

CUPRESSACEAE

Both *Cupressaceae* and the closely related *Taxodiaceae* are important Holarctic families which also have representatives in the southern hemisphere. A few species of both extend into habitats on the margins of the tropics or into tropical highlands. Of 18 genera of *Cupressaceae* only *Libocedrus* reaches into Malesia. Occasional reports of *Callitris* in New Guinea have been based on similar appearing specimens of *Casuarina*.

1. LIBOCEDRUS

ENDL. Syn. Conif. (1847) 42; CARR. Traité Gén. Conif. (1855) 84; MASTERS, J. Linn. Soc. Bot. 30 (1895) 20; WARB. Monsunia 1 (1900) 189; DALLIMORE & JACKSON, Handb. Conif. (1923) 300; LI, J. Arn. Arb. 34 (1953) 17; FLORIN & BOUTELJE, Acta Horti Berg. 17 (1954) 31; DE LAUB. Fl. Nouv. Caléd. et Dép. 4 (1972) 145; SILBA, Phytologia Mem. 8 (1986) 108. — *Libocedrus* subg. *Eulibocedrus* PILGER in E. & P. Nat. Pfl. Fam. ed. 2, 13 (1926) 389. — *Papuacedrus* LI, J. Arn. Arb. 34 (1953) 25; FLORIN & BOUTELJE, Acta Horti Berg. 17 (1954) 31; BOUTELJE, l.c. 198, t. 4, pl. 7 & 8; VAN ROYEN, Alp. Fl. New Guinea 2 (1979) 1. — *Austrocedrus* FLORIN & BOUTELJE, Acta Horti Berg. 17 (1954) 28. — Fig. 88, 89.

Monoecious evergreen trees or shrubs. Bark smooth but fissured, peeling in strips or flakes, fibrous, rich brown but weathering to blackish or gray. *Leaves* in alternating whorls of 3 or 4 soon reduced to opposite decussate, those of the seedling single veined and linear, c. 1 cm long, changing abruptly on lateral branches and throughout mature trees to specialized scale forms. *Scale-bearing branches* with small dorsally keeled facial scales alternating decussately with larger marginal leaves that are strongly bilaterally flattened and sometimes extend outward wing-like, the basal margins of each pair meeting between the succeeding facial leaves, the whole branch system further differentiated dorsiventrally with a convex upper surface bearing few or even no stomata and a concave lower surface where the stomata are concentrated, the leaf differentiation diminishing (or more or less disappearing) on older more exposed plants. Foliage buds nothing more than the last pair of developing leaves. *Fertile structures* solitary, terminal, often on short lateral branches. *Pollen cones* cylindrical, composed of decussate or more or less crowded scales each with 2–6 inverted pollen sacs. *Seed cones* woody, composed of two oval opposed fertile scales each bearing two erect ovules at their bases and two small triangular lateral sterile scales. The bracts are mostly fused to the outer surface of the scales, the apex of the bract a short to elongated acute spreading projection. *Seed* an elongated cone with two very unequal wings, a narrow wing along one side and an elongated more or less expanded wing at least twice as long as the seed on the other side and extending beyond and more or less outward from the seed apex (micropyle).

Distr. There are 7 spp. of Antarctic forests and tropical highlands including New Guinea, New Caledonia, New Zealand, and S. Central Chile with adjacent parts of Argentina. In *Malesia*: 1 sp. with 2 varieties endemic to New Guinea and nearby islands. Fig. 87.

Fossils. Foliage shoots and wood from the Eocene of Patagonia and Chile (FLORIN, K. Svenska Vet. Ak. Handl. II, 19, nr. 2, 1940, 82).

Ecol. A wide range of forest and rain-forest habitats from lowland tropics to the tropical tree line and throughout the Antarctic forests (in Chile prospering on the dry margins of the forest). Pollination and seed dispersal strictly by wind. Seedlings germinating in abundance in rich humous soils.

Uses. The aromatic wood is similar to that of *Juniperus* in appearance and uses, with light coloured sapwood and reddish brown to purplish heartwood. Where large enough it is much appreciated for construction and furniture while the bark is sometimes used for roofing.

