

**Chapter 7.**  
**A monograph of the Oliniaceae**

**R. J. Sebola<sup>1, 2</sup> and K. Balkwill<sup>1</sup>**

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<sup>1</sup> C. E. Moss Herbarium, School of Animal Plant and Environmental Sciences, P/Bag 3, University of the Witwatersrand, WITS, 2050, South Africa.

<sup>2</sup> Corresponding author: Email: [Ramagwai.Sebola@students.wits.ac.za](mailto:Ramagwai.Sebola@students.wits.ac.za)

## Abstract

Morphological variation within the Oliniaceae is discussed with reference to diagnostic characters used to delimit species and infraspecific taxa. The Oliniaceae is hereby considered to comprise a single genus, *Olinia* Thunb. with ten species assigned to two sections: Sect. *Olinia*, and Sect. *Rochetiana*. The two sections are distinguishable on the basis of the pattern of leaf venation, shape of leaves and petals. Section *Olinia* comprises *O. capensis*, *O. emarginata*, *O. micrantha*, *O. ventosa*, *O. radiata* and *O. vanguerioides*; whereas Section *Rochetiana* includes *O. huillensis*, *O. rochetiana*, *O. ruandensis* and *O. usambarensis*. *Olinia huillensis* Welw. shows infraspecific variation categorised as *O. huillensis* subsp. *huillensis*, *O. huillensis* subsp. *burttdavii* and *O. huillensis* subsp. *discolor* occurring mainly in southern Africa. Floral features provide useful and reliable distinguishing characters that consistently separate taxa at specific and infraspecific ranks. In particular, the following features are taxonomically useful: flowers which are organised into either tightly compact inflorescences or loose and open inflorescences, floral whorls comprising either four or five units; and variation in the shape and length of petal lobes. A full taxonomic account of *Olinia* over its total geographic distribution is provided with an identification key, descriptions, illustrations and distribution maps for all recognised taxa.

**Key words:** Morphology, *Olinia*, Oliniaceae, species, subspecies, variation.

## Introduction

The Oliniaceae is a monogeneric core Myrtalean family (Dahlgren & Thorne 1984; Conti *et al.* 1996; Conti *et al.* 1997; APG 1998; Clausing & Renner 2001; Jansen *et al.* 2002; Schönenberger & Conti 2003; Judd & Olmstead 2004) of trees and shrubs endemic to the African continent; and is characterised by quadrangular branches and branchlets, flowers organised in triads, and an inflorescence placement that is axillary and or terminal. Ovaries are inferior and support a long tube or hypanthium which ends in four or five teeth/ridges and an equal number of linear or spatulate coloured lobes. There are 4 or 5 stamens inserted at the throat of the hypanthium below hooded scales. The fruits are drupaceous, vary in size and persistently show a scar from a caducous hypanthium. The protologue of *Olinia* seems to be based on two elements (Figure 1): a Linnaean specimen (LINN 277.1 and LINN 277.2) and Burmann's (1738) figure (t. 94 opposite p. 257) of a shrub for the fruit characters (Bullock 1932). Burmann's (1738) figure is also associated with Linnaeus's (1767) *Plectronia* L., but *Plectronia sensu* DC is a different genus and a synonym of Lamarck's (1795) *Canthium*. Thunberg's description of *Olinia* was based on *O. cymosa* (L.f.) Thunb. (Thunberg 1799) from South Africa, which is then the type. According to the International Code of Botanical Nomenclature (Greuter *et al.* 2000; McNeill *et al.* 2006), the name *Olinia* is conserved against *Plectronia* L. with the specimen in the Linnaean Herbarium regarded as the lectotype of *Plectronia*. Therefore, the name *Plectronia* L. is treated as a synonym of *Olinia* Thunb. Arnott (1839) and Decaisne (1877) associated *Olinia* with a loose group comprising the genera *Myrrhinium* and *Fenzlia* intermediate between Melastomataceae and Lythraceae. *Olinia* was formerly placed under Lythraceae by Bentham and Hooker (1867), although these authors pointed to its being an anomalous genus in that family. Baillon

(1877), however, accorded *Olinia* tribal status, Olinieae, close to Hyppocrateae within the Celastraceae.

The most comprehensive revision of the family to date is that of Cufodontis (1960) who recognised ten species, one of which (*O. ventosa* (L.) Cufod) was newly described. In addition, revisions have been produced for particular regions (Table 1 and Fernandes & Fernandes 1962; Verdcourt 1975 & 1978; Verdcourt & Fernandes 1986). In both *Flora Zambesiaca* (Verdcourt 1978) and the *Flora of Mozambique* (Verdcourt & Fernandes 1986) two species, *O. vanguerioides* and *O. rochetiana*, are recognised and the latter species is treated as a highly variable complex representing all taxa occurring in east tropical Africa. These treatments and categorisations of variation have provided a convenient system for distinguishing groups of species on the basis of readily observable morphological features.

Both Verdcourt and Cufodontis relied on the limited sample of herbarium specimens available to them to make taxonomic decisions. Perusal of these specimens indicates that most lack basic information regarding habit and habitat. This has led to species limits and concepts in *Olinia* being too broad, thus requiring re-evaluation. Access to, and examination of new material of *Olinia* that has recently been accumulated has increased the need to critically re-assess the species limits. Coupled with this, is a problem of non-typification of names, which has led to misapplication of names to taxa, and names simply being adopted without critical examination of the specimens cited. Sonder (1862) recognised only one species for the *Flora capensis* region, *O. cymosa* Thunb., with three varieties (var. *latifolia*, var. *intermedia* and var. *acuminata*) differentiated on the basis of leaf shape. Further examination and analysis of *Olinia* material from southern Africa is

necessary to re-evaluate and assess the taxonomic position of these taxa. Although the revisions of Oliniaceae by Verdcourt (1975 & 1978) and Cufodontis (1960) have contributed enormously towards our understanding and knowledge of the family, both are rather out of date and have thus become inadequate and limited with regard to categorisation of variation and apparent morphological discontinuities on new material that has accumulated since their publication. Here we present a modern, up to date revision of the Oliniaceae worldwide that provides a critical re-appraisal of the family, including full descriptions, illustrations, a key to all taxa recognised and maps of their distribution.

## **Materials and Methods**

This revision is based on observations, descriptions and measurements obtained from specimens of *Olinia* housed at J, and supplemented by specimens on loan from the following herbaria: B, BM, BOL, ETH, K, PRE, SAM (abbreviations after Holmgren *et al.* 1990). Field studies were undertaken on populations of *Olinia* occurring in South Africa to observe habit and habitat features, obtain information on colour and shapes, and to measure interspecific and infraspecific variation at population level. Micromorphology of the leaves, floral parts and pollen were examined with the aid of the light microscope and, where necessary, a Scanning Electron Microscope. Locality information on specimen labels was used to generate distribution maps for each taxon recognised. The type specimens, cited specimens and literature were studied to gain understanding and knowledge of each author's concept of taxa. Keys were generated to aid in the identification of taxa.

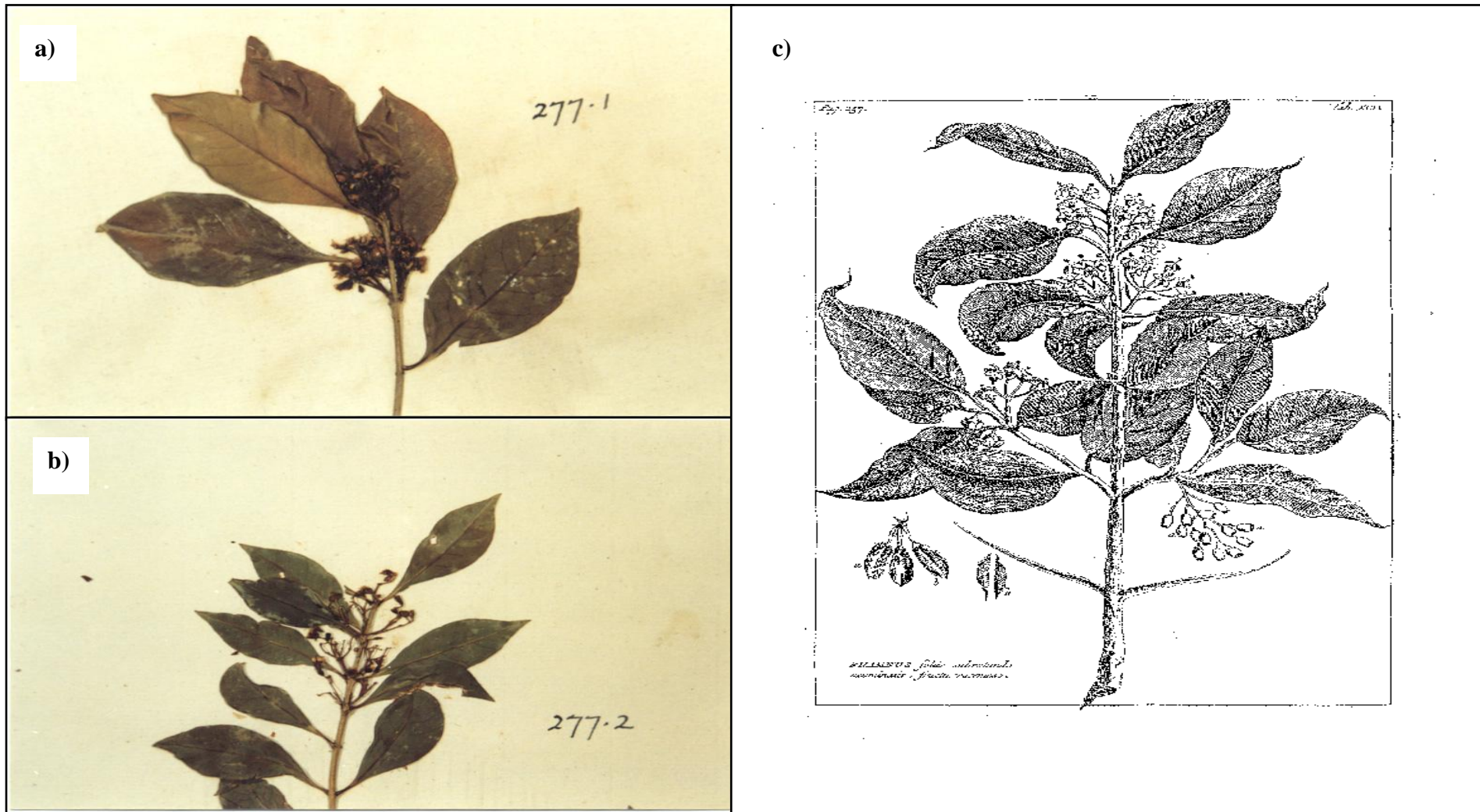


Figure 1. Material used by Linnaeus (1767) to typify *Olinia*: a & b) photographs of Linnaean specimens (LINN 277.1 and LINN 277.2 from the Linnaean Herbarium, London); c) Burman's (1738) figure.

Table 1. Previous accounts of the family Oliniaceae (updated from Sebola & Balkwill, 1999).

Date	Author(s)	Region	Recognised taxa (and synonyms)
1862	Sonder	South Western Cape	<i>O. cymosa</i> Thunb., <i>O. cymosa</i> var. <i>cymosa</i> , var. <i>latifolia</i> , var. <i>acuminata</i> , var. <i>intermedia</i> , <i>O. emarginata</i> , <i>O. radiata</i> .
1921	Hofmeyr & Phillips	Southern Africa	<i>O. cymosa</i> Thunb., <i>O. acuminata</i> (= <i>O. cymosa</i> var. <i>acuminata</i> ), <i>O. radiata</i> .
1871	Hiern	Tropical Africa	<i>O. ventosa</i> (= <i>O. cymosa</i> ). He noted its close similarity with <i>O. rochetiana</i> .
1926	Burt Davy	Fomer Transvaal (now Mpumalanga, Limpopo and Gauteng provinces) and Swaziland	<i>O. emarginata</i> (= <i>O. micrantha</i> non Dec.), <i>O. usambarensis</i> Gilg. (= <i>O. cymosa</i> non Thunb.).
1975	Verdcourt	Tropical East Africa	<i>O. rochetiana</i> (= <i>O. aequipetala</i> , <i>O. cymosa</i> , <i>O. discolor</i> , <i>O. huillensis</i> , <i>O. macrophylla</i> , <i>O. ruandensis</i> , <i>O. usambarensis</i> , <i>O. volkensii</i> , <i>O. vanguerioides</i> ).
1978	Verdcourt	Zambesiaca	<i>O. rochetiana</i> , <i>O. vanguerioides</i> .
1986	Verdcourt & Fernandes	Mozambique	<i>O. rochetiana</i> , <i>O. vanguerioides</i> .
2000	Palgrave & Palgrave	Southern Africa	<i>O. rochetiana</i> , <i>O. vanguerioides</i> , <i>O. ventosa</i> , <i>O. emarginata</i> , <i>O. radiata</i> , <i>O. capensis</i> , and <i>O. micrantha</i> .
2002	Schmidt, Lotter & McClelland	South Africa (Kruger Park and Mpumalanga province)	<i>O. radiata</i> , <i>O. rochetiana</i> , and <i>O. emarginata</i> .
2006	Sebola & Balkwill	South Africa (Mpumalanga & Limpopo provinces)	Two forms (Infra-specific variation) within <i>O. rochetiana</i> A. Juss.: form 1, a shrubby form up to 2.5 m tall with thick terminal branches, coreaceous leaves, and deeply red floral tubes; and form 2, a slender tree form more than 4 m tall with thin, papery leaves, and hypanthia pale green to creamy white.
2009	Sebola & Balkwill	Tropical and sub-tropical Africa	<i>O. vanguerioides</i> , <i>O. ruandensis</i> , <i>O. rochetiana</i> , <i>O. usambarensis</i> , <i>O. huillensis</i> subsp. <i>huillensis</i> , <i>O. huillensis</i> subsp. <i>burttdavii</i> and subsp. <i>discolor</i> .

## **Morphological variation in *Olinia***

Morphological characters such as habit and leaf morphology are often plastic and affected by environmental changes (Stace 1989; Stuessy 1990). There is often a high level of subjectivity associated with the use of morphological characters, thus masking their usefulness; and often this information is incorrectly recorded on herbarium sheets. Despite the subjectivity with which morphological characters are treated, they have been found to be useful in the taxonomy of Oliniaceae at specific (Verdcourt 1975 & 1978; Cufodontis 1960; Sebola & Balkwill 1999) and infra-specific ranks (Sebola & Balkwill 2006). On the basis of habit, gross morphology and micro-morphological features, distinctions can be made among species groups within *Olinia*.

### Habit

An accurate assessment of the taxonomic value of habit cannot be made from herbarium material alone, and thus field observations are often necessary to supplement information from herbarium sheets. All members of the Oliniaceae are woody; most species are large trees (Figure 2), although shrubs with slender branches and stems up to 3 m high are encountered (*O. vanguerioides*, *O. huillensis* subsp. *burttdavii*, and *O. huillensis* subsp. *discolor*). Except for *O. vanguerioides*, almost all the shrubby species have slender, longer and slightly drooping branches. In some species the main stem only branches well above 2 m high, whereas in other species branching occurs well below 1 m above the ground. *O. capensis*, *O. micrantha*, *O. ventosa* and *O. radiata* are the largest species of *Olinia* reaching up to 15 m high. The bark is grey, smooth or rough (especially for shrubby species) and peeling (*O. emarginata*). The wood is heavy and pale brown (Dale & Greenway 1961).

## Leaves

Some species of *Olinia* (*O. vanguerioides*, *O. capensis*, *O. ventosa*, *O. rochetiana* and *O. radiata*) are evergreen and frost resistant whereas others (*O. ruandensis*, *O. usambarensis*, *O. huillensis* subsp. *huillensis*, *O. huillensis* subsp. *discolor*) are deciduous. Leaves are dark-green above, pale to light green below, typically opposite, occasionally ternate (young shoots), simple, and range from distinctly petiolate to sessile. The leaf margins are generally entire and flat, although often slightly inrolled and wavy. Leaf texture varies from: smooth, glossy, coriaceous or leathery; to thin and papery. Stipules are rudimentary in the axils.

On the basis of leaf dimensions, distinction can be made between groups of species, notably the short and narrow-leaved group (*O. emarginata*, *O. micrantha*, and *O. huillensis* subsp. *burttdavii*), the medium-leaved group (*O. ruandensis*, *O. huillensis* subsp. *huillensis*, *O. huillensis* subsp. *discolor*), and the long-leaved group (*O. radiata*, *O. rochetiana sensu stricto* and *O. usambarensis*). The midvein is either channelled above or level with the upper leaf surface, being light green to red as is the case with the petiole. Secondary veins form a network pattern that is either conspicuous or inconspicuous above. The number of secondary veins counted on one side of the midrib, and their angle of branching are useful diagnostic features to determine infra-generic groups. Leaf shapes range from elliptic, obovate to oblanceolate (Figure 3). The apices taper to a blunt, or square, notched or emarginate tip with a short mucro or arista, as an extension of the midrib. Crushed green leaves produce an almond smell, which is more pronounced and pungent in *O. radiata* and *O. huillensis* subsp. *burttdavii* than in other species.

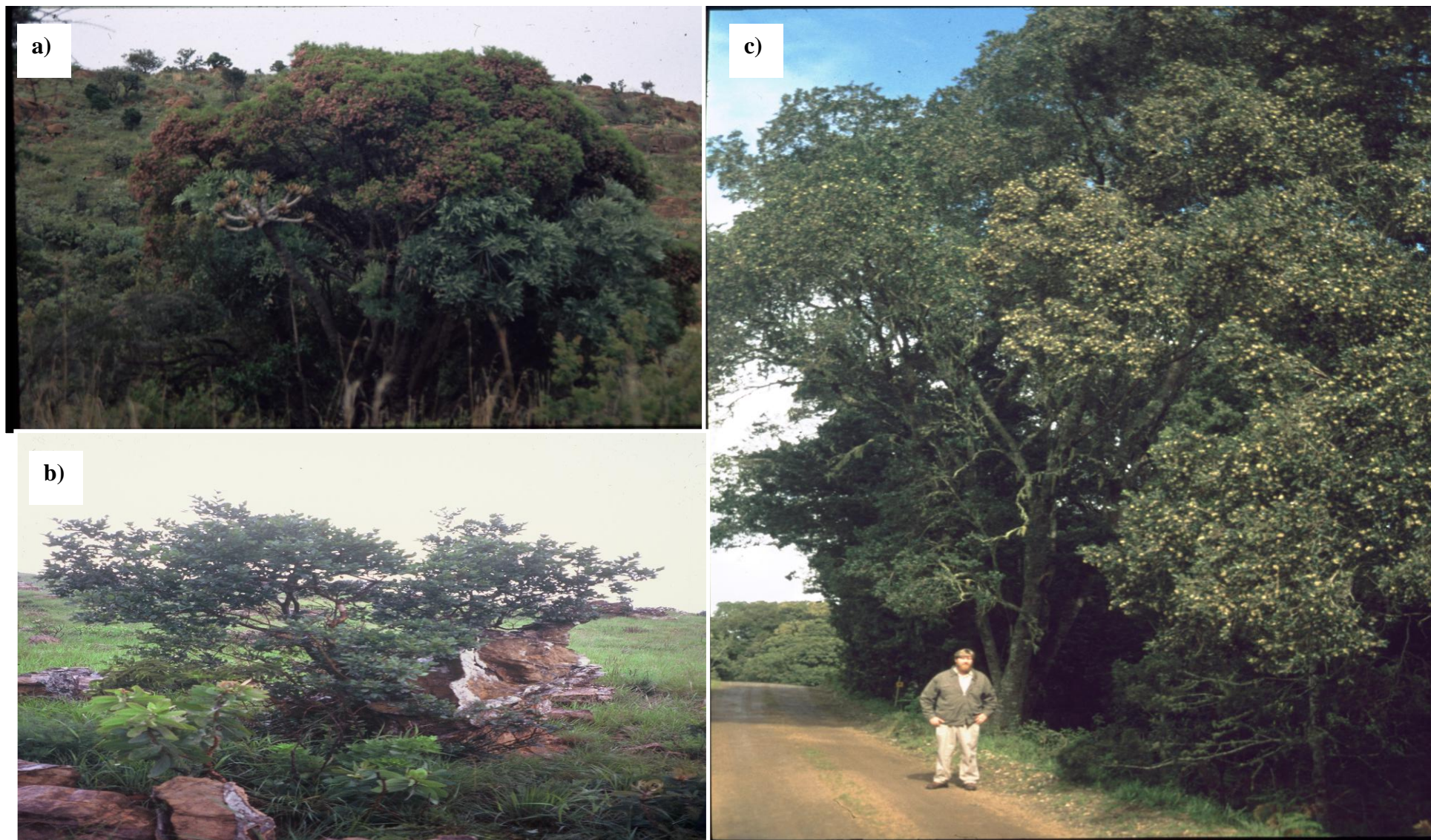


Figure 2. Habit in *Olinia* showing crown during flowering seasons of: a) *O. emarginata* at Roosenekal, Uitkijk, Mpumalanga [photograph by R.J. Sebola]; b) *O. vanguerioides* on the Great Dyke, Zimbabwe. [photograph by G. Goodman-Cron]; and c) *O. ventosa* at Diepwalle, Knysna Forest Reserve, Western Cape [photograph by R.J. Sebola].

The petiole has a characteristic groove on the adaxial surface, which is either deeply channeled or shallowly channeled. In young leaves, the petiole becomes light green to yellowish, and pink to red in mature leaves.

### Indumentum

In the Oliniaceae, indumentum occurs on the leaves, inflorescences, bracts and floral parts. There is variation among species with respect to the presence or absence of indumentum; and abundance or degree of pubescence (Table 2b). Trichomes or hair types in *Olinia* are all eglandular, but the surface can be categorised as either granular or agranular (Figure 4, a & b). The granular types are found consistently on inflorescence axes and petiole surfaces, whereas the agranular types with smooth surfaces are found in varying proportion on leaves, bracts, scales or floral parts. Variation in indumentum does not support any infra-generic and/or infra-specific groups within *Olinia*.

### Inflorescences

Flowers in *Olinia* are clustered into tight or compact inflorescences of a ‘primitive monotelic’ type (Weberling 1988) with the main axis and inflorescence units ending with a terminal flower. Three flowers are produced in monochasial cymes, and three cymes are grouped into a nine-flowered inflorescence unit (Sebola & Balkwill 1999). *Olinia ventosa* and *O. capensis* are distinguishable from each other by, among other characters, the reduction of the axes of inflorescence units. There is no variation in inflorescence type that is associated with any infra-generic and/or infra-specific groups within *Olinia*.

