

## THE ENDEMIC SPECIES OF *PODOCARPUS* IN NEW GUINEA

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Among the more than a dozen species of *Podocarpus sensu stricto* known to occur on the island of New Guinea incl. New Britain, five are not known elsewhere. Unlike most of the non-endemic species, these five are widely distributed on the island in their appropriate ecological zones. Only one of the five, *P. brassii* Pilger, can be said to be free of confusion in the literature.

Six species and one variety of *Podocarpus* have been described specifically from New Guinea. Of these, *P. schlechteri* Pilger is a synonym of *P. pilgeri* Foxworthy and *P. thevetifolius* Blume is a synonym of *P. polystachyus* R. Brown, both extending far beyond New Guinea. Besides *P. brassii*, the remainder are *P. ledermannii* Pilger, *P. idenburgensis* Gray, *P. archboldii* Gray, and *P. archboldii* var. *crassiramosis* Gray. Another endemic species has never been named. Confusion centers around *P. archboldii* and its relationships to the other endemic species.

The description of *P. archboldii* by Gray in 1958, and nine of the eleven specimens she cited, actually belong to a different, unnamed, important New Guinea species. The specimen selected as the type for *P. archboldii* by Gray not only differs from the taxon Gray had in mind, but also comes from a distinctly lower elevation than the range she indicated for her species, a fact she apparently overlooked. The true *P. archboldii* (based on the type specimen) resembles *P. neriifolius* Don, with which it has often been confused.

It is hard to know what Gray truly had in mind for her variety *crassiramosis*, because four taxa are represented among the seven specimens cited. Three of these are the same as the majority cited for the species, but represent a somewhat larger leaf which, it turns out, occurs on younger trees or on the lower parts of mature trees. This later on has generally been taken as the intended taxon, but it is not the same as the type specimen. Both the type specimen and one other specimen cited belong to a second unnamed species, as does one specimen cited under the description of *P. archboldii*. A sixth specimen cited under the variety is *P. neriifolius* and the last belongs to a taxon known as *P. neriifolius* var. *atjehensis* Wasscher.

Three specimens are cited by Gray for *P. idenburgensis*. The type belongs to *P. ledermannii*. The second belongs to *P. archboldii*, and the third belongs to the unnamed species included in *P. archboldii*. Three specimens of *P. ledermannii* were correctly cited by Gray, while she placed others under *P. rumphii* and *P. ridleyi*. Under *P. ledermannii* Gray cited several specimens of *P. neriifolius* and *P. bracteatus* among others. Wasscher (1941) cited only the specimens of *P. ledermannii* given in the original description. He appears not to have seen many other specimens of endemic *Podocarpus* from New Guinea, and such as he did see were mostly listed under *P. neriifolius*.

A clarification of the characters and distinctions among the four confused endemic species appears to be needed. Two will have to be named.

Although not properly described by Gray, *P. archboldii* is a valid species. The leaves strongly resemble those of *P. neriifolius*, but differ in that the apex is never acuminate as is usually the case for the latter. The leaves are linear or linear lanceolate, tapering to a broadly acute apex, and more abruptly so at the base to a short petiole up to 5 mm long. The midrib is prominently raised on the upper surface of the leaf, about 0.5 mm wide, broader below. Mature leaves are 7–12 cm long and 10–14 mm wide. Juvenile leaves reach at least 18 cm by 16 mm. Foliage buds are 2–4 mm long by 3–4 mm in diameter, the outer scales are triangular with slightly spreading apices, and at least 1 mm wide at their bases. Pollen cones are solitary, about 4 cm long and 4 mm diam. when mature, and subtended by a few, spreading, sterile scales, resembling the foliage bud scales, sessile, or more commonly with a peduncle up to at least 4 mm long. The apex of the microsporophyll beyond the pollen sacs is a tiny spur about half a mm long. The fruit is produced on a peduncle 5–11 mm long. The two bracts at the base of the fruit are linear lanceolate and about 2 mm long. The receptacle, which becomes red when mature, is made up of 2 or 3 fleshy bracts, the fertile one the longest and 6–10 mm long. A second, slightly shorter, fleshy bract lies adjacent to the fertile bract as is normal in the genus, but frequently there is a third, even shorter, fleshy bract beside the second bract, an unusual condition known only elsewhere in *P. rumphii*. The oval seed with its enveloping leathery scale is 7–8 mm long. Besides the not acuminate leaf apex, *P. archboldii* is distinguished by the extra, sterile, fleshy bract of the fruit and by the solitary and usually pedunculate pollen cones. The pollen cones of *P. neriifolius* are sessile and normally in groups of three. While *P. neriifolius* is mainly reported from lowland and transitional rainforests, *P. archboldii* is found scattered and locally common in mid mountain rainforest with *Castanopsis*, between 720 and 1650 m, as a good sized tree up to 40 m high. The type specimen is *Brass & Versteegh 13121*.

