

Systematic studies in subfamily Celastroideae (Celastraceae) in southern Africa: The genus *Putterlickia*

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Received 28 July 1997; revised 28 July 1998

The genus *Putterlickia* Endl. is confined to the moister eastern coastal parts of southern Africa, from the Western Cape in the south to southern Mozambique in the north, with one disjunct species in the arid interior of the Northern Cape. Four species are recognised: *P. pyracantha* (L.) Szyszyl., *P. verrucosa* (E. Mey. ex Sond.) Szyszyl., *P. retrospinosa* Van Wyk & Mostert and *P. saxatilis* (Burch.) M. Jordaan. The nomenclature, including concise synonymy and typification, descriptions of the genus and species, key for identification, notes on habitat and relationships, history and distribution maps, as well as notes on leaf anatomy are supplied for each species. An illustration of *P. verrucosa* is provided.

Keywords: Anatomy, Celastraceae, *Gloveria*, Celastroideae, *Gymnosporia*, *Putterlickia*, southern Africa, taxonomy.

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Introduction

Putterlickia Endl., *Gymnosporia* (Wight & Arn.) Hook.f. and *Gloveria* M. Jordaan (Jordaan 1995, Jordaan & Van Wyk 1998) form a natural assemblage in subfamily Celastroideae (Celastraceae), indicated by sharing the following derived characters: presence of brachyblasts (short shoots) and spines, fasciculate as well as alternate leaves on the branches or brachyblasts, and a dichasial inflorescence type. Both *Putterlickia* and *Gymnosporia* have spines with only one node that bears leaves and/or inflorescences (if present, usually on younger branchlets), whereas *Gloveria* always has spines with more than one node. Like *Putterlickia*, *Gloveria* has more than two ovules per locule, up to six. Flowers of *Putterlickia* and *Gloveria* are always bisexual, whereas those of *Gymnosporia* are apparently always unisexual (superficially appearing structurally bisexual).

Gymnosporia are widely distributed in southern Africa and in most parts of the African continent, its distribution extending further eastwards as far as Queensland, Australia. *Putterlickia* and *Gloveria* have a mutually exclusive distribution and are restricted to southern Africa (Jordaan 1995, Jordaan & Van Wyk 1998). The genus *Putterlickia* is confined to the southern parts of Africa, south of the 25° latitude. The highest concentration of species is in the moister southwestern and eastern regions, with an outlier species in the arid Northern Cape.

Putterlickia has the most primitive character states of the southern African genera in subfamily Celastroideae, mainly on account of its greater number of ovules per locule, capsules which are always trilobular, bisexual flowers and comparatively simple leaf anatomy (Jordaan 1995). *P. retrospinosa* Van Wyk & Mostert is the only woody climber in the genus and subfamily. *P. saxatilis* (Burch.) M. Jordaan is the most distinct species with ovaries which usually have a reduced number of ovules and leaves with a rather specialised xerophytic anatomy.

Three of the *Putterlickia* species recognised, namely *P. pyracantha* (L.) Szyszyl. (1888), *P. verrucosa* (E. Mey. ex Sond.) Szyszyl. (1888) and *P. retrospinosa* Van Wyk & Mostert (1987), have been formally described. This paper deals also with a fourth hitherto largely overlooked species, first described by Burchell (1824) as *Celastrus saxatilis* and referred to as *Gymnosporia saxatilis* by Davison (1927). However, this species has never really received recognition and has been treated in the past as a karroid form of *P. pyracantha* (Robson 1965). The principal aim

of the present paper is to provide an updated taxonomic revision of the genus *Putterlickia*. Morphological evidence is supplemented by leaf anatomical observations.

History of the genus

Endlicher erected the genus *Putterlickia* in 1840, based on *Celastrus pyracanthus*, described by Linnaeus in 1753, the only species of Celastroideae then known to have more than two ovules per locule. The name *Putterlickia* honours Alois Putterlick, an Austrian botanist and physician, who worked at the Natural History Museum at Vienna from 1840–1845 (Stafleu & Cowan 1983). Sonder (1860) placed *Putterlickia* as a section under *Celastrus* L. and dealt with two species, namely *C. pyracanthus* and *C. verrucosus* E. Mey. ex Sond. Szyszylowicz (1888) was the first to establish *Putterlickia* as a distinct genus based on these two species. In the most recent comprehensive revision of the southern African Celastraceae, Davison (1927) accepts the genus *Putterlickia*, comprising *P. pyracantha* and *P. verrucosa*. She also recognises *Celastrus saxatilis* Burch. as a distinct species, but places it in the genus *Gymnosporia*.

Material and Methods

This account is based on a study of herbarium material supplemented by extensive field observations. Specimens from the following herbaria were studied: B, BOL, BR, COL, G, GRA, HAL, J, K, KNP, NBG, NH, NMB, NU, PRE, PRU, S, SAM, STE, and WIND.

Anatomical observations are based on specimens from different localities. Mostly live material, preserved in formalin-acetic-acid-alcohol (FAA) (Johansen 1940), was used. This was supplemented with small portions of dried leaves removed from herbarium specimens. A complete set of mounted slides is housed at the National Herbarium, Pretoria.

Results

Leaf anatomy

Putterlickia pyracantha, *P. retrospinosa* and *P. verrucosa* were anatomically very similar (Jordaan 1995). Leaves were hypostomatic and dorsiventral with palisade on the adaxial side. The epidermis was uniseriate, the cells of the adaxial epidermis larger than those of the abaxial epidermis. The mesophyll consisted of 2–4 layers of palisade parenchyma, and spongy mesophyll with distinctive, large intercellular spaces. *P. retrospinosa*, a forest

