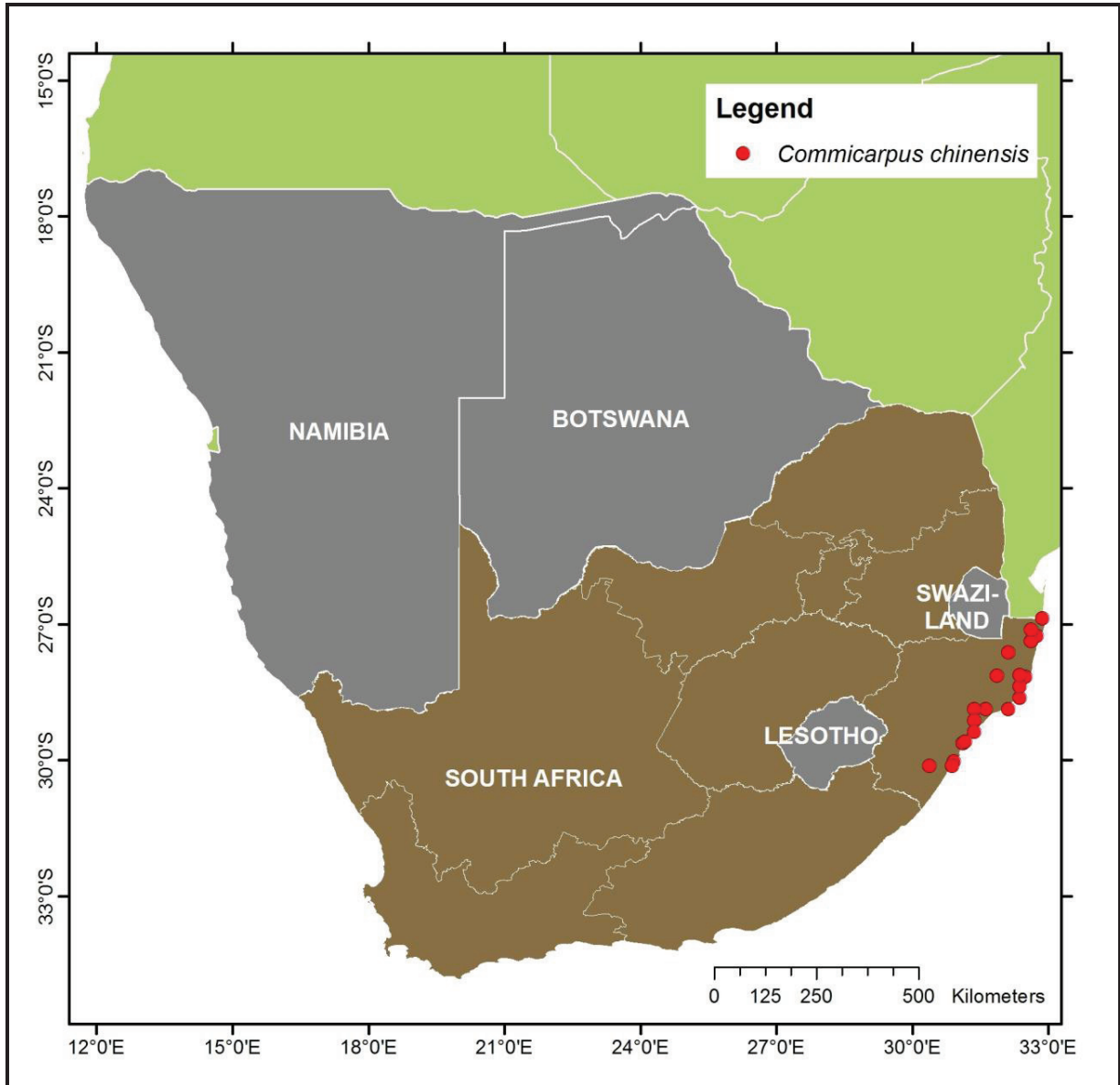


Figure 8.18: Known distribution of *Commicarpus chinensis* subsp. *natalensis* in southern Africa.