NEW GUINEA. West: Vogelkop, Tobi Mts., Kebar Valley, *Sijde BW 5580*, ♀, *Koster BW 7103*; 4 km SW. Bernhard Camp, *Brass & Versteegh 13121*, ♀, 850 m (A, holotype; BM, BO, BRI, L, LAE, isotypes), *13530*, ♂. — East: W. Highland, Kopiago, *Womersley, Vandenberg, & Galore NGF 37214*, ♂, Morobe, Bulolo, *Havel NGF 7577, 17131*, ♀, *17144*, ♀, *Havel & Kairo NGF 17330*, ♂, *de Laubenfels P725*, ♀, *P726*, ♂, *P727*, ♀, *P728*; Morobe, Wau, Edie Creek Road, *Womersley NGF 15337*, ♀, *Womersley & de Laubenfels NGF 19457*, ♂, *19458*, ♀, *de Laubenfels P478*, ♂, *P479*, ♀, *Hartley TGH 11546*; Morobe, Waria, *Clemens 1481*.

Also a low elevation species, *P. ledermannii* has never been completely described correctly. This species has large, linear, acute, and usually acuminate leaves 11–18 cm long and 17–21 mm wide, abruptly narrowed at the base to a short petiole up to about 5 mm long. The midrib on the upper side of the leaf is broad and rounded, sometimes collapsing on dried specimens to a small narrow ridge. Foliage buds are 4–8 mm long, and 3–4 mm in diameter at the base, with spreading, linear lanceolate, scales which are at least one mm wide at the base. Pollen cones are in groups of three on a peduncle 3–4 mm long, and are subtended by a cluster of spreading, triangular, sterile scales 2–3 mm long, the mature cone about 4.5 cm long and 4 mm in diameter. The exposed part of the microsporophyll is about 1 mm long. The fruit is produced on a peduncle 4–15 mm long. The two bracts at the base of the fruit are linear lanceolate, and about 2 mm long. The receptacle, which becomes red when mature, is made up of two fleshy bracts, the longer fertile one of which is 9–16 mm long. The oval seed, with its enveloping leathery scale, is 11–13

mm long and 9–10 mm in diameter. Besides the large leaf and large fruit, *P. ledermannii* is distinguished by the three pollen cones on a peduncle and the rather long, more or less foliose, foliage buds. Normally, *P. ledermannii* is a small to medium sized tree up to 26 m high, growing scattered, and locally common, in the understory of low to medium elevation primary rainforests up to a maximum of 2,200 m. Fertile specimens as little as 4 m high have been seen. The type specimen is *Ledermann 9943*.

NEW GUINEA. West: Vogelkop, Central Tamrau Range, *Van Royen, Sleumer, & Schram 7792*, ♀; Mt. Krabo, S. of Manokwari, *Koster BW 10753*; Wissel L., Motito, *Vink & Schram BW 8685, 8691*, ♂; Wissel L., Mt. Bubeiro, *Eyma 4911*, ♂; 6 km SW. of Bernhard Camp, *Brass & Versteegh 12581*, ♀, 1,200 m (A, holotype *P. idenburgensis*; BM, BO, BRI, L, LAE, isotypes), *Brass 12749*, ♀; Sidoarsi Mt., 200 km W. of Hollandia, *Vink BW 8440*. — East: Sepik Reg., Lordberg, *Ledermann 9878*, ♂, 1,000 m (B, syntype), *9943*, ♂ (B, holotype; K, L, isotypes), *10064a*, ♂ (K, L, syntypes); E. Highlands, Arau, *Brass 32192*, ♀; E. Highlands, Aiyura, *Smith NGF 1102*; Morobe, Yunzang, *Clemens 2352*; Morobe, Oomsis Creek, *Hartley NGF 10525*, ♀; Morobe, Ilaru, *de Laubenfels P735*, ♀, *P736*; Central Prov., Woitape, *Corner & Gray NGF 8249*, ♀.

NEW BRITAIN. T a l a s e a : Cape Gloucester, *Frodin NGF 26662*, ♀; Mt. Talawe, *Frodin NGF 26855*, ♀.

The taxon which Gray had in mind while describing *P. archboldii* requires a name and diagnosis, as follows:

***Podocarpus crassigemmis* de Laubenfels, *spec. nov.***

Arbor minor loci expositi ad arbor magna silvae, 4–38 m alta. Gemma foliata crassa globosa 4–5 mm diametra 3–5 mm longa, squamis exterioribus triangularibus 3–4 mm longis, 1.5 mm latis, acutis. Folia lenticula, 3–11 cm longa, 4.5–12 mm lata, marginibus revolutis. Strobili masculi solitarii vel bini, pedunculatis, 3–7 mm longis, squamis basalis pluribus, 3–4 cm plusve longi, 5–8 mm diametri. Semina ovoidea 11–14 mm longa, 9–10 mm diametra. T y p u s : *de Laubenfels P743* (L; iso in A, K, LAE), E. Highlands, Marafunga.