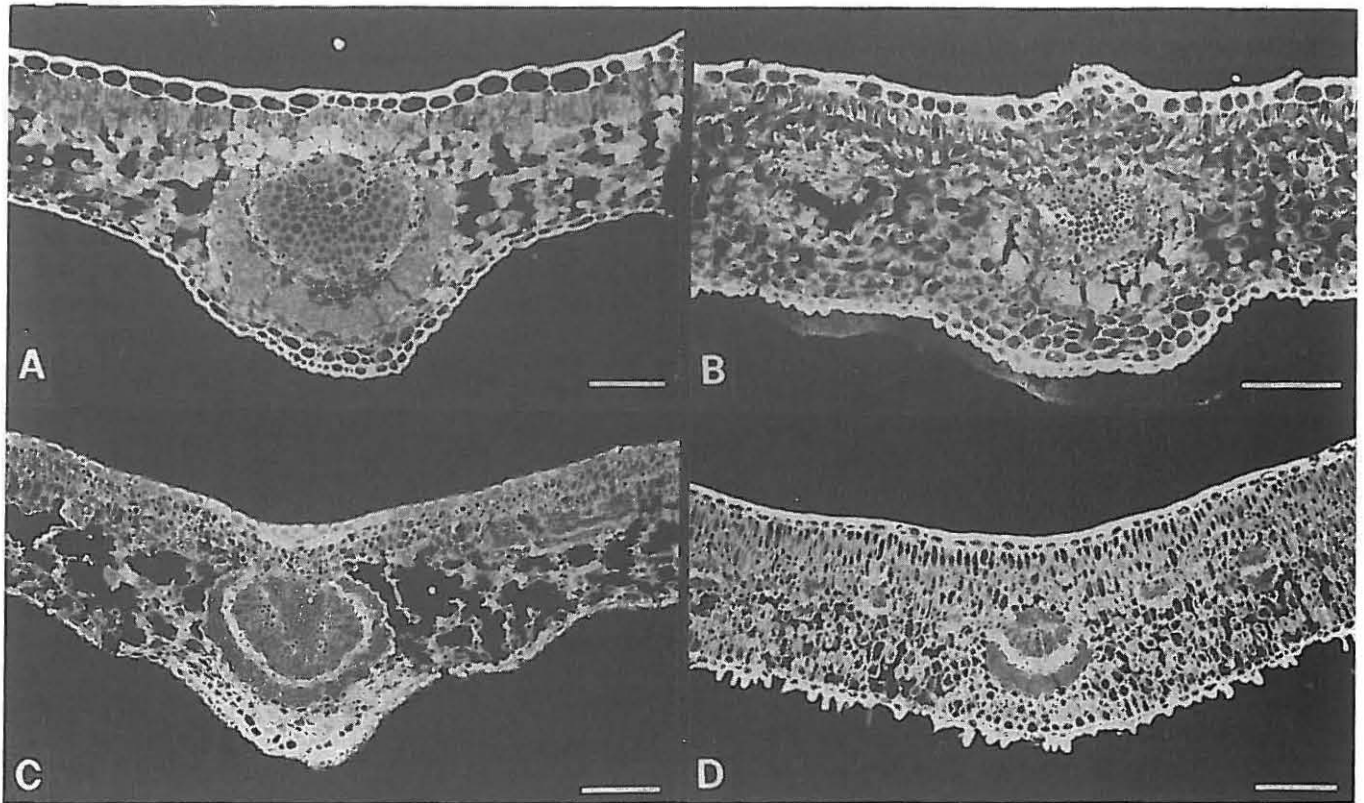


Figure 1 Transverse sections of leaves. **A.** *Putterlickia pyracantha* (Jacot Guillarmod 3513); **B.** *P. verrucosa* (Pretoria NBI-Garden); **C.** *P. retrospinosa* (Van Wyk 5137); **D.** *P. saxatilis* (Puff 780415). Scale bar = 10 μ m.

species, exhibited the most extensive aerenchyma (Figure 1C). Vascular tissue of the midrib was surrounded by mesophyll cells or weakly developed collenchyma, usually only one layer thick.

P. saxatilis had a compact spongy mesophyll (Figure 1D) (Jordan 1995), a typical pattern in xerophytic plants (Mauseth 1988). Abaxial epidermis cells of *P. saxatilis* consistently formed well developed papillae (Figure 1D). Papillae were absent in *P. pyracantha* (Figure 1A) and *P. retrospinosa*, but were sometimes present in *P. verrucosa* (Figure 1B).

Taxonomy

Putterlickia Endl., Generum plantarum 2: 1086 (1840); Walp.: 529 (1842); Szyszyl.: 36 (1888); Davison: 336 (1927); N. Robson: 5 (1965); R.A. Dyer: 333 (1975). Type species: *P. pyracantha* (L.) Szyszyl.

Evergreen shrubs (often spreading or straggling) or woody climbers, spinescent, with long and short shoots (brachyblasts), glabrous, hermaphroditic. Branches angular or terete and reddish brown when young, becoming terete and grey with age, lenticellate, smooth or verrucose. Spines slender to robust, up to 100 mm long, straight, spreading or pointing backwards, axillary, occasionally leafy and floriferous, with only one node. Leaves alternate or fasciculate, subsessile, glabrous; lamina ovate, obovate, oblanceolate-spathulate or broadly elliptic, venation brochidodromous. Stipules free, small, subulate, marcescent. Inflorescence a lax to dense dichasium or monochasium, in axils of leaves or in clusters on brachyblasts. Flowers bisexual, actinomorphic, 5-merous, few to many in a cyme, hypogynous, pedicellate. Sepals subequal, imbricate, free or united at base, margin ciliolate. Petals white or cream, occasionally tinged pink, imbricate in bud, spreading or suberect. Disc intrastaminal, single, convex, shallowly 5-crenate. Stamens free, subterete; filaments slender, attached to base of disc; anthers basifixed, slightly versatile, latrorse, with separate thecae dehiscing longitudinally. Ovary sessile, with quarter to half immersed in and adnate to disc, 3-

locular; ovules (4-)6(-12) per locule, placentation axile with ovules ventrally hypotropous and arranged in two rows; style short, cylindrical; stigma 3-lobed. Fruit a dry capsule, dehiscing loculicidally to base. Capsules cream to pink or red, obconic-trigonous, smooth. Seeds 6-18, glossy, reddish brown, with fleshy endosperm, completely enveloped by a well developed, fleshy, orange aril.