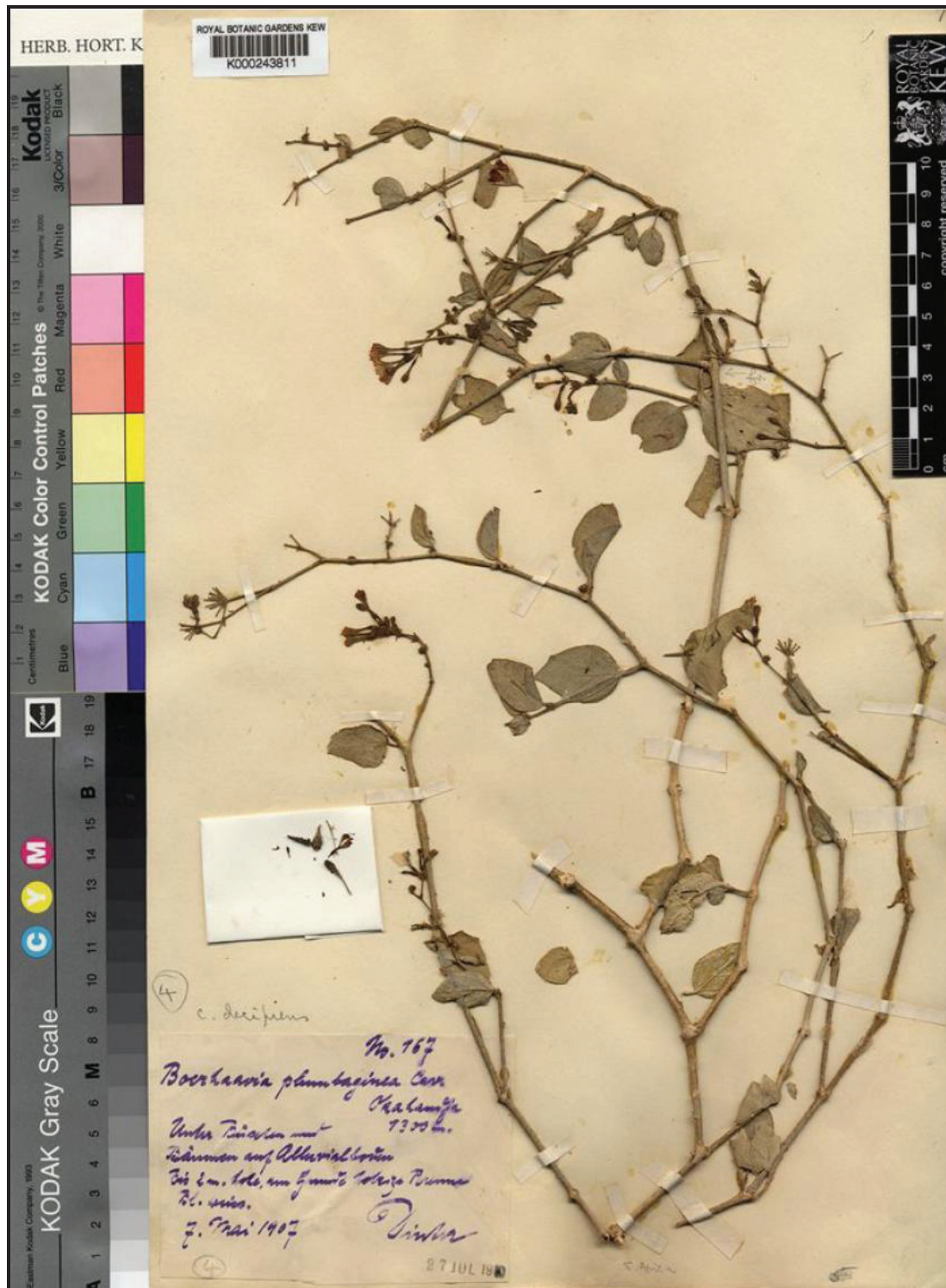


Figure 8.19: Type specimen of *Commicarpus decipiens* (Aluka, 2011).

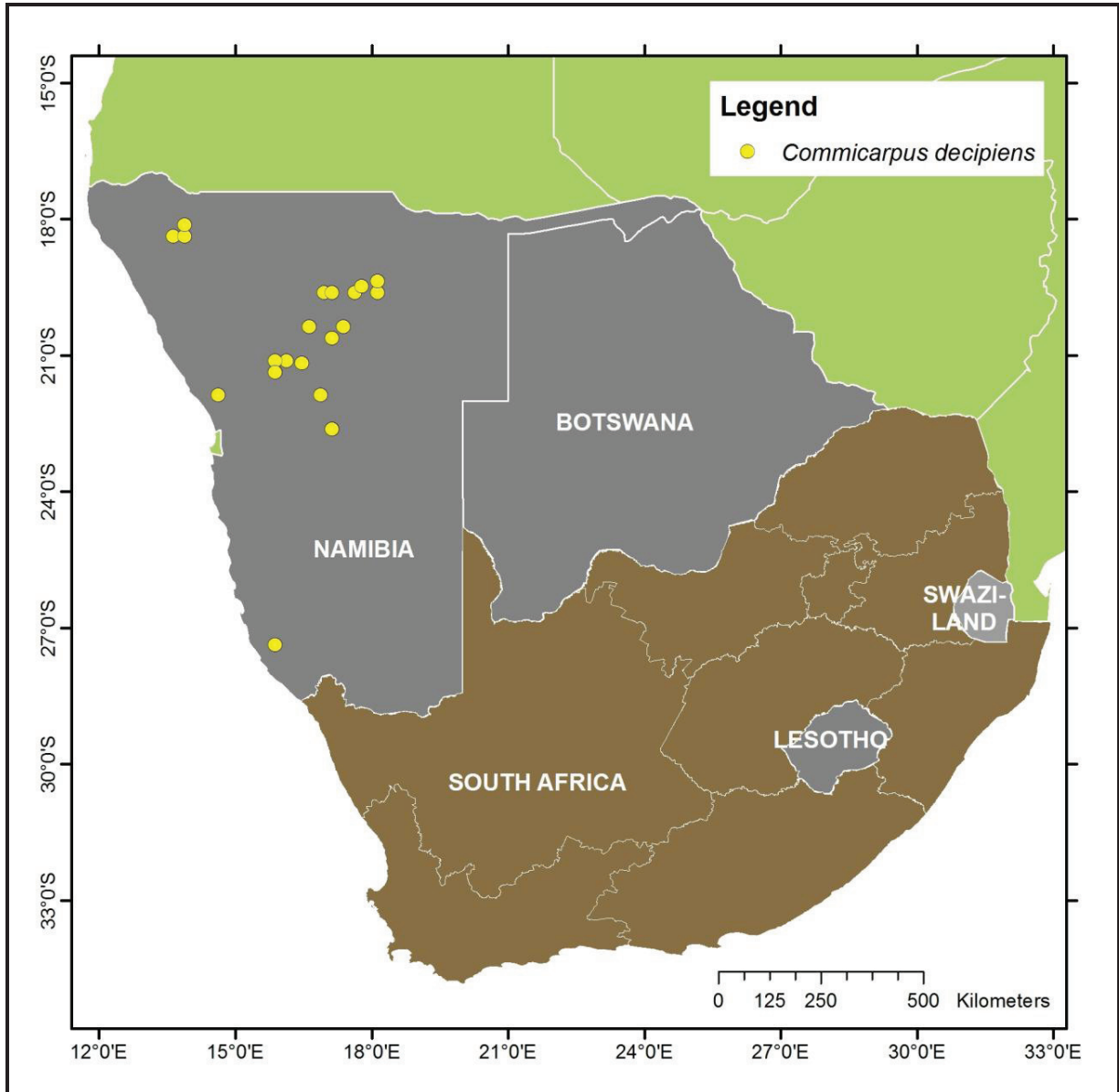


Figure 8.20: Known distribution of *Commicarpus decipiens* in southern Africa.