Leaves thick, quite variable in size, in juvenile specimens reaching at least 16 cm in length; the apex normally narrowly acute, but sometimes broadly acute on wider specimens; narrowing gradually more or less to a petiole up to 5 mm long at the base; midrib narrow but more or less prominent above, 0.2–0.4 mm wide, broader and quite prominent below. Pollen cones usually solitary; buds for pollen cones resembling the foliage buds; the apex of the microsporophyll elongated, broadly acute, 2–3 mm long, 1 mm wide. The fruit is produced on a peduncle 5–14 mm long. The two bracts at the base of the fruit are linear lanceolate and about 2 mm long. The receptacle, which changes from deep red to almost black when fully ripe, is made up of two fleshy bracts, the longer fertile one of which is 10–15 mm long. The large foliage buds, and the large buds for pollen cones which are produced on a peduncle, as well as the smallest tough lens-shaped leaves, and the elongated microsporophylls, are distinguishing characteristics. Scattered, locally dominant, in high mossy forests from 1,800 to 3,500 m.

NEW GUINEA. West: 9 km NE. of L. Habbema, *Brass & Versteegh 10452*, ♀; 18 km E. of L. Habbema, *Brass & Versteegh 11133*, ♂; 15 km SW. of Bernhard Camp, *Brass & Versteegh 11946*, ♀; 18 km SW. of Bernhard Camp, *Brass & Versteegh 11946A*, ♂, *Brass 12492*, ♀; Hellwig Mts., Mt. Agathodaemon, *von Römer 1230*. — East: W. Highlands: Sirunki, Kabanunt, *Walker ANU 847*, ♀; Yobobos, Laiagam, *Hoogland & Schodde 7541, 7558*, ♂; 12 miles. N of Wabag, *Womersley NGF 11071, 11263, 11282*, ♂; Hagen-Wabag Rd. just above Tambul rd. junct., *Quinn 4212*, ♂; lower slopes Mt. Hagen Range, *Saunders 626*; S slope Mt. Hagen Range near Tomba, *Hoogland & Pullen 6115*, ♀, *Hoogland & Pullen 5895*; Upper Kaugel Valley, Mt. Hagen Dist., *Bowers 447*, ♀, *600*, ♂; Nona Divide, Kubor Range, S of Minj, *Pullen 5206*, ♀; Wahgi-Jimmi Divide, N of Nondugl, *Van Royen NGF 18227*, ♀; Al R. Mts.,

Nondugl, *Womersley NGF 5361*. S. Highlands: Mt. Kerewa, Tari, *Kalkmann 4742; Ebenda, Anga Valley, Schodde 1625*; Mt. Giluwe, *Coode & Katik NGF 32980*, ♀, *Womersley NGF 37485*, ♀, *Schodde 1814*, ♂, 2050, ♂; Iaro R., Ialibu, *Larivita LAE 67137*. E. Highlands: Kunidawa, Chimbu, *Vandenberg NGF 39507*, ♀, *Hilde 251*, ♂; Chimbu, *Cavanaugh NGF 3329*; Keglsugl, *McVean & Wade ANU 7221*, *Wade ANU 7674*, ♀; Keglsugl-Pindaunde Trail, Mt. Wilhelm, *Wade ANU 7336*, ♀; Mt. Wilhelm, *Brass 30191*, ♀, 30383, ♂, 30662, ♀, 30753, ♂, *Wade ANU 7413*; Marafunga, Upper Asaro Vallay, *Womersley & Sleumer NGF 14030*, ♂, *Havel NGF 17419*, ♂, *Stevens LAE 51011*, *Anderson JARA 6*, ♂, *de Laubenfels P742, P743*, ♂ (L, holotype; A, K, LAE, isotypes); W of Fatima R., *Grubb & Edwards 141*, ♂, 269, ♀; Fatima R., *Stevens LAE 51046*, ♀, *51046A*, ♂; Mt. Otto, *Brass 30891*, ♂, above Goroka, *Womersley & Floyd NGF 6137*, ♂, ♀, *Collins W952*; Kerigomna Camp, Goroka, *Hoogland & Pullen 5573*, ♀, 5608, ♂, *Stevens & Grubb LAE 54665*, ♀; Asaro-Mairi Divide, *Hoogland & Pullen 5442*, ♀; Aiyura Range, *Womersley NGF 3374*. Morobe: Mt. Sarawaket, *Clemens 10073*, ♀, *Hartley TGH 11204*, ♂; Mongi Valley, below Sarawaket, *Lane-Poole 529*; Samanzing, *Clemens 9503*, ♀, 9525, ♀, 9525A, ♂; Mannasat, Cromwell Mts., Huon Penn., *Hoogland 9587*; Wau, Mt. Kaindi, *Jacobs NGF 53*, ♂; *Womersley & de Laubenfels NGF 19461*, ♀, *de Laubenfels P486A*, *Womersley NGF 24509*, ♀. Central Prov.: Mt. Strong, Tapini, *Coode & Stevens NGF 46357*, ♂; Murray Pass, Goilala, *Ridsdale NGF 36946*, ♂; Avious, Goilala, *Foreman & Lelean NGF 48389*, ♀; Avios, Woitape, *Millar UPNG 1228*, ♀; W slopes, Wharton Range, *Van Royen NGF 30034*, ♀; Kerau Mission, *Frodin 693, 760*; Mt. Tafa, *Brass 5118*; Mt. Kenevi, *Croft LAE 65146*, ♂. Milne Bay: Mt. Manaman, *Crutwell 1271*; track from Goepon to Goe, Raba Raba, *Stevens & Veldkamp LAE 54407*, ♀.