Key to the species

- 1a Stems not verrucose, without conspicuous lenticels:
 2a Leaves larger, usually longer than 15 mm, margins subentire, with teeth in distal half; pedicels longer than 5 mm; capsules usually longer than 12 mm; ovules usually 6 or more per locule; Western and Eastern Cape 1. *P. pyracantha*
 2b Leaves very small, shorter than 12 mm, margins entire; pedicels shorter than 4 mm; capsules usually shorter than 10 mm; ovules usually less than 4 per locule; Northern Cape 4. *P. saxatilis*
- 1b Stems verrucose, with prominently raised, wart-like lenticels:
 3a Erect shrubs, or small trees; spines spreading, pointing forward (towards the distal end of the main shoot); leaves usually narrower than 25 mm; Mpumalanga, Swaziland, KwaZulu-Natal, Eastern Cape 2. *P. verrucosa*
 3b Woody climbers; spines usually pointing backward; leaves usually wider than 30 mm; KwaZulu-Natal and Eastern Cape 3. *P. retrospinosa*

1. *Putterlickia pyracantha* (L.) Szyszyl. in Polypetalae disciflorae Rehmmanianae: 36 (1888); Sim: 188 (1907); Marloth: 153 (1925); Davison: 336 (1927); Codd: 115 (1973); Coates Palgrave: 503 (1977); Pooley: 270 (1993). *Celastrus pyracanthus* L.: 197 (1753); Miller: 58, pl. 87 (1785); Lam.: 661 (1785); Aiton: 272 (1789); Gaertn.: 85 (1791); Thunb.: 42 (1794); Willd.: 1129 (1798); Sims: pl. 1167 (1809); Roem. & Schult.: 426 (1819); Thunb.: 220 (1823); Spreng.: 773 (1824); DC.: 8

(1825); Eckl. & Zeyh.: 119 (1834–1835); E. Mey.: 123, 137 (1843); Schldtl.: 623 (1846); Sond.: 453 (1860). Type: Cape, *Herb. LINN 268.6* (LINN, lecto.; S-LINN, iso., fide Wijnands: 64 (1983); PRE, microfiche!).

Celastrus obtusus Thunb.: 217 (1823); E. Mey.: 78 (1843). Type: Cape, Thunberg in *Herb. Thunberg 5629* (UPS, holo.; PRE, microfiche!).

Celastrus campestris Eckl. & Zeyh.: 119 (1834–1835); Walp.: 533 (1842); Krauss: 42 (1846). *Catha campestris* (Eckl. & Zeyh.) C. Presl: 34 (1844). Type: Zwartkopsrivier [Uitenhage], Ecklon & Zeyher 937 (GRA! lecto., here designated; S! iso.).

Rigid or straggling shrub up to 3 m tall, sometimes a small tree, spinescent, glabrous. Branches terete, twigs angular, greyish brown, often covered by a thick whitish grey wax layer, splitting longitudinally and peeling off, revealing pale nonwart-like lenticels. Spines slender or robust, straight, up to 50 mm long, naked or leafy. Leaves alternate or fasciculate, shortly petiolate, coriaceous, glossy dark green, glabrous; lamina obovate, 13–7 × 8–35 mm, apex rounded, obtuse to emarginate, base cuneate, margin revolute, usually entire and wavy or spinulose-denticulate, venation reticulate, more prominent below than above; petiole 1–4 mm long. Stipules subulate, ± 1–2 mm long. Inflorescence a lax dichasium or subdichasium; peduncle 10–25 mm long; pedicels 7–10 mm long. Flowers 5-merous, 3–9 in a cyme, 6–10 mm in diameter. Sepals ± 1 mm long, unequal, two exterior ones shorter than three interior ones, broadly triangular, margin lacinate. Petals 4–5 mm long, white, oblong, apex rounded, margin slightly ciliate, reflexed lengthwise. Disc thick, fleshy, obsoletely crenate, furrowed. Stamens 3 mm long, situated in shallow sinuses of disc. Ovary 3-locular; ovules 6–12 per locule; style 1 mm long; stigma 3-lobed. Capsules cream to pink or red, obconic-trigynous, smooth, 10–20 mm long. Seeds reddish-brown, completely enveloped by a well developed, orange aril.

Diagnostic characters

Branches of *P. pyracantha* are smooth, covered by a whitish grey wax layer which splits longitudinally and peels off, revealing nonwart-like lenticels (never verrucose as in *P. verrucosa* and *P. retrospinosa*); the pedicels are longer than 5 mm.

Distribution and habitat

P. pyracantha occurs in scrub, fynbos and coastal forest along the southwestern Cape coast from the Vredenburg–Saldanha, Velddrif, Melkbosstrand and Cape Town areas to as far northeast as Tsitsa Falls in the Eastern Cape (Figure 2). It is often associated with *Gymnosporia buxifolia* (L.) Szyszyl.

History

P. pyracantha has been known to science at least since the last decade of the 17th century when it was illustrated by Plukenet in his *Almagestum botanicum* (1694) and in Commelin's *Horti medici Amstelodamensis* (1697). Boerhaave (1727) mentioned *P. pyracantha* and it has been illustrated again by Weinmann (1742). *P. pyracantha* and *Gymnosporia buxifolia* (L.) Szyszyl. are the only southern African members of *Putterlickia* and *Gymnosporia* mentioned in the taxonomically important *Hortus cliffortianus* of Linnaeus (1737). The protologue reads: 'ramis teretibus, spinis nudis, foliis acutis. Lycium aethiopicum, pyracanthae folio' (*Putterlickia pyracantha*). However, the nomenclatural type of *P. pyracantha* is not Plukenet's figure, but Linnaeus's specimen 268.6 in the Linnean Herbarium, selected by Wijnands (1983).

In his catalogue of the plants cultivated in the Royal Botanic Garden at Kew, Aiton (1789), mentioned *Celastrus pyracanthus* and gave the vernacular name as 'pyracantha-leafed staff-tree', cultivated in 1752. Sims (1809) provided a description of *Celas-*

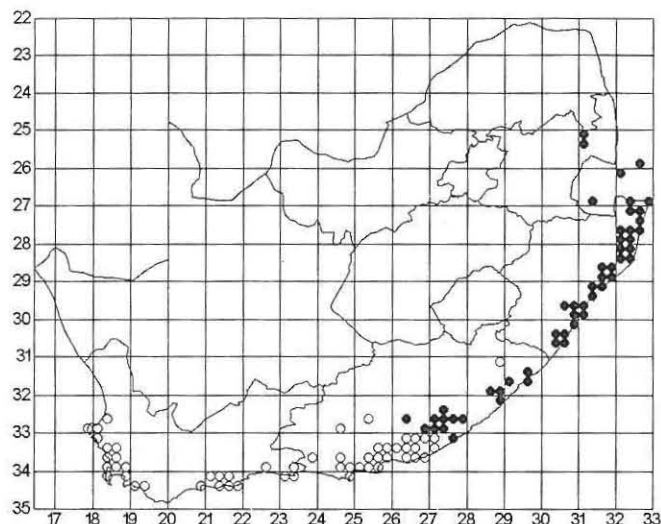


Figure 2 Known distribution of *Putterlickia pyracantha* (○) and *P. verrucosa* (●).

trus pyracanthus with a colour illustration and a list of its synonyms with their literature references, and gave the vernacular name as 'leafed staff-tree'. He mentions that this species is a native of the Cape of Good Hope from where it was introduced to The Netherlands, and thence dispatched to many parts of Europe. In cultivation *P. pyracantha* is sometimes without spines, and the drawing was obviously made from a part of a plant with almost no spines.