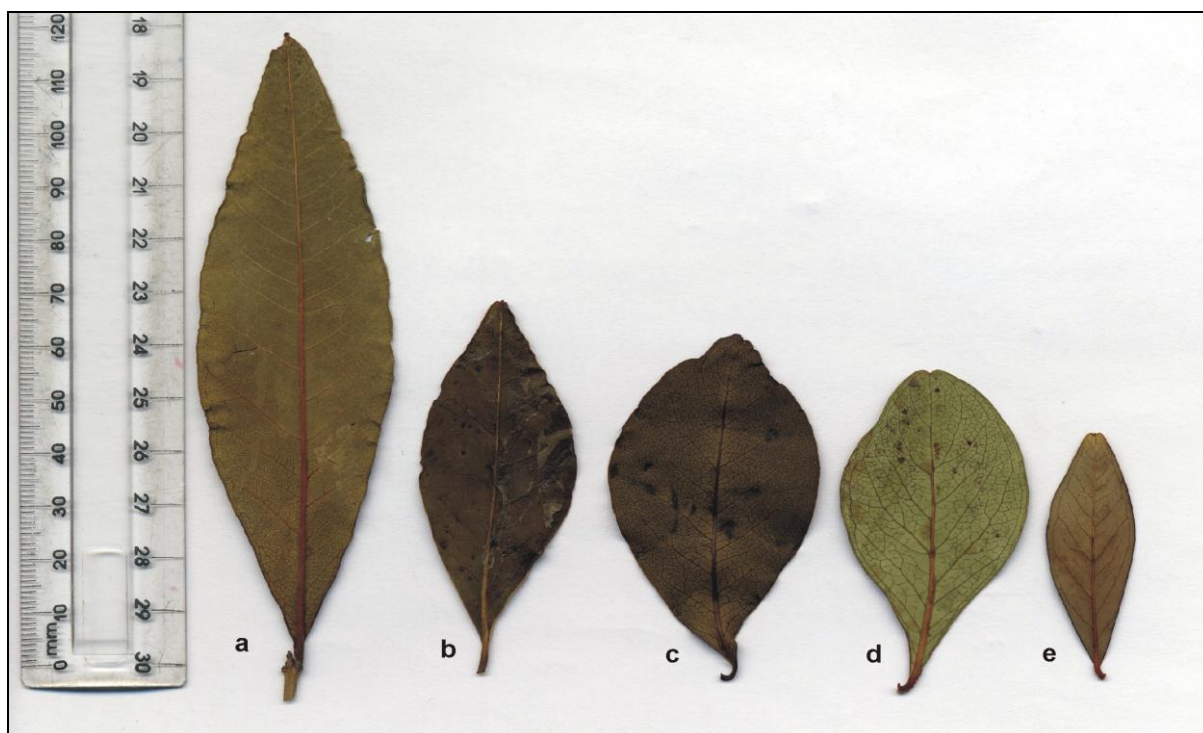


Figure 3. Variation in the shape of the leaf lamina among species of *Olinia*: a) elliptic and large with a mucro, *O. vanguerioides* [Wild 3310, K]; b) elliptic to slightly ovate with a mucro, *O. rochetiana sensu stricto* [Chaffey 476, ETH]; c) ovate to obovate with oblique base, *O. usambarensis* [Howard IM 81, K]; d) ovate to obovate with cuneate base and notched apex, *O. huillensis* subsp. *burttdavii* [Keet 1347, PRE]; e) elliptic and narrow with emarginate apex, *O. emarginata* [Moss 16557, J].

### Bracts and bracteoles

The bracts are either leathery or papery. In most species, bracts and bracteoles are deciduous, except for *O. capensis*, *O. micranthta*, *O. radiata* and *O. usambarensis* in which the bracts are persistent through anthesis. Bracts that are papery, cream-white and slightly transparent are highly pubescent on both surfaces and show a distinct pattern of reticulate venation (Figure 5, f). This is in contrast to the greenish, leathery and foliaceous or leaf-like bracts that are glabrous and only slightly pubescent at the base (Figure 5, g).

Table 2(a). Variation in selected morphological features among species of *Olinia*.

Character / Taxon	<i>O. emarginata</i>	<i>O. radiata</i>	<i>O. micrantha</i>	<i>O. capensis</i>	<i>O. ventosa</i>	<i>O. vanguerioides</i>	<i>O. rochetiana s. str.</i>	<i>O.ruandemsiss</i>	<i>O. usambarensis</i>	<i>O. huillensis</i>
Habit	Medium to large tree	Large tree	Large tree	Medium to large tree	Large tree	Shrubs to medium trees	Medium to large trees	Trees	Trees	Shrubs to medium trees
Leaf lamina shape	Oblong to oblanceolate	Elliptic to oblanceolate	Broadly elliptic to obovate	Obovate to oblanceolate	Obovate to oblanceolate	Elliptic	Elliptic	Elliptic	Broadly elliptic	Obovate (young) to elliptic (mature)
Leaf apex	Notched to emarginate	Broadly tapering	Obtuse to apiculate & slightly mucronate	Rounded, sometimes notched	Acuminate to obtuse (juvenile), emarginate (mature)	Emarginate	Emarginate	Emarginate	Emarginate to deeply notched	Emarginate to deeply notched
Leaf base	Cuneate to slightly tapering	Attenuate	Attenuate or tapering	Tapering	Cuneate to attenuate	Tapering	Oblique to tapering	Tapering	Tapering	Tapering
2ndary veins branching angle	26 - 30	34 – 38	25 - 32	35 – 42	30 – 40	46 - 52	45 - 50	55 - 61	48 - 56	45 - 54
Visibility of tertiary veins on adaxial surface	Inconspicuous	Inconspicuous	Inconspicuous	Inconspicuous	Inconspicuous	Conspicuous	Conspicuous	Conspicuous	Conspicuous	Conspicuous
No. of loops by tertiary veins at margins	Once	Once	Once	Once	Once	Twice	Twice	Twice	Twice	Twice
Leaf attachment	Shortly petiolate	Distinctly petiolate	Shortly petiolate	Distinctly petiolate	Distinctly petiolate	Distinctly petiolate	Distinctly petiolate	Distinctly petiolate	Distinctly petiolate	Shortly petiolate to sessile
Bracteoles persistent/caducous.	Caducous	Caducous	Persistent	Persistent	Caducous	Caducous	Caducous	Caducous	Persistent	Caducous
Floral merocity	5	5	5	5	5	5	5	5	4	5
No. flowers per inflorescence Unit	3	9	3	9	3	3	3	3	3	3
Inflorescence arrangement loose / compact	Loose & open	Highly compact & dense	Compact	Highly compact & dense	Loose, open & spaced	Loose, open & spaced	Open & spaced	Open & spaced	Clustered, compact & dense	Open & spaced
Leaf texture	Leathery	Slightly papery to leathery	Leathery	Leathery / coriaceous	Leathery / coriaceous	Leathery / coriaceous	Leathery / coriaceous	Leathery	Slightly papery, but largely leathery	Papery to leathery
Gall formation	Flowers twisted into ball-like structure	Flowers twisted into ball-like structure	Swollen	Swollen	Swollen	Flowers form narrow elongate tubercles / ridges	Swollen	Swollen	Swollen	Flowers swollen & twisted into ball-like structure
Petal shape	Elliptic to oblong	Linear to spatulate	Oblong	Linear	Linear to oblong	Spatulate	Spatulate	Shortly obovate to spatulate	spatulate	Oblong
Petal apex	Apiculate	Apiculate	Apiculate	Truncate	Truncate	Truncate & shortly apiculate	Truncate & shortly apiculate	Truncate, not apiculate	Apiculate	Truncate

Table 2(b). Variation in indumentum characters among species of *Olinia*.

Character /Taxon	<i>O. emarginata</i>	<i>O. radiata</i>	<i>O. micrantha</i>	<i>O. capensis</i>	<i>O. ventosa</i>	<i>O. vanguerioides</i>	<i>O. rochetiana s. str.</i>	<i>O. ruandensis</i>	<i>O. usambarensis</i>	<i>O.huillensis</i>
Lamina dorsal surface	Glabrous	Glabrous	Sparsely pubescent	Glabrous	Glabrous	Glabrous, but pubescent near petiole	Glabrous	Glabrous	Glabrous	Glabrous
Lamina ventral surface	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous
Petiole surface	Glabrous	Glabrous	Sparsely pubescent on adaxial surface	Pubescent	Pubescent	Pubescent	Glabrous	Glabrous	Sparsely pubescent	Glabrous
Inflorescence axis	Sparsely pubescent with minute short hairs	Pubescent	Pubescent	Sparsely pubescent	Sparsely pubescent	Puberulent	Pubescent	Pubescent	Puberulent	Sparsely pubescent
Bracts dorsal surface	Pubescent	Pubescent	Pubescent	Pubescent	Pubescent	Pubescent	Pubescent	Sparsely pubescent	Pubescent	Pubescent
Hypanthium outer surface	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous	Sparsely pubescent	Glabrous	Puberulent	Glabrous (mature), pubescent (young)
Petal dorsal surface	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous	Sparsely pubescent	Sparsely pubescent
Petal ventral surface	Glabrous, but hairy at point of attachment	Glabrous, but hairy at point of attachment	Glabrous, but hairy at point of attachment	Glabrous, but hairy at point of attachment	Glabrous, but hairy at point of attachment	Glabrous, but hairy at point of attachment	Glabrous, but hairy at point of attachment	Glabrous, but hairy at point of attachment	Sparsely pubescent	Glabrous, but hairy at point of attachment
Style surface	Pubescent	Sparsely hairy with very short hairs	Glabrous	Glabrous	Glabrous	Pubescent	Pubescent	Pubescent	Puberulent	Pubescent

Table 2(c). Variation in selected quantitative morphological features among species of *Olinia*. Data represent (Min. value–)(Mean - Standard deviation) – (Mean + Standard deviation)(–Max. value)

Character / Taxon	<i>O. emarginata</i>	<i>O. radiata</i>	<i>O. micrantha</i>	<i>O. capensis</i>	<i>O. ventosa</i>	<i>O. vanguerioides</i>	<i>O. rochetiana s. str.</i>	<i>O. ruandensis</i>	<i>O. usambarensis</i>	<i>O. huillensis</i>
Lamina length	(23.0–)29.9–39.5(–44.0)	(62.3–)63.8 – 75.8(–78.8)	(23.3–)25.7 – 36.5(–37.5)	(36.3–)46.1 – 63.9(–71.0)	(36.0–)44.3 – 68.8(–79.8)	(53.7–)60.2 – 91.5(–104.7)	(32.4–)41.1 – 64.5(–82.7)	(38.4–)46.0 – 56.3(–63.2)	(28.6–)41.5 – 57.9(–66.5)	(30.3–)35.7 – 53.3(–57.0)
Lamina width	(10.0–)10.3 – 14.6(–18.7)	(24.3–)25.5 – 30.5(–31.0)	(9.5–)11.8 – 17.3(–17.7)	(16.0–)21.1 – 28.8(–34.0)	(17.3–)20.3 – 29.1(–34.5)	(23.5–)27.9 – 39.7(–42.2)	(23.0–)28.7 – 43.4(–53.4)	(21.5–)27 – 33.6(–39.0)	(20.5–)26.2 – 33(–38.4)	(19–)20.5 – 31.1(–33.5)
Petiole length	(1.0–)1.4 – 2.1(–2.8)	(2.3–)2.9 – 4.6(–4.5)	(1.2–)1.6 – 2.8(–2.9)	(2.3–)3.9 – 6.7(–7.8)	(2.8–)3.6 – 6.5(–7.6)	(1.7–)3.0 – 5.8(–9.2)	(1.6–)2.3 – 2.8(–3.0)	(2.0–)2.5 – 4.6(–6.0)	(4.5–)5.7 – 7.3(–8.0)	(1.0–)1.5 – 2.0(–2.5)
Inflorescence Axis length	(4.8–)5.9 – 8.0(–9.2)	(3.0–)2.9 – 3.9(–4.3)	(5.5–)5.7 – 7.9(–8.9)	(6.7–)7.1 – 8.9(–10.5)	(5.5–)6.6 – 9.1(–11.0)	(5.3–)5.7 – 8.6(–10.0)	(12.0–)15.0 – 24.0(–28.1)	(9.5–)12.8 – 16.2(–18.0)	(20.0–)21.6 – 22.4(–28.0)	(14.5–)16.9 – 17.1(–19.5)
Inflorescence Unit length	(2.3–)3.0 – 4.7(–5.5)	(2.3–)2.4 – 3.7(–5.0)	(3.0–)3.1 – 4.2(–5.0)	(1.0–)1.3 – 1.8(–2.0)	(2.0–)2.4 – 2.6(–3.0)	(2.6–)3.0 – 4.2(–5.4)	(4.5–)8.0 – 12.2(–14.6)	(4.0–)4.8 – 7.2(–8.5)	(5.0–)6.3 – 7.3(–7.5)	(6.5–)9.6 – 11.3(–13.5)
Peduncle length	(1.5–)2.4 – 4.2(–5.3)	(1.5–)1.4 – 1.7(–1.8)	(1.5–)1.9 – 2.9(–3.8)	(0.66–)0.87 – 1.9(–2.4)	(3.0–)3.1 – 4.2(–5.0)	(2.3–)2.4 – 3.7(–5.0)	(0.5–)1.5 – 1.8(–2.5)	(2.0–)2.6 – 3.4(–4.5)	(1.5–)2.2 – 2.7(–4.5)	(0.5–)1.0 – 1.5 (–1.5)
Pedicel length	(0.3–)0.7 – 1.2(–1.5)	(0.5–)0.5 – 0.5(–0.5)	(0.47–)5.0 – 0.8(–0.9)	(0.3–)0.4 – 0.9(–1.0)	(0.5–)0.53 – 1.0(–1.3)	(0.6–)0.9 – 1.2(–1.6)	(0.4–)1.4 – 1.6(–2.1)	(0.5–)1.5 – 3.6(–4.0)	(3.5–)4.8 – 7.2(–10.0)	(4.5–)6.8 – 12.4(–20.0)
Hypanthium length	(3.3–)4.0 – 5.3(–5.8)	(1.5–)1.5 – 1.7(–1.7)	(1.75–)1.9 – 2.5(–2.7)	(1.5–)1.6 – 1.9(–2.0)	(3.0–)4.6 – 6.8(–7.8)	(1.8–)2.7 – 5.7(–6.5)	(2.1–)4.3 – 8.5(–10.5)	(3.5–)5.6 – 7.2(–8.0)	(2.5–)3.4 – 4.1(–5.0)	(3.3–)4.9 – 6.4(–7.5)
Petal length	(1.5–)1.7 – 2.5(–2.8)	(0.7–)0.7 – 1.1(–1.0)	(1.0–)1.2 – 1.89(–2.0)	(1.2–)1.5 – 1.9(–2.0)	(1.5–)2.0 – 2.9(–3.3)	(1.0–)0.98 – 1.6(–1.9)	(1.5–)1.6 – 2.7(–3.4)	(1.0–)1.7 – 2.2(–2.5)	(1.5–)1.8 – 2.7(–3.0)	(1.0–)1.5 – 2.5(–3.0)
Petal width	(0.5–)0.5 – 0.9(–1.0)	(0.5–)0.5 – 0.5(–0.5)	(0.5–)0.7 – 0.8(–1.0)	(0.3–)0.4 – 0.8(–0.9)	(1.0–)0.9 – 1.5(–1.5)	(0.5–)0.2 – 1.3(–2.0)	(2.5–)4.6 – 5.7(–7.7)	(2.0–)4.8 – 5.2 (–5.5)	(3.3–)3.8 – 5.4(–7.5)	(4.0–)4.4 – 5.2(–6.5)
Bract length	(4.5–)4.8 – 5.6(–8.0)	(6.0–)6.2 – 6.6(–10.0)	(5.0–)7.4 – 8.8(–12.0)	(6.5–)7.7 – 9.8(–13.5)	(4.5–)5.1 – 7.3(–9.5)	(3.5–)4.2 – 4.3(–6.0)	(2.6–)3.8 – 4.3(–5.4)	(3.5–)4.4 – 5.2(–6.0)	(3.0–)4.2 – 4.8(–5.7)	(3.5–)3.2 – 3.7(–4.5)
Bract width	(4.5–)4.7 – 5.5(–6.0)	(3.5–)4.7 – 5.2(–7.5)	(2.5–)4.9 – 5.3(–6.5)	(4.0–)4.4 – 5.9(–6.5)	(3.5–)5.2 – 5.5(–6.0)	(3.5–)3.8 – 4.0(–4.5)	(4.4–)6.0 – 6.5(–8.0)	(5.4–)6.0 – 7.9(–9.0)	(8.0–)8.4 – 12.5(–15.0)	(6.0–)8.0 – 10.0(–14.0)



Figure 4. Scanning Electron Micrographs showing the types of indumentum within *Olinia*: a) granular trichome on inflorescence surface, *O. radiata*, Fegen 2286, PRE; b) agranular trichome on surface of scales of *O. emarginata*, Galpin 1275, PRE. Scale bar = 10  $\mu\text{m}$ .

## Flowers

In *Olinia* the flowers appear superficially uniform, but are the most variable organs that provide taxonomically important features (or characters) by which groups of species are identified. Flowers are arranged in the leaf axils, mainly at the end of branches (Figure 6, a). The flower is bisexual, actinomorphic, four- or five-merous with the floral tube extended over the ovary. The floral structure in *Olinia* has been subject to different interpretations by many authors (Hofmeyr & Phillips 1922; Burt Davy 1926; Mujica & Cutler 1974; Dahlgren & Van Wyk 1988; Sebola & Balkwill 1999; Schönenberger & Conti 2003; Von Balthazar & Schönenberger 2006). In this study, three whorls of the perianth organs are distinguished from each other. The ovary is inferior; above this there is a tube (or hypanthium) formed by the fusion of the lower area of the calyx, corolla and androecium. The outermost whorl is represented by highly reduced, tooth-like ridges or outgrowths on the hypanthium rim, thus forming a reduced calyx. This, however, is not synonymous with the epicalyx referred to in Lythraceae (Dahlgren & Van Wyk 1998) in which *Olinia* was formerly included as an anomalous genus (Bentham & Hooker 1867). The middle whorl, representing the corolla, is formed by colourful (white or pinkish to red) lobes, which are slightly shorter than the length of the hypanthium tube; and the innermost whorl is made up of scale-like structures above the stamens. Each flower is basally subtended by a short internode ending with some blunt teeth called “calyculi” which is part of the stem structure (Takhtajan 1967; Dahlgren & Thorne 1984).

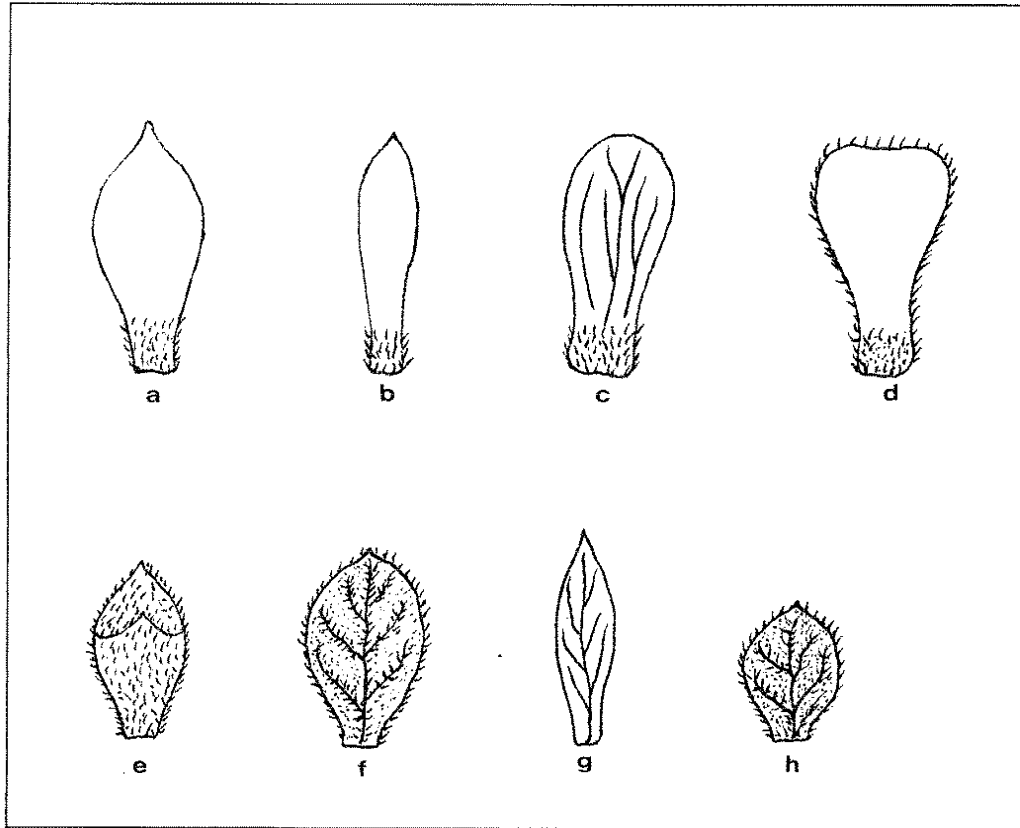


Figure 5. Variation in the shape of petal lobes (a – d) and bracts (f – g) in *Olinia*. Scales and bracteoles are represented by e & h, respectively. a: oblong with a mucro, *O. ventosa*, Rycroft 3306, NBG; b: linear to spathulate with a mucro, *O. micrantha*, Burchell 3592, K; c: spathulate with rounded apex, *O. usambarensis*, Holst 9115, BM; d: spathulate with broadly emarginate to truncate apex, *O. rochetiana sensu stricto*, Selassie 71, ETH); e: scale which is highly puberulous on both surfaces, *O. vanguerioides*, Chase 5480, BM); f: ovate bract with papery texture, *O. ventosa*, Rycroft 3306, NBG; g: elliptic bract with leathery texture, *O. capensis*, Kensit 523, PRE; and h: ovate bracteole, *O. micrantha*, Acocks 12174, J). Magnification X3.5

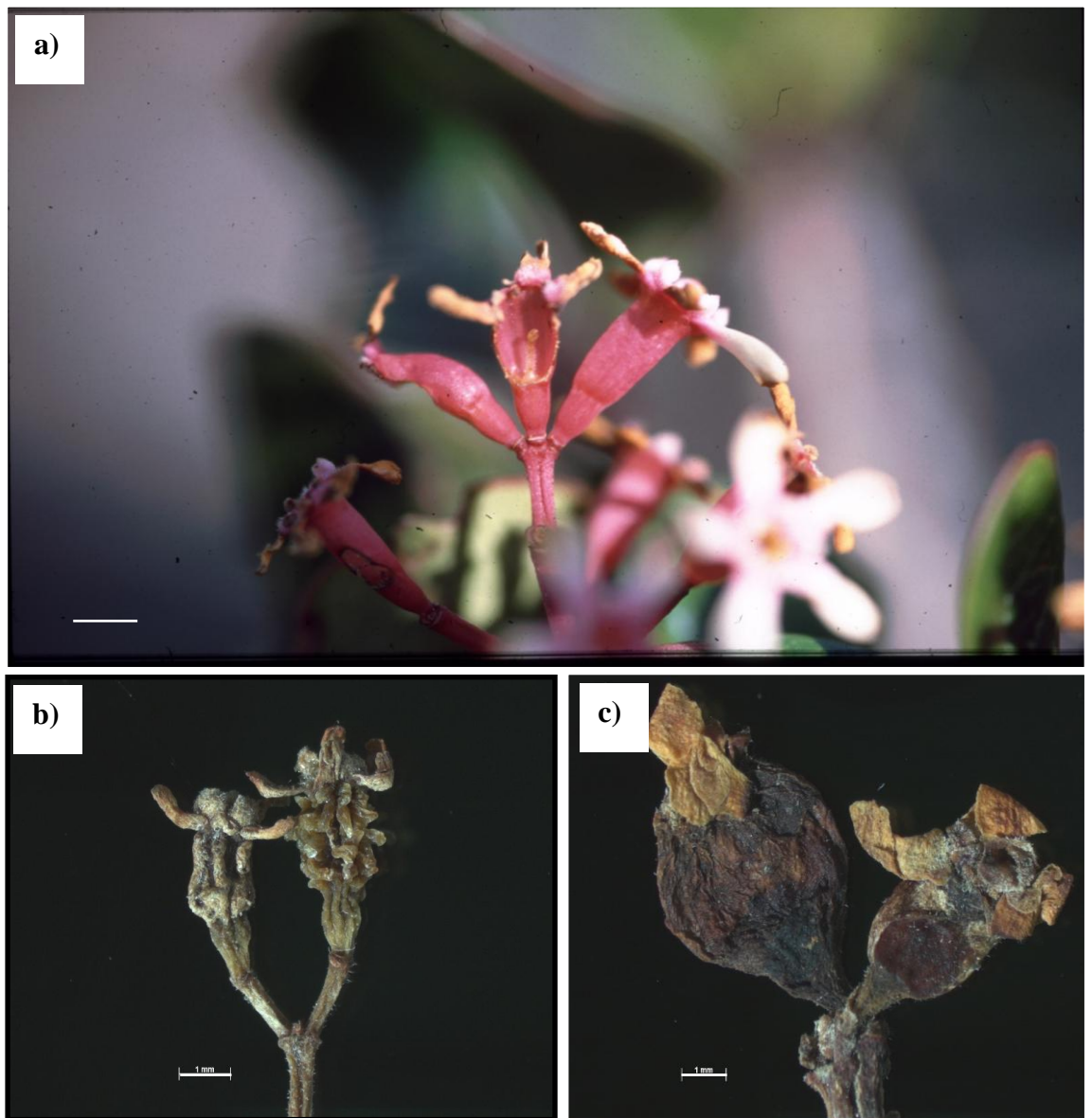


Figure 6. Inflorescence unit showing a triad arrangement of flowers in: a) *O. huillensis* subsp. *burttidavii*, *Sebola* 225 (J) with damaged floral tube exposing the style and stigma, scale bar = 2 mm; b) Galled flowers showing elongate tubercles, *Goldsmith* 7-71 (K), scale bar = 1 mm; c) Galled flowers showing swollen tubes, *Howard* IM81 (K), scale bar = 1 mm.

