doi: 10.1017/S0960428619000076

STUDIES IN THE FLORA OF ARABIA: XXXII. *VACHELLIA PENNIVENIA* (LEGUMINOSAE: MIMOSOIDEAE) – A LITTLE-KNOWN TREE SPECIES ENDEMIC TO THE ISLAND OF SOCOTRA

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A new combination in *Vachellia* is published for *Acacia pennivenia*. A summation of the current state of knowledge of this Socotran endemic species is presented, including a morphological description, a distribution map and an updated conservation assessment. Colour photographs and a black-and-white line drawing are presented.

Keywords. *Acacia*, Fabaceae, island endemic, *IUCN Red List*, new combination, Socotra, *Vachellia*, Yemen.

Introduction

Traditionally, *Acacia* Miller has been recognised as a broadly circumscribed, morphologically variable pantropical genus of about 1500 species (Lewis *et al.*, 2005). More recently, molecular studies have shown that *Acacia sensu lato* is polyphyletic and comprises at least five distinct genera: *Acacia sensu stricto*, *Acaciella* Britton & Rose, *Mariosousa* Seigler & Ebinger, *Senegalia* Rafinesque and *Vachellia* Wight & Arnott (Miller *et al.*, 2003; Seigler *et al.*, 2006; Miller & Seigler, 2012). Consequently, many species previously accommodated within *Acacia sensu lato* have been transferred to one of the other four genera, and in the majority of cases a new combination within the appropriate genus has been published. Several such new combinations were made for former *Acacia sensu lato* species native to Socotra, Republic of Yemen (Ragupathy *et al.*, 2014), but the authors overlooked the need for a new combination for *Acacia pennivenia* Schweinf., a Socotran endemic species. We make that combination here and designate a lectotype. This combination is required for the recently revised *IUCN Red List* assessments of trees and endemic species of the Arabian Peninsula and reassessments of selected taxa for the Socotra (also spelled Soqotra) Archipelago.

Materials and Methods

Data regarding this species have been collated from published and unpublished data sets held by the Centre for Middle Eastern Plants at the Royal Botanic Garden Edinburgh (RBGE). Anatomical measurements are derived from herbarium holdings at RBGE (E). Morphological terminology follows Hickey & King (2000). Estimates of the extent of occurrence (EOO) and area of occupancy (AOO) of each species were made using

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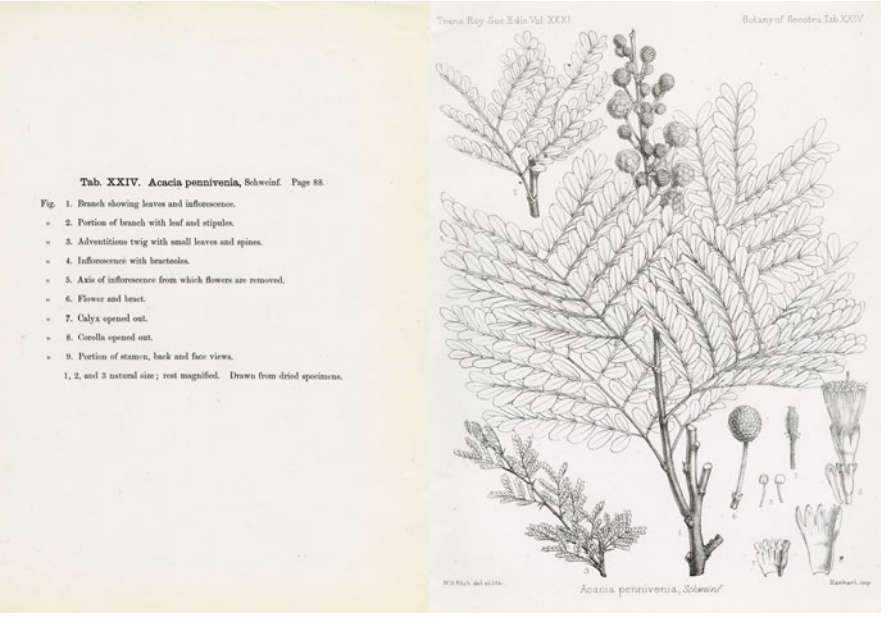

FIG. 1. Line drawing of *Vachellia pennivenia* (as *Acacia pennivenia*) reproduced from *Botany of Socotra*, t. 24 (Balfour, 1888).