Representative specimens examined

Western Cape

—3217 (Vredenburg): Farm De Klip, between Vredenburg and Saldanabaai (–DD), *Botha & Coetzee 1693* (PRE).

—3218 (Clanwilliam): Rocher Pan Nature Reserve, Velddrif (–CB), *Van Rooyen & Ramsay 494* (STE); 50 km from Piketberg on road to Velddrif (–CC), *Joffe 502* (PRE).

—3318 (Cape Town): Geelbek, Langebaan (–AA), *Bösenberg & Rutherford 255* (STE); Darling (–AD), *Van Rensburg 138* (STE); Bakoven Bay (–CB), *Marais 605* (GRA, PRE); Sandy Bay turnoff to Llandudno (–CC), *De Villiers 163* (PRE); Camps Bay (–CD), *Esterhuysen 12845* (BOL), *MacOwan 1822* (G, GRA, PRE, SAM); Pella area, Malmesbury District (–DA), *Boucher & Shepherd 4406* (STE); Stikland (–DC), *Acocks 281, 1124* (S); N slopes of Stellenboschberg (–DD), *Taylor 7141* (PRE, STE).

—3418 (Simonstown): Wynberg Hill, N side (–AB), *Gillett 3322* (PRE, STE); Hottentots Holland Mountains (–BB), *Bolus 9289* (BOL, PRE); Sand dunes at Strand (–BB), *Parker 3970* (BOL).

—3419 (Caledon): Kleinmond (–AC), *Boucher 1791* (PRE, STE); Klein River (–AD), *Fourcade 5498* (STE).

—3420 (Bredasdorp): Breede River (–BD), *O'Callaghan 448, 450* (STE).

—3421 (Riversdale): Corente River, Riversdale District (–AA), *Muir 5068* (PRE); 2 km S of bridge on Kafferkuijs River, Riversdale (–AB), *Bohnen 7331* (STE); Stilbaai (–AD), *Buffelskraal, Riversdale District* (–BA), *Muir 1590* (BOL, PRE); Canca, SE of Albertinia (–BC), *Oliver 5732* (STE); Gouritz River Mouth (–BD), *O'Callaghan, Fellingham & Van Wyk 327* (PRE, STE).

—3422 (Mossel Bay): Kleinrakovier, Mossel Bay (–AA), *Taylor 1113* (PRE).

—3423 (Knysna): Salt River near Knysna town (–AA), *Taylor 996* (PRE); Keurboomstrand, Knysna District (–AB), *Taylor 4405* (PRE, STE).

Eastern Cape

- 3128 (Umtata): Tsitsa Falls (–BB), *Strey 10686* (NH, PRE).
 —3224 (Graaff–Reinet): 35 miles S of Graaff Reinet on Port Elizabeth road (–DC), *Bolus 1662* (BOL).
 —3225 (Somerset East): Between Zuureberge and Kleinbruintjieshoogte (–CB), *Drège s.n. S 93/97* (S).
 —3227 (Stutterheim): Woods near Komga (–DB), *Flanagan 136* (PRE).
 —3322 (Oudtshoorn): Fairy Knowe, George District (–DC), *Wright 211* (PRE).
 —3323 (Willowmore): Keurbooms Nature Reserve (–CD), *Van Wyk BSA2356* (PRU); Studtis Kloof, Baviaanskloof (–DB), *Taylor 398* (PRE).
 —3324 (Steyterville): Witrivier between Cambria and Patensie (–DA), *Geldenhuis 1254* (PRE); Zwartkopsrivier, Uitenhage District (–DB), *Ecklon & Zeyher 265* (BOL, G, STE), *Ecklon & Zeyher 935* (S, GRA, SAM), *937* (GRA, S), *Zeyher 2176* (G, K, P, PRE, S); Slangfontein, Jansenville (–DC), *Hoffman 880* (GRA); Hankey (–DD), *Fourcade 2267* (BOL).
 —3325 (Port Elizabeth): Addo National Park (–BC), *Hall-Martin 5986* (PRE); Suurberge, on road from Paterson to Cookhouse (–BD), *Jordaan 2304* (PRE); Bronne Nature Reserve, Uitenhage District (–CB), *Grobhelaar 2119* (PRE); Van Stadenspas, Port Elizabeth District (–CC), *Admiraal & Drijfhout 2800* (PRE); Uitenhage (–CD), *Thode A636* (PRE); 11.9 miles from Addo on road to Uitenhage (–DA), *Marais 396* (PRE); 4.1 miles from Ncanaha on Alexandria road (–DB), Coega area, Port Elizabeth District (–DC), *Van Wyk 6729* (PRE, PRU); Algoa Bay (–DD), *Long 865* (GRA, PRE).
 —3326 (Grahamstown): Cradock Road, Grahamstown (–AB), *Jacot-Guillarmod 3513* (GRA, PRE); 1 mile from Tootabi turnoff near Alicedale (–AC), *Johnson 999* (PRE); Slaaikraal (–AD), *Hoole B2* (GRA); Botha's Hill, Grahamstown (–BA), *Dyer 2247* (PRE); Committees flats (–BB), *Archibald 715* (GRA); Blaauwkrantz Pass (–BC), *Hall 46* (GRA); Forest near Alexandria (–CB), *Theron 1085* (PRE); Boesmansriviermond (–DA), *Strey 10366* (NH, PRE); Kowie West, Bathurst District (–DB), *Britten 2847* (STE).
 —3327 (Peddie): Peddie (–AA), *Compton 23369* (NBG); Fish River Mouth (–AC), *Cousins 30* (GRA); 5 km from Kiwane to East London (–BA), *Van Wyk & Kok 5828* (PRU); East London (–BB), *Hilner 264* (GRA, PRE).
 —3424 (Humansdorp): Humansdorp (–BB), *Fourcade 1088* (SAM, STE).
 —3425 (Skoenmakerskop): Cape Recife (–BA), *Olivier 2773, 2933* (GRA).

