

***Cylindropuntia fulgida* (Engelm.) F.M.Knuth var. *fulgida* (Cactaceae) is naturalized and spreading in Zimbabwe**

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Summary: There is lack of historical information on dates and modes of introduction as well as colonization and invasion processes of exotic plants in Zimbabwe. *Cylindropuntia fulgida* (Engelm.) F.M.Knuth var. *fulgida* (chain-fruit cholla, family Cactaceae), a native of arid desert of the Guaymas region of Sonora in northwestern Mexico is here recorded as having become naturalized and invasive in south-western areas of Zimbabwe. Notes on residence status, ecology and habitat of *C. fulgida* var. *fulgida* in south-western Zimbabwe are provided. A description and dichotomous key that can be used to distinguish it from the closely related *C. imbricata* (Haw.) F.M.Knuth is provided. The latter species is commonly grown in Zimbabwe while *C. fulgida* var. *fulgida* is spreading and has become firmly established as part of the introduced flora of Zimbabwe.

Zusammenfassung: There is lack of historical information on dates and modes of introduction as well as colonization and invasion processes of exotic plants in Zimbabwe. *Cylindropuntia fulgida* (Engelm.) F.M.Knuth var. *fulgida* (chain-fruit cholla, family Cactaceae), a native of arid desert of the Guaymas region of Sonora in northwestern Mexico is here recorded as having become naturalized and invasive in south-western areas of Zimbabwe. Notes on residence status, ecology and habitat of *C. fulgida* var. *fulgida* in south-western Zimbabwe are provided. A description and dichotomous key that can be used to distinguish it from the closely related *C. imbricata* (Haw.) F.M.Knuth is provided. The latter species is commonly grown in Zimbabwe while *C. fulgida* var. *fulgida* is spreading and has become firmly established as part of the introduced flora of Zimbabwe.

Introduction

Previous research on introduction and naturalization of exotic species in Zimbabwe by Maroyi (2006, 2012) revealed that there is lack of histori-

cal information on dates and modes of introduction, colonization and invasion processes of exotic species. Invasions by alien plant species are known to alter ecosystems and ecological process through a variety of pathways (Vitousek *et al.* 1997), competing with native species in the process. Documentation of the naturalization process of exotic species should include analyses of the taxon's origin, residence and the invasion status (Pyšek *et al.*, 2004). The historical and potential ecological impacts of *Cylindropuntia fulgida* (Engelm.) F.M.Knuth var. *fulgida* and *C. imbricata* (Haw.) F.M.Knuth on natural vegetation in South Africa have been documented by Walters *et al.* (2011). These are to date the only species of *Cylindropuntia* (Engelm.) F.M.Knuth that have been recorded as occurring in Zimbabwe (Hyde *et al.*, 2015), both erroneously ascribed as members of the genus *Opuntia* Mill. Recent fieldwork in the southern parts of Zimbabwe revealed *C. fulgida* var. *fulgida* as having become naturalized (Figure 1).

Site location and invasion status in Zimbabwe

The author encountered *C. fulgida* var. *fulgida* (Figure 1) in December 2011 about 50km from Beitbridge town, along Beitbridge-Bulawayo road, southern Zimbabwe (GPS coordinates: S21°44.214', E29°52.281'), where it has the potential to move from being naturalized to becoming by definition (Pyšek *et al.*, 2004), invasive. According to Pyšek *et al.* (2004), naturalized species are defined as alien species that reproduce consistently without direct human intervention, and invasive aliens as naturalized species producing offspring in large numbers and at considerable distances from the parent plants with the potential to spread over a large area. In 2011, about a hundred individual plants were found mainly on the Beitbridge-Bulawayo roadside, and on a subsequent site visit in October 2015, all the plants had been cleared by the Environmental



Figure 1. *Cylindropuntia fulgida* var. *fulgida* photographed near Beitbridge, southern Zimbabwe.

Photograph: Alfred Maroyi

Management Agency, Zimbabwe (Figure 2). The current habitat of *C. fulgida* var. *fulgida* in Zimbabwe is part of the arid savanna with a mean annual rainfall of less than 400mm and average daily temperatures varying from 5°C to 34°C (Mupangwa *et al.*, 2011). *Cylindropuntia fulgida* var. *fulgida* and a closely related species, *C. imbricata* (Figure 3) have been included in the database of Zimbabwean exotic plants (Hyde *et al.*, 2015) under *Opuntia* genus. *Cylindropuntia fulgida* var. *fulgida* can be distinguished from *C. imbricata* on vegetative morphological as well as reproductive characters, see dichotomous key below.

Elsewhere, *C. fulgida* var. *fulgida* is native to the arid desert of the Guaymas region of Sonora in northwestern Mexico (Felger *et al.*, 2014). However, it has become established and invasive in South Africa where it is thought to have been introduced for horticultural purposes and previously used as a protective hedge around many homesteads (Walters *et al.*, 2011). *C. imbricata* is native to semi-arid environments and also drier sub-tropical and warmer temperate regions of southern USA and high plateaux of northern Mexico (Sanz-Elorza *et al.*, 2006). *Cylindropuntia imbricata* is naturalized and invasive inland and in



Figure 2. *Cylindropuntia fulgida* var. *fulgida* population cleared by the Environmental Management Agency in Beitbridge, southern Zimbabwe.

