PHYTOLOGIA MEMOIRS VIII

ENCYCLOPAEDIA CONIFERAE

Compiled by

JOHN SILBA

Consultant Botanist, 198 West Hoffman Avenue, Lindenhurst, New York 11757

PHYTOLOGIA MEMOIRS are published by Harold N. Moldenke and Alma L. Moldenke, 509 Hemlock Avenue N.W. Corvallis, Oregon 97330-3818 USA as a cooperative nonprofit series to facilitate the publication of larger botanical and phyto-ecological papers.

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Preface

In a continuation of my comprehensive taxonomic analysis of the Coniferae I have now prepared a manuscript giving concise taxonomic descriptions of all species and varieties accepted in my An International Census of the Coniferae, I (1984). A supplement to the original checklist with a few nomenclatural changes and additional citations of published names was recently published in Phytologia (1985). Many descriptions in the literature of various species have been quite vague as regards to the listing of morphological characteristics of the rarer taxa. I have tried to list as many morphological characteristics of a given taxon as possible. These descriptions are based on an examination of type specimens, descriptions in the literature and by my own personal observations in the field and in arboreta. This manuscript is a mere listing of the morphological characteristics of taxa which I believe to be valid taxa. The style here can be likened to that of Hortus Third, in that I have not made any keys here. It is possible that I may have keys in a later edition or in following individual monographic essays in which I will be able to take a closer examination of all the critical morphological characteristics of a given taxon.

What I am stressing in this manuscript is distinctions based on gross morphological characteristics which can easily be seen in the field or sometimes with the use of a simple handlens at the type locality of a given taxon. It should be noted that the morphological characteristics can vary greatly within a individual species, especially in a species that has a relatively widespread distribution.

I must stress that it is sometimes just as important to make studies of cultivated plants as it is to make studies of plants in the wild, especially when the origin of a species is questionable. An example of this is Cupressus torulosa var. cashmeriana (Carr.) Kent. Recent collections of a wild Cupressus in Bhutan by D. Long (E) look identical to me in gross morphology to the plant long known in cultivation in Britain as C. cashmeriana Carr., which was previously unknown in the wild. However, Long had first concluded that the Cupressus collected in Bhutan was similar to the plant named C. corneyana Carr. or C. torulosa var. corneyana (Carr.) Carr., which again was long cultivated in Britain and unknown in the wild. My own analysis is that the wild Cupressus in Bhutan has long, flattened, chain-like branchlets with sharply acute leaves, characteristics of which match the plant long known in cultivation in Britain as C. cashmeriana. Photographs of the Bhutan Cupressus indicate that the trees have a greener foliage as opposed to the silvery-glaucous foliage of cultivated specimens in Britain. However, color of foliage is not always a valid characteristic, as is also the example of Cedrus libani var. atlantica cv. 'glauca' which normally appears as having glaucous foliage. Interestingly, the foliage of the Blue Atlas Cedar may appear markedly green at various times of the season, especially after rainy weather or sometimes in the autumn. Further, cultivated material of Cupressus corneyana Carr. in Britain has short, irregularly disposed branchlets with yellowish-green, obtuse leaves and does not look anything like the Bhutan Cupressus. If one were just to examine the literature the original descriptions of C. cashmeriana and C. corneyana are quite similar, however on a examination of cultivated material long known under these names the relationship of C. cashmeriana to the Bhutan Cupressus can clearly be seen. This is one of the reasons why it is essential to study cultivated plants as well as looking at descriptions in the literature and studying plants in the wild to see the correlation between these.

The basis for my analysis is from comparisons of type herbarium specimens, type descriptions and an examination of cultivated material in many arboreta in the U.S., Europe and Australasia. An examination of type specimens is a very important factor. An example of this is a taxon I am calling Juniperus barbadensis var. urbaniana (Pilg. et Ekm.) Silba, which is native to S.W. Haiti and the W. Dominican Republic. A synonym of this taxon is J. ekmanii Florin, as to the type specimen. The type specimen of J. ekmanii has quadrangular branchlet systems and sharply acute leaves with an acuminate apex which are the same characteristics I am using to distinguish the plant J. barbadensis var. urbaniana on the basis of the type specimen of the latter taxon. Typical J. barbadensis has rounded branchlets with distinct obtuse leaves which do not have an acuminate apex. Interestingly, recent collections by T. Zanoni in Haiti and the Dominican Republic labeled as J. ekmanii do not look anything like the type specimen of that taxon, instead these collections have rounded branchlet systems and obtuse leaves typical of J. barbadensis. Again, if one were just to look at the type description of J. ekmanii the essential characteristics of the quadrangular branchlets and acute leaves are not highlighted there. It seems logical how easy it can be for collectors to confuse or missapply the name of a particular taxon if they have not actually seen the type specimen itself. Another example of this is a taxon formerly named Agathis dammara (Lamb.) Rich., the type specimen is actually a specimen of A. borneensis Warb., however the type description of A. dammara agrees with typical A. philippinensis Warb..

In these series of monographic essays what I am stressing is the need for a uniform system of classification of the Coniferae. Many authors have completely different opinions on certain individual species, for example some botanists in certain countries have named new species primarily on the basis of geographic distribution. That is some authors seem to recognize separate taxa just because they are native in different nearby countries. I seriously wonder whether politics sometimes interferes with scientific studies. This can be further illustrated by some scientists following trends as to just be accepted by their colleagues. For instance, most botanists in the Western United States use the term "subspecies" for infraspecific taxa of the Coniferae as opposed to most botanists in the Eastern United States that use the term "varietas" for infraspecific variation in the wild. It has been my observation that just because a certain majority of scientists follow one particular theory it does not mean that they are always right. It is often true that a scientist can not always depend on the work of earlier scientists, but that he has to make his own observations from scratch. Then the scientist has to try to correlate his new data with previous data and to make his observations known even if they are in general disagreement with the majority.

Some botanists seem to classify species on the sole basis of chemotaxonomy and other questionable characteristics that can not be easily seen on hand in the field. An example of this is Abies bifolia Murr., which is actually a synonym of A. lasiocarpa (Hook.) Nutt.. Recent publications have stated that A. bifolia is chemically distinct from A. lasiocarpa. However, if we were to compare herbarium specimens of these two taxa it can clearly be seen that there is absolutely no consistent difference in visible morphological characteristics. I do not view characteristics such as volatile oils of leaves or tropolones of heartwood of various species to be the sole basis for the distinction of a species. These characteristics should be combined with differences in morphological characteristics if they are to have any use to the taxonomist. Further, such characteristics as hypodermis of leaves is a

questionable basis for the distinction of a species if it is used as the sole basis for the naming of a species. An example is that of Amentotaxus assamica Ferguson, which is supposedly distinct in its continuous hypoderm of the leaves as opposed to other Amentotaxus species without continuous hypoderm. Yet, how can this feature be of any value when probably less than five incomplete specimens of Amentotaxus have been collected from Assam. Interestingly, the general description of A. assamica Ferguson well agrees in gross morphological characteristics to that of typical A. argotaenia (Hance) Pilg. and is reduced to synonymy in this manuscript.

Characteristics which I am stressing is that of gross morphology combined with geographic distribution. These characteristics do vary considerably in some species, however what I am stressing is that these characteristics can be used in the field when looking at type localities in particular. Certain taxa with relatively widespread distributions may look rather different in areas other than the type locality and as such may appear to merge into or sometimes hybridize with closely related species. Another interesting point is that what works well as far as taxonomic distinctions in one group or genus may not work very well in another group or genus. An example of this is that of Callitris Vent., the primary distinction of species in this genus is that of differences in the female cones. If we were to use foliage characteristics as the only basis to distinguish the various Callitris species in a key it would nearly be impossible to use this as a valuable taxonomic guide. Whereas, in Cupressus L. leaf characteristics can easily be distinguished in a key if they are combined with branchlet characteristics, though unfortunately in some species of Cupressus L. female cone distinctions can not always be easily seen.

My own definition of a species is a taxon which is usually separated geographically from another related taxon and which differs in at least two or three major morphological characteristics. A species in my opinion should be based on differences in habit (crown characteristics), bark, bud, leaf characteristics (shape, texture, duration, structure, shape of the apex, stomata), male strobili (number of scales, shapes of the microsporophylls), female cones (arrangement, duration, umbos), seeds (shape, color, wings), cotyledons (number, size, shape of the apex, hypogeal or epigeal) combined with geographic distribution and ecological habitats. A clear example of this is Cupressus chengiana Hu and C. duclouxiana Hickel. The former species grows in dry regions in S. Kansu and N.W. Szechuan and is distinguished by its fissured bark, the branchlets divided into a fishbone pattern, its distinctly glandular leaves, glaucous-brown female cones with smooth, flattened,rounded, tan seeds. The latter species grows in wet regions in S.E. Tibet and N.W. Yunnan and has finely fissured bark, finely divided branchlet systems, obscurely glandular leaves, reddish-brown female cones with warty, non-flattened, ovoid, reddish-brown seeds. A less clear distinction of species is that of Cupressus goveniana Gord. and C. macrocarpa Hartw.. Both species are similar in foliage characteristics and occupy similar ecological habitats within close proximity of one another. Both species have irregularly disposed branchlets, dark green obtuse leaves with obscure glands and also have similar male strobili. However, they differ markedly in crown and female cone characteristics. Cupressus goveniana is a broadly conical tree with small, globular female cones with 6-10 scales and with small, blackish, densely wartly seeds. Cupressus macrocarpa has a rounded crown with horizontal branches, it has large subglobose female cones with 8-12 scales with larger, brown, less warty seeds. These characteristics which I am stressing are of value in the field and in cultivation not only to the botanist, but also to the horticulturist and to the forester, as opposed to chemotaxonomic

characteristics which are usually only valuable to the biologist in the laboratory.

Some botanists may argue that the characteristics used to distinguish the species of the Coniferae are vague and would not hold up if compared to morphological characteristics used to distinguish species of Angiosperms. However, as I have already stated what works with one group may not work at all in another group. The Conifers are a unique group of plants and there are also other plant groups that are unique such as Palms. It is my opinion that morphologically each distinct group should be viewed as to taxonomic distinctions as to what works well with that particular group. I am also under the impression that this can be done in a uniform manner.

As to the definition of infraspecific variation it is my opinion that only one term is needed for taxa in the wild, namely the term "varietas". This is necessary as to designate a uniform system of classification on an international scale. The term "varietas" has appeared more frequently in the literature on the Coniferae, also it is an older term. The terms "subspecies" and "formas" are recent terms in which the distinctions between these terms and "varietas" are ill-defined and probably subject to bias opinion. There are many taxa of the Coniferae at the "species" level which are closely related and yet there are some that are markedly distinct from one another. For instance, Pinus cembroides Zucc. and P. culminicola Andr. et Beam. are closely related, whereas P. krempfii Lecompte is markedly distinct from these, yet all these distinctions are at the "species" level. In other words, why should other terms be introduced to distinguish greater distinctions between different infraspecific taxa without giving an equal argument to distinctions at the species level? It is appropiate to classify different species into different sections of a particular genus on the basis of their degree of distinctions, however to introduce other commonly used terms such has been done at the infraspecific level is not at all necessary. A level which can be distinguished from infraspecific variation in the wild as opposed to infraspecific variation in cultivation or civilization is the term "cultivar". The term cultivar can be appropiately used because its level of distinction is quite different from the "varietas" level. Taxa at the "cultivar" level are usually not found in the wild and are usually the results of chance seedlings or odd mutations which cultivation gives a better chance of survival for than in the wild. Also, a "cultivar" differs from a "varietas" in that it id not slowly differentiate from the typical species by geographic isolation in the wild. My own definition of a "varietas" is a taxon which is usually separated geographically from the typical variety, is similar in general gross morphology to the typical variety, however differs in at least one or more significant consistent morphological characteristics. An example is Cupressus lusitanica var. benthamii (Endl.) Carr., the general characteristics of this taxon well agree with typical C. lusitanica Mill. Both taxa have shreddy bark, drooping branchlets, acute leaves with inconspicuous glands and female cones which open upon maturity. However, C. lusitanica var. benthamii differs in its branchlets being disposed in one plane, its greener foliage with more conspicuous glands on younger trees and by its female cones with fewer scales, whereas typical C. lusitanica has irregularly disposed branchlets with gray-green foliage and with obscure glands. Another example is Abies pindrow var. brevifolia Dallim. et Jacks., which agrees in female cone characteristics to typical A. pindrow (Lamb.) Royle, however it is different in its shorter, spirally arranged leaves and by its reddish-brown branchlets. It is my opinion that a single species should not contain more than four varieties including the typical variety.

No doubt there are always exceptions to the general rule, however what I am stressing here again is international uniformity. In the past authors have included species with several varieties each with other several subspecies and with numerous formas of a single species. Such treatments are quite misleading and are too broad. To avoid excessive lumping or splitting of a species I propose that a single species should not contain more than four varieties,including the typical variety,of the Coniferae, with perhaps only a few exceptions to this general rule.

Taxonomic Concepts

The Coniferae are a unique group of plants, many genera and species are single representatives of relic families. It is also interesting to note that many species have not undergone magor morphological changes over the many years of their existence on the earth. The various species mainly occupy cooler temperate regions, but are scattered on many continents of the earth.

The Conifers are the cone-bearing plants. They are woody, usually evergreen shrubs or trees having their seeds borne upon hard or papery scales arranged in spiral whorls around a central axis, forming a wooden or fleshy cone. All Conifers typically bear their pollen in a relatively small, thin-scaled male cone, each scale bearing at least two pollen sacs.

Three Orders of Conifers are accepted here, these orders contain a combined total of eight families with a total of 553 species.

Order GINKGOALES

The leaf epidermis is usually without an exothecium. A tree having a distinct mode of fertilization by motile or free swimming male sperms. Fertilization is usually by wind pollination. Female trees bear paired ovules.

Family GINKGOACEAE

A deciduous tree with flattened, fan-shaped leaves, with numerous parallel veins. Dioecious. Male strobili catkin-like. Female strobili borne on a long stalk, usually with 2 terminal ovules. Female cone drupe-like, orange-yellow, fleshy, pulpy, without scales, maturing in one year, containing a single ovule. Seeds globular, thin-shelled, wingless. A single species of the genus GINKGO.

Order TAXALES

Male strobili usually with perisporangiate microsporophllys (though recently reclassified as being hyposporangiate); ovules borne terminally on fertile branchlets; ovule with a variable number of vascular bundles transversing the seed coat; seeds nearly or completely covered by a fleshy aril, usually one per cone.

Family TAXACEAE

Evergreen trees or shrubs. Buds distinct from the leaves. Leaves usually somewhat linear, spirally arranged though often appearing 2-ranked, leaves with a single vein, flattened. Dioecious usually. Male cones with 3-8 microsporophylls with inverted pollen sacs, sporophylls radially symmetrical or dorsiventral; pollen grains wingless. Female cones axillary, pendent, maturing in one year, containing a single, erect ovule without a subtending bract, the seed partly or more often completely surrounded by a fleshy aril. Seeds wingless. Cotyledons 2, single veined. Wood without resin ducts. Five genera, mainly in the Northern Hemisphere: AMENTOTAXUS, AUSTROTAXUS, PSEUDOTAXUS, TAXUS, TORREYA.