2. *Putterlickia verrucosa* (E. Mey. ex Sond.) Szyszyl. in *Polypetalae disciflorae Reimannianae*: 36 (1888); Loes.: 208 (1896); Sim: 189 (1907); Loes. & Engl.: 232 (1921); Davison: 338 (1927); N. Robson: 356 (1966); N. Robson & Sousa: 4 (1969); Coates Palgrave: 504 (1977); Moll: 48, 185 (1992); Pooley: 272 (1993). *Celastrus verrucosus* E. Mey.: 142 (1843) nom. nud. ex Sond.: 453 (1860). Type: Cape, woods between the Keiskamma and Buffels River, *Drège 5613* (S! lecto., lower specimen on sheet here designated; P, TCD?, isolecto.).

Straggling shrub or small tree up to 3 m tall, spreading, much-branched, spinescent, glabrous. Branches terete, with angular twigs, reddish or purplish brown, becoming grey-brown and verrucose with prominent whitish warty lenticels, each with a longitudinal slit, sometimes with insect galls (locally swollen). Spines slender or robust, straight, up to 70 mm long, not floriferous, sometimes leafy. Leaves alternate or fasciculate, shortly petiolate, coriaceous, glossy grey-green above and paler brown below when dry, glabrous; lamina ovate, obovate to oblanceolate-spathulate, 10–85 × 6–24 mm, apex often emarginate and mucronate, otherwise obtuse to rounded, base cuneate, margin serrulate or spinulose-denticulate, sometimes

subentire and undulate with a few teeth, revolute, venation more raised below than above, principal lateral veins drib raised on both sides; petiole 0.5–3.0 mm long. *Stipules* subulate, *Inflorescence* a dichasium or subdichasium, solitary, axillary or on brachyblasts; peduncle 7–40 mm long; pedicels (1–)3–5 mm long. *Flowers* 5-merous, 3–20 in a cyme, 5–10 mm in diameter. *Sepals* 1–2 mm long, equal, oblong to suborbicular, apex obtuse to rounded, margin lacinate. *Petals* 2.0–4.5 mm long, white or cream, oblong, margin uneven or ciliolate, reflexed lengthwise. *Disc* broad, flat, saucer-like, margin slightly crenate. *Stamens* 2 mm long; anthers small, 1 mm long. *Ovary* 3-locular, 1.5 times as long as style; ovules 6–12 per locule; style 0.5 mm long; stigma subcapitate or 3-lobed. *Capsules* cream to pink, becoming reddish brown when mature, obconic-trigonal, smooth, 15–25 mm long. *Seeds* 2–8, reddish brown, completely enveloped by a well developed, orange aril (Figure 3).

Diagnostic characters

Branchlets of *P. verrucosa* are verrucose with prominently raised, warty lenticels, hence the specific epithet; spines are spreading; leaves are narrower than 15 mm; pedicels are usually shorter than 4 mm.

Distribution and habitat

P. verrucosa grows in tropical coastal dune forest, bush clumps or thickets, 0–400 m above sea level. It occurs in the Eastern Cape from East London to Port St Johns, but is absent from the southern Natal/Pondoland sandstone (Natal Group) region where it is replaced by *P. retrospinosa*. It extends its range northwards from Hibberdene and Oribi Gorge through the KwaZulu–Natal coast to the Lebombo Mountains, inland forests of Swaziland and the Kruger National Park (Numbi, Pretoriuskop and Shabeni) in Mpumalanga. It is also recorded from southern Mozambique (Figure 2).

History

Herbarium collections were made by Drège in the early 1800s. The name *Celastrus verrucosus*, which Meyer (1843) based on Drège specimens, appeared as a *nom. nud.*, but Sonder (1860) subsequently took it up. Sonder treated *Putterlickia* as a section under the genus *Celastrus* where he placed two species, *C. pyracanthus* and *C. verrucosus*, both distinguished in his key by the presence of six or more ovules per locule and a raised floral disc. Szyszylowicz (1888) classified *C. verrucosus* and *C. pyracanthus* in the genus *Putterlickia* Endl. Loesener (1892), Davison (1927) and all subsequent workers on the genus recognise *P. pyracantha* and *P. verrucosa* as distinct species.

Representative specimens examined

Mozambique

—2532 (Maputo): Maputo (–DC), *Borle 264* (PRE).

Mpumalanga

—2531 (Komatipoort): Numbi, Kruger National Park (–AA), *Van der Schijff 3440* (PRE); Lekasi (–AC), *Nel 383* (PRE).

Swaziland

—2631 (Mbabane): 20 km S of Sidvokodvo towards Grand Valley (–CD), *Van Jaarsveld 1189* (PRE).

—2632 (Bella Vista): Mlawula Nature Reserve (–AA), *Alward 190* (PRE).

Kwazulu–Natal

—2632 (Bella Vista): Mavilo Hill, Pongolo flood plain (–CD), *Moll 4267* (NH, PRE); Lake Nhlanga (–DD), *Tinley 382* (PRE).