Figure 8.21: Type specimen of *Commicarpus fallacissimus* (Kew: <http://apps.kew.org/herbcat/getImage.do?imageBarcode=K000243813>).

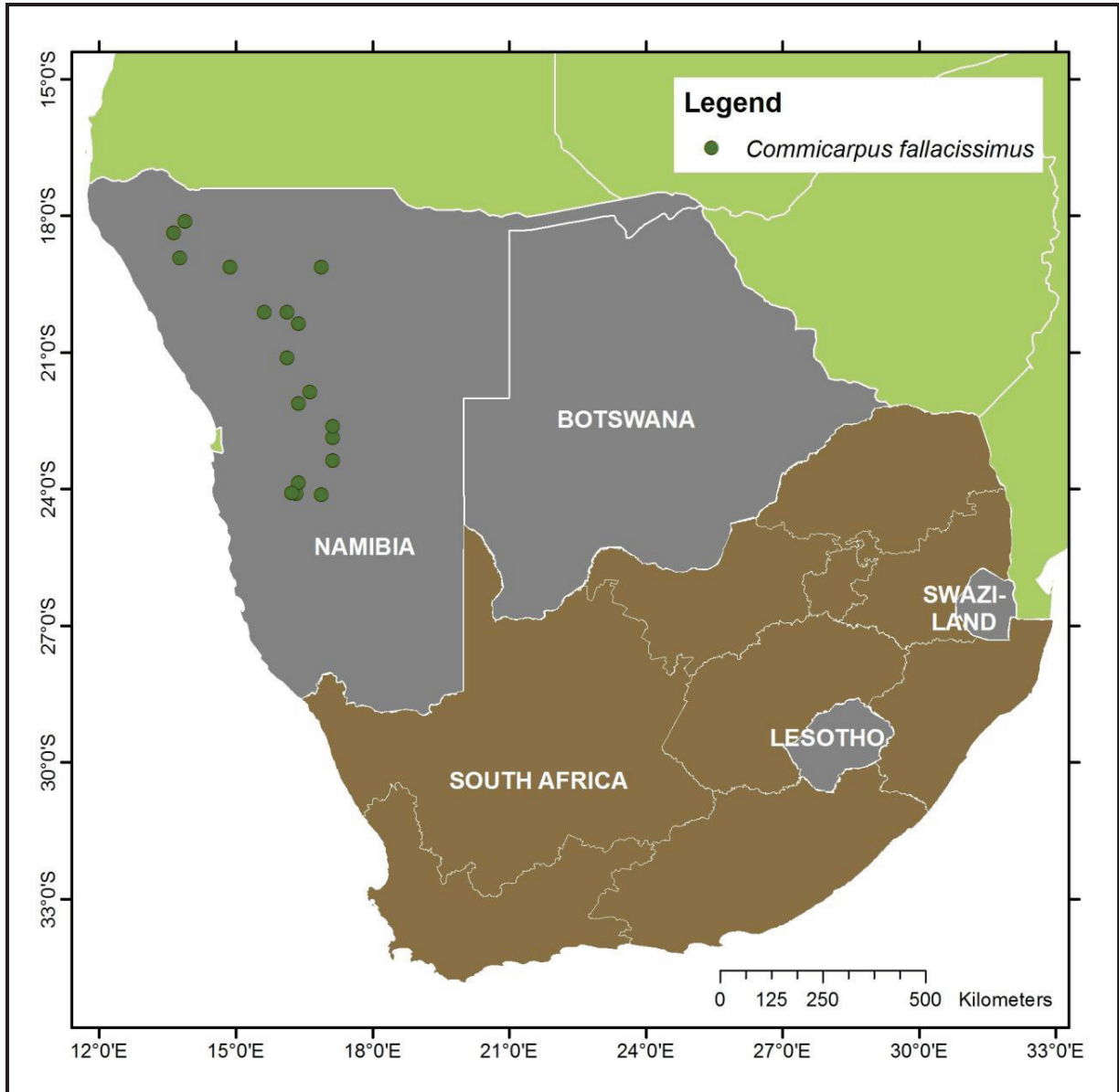


Figure 8.22: Known distribution of *Commicarpus fallacissimus* in southern Africa.



Figure 8.23: Type specimen of *Commicarpus helenae* var. *helenae* (Aluka, 2011).