Family CEPHALOTAXACEAE

Evergreen trees or shrubs. Branches opposite or in whorls. Leaves spirally

arranged on terminal branchlets, appearing 2-ranked on lateral branchlets. Usually dioecious. Male strobili axillary, subglobose, sporophylls with 3-5 pollen sacs; pollen grains are winged. Female cones pendent, much reduced, on a long petiole, maturing in one year, consisting of a few decussate pairs of simple bracts each subtended by two ovules; usually one fertile ovule per cone, completely covered by a leathery, fleshy outer aril. Seeds wingless. A monotypic family, represented in the Northern Hemisphere by the genus CEPHALOTAXUS.

Order CONIFERALES

The largest order of the Conifers characterized by having staminate or pollen-producing cones and most of which bear ovulate or seed producing cones.

Family PODOCARPACEAE

Evergreen shrubs or trees. Leaves usually spirally arranged, sometimes opposite, scale-like or needle-like, linear to lanceolate. Monoecious or dioecious. Male strobili usually catkin-like; microsporophylls with two inverted pollen sacs; pollen grains usually winged. Female cones maturing in one year , much reduced to a few fleshy bracts or scales, pendent, usually borne on a thin peduncle, containing a single inverted ovule. Seeds completely covered by a fleshy structure referred to as a epimatium, wingless. Cotyledons 2, with 2 parallel vascular bundles. Thirteen genera, mostly from the Southern Hemisphere : ACMOPYLE, DACRYCARPUS, DACRYDIUM, DECUSSOCARPUS, FALCATIFOLIUM, HALOCARPUS, MICROCACHRYS, MICROSTROBUS, PARASITAXUS, PHYLLOCLADUS, PODOCARPUS, PRUMNOPITYS, SAXAEGOTHAEA.

Family ARAUCARIACEAE

Evergreen trees with spirally arranged, narrow or broad leaves often with parallel veins. Dioecious or monoecious. Male strobili relatively large, cylindrical, with numerous sporophylls and with more or less 12 inverted pollen sacs; pollen grains wingless. Female cone usually borne erect, subglobose to ovoid, maturing in two years, relatively large and milky, falling upon maturity; scales one-seeded, without distinct bracts. Cotyledons 4, often fused into 2 double cotyledons. Two genera, mainly from the Southern Hemisphere: AGATHIS, ARAUCARIA.

Family CUPRESSACEAE

Evergreen trees or shrubs. Monoecious or dioecious. Buds usually inconspicuous. Juvenile foliage needle-like and spirally arranged. Adult leaves, small, usually scale-like, adpressed, in opposite pairs or sometimes ternate. Male strobili globose or oblong, with relatively few, decussate scales; pollen grains often rounded. Female cones borne erect, usually globular, maturing in 1-2 years, relatively small, with relatively few woody or sometimes somewhat fleshy scales which meet at their edges; the fertile scales with one to numerous erect ovules; bracts not externally visible. Seeds often with 2 narrow, broad wings or sometimes wingless. Cotyledons 2-4, relatively small. Nineteen genera, mainly of the Northern Hemisphere: ACTINOSTROBUS, CALLITRIS, CALOCEDRUS, CHAMAECYPARIS, x CUPRESSOCYPARIS, CUPRESSUS, DISELMA, FITZROYA, FOKIENIA, JUNIPERUS, LIBOCEDRUS, MICROBIOTA, NEOCALLITROPSIS, PILGERODENDRON, PLATYCLADUS, TETRACLINIS, THUJA, THUJOPSIS, WIDDRINGTONIA.

Family TAXODIACEAE

Shrubs or trees usually evergreen, sometimes deciduous. Leaves linear to awl-shaped, spirally arranged, sometimes somewhat 2-ranked. Monoecious. Male strobili relatively small; microsporophylls with 2-9 pollen sacs; pollen grains wingless. Female cones usually globose, usually maturing in one year, relatively small, with several or many spirally arranged woody scales, scales more or less fused with the bracts, each scale bearing 2 or more inverted ovules. Seeds often with 2 narrow even wings. Cotyledons often 2. Ten genera, mainly from the Northern Hemisphere : ATHROTAXIS, CRYPTOMERIA, CUNNINGHAMIA, GLYPTOSTROBUS, METASEQUOIA, SCIADOPITYS, SEQUOIA, SEQUOIADENDRON, TAIWANIA, TAXODIUM.

Family PINACEAE

Shrubs to large trees, usually evergreen, sometimes deciduous. Monoecious. Buds scaly, distinct from the leaves. Leaves needle-like, usually spirally arranged, sometimes appearing 2-ranked, or sometimes in tufts; usually leaving distinct basal scars after they fall. Male strobili cylindrical, with numerous scales; microsporophylls with two pollen sacs; pollen grains usually with two bladder-like wings. Female cone woody, erect or pendent, maturing in 1-2 years, with numerous spirally arranged scales; bracts separated from the cone scales, except near the base, usually relatively small and narrow or sometimes longer than the scale. Seeds 2 per fertile scale, inverted, usually with one long wing projecting backwards. Cotyledons several to many, often single-veined. Nine genera, mainly from the Northern Hemisphere in relatively cooler regions : ABIES, CEDRUS, KETELEERIA, LARIX, PICEA, PINUS, PSEUDOLARIX, PSEUDOTSUGA, TSUGA.

ABIES (Plin. ex Tourn.) Mill. (Pinaceae)

A genus of 38 species from the Northern Hemisphere from N. America, Europe, N. Africa, Asia and Japan. Monoecious evergreen trees or shrubs with branches borne in whorls and flattened into a horizontal plane. Branchlets grooved or smooth, marked at the base with persistent bud scales from the previous years growth. Buds ovate, terminal bud surrounded by 4-5 secondary buds. Leaves 2-ranked, sometimes spirally arranged, needle-like, generally flattened, linear, bearing several grayish or white lines of stomata below, keeled below, rounded or notched at the apex, each leaf bearing distinct resin canals and leaving a circular scar when they fall. Leaves on fertile branchlets more or less erect, incurved to nearly falcate, thickened or quadrangular. Male strobili axillary, densely clustered along undersides of seasonal branchlets, globular or conic, appearing in the spring, pendent. Female cones borne erect, cylindrical, generally resinous, maturing in one year; cone scales rounded with a hidden or sometimes protruding lobed bract which may be erect or reflexed, scales break apart from the cone when ripe leaving a central spike and base-plate on the branchlets. Seeds 2 per scale, with one long oval wing projecting backwards. Seedlings with 5-7 cotyledons.

A. ALBA Mill. Common Silver Fir or European Silver Fir
=A. pardei Gaussen

A pyramidal tree 45-55 m. tall, 6-8.2 m. in girth, with a long clear bole, becoming flat-topped with age. Bark smooth, gray, divided into scales, with resin blisters. Branchlets pale brown or dull gray, with blackish pubescence, grooved. Buds ovoid, apex obtuse, pale brown to reddish-brown, sometimes slightly resinous, 8-11 mm. in diameter, slightly pubescent. Leaves usually 2-ranked, spreading horizontally below, upper ones more or less erect, distinctly parted, grooved above, keeled below, dark shiny green above, 1.5-3 cm. long by 1.5-2 mm. wide, glaucous to whitish-green below; stomata usually absent above, in 5-8 ranks below; base twisted, apex notched or rounded. Male strobili 1-3 cm. long, blue-violet-red. Female cone cylindrical, attenuate at both ends, 10-16 cm. long by 3-5 cm. wide, greenish turning reddish-brown, scales finely pubescent; bracts exserted and reflexed, about 2/3 height of the scale, spathulate. Seed obovoid, reddish, winged, to 2.5 cm. long.
France; Switzerland; Germany; Austria; Bulgaria; USSR, 300-1950 m. altitude.

A. AMABILIS Dougl. ex Forb. Pacific Silver Fir

A conical tree 24-46 m. tall, 0.6-5.6 m. in girth, with short, down-curving branches and with a spire-like crown. Bark light gray, smooth, turning reddish-gray and scaly on old trees. Branchlets pubescent, red-brown to gray-brown . Buds small, spherical, 6-9 mm. in diameter, with violet wax. Leaves spreading forwards in 2 rows, overlapping above, pointing forwards, nearly covering the branchlet; curved upwards on upper branchlets; grooved above, somewhat flattened below, dark shiny green above, silvery-white below; stomata few or absent above, in 7-8 lines below; 2-4 cm. long by 2 mm. wide, crowded, fern-like, apex notched, citrus scented. Male strobili reddish. Female cone ovoid-cylindric, resinous, purplish then brown, 8-18 cm. long by 5-7 cm. wide; scales finely pubescent; bracts hidden, purplish, about 1/2 height of the scale. Seeds yellowish-brown to pale brown, to 2.6 cm. long with the paler wing.
Canada: W. British Columbia; U.S.A. : S.E. Alaska to N.W. California, 305- 1829 m. altitude.

A. BALSAMEA (L.) Mill. Balsam Fir

A narrowly conical tree 12-20 m. tall, 0.3-2 m. in girth, with a spire-like crown and with spreading branches. Bark brown, smooth, resinous, becoming scaly. Branchlets finely pubescent, yellowish gray-brown or grayish. Buds ovoid to globose, scales slightly pubescent, 9-11 mm. in diameter, reddish-purple, resinous. Leaves spreading at right angles in 2 rows, with a V-like parting; curved upwards on upper branchlets; grooved above, keeled below, shiny dark green above, 1.5-2.5 cm. long by 1.5-2 mm. wide, green or gray-green below; stomata in 3-4 short lines above, in 6-8 lines below; base twisted; apex pointed or obtuse. Male strobili 1.5 cm. long, greenish-yellow, tinted purple. Female cone resinous, apex rounded, broadly ovoid, 6-10 cm. long by 2.5-3.75 cm. wide, blue-gray-green or purple turning gray-brown or violet-brown; scales rounded, finely pubescent; bracts hidden, about 1/2 size of the scale, spine-tipped. Seeds triangular, nut to 6 mm. long, wing to 7 mm. long or more, steel blue above, gray below.
Canada: S. Yukon to Newfoundland; U.S.A. : E. Minnesota to W. Virginia, to 1219 m. altitude.

A. BRACTEATA D. Don ex Poit. Bristlecone Fir
= A. venusta (Dougl.) K. Koch.

A narrowly conical tree 12-30 m. tall, 0.3-0.9 m. in girth, with a spire-like crown and with short, slightly drooping branchlets. Bark light reddish-brown, becoming scaly and slightly fissured at the base. Branchlets smooth to somewhat pubescent, shiny light reddish-brown. Buds fusiform, pale yellowish-brown, sharp-pointed, 10-20 mm. long, non-resinous. Leaves spreading at right angles in 2 rows, flattened, stiff, pointing forwards, distinctly parted, shiny dark green above, 3.5-5.5 cm. long by 2.5 mm. wide, with 2 broad white bands below with 9-16 lines of stomata, base twisted; apex pungent, long-spined; cross section flat-convex. Male strobili pale yellowish, 5-7 cm. long by 2-3 cm. wide. Female cone ovoid, resinous, 6-14 cm. long by 4-5.5 cm. wide, violet-brown to purple-brown; scales thin, rounded, finely serrulate; bracts long exserted, trilobed, yellowish-brown, extending 4-5 cm. beyond the scales, resinous. Seeds shiny, reddish-brown, 4.5 mm. long, wing 8-11 mm. long.
U.S.A.: California; Monterey County, Santa Lucia Mountains, 610-1524 m.

A. CEPHALONICA Loud. Grecian Fir

A broadly pyramidal tree to 30 m. tall, 2.7-4.5 m. in girth, with long horizontal branches. Bark gray-brown, smooth, becoming fissured into oblong plates. Branchlets smooth, bright brown or reddish-brown. Buds conical or ovoid, resinous, scales visible at the apex, surrounded by the leaves, violet to reddish, somewhat pubescent, 1.2-1.6 mm in diameter. Leaves spirally arranged, not or rarely grooved above, keeled below, dark shiny green above, greenish-white below; with 2-3 short stomatal lines above, with 6-7 lines of stomata below; 1.5-3.5 cm. long by 2-3 mm. wide, cross-section flattened, apex sharp-pointed. Male strobili ovoid, 1.4 cm. long by 4 mm. wide. Female cone narrowly cylindrical, brownish-red to violet, apex obtuse or with a nipple, somewhat resinous, 12-16 cm. long by 3.8 cm. wide; scales cuneiform, somewhat triangular; bracts short, erect, slightly protruding, golden-brown, triangularly pointed, about 2/3 height of the scale. Seeds angular, reddish, winged, 1.2-1.9 cm. long.
Greece: Epirus to Eubea Region, 760-2000 m.

A. CEPHALONICA var. GRAECA (Frans) Liu Apollo Fir
= A. cephalonica var. apollinis (Link) Beissn., = A. nordmaniana subsp. equi-trojani (Asch. et Sinb.) Coode et Cull.

A narrowly conical tree 20-30 m. tall, 1.8-4 m. in girth, with a somewhat rounded crown. Bark thick, divided into scaly plates, yellowish-gray-brown. Branchlets shiny yellowish-brown to orange-brown, non-pubescent. Buds ovoid, chestnut-brown, scales free at the apex, apex obtuse, 1-1.2 mm. in diameter, resinous. Leaves densely set, irregularly disposed, mostly lying forward and crowded on upper side of branchlet, curving upwards on the lower side of the branchlets, grooved above near the base, 1.5-3 cm. long by 1.5-2 mm. wide, with 2 white bands of stomata below with 6-8 lines, apex pointed or obtuse. Female cone cylindric-ovoid, reddish-brown to dark brown, apex ovoid, to 10 cm. long by 4-4.5 cm. wide; bracts long exserted and reflexed, sharp pointed, lobed. Seeds to 2.2 cm. long with the wing, nut to 6 mm. long.
Greece: Mt. Parnassus to W. Anatolia, W. Turkey, 760-2000 m.

A. CHENSIENSIS Franch. Shensi Fir
= A. fanjingshanensis Huang, Tu et Fu, = A.salouenensis Bord.-Rey et Gauss.

A pyramidal tree 50-70 m. tall, to 6 m. in girth, becoming round or flat-topped with age. Trunk straight, with short, massive branches. Bark dark gray or light brown, fissured. Branchlets yellowish, becoming pale gray, smooth or grooved. Buds ovate, not or slightly resinous, 8-11 mm. in diameter, yellowish-brown to reddish. Leaves spreading horizontally, mostly 2-ranked, with a V-like parting, yellowish-green to dark green, grooved above, keeled below, grayish-glaucous-green below; stomata absent above, in 11 lines below; 1.3-4 cm. long, sometimes to 7 cm. long, by 2 mm. wide, apex rounded to notched. Female cone cylindric or ovoid, green turning reddish-brown or grayish, 8-10 cm. long by 4-5 cm. wide; scales obovate, pubescent, slightly resinous; bracts hidden, yellowish-brown, about 1/3 height of the scale. Seed obovoid, nut to 7 mm. long, wing pale brown to 1.3 cm. long.
China: S.E. Kansu; Shensi; W. Hupeh: N.W. Yunnan; N.E. Kweichow; possibly in N. India (Assam) or N. Burma, 2100-3500 m.