### *Calyx*

The hypanthium is either narrow and elongate or broad and stout, and ends with four or five minute outgrowths or ridges (Figure 7, a). The divergent views and interpretations of these structures have led to the recognition of either a reduced calyx (Sebola & Balkwill 2009) or an epicalyx (Schönenberger & Conti 2003; Von Balthazar & Schönenberger 2006) in *Olinia*. The outer surface of the hypanthium is either glabrous or distinctly pubescent with minute soft hairs (Figure 7). Without exception, the inner surface is glabrous. Insects, particularly hemipteran larvae, often chew and damage the hypanthia or floral tubes, which in turn form galls that are either twisted into elongate tubercles, or become swollen (Figure 6, a – c).

### *Corolla*

The petals are represented by the four or five linear–spathulate or obovate, white or pinkish lobes inserted at the rim or throat of the hypanthium (Figure 7, b). These alternate with the highly reduced minute sepals that appear as small ridges or outgrowths on the ends of the hypanthium, and the scale-like structures on the inside of the hypanthium. Variation in size and shape of the petals is diagnostic of some species groups (Figure 5, a – d), and supports infra-specific categorisation within *Olinia*.

### *Scales*

At the throat of the floral tube there are incurved or hooded structures referred to here as scales which are highly pubescent (Figure 7, c). These structures seal the tube at bud stage and spread to become reflexed at anthesis to expose stamens below. The movement of the scales is possibly induced by the stamens recurving at maturity, thus forcing the scales apart. Linked to this ‘movement’ is the elongation and extension of the style, which at

bud stage is considerably below the stamens. At anthesis the style and stigma almost reach the radii of the scales, having pushed and penetrated through the incurved stamens. Apart from the apparent 'protective' role, there is no other plausible function linked to the scales in *Olinia*.

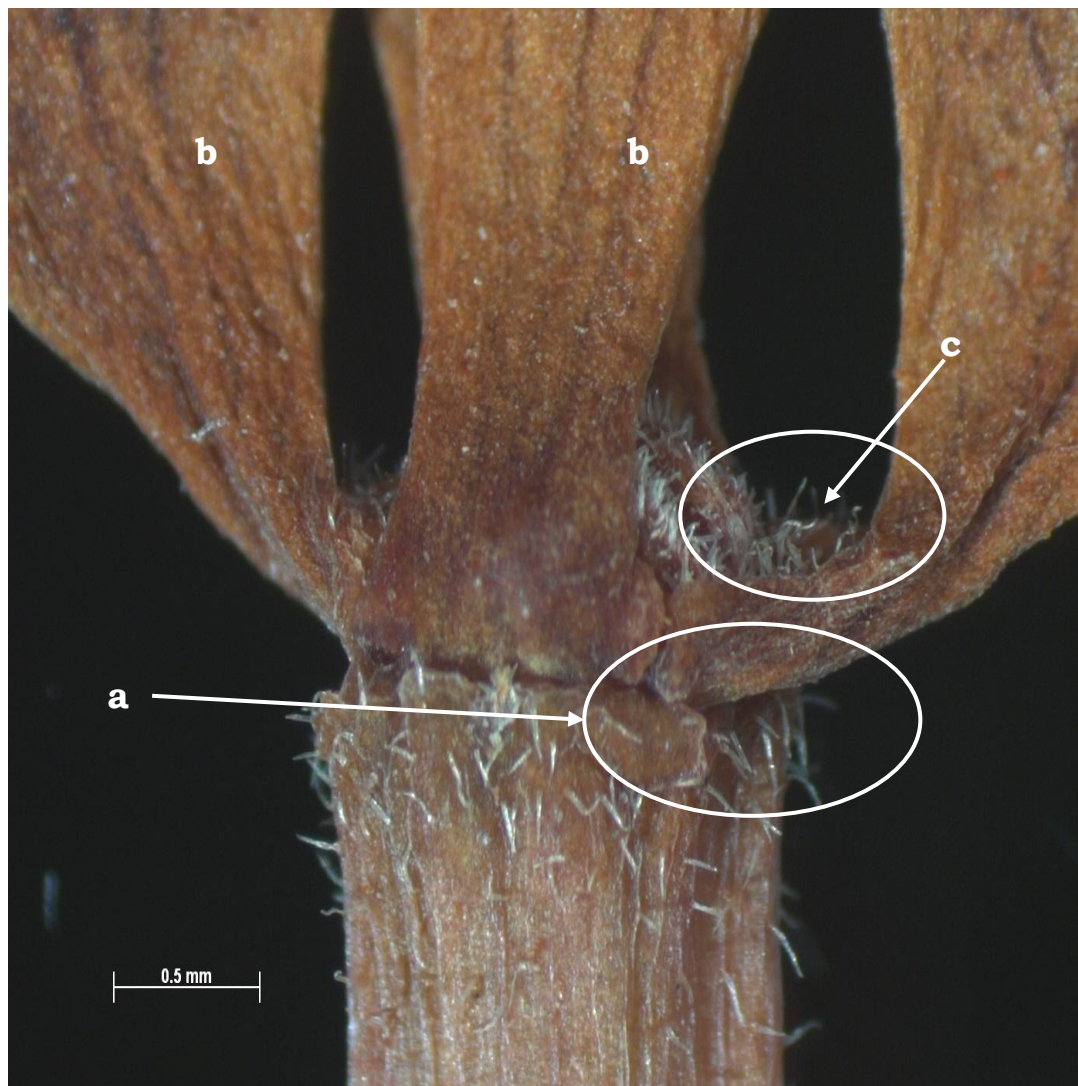


Figure 7. Floral tube or hypanthium in *Olinia* showing: a) outgrowths or ridges on the outer circumference; b) petal lobes; and c) highly pubescent scales on the inside of the tube. [*O. usambarensis*, Bogdan 4762, K].

### *Androecium*

The four or five stamens are inserted below the scales and incurved at bud stage. During anthesis stamens are reflexed; and it is this reflex motion that pushes the scales above to split open, showing anthers that almost fill the mouth of the floral tube/hypanthium. Stamens are all arranged along the same radius of the hypanthium tube; they are antisepalous (opposite the minute sepals) and altipetalous (alternate with petals). The anthers have a thickened connective, are dorsifixed and introrse, dehiscent longitudinally along the axis of each theca. Two pollen sacs face downwards, and are suspended by a short thick connective. The filaments are very short, and glabrous.

### Pollen

Pollen grains in *Olinia* are ovoidal in shape, heteropolar with one pole colpate (i.e. colpus without a pore) and the other pole heterocolpate (Figures 1 – 3 & 9 – 12, Patel *et al.* 1983), with a smooth surface although the area around the aperture is coarse and granular. The pollen grain exine (outer surface) has three furrows or folds (palynologically known as colpi) which are associated with pollen tube emergence or germination, hence the pollen is referred to as colpate (i.e. pollen has pores in the colpi). These furrows in *Olinia* are linked to the harmomegathis mechanism of regulating volume changes within the pollen grain (Faegri & Van der Pijl 1979; Fegurson & Skvarla 1981; Muller 1981; Patel *et al.* 1983). The pseudocolpi or half pseudo-colpi are common features in most myrtalean families (Patel *et al.* 1983), and in the Oliniaceae this feature is restricted to one polar face only. There are no variations in pollen micro-morphological features between species in *Olinia*.

## *Gynoecium*

The ovary is inferior, it has four or five fused carpels, and four or five locules. The style is simple, ending in a club-shaped or globular stigma. The style length varies from 2.5 – 4 mm in mature flowers and is either glabrous or pubescent. There are three or five ovules per locule and these are pendulous with axile placentation and are campylotropous (that is, the body is bent or curved on one side such that the micropyle is positioned near the funiculus or stalk that attaches the ovule to the placenta).

## Fruit and seeds

*Olinia* fruits are drupes, globose to obovoid, pink to red when mature, and exhibit a scar at the tip, marking the position of a deciduous hypanthium (Figure 8). The pericarp is shiny and thinly fleshy; the endocarp is hard and woody (Figure 9). The seeds are ovoid to ellipsoidal, and have a spiral or convoluted embryo without endosperm (Chant 1978).

There is usually one seed per locule and nearly always one seed per fruit, since others degenerate and only one survives (Phillips 1926; Tobe & Raven 1984). The embryo has a short radicle and spirally twisted or convolute cotyledons (Tobe & Raven 1984; Von Balthazar & Schönenberger 2006).

## **Ecology**

### Pollination and dispersal

The attraction of pollinators in *Olinia* is through the colourful (white or pink to red) petals and the scent from flowers. However, given the relative position of anthers to the stigma within the hypanthium tube, pollination by gravity cannot be ruled out.

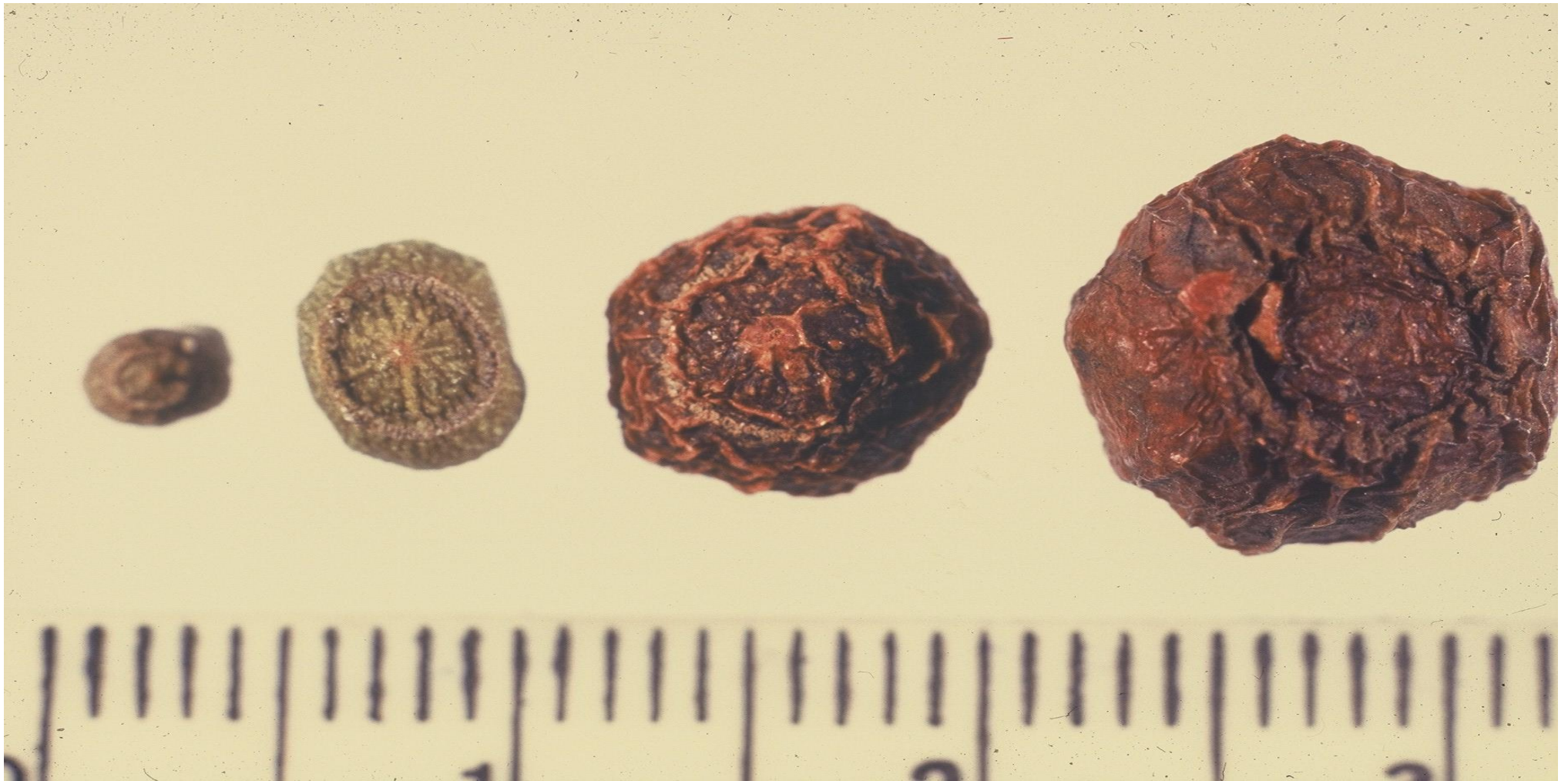


Figure 8. Variation in the size and shape of fruits, from left to right: *O. emarginata* [Moll 5433, PRE], *O. ventosa* [Taylor 7423, K], *O. rochetiana sensu stricto* [Verdcourt 2139, PRE], and *O. radiata* [Edwards 3309, PRE]. The polar view indicates a scar left by deciduous hypanthium. 1 interval = 1 mm on the scale.



Figure 9. Cross section of the fruit of *Olinia* showing a woody endocarp and: a) four locules in *O. radiata* (Fegen 2286, PRE); and b) five locules in *O. emarginata* (Moll 845, PRE).

At the peak of the flowering season *Olinia* trees produce exceedingly numerous flowers, so that the crown is identifiable from a distance by the colour of the flowers (Figure 2, a & c). Phillips (1926) estimated a single tree to bear from 300 000 to 1 million flowers, although the individual tree does not bear flowers, either at all or in any significant quantities, more often than one year in three successive years. This leads to an alternation of “full-flowering” and “non or poor-flowering” years, particularly in *O. ventosa* and *O. capensis*. This condition was also observed among populations of *O. huillensis* occurring in Mpumalanga and Limpopo provinces, South Africa (Sebola & Balkwill 2006).

During anthesis the style elongates, thus pushing through the overhanging stamens. This ‘motion’ forces the scale-like structures to reflex and open the hypanthium tube, thus exposing the stamens. Within twenty four hours or so of anthesis, the anthers of exposed stamens begin to curl backward, dehisce longitudinally and yellowish grains become visible. The close proximity of stigma and anthers at this stage increases the possibility of self pollination occurring by gravity should vigorous shaking of the flowers by wind, birds or mammals take place. Self pollination could also be effected by insects entering the floral tube, thus picking up pollen grains and eventually dusting them off onto the stigma as they crawl down the tube. In all species of *Olinia* the style and stigma are within the bounds of floral tubes and this may increase the chances of self pollination occurring. However, cross pollination in *Olinia* can be effected easily by biotic agents such as insects attracted to the flowers. Whether species are self-compatible or not needs to be investigated.

Most flowers in *Olinia* produce copious nectar after anthesis, despite having no trace of a nectariferous disk. Phillips (1926) recorded the presence of ‘copious golden, sweet-tasting honey-dew in the calyx tube’. Adamson (1950) recorded sterility of lateral flowers in a triad. However, this needs thorough examination and documentation, since

an evaluation of the pollination systems in *Olinia* by Hofmeyr & Phillips (1922), Phillips (1926) and Sebola & Balkwill (2006) did not allude to this condition. Bees were observed visiting scent- and nectar-producing flowers in populations of *Olinia* in Mpumalanga and Limpopo provinces, South Africa (Sebola & Balkwill 2006).

Insect visits are common to flowers of *Olinia*, and these often lead to infection of the floral tubes/hypanthia. Different species of *Olinia* respond uniquely to insect (hemipteran larvae) infection to form characteristic galls (Figure 5, b & c). The infection of flowers often leads to the absence of fruit set, and also interferes with the regular alternation of full and non- or poor-flowering periods.

The fresh pericarp is slightly fleshy and has a bitter-sweet taste likely to attract birds and mammals, including monkeys and baboons. These biotic agents are responsible for long distance fruit dispersal in *Olinia* (Phillips 1926). Fruits can persist for several months on trees, and these often have limited dispersal ranges, as they tend to fall on the soil beneath the crown or just a few metres away from the crown.

### Conservation

There are currently two species, *O. radiata* Hofmeyr & Phill. and *O. micrantha* Decne. that are protected under the South African National Forests Act (84, 1998) without any information provided on their status (i.e. rare, endangered, etc.). These species have very limited distribution ranges and occur largely in protected environments such as nature conservancies. Evaluation of information for other species of *Olinia* against the criteria for any of the IUCN Red List categories indicates that except for *O. radiata*, all other species are likely to rate as Least Concern.

## Distribution

The information gleaned from herbarium specimens indicates that *Olinia* is endemic to the African continent (Map 1). With the exception of only two species (*O. rochetiana sensu stricto* and *O. ruandensis*), all other species of *Olinia* occur south of the equator. The distribution of some species (*O. usambarensis*, *O. vanguerioides*, *O. ruandensis*, *O. radiata*, *O. huillensis*, and *O. emarginata*) is correlated with the summer rainfall areas, mixed summer/winter rainfall areas (*O. micrantha*) and strictly winter rainfall areas (*O. capensis* and *O. ventosa*). Although the distribution of the latter two species coincides with that of Fynbos vegetation, these species are particularly found in coastal forests, in mountainous terrain. Only three species (*O. vanguerioides*, *O. huillensis*, and *O. ruandensis*) occur widely within the Zambesian region, in predominantly woodland vegetation (the miombo vegetation type).

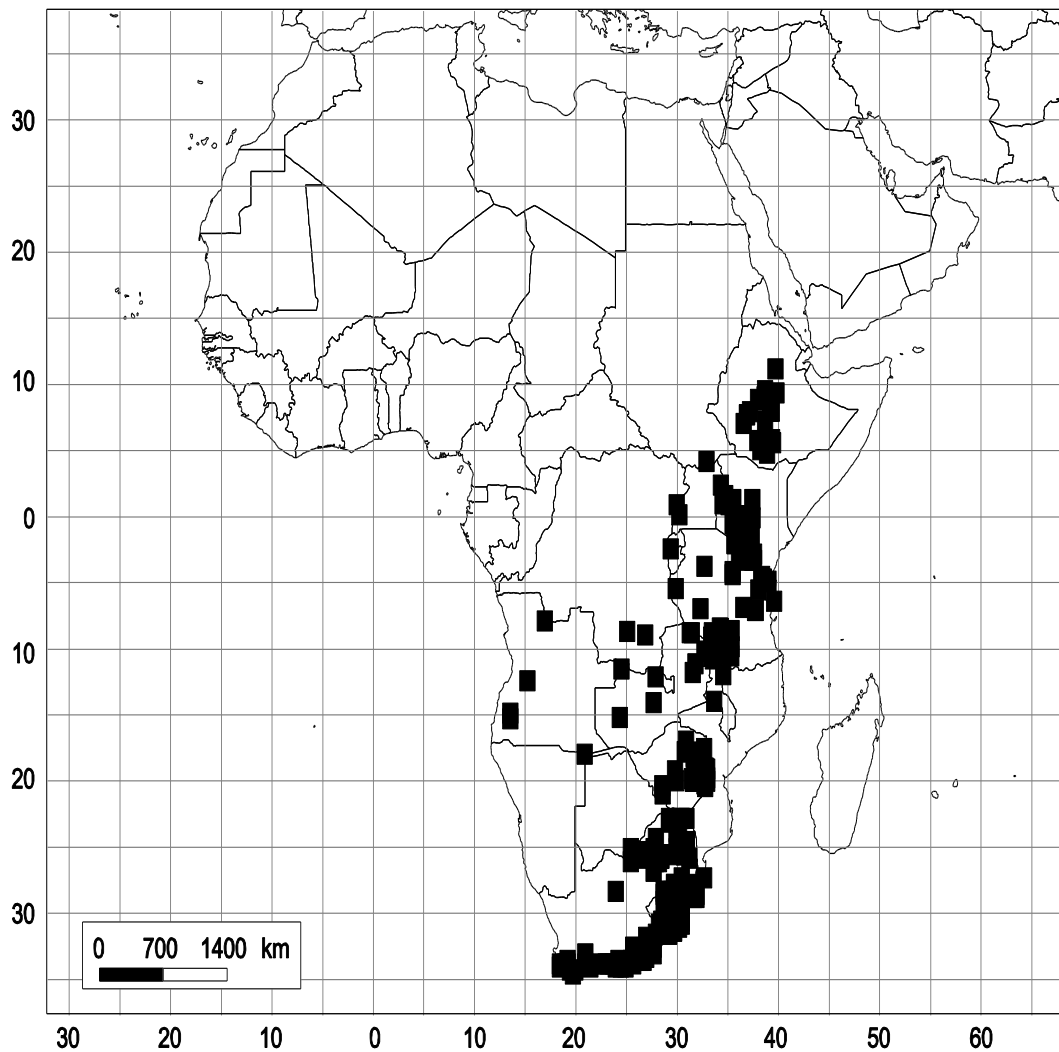
The area of greatest morphological diversity for the members of *Olinia* appears to be in southern Africa. In this area the species occupy a wide range of habitats compared to those occurring in east-tropical areas, which have a relatively limited habitat range. The South African taxa are readily separable, apart from those occurring in the north-eastern parts of South Africa which form part of the *O. rochetiana* complex (Verdcourt 1975 & 1978). Fieldwork has led to the expansion of the distribution records for *O. radiata* and *O. emarginata*. It appears that for a number of years *O. radiata* has remained uncollected beyond KwaZulu-Natal and the Eastern Cape until the work of Schmidt *et al.* (2002) in the Blyde River Canyon Nature Reserve, Mpumalanga. The migration of *O. radiata* from one area to another would involve crossing of major geographical barriers and in this case the northern Natal Drakensberg highlands.

*O. emarginata* is abundant in South Africa, and occurs in a wide range of habitats and climatic conditions. The distribution ranges from: northern Swaziland to Barberton in Mpumalanga, Limpopo Province,

Gauteng, North West Province, Free State, and KwaZulu-Natal, the area which is part of the Sudano–Zambezian phytogeographic region in southern Africa (White 1978; Werger & Coetzee 1978), and in particular within the savannah biome of Southern Africa (Goldblatt 1978). Compared to populations of *O. emarginata* occurring in other regions, those that occur in Limpopo Province and the North West Province have relatively narrow and smaller leaves that are slightly rough and glaucous, thus correlating with the aridity of the areas. These features may possibly allow *O. emarginata* to cope with the frost conditions of the area. The wide distribution of *O. huillensis* suggests a considerable degree of tolerance and adaptability to a wide range of environmental and climatic conditions. The leaves that are narrow, leathery and often caducous in both *O. emarginata* and *O. huillensis* subsp. *huillensis* certainly provide a mechanism to survive the dry conditions and sometimes high temperatures associated with temperate southern Africa.

Phytogeographically, only two species namely *O. capensis* and *O. ventrosa* are endemic to the Capensis region *sensu* Werger (1978). *Olinia capensis* and *O. ventrosa* flower in winter (June to August) as do other taxa that occur in this winter rainfall area. However, the occurrence of *O. micrantha* in this region (Capensis) creates an anomaly as this species flowers in spring to summer like other species of *Olinia* occurring in temperate and tropical regions. *Olinia micrantha* is confined to a small region in the Eastern Cape Province, a transitional zone that receives moderate summer and winter rainfall. *Olinia radiata* occurs north of this region in the Tongaland–Pondoland region (Goldblatt 1978) and extends eastwards as far as Mpumalanga Province.

The distribution pattern of *O. micrantha* suggests that the penetration and adaptation of *O. micrantha* to the Capensis region might be a relatively recent event, as the Mediterranean type climate in the Capensis region is also regarded as a geologically recent development (Coetzee 1978a and 1978b; Werger & Coetzee 1978).



Map 1. Known distribution of *Olinia*.

This may also suggest that during the supposed southward migration of vegetation, some peripatric populations of *Olinia* penetrated further south than the rest of the species, and could possibly be the most recently derived species (*O. capensis* and *O. ventosa*) of the southern African members of *Olinia*. Barriers to migration of these two species to other areas outside Capensis are unknown. At this stage one can only hypothesise broadly about the climatic, edaphic and biotic factors as possible contributors to the observed distribution patterns of these species. The single record for *O. ventosa* in St. Helena is regarded as a recent introduction from South Africa, possibly through cultivation (Hutchinson 1964). *Olinia capensis* (Jacq.) Klotzsch is recorded as being cultivated in the Berlin Botanical Gardens (Jacquin 1809; Klotzsch 1836; 1840 & 1841 a&b) and it is of uncertain origin.