—2732 (Ubombo): 5 km from Makanis Pont on road to Ndumu (–AB), *Van Wyk 2504* (PRE); Sileze Forest (–BA), *Ward 1361* (NH); Near Manzengwenya Inspection Quarters (–BB), *Moll 4851* (NH,

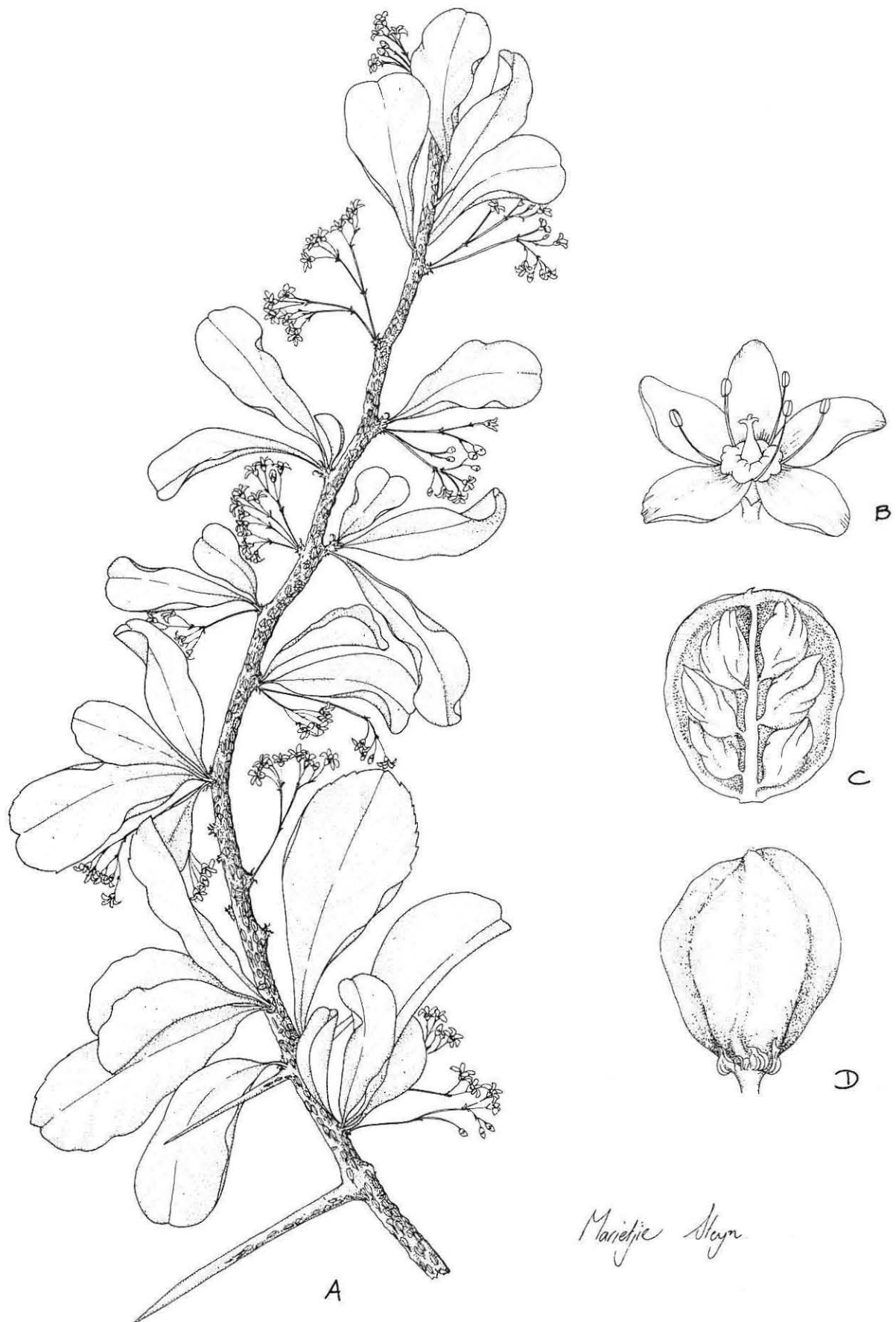


Figure 3 *Putterlickia verrucosa*. **A.** Flowering branch $\times 1$; **B.** flower $\times 8$; **C.** open capsule with the seed completely enclosed by an aril $\times 2.5$; **D.** capsule $\times 2.5$. A drawn from plant growing in Pretoria National Botanical Garden (Jordaan 3132), B drawn from Ward 1826 (PRE) and C & D drawn from Edwards 1351 (NU).

PRE, S); Lake Sibayi (–BC), *Balsinhas* 3225, 3239 (PRE); Mkuzi Game Reserve (–CB), *Balsinhas* 3067 (PRE); 9 miles N of Biyela Store, Entonjaneni District (–CC), *Codd* 1909 (PRE); False Bay Park (–CD), *Davidson s.n.* J68959 (J); Bhangazi Lake (–DA), *Jordaan* 512 (NH, PRE).

—2831 (Nkandla): 2 km from Empangeni–Melmoth and Eshowe–Melmoth junction (–DA), *Henderson* 132 (PRE); Ian Scott–Barnes' Farm (–DB), *Moll* 4967 (NH); Mtunzini State Forest (–DD), *Groenewald* 28 (NH).

—2832 (Mtubatuba): Hluhluwe Game Reserve (–AA), *Guy* 27 (PRE); False Bay, Hlabisa District (–AB), *Moll* 2828 (PRE); Palm Ridge Farm, Hlabisa District (–AC), *Harrison* 221 (NH, PRE); Dukuduku (–AD), *Moll* 2728 (PRE).

—2930 (Pietermaritzburg): Nagle Dam, Camperdown (–DA), *Wells* 1266 (PRE); Inanda (–DB), *MacOwan* 615 (SAM); Stellabush, Durban (–DD), *R. & Th. Fries* 3406A (S).

—2931 (Stanger): Under Tugela Bridge, Mandini (–AB), *Edwards* 1351 (PRE); Groutville (–AD), *Moll* 2533 (PRE); Amatikulu River Mouth (–BA), *Cooper* 115 (NH, PRE); Hawaan Forest, S bank of Umhlanga River (–CA), *Ross & Moll* 2180 (NH, PRE); Avoca, near Durban (–CC), *Schlechter* 3008 (GRA, NH, PRE).

—3030 (Port Shepstone): Umdoni Park (–AD), *Nicholson* 2108 (PRE); Isipingo North (–BB), *Ward* 545 (PRE); Vernon Crookes Nature Reserve (–BC), *Balkwill & Cadman* 2285 (J); Ifafa (–BC), *Rudatis* 1167 (G, NH, PRE, S, STE); Gibraltar (–CB), *Strey* 11003 (NH, PRE); Hibberdene (–DA), *Mogg* 33815 (PRE).

Eastern Cape

—3128 (Umtata): Mqanduli (–DC), *Pegler* 602 (BOL, PRE); SE of Mqanduli, 11.6 miles on Coffee Bay road (–DD), *Marais* 750 (PRE).