A. CILICICA (Ant. ex Klotsch.) Carr. Cilician Fir

A narrowly pyramidal tree 25-35 m. tall, to 2.10 m. in girth, with ascending branches. Bark ashy-gray, smooth, becoming deeply fissured into scaly plates. Branchlets smooth, reddish-yellow-gray to olive-brown, with scattered pubescence. Buds ovoid, non-resinous, chestnut-brown, scales keeled and free at the tips, 1-1.8 mm. in diameter. Leaves speading upwards and forwards,or 2-ranked with a V-like parting, linear, dark green above, whitish-green below; with 2-3 short lines of stomata above, in 6-7 lines below in narrow bands; 2-4 cm. long by 1.5-3 mm. wide, apex entire or slightly bifid. Female cone cylindrical, reddish-brown, 15-30 cm. long by 4-6 cm. wide, apex bluntly pointed; scales fan-shaped; bracts hidden, 1/4-1/2 height of the scale, mucronate. Seeds reddish-brown, wing obovoid, to 2 cm. long.
E. Turkey: Antitaurus Mts.; N. Syria; Lebanon, 1000-2100 m.

A. CONCOLOR (Gord. et Glend.) Lindl. Colorado White Fir

A narrow tree 21-49 m. tall, 0.5-3.6 m. in girth, with a pointed crown, with short, symmetrical, horizontal branches. Branchlets shortly pubescent, grayish-yellow, bright colored. Buds ovoid, slightly hidden by the leaves, purplish or golden, scales hidden by resin. Leaves spreading nearly at right angles in 2 rows, curved upwards and outwards and pointing forwards on upper branchlets, slightly convex above, concolored, gray or light bluish-glaucous, brighter below; with 6-8 whitish lines of stomata above, 5-8 stomatal lines below; 2.5-5.5 cm. long or longer by 2-2.5 mm. wide,cross section elliptic or flattened-convex; resin canals marginal, 2;apex bluntly acute. Male strobili cylindrical, yellowish or red, 1.2-1.9 cm. long by 6 mm. wide. Female cone cylindrical-elliptic, pale green or blue-purple-violet, yellowish-brown at maturity, 7.5-14 cm. long by 2.5-6.5 cm. wide, apex obtuse or rounded; scales finely pubescent; bracts hidden, at base of the scale. Seeds angular, cuneiform, yellowish-brown or grayish, nut to 10 mm. long, wing to 10 mm. long.

U.S.A.: S.E. Idaho to W. New Mexico, 610-3353 m.

A. CONCOLOR var. LOWIANA (Gord.) Lemm. California White Fir

A columnar tree to 75 m. tall, to 5.5 m. in girth, becoming somewhat round or flat-topped with age. Bark furrowed, gray-brown, with resin blisters. Buds relatively smaller, conical.Branchlets slightly pubescent, yellowish-red-brown turning yellow-brown to olive-green. Leaves linear, 2-ranked, speading horizontally, grooved above, dull green, tinted glaucous; stomata in central bands above, in 6-10 lines below; 3-7.5 cm. long by 2-3 mm. wide, base twisted; apex slightly notched; cross-section flat-convex. Male strobili ovate-lanceolate, yellowisn or reddish. Female cones green turning brown, not purplish, ovoid-cylindric, 8-12 cm. long by 4-6 cm. wide, apex rounded; scales slightly pubescent; bracts hidden, lobed, at base of the scale. Seed with a nut to 1.2 cm. long, wing to 1.4 cm. long.

U.S.A.: S.W. Oregon to N. Baja California, Mexico.

A. DELAVAYI (Van Tiegh.) Franch. Delavay Fir
= A. beshanzuensis Wu, = A. fabri (Mast.) Craib., = A. nukiangensis Cheng et Fu, = A. ziyuanensis Fu et Mo.

A conical tree 18-40 m. tall, to 4 m. in girth. Trunk straight, erect. Bark dark gray or brownish-gray, fissured, exfoliating in thin flakes. Branchlets usually smooth, slightly grooved, yellowish-brown or gray-brown with reddish spots. Buds ovoid-elliptic, with reddish-brown transparent resin, 8-10 mm. in diameter. Leaves spreading nearly at right angles, usually twisted in 2-ranks, lower leaves spreading outwards or downwards, dark green above, whitish below; stomata absent above, in 8-12 lines below, 1-2.4 cm. long or longer by 2-2.2 mm. wide; apex notched; margins acute and revolute. Male strobili cylindrical, to 2 cm. long, reddish. Female cone ovoid-cylindric, bluish-black or dark violet, apex bluntly rounded, 6-11 cm. long by 3-4 cm. wide; bracts nearly as long as the scales, usually hidden, sometimes slightly reflexed, yellowish-brown. Seeds with a nut 5-6 mm. long, wing to 5 mm. long or longer.

N.E. India; N. Burma: China: Tibet; N.W. Yunnan; N.E. Kwangsi Chuang; Chekiang, 1500- 4300, probably scattered in other areas of S. China.

A. DELAVAYI var. GEORGEI (Orr) Melv. George Fir

A tree 25-30 m. tall, 1-3 m. in girth, with horizontal branches and a spire-like crown. Bark gray, smooth then fissured. Branchlets grooved, with dense reddish-brown or purplish pubescence. Buds ovoid-obtuse to globose, to 1.4 mm. in diameter, with yellowish resin. Leaves spreading pectinately, bright dark green above, grooved above, keeled below, with 2 glaucous bands of 10 stomatal lines each below, 1-2 cm. long by 2-2.5 mm. wide, apex notched. Male strobili cylindrical, on a long peduncle, blackish, to 3 cm. long. Female cone oblong-cylindric or oblong-ovoid, on a short peduncle, deep violet-brown or bluish-black, apex broadly rounded and slightly depressed, 6-10 cm. long by 3.5-5 cm. wide; scales with reddish-brown pubescence; bracts erect, exserted well beyond height of scales, narrowly acuminate. Seed with an ovate-oblong, brown nut to 1 cm. long; wing blackish-brown to 1.8 cm. long.
N. Burma; China: Yunnan and Szechuan, 2600-4200 m.

A. DELAVAYI var. SMITHII (Vig. et Gauss.) Liu Forrest Fir
=A. delavayi var. forrestii (Rog.) Jacks. ex Chitt., = A. yuanbaoshanensis Lu et Fu.,=A. chengii Rushf.

A slender conical tree 20-40 m. tall, with horizontal branches. Bark reddish-brown. Branchlets rusty-red to gray-brown, smooth to slightly pubescent. Buds globose to ovoid, not hidden by the leaves, deep brown with whitish resin, to 1.4 mm. in diameter. Leaves pectinately arranged in a V-like pattern, grooved above, dark shiny green above, prominently white below; stomata absent above, in 10-12 lines below; 1.5-4 cm. long by 2-2.5 mm. wide, apex notched. Male strobili cylindrical, 9 mm. long by 3-4 mm. wide. Female cone oblong-cylindric, apex rounded, bluish-black to brownish, to 9 cm. long; scales broadly ovate-cuneate, pubescent; bracts usually exserted and reflexed, yellowish-brown. Seeds with a yellowish nut 9-12 mm. long; wing purple-brown, 12-18 mm. long.
N. Burma; China: N.W. Yunnan; S.W. Szechuan to N. Kwangsi Chuang, 1700-4460 m.

A. DURANGENSIS Mart. Durango Fir

A narrow tree 20-40 m. tall, 60-100 cm. in girth, with a pyramidal or rounded crown. Bark dark reddish-brown, fissured, exterior surface grayish. Branchlets reddish-brown, smooth to finely pubescent in the grooves. Buds oblong-ovoid, very resinous, with pinkish-yellow resin. Leaves nearly 2-ranked, 1-4 cm. long by 1.5 mm. wide, grooved above, keeled below, bright green above, glaucous below; stomata on both surfaces, more numerous below in 2 white bands with 10 lines; apex rounded or obtuse. Female cone in groups of 1-2, subcylindric or oblong, pale to medium brown, 5.5-10 cm. long by 3.5-4 cm. wide; scales oblong-transverse; bracts hidden, about 1/2 height of the scale or more. Seeds resinous, with a yellowish nut to 8 mm. long; wings 7-10 mm. long, orange-yellowish.
Mexico: Durango and Chihuahua, at 1600-2933 m. altitude.

A. DURANGENSIS var. COAHUILENSIS (Johnst.) Mart. Coahuila Fir

A tree 20-30 m. tall, to 90 cm. in girth, Douglas-Fir-like in habit. Bark rugose, blackish, smoother and paler on upper parts of the tree. Branchlets densely pubescent, brownish. Leaves nearly 2-ranked, shorter, 1-2.5 cm. long by 1.7 mm. wide, shiny green, hypoderm thicker, fibrovascular bundle continuous, stomata often only on the upper surface, apex pointed or obtuse.Female cone ovoid; apex pointed, with a slight nipple; brown, to 10 cm. long by 4 cm. wide; scales obovate-cuneate, pubescent, erose-denticulate on their margins; bracts hidden, about 2/3 size of the scale. Seeds with a nut 6-8 mm. long, wing to 10 mm. long.

Mexico: Coahuila; N. Sierra Madre, to 2270 m. altitude.

A. FARGESII Franch. Farges Fir
=A. fargesii var. sutchuenensis Franch

A conical tree 35-65 m. tall, 2-5 m. in girth, with a cylindrical trunk. Bark grayish-brown, scaly, fissured on old trees. Branchlets smooth, slightly pubescent in the grooves, slightly grooved, dark brown, reddish or yellowish. Buds ovoid to broadly obtuse, resinous, keeled, 8-10 mm. in diameter, purplish-red. Leaves spreading at nearly right angles, those below pectinate, grooved above, margins slightly revolute, green above, whitish below; stomata absent above, in 11 lines below; 2-3 cm. long by 2.5 mm. wide, apex rounded or notched. Male strobili cylindrical, yellowish, 1.3 cm. long by 5 mm. wide. Female cone purplish or dark red-brown, apex rounded, broadly cylindric, 5-6 cm. long by 3-4 cm. wide; scales orbicular-triangular; bracts hidden or slightly exserted and reflexed, denticulate. Seeds with a blackish wing to 1.5 cm. long.

China: N. Yunnan; N.W. Szechuan; N.W. Hupeh; S.W. Shensi, 1500-3900 m..

A. FARGESII var. FAXONIANA (Rehd. et Wils.) Liu Faxon Fir
=A. chayuensis Cheng et Fu, =A. delavayi var. faxoniana (Rehd. et Wils.) Jacks., =A. ferreana Bord.-Rey et Gauss., = A. minensis B.-R.G., =A. yuana B.-R.G.

A conical tree 20-40 m. tall, to 1.5 m. in girth, with horizontal branches. Bark dark gray and smooth, becoming fissured. Branchlets slightly grooved, slightly pubescent, red-brown or gray, turning yellowish. Buds ovoid, apex obtuse, purplish-brown, resinous, 8-9 mm. in diameter. Leaves irregularly spreading, grooved above,bright yellowish-green above, greenish-white below; stomata absent above, in 8-14 lines below; 1-3.5 cm. long by 2-2.5 mm. wide, nearly 2-ranked, straight or slightly curved, apex rounded or finely notched. Male strobili reddish, to 1 cm. long. Female cone broadly rounded, apex with a blunt point, ovoid or oblong, somewhat resinous, violet-purple or dark blue, 5-9 cm. long by 3.5-4 cm. wide; bracts exserted and reflexed, relatively narrow, somewhat spathulate. Seeds with a dark brown-purplish nut, with a blackish to purple wing, 1.3-2 cm. long.

N.E. Burma; China: C. Kansu; N.W. Szechuan; Tibet, 2600-4000 m..

A. FIRMA Sieb. et Zucc. Momi Fir

A conical tree to 50 m. tall, 4-5 m. in girth, with a straight trunk. Crown broadly pyramidal becoming nearly flat-topped with age. Bark dark gray, smooth then fissured, grayish-brown with exfoliating flakes. Branchlets grooved, yellowish-green to gray-brown or pinkish-brown, with blackish pubescence. Buds ovoid, apex obtuse, slightly resinous, grayish-brown. Juvenile leaves bifid, extremely sharp pointed, present at the base of old trees. Leaves pectinate, nearly 2-ranked, spreading outwards and upwards,with a distinct V-like parting, grooved above, keeled below, bright dark green above, glaucous-yellow below; stomata usually absent above, in 12-13 lines below; 1.5-3.5 cm. long by 2-3 mm. wide, base twisted, apex notched. Male strobili cylindrical, yellowish-red or greenish, to 2.5 cm. long. Female cone cylindrical, ovoid-obtuse, apex rounded, yellowish-green, 8-15 cm. long by 3-5 cm. wide, resinous; bracts erect and slightly exserted, narrow, diamond-shaped. Seed with a brownish wing, nut greenish.

S. Japan: S. Honshu; Shikoku and Kyushu, 300-1600 m..

A. FRASERI (Pursch.) Poir. Fraser Fir

A tree 9-20 m. tall, 1-2 m. in girth, with an open, pointed crown. Bark brown, with many resin-blisters, becoming pinkish-gray and shreddy. Branchlets slightly grooved, gray or bright reddish-brown, with reddish pubescence. Buds globular, resinous, tan-gray to red-brown, 8-10 mm. in diameter. Leaves spreading nearly at right angles in two rows, with a V-like parting, curved upwards on upper branchlets, grooved above, bright dark green above with stomata near the apex, bluish-white to silvery-white below; stomata in 4-5 short lines above, in 9-11 lines below; 1-2.5 cm. long by 2-2.5 mm. wide, base slightly twisted, cross-section avicular; apex rounded, somewhat bilobed. Male strobili oblong-cylindric, yellowish, tinted red, 1.2 cm. long by 6 mm. wide. Female cone broadly cylindric, apex broadly rounded, dark violet or dark purple, 5-7 cm. long by 2.5-3 cm. wide; scales triangular, finely pubescent; bracts exserted and reflexed, rather broad, bright yellowish-green, serrulate. Seed with a grayish-brown wing.

U.S.A.: S.W. Virginia; E. Tennesee; North Carolina: Alleghany Mts., 1219-2012 m. altitude.

A. GRANDIS (Dougl. ex D.Don) Lindl. GRAND FIR

A narrowly conical tree 30-61 m. tall, 0.5-4.80 m. in girth, with stout, curved, slightly drooping branches. Bark brown, smooth, with resin blisters, becoming deeply furrowed. Branchlets pubescent then smooth, reddish-brown to yellow-brown or olive-brown. Buds conical, obtuse, gray or violet-gray, resinous, 7-10 mm. in diameter. Leaves spreading at right angles in 2 rows, spreading to the left and right, curved upwards on upper branchlets, grooved above, dark shiny green above, greenish-white to silvery-white below; stomata rare or absent above, in 10 lines below; 2-3.5 cm. long by 2 mm. wide, base twisted, apex bilobed or slightly bifid. Male strobili pinkish or violet then yellowish-green or yellowish, tinted purple, 2-3.5 cm. long by 2 mm. wide. Female cones at tops of trees, cylindrical-conical, greenish-brown, rounded at the apex, 7-12 cm. long by 2.5-4 cm. wide; scales pubescent; bracts hidden, at the base of the scales. Seed light brown, nut 1-1.2 cm. long, wing to 2mm. long.