## **Economic uses**

The wood is hard, durable and used in wagon work (i.e. felloes, spokes, and long wagon poles), fencing and telegraph poles, railway sleepers, furniture; and is also believed to make good charcoal (Hofmeyr & Phillips 1922). It is probably the quality of its wood that *Olinia* was erroneously called “Hard Pear”, although the true Hard Pear is *Strychnos henningsii* (Sim 1907).

## **Taxonomic treatment**

### Oliniaceae

Oliniaceae Arnott ex Sonder, *Flora capensis*, 2: 519 (1862); Decaisne, *Sur les Caracteres et les affinites des Oliniées*, 3 (1877); Baillon, *Natural History of Plants*, 48 (1880); Gilg, *Die Naturlichen Pflanzenfamilien*, 213 (1894); Gilg, *Botanische Jahrbucher*, 19: 278 (1895); Gilg, *Deutschen Zentral-Afrika Expedition 1907–1908, Band II*: 575 (1914); Adamson, *Flora of the Cape Peninsula*, 593 (1950); Phillips, *The Genera of South African Flowering Plants*, 526 (1951); Fernandes, *Comptes Rendus IV<sup>e</sup> Reunion AETFAT*, 283 (1960); Dale & Greenway, *Kenya Trees and Shurbs*, 350 (1961); White, *Forest Flora of Northern Rhodesia*, 269 (1962); Von Breitenbach, *Indigenous Trees of Ethiopia*, 107 (1963); Takhtajan, *Systema et Phylogenia Magnoliophytorum*, 304 (1966); Takhtajan, *Diversity and Classification of Flowering Plants*, 288 (1967); Hutchinson, *The Familes of Flowering Plants*, 204 (1973); Verdcourt, *Flora of tropical East Africa*, 1 (1975); Verdcourt, *Flora Zambesiaca*, 4: 232 (1978); Coates Palgrave, *Trees of southern Africa*, 643 (1983); Dahlgren & Thorne, *Annals of the Missouri Botanical Garden*, 71: 665 (1984); Verdcourt & Fernandes, *Flora de Mozambique*, 1 (1986); Goldblatt & Manning, *Cape Plants, Strelitzia* 9: 549 (2000); Archer, *Seed Plants of southern Africa: Families and Genera, Strelitzia* 10: 430 (2000); Coates-Palgrave & Coates-Palgrave, *Trees of southern Africa*, 771

(2002); Schmidt *et al.*, Trees and Shrubs of Mpumalanga and Kruger National Park, 446 (2002); Archer, Plants of southern Africa, *Strelitzia* 14: 753 (2003); Von Balthazar & Schönenberger, The Families and Genera of Vascular Plants, IX: 206 (2006).

Type: *Olinia* Thunb.

Shrubs, or small to large trees, evergreen or deciduous; *branchlets* characteristically quadrangular, reddish (young) or pale to grey (mature). *Bark* grey, smooth or rough, often peeling or fissured. *Leaves* simple, opposite, decussate or sub-opposite in growing branches, petiolate, entire, slightly wavy or recurved, obovate, elliptic or lanceolate, often acuminate, rounded or cuneate, glabrous; midrib prominent, level or sunken above; venation conspicuous or inconspicuous beneath. *Stipules* absent or rudimentary. *Petiole* short or distinct with a groove along adaxial surface, reddish or green, glabrous or distinctly pubescent. *Inflorescence* paniculate, terminal or axillary, longer or equalling the leaves. *Bracts* opposite, sometimes as long as the flower, papery or leathery, caducous or persistent at or after anthesis. *Flowers* bisexual, actinomorphic, 4- or 5-merous, epigynous, arranged in terminal or axillary triads or trichotomous cymes. *Floral tube/hypanthium* inserted on the ovary, ends in 4 or 5 minute teeth. *Sepals* 4 or 5, rudimentary or minute ridges on outside of hypanthium rim. *Petals* 4 or 5, obovate or linear-spathulate, white or pinkish, usually pubescent at base, adnate to hypanthium and inserted at the throat or margin of tube. *Scales* 4 or 5, highly pubescent, incurved and closing tube at bud stage, spreading and reflexed at anthesis exposing stamens. *Stamens* 4 or 5, arising in floral tube/hypanthium, opposite to and below scales, slightly sessile; *filaments* very short or virtually absent; *anthers* small, didymous, 2-theous, dehiscent by longitudinal slits, dorsifixed with thickened connective. *Ovary* inferior, (3-)4 or 5 fused carpels, each forming a locule; ovules 3 to 5 per locule, axile, pendulous, superposed, hemitropous, bitegmic; *style* straight, glabrous or distinctly pubescent; *stigma* thickened and globular. *Fruit* a drupe,

globose, dry or with thin flesh, apex with a circular scar left by deciduous floral tube or hypanthium, pink (young) to reddish brown (mature). *Seeds* obovoid, 3 – 5, testa thick and brown; cotyledon spiral or irregularly folded; no endosperm.

There is only one genus, *Olinia*.

*Olinia* Thunb., Archiv für die Botanik, 2: 4 (1799); Bentham & Hooker, Genera Plantarum 785 (1838); Harvey, Genera of South African Flowering Plants, 3 (1838); Arnott, Annals of Natural History, 154 (1839); Sonder, Flora capensis, 2: 519 (1862); Hiern, Flora of tropical Africa, 2: 464 & 485 (1871); De Candolle, Prodrromus Systematis Naturalis, Regni Vegetabilis Pars II, 41 (1873); Baillon, Histoire des Plantes, 6: 441 & 515 (1877); Baillon, Natural History of Plants, VI, 48 (1880); Gilg, in: Engler & Prantl, Pflanzenfamilien 3, 6a: 213 (1894); Gilg, Botanische Jahrbucher, 19: 278 (1895); Engler, Pflanzenw. Ost.-Afrika, C: 285 (1895); Sim, Forests and forest flora of the Cape, 227 (1907); Engler, Pflanzenw. Afrikas 3, 2: 624 (1921); Hofmeyr & Phillips, Bothalia, 1: 97 (1922); Burt Davy, Flora of Transvaal, 1: 199 (1926); Adamson, Flora of the Cape Peninsula, 593 (1950); Verdcourt, Flora of tropical East Africa, 1 (1975); Verdcourt, Flora Zambesiaca, 4: 232 (1978); Coates-Palgrave, Trees of southern Africa, 643 (1983); Coates-Palgrave & Coates-Palgrave, Trees of southern Africa, 771 (2002).

Type species: *Olinia cymosa* (L.f.) Thunb. from South Africa.

Description of genus as for family.

#### Key to the sections of *Olinia*

- 1a. Leaves with secondary veins branching from midrib at 30° – 44° and looping once before the margins; tertiary veins not clearly visible on upper surface ..... Sect. **Olinia**

- 1b. Leaves with secondary veins branching from midrib at 45° – 60° and looping more than once before the margins; tertiary veins clearly visible on upper surface ..... Sect. **Rochetiana**

Key to the species of Sect. *Olinia*

- 1a. Bracts reduced to scales, shorter than 0.5 mm, narrower than 1 mm and green; common in KwaZulu-Natal, Mpumalanga, Gauteng, North West and Limpopo Provinces; flowering in October/November to December/January ..... **2**
- 1b. Bracts longer than 1 mm, wider than 2 mm and creamy white; restricted to Western Cape & Eastern Cape; flowering in May/June to August/September..... **3**
- 2a. Leaves discolorous, (23–)30–40(–44) × 10–15(–19) mm; inflorescence loose and terminal; hypanthium glabrous, (3.3–)4–5(–6) mm long; style puberulent; petal lobes (1.5–)1.7–2.5(–3) mm long; locules 5 ..... **4. *O. emarginata***
- 2b. Leaves concolorous, (62–)64–76(–79) × (24–)25.5–30.5(–31) mm; inflorescence dense, and axillary; hypanthium puberulent, 1.5–1.7 mm long; style glabrous; petal lobes up to 1 mm long; locules 4 ..... **5. *O. radiata***
- 3a. Bracts persistent through anthesis; 9 flowers clustered at the tip of each identifiable axis ..... **1. *O. capensis***

- 3b. Bracts falling at or soon after onset of anthesis; 3 flowers at the tip of each identifiable axis ..... **4**
- 4a. Hypanthium longer than 3 mm; petal lobes (1.5–)2–2.5(–3) × 1–1.5 mm ..... **2. O. ventosa**
- 4b. Hypanthium shorter than 2.6 mm; petal lobes (1–)1.2–1.5(–2) × 0.5–1 mm ..... **3. O. micrantha**

Key to the species of Sect. *Rochetiana*

- 1a. Leaf lamina with conspicuous pattern of reticulate venation on both surfaces, narrowly elliptic; lateral nerve pairs 8–10, strongly raised on under-surface; petioles puberulent, 6–9 mm long; galled flowers narrow with elongate tubercles; petals 1–2 × 0.5–1 mm ..... **6. O. vangerioides**
- 1b. Leaf lamina with conspicuous pattern of reticulate venation on under surface only, broadly elliptic to obovate; lateral nerve pairs 4–6, more or less level with under-surface; petioles glabrous, shorter than 3 mm; galled flowers swollen; petals 3–5 × 1–2 mm ..... **2**
- 2a. Leaves slightly papery; up to 7 inflorescence units along inflorescence axis ..... **7. O. huillensis**
- 2b. Leaves coriaceous; between 9–11 inflorescence units along inflorescence axis ..... **3**

- 3a. Leaf lamina discolorous below, broader than long; internodes on terminal branches longer than inflorescence axes .....**8. *O. ruandensis***
- 3b. Leaf lamina concolorous, longer than broad; internodes on terminal branches shorter or equal to inflorescence axes ..... **4**
- 4a. Petals 5 on lateral flowers; scales shorter than 1 mm, rarely sealing the hypanthium opening/throat .....**9. *O. rochetiana***
- 4b. Petals 4 on lateral flowers; scales longer than 1 mm, often sealing the hypanthium opening/throat .....**10. *O. usambarensis***

#### Nomenclature and description of species

**1. *O. capensis*** (Jacq.) Klotzsch, *Allgemeine Gartenzeitung* 4 : 27, pl. 2 (1836); Decaisne, *Sur les caractères et les affinités des Oliniées*, 13 (1877).

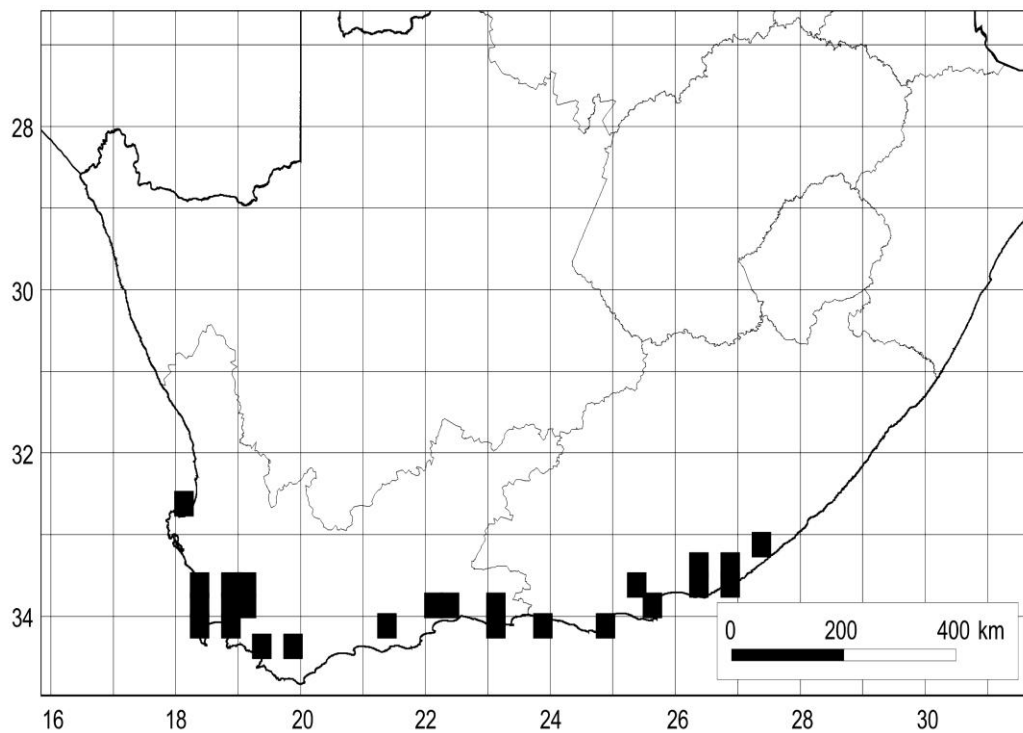
*Cremastostemon capensis* Jacq., *Fragmenta Botanica* 68, t.103 (1809).  
Iconotype (designated by Sebola & Balkwill, 1999): Jacq. in *Fragmenta Botanica*, t.103, (K!).

*Olinia acuminata* Klotzsch, *Allgemeine Gartenzeitung*, 1 (4), 53 (1841).

*O. cymosa* var. *acuminata* (Klotzsch) Sond., *Flora capensis* 2, 520 (1862); Sim, *Forests and forest Flora of the Cape*, 227 (1907).  
Iconotype (designated by Sebola & Balkwill, 1999): Klotzsch & Otto in Link, J. H. F., *Icones Plantarum Rariorum*, 1(4), t.21 (1841) (K!).

A medium to large tree up to 5 m high. *Bark* pale to grey, smooth; *branchlets* pinkish, quadrangular. *Leaves* obovate to oblanceolate, 31–70 x 20–30 mm, glossy and dark green above, paler and dull below; apex tapering to rounded, sometimes notched; base tapering; margin entire, wavy, slightly rolled under. *Primary veins* or *midrib* impressed or channeled above, prominent below. *Secondary* or *tertiary veins* inconspicuous above. looping once before margin, net-veining conspicuous below. *Petiole* 4–6 mm long, pink, velvety. *Inflorescences* axillary, highly compact and dense. *Peduncle* short, pubescent. *Bracts* creamy-white, linear, up to 8 mm long, persistent after anthesis or after flowers have opened. *Flowers* very small, whitish sometimes tinged with pink, nine tightly clustered together per inflorescence, on very short stalks, in dense axillary cymes 50–60 mm long, sweetly scented. *Pedicel* glabrous, 0.5–1 mm long. *Hypanthium* white to pink, glabrous, (1.5–) 1.6–1.9(–2) mm long. *Sepals* tooth-like or rudimentary. *Petals* creamy-white, elliptic, (1.2–)1.5–1.9(–2) x (0.3–)0.4–0.8(–1) mm, inserted at throat of hypanthium, pubescent on lower surface at point of attachment; base sessile; apex rounded; margin entire. *Scales* creamy white, hooded, enclosing stamens, alternating with petal lobes, up to 1 mm long, densely pubescent on both surfaces. *Stamens* attached just below sinuses, alternating with petal lobes; *filaments* highly reduced; *anthers* hidden by scales above them, dehiscing by longitudinal slits. *Ovary* inferior, 5-locular; *style* glabrous, 0.5–1 mm long; *stigma* globular to capitate. *Fruit* a spherical drupe 6–9 mm in diameter, thinly fleshy, and red; circular scar at apex visible, 4–6 mm in diameter.

DISTRIBUTION. The species is known to occur in the Western Cape and Eastern Cape, South Africa. Map 2(a).



Map 2 (a). Known distribution of *O. capensis*

COMMON NAMES. Hard pear, Hardepeer (Afrikaans).

HABITAT. Occurs in forests, forest margins, coastal scrub and on rocky hillsides.

CONSERVATION STATUS. This species is endemic to the southern Western Cape and the Eastern Cape, South Africa and is abundant where it occurs. It occurs in many nature reserves, and with respect to the IUCN Red Data status this species is likely to rate as Least Concern.

SPECIMENS EXAMINED. SOUTH AFRICA: Eastern Cape. Knysna, Commonage, forest, August 1916, *Keet s.n* (PRE); Knysna, Kaatjies Kraal, 1 April 1914, *Burchell* 5246 (K); Knysna, Pisang River Valley, 26 July 1935, *Kaap* 113 (K, PRE); Knysna, 8 July 1932, *Phillips* 20160 (J); George, Noodville Farm Reserve, July 1927, *Rendle* 145 (BM); Deepwalls, Forest Reserve, 4 October 1974, *Rodin* 1164 (K); Uitenhage, Groendal Wilderness Reserve, 12 July 1974, *Scharff* 1412 & 1417 (PRE); Port Elizabeth, 26 August 1912, *Paterson* 2319 (BOL); Grahamstown, August, *MacOwan* 349 (BM); Albany, Coldspring district, 12 September 1947, *Story* 3129 (K); Bathurst, Hopewell

area, 12 January 1945, *Acocks 11137* (K); Alexandria, Bushmans River Mouth, 10 August 1954, *Johnson 1013* (K, PRE); Bloukrans, Rosslyn farm, 19 December 1972, *Bayliss B134* (K); Komgha, near Kei Mouth, July 1894, *Flanagan 2341* (K, PRE); Humansdorp, Noetjie, coastal forest, 11 July 1960, *Acocks 21207* (K, PRE); Humansdorp, Storms River, high forest on coastal plateau, 8 August 1920, *Keet 523* (K, PRE); Storms River, August 1920, *Fourcade 843* (PRE); Humansdorp, May 1926, *Thode A841 & A2537* (K, PRE). Western Cape. Cape Town, Camps Bay, 6 July 1946, *Strey 749* (K); Kirstenbosch, August 1907, *Kensit 10748* (K), 1 July, *Zeyher 244* (SAM); Simonstown, Kogelberg Forest Reserve, 12 May 1969, *Boucher 321* (K); Waterval, July, *Zeyher 179* (SAM); Paarlberg, 1839, *Drège s.n.* (K, SAM); Marais Park, 18 October 1960, *Van Rensburg 2144* (K); Stellenbosch, upper Zourens River valley, 2 September 1943, *Parker 3825* (K); Jonkershoek, Langrivier, 14 July 1965, *Kerfoot K5273* (K); Worcester, Du Toits Kloof, 28 September 1949, *Esterhuysen 15678* (BOL); Paarl, Donkerkloof, Klein Drakenstein Mtns, 16 April 1961, *Esterhuysen s.n.* (BOL); Albany, Mountain Drive, 22 July 1947, *Story 2687* (K); Albany, *Bowker s.n.* (K); Albany, undated, *Zeyher 883* (K); Lambrechtsbos, 10 September 1984, *Richardson 121* (PRE); Caledon, Vogelgat, Hermanus, 4 July 1975, *Williams 2007* (NBG, PRE); Klein River Mouth, ravine forest, 14 September 1981, *Bean 670* (BOL); Rooi Els, 16 September 1944, *Compton 16344* (NBG); Kogel Bay, ravine near sea, 13 June 1946, *Parker 4072* (BOL, K); Riversdale, Stillbay, 11 August 1960, *Acocks 21368* (K, PRE). St. Helena Island, near Government House, 12 January 1937, *Toms 63* (K).

NOTES. The species is reported to normally flower in profusion every three years, but if the flowers become infested and galled the cycle is interrupted, and flowering will only occur in the next two years.

USES. The wood is used for charcoal and was used during wagon making.

**2. *O. ventosa*** (L.) Cufod., *Osterreichischen Botanischen Zeitschrift*, 107: 106 (1960); *Plectronia ventosa* L., *Mantissa Plantarum* 1: 6, 52 (1767); L., *Systema. Naturae*, ed. 2, 2: 6, 138, 183 (1767); L., *Systema*

Vegetabilium, 14, 242 (1784); De Candolle, Prodrum Systematis Naturalis Pars. IV, 476 (1830); Hiern, Catalogue of the African Plants 1(2): 369 (1898); Coates-Palgrave & Coates-Palgrave, Trees of southern Africa, 774 (2002). - Lectotype (designated by Ross, 1975): Caput bona spei, Herb. Linn. No. 277.2 (LINN!).

*Sideroxylon cymosum* L.f., Supplementum Plantarum, 152 (1781); L., Systema Vegetabilium XIV, 232 (1784); Thunb., Prodrum, 36 (1794); L.f., Systema Vegetabilium, 779 (1825); *Olinia cymosa* (L.f.) Thunb., Archiv für die Botanik, 2(1), 4 (1799); L.f., Systema Vegetabilium, 482 (1828); Klotzsch, Icones Plantarum Rariorum, 60, t.24 (1841); Sond., Flora capensis 2, 520 (1862); Hiern, Flora of tropical Africa, 585 (1871); De Candolle, Prodrum Systematis Naturalis, Regni Vegetabilis Pars II, 41 (1873); Decne., Sur les caracteres et les affinites des Oliniées, 13 (1877); Sim, Forests and forest Flora of the Cape, 227, pl. LXX, II fig.14 (1907). Lectotype (designated by Sebola & Balkwill, 1999): Caput bona spei, in Tafelberg, *Thunberg 5428*, (UPS, microfiche J! & K!).

*O. cymosa* var. *latifolia* Sond., Flora capensis 2, 519 (1862); Sim, Forests and forest Flora of the Cape, 227 (1907), nom. illeg. (= *O. cymosa* (L.f.) Thunb.).

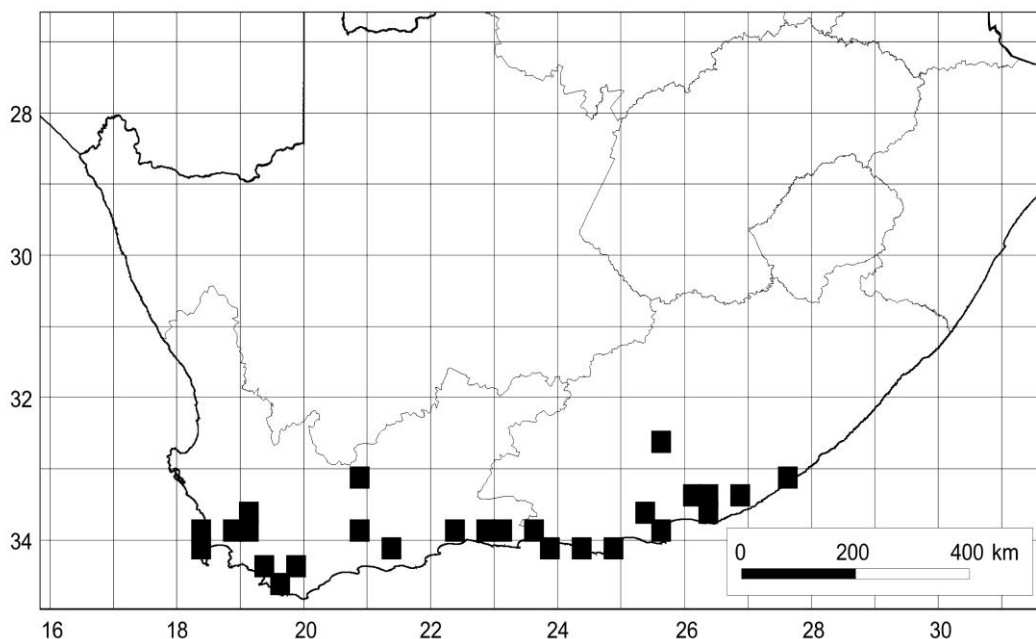
Large tree, up to 5 m high. *Bark* smooth and greyish; *branchlets* pink and quadrangular. *Leaves* simple, opposite, decussate, obovate to oblanceolate, petiolate, discolorous, glabrous on both surfaces, (36–)44–69(–80) x (17–)20–29(–35) mm; base cuneate to attenuate; apex acuminate to obtuse in juvenile leaves, slightly emarginate in mature leaves; margin entire, undulate, slightly revolute; venation brochidodromous. *Primary* or *midvein* slightly sunken, protruding below surface. *Secondary* veins branching at 30°–40° from midrib, looping once before margins; *tertiary* veins inconspicuous above. *Petiole* pink, pubescent, (3–)3.6–6.5(–7.6) mm long. *Stipules* rudimentary, brownish black. *Inflorescences* axillary, dichasial cymes, loose; axes slightly pubescent, (5.5–)6.6–9(–11) mm long; *peduncle* (3–)3.1–4.2(–5) mm long. *Bracts* caducous, cream-white, obovate, (1.5–

)3.5–5(–7) x 1.5–3.5 mm, pubescent on both surfaces; apex acuminate; base decurrent (for those attached to inflorescence units). *Flower* perigynous, 5-merous. *Pedicel* glabrous, 0.5–1 mm long. *Hypanthium* pink, glabrous, (3–)4.6–6.8(–7.8) mm long. *Sepals* rudimentary. *Petals* cream-white, elliptic, (1.5–)2–3(–3.3) x 1–1.5(–1.5) mm, inserted at throat of hypanthium, pubescent on lower surface at point of attachment, base sessile; apex rounded; margin entire. *Scales* cream-white, hooded, enclosing stamens, alternating with petal lobes, 0.5–1 mm long, pubescent on both surfaces. *Stamens* attached just below sinuses, alternating with petal lobes; *filaments* highly reduced; *anthers* hidden by scales above them, dehiscing by longitudinal slits. *Ovary* inferior, 5-locular; *style* glabrous, ±1 mm long. *stigma* capitate. *Fruit* pink to red, globose to ovoid, 5–7 mm in diameter; hypanthium scar 4–5 mm in diameter.