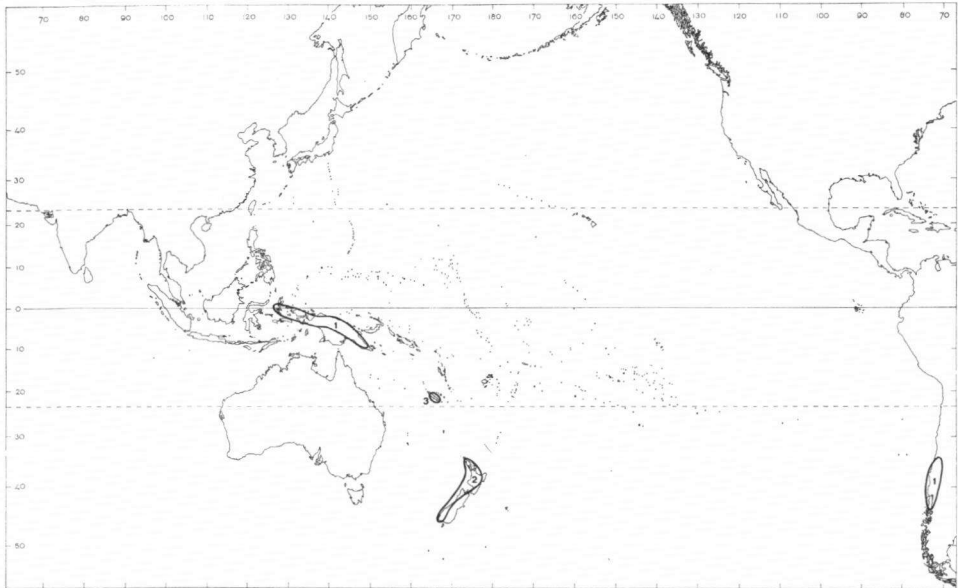


Fig. 87. Range of the genus *Libocedrus* ENDL. with the number of species, all endemic.

Notes. The relationships of *Libocedrus* are emphatically with the Holarctic *Thuja* group of genera (*Tjujoideae*) within *Cupressaceae* making it phytogeographically much like the everywhere associated *Nothofagus* whose relatives are also in the north. Like the other members of *Thujoideae*, the leaves are strongly differentiated into lateral and facial types and even further like many of these genera the branches are also differentiated dorsiventrally (the Holarctic genus *Calocedrus* was for a long time included within *Libocedrus*). Attempts as in LI (1953) to attach *Libocedrus* to southern hemisphere cypresses (*Callitroideae*) by ignoring the highly specialized foliage forms and describing the seed cones as 'valvate' are inadmissible. The so-called valvate appearance is due to the few cone scales, the lowermost scales of any *Cupressaceae* seed cone being the same so that this appearance occurs wherever the number of scales is reduced, as in *Chamaecyparis nootkatensis*.

The species of New Guinea and of Chile have been placed into separate genera based on slight differences. The upper surface of the leaves of the Chilean species are so constricted that little or no space is left for stomata, making them more or less hypostomatic while other species are clearly amphistomatic but with rather few upper stomata. The New Guinea species was separated on the basis of spirally placed microsporophylls. In fact, simple opposite decussate pollen cones occur alongside crowded cones whose microsporophylls appear to be whorled or perhaps spirally placed. FLORIN & BOUTELJE (1954) carefully examined these cones and found each two decussate pairs of microsporophylls brought to the same level but certainly not spirally placed. On the other hand, they adduced some other minor distinctions for the New Guinea material, in particular that the stomate bands are more or less separated by narrow irregular stomate-free zones, a character not seen elsewhere in the genus. In my opinion these otherwise very similar species should not be separated generically by such unimportant distinctions.

1. *Libocedrus papuana* F.v.M. Trans. R. Soc. Vict. n.s. 1 (1889) 32; WARB. Monsonia 1 (1900) 189; K.SCH. & LAUT. Fl. Schutzgeb. Südsee (1901) 156; Nachtr. (1905) 51; KOORD. Nova Guinea 8 (1911) 613; LAUT. Bot. Jahrb. 50 (1913) 52, f. 2A-G; LANE-POOLE, For. Res. Terr. Papua New Guinea (1925) 74; SILBA, Phytologia Mem. 8 (1986) 109. — *Thuja pa-*

pauana (F.v.M.) Voss, Mitt. Deut. Dendr. Ges. 1907 (1908) 88. — *L. torricellensis* SCHLTR ex LAUT. Bot. Jahrb. 50 (1913) 52, f. 2H-N. — *Papuacedrus papuana* (F.v.M.) LI, J. Arn. Arb. (1953) 25; FLORIN & BOUTELJE, Acta Horti Berg. 17 (1954) 32, pl. 2, t. 1-3; HARRISON in Dallimore & Jackson, Handb. Conif. ed. 4 (1966) 323; VAN ROYEN, Alp. Fl. New



Fig. 88. View south over the Archbold Expedition camp and Lake Habbema to snow-capped Mt Wilhelmina, from an altitude of 3265 m. Open forest of *Libocedrus papuana* F.v.M. in foreground centre and big, moss-cushioned *Podocarpus compacta*; alt. of Lake Habbema 3225 m, Mt Wilhelmina 4750 m (Photogr. L.J. BRASS, August 1938).

Guinea 2 (1979) 2, f. 33. — *Papuacedrus torricelensis* (SCHLTR) LI, J. Arn. Arb. 34 (1953) 25; FLORIN & BOUTELJE, Acta Horti Berg. 17 (1954) 31, pl. 2, t. 4–6; HARRISON in Dallimore & Jackson, Handb. Conif. ed. 4 (1966) 323. — Fig. 88, 89.