Canada: S.W. British Columbia to N.W. California, U.S.A., 427-1829 m..

A. GUATEMALENSIS Rehd. Guatemalen Fir
=A. guatemalensis var. jaliscana Mart.,= A. tacanensis Lundell

A conical tree 20-35 m. tall, 60-90 cm. in girth, with horizontal branches. Bark blackish-brown, divided into plates. Branchlets reddish-brown to deep blackish-red, pubescent. Buds globular-ovoid, resinous, to 5 mm. long. Leaves somewhat comb-like or nearly pectinate in arrangement, unequal, deep green above, glaucous beneath, 1.5-5.5 cm. long by 1.2-2 mm. wide; stomata usually absent above, in 8-10 lines below; resin canals 2, marginal; apex notched and emarginate. Female cones oblong-cylindric, apex pointed to somewhat flattened, yellowish-brown with a violet bloom, 8-11.5 cm. long by 4-5.5 cm. wide; scales oblong, broader than long; bracts hidden, about 1/2 height of the scale, cuneate-obovoid. Seeds light brown, nut to 9 mm. long, wing to 1.5 cm. long.
S.E. Mexico to W. Guatemala, 1800-4083 m. altitude.

A. HICKELI Flous et Gauss. Hickel Fir
=A. oaxacana Mart.

A conical tree 20-30 m. tall, with an irregular crown. Bark gray, furrowed into quadrangular plates. Branchlets dark brown to reddish, slightly pubescent. Buds globular or slightly ovoid, slightly resinous, scales obtuse. Leaves nearly 2-ranked, spreading widely, grooved above, Dark shiny green above, 1.5-3.2 cm. long by 1-1.5 mm. wide, flattened below except near the base, margins somewhat revolute, glaucous below; stomata absent above, in 14-16 lines below; base twisted; apex often notched. Female cone cylindric-oblong, shortly pointed at the apex or obtuse, slightly resinous, on a peduncle 1 cm. long, dark brown to violet-brown, 7-12 cm. long by 3.5-7 cm. wide; scales suborbicular, margins denticulate; bracts slightly exserted, erect, triangular-ovoid. Seed with a nut 6-7 mm. long, wing orange-yellow to 1.3 cm. long.
S. Mexico: Veracruz; Guerrero; Oaxaca; Chiapas, 1650-3000 m..

A. HOLOPHYLLA Maxim. Manchurian Fir

A narrowly conical tree 25-40 m. tall, 1.2-5 m. in girth, with horizontal branches. Bark scaly, gray or grayish-brown, becoming shallowly fissured. Branchlets smooth, shiny gray-brown to yellowish-gray. Buds acuminate, pinkish-brown, free from the leaves, slightly resinous, 1.2-1.8 mm. in diameter. Leaves spreading at right angles upwards and outwards above, pectinate below, bright green above, glaucous-green or grayish below; stomata usually absent above or in 1-2 short lines near the apex, in 7-10 lines below; 2-4 cm. long by 2 mm. wide, cross-section elliptic, spine-tipped, base contorted. Male strobili pale yellow tinted pink. Female cone cylindrical, resinous, apex bluntly rounded and somewhat depressed, blue-yellow-green then bright yellow-brown-gray, 12-14 cm. long by 4-5 cm. wide; scales smooth, broadly rounded; bracts hidden, about 1/2 height of the scale. Seeds cuneiform, greenish-yellow with a long,nearly quadrangular wing.
U.S.S.R.; China: Heilungkiang (Manchuria); N. Korea; 0-1500 m..

A. HOMOLEPSIS Sieb. et Zucc. Nikko Fir

A pyramidal tree 25-40 m. tall, 1-5 m. in girth, with horizontal branches. Bark grayish-brown, with exfoliating scales. Branchlets slightly smooth, gray or brown to yellowish-brown, tinted pink, deeply grooved. Buds ovoid or ovoid-conical, partially hidden by the leaves, chocolate brown with white resin, 10-14 mm. in diameter. Leaves spreading outwards and upwards, with a distinct V-like parting above, spreading horizontally below, flattened on both faces, shiny dark green above, bluish-white below, 1-3 cm. long by 2-2.5 mm. wide; stomata very scarce above, in 6-8 lines below; cross-section avicular, base twisted, apex obtuse or bifid. Male strobili ovoid, yellowish-green, stamen dark purple, 1.4 cm. long by 7 mm. wide. Female cone cylindrical, apex rounded, resinous, dark violet then brown, 7-10 cm. long by 3-4 cm. wide; scales slightly pubescent, denticulate; bracts hidden, about 1/2 height of the scale. Seeds grayish, to 1.8 cm. long.
Japan: Mount Adsuma to Mount Takakuma, 700-2200 m..

A. KAWAKAMII (Hay.) Ito Kawakami Fir

A shrub or pyramidal tree 15-35 m. tall, 0.5-1 m. in girth, with a straight, erect trunk. Bark smooth and resinous, gray-white, becoming gray-brown and scaly. Branchlets deeply grooved, yellowish-gray to dark brown, with brown pubescence. Buds ovoid, very resinous, brown to reddish, scales obtuse, to 1 mm. in diameter. Leaves pointing forwards, curving outwards and upwards, overlapping above, strongly grooved above, dark green above, whitish below, 1.5-3 cm. long by 1.7 mm. wide; stomata near the apex above, in 7-8 lines below; apex notched. Male strobili cylindrical, to 1.5 cm. long. Female cone broadly cylindric, apex rounded and somewhat depressed, 6-7.5 cm. long by 3.7-4 cm. wide, purple-violet at maturity; bracts hidden, about 1/2 height of the scale, lobed. Seeds blackish, wing to 1.6 cm. long.
Taiwan: Mount Morrison, 2400-3800 m..

A. KOREANA Wils. Korean Fir

A shrub or broadly pyramidal tree 9-18 m. tall, 1-2 m. in girth. Bark smooth, with resin blisters, then furrowed and plate-like, purplish then pale gray, inner-bark reddish-brown. Branchlets grooved, slightly pubescent, shiny gray or yellowish-red becoming purplish. Buds ovoid, free from the leaves, chestnut-brown to red with whitish resin, 8-1.2 mm. in diameter. Leaves crowded, spreading upwards and outwards, nearly spirally arranged, straight, linear, keeled below, shiny green above, bluish-white below; stomata usually absent above, with 10 stomatal lines below; 1-2.5 cm. long by 2-3 mm. wide, apex notched. Male strobili globular-ovoid, reddish-yellow or green tinted violet-brown, 1 cm. long by 0.7 cm. wide. Female cone broadly rounded, blunt-topped, 5-7 cm. long by 2.5-4 cm. wide, blue-gray then dark violet with white resin spots; scales reniform; bracts slightly exserted and reflexed, reddish-brown. Seed ovoid, nut violet-purple, 7mm. long; wing reddish-brown.
Korea: Chirisan, to 1000 m..

A. LASIOCARPA (Hook.) Nutt. Subalpine Fir
=A. bifolia Murr.

A narrowly conical tree 18-50 m. tall, 0.3-3.5 m. in girth, densely branched, with a spire-like crown and with rows of horizontal branches nearly to the base. Branches somewhat pendent. Bark silvery then gray, deeply fissured. Branchlets slightly pubescent, slightly grooved, reddish then gray. Buds ovoid to globular, resinous, gray or gray-brown, 8-11 mm. in diameter. Leaves directed forwards and upwards or nearly 2-ranked, flattened above, keeled below, dark green to dull yellow-gray-green above, glaucous-gray-green below, 1.5-3.5 cm. long by 1.5-2 mm. wide; whitish stomata in several lines above, in 6-7 lines below; base twisted, cross-section elliptic, apex obtuse or bilobed. Male strobili ovoid, dark indigo-blue to violet, tinted yellow, to 1.2 cm. long by 6 mm. wide. Female cone cylindric-ovoid, bluntly rounded at the apex, violet-purple and gray-green becoming brighter, 5-10 cm. long by 3.5-4.5 cm. wide; scales finely pubescent, triangular; bracts hidden, about 1/2 height of the scale. Seed with a cuneiform nut to 7 mm. long, ivory-brown; wing bright fawn-purple.
W. Canada; U.S.A.: S.E. Alaska to C. Utah, 600-3650 m..

A. LASIOCARPA var. ARIZONICA (Merr.) Lemm. Corkbark Fir

A tree 15-30 m. tall, to 30 cm. in girth. Bark creamy-white, thick and corky, becoming plate-like and exfoliating, non-resinous. Branchlets pubescent, faintly grooved, yellowish-gray or dark gray. Buds globose, partially hidden by the leaves, resinous, gray-green, to 9 mm. in diameter. Leaves curving upwards or irregularly pectinate, often more distinctly pectinate, blue-green with a median white band above, whiter below, 1-2.5 cm. long by 1.5 mm. wide, with 2 median resin canals, apex emarginate or notched,leaves flattened above; stomata in 5-7 lines above, in 5-7 lines below. Female cone cylindrical-ellipsoidal, apex ovoid, dark purple, 5 cm. long by 2 cm. wide; bracts hidden, blackish, sharp-pointed. Seed with a yellow-brown or light violet nut to 6 mm. long.
U.S.A.: E. Arizona; Colorado; New Mexico, 2700-4000 m..

A. MAGNIFICA A. Murr. California Red Fir

A conical tree 18-37 m. tall, 0.3-4 m. in girth, with an open, rounded crown, and with short, nearly horizontal branches. Bark reddish-brown, deeply furrowed. Branchlets finely pubescent at first, violet-gray-brown to greenish, tinted purple. Buds globose, purplish-violet-brown, scales free at the base and pubescent. 4-10 mm. in diameter. Leaves spreading in 2 rows, spreading outwards and upwards, curving forwards, crowded and curved on upper branchlets, keeled on both faces, glaucous gray-green on both faces, lower face brighter, 2.5-3.5 cm. long by 1.5-3 mm. wide; upper face with 5-8 lines of whitish stomata, lower face with 4-5 lines of whitish stomata; cross-section diamond-shaped; apex obtuse to bluntly acute. Male strobili reddish-purple. Female cone cylindrical, at tops of trees, resinous, rounded at the apex, violet-purple then purplish-brown, 15-23 cm. long by 7.5-12 cm. wide; scales finely pubescent; bracts usually hidden, yellowish, about 2/3 height of the scale. Seeds brown, ovoid, nut to 6 mm. wide, winged, to 2.2 cm. long.
U.S.A.: S.W. Oregon; N. California to W. Nevada, 1829-2743 m..
Red Fir hybridizes with Noble Fir near Mount Shasta, N. California, this hybrid entity was formerly recognized as a variety of the former species.

A. MARIESII Mast. MARIES FIR

A tree 24-26 m. tall, to 2 m. in girth, with a straight trunk and with an oval or flat-topped crown. Bark pale gray or glaucous, smooth, bloomed purple, nearly white on old trees. Branchlets prominently pubescent when young, dark brown to reddish-gray. Buds spherical, slightly resinous, free from the leaves, red-brown to gray-brown. Leaves overlapping, pointed forwards above, crowded on the upper sides of the branchlets, pectinate below and overlapping, grooved above, bright green above, glaucous-yellow to whitish below, 0.8-2 cm. long by 2-2.5 mm. wide; stomata absent above, in 7 lines below; apex rounded or bifid. Male strobili short, reddish to yellowish-carmine and slightly darkened. Female cone ellipsoidal, rounded at both ends, apex somewhat flattened, dark blue then blackish-red-brown, 7-15 cm. long by 4-5 cm. wide; bracts hidden, about 2/3 height of the scales. Seed with a yellowish-red nut, wing purplish-brown.
C. Japan: Honshu, Mount Hakkoda, 1000-2900 m..

A. NEBRODENSIS (Locaj.-Poj.) Mattei Silician Fir

A tree 8-15 m. tall, to 1 m. in girth, with a broad rounded or somewhat flattened crown. Bark shallowly fissured and flaky, orange. Branchlets gray-green to yellowish, grooved, rarely with brown pubescence. Buds ovoid-conical, smooth, sometimes slightly resinous, pale reddish-brown, 7-9 mm. in diameter. Leaves nearly 2-ranked, spreading horizontally, non-pectinate, linear, rigid, grooved above, dark shiny green above, glaucous below; stomata rarely present above, in 9-12 lines below; 1.2-2 cm. long by 2-2.5 mm. wide, apex rounded or notched. Male strobili with pollen grains 85 microns in diameter. Female cone cylindrical, rounded at the apex, relatively stout, dark brown, 13-20 cm. long by 4 cm. wide; scales finely pubescent at the margins; bracts exserted and reflexed. Seed to 7 mm. long.
Italy: Sicily: Polizzo, Monte Cervo, at 1400-2000 m., very rare.

A. NEPHROLEPIS (Trautr.) Maxim. Eastern Siberian Fir or Khinghan Fir

A narrowly pyramidal tree 25-35 m. tall, 0.75-1 m. in girth, with horizontal spreading branches and with a dense crown. Bark gray-white to light gray-brown, smooth, becoming shallowly fissured. Branchlets slightly grooved, pubescent, yellowish-white to yellowish-brown. Buds ovoid, hidden by the leaves, slightly resinous, violet-white; scales obtuse, slightly keeled; 10-13 mm. in diameter. Leaves pointing forward, covering the branchlet, pectinate below, linear, grooved above, flattened below, dark shiny yellow-green to dark green above, grayish-green below, 1.5-3.5 cm. long by 1.2-1.5 mm. wide; stomata usually absent above, in 4-5 lines below; cross-section elliptic, apex rounded or notched. Male strobili reddish-yellow. Female cone cylindrical, apex pointed with a short nipple, reddish-brown to dark violet, 4.5-8 cm. long; scales nearly horizontal, pubescent; bracts slightly exserted, rather broadly covering the scale; cone 1.5-2 cm. wide. Seed with a dark brown nut, wing violet-purple.
N. China; U.S.S.R.: E. Siberia; Korea, 500-2000 m..

A. NORDMANNIANA (Stev.) Spach. Caucasian or Nordmann Fir

A conical tree 30-60 m. tall, to 4.5 m. in girth, with ascending branches. Crown pointed, sometimes somewhat flattened. Bark smooth, gray, with resin blisters. Branchlets variably pubescent, grooved, shiny maroon or yellowish-green. Buds ovoid, pointed, shiny brown, slightly resinous, 9-15 mm. in diameter. Leaves pointing forwards and overlapping above, pectinate below, grooved above, dark shiny green above, whitish below; stomata in 1-3 short discontinuous lines above, in 8-10 lines below; 1.5-3.5 cm. long by 1.5-2 mm. wide, apex notched. Male strobili bright red or bright yellowish, tinted brown or pinkish, 1.5 cm. long by 5-6 mm. wide. Female cone cylindrical-elliptic, resinous, apex with a blunt nipple, dark violet-brown to brown, 11-18 cm. long by 4-6 cm. wide; bracts exserted and reflexed, lobed, 2/3 height of scale or more. Seed with a nut to 1.3 cm. long, wing to 2 cm. long.