**DISTRIBUTION.** Known only from the Western Cape and Eastern Cape in South Africa. The region has a mediterranean type climate, and receives rain mainly in winter and some areas in the East receive rainfall all year round. Map 2(b).

**COMMON NAMES.** Hard pear, Hardepeer (Afrikaans).

**HABITAT.** Occurs in mountain forests and along ravines, with altitudinal variation ranging from 960 – 1500 m.



Map 2 (b). Known distribution of *O. ventosa*

CONSERVATION STATUS. This species has a narrow distribution in the southwestern Cape region of South Africa. However, the high abundance, and occurrence in most conservancies in the region makes this species likely to rate as Least Concern.

SPECIMENS EXAMINED. SOUTH AFRICA: Eastern Cape. Port Elizabeth, Baakens River, Dodd's Farm, Baakens River Valley, 7 May 1974, *Olivier 1071* (NBG, PRE); Port Elizabeth, 26 August 1912, *Paterson 2320* (BOL); Uitenhage, Coega Catchment Basin, Groendal Wilderness Reserve, 236 Uitenhage Farm, undated, *Scharf 1613* (PRE); Grahamstown, Sidbury, 12 July 1975, *Bayliss BRI B1485* (K); Grahamstown, Stone Hill, along road to Southwell, 27 May 1990, *Phillipson 3680* (PRE); Grahamstown, Howison's Poort, undated, *Zeyher 2465* (NBG); Bathurst, Hopewell, 6 July 1955, *Acocks 18364* (K); Grahamstown, Kap River, near Shaw Park, Cancer Research Station, 1 October 1974, *Bayliss BRI B.1090* (PRE); Alexandria, Paynes Farm, Bushmans River Poort, 31 August 1954, *Johnson 1027* (K); Swellendam, Grootvadersbosch, undated, *Zeyher 2464* (K) & *Pappe 130* (SAM); Humansdorp, Geelhoutboom River, September 1923, *Fourcade 2728* (K). Somerset East, November 1867, *Bolus 1772* (BM); George, 12 August 1933, *Humbert 9827* (K); Knysna, Millwood Forest Station, 11 October 1920, *Keet 589* (BM); Knysna, near Coldstream, 14 September 1947, *Rodin 1300* (K); Knysna, Melville, undated, *Burchell 5475* (K); Knysna, Olifantshoek, 20 June 1914, *Burchell 5469* (K); Western Cape. Kirstenbosch Botanical Garden, 31 September 1973, *Carlquist 4599* (K), 16 October 1942, *Henderson 1235* (NBG), 6 September 1963, *Stauffer 5126* (K), December 1840, *Zeyher s.n.* (SAM); Stellenbosch, Jonkershoek, 19 May 1952, *Parker 4537* (K); Stellenbosch, Brian Rycroft Nature Reserve, Dwarsriviershoek, Banghoek, 21 October 1978, *Rycroft 3306* (NBG); Orange Kloof, July 1890, *Gamble 2201 & 2215* (K); Caledon, Hermanus, Voelklip, 28 March 1981, *Williams 652* (K); Hermanus, Fernkloof Nature Reserve, 4 October 1980, *Orchard 575* (K); Platbos, near Strandskloof, 4 November 1969, *Taylor 7423* (K); Cape of Good Hope, Simon's Bay, 9 December 1865, *Wright s.n.* (K);

Cape Town, undated, *Burchell* 8397 (K); Table Mountain, September 1879, *Bolus* 1772 (K).

**3. *O. micrantha*** Decne., Sur les caracteres et les affinites des Oliniées, 14 (1877); Engler, Die Pflanzenwelt Afrikas, 625 (1921); Coates-Palgrave & Coates-Palgrave, Trees of southern Africa, 772 (2002). Type: Afr. Austr. Cat. Geogr. Plant Extratrop., *Burchell* 3592 (holotype K!).

*O. acuminata* sensu Hofmeyr & Phillips, Bothalia 1: 102 (1922), *pro parte*.

*O. cymosa* (L.f.) Thunb. var. *acuminata* sensu Sim, Forests and Forest Flora of the Cape, 227 (1907).

A large tree up to 15 m high. *Bark* pale to dark grey and rectangularly fissured or reddish brown and flaking, trunk often fluted; *branchlets* quadrangular, slightly velvety. *Leaves* simple, opposite, decussate, concolorous, broadly elliptic to obovate, 20–30 × 10–11 mm, leathery, more or less the same colour on both surfaces; apex obtuse to apiculate, slightly mucronate; base attenuate or tapering; margin entire. *Midrib* or *primary veins* level with lamina. *Secondary veins* inconspicuous above and below. *Petiole* (1–)1.5–2.8(–3) mm long, slightly pubescent on dorsal surface. *Stipules* rudimentary, brownish black. *Inflorescence* axillary and terminal, compact, dichasial cymes. *Peduncle* pubescent, (1.8–)2–3.5(–3.8) mm long. *Bracts* subulate, pubescent on both surfaces, (5–)7–9(–12) × (2.5–)5–5.5(–6.5) mm, cream-white, persistent or falling shortly after the flowers open (anthesis) (August–January). *Flowers* very small, whitish, sometimes tinged with pink, in dense axillary heads, 50–60 mm long, sweetly scented; *pedicel* glaucous, short. *Hypanthium* glabrous, (1.5–)2–2.5(–3) mm long. *Sepals* minute, tooth-like. *Petals* glabrous on outer surface, inner surface with tuft of short hairs at base, (1–)1.2–1.8(–2) × (0.5–)0.7–0.8(–1) mm. *Scales* incurved, highly pubescent. *Stamens* 5, alternating with equal number of petals;

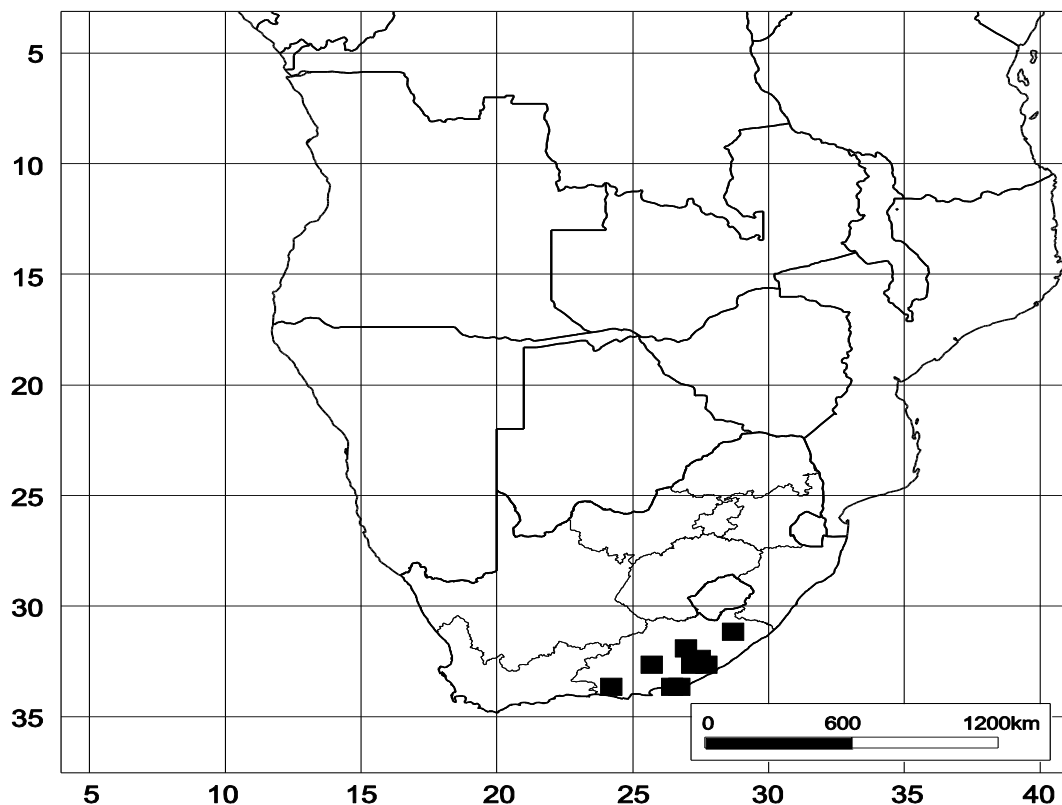
*filaments* reduced, extending into a thick connective; *anthers* face downward, covered by scales. *Ovary* inferior, 3- – 5-locular; *style* glabrous, shorter than floral tube; *stigma* globular. *Fruit* globose, about 10 mm in diameter, soft and thinly fleshy, red, visible circular scar at the apex on young fruit, disappearing in mature fruit (December – June).

**DISTRIBUTION.** The species is known only from the Eastern Cape, South Africa, mainly in the transitional zone receiving both winter and summer rainfall. Map 3.

**COMMON NAMES.** None.

**HABITAT.** Occuring in evergreen forest, at forest margins, and along ravines. Altitudinal variation ranging from 950–1950 m.

**CONSERVATION STATUS.** This species has a narrow distribution range in the Eastern Cape region of South Africa, is a listed species and protected under section 12 of the National Forests Act (Act no. 84, 1998) of South Africa. Since this species occurs in protected areas, and is abundant where it occurs, it is therefore likely to be assigned the IUCN Red Data status of Least Concern.



Map 3. Known distribution of *O. micrantha*.

SPECIMENS EXAMINED. SOUTH AFRICA. Eastern Cape. Mount Fletcher district, Lusi River, 9.5 miles up Lusi River road, 19 January 1962, *Acocks* 21925 (PRE); Queenstown, Bongola, Rockwood, 19 February 1899, *Galpin* 2500 (PRE); Alexandria Forest, 31 August 1973, *Bayliss BRI B 514* (PRE); Transkei, Gxwaleni Forest, 21 July 1922, *Curator* 4350 (PRE); Transkei, Insikeni Forest, 26 July 1922, *Dawson* 4309 (PRE); Maclear district, Pot River Mtn, in kloof, 20 March 1904, *Galpin* 6628 & 6629 (PRE); Baviaanskloof, 22 June 1975, *Bayliss BRI. B.1464* (PRE); Kei road, Gleniffer Farm, 25 March 1972, *Ellis & Jarman* 1080 (PRE); Grahamstown, 30 August 1913, *Burchell* 3592 (J, K), August, *MacOwan* 349 (J); Elandis, post near Amatola Mtn, August, *Borcherds s.n.* (J); Uitrecht, Donkerhoek, 10 August 1970, *Devenish* 1413 (J); Dullstroom, on farm Middelplaats, 15 miles NW, 24 January 1933, *Galpin s. n.* (J); Encoba Mtn, January 1896, *Flanagan* 2687 (K); Tsolo district, Ntywenda Pass, south-east of Maclear, 17 November 1945, *Acocks* 12174 & 12179 (J); Somerset East; Bosberg Nature Reserve, picnic area and Caravan Park, 9 November 1983, *Palmer* 1081 (PRE); Kaffraria, Fort Cunyngham, January 1897, *Sim* 2026 (PRE); Uitenhage division, Olifantshoek forest, between mouths of the Bushmans River and Sundays River, Septemebr 1830, *Ecklon & Zeyher* 21040 (PRE); Victoria East division, Hogsback, 2 miles from Inn on Keiskammahoek road, 22 November 1966, *Wells* 3789 (PRE).

NOTES. This species is sympatric with *O. capensis* and *O. ventosa*. With regard to variation in leaf dimensions, *O. micrantha* overlaps with *O. emarginata* while the retention of bracts after anthesis makes *O. micrantha* similar to *O. capensis* from which it differs by the shape (subulate versus linear to elliptic) and length of bracts (shorter than 8.5 mm). The flowering periods also distinguish *O. micrantha* (August to January) from *O. capensis* (May to July).

**4. *O. emarginata*** Burt Davy, Flora of Transvaal, 1: 47 & 200 (1926); Codd in R.A. Dyer (ed.), Flowering Plants of Africa, 32: 1260 (1957-58); Letty, Wild Flowers of the Transvaal, 228, plate 113

(1962); Coates-Palgrave, *Trees of southern Africa*, 643 (1983); Coates-Palgrave & Coates-Palgrave, *Trees of southern Africa*, 772 (2002); Schimdt, Lotter & McClelland, *Trees and Shrubs of Mpumalanga and Kruger Park*, 446 (2002). Type: Upper Moodies at 3300 ft, near Barberton, Mpumalanga, South Africa, *Galpin 1275* (holotype J!; isotypes K!, PRE!).

*O. cymosa* non. Thunb., Sonder in *Flora capensis*, 2: 518 (1862), *pro parte Zeyher 308*; Sim, *Forests and forest Flora of the Cape*, 227 (1907), tab. 72, *descript.*, *pro parte*.

*O. micrantha* non Decne., Engler in *Pflanzenwelt Afrikas*, 3, 2: 625 (1921).

*O. acuminata* non Klotzsch, Hofmeyr & Phillips in *Bothalia*, 1: 102 (1922).

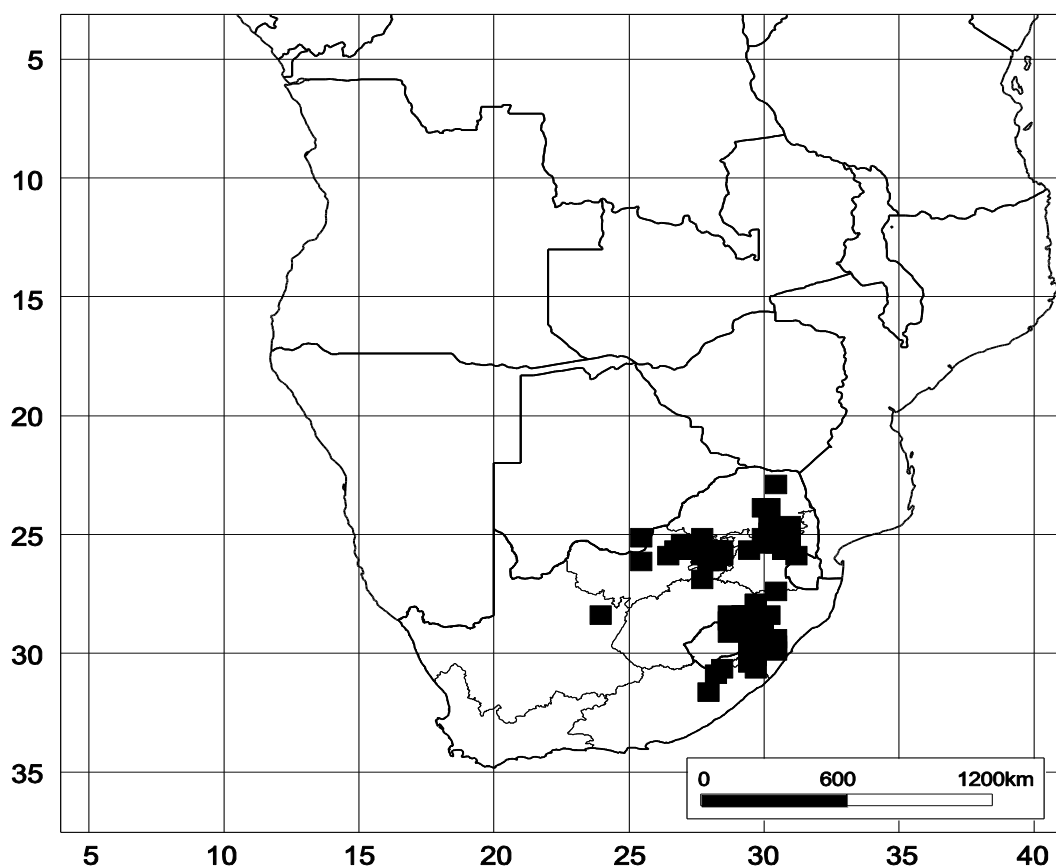
Medium to large tree 5–10 m high, evergreen. *Bark* grey to cream-white, mottled, flaking off in pieces; *branchlets* smooth, pale, quadrangular. *Leaves* oblong to oblanceolate, 20–45 x 10–20 mm, discolorous, glossy dark green above, pale green and dull below, often with a pink tinge; with a faint smell of almonds when crushed; apex rounded, notched or emarginate; base cuneate to slightly tapering; margin entire, slightly inrolled, wavy. *Primary vein or midrib* prominent above. *Secondary or lateral veins* looping once before the margin, net veining prominent on undersurface. *Petiole* short, pink to red, 2–4 mm long. *Inflorescence* loose, terminal and axillary. *Bracts* foliaceous, green. *Flowers* pink, clustered in loose triads or cymes, faintly sweet-scented; *pedicel* 1–3 mm long, slightly pubescent. *Hypanthium* glabrous, 3–6 mm long, pink to reddish. *Sepals* minute and bifid, occur as extension of floral tube/hypanthium. *Petals* 5.5–15 mm long, pinkish to red, glabrous, linear to oblong. *Scales* obovate, highly pubescent both surfaces, hooded and fused at bud stage, free and recurved at anthesis. *Stamens* below scales, alternate with petals; *filament* short, glabrous; *anthers* bi-chambered,

dorsifixed with thick connective, dehisce by longitudinal slits, enclosed by hooded scales. *Ovary* inferior; *style* glabrous to slightly pubescent, 3–4 mm long; *stigma* globose. *Fruit* ovoid, thinly fleshy, about 10 mm in diameter, pink to red with white patches; distinct circular scar at the apex marked by caducous hypanthium, style remnant at center of scar.

**DISTRIBUTION.** The species is fairly widespread from northern Swaziland through Barberton in Mpumalanga, eastern and central Limpopo Province, southward through to Gauteng, North West Province, Free State, south-western KwaZulu-Natal, the Drakensberg, southern part of Lesotho and into the north-eastern part of the Eastern Cape, Map 4. Records of its occurrence in Zimbabwe (Schmidt *et al.*, 2002) require verification.

**COMMON NAMES.** Mountain hard-pear, Berghardepeer (Afrikaans), Mulondwane (Venda).

**HABITAT.** The species grows in mountain forests, kloofs, in gullies, and occasionally on rocky hill slopes.



Map 4. Known distribution of *O. emarginata*.

CONSERVATION STATUS. The wide distribution of this species in central South Africa, as well as in Lesotho and Swaziland makes it likely to rate as Least Concern.

SPECIMENS EXAMINED. SOUTH AFRICA, Limpopo. Langjan Nature Reserve, December 1974, *Zwanziger 413* (PRE); Pietersburg (Polokwane) district, Woodbush Plantation, edge of high forest, December 1923, *Keet 1292* (PRE); Woodbush, January 1914, *O'Connor 1457* (PRE); Haenertsburg district, Iron Crown Mtn, in kloof near summit, 13 January 1939, *Mogg 16651* (PRE); Sekhukhuneland, Lulu Mtns, Groot Vygeboom Farm, summit of range, 3 September 1936, *Mogg 16962 & 16988* (PRE); Leolo Mtns, 6 June 2001, *Van Wyk 320* (PRE). Mpumalanga. Buffelskloof Nature Reserve, Water's Meet, 26 December 1990, *Burrows & Burrows 3475* (PRE); Dullstroom district, farm of R. Walwyn; below escarpment in kloof, 21 December 1986, *Fabian 1094* (PRE); Lydenburg, below stone huts, upper Buffelskloof Nature Reserve, 23 December 2002, *Burrows 7947* (PRE); Lydenburg, on Lydenburg-Machadodorp road, Badfontein farm, Marantan Hiking Trail, 17 April 1997, *Retief 2183* (PRE); Marantan Hiking Trail, opposite the Braam Raubenheimer Dam (Kwena Dam), 18 April 1997, *Bredenkamp 1450 & 1462* (PRE); Marantan Hiking Trail, ± 17 km from Lydenburg, turn-off between Machadodorp and Lydenburg, Badfontein farm, 31 October 1997, *Jordaan 3272* (PRE); Long Tom Pass, Paardeplaats 54 JT, 15 April 1988, *Momberg 166* (PRE); Barberton, 18 January 1891, *Galpin 1575* (PRE); Pilgrims Rest district, Ohrigstad Dam Nature Reserve, 21 January 1976, *Theron 3520* (PRE); Tullach Mohr, Ngodwana Game Reserve, north-west side of farm, 18 May 1975, *Van Jaarsveld 482* (PRE); Mariepskop, 5 May 1974, *Jones 120* (PRE); Lydenburg district, Klipbankspruit, 7 December 1977, *Kluge 1140* (PRE); Lydenburg district, Uitkyk, Buffelskloofbos Farm, 19 May 1978, *Cooper 217* (PRE); Lydenburg district, west of Pilgrim's Hill, June 1925, *Keet 6060* (PRE); Mac Mac Nature Reserve, 29 November 1979, *Kluge 2138* (PRE); Morgenzon Nature Reserve, 17 November 1979, *Kluge 2074* (PRE); Hendriksdal, 8 January 1921, *Pole Evans 110* (PRE);

Middelburg, Broodboomspruit, Doornkop 273 JS plaas, N. grens, 15 January 1968, *Du Plessis* 127 (PRE); Barberton, Upper Moodies, 18 January 1891, *Galpin* 1275 (PRE, isotype); Lydenburg district, Zwagershoek Nature Reserve, Lydenburg Kloof, 1 June 1935, *Obermeyer & Verdoorn* 34 (PRE); Schurinks Kloof, 1 June 1935, *Obermeyer & Verdoorn* 34A (PRE); Lydenburg, 8.4 miles SE of Lydenburg, 16 December 1955, *Prosser* 1940 (PRE); Mount Sheba, forest margin, 4 October 1970, *Jones* 38 (PRE); Belfast district, Middelplaats Farm, 15 miles NW of Dullstroom on large koppie, 24 January 1933, *Galpin* 13278 (PRE); Elandspruitberg, 5 December 1893, *Schlechter* 3864 (PRE); Dullstroom, January 1920, *Noome* 20812 (PRE); Ohrigstad Dam Nature Reserve, 14 February 1973, *Jacobsen* 2681 (PRE); Sabie Hoek Forest, 27 January 1906, *Burt* 1648 (PRE); Ngodwana, 10 miles N of Sappi Mills, 8 January 1972, *Nel* 171 (PRE). Gauteng. Pretoria district, October 1933, *Meebold* 11805 (PRE); Pretoria, Garstfontein, 14 May 1955, *Codd* 9381 (PRE), 19 June 1946, *Story* 1232 (PRE), 19 June 1946, *Repton* 3029 (PRE), 1 December 1955, *Codd* 9381 (PRE); Pretoria, Waterkloof south, head donga west of ravine, 31 August 1928, *Mogg* 15242 (PRE); Pretoria, Prinshof, December 1959, *De Winter* 7531 (PRE); Pretoria, Debbes Ravine, 26 August 1933, *Mogg* 48304 (PRE), 10 June 1928, *Mogg* 15053 (PRE), January 1948, *Repton* 3389 (PRE); Pretoria Botanical Garden, 6 July 1981, *Balsinhas* 3529 (PRE); Krugersdorp district, Witpoortjie Falls, Roodekrantz 83, 12 November 1949, *Mogg* 21345 (PRE); Johannesburg district, Mellville Koppies Nature Reserve, 12 May 1960, *Cheadle* 592 (PRE); Krugersdorp district, Magaliesberg Range, near Hekpoort, 19 May 1996, *Sebola* 311 (J, PRE). North West Province. Rustenburg Nature Reserve, 31 March 1970, *Jacobsen* 918 (PRE), 14 August 1970, *Jacobsen* 985 (PRE), Rustenburg Kloof, 23 December 1930, *Bremekamp* 29081 (PRE); Rustenburg district, Elands River, Mazista Kloof on Elands River, 22 October 1937, *Sutton* 1171 & 1173 (PRE); Avondoz, Kloof H.8, 7 October 1943, *Innes* 172 (PRE); Hekpoort, Bush Kloof No.1, 1 January 1937, *Phillips* 496 (PRE); Nooitgedacht Kloof, 17 April 1936, *Phillips* 509 (PRE); Brits district, Magaliesberg, Jacksonstun, 17 July