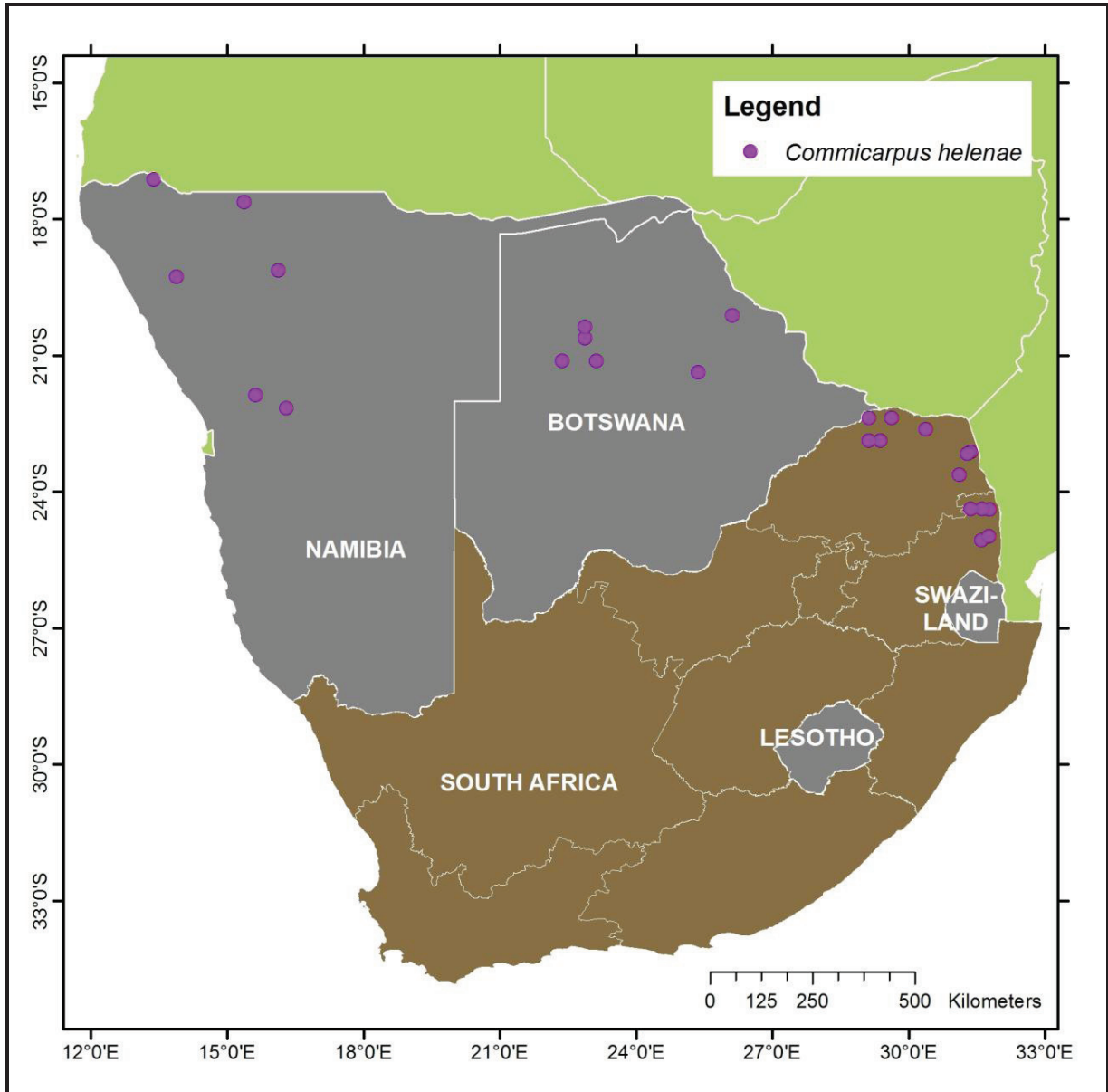


Figure 8.24: Known distribution of *Commicarpus helena* var. *helena* in southern Africa.



Figure 8.25: Type specimen of *Commicarpus pentandrus* (Kew: <http://apps.kew.org/herbcat/getImage.do?imageBarcode=K000243804>).