N.E. Turkey; W. Caucasus; southern U.S.S.R., 900-2200 m..

A. NUMIDICA De Lann. ex Carr. Algerian Fir

A pyramidal tree to 20 m. tall, to 2.4 m. in girth. Bark gray, smooth, becoming reddish-brown, fissured and scaly. Branches somewhat pendent, stiff. Branchlets smooth, grooved, shiny gray-brown. Buds large, ovoid, non-resinous, pointed, 1.5-2 mm. in diameter, pale reddish-brown. Leaves spreading forwards and upwards, middle leaves somewhat recurved, arranged horizontally below, grooved above, dark green above with broken lines of stomata near the apex, whitish-green below with 7-10 stomatal lines, 1.5-3 cm. long by 2-3 mm. wide, apex entire and bluntly acute. Male strobili ovoid, slightly resinous, yellowish-green then pink-purple-violet, 1.5 cm. long by 6-7 mm. wide. Female cones cylindrical, resinous, apex with a pointed nipple, greenish-yellow then brownish-gray, 12-20 cm. long by 3-6 cm. wide; scales fan-shaped; bracts hidden, about 1/2 size of the scale. Seeds with a purplish wing.

Algeria: Constantine, Kabylie Ranges, 1800-2010 m..

A. PINDROW (Lamb.) Royle Pindrow Fir

A narrowly conical tree 47-60 m. tall, 4-6 m. in girth, with dense, horizontal branches. Bark smooth, sivery, becoming fissured and gray-brown. Branchlets smooth, yellowish-gray to gray. Buds conical, obtuse, orange-brown or grayish-red, resinous, 1.5-1.72 mm. in diameter, with white resin. Leaves spreading forwards and upwards, covering the branchlet above, horizontally spreading below, spreading outwards and downwards below, persist 3-8 years, linear, dark shiny green above, greenish below; stomata usually absent above, in 2 faint gray bands below with 6-7 stomatal lines; 2.5-7 cm. long by 1.7-2.5 mm. wide, base twisted, apex notched. Male strobili cylindrical, pale yellow tinted pink or violet, 8-12 mm. long by 6 mm. wide. Female cone cylindric-obtuse to ovoid, apex bluntly rounded, violet purple to pale blue turning dark brown, resinous, 10-18 cm. long by 5-8 cm. wide; bracts hidden, about 1/3 height of the scale. Seed with a reddish-brown nut, wing blackish-brown.

Afghanistan; Pakistan; N.W. India; Nepal; to S. Tibet, China, 2000-3700 m..

A. PINDROW var. BREVIFOLIA Dallim. et Jacks. Gamble Fir
=A. gamblei Hickel

A tree to 17 m. or more. Branchlets shiny reddish-brown, smooth. Buds relatively large, obtuse, resinous, violet-red, 1.3 mm. in diameter. Leaves spirally arranged, acute, shiny above, paler below, 2-3.3 cm. long by 2 mm. wide; stomata absent above, in greenish-white bands below with 7-9 stomatal lines; cross-section elliptic; resin canals marginal,2; margins obtuse, petiole thickened, apex notched or acuminate. Female cone rounded, slightly flattened at the apex, pale blue at first, to 15 cm. long, bracts hidden.
N.W. India: Kashmir, Gullmack; Garwhal, Gaurikund; Chamba.

A. PINSAPO Boiss. Spanish Fir

A narrowly conical tree 25-30 m. tall, to 4.5 m. in girth. Bark smooth, dark gray or purplish-black, becoming fissured. Branchlets smooth, grooved, reddish-brown. Buds ovoid, obtuse, resinous, greenish to purplish-brown, scales projecting at the apex, upper scales acute, 9-11 mm. in diameter. Leaves spirally arranged at nearly right angles, straight, somewhat falcate, dark green tinted blue or gray-green, 0.8-1.8 cm. long by 1.5-2.5 mm. wide, with 2 greenish-white bands of stomata below with 7-8 stomatal lines, stomata abundant above, cross-section diamond-shaped to elliptic, apex pointed or obtuse. Male strobili at tips of branchlets, purplish or rose-carmine-violet, 1-1.5 cm. long by 5-7 mm. wide. Female cone in groups of 4-5, narrowly cylindric, resinous, apex pointed, greenish then reddish-green to purplish-brown or brown, 10-16 cm. long by 3-5 cm. wide; bracts hidden, at base of the scale, ovate-spathulate . Seed with a dark brown nut, wing pinkish.
S. Spain: Malaga and Granada Provinces, 1000-2100 m..

A. PINSAPO var. MAROCCANA (Trab.) Ceb. et Bol. Moroccan Fir

A conical tree 12-15 m. tall. Bark thick. Branchlets smooth, shiny, reddish-purple. Buds ovoid, resinous, reddish-brown, to 5 mm. long, scales ovate, apex obtuse. Leaves densely arranged, nearly 2-ranked, 1-1.5 cm. long by 2-2.5 mm. wide, dark green above, greenish-white below, nearly flattened above; stomata in 1-2 irregular bands above, in 2 white bands below with 6-7 stomatal lines; cross-section flattened; acute or acuminate, apex spine-tipped.Male strobili ovoid, reddish-purple, resinous at the base, 10-15 mm. long. Female cone cylindrical to obovate-oblong, 10-18 cm. long by 4-5 cm. wide, with a short nipple at the apex; scales cuneiform or nearly reniform; pale brown; bracts hidden, about 1/2 height of the scale. Seeds with a fawn-brown wing.
Morocco: S. Tetuan; W. Mount Rif, 1800-2100 m..

A. PINSAPO var. TAZAOTANA (Coz. ex H.D. Vill.) Pourt. Tazaotan Fir

A tree 30-50 m. tall, to 4.85 m. in girth, with an ovoid crown and with reflexed branches. Bark rugose, reddish-brown. Branchlets smooth, grooved, brownish to gray. Buds non-resinous; scales free at the apex, not fringed at the margins. Leaves nearly pectinate, spreading horizontally, linear, 1.2-1.8 cm. long by 1-2.5 mm. wide, flattened, dark shiny green above, whitish-green below, acute or acuminate; stomata faint above, in 2 white bands below with 7 stomatal lines; base twisted; resin canals marginal; apex spine-tipped. Male strobili ovoid, elongated, pinkish-white, 1.2-1.8 cm. long by 4-6 mm. wide. Female cones cylindrical, greenish, apex with a blunt nipple, 16-20 cm. long by 4-6 mm. wide; scales cuneate-triangular; bracts hidden, about 1/2 height of the scale. Seeds with a pinkish-violet wing.

Morocco: Mount Tazaot, at 1400-1700 m..

A. PROCERA Rehd. Noble Fir
=A. nobilis (Dougl.) Lindl.

A conical tree 30-46 m. tall, 0.8-1.2 m. in girth, with a rounded crown near the top, and with short, nearly horizontal branches. Bark gray-brown, smooth, becoming brown to red-brown and furrowed into long, scaly plates. Branchlets prominently pubescent, dull dark reddish-brown. Buds globular, resinous, violet-red-gray; scales free at the base, pubescent; 5-12 mm. in diameter. Leaves spreading outwards and upwards, curved forwards, covering the branchlet, spreading in 2 rows below, grooved above, glaucous or blue-green above, glaucous below, 1.5-4 cm. long by 1-1.5 mm. wide; stomata in 2 bands of 4-6 lines above, in 4-5 lines below; flattened, apex pointed or notched. Leaves on upper branchlets shorter, crowded, curved upwards, pointed and quadrangular. Male strobili purplish-red or carmine-violet-red, 3 cm. long by 6 mm. wide. Female cones at tops of trees, cylindrical, rounded at the apex, 15-30 cm. long by 6-10 cm. wide, brown-purple or violet-blue then greenish-brown to tan; scales finely pubescent; bracts long exserted, reflexed, nearly hidding the scales, lobed, papery, denticulate. Seeds red-brown, with a shiny, light-brown wing.

S.W. Canada; S. British Columbia to N.W. California, U.S.A., 61-2682 m..

A. RECURVATA Mast. Min Fir

A conical tree 20-40 m. tall, 1.8-4.5 m. in girth, with horizontal branches, becoming somewhat flat-topped. Bark dark gray to red-brown, papery, flaky, exfoliating. Branchlets smooth or grooved, shiny yellowish-gray, ridged. Buds ovoid, resinous, free from the leaves, red-brown, 7-10 mm. in diameter. Leaves more or less recurved, erect or overlapping, without a distinct parting above, bright green above, paler green to gray-green below; stomata usually absent above; 1.6-3.3 cm. long by 2 mm. wide; apex acute, spine-tipped. Female cones in clusters, oblong-ovoid, apex rounded, violet-purple becoming gray-brown, 5-9 cm. long by 3-4 cm. wide; scales reniform, shortly pubescent; bracts hidden, about 1/2 size of the scale. Seed with a dark violet wing.

China: S. Kansu; W. Szechuan, Min Shan, 2300-3600 m..

A. RECURVATA var. ERNESTII (Rehd.) Rushf. Chien-Lu Fir
= A. chensiensis var. ernestii (Rehd.) Liu

A narrow tree 40-60 m. tall, 2-5 m. in girth, with wide-spreading branches and with a parasol-like crown with age. Bark dark gray or gray-brown, fissured, rugose. Branchlets slightly pubescent, grooved, shiny yellowish then gray or yellowish. Buds ovoid to globular, very resinous, light gray to yellowish-green, 6-7 mm. in diameter. Leaves crowded, ascending and spreading, sometimes recurved, grooved above, yellowish-green above, 1-3.5 cm. long by 2-2.5 mm. wide, paler below with grayish bands of stomata in 13-14 lines, stomata usually absent above, base twisted; apex notched, often bloomed; margins slightly recurved. Male strobili cylindrical, reddish. Female cone ovoid, apex bluntly pointed, brownish-gray or purplish-brown, 5-8 cm. long by 2.5-3.7 cm. wide; scales obovoid-triangular; bracts hidden, 1/2 height of the scale or less. Seeds brownish, nut 5-7 mm. long, wing to 9 mm. long.
China: S.W. Kansu: Upper Tebbu-Yiwaku to Kangting, Szechuan, 2400-3500 m..

A. RELIGIOSA (H.B.K.) Schl. et Cham. Sacred Fir

A conical tree 30-60 m. tall, with ascending horizontal branches. Bark gray, fissured into irregular, oblong plates. Branchlets slightly pubescent, reddish-brown above, olive-green below. Buds conical-cylindric, obtuse, free from the leaves, resinous, violet-brown, 1-1.4 mm. in diameter; scales greenish-white, slightly pubescent. Leaves directed forwards and upwards above, pectinate below, grooved above nearly to the apex, dark green above, glaucous below; stomata in short ranks above, in 7-12 lines below; 1.5-4.5 cm. long by 1.5-2 mm. wide, base twisted, apex pointed. Male strobili oblong, obtuse, resinous, violet-carmine, 1.2-1.4 cm. long by 5 mm. wide. Female cone conical, ovoid, violet-blue then dark gray-brown, resinous, apex broadly rounded, 10-16 cm. long by 4-7 cm. wide; scales cuneiform; bracts erect, slightly exserted, sometimes reflexed, triangular, chestnut-brown. Seeds with a nut to 1.3 cm. long, maroon to chestnut-brown, wing to 1 cm. long.
South and central Mexico to N. Guatemala, 1200-4100 m..

A. SACHALINENSIS (Fr. Schm.) Mast. Sakhalin Fir

A densely branched, ovate-pyramidal tree 30-40 m. tall, 2-3 m. in girth. Bark smooth, whitish, with numerous resin blisters; becoming fissured,scaly, reddish or gray-brown. Branchlets grooved, pubescent, bright gray or bright brown. Buds globular, partially hidden by the leaves, to 8 mm. in diameter, very resinous, pubescent, bluish-gray turning red-brown. Leaves forward pointing, curving upwards above, grooved above, flattened below, shiny dark green above, 2-4 cm. long by 1.5 mm. wide; stomata usually absent above, in 2 inconspicuous bands with 7-8 lines below; leaves greenish-white below, cross-section rounded, base twisted, apex bilobed. Male strobili numerous, ellipsoid, 8-10 mm. long by 6-7 mm. wide, stamen obovoid-cuneiform. Female cone cylindrical, apex rounded, violet-gray then brown to dark olive-green, 6-9 cm. long by 2.5-3.5 cm. wide; scales thin, fan-shaped, slightly pubescent; bracts exserted and reflexed, nearly concealing the scales. Seed with a nut to 5 mm. long; wing to 9 mm. long, gray-brown to blackish-purple.
U.S.S.R.: Okha to Kurile Islds.; Japan: Hokkaido, Kabetsu, to 1650 m..

A. SACHALINENSIS var. MAYRIANA Miyabe et Kudo Mayr Fir

A oval tree to 30 m. tall, 1-3 m. in girth, loosely branched. Apex of crown obtuse, trunk with horizontal, slightly pendent branches. Branchlets dark brown, grooved, densely pubescent. Buds reddish-brown, resinous, globular, 10-12 mm. in diameter, with white pubescence. Leaves shorter, 1.5-2.5 cm. long by 1.6 mm. wide, curving upwards below, deep green, linear, pale green below; stomata absent above, in 4-5 lines below; cross-section avicular, apex emarginate or bifid. Male strobili numerous, ellipsoid-oblong or ovoid-oblong, yellowish-red, 8 mm. long by 4 mm. wide. Female cone cylindrical, obtuse or abruptly pointed at the apex, blackish or blackish-purple, 5-7 cm. long by 2-4 cm. wide; scales greenish-black; bracts long exserted, reflexed, greenish. Seeds obovate-cuneate, nut to 6 mm. long, brown; wing 4 mm. long, wedge-shaped, light-brown to yellowish-brown.

U.S.S.R.: S. Sakhalin; S. Kuriles; N. Japan : Hokkaido.

A. SIBIRICA Ledeb. Western Siberian Fir

A pyramidal tree 30-40 m. tall, 0.6-1 m. in girth, with a slender trunk. Bark smooth, gray, with numerous resin blisters. Branchlets silvery-gray to yellowish-gray, with minute scattered blackish pubescence. Buds nearly globose, very resinous, free from the leaves, scales hidden, yellowish-brown to whitish-purple. Leaves crowded, pointing forward, overlapping above, horizontally spreading below, resin-scented, grooved above, dark green above, glaucous or grayish below, 2-3.5 cm. long by 1.3-2 mm. wide; stomata usually absent above, in 6-7 lines below; apex notched. Male strobili cylindrical-ovoid, 6-8 mm. long by 5-6 mm. wide, shiny yellow or red. Female cones cylindrical, apex pointed, resinous, reddish-blue turning bright brown, 5-8 cm. long by 3-4 cm. wide; scales fan-shaped, rounded to a blunt central point, pubescent; bracts hidden, about 1/2 height of the scale. Seeds ovoid, nut fawn-brown, to 7 mm. long; wing reddish to 1.5 cm. long.