Trees 2–50 m tall, rarely shrubby, pyramidal or spreading or even slightly pendulous with age. *Leaves* on older and more exposed trees becoming quite small, facial scales rhomboidal, acute, up to half as long as the lateral scales, c. 1 mm long, the lateral scales nearly straight, their base between the outermost edges of the next lower facial scales, spreading slightly and then straight or weakly convex, tips extending slightly beyond the outermost edges of the next higher facial scales and either straight or slightly spreading or (when convex) slightly incurved and \pm touching the base of the next lateral leaves but below the tips of the next facial leaves, down to c. 2 mm long. Branches darker above and often glaucous below. *Pollen cones* 4–25 mm long by

2–3 mm in diameter, the upper part of the microsporophyll roughly triangular, c. 1.5 mm long, with 2–4 pollen sacs. *Seed-bearing scale* broadly lanceolate to almost elliptic, at least slightly rounded at the tip, 8–12 mm long and 4–6 mm wide, narrowing at the base and sometimes slightly constricted along the side where touched by the smaller lateral scales which are about half as long and \pm lanceolate. *Bracts* broadly fused to the dorsal side of their corresponding scale on its lower half with a short spreading acute to obtuse tip. The woody mature *cone* brown or blackish, often with ridges radiating from the bracts to the margins of the scale. *Seed* 2–3 mm long, the wing twice as long and spreading upward with a bend partway along the outer edge towards the straight inner edge forming an acutish rounded apex.

var. papuana

Apex of lateral leaves becoming widely spreading on young plants up to 6 mm from the stem and often



Fig. 89. *Libocedrus papuana* F.v.M. var. *papuana*. A. sterile twig; B. fertile twig; C. pollen cone; D. seed cone; E. scales with pollen sacs (from LAUT. Bot. Jahrb. 50, 1913, 52, f. 2).

falcately bent outwards but the tip always turned upwards, up to 13 mm from base to tip, gradually becoming smaller and less spreading as the tree matures.

Distr. *Malesia*: most of the length of New Guinea along the central range but also on the Huon Peninsula, the Torricelli Mts, and the Cycloop Mts, grading into the other variety towards the western end of New Guinea, particularly at higher elevations. Fig. 90.

Ecol. A tree of mountain rain-forests and especially the mossy forest from 1500 m to the tree line in the central range, sometimes emerging from the alpine scrub to as high as 3800 m, as low as 620 m along the north coast. Above 3300 m a stunted tree less than 10 m tall.

Vern. *Tera*, Garaina; *gamuga*, *kamgenkuna*, Togoba, Hagen, *ogeleh*, *oleh*, Chimbu, Masul, *dza-gosa*, *dzasihanini*, *hanini*, Asaro, Kefamo, *guta*, *juta*, Mairi, Watabung, *kaibel-kombam*, *kaipil*, *ongol*, Wahgi, Minj, *mandilasop*, *mondalasap*, *mondolasop*, *wrenak*, Mendi, *ab*, *aiap*, *aip*, *hap*, *kap*, Enga, Kepilam, *aioba*, *hohoba*, Lei area, *bit*, Yogom, *iwunturra*, Manki, *ye-enka*, Nauti, *sukou*, Wapi, Migote.

var. *arfakensis* (GIBBS) DE LAUB., *stat. nov.* — *L. arfakensis* GIBBS, Arfak (1917) 84, f. 6a, b; DALLIMORE & JACKSON, Handb. Conif. (1923) 301; SILBA, Phytologia Mem. 8 (1986) 108. — *Papuacedrus arfakensis* (GIBBS) LI, J. Arn. Arb. 34 (1953) 25; FLORIN & BOUTELJE, Acta Horti Berg. 17 (1954) 32,

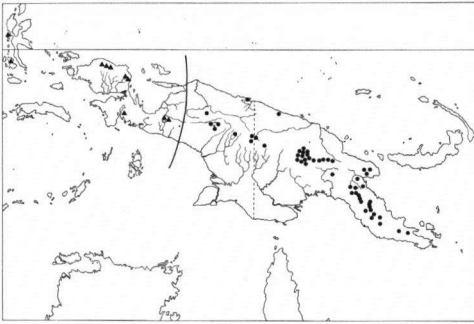


Fig. 90. Range of
(dots) and
(triangles).
F.v.M.
(GIBBS) DE LAUB.

t. 3; HARRISON in Dallimore & Jackson, Handb. Conif. ed. 4 (1966) 322.

Apex of lateral leaves at first spreading but soon

constricted to the position on older trees close to the base of the following facial leaves but between their base and tip the lateral leaves expanded outward as much as 3 mm and overall as much as 10 mm long, thus producing a strongly convex shape, gradually becoming smaller until they become indistinguishable from the type variety on older and exposed trees.

Distr. *Malesia*: from the Wissel Lakes through the Vogelkop Peninsula and probably including the material from Batjan and Ternate. Fig. 90.

Ecol. Like the type variety from 1600 to 2500 m, but as low as 840 m along the north coast of the Vogelkop Peninsula.

Vern. *Autibo, dautibo, dautie, matu, matu-dautie*, Kepauko, *wonga*, Arfak area, *bootsjeka, butsga*, Manikiong, *pomoan*, Manikiong, Hattam, *duwak, nipau, tuwa*, Kebar, *sowa, swa*, Kebar, Andjai, *araum, eis*, Karoon.

Note. Despite the strikingly different juvenile leaves, intermediate specimens exist, especially at higher elevations and it has not been possible to separate specimens taken from older plants.