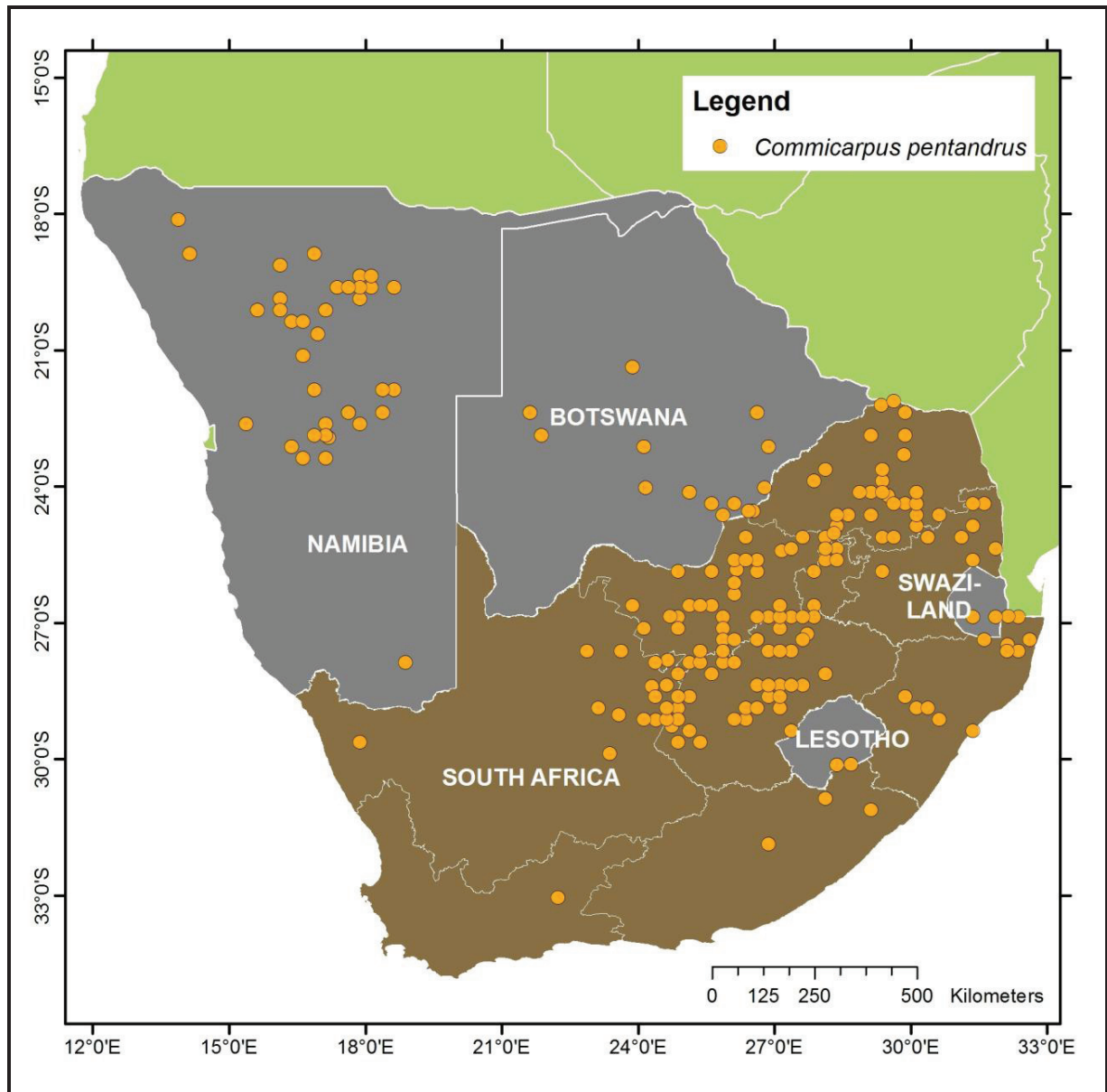


Figure 8.26: Known distribution of *Commicarpus pentandrus* in southern Africa.

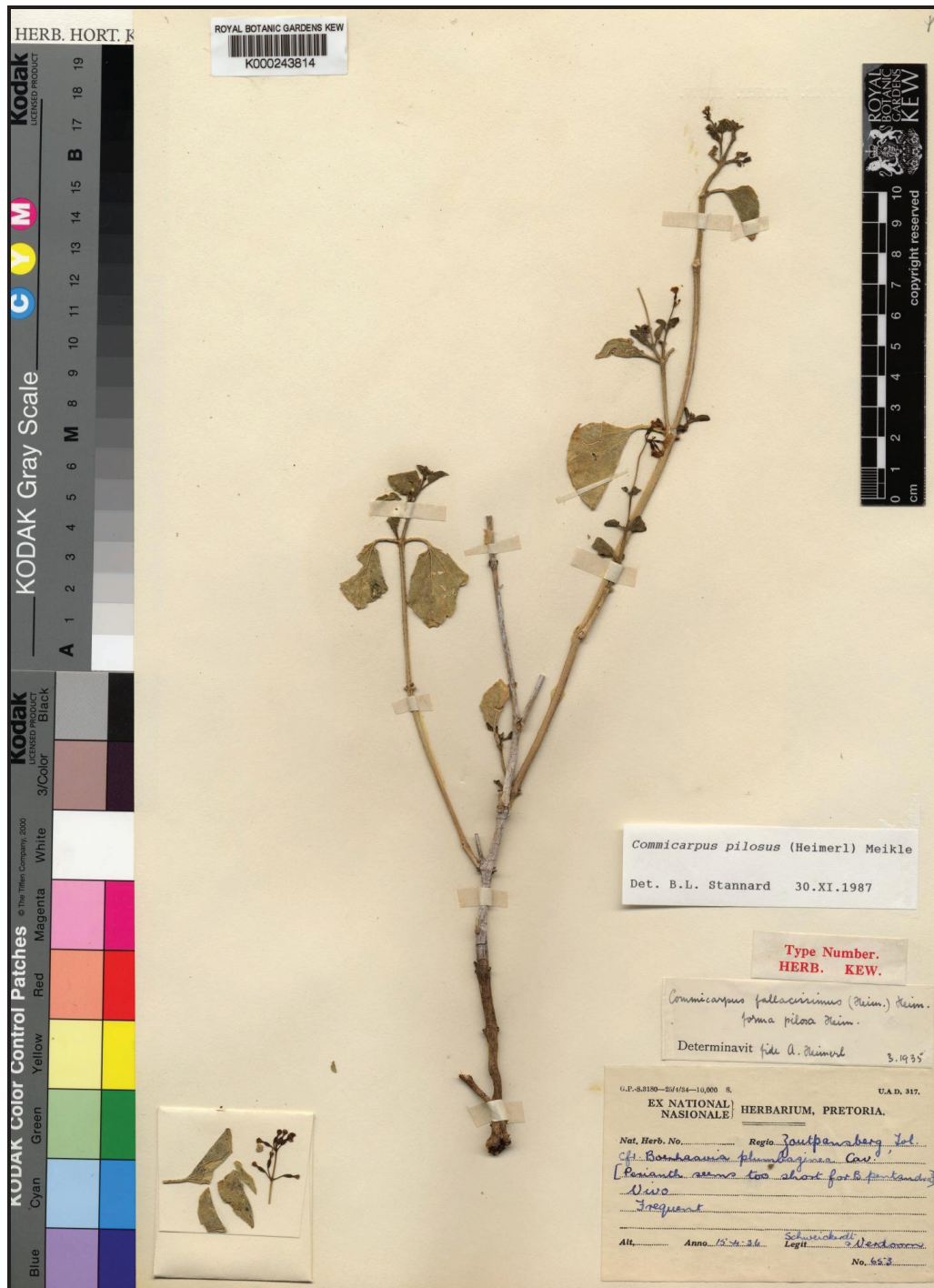


Figure 8.27: Type specimen of *Commicarpus pilosus* (Kew:
<http://apps.kew.org/herbcat/getImage.do?imageBarcode=K000243814>)