N.E. USSR: Siberia to Altai Mts.; N. China: Heilungkiang, 50-2000 m..

A. SIBIRICA var. SEMENOVII (Fedtsch.) Liu Semenov Fir

A pyramidal tree 30-50 m. tall, 0.5-1 m. in girth. Bark smooth, gray or glaucous with resin blisters. Branchlets yellowish-brown, prominently ridged, with scattered pubescence. Buds ovate, 3.5-4.5 mm. long, scales always visible though covered with resin.Leaves crowded, 2-ranked, pectinate below, straight or slightly curved, 3.5-4 cm. long or longer, 1.8-1.9 mm. wide, grooved above with a broad keel, gray beneath with 2 white bands with 5-7 stomatal lines each, margins revolute, apex notched. Female cone cylindrical, obtuse at the apex, 8-10 cm. long by 3-4 cm. wide, yellowish-brown; scales broadly rounded; bracts hidden, about 1/2 height of the scales. Seeds broadly cuneate, nut 5-6 mm. long, 3.5 mm. wide; wings 10-12 mm. long.

U.S.S.R.: Kazakhistan, W. Tien Shan, Fergana and Talass Ranges, 1350-2800 m..

A. SPECTABILIS (D.Don) Spach. Himalayan Fir
=A. webbiana (Wall.) Lindl.

A broadly conical tree 25-30 m. tall, with horizontal branches, becoming flat-topped with age. Bark gray-brown, fissured, scaly. Branchlets pubescent, brown in the grooves, reddish-brown to dark brown, deeply grooved. Buds ovoid, resinous, scales keeled, yellowish-brown to red-brown, 1.5-2.5 mm. in diameter. Leaves directed outwards and upwards above, with a V-like parting; 2-ranked, horizontally spreading below, grooved above, flattened at the apex, shiny green abovesometimes with a short stomatal line above, with white stomata below in 8-12 lines, 1.3-3.5 cm. long by 2.5 mm. wide, apex rounded or notched. Male strobili ovoid, purplish-violet, 1.3 cm. long by 1 cm. wide. Female cone cylindrical, resinous, dark violet-blue then brown, 7-10 cm. long by 3-4 cm. wide; scales triangular, broadly cuneate; bracts hidden, somewhat rounded, at base of scales. Seeds with a violet wing.
N.E. Afghanistan; N.W. India; W. Nepal, 1600-4270 m..

A. SPECTABILIS var. DENSA (Griff.) Silba Sikkim Fir

A broadly conical tree to 60 m. tall, with horizontal branches. Bark dark brown or blackish-gray, becoming deeply fissured. Branchlets grooved, pubescent, orange-brown. Leaves crowded, distichous, fine, dark green, 1.2-6 cm. long, midrib raised, keeled below, with 2 silvery-glaucous bands of stomata below; resin canals marginal, 3; margins recurved or revolute; retuse or emarginate, apex pointed. Male strobili in groups, purple, pollen sacs linear. Female cone cylindric, larger, 10-17.5 cm. long by 3.7-7.5 cm. wide, bluish; bracts narrowly acuminate, slightly exserted. Seeds to 1.5 cm. long, relatively larger.
Sikkim: Chumbi Valley; Bhutan; China: S.E. Tibet; N.E. India: Assam, 2450-3800 m..

A. SQUAMATA Mast. Flaky Fir

A broadly conical tree 15-40 m. tall, 3-5 m. in girth. Bark shaggy, purplish-brown, exfoliating in thin, papery layers, birch-like, inner bark purplish-red. Branchlets reddish to dark brown, pubescent. Buds ovoid, reddish-brown with white resin, apex flattened, 1.2 mm. in diameter. Leaves pointing forward and overlapping above, nearly 2-ranked below, grooved above, flattened below, curved, dark green to blue-green above, gray-white below; stomata in 4 discontinuous lines 1/3 length of leaves above, in 5-7 lines below, 1.5-2.5 cm. long by 1.5 mm. wide, apex notched. Male strobili cylindrical, 1.5-2.5 cm. long. Female cone oblong-ovoid, apex rounded, resinous, slightly depressed on top, violet, 5-6 cm. long by 3.5 cm. wide; scales sparsely pubescent; bracts slightly exserted, erect, reflexed sometimes, lobed, with a sharp central point. Seeds with a blackish nut to 6 mm. long; wings gray or pale red-brown to 1 cm. long.
China: Tibet; Tsinghai; W. Szechuan; N.W. Yunnan; S.W. Kansu, 3000-4700 m..

A. VEITCHII Lindley Veitch Fir

A narrowly conical tree 18-40 m. tall, to 90 cm. in girth or more, with a slender trunk and short slender branches. Branches leaving the trunk at an oblique angle. Bark smooth, pale gray or white, with prominent resin blisters, becoming scaly. Branchlets yellowish-brown to reddish-gray, pubescent. Buds small, subglobose, reddish-brown to purple, resinous, 8-10 mm. in diameter. Leaves crowded, directed forwards and more or less upwards, overlapping above, pectinate below, grooved above, keeled below, dark shiny green above, glaucous-white to silvery-white below, 1-4.3 cm. long by 1.5-2 mm. wide; stomata generally absent above, in 7 lines below; base twisted, apex notched, cross-section avicular. Male strobili cylindrical, dark brown, tinted yellow, 1.4 cm. long by 4 mm. wide. Female cone cylindrical, with a nipple at the apex, bluish-purple turning dark red-brown, 6-8 cm. long by 2.5-3 cm. wide; scales reniform; bracts slightly exserted and reflexed, as long as the scales. Seeds with a grayish to reddish-blue nut, 6-7 mm. long; wing 10-11 mm. long, with a bluish margin.

C. Japan: Honshu, 1500-2800 m..

A. VEITCHII var. SIKKOKIANA (Nak.) Kus. ex Iw. et Kus. Shikoku Fir

A pyramidal tree to 20 m. tall, to 60 cm. in girth, with horizontally spreading branches. Bark gray-white, smooth. Branchlets yellowish-brown, puberlent, pubescent at first then soon smooth. Buds resinous, lower scales slightly ridged. Leaves crowded, flat, 0.8-2 cm. long by 2 mm. wide, shiny green, margins slightly revolute, stomata in 13-15 lines below, apex obtuse. Female cone short-stalked, rounded at both ends, cylindrical-elliptical, 3-4.5 cm. long by 1.5-2 cm. wide, blackish blue-purple; scales reniform; bracts hidden to slightly exserted, purplish. Seeds oblong-ovate, nut to 5 mm. long by 2.5 mm. wide, blackish purple.

Japan: Shikoku Mountains, 800-1900 m..

A. VEJARI Mart. Vejar Fir

A conical tree 30-40 m. tall, with a straight trunk. Bark gray, smooth, with white spots. Branchlets whorled, smooth, gray to purplish-red. Buds globose, very resinous, deep purplish-red; scales keeled, triangular-ovate. Leaves nearly spirally arranged, spreading forwards, 1.5-2 cm. long by 1.5 mm. wide, flattened above, nearly glaucous below, dark green above; stomata in 4-5 lines above, in 2 gray bands with 9 stomatal lines below; apex acute to obtuse. Female cone oblong or nearly ovoid, resinous, apex obtuse, bluntly pointed, blackish-purple turning greenish-brown, 6-15 cm. long by 4-5 cm. wide; bracts slightly exserted, triangular, pointed. Seeds resinous, nut to 1 cm. long, violet-yellow; wing violet-brown, to 1.2 cm. long.

Mexico: Coahuila; Neuvo Leon and Tamaulipas, 2000-3000 m..

A. VEJARI var. MEXICANA (Mart.) Liu Mexican Fir

A narrowly conical tree 30-40 m. tall. Bark nearly smooth, gray, becoming blackish, rough, with purplish-red inner-bark. Branchlets violet-red, finely pubescent. Buds globular, very resinous. Leaves nearly spirally aranged, pointing slightly upwards and forwards, rigid, convex or slightly flattened above, bright green above, glaucous below, 1.3-2 cm. long by 1.5 mm. wide, with 10-12 lines of stomata; apex acute, obtuse or rounded. Female cone narrowly cylindric, oblong-ovoid, apex rounded, resinous, gray-brown to blackish-brown, 6-9.5 cm. long by 4.5-5.3 cm. wide; scales broadly cuneiform, obovate; bracts hidden, about 1/3 height of the scales, with a central point about 4/5 height of the scale. Seeds with a violet-purple-brown wing.
Mexico: N. Coahuila; Nuevo Leon; N.W. Tamaulipas, 2000-3000 m..

ACMOPYLE Pilg. (Podocarpaceae)

A genus of two species, one from New Caledonia and one from Fiji. Usually monoecious. Buds hidden by the leaves or inconspicuous. Foliage Yew-like, branches bilaterally flattened. Leaves linear, 2-ranked, somewhat falcate, generally growing close together as to hide the branchlet, flattened, with more stomata below, leaves whitish below. Fertile branchlets with scale-like leaves. Male strobili cylindrical, borne on a scaly peduncle. Female cone borne on a long scaly peduncle, pendent, oblong-ovoid, purplish-green with a single subterminal seed and with a warty receptacle; ovule inverted at first and partially covered by the epimatium, then becoming nearly erect and fused with the epimatium. Seeds nearly globose, thick-shelled, wingless.

A. PANCHERI (Brongn. et Gris.) Pilg. New Caledonian Acmopyle
=A. alba Buchh.

A tree 5-25 m. tall, with erect branches. Bark hard, smooth, gray, inner-bark brown, exfoliating in scales on older trees. Leaves 2-ranked, sessile, flattened, decurrent, distichous, linear, closely set, 0.8-2.5 cm. long by 2-4 mm. wide,falcate, apex obliquely obtuse, glaucous, with prominent white bands below with 30-40 stomatal lines, midrib more prominent below, margins slightly parallel. Leaves on fertile branchlets scale-like, triangular, keeled, less than 2 mm. long, broadly decurrent and dispersed on main branchlets, crowded on fertile branchlets. Male strobili cylindrical, at the apex of a scaly branchlet, in groups of 1-3, sometimes glaucous, 10-20 mm. long by 2-3 mm. wide; microsporophylls triangular. Female cone terminal, on a leafy branchlet, on a peduncle 9-22 mm. long covered by overlapping scales; receptacle 8-18 mm. long with 4-8 bracts with free tips. Seed globular, 10-11 mm. in diameter.
New Caledonia: local, type from Mount Mou, 200-1200 m..

A. SAHNIANA Buchh. et Gray Fijian Acmopyle

A small tree 3-5 m. tall, with a gnarled trunk. Foliage dense, dimorphic. Leaves flattened, slightly falcate, distichous, linear, 10-19 mm. long by 2-3.2 mm. wide, leaf margins nearly parallel, glaucous, with prominent stomata below in 10-12 lines, midrib weakly marked, apex obliquely acute. Leaves on fertile branchlets scale-like, flattened, long-triangular, 1.5-2.5 mm. long, keeled, broadly decurrent. Male strobili terminal, 5 mm. long by 2 mm. wide; microsporophylls triangular, acute. Female cone on a branchlet with a scaly peduncle to 5 mm. long, cone with 2 bracts; ovule inverted, solitary, covered by a broad epimatium; purplish-green. Seed nearly erect, rounded and elongated into a conical point, covered by a nearly blackish receptacle at maturity.

Fiji: Mount Vakarogasiu and Mount Koroyanitu, 800-1050 m..

ACTINOSTROBUS Miq. ex Lehm. (Cupressaceae)

A genus of two species from W. Australia. Monoecious shrubs with jointed branchlets. Buds inconspicuous. Juvenile leaves needle-like, 3-ranked. Leaves scale-like, small, in whorls of three, acutely pointed, sometimes with sparse resin spots, without prominent stomata. Male cones oblong or somewhat globular, with the stamens in whorls of 3-6 vertical columns. Female cones borne erect, ripening the first year, ovoid to globose; with six triangular, grooved, somewhat overlapping scales on a central axis; each scale bearing 1-2 triangular, 3-winged seeds; cone opens in the center upon maturity; the base of the cone is surrounded by closely pressed, rounded bracts. Seeds tan, with even wings, seeds emit a yellowish dye if crushed. Cotyledons 2.

A. ACUMINATUS Parl. Moore Cypress-Pine

A prostate plant or a small broadly conical shrub 1.8-4.5 m. tall. Branchlets finely divided, twisted into long branchlets. Juvenile leaves light silvery-green, 8-15 mm. long, needle-like, persistent. Adult leaves scale-like, in whorls of 3, 1.5-2 mm. long, not grooved above, bluntly acute, sometimes with scarce resin. Male cone globose to oblong, on a peduncle 4 mm. long, cone 3.5-5 mm. long by 4 mm. wide, with 20 acuminate scales with a dorsal crest. Female cone acuminate, globose, narrowing abruptly at the apex, often subtended at the base by juvenile leaves to 1 cm. long, cone to 1.5 cm. long, with 6 scales which are somewhat outcurved at the apex, yellowish-brown to glaucous-brown. Seeds variable, dark brown, 9-12 mm. long, 9-13 mm. wide, wing 2-5 mm. wide, hilium 3-5 mm. long and white, seeds often have low germination. Cotyledons 2, light green, 15-18 mm. long by 3-3.5 mm. wide, apex bluntly acute, stem to 2 mm. thick. Reported as having a medicinal use for rheumatism.

W. Australia: between Moore and Murchison Rivers, relatively low altitude.

A. PYRAMIDALIS Miq. ex Lemm. King George's Cypress-Pine

A narrowly conical shrub 1-4 m. tall, with erect, closely arranged branches. Bark brown, smooth. Branchlets divided into long, straight, slender branchlets. Juvenile leaves glaucous, 7-8 mm. long, rarely persistent on mature trees. Leaves scale-like, ovate, spreading, 1-2 mm. long, in 6 ranks, green to gray-green, free at the apex, pointed, somewhat decurrent, slightly keeled. Male cone globular, 2.5-4 mm. long, with 16-18 ovate scales; microsporophylls 2-4. Female cone globose or ovoid, on a short peduncle, gray-brown, 1.5- 2 cm. long, with 6 valvate scales; scales thin, bluntly acute, slightly overlapping; with large rounded or nearly ovate basal bracts. Seeds tan or yellowish-brown, resinous, 5-7 mm. long, wings 1.5-1.9 mm. wide. Cotyledons 2, blue-green, 9-15 mm. long by 1.5-2 mm. wide, apex bluntly acute, stem 0.5-1 mm. thick.
W. Australia: King George's Sound, Baxter to Swan River.