—3129 (Port St. Johns): Embotyi (–BC), *Marais* 1214 (PRE); 3 miles N of Ngqeleni (–CA), *Marais* 759 (PRE); Port St. Johns (–DA), *Miller* B/957 (PRE); Intafufu River (–DD), *Mills* 423 (NH, PRE).

—3226 (Fort Beaufort): Fort Fordyce, Fort Beaufort (–CB), *Story* 2116 (PRE); Farm Dal Eendracht, S of Alice (–DD), *Giffen s.n.* (PRE).

—3227 (Stutterheim): Fort Cunynghame (–AD), *Sim* 1001 (BOL), 1699 (PRE); Keiskammahoek (–CA), *Kotsokoane* 140 (J); Dohne, Stutterheim District (–CB), *Acocks* 8943 (PRE); 4.1 miles N of Debe Nek (–CC), *Comins* 997 (PRE); King Williams Town (–CD), *Sim* 1665, 1697, 1698 (PRE), 1967 (BOL); Amabele (–DA), *Moss* 2370, 2371 (J); Prospect Farm, Komgha (–DB), *Flanagan* 606 (PRE, SAM).

—3228 (Butterworth): The Haven, Elliotdale District (–BB), *Gordon–Gray* 1038 (GRA); Manubi Forest, Mazeppa Bay (–DA), *Van Wyk* 8284 (PRU).

—3327 (Peddie): Kidds Beach (–BA), *Pienaar* 174 (PRE); East London (–BB), *Aveling* 31 (PRE).

3. *Putterlickia retrospinosa* Van Wyk & Mostert in South African Journal of Botany 53: 267 (1987); Moll: 48 (1992); Pooley: 272 (1993). Type: KwaZulu–Natal, Umtamvuna Nature Reserve, Beacon Hill, 10.12.1981, *Van Wyk* 5281 (PRU!, holo.; PRE!, iso.).

Putterlickia sp. no. 1 in Coates Palgrave: 504 (1977).

Evergreen woody climber up to 5 m tall, spinescent, glabrous. Branches brown, becoming dark grey to blackish with numerous white verrucose lenticels. Spines slender or robust, perpendicular to stem or often pointing backward, up to 100 mm long, naked. Leaves alternate or fasciculate, petiolate, coriaceous, dark green and shiny above, paler green and dull below, glabrous; lamina broadly elliptic to broadly obovate, rarely elliptic or ovate, (25–)80–120(–150) × (15–)40–60(–70) mm, apex rounded or retuse, mucronate, base rounded to cuneate, margin subentire or with few teeth in distal half, thick, midrib slightly raised above, principal lateral veins raised or

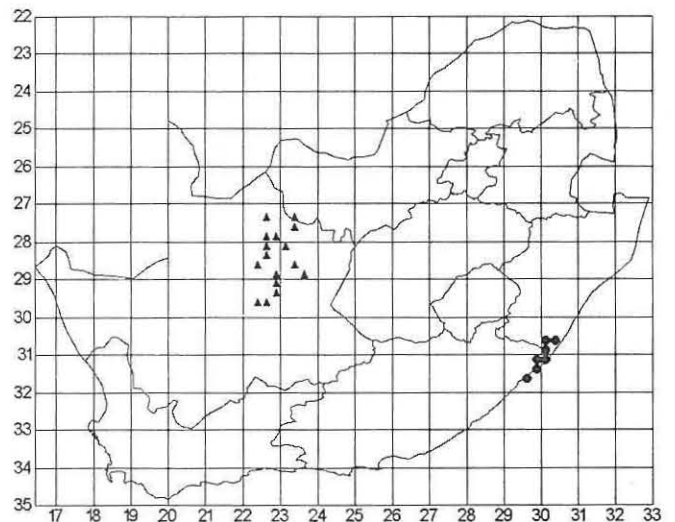


Figure 4 Known distribution of *Putterlickia retrospinosa* (●) and *P. saxatilis* (▲).

obsure above, slightly raised below; petiole 8–15 mm long. *Stipules* subulate, ± 2 mm long. *Inflorescence* a lax subdichasium, terminal or axillary, 80–140 mm long; peduncle 30–50 mm long; pedicels 3–5 mm long. *Flowers* 5-merous, many in each cyme, ± 5 mm in diameter. *Sepals* ± 1 mm long, green, fleshy, cucullate, subrotund, apex rounded, margin ciliate. *Petals* 3.5 × 2.0 mm, white, erect or spreading, oblong, apex obtuse, margin irregularly toothed. *Disc* slightly concave, margin shallowly crenate. *Stamens* subterete, 1.5 mm long; anthers 0.5 mm long. *Ovary* 3-locular; ovules (6–)8–10 per locule; style very short; stigma 3-lobed, spreading. *Capsules* whitish green, turning pink or red, obconic–trigonous, smooth, glabrous, pendulous, 30 × 20 mm. *Seeds* 1–3 per locule, ellipsoid, dark reddish brown, 8 mm long, completely enveloped by a well developed, orange aril.

Diagnostic characters

P. retrospinosa is the only member of the subfamily Celastroideae which is a woody climber and with spines that are pointing backward, hence the specific epithet. It has stems with abundant verrucose lenticels like *P. verrucosa*, but has the largest leaves in the genus, with entire to subentire margins and relatively larger and more lax inflorescences.

Distribution and habitat

P. retrospinosa is endemic to the Transkei sandstone forests (Jacobs 1996) and Natal Group sandstone areas of southern KwaZulu–Natal, from the Mntafufu River (Port St Johns district) in the south to the Izotsha River (Port Shepstone district) in the north (Figure 4). It is fairly common in riverine forest and forest fringes.

History

This taxon was recognised as a possible new species by plant collectors in southern KwaZulu–Natal between 1960 and 1980, notably R.G. Strey, H.B. Nicholson, K.H. Cooper, C.J. Ward and A. Abbott. It was described by Coates Palgrave (1977) under *Putterlickia* sp. no. 1.