GeoCAT (Bachman *et al.*, 2011). Distribution maps and GeoCAT calculations are based on occurrence data derived from herbarium specimen collection localities and from field observations. We include a line drawing of the taxon first presented by Balfour (1888). An updated description of the species is provided below.

NOMENCLATURE AND TAXONOMY

Vachellia pennivenia (Schweinf.) F.L.Anderson & Knees, **comb. nov.** – *Acacia pennivenia* Schweinf., Proc. Roy. Soc. Edinb. 12: 404 (1884). – Type: Socotra, Wadi Digal, 23 iv 1881, *Schweinfurth* 519 (lecto K [K000244273], designated here). **Figs. 1, 2.**

Tree to 5 m. *Bark* rough, brown, with pale yellow lenticels, branchlets finely striate, tawny brown or grey to purplish brown when immature, glabrous to pubescent, with scattered rusty brown to pale yellow ovate lenticels, c.1 mm long. *Stipular spines* in pairs or absent, c.1.5–3 mm long, straight, tawny brown, pubescent with rusty grey hairs. *Leaves* bipinnate, glabrescent to shortly pubescent along the petiole, rachis and rachillae; petiole (5–)12–35(–40) mm long, flattened, grooved, rusty brown to grey-green with prominent dark red midrib on underside, particularly evident in dried material; rachis 8–26(–35) mm long, flattened, grooved, grey-green with prominent dark red-purple midrib on underside; glands when present single, circular, 0.5–1 mm in diameter, rusty orange, occasionally at the point of insertion of the top pair of pinnae or rarely on the rachillae at the point of insertion of the top pair of leaflets; pinnae usually 2 pairs (rarely 3), grey-green with darkened midrib along

FIG. 2. *Vachellia pennivenia*. A, Habitat and habit; B, inflorescences at various stages of development; C, immature pod; D, fallen pods. (Photographs: A and D, Lisa Banfield; B, Anthony Miller; C, Petr Maděra.)

underside of rachilla; leaflets 6–11 pairs, oblanceolate, 6–16 × 2–4.5 mm, opposite or subopposite, shortly puberulous at base, particularly on underside, base variable, apex rounded to abruptly acute, occasionally mucronulate, rugose, yellow or grey-green above, yellow or grey-green below, midvein purplish black often with reddish secondary veins. *Inflorescence* an axillary cluster of pedunculate heads. *Flowers* in heads 4.5–11 mm in diameter, creamy white to pale yellow; peduncle 10–20 mm; involucel within the lower 2/3 of the peduncle; calyx 1–2 mm long; corolla 2–3 mm long; stamen filaments 2.5–4.5 mm long. *Pods* unknown from herbarium collections but see notes below.

Habitat. Occurs in a variety of habitats throughout Socotra, but mostly as a component of drought deciduous woodland at lower elevations and less commonly in semi-evergreen woodland above 500 m. In places it may be codominant with *Croton socotranus* Balf.f. and *Jatropha unicostata* Balf.f. It is often found on rocky slopes and gravel in the unique succulent shrubland of Socotra with *Dendrosycios socotrana* Balf.f. and *Adenium obesum* (Forssk.) Roem. & Schult. Fig. 2A.

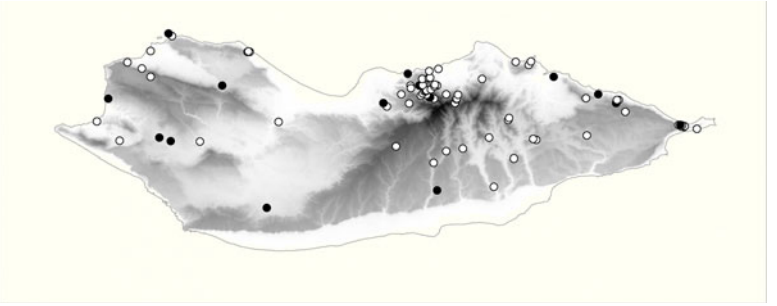

FIG. 3. Distribution of the endemic Socotran species *Vachellia pennivenia*. Closed circles, localities based on herbarium records; open circles, localities based on field observations.