1957, *Van Vuuren* 252 (PRE); Brits district, Magaliesberg, opposite Wolhuterskop turn-off, 10 November 1946, *Innes & Story* 1390 (PRE); Brits district, Magaliesberg, Aasvoelkrans, 12 November 1957, *Van Vuuren* 362 (PRE); Brits district, Bokfontein 647, farm Jacksonstuin on the N. slopes of Magaliesberg, 8 March 1934, *Mogg* 14976 (PRE); Uitkomst 499 farm, between Waterval and Onderste Damwal Van Dunningkamp, 2 October 1970, *Coetzee* 287 (PRE); Uitkomst 499 farm, between Tarentaaldrif and Bobbejaan Kloof, 23 September 1970, *Coetzee* 269 (PRE); Skeerpoort River, Uitkomst 499 JQ, net bokant Waterval in Skeerpoortrivier, 2 October 1970, *Coetzee* 288 (PRE). Free State. Bethlehem, Qwa Qwa National Park, Zaphira, 1 February 1995, *Zietsman* 2956 (PRE); Golden Gate National Park, Donkerkloof, 2 September 1990, *Van Wyk & Van Wyk* 2374A (PRE); Mt Pierre se Kloof, Boskloof, 12 December 1988, *Gertenbach & Groenewald* 8961 (PRE); Harrismith district, Groenkloof farm, near Natal border, 17 January 1978, *Muller & Viljoen* 18 (PRE); Maweni Heights, 18 December 1963, *Van Zinderen Bakker* 15 (PRE); Bethlehem district, Golden Gate Highland, January 1923, *Liebenberg* 7009 (PRE); Witsieshoek district, Korfshoek, Kloof Forest, 20 December 1963, *Van Zinderen Bakker* 23 (PRE). KwaZulu-Natal. Normandien district, Glendale Farm in Kloof, December 1971, *Biggs* 37 (PRE); Bergville district, Cathedral Peak, Mlambonja Valley, 11 January 1966, *Killick & Vahrmeijer* 3545 (PRE); Utrecht district, Donkerhoek, 10 August 1970, *Devenish* 879 & 1413 (PRE); Lions River district, Umgenipoort, 19 May 1964, *Moll* 845 (PRE); Champagne Castle, January 1942, *Bayer* 1228 (PRE); Lions River district, Dargle, near hotel, January 1921, *Sim* 19124 (PRE); Drakensberg, May 1893, *Wood* 4957 (PRE); Drakensberg, Little Switzerland, scree forest at campsite, 8 March 1969, *Anderson* 167 (PRE); Oliviershoek, Keswick farm, Little Switzerland Resort, 11 June 1974, *Van der Zeyde* 150 (PRE); Drakensberg, Bergville district, Umlambonja Valley, July 1936, *Marriott* 22639 (PRE); Bergville district; Cathedral Peak Forest, forest in Indumeni Valley, 16 July 1952, *Killick* 1743 (PRE); Cathedral Peak, Catchment 13, near stream bank, 15 February 1984, *Buthlezi* 424 (PRE); Drakensberg,

Cathedral Peak district, Indumeni Stream, 19 March 1973, *White 10592* (PRE); Cathedral Peak, Ndedema Gorge, 1 February 1992, *Edwards 1092* (PRE); Northern Drakensberg, Ncandu State Forest, 8 May 1984, *Nicholas & Button 1962* (PRE); Giant's Castle Reserve, 22 January 1969, *MacAllister 146* (PRE); Giant's Castle Reserve, 17 January 1967, *Moll 3431* (PRE); Bergville district, Mont Aux Sources, 27 August 1930, *Hutchinson, Forbes & Verdoorn 15* (PRE); Estcourt district, 4 December 1939, *West 1492* (PRE); Estcourt district, 1 mile east of Estcourt Town, 14 December 1975, *Green 114* (PRE); Estcourt district, Tabamhlope Mtn, 20 April 1937, *West 182* (PRE); Estcourt district, Giant's Castle Reserve, 2 February 1967, *Magnet 6* (PRE); Estcourt district, Tabamhlope S.A.P, 8 June 1937, *Pentz 321* (PRE); Tabamhlope Mtn, 23 August 1939, *West 1138* (PRE); Pietermaritzburg district, Zwartkop, 1918, *Sim 48300* (PRE); Boschoek farm, between Mooirivier and Pietermaritzburg, 20 April 1978, *Van Wyk 2301* (PRE); Bergville district, Cathedral Peak Forest, 31 January 1951, *Killick 1355* (PRE); New Hanover district, Karkloof, Benvie, October 1966, *Moll 3371* (PRE); Royal Natal National Park, Sunday Falls Forest, along streams, 23 January 1955, *Edwards 492* (PRE); Royal Natal National Park, Gudu Forest, Guelu River, 21 May 1955, *Edwards 478* (PRE); Royal Natal National Park, Isuelu Falls, 19 January 1955, *Edwards 464* (PRE); Royal Natal National Park, Gudu Forest, 21 April 1971, *Moll 5433* (PRE); Balgowan district, Burnside, 27 May 1959, *Booyesen 78* (PRE); Dundee district, Blesboklaagte, 9 miles S. of Dundee, 28 December 1946, *Codd 2422* (PRE); Underberg district, Cobham Forest Station, 7 November 1980, *Hilliard & Burt 13310* (PRE); Underberg district, Cobham Forest Station, Ndlovini, Troutbeck, 8 November 1980, *Hilliard & Burt 13340* (PRE); Cobham State Forest, Giants Cub Trail, Ngenwa Pool, 21 June 1982, *Nicholas & Van den Berg 1341* (PRE); Underberg district, Garden Castle Forest Reserve, beyond forester's house, 11 November 1980, *Hilliard & Burt 13444 & 13445* (PRE); Van Reenen, Boschkloof, east of Van Reenen near Mtn, along road to Brakwal Station, 29 December 1975, *Jacobsz 1754* (PRE); Van Reenen, Nolens Volens, farm east of Van Reenen, along gravel road above

national road, 19 June 1974, *Jacobsz 1515* (PRE); Little Tugela River, No.1 Location, 4 May 1937, *Pentz 180* (PRE); Griqualand East, Mount Currie, on the slopes, undated, *Forest Officer 635* (PRE).

NOTES. The species flowers from October to January and sets fruit from March to July. The fruits are pink to red and eaten by birds. The species is frost tolerant, but drought sensitive. Propagation from either seed or cuttings has been unsuccessful.

**5. *O. radiata*** Hofmeyr & Phillips, *Bothalia*, 1(2): 102 (1922); Coates-Palgrave, *Trees of southern Africa*, 644 (1998); Coates-Palgrave & Coates-Palgrave, *Trees of southern Africa*, 773 (2002). Schmidt, Lötter & McClelland, *Trees and Shrubs of Mpumalanga and Kruger National Park*, 446 (2002). Type: Ngadodo Forest, Ngqeleni, former Transkei, Eastern Cape, South Africa, *Fegen 2286* (holotype K!; isotypes J!, PRE!).

Large tree up to 20 m high. *Bark* dark brown, smooth to flaky; *branchlets* quadrangular, reddish to light brown, and glabrous. *Leaves* simple, opposite, decussate, oblanceolate to elliptic, 50–90 x 20–40 mm, glossy dark green above, dull and somewhat paler below; apex broadly tapering, margins entire, wavy. *Primary or midvein* conspicuous, slightly raised above; *secondary or lateral veins* inconspicuous above, looping once before the margin. *Petiole* distinct, glabrous to slightly pubescent. *Stipules* rudimentary. *Inflorescence* axillary, in dense many-flowered axillary cymes and compact, shorter than subtending leaf. *Peduncle* sparsely pubescent. *Bracts* greenish, foliaceous/leaf-like and deciduous. *Flowers* small, whitish, tightly clustered at base of leaf axils and against branches. *Pedicel* 1.5 – 3 mm long, glabrous. *Hypanthium* 1.5–5 mm long, glabrous. *Sepals* minute, opposite hooded scales, alternating with petals. *Petals* 5, inserted at rim or throat of hypanthium, linear-spathulate, base with tuft of hairs, 1.5–3 mm long, acute. *Scales* incurved, highly pubescent, obovate, and alternate with petals. *Stamens* 5, adnate to hypanthium below scales; *filaments* very short to absent; *anthers* dorsifixed, thick connective, enclosed by hooded

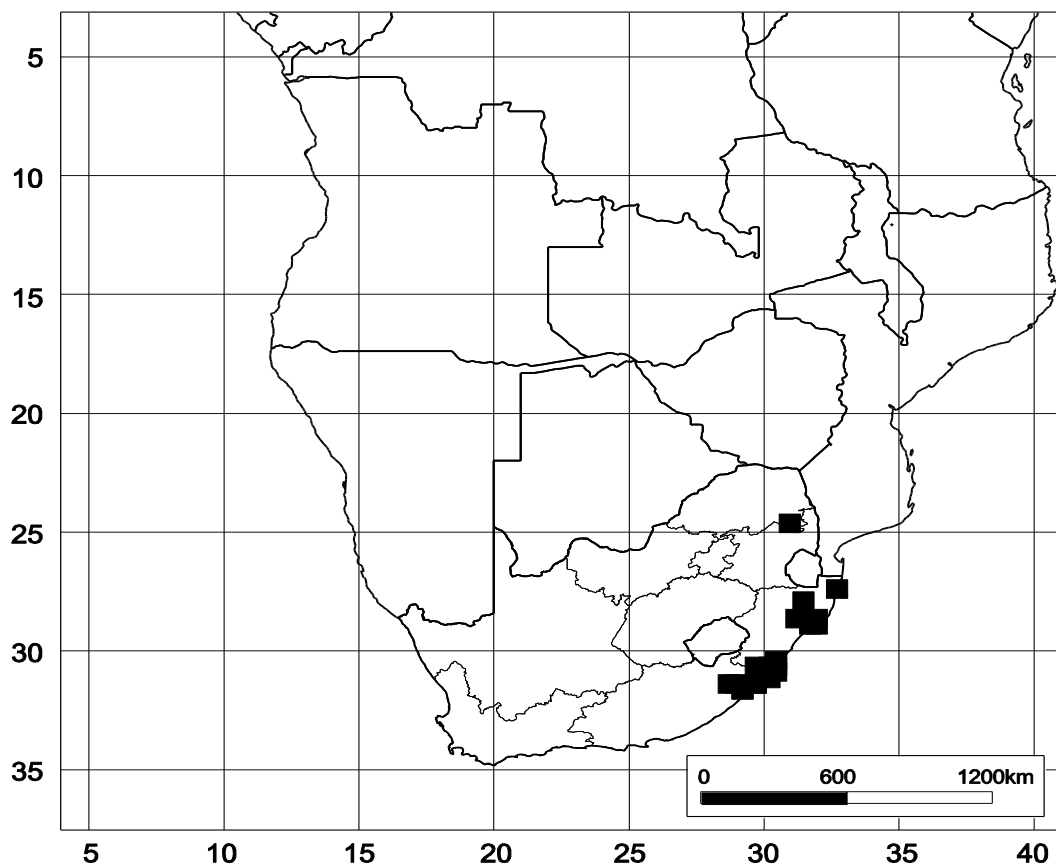
scales. *Ovary* inferior, 5-locular; *style* subulate, very short, highly pubescent; *stigma* obtuse. *Fruit* reddish purple, globose, 15–20 mm in diameter, fleshy with scar at apex.

DISTRIBUTION. The species is traditionally known from southern and eastern KwaZulu-Natal, and the Eastern Cape of South Africa. However, the pattern of distribution shows disjunctions since there are new records of this species in the forests of the Blyde River Canyon Nature Reserve, Mpumalanga. Map 5.

COMMON NAMES. Forest Hard-Pear, Natal Hard-Pear, UmZanene (Zulu).

HABITAT. Occurs mainly in closed canopy forests, and along ravines.

CONSERVATION STATUS. This species is protected under section 12 of the National Forests Act (Act no. 84, 1998) of South Africa.



Map 5. Known distribution of *O. radiata*.

SPECIMENS EXAMINED. SOUTH AFRICA. Mpumalanga. Blyde River Canyon Nature Reserve, Bourkes Luck, 8 May 1999, *Sebola & Lötter*

365 (J). KwaZulu-Natal. Ngotshe district, Ngome Forest, 27 July 1944, *Gerstner* 4863 (PRE); Ngoye Forest Reserve, 22 October 1970, *Venter* 6047 (PRE), undated, *Garland sub PRE* 48314 (PRE), 10 July 1973, *Moll* 5739 (PRE); Nkandla district, Nkandla Forest, 12.7 miles from Nkandla Hotel on road to Eshowe, 10 April 1964, *De Winter* 8270 (PRE); Nkandla Forest, 10 April 1964, *Edwards* 3309 (PRE); Nkandla Forest, 1 May 1956, *Edwards* 1379 (PRE); Nkandla Forest, 30 April 1956, *Edwards* 1369 (PRE); Mtunzini district, left hand branch of Ngoya Forest road, 20 February 1961, *Wells & Edwards* 87 (PRE); Hoopoe Falls, first river crossing Hoopoe Falls trails, undated, *Nicholson* 814 (PRE); Uvongo, Uvongo River, 23 August 1974, *Nicholson* 1500 (PRE); Port Edward, Craigador Farm, in kloof, 10 July 1973, *Nicholson* 1538 (PRE); Oribi Gorge Nature Reserve, 5 September 1969, *Nicholson* 801 (PRE); Baboon Kloof, undated, *Nicholson* 1274 (PRE); Umtamvuna Nature Reserve, 18 August 1973, *Nicholson* 1304 (PRE); Umtamvuna Nature Reserve, next to bank of Bululu River, 16 October 1980, *Van Wyk* 4203 (PRE), Umtamvuna Nature Reserve, Umtamvuna River Resort, 16 October 1980, *Nicholson* 2107 (PRE); Sibayi district, 1 July 1968, *Project Sibayi* 342 (PRE, K); Alexandria division, Dumisa Station, Ellesmere, 7 February 1911, *Rudatis* 1452 (PRE). Eastern Cape. Transkei, Tsolo district, Ceka Forest, November 1920, *Curator* 3099 (PRE); Alfred district, Ingeli Forest Station, 19 November 1915, *Chilvers* 1942 (PRE); Nqadu Forest Station, May 1917, *Roux* 2472 (PRE), May 1917, *Forest Officer Natal s.n. (Forestry Dept. Herb No: 2472)* (PRE); Eastern Pondoland, Lusikisiki, Mpanzi Forest, February 1916, *Leigh* 1839 (*Forestry Herb no: 1839*) (PRE); Ntsubane, 29 September 1922, *Curator* 4357 (PRE); Ntsubane Forest, 21 August 1915, *Leigh s.n. (Herb No: FH1553)* (PRE); Ntsubane Forest, undated, *Leigh* 2051 (PRE); Umtata district, Kambi, May 1917, *Hechter PRF* 2471 (PRE); Ngqeleni, Nqododo Forest, 15 November 1916, *Fegen* 2286 (PRE), 21 September 1917, *Fegen s.n. (Forestry Herb No: 2490)* (PRE).

NOTES. This species flowers from October/November to January and fruits from December to May. The species shows a disjunct distribution in that it is found in the Eastern Cape (Pondoland,

MaClear district, Lusikisiki district, up through to Ingeli Forests), southern and eastern KwaZulu-Natal and in Mpumalanga (Blyde River Canyon Nature Reserve). It is recorded as plentiful in the forests of Izinga, Ngododo, Qakama, Maseko, Ntsubane (between Umsikaba and Umzimhlava rivers) and neighbouring forests (Hofmeyr & Phillips, 1922). High numbers of *O. radiata* trees have also been observed (*pers. obs.*) in the forests in Blyde River Canyon Nature Reserve, Mpumalanga). The wood apparently makes good charcoal, and was used during wagon making (naves and felloes).

**6. *O. vanguerioides*** Baker f., Journal of Linnean Society, Botany, 40: 72 (1911); Verdcourt, Flora Zambesiaca, 326 (1978); Verdcourt & Fernandes, Flora de Mozambique, 1 (1986); Coates-Palgrave, Trees of southern Africa, 645 (1983). Coates-Palgrave & Coates-Palgrave, Trees of southern Africa, 774 (2002). Type: Zimbabwe, Umswirizwi head-waters, 1067 m, *Swynnerton* 158 (holotype BM!; isotypes K!, PRE!).

Shrubs or medium to large trees up to 10 m high. *Bark* thin, grey, and finely reticulate; *branchlets* quadrangular. *Leaves* opposite; lamina dark green on upper surface with pink-mauve tinge, light olive-green on under surface, elliptic, coriaceous; 36–73 × 24–40 mm; margins inrolled. *Primary* veins channelled above, light green. *Secondary* veins distinctly visible on both surfaces, parallel to each other on each side of the midvein. *Petiole* pink to red, pubescent, up to 4 mm long. *Inflorescence* puberulent, spreading, light green and thin. *Bracts* caducous, papery. *Flowers* 5-merous, greenish to yellow, sweetly scented. *Pedicels* distinct, puberulent. *Hypanthium* glabrous, narrow and thin-walled; galled flowers show elongate wart-like tubercles. *Sepals* 5, rudimentary, often as minute bifid ridges alternating with petals. *Petals* 5, spatulate, short, narrow and thinly textured, yellowish, glabrous on both sides; apex truncate. *Scales* highly puberulent with soft hairs on both surfaces. *Stamens* alternate with petals, attached below sepals; *filaments* highly reduced or absent; *anthers* covered by hooded scales. *Ovary* inferior,

3- – 5-locular; *style* puberulent, shorter than floral tube; *stigma* globose. *Fruit* globose, 5–7 mm in diameter, whitish with circular scar at tip 2–4 mm wide.

DISTRIBUTION. Known only from Zimbabwe, Map 6. It is widespread in central, south and eastern Zimbabwe. Although no records exist for Mozambique, it is highly probable that it occurs there given the similarity of habitats along the Zimbabwe/Mozambique border, especially along the Chimanimani mountain range.

HABITAT. In crevices or among granite boulders/rocks; near streams in kloof forests or on edge of relic forests; solitary or often among *Polysphaera*, *Erythroxylon*, *Hymenodictyon*, *Combretum*, *Ochna*, *Uvaria* and *Clerodendrum* evergreen thicket.

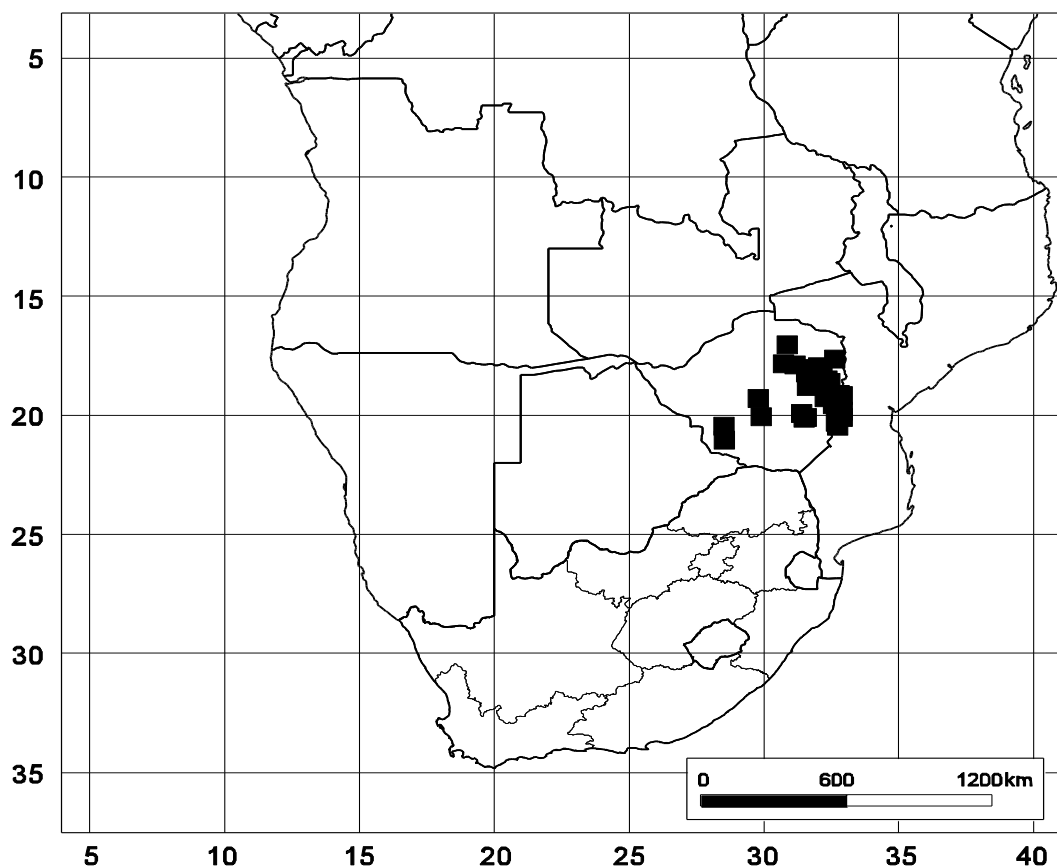
PHENOLOGY. Flowers from December to February and fruits between March and June.

COMMON NAME. Zimbabwean *Olinia*.

CONSERVATION STATUS. The distribution of this species is limited to Zimbabwe where it is widespread (central, south and eastern parts and the highlands along the border with Mozambique). The number of collections in herbaria suggests great abundance in the areas of occurrence. Although there are no precise records of population numbers or information on possible habitat destruction, some labels indicate that the species is common where it was collected. Available evidence thus indicates that this species is likely to rate as Least Concern under the IUCN Red List Categories.

SPECIMENS EXAMINED. ZIMBABWE. Chimanimani, Sawerombi, 5 May 1996, *Jacobsen 5188* (PRE); Bikita district, Mt Horzi, 9 May 1969, *Biegel 3082* (K, PRE); Chipinga district, Chirinda Forest margin, January 1966, *Goldsmith 9/67* (PRE); Chipinga district, main road to Chipinga, just above Msilizwe River near Chirinda, July 1962, *Goldsmith 159/62* (PRE); Headlands district, Lake Gwani, December 1948, *Greenshaw s. n.* (~ *sub SRGH 37362*) (K); North of Shiwa Ngandu, August 1938, *Greenway & Trapnell 5568* (K); Inyanga district, Inyanga National Park, Inyangombe Watershed, road to TroutBick, 2 January 1965, *West 6245* (K, PRE), 13 January 1931, *Norlindh & Weimarck 4257* (BM); Makoni district, 15 June 1957,

*Chase 6521a* (B, PRE); Marandellas district, April 1950, *Wild 3310* (K), Grassland Research Station, 6 December 1965, *West 6990* (K); Matobo district, farm Besna Kobila, on stream bank, December 1953, *Miller 1988* (B, K); Matobo district, farm Besna Kobila, March 1957, *Miller 4192* (K); Matobo district, on stream bank, December 1953, *Miller 1994* (B, K, PRE); Mazoe district, Umvukwes, Ruora Range, December 1952, *Wild 3928* (B); Melsetter district, Nyahodi Valley, northwest of Tarka Forest Reserve on upper reaches of a tributary of the Nyahodi River, February 1971, *Goldsmith 7/171* (B); Umtali district, Vumba Mtn, February 1955, *Chase 5480* (B, K, PRE); Umtali district, Butter North Farm, Tsetsera Mtn, near homestead, November 1957, *Chase 6774* (PRE);



Map 6. Known distribution of *O. vangerioides*.