A. PYRAMIDALIS var. ARENARIUS (C. Gardn.) Silba Tamin or Bruce Cypress-Pine.

A small tree 2-5 m. tall. Branches spreading; branchlets short, nearly triangular in the cross-section. Foliage conspicuously glaucous-green. Leaves in 3's, ovate, acute, spreading, loosely imbricate, scale-like, to 2 mm. long, slightly keeled, ovoid-deltoid in the free portion. Male cone oblong, 3.5 mm. long, with 16-18 ovate or rounded scales narrowing in the center to a point. Female cone ovate to obovoid, 1.5-1.6 cm. long by 1.6 cm. wide, apex not out-curved, broadly narrowing, greenish-yellow bloomed glaucous, apex prominently glaucous; with 6 thin, overlapping scales with rounded, hump-backed, glaucous, basal bracts. Seeds tan or yellowish-brown, 6-11 mm. long, 2-3 winged, wings 1-2 mm. wide, hilium 2 mm. long. Cotyledons 2, rarely 3, blue-green, 9-14 mm. long by 1.5-2 mm. wide, stem thin, apex oval and bluntly acute.
W. Australia: Irwin and Avon Districts, Darling Range, Bruce Rock.

AGATHIS Salisb. (Araucariaceae)

A genus of twenty species from the Philippines to Malaysia, Indonesia and Australasia. Trees that are evergreen and usually monoecious. The bark emits a milky sap when punctured. Buds usually globular, with few, imbricate, overlapping scales. Branches horizontal, leaving circular scars on the trunk after they fall. Leaves opposite, decussate, oval-shaped, flat, broad, leathery, thick, multi-veined, sometimes glaucous underneath, with a distinct petiole, spirally arranged on main branchlets, opposite or alternate on side branchlets, reddish when young turning dark green, leaving a rough cushion-like scar after they fall. Male strobili axillary, cylindrical, subtended at the base by rounded,sterile bud scales. Female cones usually on short lateral branchlets, maturing in 2 years, globose-ovoid, with numerous, flattened, broadly ovate scales without bracts and with minute apical umbos. Seeds one per scale, with 2 broad uneven wings. Cotyledons 2.

A. ATROPURPUREA Hyland Blue Kauri

A tree to 50 m. tall. Bark purplish-brown or purplish-black, sometimes glaucous, smooth to coarsely scaly. Branchlets sometimes glaucous. Buds globular, to 1.5 mm. long. Leaves oval-lanceolate to oblong-elliptic, 3.7-4.5 cm. long by 8-14 mm. wide, closely set, glaucous underneath, apex bluntly notched. Male strobili 9-16 mm. long by 4-7 mm. wide; microsporophylls strongly imbricate, margins entire; anthers 2-5; on a peduncle 2-3 mm. long. Female cone globular, 3.5-5.5 cm. wide, olive-green, somewhat glaucous. Seeds tan, to 1.2 cm. long, wings cinnamon-brown, larger wing to 1.5 cm. wide.
Australia: N. Queensland: Cook District, Bellenden Ker Range, 900-1500 m..

A. AUSTRALIS (Lamb.) Steud. New Zealand Kauri

A narrowly conical tree 40-50 m. tall, 3-10 m. in girth or more, becoming flat-topped with age. Trunk remarkably cylindrical. Bark ashy-gray, mottled purple, in large thick plates, smoothish. Branches in whorls or irregularly horizontal. Branchlets smooth, glaucous. Buds rounded, with imbricate scales. Juvenile leaves glaucous-green, 5-10 cm. long. Adult leaves ovate-lanceolate, 1.5-6 cm. long by 1-1.5 cm. wide, green, slightly glaucous underneath near the petiole, obtuse, with 15 parallel nerves, with a short petiole. Usually monoecious. Male strobili cylindrical, 3-6 cm. long by 1 cm. wide, on a stout peduncle 1 mmm. wide; microsporophylls imbricate, margin weakly erose. Female cone subglobose, on a short peduncle, 6 cm. long by 6-8 cm. wide, glaucous-green, scales 1.8 cm. long with a short mucronate umbo.
New Zealand, northern peninsula of Northern Island, lowland elevation.

A. BORNEENSIS Warb. Bornean Kauri
=A. beccarii Warb., =A. latifolia Meij. Dr.,=A. rhomboidalis Warb..

A tree 50-55 m. tall or more, 1-2 m. in girth, with rigid branches. Bark gray or blackish, finely dippled to thinly scaly. Leaves oval, dark green above, paler below, non-glaucous below, narrowing at the base to a short petiole 5 mm. long, narrowing at the other end to a bluntly acute apex, leaf 6-12 cm. long by 2-3.5 cm. wide, margins recurved; with paired resin ducts, one above the other, in some or most of the vascular strands. Male strobili oblong, 4-7 cm. long by 2.5 cm. in diameter, apex rounded, narrowing abruptly at the base to a short peduncle 2-10 mm. long; microsporophylls large, apex exposed, margin semi-circular. Young female cone oval, upper edges of scales more or less spreading. Adult female cone ovoid, 7-10 cm. long by 6-8 cm. wide; scales triangular, well rounded in the upper corners. Seeds obovoid or oblong, 1.3-1.4 cm. long by 7 mm. wide with a decurrent wing.
Malaysia: Malay; Sarawak. Indonesia: Sumatra; Borneo.

A. CELEBICA (Koord.) Warb. Celebes Kauri
=A. hami Meij. Dr.

A tree 60-65 m. tall, to 1.40 m. in girth, with a long clear, cylindrical trunk, indistinctly buttressed at the base.A relatively poor producer of resin. Juvenile leaves to 13 cm. long by 3.5 cm. wide, distinctly lanceolate. Adult leaves oval, acute, 6-8 cm. long by 2-3 cm. wide, well rounded at the apex, petiole indistinct. Male strobili to 3.5 cm. long by 1-1.5 cm. wide; microsporophylls broadly rounded with a narrow flange, exposed; pollen sacs 7-12. Female

cone globular or ovoid, 5.5-8 cm. long by 5-7.8 cm. wide, scales nearly triangular, exposed part of scale extends the entire width of the scale, upper corners of scales usually angular and rigid, scales with a small scallop 1/6 size of the scale near the base. Seeds subovoid, 1.5 cm. long by 1 cm. wide, one wing small, one rather large.
Philippines: Palawan;Indonesia: Celebes; Moluccas, 200-2000 m..

A. CORBASSONII De Laub. Corbasson Kauri

A tree to 40 m. tall. Bark tan to red-brown, resinous, scaly. Juvenile leaves lanceolate, 10-11 cm. long by 1.6-2 cm. wide. Buds yellowish, 4 mm. long, scales finely denticulate. Adult leaves linear,Willow-like, oval, obtuse, 4.5-7 cm. long by 6-11 mm. wide, glaucous underneath, with a long petiole. Male strobili cylindrical, 2.5-5 cm. long by 6-10 mm. wide; microsporophylls strongly imbricate, edges serrulate; anthers 4. Female cone obovate, to 10 cm. long, with broad, round scales without a lip or umbo. Seeds with an oblong nut, 15 mm. long by 10 mm. wide, one wing short and one oval to 2 cm. long by 1.5 cm. wide.
New Caledonia: north and central areas, type near Me Aoui, 300-700 m..

A. ENDERTII Meij. Dr. Endert Kauri

A large tree 60-64 m. tall, to 1 m. in girth. Bark purplish gray-brown. Juvenile leaves large,oval, acute. Adult leaves oval, narrowing at the base to a short petiole to 5 mm. long, narrowing at the other end to a bluntly acute apex, leaves 5-9 cm. long by 2-3 cm. wide, non-glaucous underneath, resin canals isolated. Male strobili cylindrical, 3-4 cm. long by 2-3 cm. wide, rounded at the apex, narrowing to a sessile base; microsporophylls with a semi-circular margin. Young female cone oval, dominated by spreading or reflexed lips of individual scales. Mature female cone oval, to 6 cm. long; scales roughly triangular but well rounded at the upper corners, with a prominent triangular-rounded lip protruding from the upper margin. Seed obovoid, 1 cm. long by 8 mm. wide.
Indonesia: C. Borneo, sandstone regions, sedimentary formations, 220-1600 m..

A. FLAVESCENS Malesian Kauri

A tree to 12 m. tall or more, 0.9-1 m. in girth. Bark fragile, green or brown, with numerous pustules. Branchlets yellowish. Leaves yellowish-green, elliptic-obovate, obtuse, 3.8-6.3 cm. long by 12-25 mm. wide, glaucous below, with a short petiole. Male strobili cylindrical, on a peduncle to 15 mm. long, 2.5-3.8 cm. long by 13 mm. wide, base subtended by 2 large bracts, surface of cone loose.Female cone globose, maturing in 2 years, 6.3 cm. long by 4.5 cm. wide, purplish; scales 3.2 cm. long by 2.5 cm. wide. Seeds ellipsoid, 1.3 cm. long by 0.6 cm. wide, wing to 1.2 cm. long on one side.
Malaysia: N. Malaya, Gunung Tahan and G. Rabong, 1200-1350 m..

A. KINABALUENSIS De Laub. Kinabalu Kauri

A tree to 36 m. tall. Produces a white resin. Bark dark brown externally, internally reddish, granular, exfoliating in irregular plates, with numerous lenticels. Young trees with smooth bark. Juvenile leaves round, usually acuminate, to 9 cm. long by 4.4 cm. wide, on a short peduncle. Adult leaves round, acuminate or obtuse, on a short peduncle, 4-7 cm. long by 1.8-3.2 cm. wide, non-glaucous underneath. Male strobili cylindrical, 2-3 cm. long by 9 mm. in diameter, on a peduncle 4 mm. long; scale apices small triangular; apex of microsporophylls distinctly angled. Young female cone smooth, upper edges of scales imbricate. Female cone to 11 cm. long by 8 cm. in diameter; scales triangular, apex angular and rounded. Seed with an acute projection 2mm. long on upper corner opposite the wing, borne on a scale without a lip.
Malaysia: Sabah; Mt. Kinabalu , Ranau, 1500-2400 m..

A. LABILLARDIERII Warb. Western New Guinean Kauri

A tree to 60 m. tall, to 2 m. in girth. Bark dark brown. Crown with branches diagonally upwards. Branchlets cylindrical, secondary branches striated. Leaves oblong-lanceolate or elliptic, 7.5-10 cm. long by 1.8-3 cm. wide, shiny below, apex obtuse or bluntly acute, petiole 5-7 mm. long by 2-3 mm. wide. Male strobili broadly cylindrical, on a stout short peduncle 1-2 mm. long, 1.8-3 cm. long by 1-1.5 cm. wide; microsporophylls umbonate, head with a rugulose 1 mm. rectangular umbo. Female cone globular, 7.5-8.5 cm. long by 6 cm. wide, greenish; scales imbricate, angular. Seeds 1 cm. long by 8 mm. wide, with a small distinct wing.
New Guinea: Irian Jaya to N.W. Papua, 200-1700 m..

A. LANCEOLATA Lindl. ex Warb. Koghis Kauri

A tree to 40 m. tall, sometimes free of branches for 15 m. high. Crown irregular, dense with ascending branches. Branchlets in whorls of 4. Bark red-brown, finely scaly. Buds globular, 4-8 mm. in diameter;scales numerous, imbricate. Juvenile leaves attenuate, 9 cm. long by 3.5 cm. wide, on a short peduncle. Adult leaves lanceolate to elliptic, 6-8 cm. long by 1.6-2 cm. wide, dark green above, non-glaucous below, margins pale and recurved, apex acute. Male strobili in opposite pairs in axils of the leaves, cylindrical, 13-23 mm. long by 7-10 mm. in diameter, on a peduncle 2-4 mm. long; microsporophylls imbricate, entire, head subreniform. Female cone elliptic to globular, 12 cm. long by 10 cm. wide, scales broadly rounded. Seed ovoid, 1.2-1.5 cm. long by 7 mm. wide with a wide spreading wing 20 mm. long by 13 mm. wide.
S. New Caledonia, type near Mt. Koghis, 100-900 m..

A. LENTICULA De Laub. Sabah Kauri

An immense tree to 45 m. tall. Produces white resin. Bark gray-white externally, internally reddish-brown, exfoliating in irregular plates, with numerous lenticels. Juvenile trees with flaky bark. Juvenile leaves round, acuminate, on a short peduncle, to 10 cm. long by 4.4 cm. wide. Adult leaves lenticular, apex acute, 5-7 cm. long by 1.8-2.4 cm. wide, glaucous below, on a short peduncle. Male strobili cylindrical, to 4 cm. long by 10 mm. wide, on a peduncle to 6 mm. long; scale apices round. Female cone scales semi-elliptical, 28 mm. high by 40-45 mm. wide.Young female cone oval with imbricate margins of seed scales sometimes slightly raised.
Malaysia: Sabah; Mt. Kinabalu, Ranau, 1140-1680 m..

A. MACROPHYLLA (Lindl.) Mast. Melanesian Kauri
=A. obtusa (Lindl.) Mast., =A. vitiensis (Seem.) Benth. et Hook. f.

A stout tree 30-45 m. tall, 3.6-5 m. in girth, with wide-spreading branches. Bark whitish, reddish internally, strongly scaly. Crown to 36 m. in diameter with huge limbs. Buds small, brown, rounded. Branchlets nearly quadrangular, smooth, olive-brown. Leaves lanceolate, thick, 9-18 cm. long by 1.8-5 cm. wide, dark green above, narrowed at the apex, margins recurved, often glaucous below, obtuse, with a short flattened petiole. Male strobili cylindrical, 2-2.5 cm. long by 0.8-1 cm. wide, on a stout peduncle 3-7 mm. long; microsporophylls strongly imbricate, margins thin, entire or erose. Female cone ovoid or globular, 9-12.5 cm. long by 7-10 cm. wide, glaucous; scales acuminate, with a lip. Seed to 1.2 cm. long, one wing short, another to 2 cm. long by 1.5 cm. wide.
Solomon Islands; New Hebrides; Fiji, 200-900 m..

A. MICROSTACHYA J.F. Bail. et C.T. White Atherton Kauri

A tree 48-50 m. tall, with a smooth trunk for 30 m. Bark brown to gray-brown, coarsely scaly. Leaves lanceolate to elliptic, obtuse, 3.7-6.5 cm. long by 1.2-1.5 cm. wide, with a short indistinct petiole. Male strobili cylindrical, small, 11-16 mm. long by 6-8 mm. in diameter, subglobose or shortly ovoid; microsporophylls umbonate, non-imbricate, heads forming an irregular honey-comb. Female cone globose to ovoid, 10-15 cm. long by 7.5-10 cm. wide, usually glaucous, scales rounded.
Australia: N. Queensland, Cook District, coastal areas, 500-700 m..

A. MONTANA De Laub. Panie Kauri

A small tree 15-20 m. tall, with a large, flattened crown. Bark tan, red-brown inner-bark, exfoliating in fine plates or scales, with small lenticels. Buds globular. Juvenile leaves oval-lanceolate, attenuate at the base, 8-10 cm. long by 2.6-3.5 cm. wide. Adult leaves lanceolate to elliptic, distichous, oval-lanceolate, 6-8 cm. long by 1.5-2 cm. wide, bluntly acute, on a short petiole. Male strobili cylindrical, 4-5 cm. long by 0.8-1 cm. wide; microsporophylls imbricate, slightly denticulate. Female cone on a thick peduncle, globular, 9 cm. long by 7 cm. wide, scales ovoid and obtuse. Seed with a rounded nut and a obovoid wing on one side.
N.E. New Caledonia: Mount Panie, 1000-1640 m..