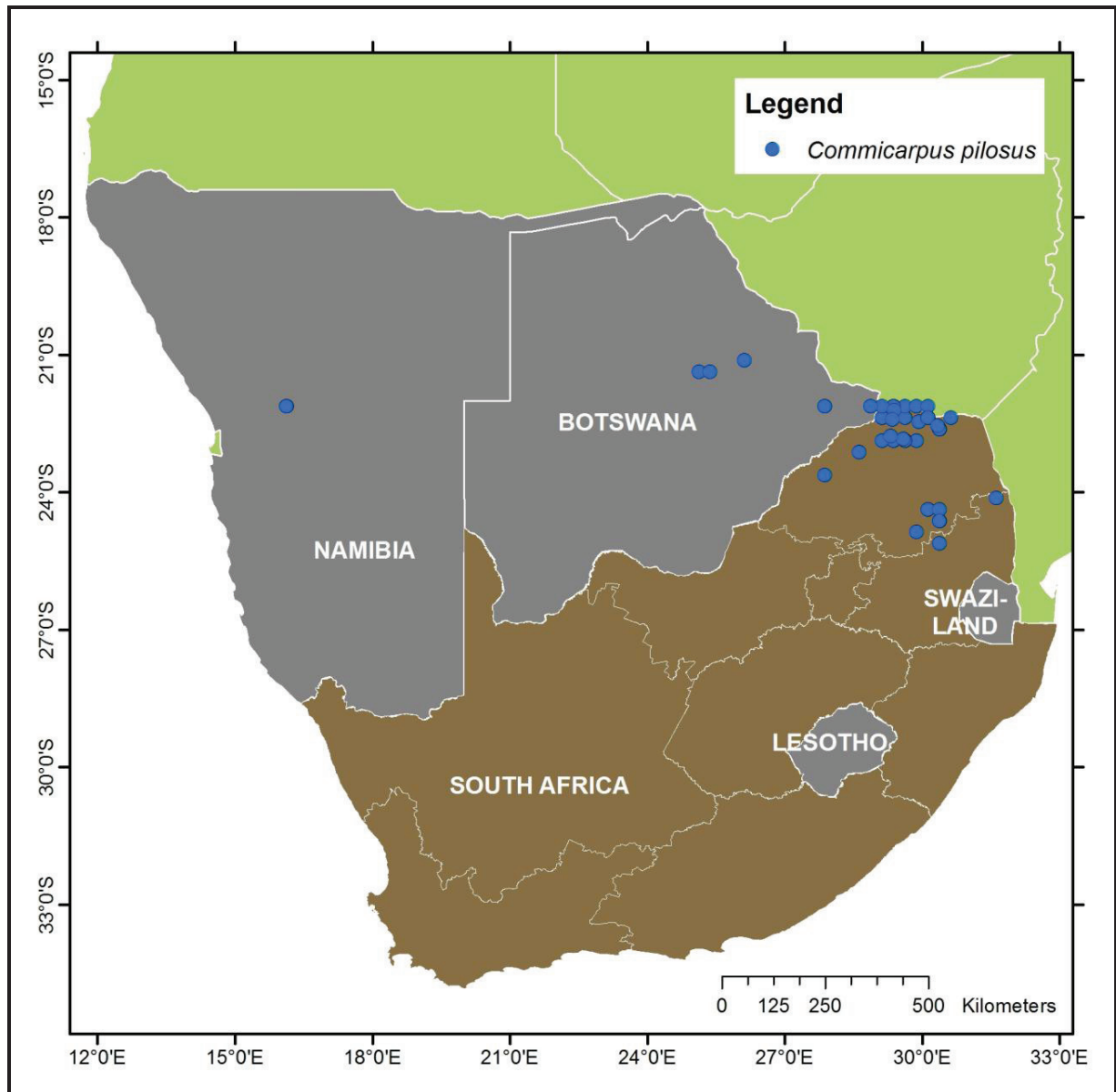


Figure 8.28: Known distribution of *Commicarpus pilosus* in southern Africa.



Figure 8.29: Type specimen of *Commicarpus plumbagineus* (Aluka, 2011).