Umtali district, Rowa Township, 5 February 1957, *Chase 6320* (PRE), 19 February 1955, *Chase 5480* (BM); Umtali district, Vumba Mtn, January 1947, *Fisher 1218* (PRE); Umtali district, from left side of Vumba to farm track to Msasa Knoll, July 1948, *Chase 4173* (BM); Wedza district, Wedza Mtn near Schulite Mine, April 1964, *Wild 5608*

(K), February 1963, *Wild* 5998 (K, PRE); Umswirizwi head-waters, December, *Swynnerton* 158 (BM, K, PRE).

**7. *O. huillensis*** Welw. ex A. & R. Fernandes, Mem. Junta Invest. Ultramar, 2, Sér. 38, 15 (1962). Type: Angola, Huila region, between Lopollo and Humpata, *Welwitsch* 991 (holotype LISU; isotype BM!).

*Key to infraspecific taxa within O. huillensis*

- 1a. Slender tree, 4–6 m high; terminal branches slender, light green to grey; leaves thin, papery and evergreen; inflorescence axes and peduncles slender, narrow; pedicels 2–4 mm long; petals 6.6–9.8 mm long ..... subsp. **huillensis**
- 1b. Shrub, up to 3 m high; terminal branches short and thick; leaves coriaceous and deciduous; inflorescence axes and peduncles robust and compact; pedicels 1–2.5 mm long; petals 4.9–7.4 mm long ..... **2**
- 2a. Leaves obovate, apex distinctly notched with a mucro, concolorous; hypanthium thick-walled, wider, shorter or equal to petals; petals obovate, wider than 3.5 mm; restricted to Mpumalanga, South Africa ..... subsp. **burttdavii**
- 2b. Leaves broadly elliptic, apex slightly notched to emarginate, discolorous; hypanthium thin-walled, narrow, longer than petals; petals broadly spatulate, narrower than 3 mm; common in north-western Malawi and southern Zambia ..... subsp. **discolor**

**7a. subsp. *huillensis***

Trees or slender shrubs, up to 6 m high. *Bark* light grey; *branches* narrow. *Leaves* thinly leathery to papery, elliptic; apex emarginate with a short mucro, distinctly discoloured, both surfaces glabrous; margins flat. *Primary* vein light green (mature), flat, slightly pinky-red (young), glabrous. *Secondary* veins slightly to just visible above, conspicuous below. *Petiole* short, light green to yellow, glabrous, 1.5–2 mm long. *Inflorescence* sparsely pubescent (younger) or completely glabrous (mature) and spreading. *Bracts* leathery, linear to oblong, caducous. *Flower* pentamerous, sessile to sub-sessile. *Hypanthium* slightly narrow, 4–6 mm long, puberulent with very short hairs. *Pedicel* distinct, markedly puberulent. *Sepals* rudimentary, appear as minute bifid ridges, alternate with petals. *Petals* spatulate to oblong, 5, glabrous, thick-textured, apex truncate with a short mucro, greater or equal to the hypanthium in length. *Scales* markedly puberulent, inflexed and sealing inside of tube (young or bud stage), and reflexed (mature). *Stamens* alternate with petals, attached below scales; *filaments* highly reduced; *anthers* covered by hooded scales. *Ovary* 5-locular; *style* pubescent; *stigma* capitate. *Fruit* obovoid and roughly fissured (preserved material), 6–8 mm in diameter; hypanthium scar not distinctly marked, 3–5 mm in diameter.

DISTRIBUTION. From Angola (Benguela, Huilla, Lubango and Tundavala; Huambo district, Moco Mt) through Zambia (Abercon, Mushitu district, Isoka and Mpika districts in Northern Province, Mafingi Mtn; Makutus, Eastern Province, and Lundazi), to South Africa (Soutpansberg, Blouberg and Tate Vondo Forests, Leolo and the Wolkberg Mts in Limpopo; and Bourkes Luck in Blyderivierspoort, Mpumalanga). Map 7.

HABITAT. Often grows on rocky slopes or above upper limit of evergreen forests, in ravines; and often associated with *Phillipia*, *Podocarpus* and *Ochna*.

CONSERVATION STATUS. There are many gatherings by different collectors from at least fifteen localities in three southern African

countries (Map 7), suggesting that this taxon is both widespread and common. In addition, none of the habitats in which it occurs is considered to be under threat. The evaluation indicates that this taxon will rate as Least Concern under the IUCN Red List Category.

SPECIMENS EXAMINED. TANZANIA. Arusha district, Meru Mtn, NW flank of Mtn, edge of forest, 31 December 1966, *Richards 21852 & 21864* (K). ZAMBIA. Eastern Province, Lundazi, upper slopes of Kangampande Mtns, Nyika Plateau, 3 May 1952, *White 2579* (K); Makutus, 26 October 1972, *Fanshawe F11531, F11534* (K); Northern Province, Isoka district, Mafingi Mtn, 8 km west of Chisenga Rest House, 28 November 1952, *Angus 838* (K); Mpika district, Muchinga Escarpment, 48 km South of Shiwa Ngandu on Mpika road, 29 November 1952, *Angus 883E* (K). ANGOLA. Huila, Lubango, Tundavala, 9 December 1962, *Barbosa 10365* (K, PRE), 8 December 1971, *Borges 314* (K, PRE); Huila, between Lopollo and Humpata, 30 December 1859, *Welwitsch 991* (BM, isotype); Huambo district, Moco Mtn, December 1973, *Huntley et al. 58* (K, PRE); Huila, Humpata, 25 November 1955, *Mendes 844* (BM, PRE); Benguela, R. Cuito, near Quipei, 11 May 1937, *Exell & Mendonça 1900* (BM). SOUTH AFRICA. Limpopo, Soutpansberg, Letjuma Mtn, 28 January 1968, *Nicholson 653 & 655* (PRE), 21 December 1998, *Sebola 432* (J); Vivo, farm Llewellyn 35 LS, 4 July 1985, *Venter 10744* (PRE), 28 November 1999, *Sebola 442* (J); Hangklip, 32 km NE of Louis Trichardt (Makhado), 18 February 1946, *Gerstner 5935* (PRE); Soutpansberg, Entabeni, in Mr Menzel's garden, December 1930, *Obermeyer 905 & 1216* (PRE), 13 January 1935, *Phillips s. n.* (J); Soutpansberg, farm Bosley 773 MS, 15 March 1985, *Raal 379* (PRE); Soutpansberg, heights above Lake Fundudzi, 17 November 1904, *Story 4860* (PRE); Soutpansberg, on the farm Zwarthoek 794 MS, 13 May 1994, *Balkwill et al. 9107* (J); Sibasa district, Tate Vondo Forest Reserve, 10 December 1976, *Hemm 35* (J, PRE), 19 April 1977, *Hemm 103* (PRE). Mahovhohovho at Phiphidi, Waterfall along Tshirovha River, 13 April 1980, *Van Wyk 4156* (PRE); Ha-Khakhu, near shop along the road, 5 July 1979, *Netshiungani 922* (PRE); Blouberg Mtn, 1 June 1980, *Davidson 3504* (J); Blouberg, SW end of western plateau,

path to 'ten-ten' stove, 26 April 1997, *Winter* 1892 (J); Sekhukhuneland, Lulu Mts, farm HetFort, on summit of upper slopes, 7 January 1939, *Barnard & Mogg* 988, 1027 (J, PRE); Serala Peak, Forest Farm, 8 KT, 22 October 1985, *Venter* 11075 (PRE); Leolo Mts, farm Driekop 253 KT, 8 March 1984, *Venter* 10020 (PRE); Wolkberg, farm Haffenden Heights 35 KT, W of Legalameetse Nature Reserve, overlooking Mohlapitse Valley, from highest point locally, 25 July 1999, *Winter* 3539 (J). Mpumalanga, Middelburg district, farm Hoogstepunt, 3 September 1936, *Mogg* 16934 (PRE); Blyde River Canyon Nature Reserve, Bourkes Luck, September 1968, *Davidson* 379 (J); Blyderivierspoort Nature Reserve, north of The Pinnacle, edge of escarpment, 27 January 1981, *Balkwill et al.* P1/1 (J); Potgietersrust (Mokopane), on the farm Portugal 55 KS, about 18 km ESE of Potgietersrust near farm Grootvlei, 8 April 1956, *Maguire* 2874 (J).

**7b. subsp. *burttdavii*** Sebola, Kew Bulletin 64(1): 111 (2009). Type: South Africa, Mpumalanga Province, Graskop district, The Pinnacle, *Sebola* 225 (holotype J!; isotypes BM!, K! & PRE!).

*O. usambarensis sensu* Burt Davy, Flora of Transvaal, 200 (1926).

Shrubs up to 3 m high. *Bark* and stems dark-grey; *branchlets* grey, distinctly quadrangular, thick with short internodes. *Leaves* 30–53 × 19–31 mm, broadly elliptic, coriaceous, glabrous on both surfaces; margins with a tinge of red; base cuneate; apex often incised, recurved and slanted to one side of blade becoming deeply emarginate. *Primary* veins conspicuous above. *Secondary* veins conspicuous below, loop twice before margins. *Petiole* short, reddish, sparsely pubescent above, 1.5–2 mm long. *Inflorescence* units compact; axes thick, distinctly quadrangular. *Bracts* caducous. *Flower* 5-merous. *Pedicel* slightly glaucous, very short, 0.5–1 mm long. *Hypanthium* broad and thick-walled, glabrous, up to 12 mm long. *Sepals* rudimentary, showing small bifid ridges barely more than 1 mm long, alternate with petals. *Petals* spatulate to slightly

oblong, apiculate, thickly textured, glabrous on both surfaces, pink and turning red at maturity, 5–7 mm long. *Scales* hooded, opposite petals, markedly pubescent and often yellowish, 2.5–3 × 3 mm. *Stamens* alternate with petals, attached below scales; *filaments* highly reduced or absent; *anthers* covered by hooded scales. *Ovary* inferior, 5-locular; *style* slightly pubescent, 2–4 mm long; *stigma* capitate. *Fruit* pink, becoming red when mature, ovoid, 10–14 mm in diameter, apex marked by hypanthium scar/rim 5–7 mm in diameter.

DISTRIBUTION. Known from The Pinnacle in Graskop area, Mt Sheba, Mariepskop, Tzaneen, Lydenburg and Lost City in Pilgrim's Rest area of Mpumalanga, South Africa. Map 7.

HABITAT. The plants tend to occur on windswept rocky outcrops, or mist-prone environments at high altitudes (1475–2500 m).

CONSERVATION STATUS. The distribution is restricted to Mpumalanga, South Africa where it overlaps with that of subsp. *huillensis*. Its recorded area of occupancy is approximately 7 000 km<sup>2</sup>, mainly in nature conservation areas, where there are no apparent threats to its habitat due to human activities (development and agricultural practices - *pers. obs.*). Both the numbers of individuals per locality and the number of localities appear limited. It thus appears that field work to determine the likely UCN Red List Category is necessary.

SPECIMENS EXAMINED. SOUTH AFRICA. Mpumalanga, Pilgrim's Rest, Mt Sheba Nature Reserve, Lost City, 2 May 1980, *Balkwill M.S. 1-79* (J), 12 December 1997, *Sebola 225* (J, holotype; BM, K, PRE, isotypes), *Sebola 324* (J); Mt Sheba Nature Reserve, November 1978, *Kerfoot K8196* (J), April 1975, *Hearner & De Jager s. n.* (J); Hill near Mt Sheba, 26 October 1968, *Davidson s. n.* (J); Pilgrim's Rest, upper edge of berg, 29 January 1906, *Burt Davy 1482* (BOL), *Burt Davy 5220* (J, PRE, cited by Burt Davy as *O. usambarensis*), 10 December 1963, *Van der Schyff 6348* (PRE); Van der Merwe Bush, 30 January 1906, *Burt Davy 1425* (PRE); Graskop, on slopes of escarpment, 25 October 1945, *Lock s. n.* (PRE); slopes of escarpment, 2 November

1942, *Forest Research Officer, Pretoria* 2 (J); Mariepskop, 27 November 1924, *Keet* 1347 (PRE); Mariepskop, near the radar installations, 26 March 1988, *Balkwill et al.* 4037 (J); Sikorora Mts, Macoutsi River, December 1922, *Van Dam s. n.* (PRE); Mariepskop, summit of mountain, along path to Trig Station, 5 December 1961, *Van der Schyff* 5835 (BOL, J, K), 23 October 1962, *Van der Schyff* 6200 (PRE); Mac Mac Pools, 23 October 1985, *Hilliard & Burt* 18451 (PRE); Lydenburg district, Vygenhoek Farm, west of Lydenburg, 2 December 1997, *Burgoyne* 6579 (PRE); Tzaneen, Wolkberg 643T, New Agatha Forest Reserve, 24 April 1971, *Muller & Scheepers* 196 (PRE).

**7c. subsp. *discolor*** (Mildbr.) Sebola, Kew Bulletin 64(1): 112 (2009). *O. discolor* Mildbr., Notizbl. Bot. Gart. Mus. Berlin 11: 669 (1932). Type: Tanzania, Iringa Province, Lupembe, Likanga-Bushes, *Schlieben* 20 (holotype BM!).

Shrubs up to 2 m high. Bark and stem pale-grey; *branchlets* grey and quadrangular. *Leaves* obovate to elliptic, 36–57 × 21–34 mm, base cuneate, symmetrical; apex slightly notched to emarginate, distinctly discolorous; margins slightly undulate, coriaceous, glabrous on both surfaces. *Primary* veins slightly raised above. *Secondary* veins conspicuous on abaxial surface. *Petiole* short, sparsely pubescent above, up to 1.5 mm long. *Inflorescence* units compact to slightly sparse; axes thick, distinctly quadrangular. *Bracts* leathery, caducous. *Flower* 5-merous, glabrous. *Pedicels* glaucous, very short, 0.5–1 mm long. *Hypanthium* narrow, longer than petals, up to 20 mm long. *Sepals* as in subsp. *burttdavii*. *Petals* broadly spathulate, narrower, than 3 × 3 mm. *Scales* as in subsp. *burttdavii*. *Stamens* attached below sepals; *filaments* highly reduced or absent; *anthers* covered by hooded scales, subsessile, up to 1 mm in diameter. Ovary inferior; *style* pubescent, short, up to 1.5 mm long; *stigma* slightly globula to terete. *Fruit* globose, pink.

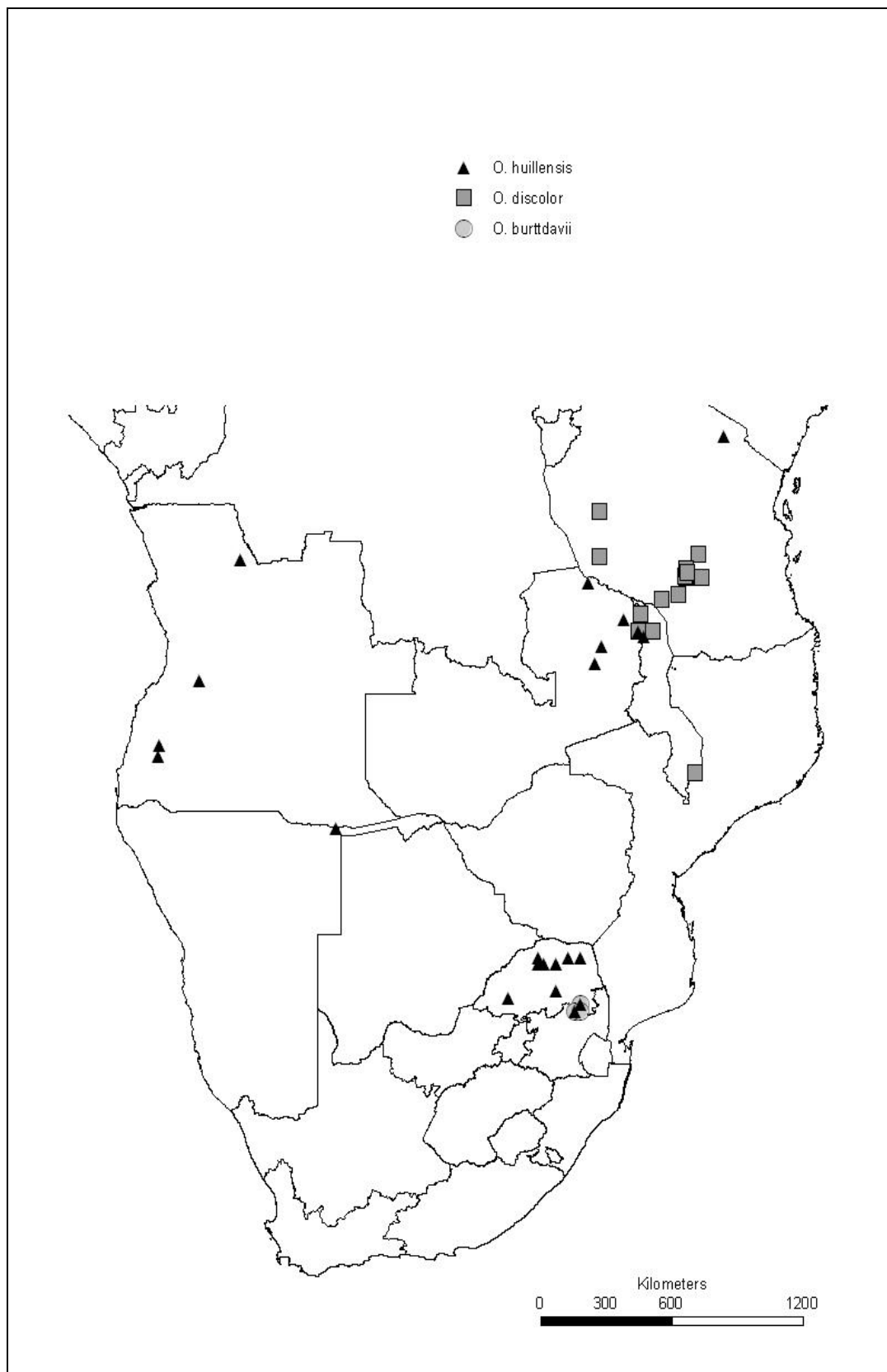
DISTRIBUTION. Occurs largely in Zambia, Nyika Plateau; Malawi, north of Lake Malawi and in Tanzania, Mufindi and Ufipa districts.

Also occurs in Zimbabwe, Chimanimani Mtns and Mozambique, Manica and Tete provinces. Map 7.

HABITAT. Forests and forest margins, with altitudinal variation from 1768–2250 m.

CONSERVATION STATUS. This taxon is widely distributed in north western Malawi, western Tanzania, north eastern Zimbabwe and northern Mozambique. It is so widespread and common as to be rated Least Concern.

SPECIMENS EXAMINED. TANZANIA. Ufipa district, Mbisi Forest, 13 September 1960, *Richards 13102* (K); Iringa district, Mafindi, Kigogo Forest Reserve, 18 December 1961, *Richards 15759* (K); Iringa district, Kigogo, December 1953, *Carmichael 324* (K); Iringa Province, Mufindi, Iringa Farm, 6 November 1938, *Hartmann 127* (B); Iringa Province, East Mufindi, November 1928, *Haarer 1647* (K); Iringa Mtn, Ibagama, Ukwama, 1 May 1958, *Ede 3* (K, PRE); Mufindi district, Sao Hill, November 1964, *Proctor & Shibani 2708* (K); S. Highlands Province, Irundi, 9 November 1955, *Benedicto 80* (K); Iringa Province, Msima Stock Farm, 1932, *Emson 291* (K); Iringa Province, Lupembe, Likanga-Bushes, *Schlieben 20* (BM, holotype). ZAMBIA. Nyika Plateau, 14 November 1967, *Richards 22531* (K). MALAWI. Northern Province, eastern side of Mafinga Hills, November 1952, *Chapman 56* (K); Southern Region, Mulanje Mtn, Lutchenya Plateau, 12 November 1986, *Chapman & Chapman 8207* (PRE); Nyika Plateau, path to Chipopoma Waterfall, 27 November 1967, *Richards 22770* (K).



Map 7. Known distribution of *O. huillensis* subsp. *huillensis* (▲), subsp. *burttdavii* (●) overlapping with subsp. *huillensis* at its southern most latitude point, and subsp. *discolor* (■).

**8. *O. ruandensis*** Gilg, Wissenschaftliche Ergebnisse der Deutschen Zentral-Afrika Expedition 1907 – 1908, Band II, 575 (1914). Type: Rwanda, Rugege-Wald, *Mildbraed* 1027 (holotype B†; isotype K!).

*O. macrophylla* Gilg, Wissenschaftliche Ergebnisse der Deutschen Zentral-Afrika Expedition 1907 – 1908, Band II, 575 – 576 (1914). Type: Zaire (Democratic Republic of the Congo), Ruwenzori, Butagu-Tal to Waldgrenz, *Mildbraed* 2541 (holotype B†; isotype K!).

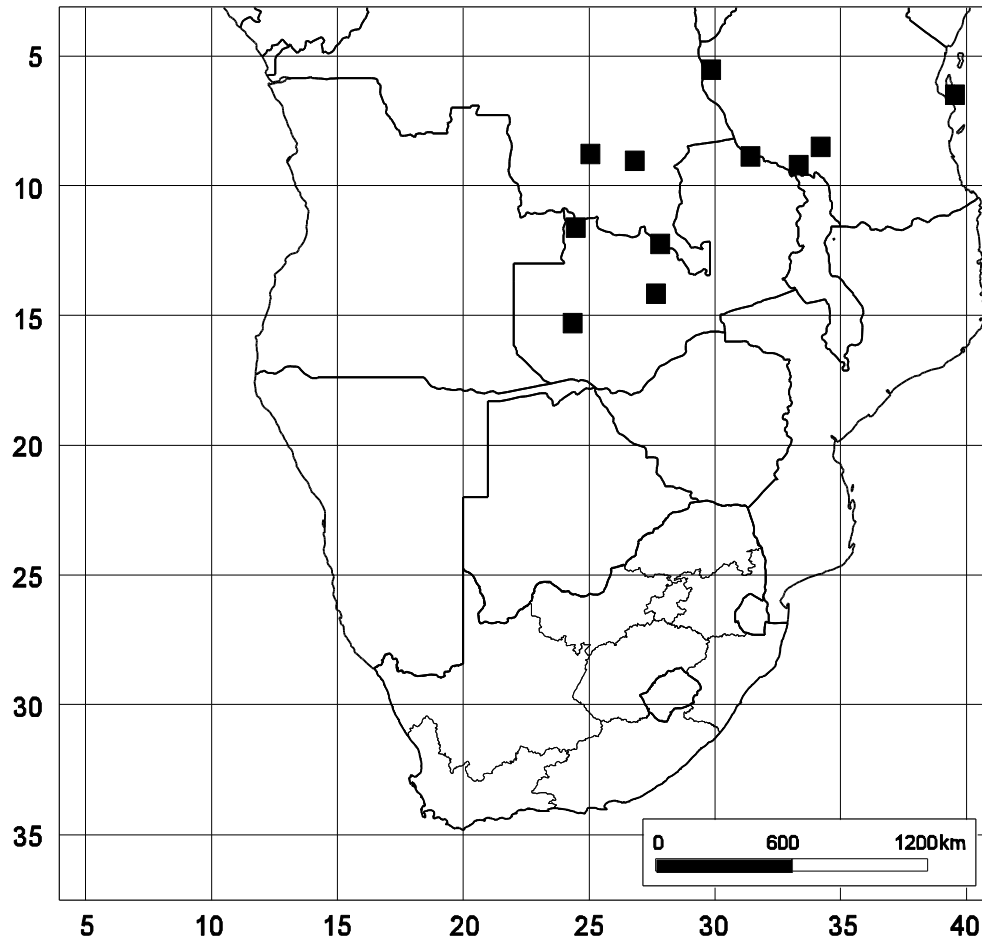
Shrubs up to 6 m high. *Bark* grey and slightly peeling; *branchlets* pale and quadrangular. *Leaves* 46–63 × 27–39 mm, discolourous, broadly elliptic; apex acuminate; base rounded to cuneate. *Primary* veins channelled or impressed above, prominent below. *Secondary* veins faintly visible above, just visible below, second loop before margins invisible above. *Petiole* 2.5–6 mm long, glabrous. *Inflorescence* units sparsely pubescent, slightly compact. *Bracts* caducous or rarely persistent, pubescent, thin and papery. *Flower* 5-merous. *Pedicels* 2–4 mm long, pubescent. *Hypanthium* narrow, glabrous, 10–14 mm long. *Sepals* rudimentary, appear as bifid minute ridges, alternating with petals. *Petals* 3.5–5 mm long, oblong, bluntly apiculate, hairy on margins, glabrous on outside and inside, broader than long. *Scales* yellowish, 2–5 mm long, markedly puberulent. *Stamens* attached below scales; *filaments* highly reduced or absent; *anthers* covered by hooded scales. *Ovary* 5-locular; *style* slightly glabrous, shorter than hypanthium; *stigma* slightly terete. *Fruit* globose, 6–9 mm in diameter, often with pale to whitish lenticels, apex with a circular hypanthium scar 4–6 mm in diameter, sharp point marks remnant of style.