Distribution. Socotra, Republic of Yemen (endemic). Fig. 3.

Field characters. Leaves may be succulent or not in appearance. Typically 2 pairs of pinnae, rarely 3. Stipular spines short, sometimes absent. Distinct but unspecified odour on cutting twigs. Flower heads white or cream-coloured.

Balfour (1888) provisionally recorded the presence of an *Entada* species on Socotra. He described the putative *Entada* species as "a beautiful and graceful tree of which our material is too fragmentary to permit identification" and cited a single voucher, *Balfour, Cockburn & Scott* 635. No specimen has been traced and the identity of the taxon remains uncertain. However, Balfour (1888) also noted that the taxon had some resemblance to *Acacia pennivenia* Schweinf. and shared the same local name of *tomhor*. No species of *Entada* has since been recorded from the island, and Miller & Morris (2004) concluded that it is likely that Balfour's plant was in fact *Acacia pennivenia*.

In 2008, during fieldwork in Socotra near Irisal (Fig. 2A), pods were seen on the ground in the close vicinity of individuals of *Vachellia pennivenia* (L. Banfield, Al Ain Wildlife Park & Resort, Abu Dhabi, personal communication). Banfield's photograph (Fig. 2D) shows pods that are linear, compressed and up to about 15 × 0.7 cm. These may represent the first record of mature pods of *Vachellia pennivenia*. We have since seen a photograph of a developing pod, taken by Petr Maděra on Socotra in 2009, and this is now reproduced here (Fig. 2C).

The species is common in the succulent shrubland of Socotra, and it is noted that the leaves seem to develop thickening and succulence with age. This is a trait shared by several of the plants that grow in this community and is probably an adaptation to desiccation caused by the extremely drying winds of the summer monsoon. This observed succulence is not a feature generally found in *Acacia sensu lato* or *Vachellia*.

CONSERVATION

Vachellia pennivenia is assessed here as Least Concern (LC) under the criteria version 3.1 of the IUCN (IUCN, 2012). At just under 3000 km^2, the estimated EOO of this species falls within the Endangered (EN) threshold of less than 5000 km^2 for criterion B1, as does the

estimated AOO, at only 244 km^2 for a threshold of less than 500 km^2. However, we do not consider *Vachellia pennivenia* to warrant placement within a threatened category, because current evidence indicates that the species does not fulfil the other conditions. Namely, (a) *Vachellia pennivenia* is not severely fragmented, occurring widely across the island (see Fig. 3), and as such the known potential threats are unlikely to apply across the entire range, (b) no continuing decline in population has been observed, and (c) extreme fluctuations in any of the listed categories do not usually apply to long-lived tree species.

Previously, *Vachellia pennivenia* (as *Acacia pennivenia*) was listed as Vulnerable (VU D2) by Oldfield *et al*. (1998), using criteria version 2.3, and as Near Threatened (NT) by Miller & Morris (2004), also using criteria version 2.3. In their justification, Miller & Morris (2004) described *Vachellia pennivenia* as abundant but regularly lopped for livestock fodder and browsed in dry periods. It was noted that should livestock numbers increase greatly, or a succession of drought years occur, then this species could become increasingly threatened. Concerns expressed by Miller & Morris (2004) about the impact of droughts remain, but conversely, data gathered in the interim period show that *Vachellia pennivenia* is more widely distributed than previously thought and occurs in a more diverse range of habitats, with no reports of sustained decline in any of those habitats.

Consequently, based on our current data and understanding of threats, we consider the conservation status of *Vachellia pennivenia* to be Least Concern (LC).

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Acknowledgements

We are grateful to the RBGE Sibbald Trust for funding the first author (F.A.). We would also like to thank Barbara Mackinder for advice on the nomenclature, as well as Lisa Banfield, Anthony Miller and Petr Maděra for the use of their photographs. The RBGE is supported by the Scottish Government's Rural and Environmental Science and Analytical Services Division.

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Received 29 September 2018; accepted for publication 18 February 2019; first published online 16 May 2019