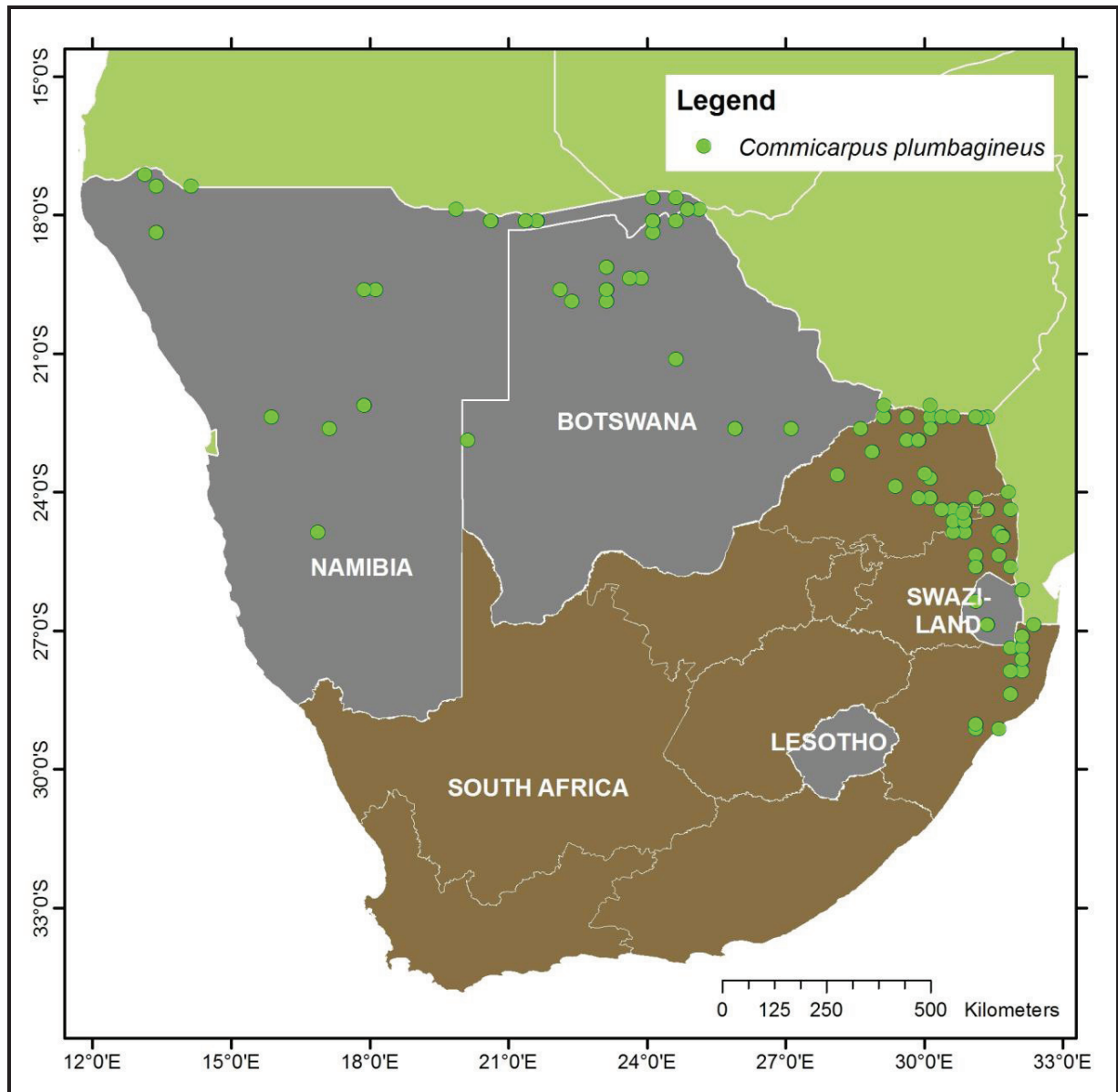


Figure 8.30: Known distribution of *Commicarpus plumbagineus* in southern Africa.

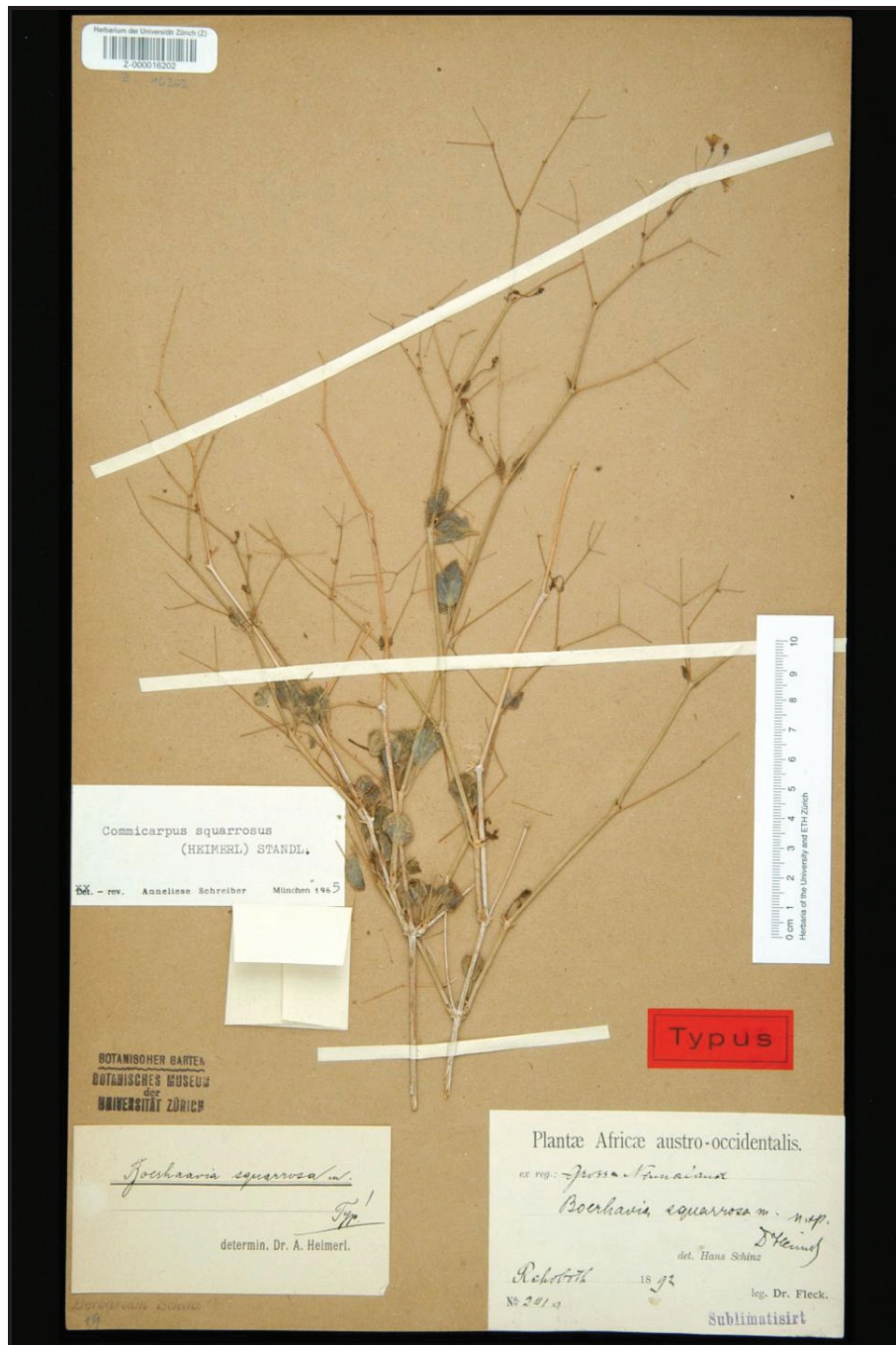


Figure 8.31: Type specimen of *Commicarpus squarrosus* (Zürich herbarium:

[http://www.zuerich-](http://www.zuerich-herbarien.uzh.ch/datenbanken/list.php?l=d&spCouCod=&spTaxFlg=A&spFam=Nyc%25&spGen=&spSpeEpi=&spInfEpi=&spSpeAut=&spColNam=Fleck&spCou=&spTaxFlg=A&spTypFlg=%25&spHer=%25&sort=familie&Submit=Suche)

[herbarien.uzh.ch/datenbanken/list.php?l=d&spCouCod=&spTaxFlg=A&spFam=Nyc%25&spGen=&spSpeEpi=&spInfEpi=&spSpeAut=&spColNam=Fleck&spCou=&spTaxFlg=A&spTypFlg=%25&spHer=%25&sort=familie&Submit=Suche](http://www.zuerich-herbarien.uzh.ch/datenbanken/list.php?l=d&spCouCod=&spTaxFlg=A&spFam=Nyc%25&spGen=&spSpeEpi=&spInfEpi=&spSpeAut=&spColNam=Fleck&spCou=&spTaxFlg=A&spTypFlg=%25&spHer=%25&sort=familie&Submit=Suche)).

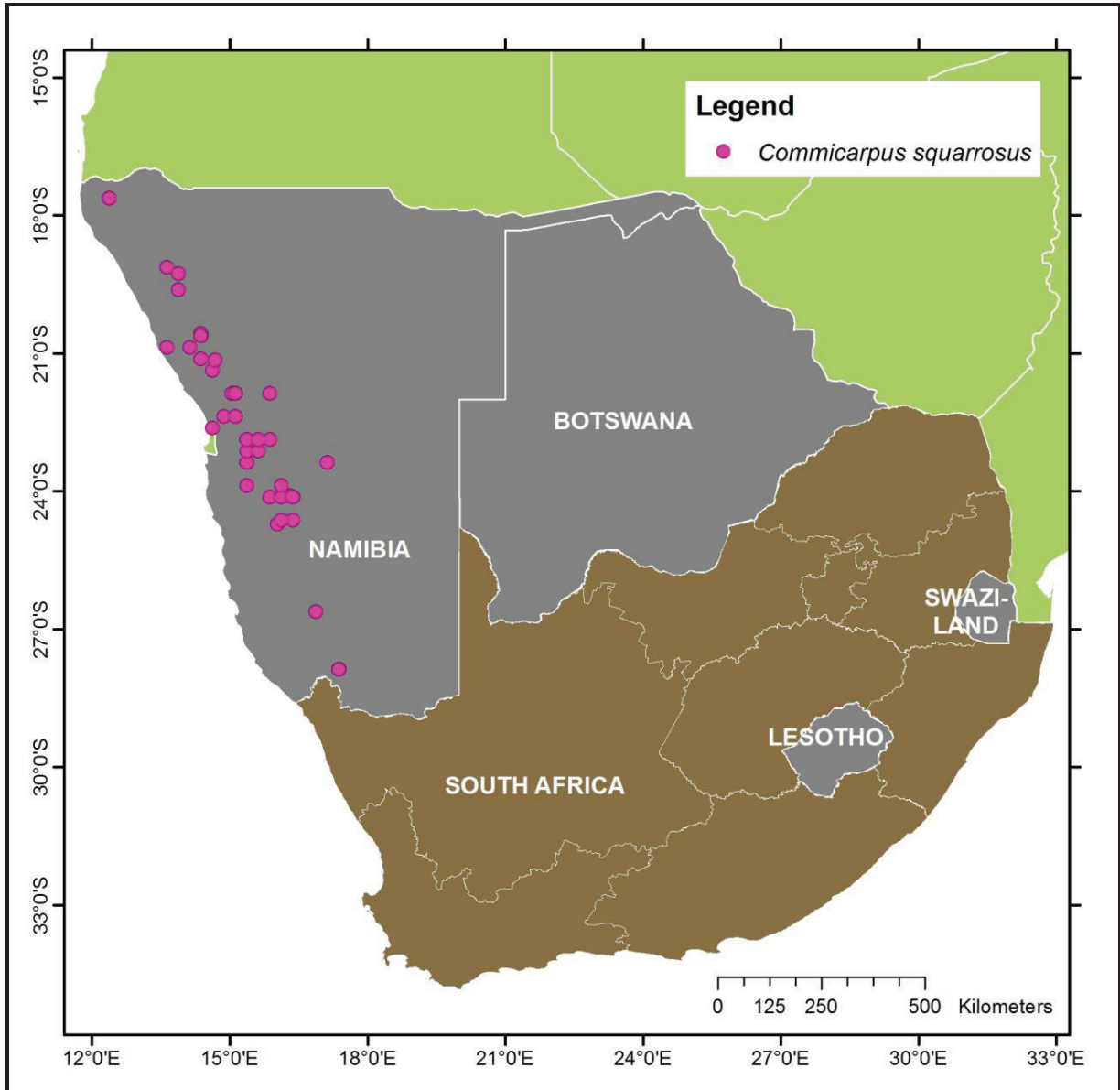


Figure 8.32: Known distribution of *Commicarpus squarrosus* in southern Africa.