Photograph: Alfred Maroyi

sub-coastal areas, as well as a weed of roadsides, disturbed sites, pastures, open woodlands, rangelands and grasslands of Australia (Chuk, 2010; Potter & Rutherford, 2013), Europe (Dana *et al.*, 2001), especially the Iberian Peninsula (Sanz-Elorza *et al.*, 2006). In terms of the Alien and Invasive Species (AIS) Regulations, National Environmental Management: Biodiversity Act,



Figure 3. *Cylindropuntia imbricata* planted in Maleme Rest camp, Matobo National Park, western Zimbabwe. Photograph by B.T. Wursten

South Africa (Act no.10 of 2004), both *C. fulgida* var. *fulgida* and *C. imbricata* are declared weeds and invader plant species category 1b, which necessitates their control or removal and destruction if possible (<https://www.pwonline.co.za>). Declared weed and invader plant species category 1b plants cannot be tolerated in South Africa, either in rural or in urban areas and may no longer be planted or propagated and all trade in their seeds, cuttings or other propagative material is prohibited (<https://www.pwonline.co.za>)

Key to the species of *Cylindropuntia* in Zimbabwe

Stems densely spiny, obscured by interlacing spines, 2.5-3.5cm long, barbed, covered with whitish, papery sheaths, flowers pink, fruits fleshy, smooth to shallowly tubercled, green to yellow-green, sometimes tinged red to purple at maturity, usually forming chains in older plants . . .
 *C. fulgida* var. *fulgida*

Stems not densely spiny, stems not obscured by spines, flowers purplish-red, fruits strongly tuberculate, tubercles of stems widely spaced, 2-5cm high, fruits yellow-green to yellow (sometimes tinged red to purple) or orange-yellow at maturity, spineless, often clustered at end of terminal cladodes, but not proliferating in chains . . *C. imbricata*

Cylindropuntia fulgida (Engelm.) F.M.Knuth var. *fulgida* in BACKEBERG & KNUTH *Kaktus-ABC*: 126 (1936). Walters *et al.* (2011: 113–118); Felger *et al.* (2014: 26–27).
 = *Opuntia fulgida* Engelm. in *Flora of Zimbabwe: Species information* (2015),
 = *Opuntia rosea* DC. in *Flora of Zimbabwe: Species information* (2015) and

= *Cylindropuntia rosea* (DC.) Backeb. in *Flora of Zimbabwe: Species information* (2015), a name that has been misapplied in Zimbabwe.

In literature the following names have been associated with what is considered *C. fulgida* var. *fulgida* in Zimbabwe:

- *Cylindropuntia rosea* (DC.) Backeb. in *Cactaceae* (Backeberg) 1: 197 (1958), *Flora of Zimbabwe: Species information* (2015)
- *Opuntia rosea* DC. in *Prodr.* (A.P. de Candolle) 3: 471 (1828), *Flora of Zimbabwe: Species information* (2015)
- *Opuntia fulgida* Engelm. in *Proc. Amer. Acad. Arts* 3: 306 (1856), *Flora of Zimbabwe: Species information* (2015),

Description

Shrub to small tree 1–3m tall, trunk well developed and seldom straight, usually 20–25cm diameter, often with several major branches, branching divaricate, branch segments ovoid to narrowly ovoid-cylindric, 6–23 × 2–3.5cm, glaucescent, terminal segments easily detached, tubercles salient, 8–13 (–19)mm tall, broadly ovoid, strongly mamillate, obscured by longer and denser spines that are interlaced with spines from adjacent tubercles, areoles with gold or brown wool, glochidia 1–3mm long, yellow. Cladode segments break off easily, detaching at the slightest touch and take root and grow readily. Spines 2.5–3cm long, yellow, sheaths baggy, whitish to yellowish. Flowers opening late afternoon, 2.5–5cm wide, inner tepals obovate to ligulate, usually recurved, pink to magenta, spreading widely and sometimes curling back. Flower buds form from the previous year's fruit. The tepals, stamens and style usually fall as a unit. Filaments bright purplish pink, the inner filaments, stigma and anthers usually white. Fruit obovoid, 2-5.5 × 1.3–4.5cm, obscurely tuberculate, mostly spineless, fleshy, grey-green, usually persisting for several years and proliferating in hanging chains.

Common names: Chain-fruit cholla, jumping cholla (English)

Distribution: *Cylindropuntia fulgida* var. *fulgida* is considered naturalized in Botswana and South Africa (Walters *et al.*, 2011). In Zimbabwe, *C. fulgida* var. *fulgida* is known to be naturalized on roadsides, open woodlands and rocky hills in south-western Zimbabwe.

Voucher: Zimbabwe, Beitbridge district, 50km from Beitbridge town, along Beitbridge-Bulawayo road, S21°44.214', E29°52.281', roadside, rocky in dry savanna vegetation dominated by *Acacia nigrescens* Oliv., *Dichrostachys cinerea* (L.) Wight & Arn., *Sclerocarya birrea* (A.Rich.) Hochst. and *Kirkia acuminata* Oliv., 7 October 2015, A Maroyi 1220 (UFH).

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