Representative specimens examined

Kwazulu–Natal

—3030 (Port Shepstone): Drower's Plot, Oribi (–CA), *Davidson* 2413 (J); Oribi Gorge Nature Reserve (–CB), *Nichols* 691 (NH);

Mgongongo, Izotsha (–CB), *Strey 7708* (NH, PRE); Aerodrome and Smedmore Forest, Umtamvuna Nature Reserve (–CC), *Abbott 1518* (NH, PRU); Icwaka River Gorge, Port Shepstone (–CC), *Van Wyk 7179* (PRU).

—**3130** (Port Edward): Vulture Valley, Umtamvuna Nature Reserve (–AA), *Abbott 587* (PRU); Beacon Hill, Port Edward District (–AA), *Strey 7205* (NH, PRE), *Van Wyk 3336* (PRU); Kloof NW of office running into Bulolo River, Umtamvuna Nature Reserve (–AA), *Van Wyk BSA 1647* (PRU).

Eastern Cape

—**3130** (Port Edward): Sikuba River, Mzamba Forest (–AA), *Abbott 3170* (PRU); Mtentu River, Mkambati Nature Reserve (–AA), *Jordaan 948* (NH).

—**3129** (Port St. Johns): N edge of Fraser Gorge (–BC), *Van Wyk & Mathews 7681* (PRU); Daza River, Mkambati Nature Reserve (–BD), *Jordaan 1061* (NH); S edge of Msikaba Gorge, Lusikisiki District (–BD), *Acocks 13261* (PRE); Mntafufu (–DA), *Cooper 93* (NH).

4. *Putterlickia saxatilis* (Burch.) M. Jordaan, comb. nov.

Celastrus saxatilis Burch. in *Travels in the interior of southern Africa* 2: 264 (1824).

Gymnosporia saxatilis (Burch.) Davison: 303 (1927); Loes.: 149 (1942). Type: Asbestos Mountains, Griekwa Town, *Burchell 1671* (K!, holo.).

Compact, multi-stemmed, greyish shrub up to 1.5 m tall, spinescent, glabrous. Branches terete, greyish brown, with sunken lenticles; brachyblasts axillary. Spines slender, straight, up to 15 mm long, rarely leafy or floriferous. Leaves nearly always fasciculate, rarely alternate, subsessile, coriaceous, glaucous, glabrous; lamina obovate, 4–20 × 2–4 mm, apex rounded to subemarginate, base cuneate, margin entire, venation inconspicuous above, prominent below; petiole ± 0.5 mm long. Stipules short, subulate. Inflorescence a dichasium, terminal or axillary, longer than leaves; peduncle 8–10 mm long, reddish brown; pedicels 5–7 mm long. Flowers 5-merous, few in each cyme, ± 7 mm in diameter. Sepals ± 1 mm long, triangular, margin lacinate. Petals ± 4 mm long, white, cream or occasionally tinged pink, oblong, margin entire, recurved. Disc fleshy, annular, convex. Stamens 2.5 mm long; anthers 0.5 mm long. Ovary 3-locular; ovules 3–6 per locule; style 1.0–1.5 mm long; stigma 3-lobed. Capsules white to pink or red, obconic-trigonous, smooth, 6–10 mm long. Seeds 5 mm long, dark brown, completely enveloped by a well developed, orange aril.

Diagnostic characters

The leaves are small (usually shorter than 15 mm) and characteristically glaucous and entire to subentire; the flowers have only four ovules per locule, while the other three species usually have six or more, and the capsules are the smallest in the genus.

Distribution and habitat

Confined to rocky outcrops and mountains in the area between Kuruman, Campbell, Griekwa Town, Postmasburg, Niekerkshoop and Olifantshoek (Figure 4). It is locally common in Kalahari thornveld and arid semi-desert vegetation. Plants often grow in loam among rocks (often dolerite), hence the specific epithet.

P. saxatilis is geographically isolated from the rest of the genus which are confined to mainly the moister coastal and adjacent inland areas of southern Africa. Its adaptation to more arid conditions are reflected by its characteristic xerophytic leaf anatomy and the reduction in the number of ovules per locule.

History

Burchell (1824) described *Celastrus saxatilis* and wrote about it

as follows: ‘... an exceedingly pretty sort of *Celastrus* with red branches and very small leaves, decorated these rocks’. Davison (1927) placed this species in *Gymnosporia* and described it as having two ovules per locule. Marais (1960) and Robson (1965) considered *Gymnosporia* congeneric with *Maytenus* and excluded this taxon from *Maytenus*, since its ovaries have more than two ovules, but fewer than six per locule. This taxon was not attributed to any genus by Marais (1960), but Robson (1965) placed it under *P. pyracantha*, with 6–12 ovules per locule, and called it the ‘small entire-leafed Karroo form of *P. pyracantha*’.

Representative specimens examined

Northern Cape

—**2722** (Olifantshoek): Verwatersnek, 8 miles SSW of Faans Grove (–BC), *Leistner 1605* (PRE); 15 km N of Olifantshoek, Langeberg (–DC), *Puff 780415–1/10* (J); 11 miles NW of Olifantshoek (–DD), *Schlieben & Tölken 11028* (G, PRE).

—**2723** (Kuruman): Kuruman (–AD), *Bryant s.n. BOL 56771* (BOL); 30 km from Kuruman to Billingshurst (–CB), *Arnold & Musil 501* (PRE).

—**2822** (Glen Lyon): Andriesfontein, near Olifantshoek (–BA), *Acocks 445* (PRE); 25 km from Olifantshoek to Upington (–BA), *Van Wyk 9084* (PRU); Dunmurray Hills (–BC), *Pole Evans 37* (PRE); Witsand to Griekwastad (–CB), *Joffe 702* (PRE).

—**2823** (Griekwastad): Kapstewel, Postmasburg District (–AA), *Cooke s.n. GRA A7631* (GRA); Jasper Mountains, S of Niekerkshoop (–CB), *Hafström 1153* (PRE, S); Vogelfontein (–DC), *Saaiman 413* (NMB, PRE).

—**2922** (Prieska): Springfield, Griqualand West (–BB), *Wilman 1315* (BOL); Prieska (–BD), *Bryant 1131* (PRE); Blouboospoort (–CB), *Wilman 23441* (PRE); Kransfontein, Prieska District (–DA), *Acocks 527* (PRE).

Acknowledgements

The authors are greatly indebted to Marietjie Steyn for the drawing of *P. verrucosa*, Adela Romanowski for photographic services and Emsie du Plessis for critically reading the manuscript.

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