DISTRIBUTION. Occurs in Rwanda, Tanzania, the Democratic Republic of the Congo and Zambia. Map 8.

COMMON NAMES. Mbagwe (Kisamba).

HABITAT. Growing in forests and forest margins, altitudinal range: 1200–2250 m.

CONSERVATION STATUS. This species is widely distributed from the Democratic Republic of the Congo to Zambia, and Tanzania up to the Great Lakes in Rwanda. On the basis of available evidence from collections by various collectors, evaluation against the IUCN categories indicates that it is likely to rate as Least Concern.



Map 8. Known distribution of *O. ruandensis*.

SPECIMENS EXAMINED. RWANDA. Butare, Rugege–Wald, August 1907, *Mildbraed* 1027 (isotype K). TANZANIA. Mpanda district, Kungwe Mahali Peninsula, 7 September 1959, *Harley* 9550 (B, K); SE of Mbogo Mtn, 7 November 1966, *Gillett* 17617 (K); Mbeya district, Kikondo, 22 October 1956, *Richards* 6727 (K); Southern Highlands Province TT, Njombe district, Njombe–Kifonya road,

Ubená, May 1953, *Eggeling* E.6576 (K); Iringa, Usima Stock, 1932, *Emson* 254 (K). ZAIRE (Democratic Republic of the Congo). Haut-Katanga, Ruwenzori, Butagu-Tal, February 1908, *Mildbraed* 2541 (K); Haut-Katanga, Kasumbalesa, Colline Kibwe I, 20 March 1971, *Lisowski* 98 (K); Kakunda Parc National de l'Upemba, November 1974, *de Witte* 3085 (PRE). ZAMBIA. Abercon, Mushitus, 6 November 1958, *Fanshawe* F.4954 (K); Abercon, Lake Chila, 11 November 1958, *Robson & Fanshawe* 499 (PRE); Mwinilunga district, N of Mwinilunga, Luakera Falls, 24 November 1937, *Milne-Redhead* E.3381 (K, PRE); Mwinilunga district, Zambezi River above rapids, 15 November 1962, *Richards* 17233, 21850, 21848 (K).

**9. *O. rochetiana*** A. Juss., Compt. Rend. Hebd. Séances Acad. Sci. 22: 812 (1846); Decne., Sur les caracteres et les affinités des Oliniées, 14 (1877); Liben, Bulletin du Jardin Botanique National de Belgique 43: 235 – 236 (1973); Verdcourt, Flora of tropical East Africa 2: t. 1 (1975); Verdcourt, Flora Zambesiaca 4: 324 – 326 (1978); Verdcourt & Fernandes, Flora de Mozambique 74: 1 – 6 (1986). Type: Ethiopia, *Rochet* (holotype P; isotype K!).

*O. abyssinica* Engl., Die Pflanzenwelt Afrikas 3, 2: 624 (1921), *nomen nudum*.

*O. ternata* Gilg ex Engl., Die Pflanzenwelt Afrikas 3, 2: 624 (1921), *nomen nudum*.

*Tephea aequipetala* Del., Second Voyage: Mer Rouge, 340 (1846). *O. aequipetala* (Del.) Cufod., Bull. Jard. Bot. État Bruxelles 29: 603 (1959). Type: might be the same as for *Olinia rochetiana*.

Shrubs or medium to large trees up to 15 m high. Bark grey, with peeling scales; branchlets light grey and quadrangular. Leaves simple, opposite, decussate; lamina often large, broadly elliptic to obovate, slightly discoloured, glabrous on both surfaces, 41–65 × 29–53 mm; base tapering to rounded or slightly cordate; apex notched or

broadly emarginate; margins smooth. *Primary* veins slightly channelled above. *Secondary* veins branch from midrib at 45°–60° and loop more than once before the margins, slightly conspicuous above, distinctly conspicuous below. *Petiole* light green-yellow, glabrous, up to 3 mm long. *Stipules* rudimentary and brown. *Inflorescence* axillary and terminal, dichasial cyme; inflorescence units 12–28 mm long, compact or loose; *peduncle* sparsely pubescent, 8–24 mm long. *Bracts* caducous, papery and creamy white or leathery and pink, ovate or elliptic, 5–8 × 3–5 mm, markedly pubescent on both surfaces (for papery ones), glabrous on dorsal surfaces (for leathery ones). *Flower* 5-merous, subsessile. *Pedicels* glaucous, 0.5–1.5 mm long. *Hypanthium* broad and thick, glabrous to sparsely pubescent or highly puberulous, throat with hooded scales alternating with petals. *Sepals* rudimentary, appear as minute ridges. *Petals* spatulate to slightly oblong, apex slightly apiculate to rounded, base slightly narrow, glabrous on abaxial surfaces, pubescent on margins and the base on adaxial surfaces, cream-white or pink, turning red at maturity, 4–10.5 × 2–4 mm. *Scales* puberulent, enclosing stamens, 1–2.5 mm long, 0.5–1.5 mm wide. *Stamens* alternating with petals, attached below scales; *filaments* highly reduced or absent; *anthers* covered by hooded scales. *Ovary* 5-locular; *style* glabrous, 2–6 mm long; *stigma* capitate or terete. *Fruit* light green when young, pink to red when mature, globose, 6–15 mm in diameter, glabrous, apex marked by hypanthium scar 4–10 mm in diameter.

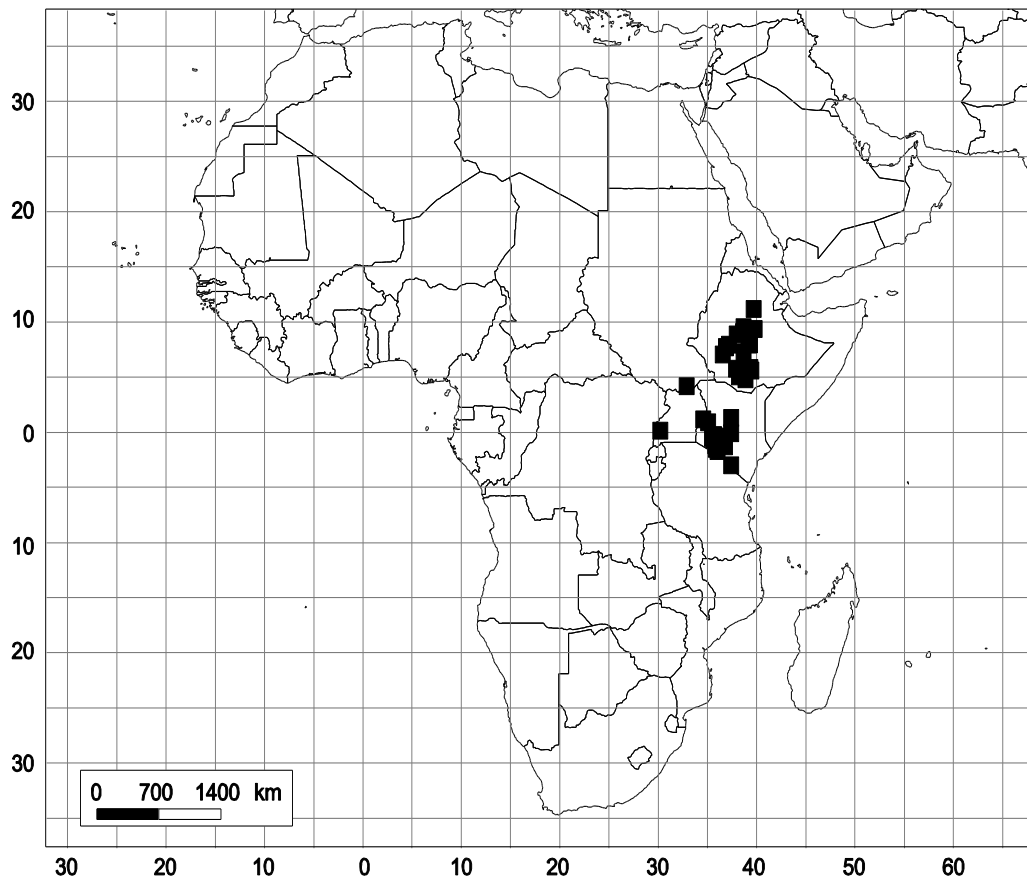
DISTRIBUTION. Known from north-east and central Ethiopia, south-east of Sudan, Uganda, north-west of Kenya and eastern Tanzania. Map 9.

LOCAL NAMES. Téphé (amhara), guna (galla: Shashamanna), nole (sidamo).

HABITAT. Occurs in mountain forests and along ravines, with altitude up to 1950 m.

CONSERVATION STATUS. This species is widely distributed in east Africa from the Ethiopian highlands through to Sudan, Uganda, Kenya, and Tanzania. Herbarium label information from various

collectors in different countries, provinces and districts indicates a diverse habitat tolerance and local abundance in areas in which it was collected. Therefore, a Least Concern IUCN Red Data status is necessary for this species.



Map 9. Known distribution of *O. rochetiana sensu stricto*

SPECIMENS EXAMINED. ETHIOPIA. Menagesha State Forest, 19 January 1994, *Afewerk Kasso* 20 (ETH), *Amshoff* 10279 (B); Near Addis Ababa, March 1975, *Chaffey* 476 & 415 (K); Asella, lower slopes of Cilalo Mtn, 14 February 1966, *De Wilde* 10043 (PRE); Uociacia Mtn, 6 March 1966, *De Wilde* 10279 (ETH); Kaffa Province, SE of Folla, 1 December 1970, *Friis et al.* 532 (K), *Friis et al.* 6075 (ETH); Arrsi Province, between Asella & Chilalo Mountains, 18 November 1972, *Tewolde* 1242 (ETH); Addis Ababa, Mr Abel's garden, 14 January 1927, *Scott s. n.* (K); Sidamo region, N of Waddera, 20 December 1980, *Haugen* 1838 (ETH); Sole, near Shashemene, 11 February 1954, *Mooney* 5688 (K); Soyuma Choko

Hill, 15 km south of Shashemene, Sidamo, 11 February 1954, *Mooney* 5726 (B, ETH, K); Kaffa Province, 7 km E of Jimma, 22 December 1961, *Meyer* 7784 (K); Arshi region, 5–10 km from Assela, 19 March 1983, *Sebsebe* 319, 1374 (ETH); ±14 km from Assela Abay Ras Hotel, on way to Assassa, 7 July 1981, *Sebsebe & Melaku* 766 (ETH); Arusi Province, 15 km S of Assela, 12 October 1964, *Selassie* 392 (ETH); Kaffa, SW Ethiopia, June 1975, *Chaffey* 476 (ETH), 10 km S of Assela, 11 February 1964, *Selassie* 71 (ETH); Choa, near Ankober, *Rochet* 18 (holotype K); Shoa Province, Square 68 B, forest at upper rim of Wonchi Crater Lake, 11 December 1971, *Ash* 1396 (K); Central Ethiopia, 64 km NE of Addis Ababa, on Dessie road, 11 January 1953, *Gillett* 14824 (B, K, PRE); Sidamo region, Arero Awraja, December 1974, *Tadesse* 6891 (ETH). SUDAN. Imatong Mtns, 10 March 1976, *Howard* 81 (K). KENYA. North of Mt Kenya, Kentrout farm, 1 March 1981, *Gilbert* 6029 (K); Kiambu district, Muguga North, 18 February 1962, *Verdcourt* 3283 (B, K, PRE); Cabarnet, W of Baringo, *Jex-Blake* 6867 (K); Isiolo (K1 & K4) to Mathews Range and Mt Nyiruki, Siruan Plateau, 1 January 1959, *Newbould* 3367 (K); Nyanza Province, Trans-Nzoia district, Mt Elgon, 19–20 February 1935, *Taylor* 3435 (BM); Njong Forest, December 1940, *Van Someren* 1396 (K); Mau Forest, *Gardner* 321 (K); Musasia, *Gardner* 1026 (PRE); Masai district, Nguruman Range, Lebettero Hills, January 1961, *Van Someren* EA12289 (K); Narok district, Olokurto Mau area, 13 May 1961, *Glover et al.* 1007 (K, PRE); Muguga, 21 km E of Nairobi, 7 March 1958, *Verdcourt* 2139 (PRE); Narok district, Oltarakwai (Narosura), 18 August 1961, *Glover et al.* 2486 (PRE). TANZANIA. Laitokitok, NE slope of Kilimanjaro, 28 July 1956, *Bally* 10701 (K). UGANDA. Tororo district, Namwamba Valley, near Kyanjoki, 17 January 1935, *Taylor* 3142 (BM, K).

**10. *O. usambarensis*** Gilg ex Engl., Abhandlungen Königl. Akademie der Wissernschaften, Berlin, 63 (1894); Engl. & Prantl, Die Natürlichen Pflanzenfamilien, 3(6A): t. 74, figs. A–G (1894); Gilg, Botanische Jahrbucher, 19: 278 (1894); Engl., Die Pflanzenwelt Afrikas 3,2: 624, t. 277, Fig. A–G (1921); Robyns, Flores des

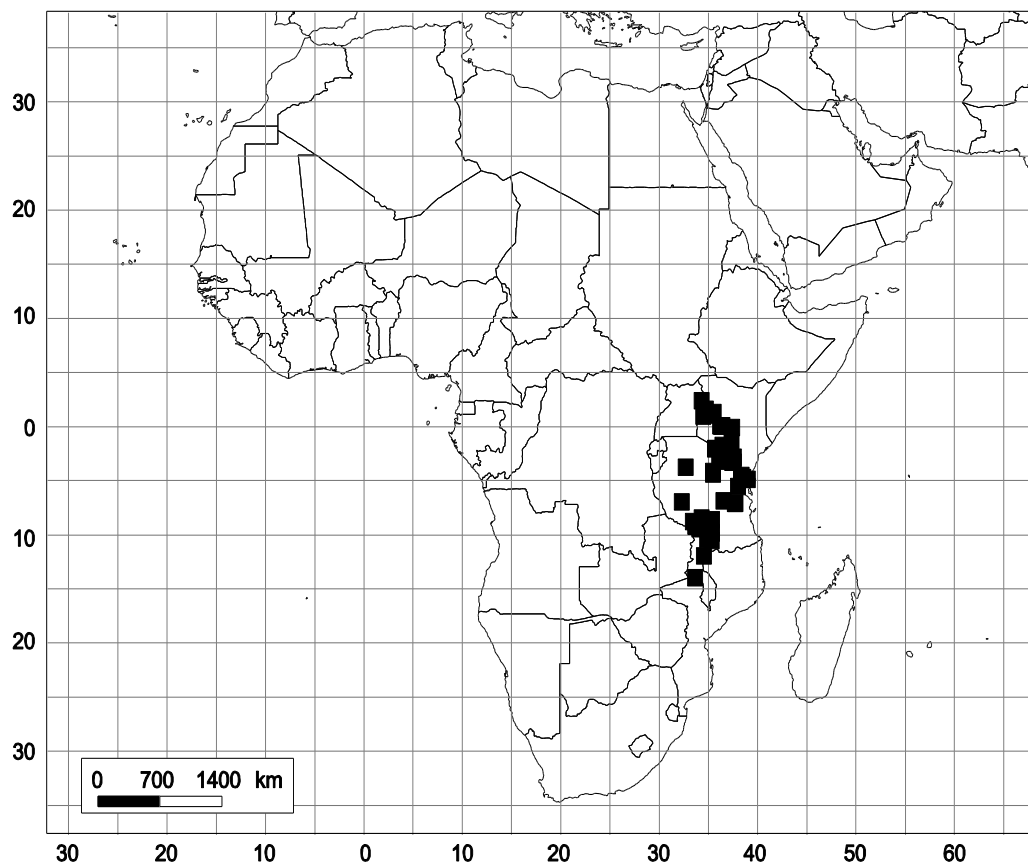
Spermatophytes du Parc National Albert, 1: 650, t. 67 (1948); Brenan, Checklists of the forest trees and shrubs of the British Empire, 5(2): 395 (1949); Eggeling & Dale, The indigenous trees of the Ugandan Protectorate, 290, t. 14 (1952); Brenan, Mem. New York Bot. Gard. 85, 441 (1954); Dale & Greenway, Kenya Trees and Shrubs, 350, t. 22 (1961); White, Forest flora of Northern Rhodesia, 269, fig. 47 (1962); Von Breitenbach, The Indigenous Trees of Ethiopia, 2nd edn, 107 (1963). Type: Tanzania, Kwa Mshuza, *Holst 9115* (holotype B†; isotypes BM!, K!).

*O. volkensii* Gilg ex Engl., Die Pflanzenwelt Ost-Afrikas und der Nachbargebiete C: 285 (1895). Type: Tanzania, Kilema, Useri, *Volgens 1816* (holotype B†; isotypes BM!, K!).

Shrubs or small trees up to 5 m high. *Bark* grey, rough; *branchlets* quadrangular; internodes short and thick. *Leaves* oblong to elliptic, persistent on inflorescence axes and units, caducous on internodes, discolorous, glabrous on both surfaces, 29–58 × 22–38 mm, apex rounded to emarginate, base slightly cuneate to cordate. *Primary veins* channelled above, sparsely pubescent above, especially on lower or proximal half of the lamina. *Secondary veins* loop twice, network conspicuous on both surfaces. *Petiole* distinct, glabrous, 4.5–8 mm long. *Inflorescence* units more than 11 per axis, compact, markedly puberulent, broader than long, thick, 20–35 mm long. *Bracts* retained after anthesis, papery, white, abaxial surface glabrous, adaxial surface and margins puberulous, obovate, slightly oblanceolate, 3–8 × 4–6 mm. *Flower* 4- or 5-merous, galled flowers swollen. *Hypanthium* yellowish to cream-white, pubescent, up to 10 mm long. *Sepals* rudimentary, present as stipular bifid ridges, alternating with petals. *Petals* 4 (lateral flowers) or 5 (terminal flowers), spatulate, large and very showy (2.5–5 mm long), broader than long (up to 2.5 mm wide), slightly thick, yellowish brown, glabrous on both sides. *Scales* hooded, opposite petals, markedly pubescent. *Stamens* 4 (lateral flowers) or 5 (terminal flowers) alternating with equal number of petals, attached below scales;

*filaments* highly reduced or absent; *anthers* covered by hooded scales. *Ovary* inferior, 4- or 5-locular; *style* pubescent, 2–4 mm long; *stigma* capitate. *Fruit* pink to red, globose, up to 8 mm in diameter, glabrous; apex marked by hypanthium scar 6–10 mm in diameter.

DISTRIBUTION. Known from Tanzania (Usambara and Kilimanjaro Mts), central to south western Kenya, and Uganda around Mt Elgon and environs. Map 10.



Map 10. Known distribution of *O. usambarensis*.

HABITAT. Often in gorges, on steep slopes or on rocky outcrops, at edges of forests or disturbed mountain forests, and associated with *Podocarpus*, *Nuxia*, *Hagenia*, *Faurea*, *Protea*, *Halleria*. Altitude ranges from 1981–2850 m.

PHENOLOGY. Flowers from October to December and fruits from January to May.

LOCAL NAMES. Kenya: Mwathanthia, Musasia, Muthangira (Meru); Kaptalonget, Nerekio (Sebei); Merikwa (Kamas); dalecho (Amhara); Ethiopia: Dalecho (Amhara).

USES. Root used in East Africa as a stomach and gastric tonic.

CONSERVATION STATUS. This species is widely distributed at high altitudes in mountain ranges of eastern Africa, largely in and around nature conservation areas, which would presumably limit human access and prevent destruction to habitats. Specimens were collected from more than twenty districts in a variety of habitats within Tanzania, although collected from fewer districts in both Uganda and Kenya. An assessment and evaluation against the IUCN categories indicates that it is likely to rate as Least Concern.

SPECIMENS EXAMINED. UGANDA. Kuburon, Mt Elgon, January 1936, *Eggeling* 2484 (K); Mt Elgon, October/November 1930, *Lugard* 202 (K); Northern Province, Karamoja district, Bokora, Napak, January 1957, *Philip* 797 (K); Eastern Province, Sebei district, Kere Village, N of Mt Elgon, 10 January 1963, *Styles* 299 (K). KENYA. Aberdares National Park, 3 km north from Shamata Gate, undated, *Beentje* 3256 (K, PRE); Subukia Escarpment (Thomson Falls to Lake Solai road), 21 January 1959, *Bogdan* 4762 (K); Cherangani Foothills, E of Kitale, 21 January 1964, *Brunt* 1399 (K); Mt Kenya, April 1935, *Synge* S1712 (K); NE of Mt Elgon, February 1955, *Tweedie* 1287 (K, PRE); Mt Kenya, Sirimam Track, 24 January 1961, *Polhill* 325 (K); Muchenge, NW of Mt Kenya, undated, *Hutchinson* 402 (PRE); SE of Mt Elgon, January 1931, *Jackson* 337a (K). TANZANIA. Arusha National Park, NE of Mt Meru, 7 January 1972, *Greenway & Fitzgerald* 14970 (K, PRE); Arusha region, Mbulu district, Gidaghandajek on W Slope of Hanang, 28 October 1968, *Carmichael* 1577 (K); Masai district, Loliondo Mtn, 23 June 1969, *Carmichael* 1703 (K); North Province, Moshi district, Kilimanjaro Mtn, Sanya Sawmill at Ngare, 13 January 1954, *Hughes* 193 (ETH, K); Usangu, undated, *Goetze* 994, 1452 (K); Mbeya region, Makete district, Kipengere Mtns, Ndumbi Forest, 22 November 1986, *Goldblatt & Love* 8245 (K, PRE); Iringa region, Mufindi district, Ngwazi, 8 May

1987, *Lovett & Lovett 2115* (PRE); Iringa region, Ludewa, along road to Mlangali, 15 November 1987, *Mwasumbi et al. 13740* (PRE); Mbeya district, Mbeya Peak, 31 August 1962, *Kerfoot 4229* (PRE), 21 January 1991, *Lovett & Kayombo 476* (PRE); Southern Highlands Province, Mbeya district, October 1959, *Proctor 1508* (PRE); Southern Highlands Province, Rungwa, NE of Rungwa Mtn, October 1959, *Proctor 1445* (PRE); Mt Kilimanjaro, 22 December 1933, *Schlieben 4417* (B, BM); Moshi district, Mt Kilimanjaro, Laitokitok, undated, *Schlieben 5128* (B, BM, K); Morogoro district, Uluguru, 23 February 1933, *Schlieben 3565* (B, BM); Kyimbila district, north of Lake Nyasa, undated, *Stolz 1721, 2288, 2367* (K); Tanga Province, Lushoto-Gare Track, 24 February 1960, *Willan 484* (K); Mt Kilimanjaro, Rongai Forest, Kibo-Nordseila, 25 December 1932, *Geilinger 4988* (K); Mkusi, W of Usambara Mtn, 2 February 1954, *Grant & Gardner H59/54/1* (PRE); Usambara Mtn, Kwa-Mshuza, August 1893, *Holst 9115* (holotype BM, K); Tanga Province, Lushoto district, Shume Forest Reserve, November 1957, *Semsei 2724* (B); Lushoto district, Lushoto-Mlalo roadside, 4 December 1982, *Sigara 257* (K); 8 December 1959, *Willan 472* (PRE); Shoa Province, Square 69B, Mt Zuquaila, 31 km SE of turnoff at Ducam, 3 February 1974, *Ash 2346* (K); Kilema, Useri, February 1894, *Volkens 1816* (isosyntype BM, syntype K), Karrakia-Schlucht, undated, *Volkens 2000* (isosyntype K).

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