The second undescribed species endemic to New Guinea corresponds to *P. archboldii* var. *crassiramosus* on the basis of the type specimen of that taxon, but a full and accurate description is still needed:

***Podocarpus pseudobracteatus* de Laubenfels, spec. nov.**

Arbor parva ad 15 m alta. Gemma foliata elongata 5–14 mm longa, basi 3–5 mm diametra, squamis exterioribus lanceolatis basis 1 mm crassis. Folia acuta lanceolata vel lenticula, 6–15 cm longa, 8–12 mm lata; costis medianis superis prominentibus, 0.3–0.5 mm latis, 0.4 mm altis. Strobili masculi solitarii sessili, squamis basalis pluribus triangularibus, ad 5 mm longis, 1.5 mm latis, plus minusve 4 cm (? ad 8 cm) longi, 3 mm diametri. Strobili feminei pedunculis 4–12 mm longis, foliis basalis 2–3 mm longis, receptaculis 7–10 mm longis, seminis cristatis 10–12 mm longis, 7–9 mm diametris. T y p u s : *Kalkman 5189* (L; iso in A, LAE, S), Lei R., Mt. Ambua, Tari, S. Highlands.

Leaves thick, ± tapering at the base to a petiole up to 4 mm long; juvenile leaves up to 20 cm long and 14 mm wide. Foliage bud scales spreading, slightly and often noticeably variable in length within a single bud. Basal scales of the pollen cone distinctly smaller than later ones. Upper part of microsporophyll triangular, the apex about 1 mm long. The ripe fleshy receptacle becomes dark red to almost black. The leathery covering of the seed has a small apical crest less than 1 mm high. A small understory tree scattered and locally common in high mountain rainforest from 1,700–3,500 m. Fertile specimens as small as 1.2 m reported. Besides the habitat, it differs from *P. bracteatus* Blume, which is a large middle elevation tree, in the sharply raised midrib of the leaf, the shorter bracts at the base of the fruit about half the size of those for *P. bracteatus*, and the crested and somewhat larger seed.

NEW GUINEA. West: Arfak Mts., *Gibbs 5985*; Wissel L., Deglina, *Rosendahl BW 3252*, ♀; 9 km NE of L. Habbema, *Brass 10874*, ♀, 2,650 m (A, holotype *P. archboldii* var. *crassiramosus*; BM, BO, BRI, K, LAE, isotypes). — East: W. Highlands: L. Inim, *Flenley ANU 2178*; 10 miles E of Wabag, near Yaibos, *Saunders 980, 982*; Kaugel Valley near Tambul, *Womersley NGF 14226*, ♀, *Bowers 326*, ♀, 849, ♀; 4–5 miles E of Nondugl, *Simonett 143*. S. Highlands: Ibiwara, Tari Gap, *Gillison NGF 25178*, ♀; Mt. Ambua, Tari, *Kalkman 5189*, ♀, 2,780 m (L, holotype; A, LAE, S, isotypes). *Vink 17480*, ♀, *Frodin NGF 28110, 28125*, ♀; Ialibu, *Womersley & Wooliams NGF 12380*, ♀. E. Highlands: Tau, near Chuave, Chimbu, *Womersley NGF 14097*, ♂; 5 miles W of Keglsugl, Chimbu, *Sanders 771*; Mt. Wilhelm, *Philipson 3457, Barrett 5*; Kerigombesia, near Marafunga, *Womersley NGF 24629*; Mt. Michael, *Brass 31381*, ♀; Okapa, *Hamilton 93*. Morobe Prov.: Ogeramngang, *Clemens 5434*, ♀; 11 km SSE of Wau, Bulldog Rd., *Allison AANG 104*. S. Prov.: Murray Pass, Wharton Range, *Brass 4605*, ♀.

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