A. MOOREI (Lindl.) Mast. Moore Kauri

A tree 15-30 m. tall, with a clear bole for 18 m.. Crown rounded and spreading. Bark whitish, tan or reddish inner-bark, exfoliating in fine scales. Branches fine, pendent at the tips. Young trees with forked branches. Buds short, round, with few,large scales. Juvenile leaves lanceolate, distichous, 20 cm. long by 3.3 cm. wide, on a short, wide petiole. Adult leaves lanceolate to elliptic, attenuate, bluntly acute, dark green, pale below, 5-7 cm. long by 0.8-1.2 cm. wide, nearly sessile. Male strobili cylindrical, 2.5-3 cm. long by 0.8-0.9 cm. in diameter, on a peduncle 8-12 mm. long; microsporophylls imbricate, irregularly angulose and finely denticulate. Female cone globular or pyriform, 10-15 cm. long by 9-12 cm. in diameter, scales broadly rounded. Seed with a narrow nut , with one oblique wing and one small, acute wing.
New Caledonia: Pembe to Thio; Dumbea to Prony, 200-1000 m..

A. PHILIPPINENSIS Warb. Indonesian Kauri
=A. dammara (Lamb.) Rich., in part.

A tree 45-60 m. tall, 1.8-6 m. in girth, with a conical crown and with somewhat pendent branches. Bark reddish-gray, thick, with numerous resin blisters. Branches cylindrical to angular, subverticillate, dull light green. Buds rounded, with few, imbricate scales. Juvenile leaves distinctly acuminate, 7 cm. long by 3 cm. wide, oval, with an acute apex. Adult leaves dark green, leathery, narrow, non-acuminate, 4-5 cm. long by 1.5-2 cm. wide, rounded at the apex, petiole 3-8 mm. long. Trees produce abundant resin from the wood. Male strobili to 2.5 cm. long; microsporophylls hump-shaped due to a broadly depressed flange which occupies 1/2 of the exposed surface; pollen sacs 3-6. Female cone globular, 7.5-12 cm. long; exposed part of the scales much less than the total width of the scale, upper corners of scales are broadly rounded and thin, scales with a prominent scallop on lower third of each scale margin. Seed to 1.3 cm. long, one wing to 1.3 cm. long, another much shorter.
Philippines; Indonesia: Sumatra; Java; Borneo; Celebes; Moluccas,450-2500 m..

A. OVATA (Moore ex Veill.) Warb. Scrub Kauri
=A. hypoleuca (Moore) Warb.

A shrub or small tree 1-8 m. tall, often branching from the base, or to 25 m. tall with a clear bole for 12 m. high. Crown somewhat flattened. Bark with prominent fissures, whitish or tan, interior-bark red-brown. Branches alternate, opposite, or in whorls of 3-4, yellowish-brown. Buds round, with 4 densely imbricate scales. Leaves ovate to ovate-elliptic, dark green, pale or glaucous below, 4-8 cm. long by 1-5 cm. wide, apex broadly obtuse, petiole flattened, margins slightly recurved. Male strobili cylindrical, glaucous, 3-5 cm. long by 1-1.5 cm. wide, on a short robust peduncle 4-6 mm. long; microsporophylls imbricate, triangular. Female cone globular, to 12 cm. long by 10 cm. wide, scales brown with a short-pointed umbo. Seeds 9-11 mm. long by 8 mm. wide, with a broad nut and an oblique wing on one side.
S. New Caledonia: Mt. Humboldt to Mt. des Sources, 150-1000 m..

A. ORBICULA De Laub. Sarawak Kauri

A tree to 40 m. tall. Produces a yellowish resin. Bark dark brown externally, internally granular and reddish-brown, exfoliating in irregular plates, with few scattered lenticels. Juvenile leaves round, acute, to 6.5 cm. long by 2.8 cm. wide, on a short peduncle. Adult leaves oval to nearly circular, obtuse or bluntly acute, closely set, glaucous beneath, 2.4-3.6 cm. long by 1.2-2.4 cm. wide, on a short peduncle. Male strobili ovate or cylindrical, 9-14 mm. long by 4-6 mm. in diameter, on a peduncle 2-3 mm. long; scale apices are rounded; exposed parts of microsporophylls are humpy. Young female cone oval. Adult female cone to 7 cm. long by 4.5 cm. in diameter; upper edges of scales imbricate, later elliptic.
Malaysia: Sabah, Ulu Moyah; Sarawak: Bumbong Rumah, 450-1050 m..

A. ROBUSTA (C. Moore ex F. Muell.) F.M. Bail. Smooth-bark Kauri
=A. palmerstonii (F.Muell.) F.M. Bail.

A tree 36-50 m. tall, with a long, straight, clear bole. Bark brown, with small, roundish scales. Branches slightly angled, smooth. Buds small, round, scales compressed. Juvenile leaves broadly ovate, newer growth reddish-green. Adult leaves lanceolate to elliptic, dark green, pale green below, 5-15 cm. long by 2-5 cm. wide, margins thickened and recurved, with a broad flattened petiole, apex acuminate. Male strobili cylindrical, 5-10 cm. long by 1 cm. wide; microsporophylls weakly imbricate, head rounded. Female cone globose to cylindrical, maturing in 2 years, dark green turning red-brown, 10-15 cm. long by 7.5-10 cm. wide. Seeds flattened, oblong-ovoid, 1.3 cm. long, one wing to 2.5 cm. long, the other much shorter.
Australia: Queensland: Cook, North Kennedy & Wide Bay Districts, 0-900 m..

A. SPATHULATA De Laub. Eastern New Guinean Kauri
=A. robusta subsp. nesophila Whitm.

A tree 25-55 m. tall, to 104 cm. in girth, with a long clear bole and with a spreading crown. Bark mottly gray-rust brown, shedding in small plates. Buds globular, 2-4 mm. long, brown. Leaves nearly obovate to spoon-shaped, bluntly acute, dark green, glossy, mid-green to paler below, 6.8-9.5 cm. long by 1.5-2.6 cm. wide. Male strobili light green, relatively thick, to 13 mm. wide; microsporophylls relatively thin, 1-2 mm. wide. Female cone blackish-green at first, then brown, scales shiny, globose, to 7.6 cm. long by 10.2 cm. wide.
E. New Guinea: Papua, Morobe District to New Britain, 518-1676 m..

AMENTOTAXUS Pilg. (Taxaceae)

Two species of evergreen shrubs or small trees from S.E. Asia. Branchlets opposite. Buds small, ovoid, with bluntly acute scales. Leaves opposite, flattened, lanceolate, nearly 2-ranked, somewhat falcate, leathery, short-stalked, bluntly acute, dark green above with a prominent midrib, with 2 lines of glaucous stomata below, margins greenish. Dioecious strobili, on seasonal branchlets. Male strobili in long spike-like racemes, in groups of 2-4, pendent, at tips of branchlets, with opposite clusters of stamens and with peltate scales. Female cone solitary, on the underside of the branchlets, on a long pendent peduncle, axillary, globose to oblong, base subtended by rounded persistent bracts or scales, fleshy, reddish-yellow. Seeds one per cone, wingless, almost completely covered by the aril except near the apex.

A. ARGOTAENIA (Hance) Pilg. Chinese Flowering Yew
=A. assamica Ferguson, =A. cathayensis Li.

A shrub 2-7 m. tall, with spreading branches. Branchlets light olive-green. Leaves 3-11 cm. long by 6-11 mm. wide, leathery, straight, spreading slightly forwards, with 2 white stomatal bands below nearly as broad as the marginal bands, apex bluntly acute or obtuse. Male strobili in groups of 1-3 at tips of branchlets, 5-6 cm. long, with 2-5 pollen sacs. Female cone ovoid or somewhat globose, light olive-green at first, 2-2.5 cm. long by 1.3 cm. wide. Seed to 1.3 cm. long.
China: S.E. Tibet to N.W. Kiangsi; N.E. India: Assam, 300-1100 m..

A. FORMOSANA Li Formosan Flowering Yew
=A. yunnanensis Li

A small, sparsely branched tree 10-15 m. tall, 25-30 cm. in girth. Branchlets yellowish. Leaves spreading sideways, falcate, 3.5-10 cm. long by 5-15 mm. wide, with yellowish-white stomatal bands below 2-3 times broader than the marginal bands, apex acute. Male strobili in groups of 4-8, 10-15 cm. long, with 5-8 pollen sacs. Female cones oblong-ellipsoidal, on a peduncle to 19 mm. long, 2.2-3 cm. long by 0.9-1.4 cm. wide. Seed 1.5-2 cm. long, brown.
N. Vietnam: Chapa; China: S.W. Yunnan; S. Taiwan: Taito, 700-1300 m..

ARAUCARIA Jussieu (Araucariaceae)

A genus of nineteen species from South America and Australasia. Evergreen, mostly dioecious trees with regularly whorled branches. Buds inconspicuous. Young trees branched to the ground, old trees with a long clear bole and with a flattened crown. Juvenile leaves needle-like, thin, loosely imbricate, spirally arranged. Adult leaves usually scale-like or sometimes needle-like, spirally arranged or nearly 2-ranked, usually closely imbricate, overlapping, flattened, sometimes lanceolate and sharp pointed, persistent for many years, often with faint stomata above. Male cones terminal and solitary or disposed in clusters, with numerous spirally arranged stamens, anthers 6-8 celled. Female cones globose, ripening in 2-3 years, heavy, milky; scales usually with thin spiny apical umbos, scales thin and somewhat flattened, scales breaking apart from the central axis upon maturity; ovules one per scale, united with the scale. Seeds united with the scale, sometimes edible, usually winged on the edges. Cotyledons 2-4. Germination with epigeal or hypogeal cotyledons.

A. ANGUSTIFOLIA O. Kuntze Parana Araucaria

A tree to 30 m. tall, with a straight trunk and with horizontal branches, becoming flat-topped. Bark finely scaly, resinous, striated horizontally. Branchlets arranged in whorls of 4-8. Leaves sharply acute, needle-like, lanceolate, midrib visible, usually in pairs, green or glaucous, thick, 3-6 cm. long by 6 mm. wide, with stomata above, keeled below. Leaves on fertile branchlets densely disposed spirally, much shorter, denser, with prominent stomata below. Male cone dense, shortly extending beyond the axil of the leaves, 10-18 cm. long by 1.2-2.5 cm. wide, scales imbricate. Female cone globular, 18-25 cm. long by 13 cm. wide, chestnut-brown, maturing in 2-3 years, scales with a long recurved bract or umbo. Seeds light brown, 5 cm. long by 0.8-2 cm. wide, with narrow wings. Germination hypogeal. Cotyledons 2.
S. Brazil: Santa Catarina, Canoinhas; N. Argentina; Paraguay, 500-2300 m..

A. ARAUCANA (Molina) K. Koch Monkey Puzzle Araucaria
=A. imbricata Pavon

A pyramidal tree 30-40 m. tall, 1-1.5 m. in girth. Bark gray-brown, resinous, smooth, marked by rings made by old branch scars. Branches horizontal, in whorls of five, in opposite pairs, lateral branches horizontal or slightly pendent. Leaves scale-like, persistent on the trunk even to the base, ovate-lanceolate, shiny green on both surfaces, 3-5 cm. long by

0.8-2.5 cm. wide, surface marked with longitudinal lines, with stomata on both faces, persist 10-15 years. Dioecious or monoecious. Male cone solitary or in groups, erect, yellowish-brown, 7-15 cm. long by 5 cm. wide, with 20 whorled scales; microsporophylls acute, recurved. Female cone globular, dark brown, maturing in 2-3 years, 10-18 cm. long by 8-15 cm. wide, falling off at maturity, scales with a long triangular recurved point. Seeds bright brown to orangish, triangular, 2.5-4 cm. long by 0.7-1.5 cm. wide, with a long narrow nut, with 2 small even wings at the top, margins denticulate at the apex.
S. Chile and S.W. Argentina; W. Andes, 950-1050 m..

A. BERNIERI Buchholz — Bernier Araucaria

A narrowly columnar tree 40-50 m. tall. Bark gray, exfoliating in thin strips. Branchlets in one plane, forming a wide U-like pattern, 4-6 mm. in diameter. Juvenile leaves triangular, needle-like, apex sharply acute, to 7 mm. long, relatively thick. Adult leaves scale-like, imbricate, triangular, keeled, 2-3.5 mm. long by 1.5-2.5 mm. wide, apex incurved. Male cone bluish-white, cylindrical, 4-9 cm. long by 8-16 mm. wide, scales lanceolate, microsporophylls triangular, pollen sacs 4-6. Female cone prominently glaucous, to 10 cm. long by 7.5-8 cm. wide, recurved lip of scale raised, bracts to 5 mm. long. Seeds to 3 cm. long, nuts ovate, wings broadly rounded.Germination epigeal.
New Caledonia: Poum, and from Canala to Plaine des Lacs, 0-700 m..

A. BIDWILLII Hook. — Bunya-Bunya Araucaria

A conical tree to 45 m. tall, 90-120 cm. in girth or more, becoming round-topped. Trunk free of branches for a considerable height. Branches long, pendent, branchlets clustered in whorls of 10-15. Bark gray-brown, thick, smooth, partially exfoliating in thin scales. Leaves spirally arranged, needle-like, non-imbricate, lanceolate, flattened, without a midrib, dark green, margins entire, apex with a long spine, to 5 cm. long by 0.5-1 cm. wide, with irregular stomata above, stomata below in regular lines. Leaves on fertile branchlets incurved, non-keeled, 2.5 cm. long. Male cone in groups of 15-20, 1.2 cm. wide on high branches, on short branchlets; microsporophylls imbricate and denticulate. Female cone on branches high from the ground, erect, elliptic or globular, 4.5 kg. heavy, to 27 cm. long by 25 cm. wide or larger, scales with a long recurved spine. Seeds rounded, with rudimentary wings, 4-7 cm. long by 2.5 cm. wide, about 150 per cone. Cotyledons 2, germination hypogeal.
Australia: S.E. Queensland, Cook District, Mount Bunya, 100-1100 m..

A. BIRAMULATA Buchholz — Biramule Araucaria

A columnar tree to 30 m. tall, with numerous, spreading branches. Bark gray or brown, exfoliating in thin strips. Branches multi-stemmed at the tips, seasonal branches 8-13 mm. in diameter. Juvenile foliage needle-like, non-flattened, curved inwards, apex sharply acute. Adult leaves spreading, ovate, scale-like, with a prominent midrib, 7-9 mm. long by 5-6 mm. wide, keeled, acuminate, stomata on both surfaces, apex incurved. Male cone cylindrical, 6-7 cm. long by 1.5-2 cm. wide, scales acuminate, pollen sacs 7-8, microsporophylls triangular. Female cone 9-10 cm. long by 8-9 cm. wide; bracts erect, to 8 mm. long. Seeds to 3 cm. long, with a long triangular nut and with ovate wings. Germination epigeal.
W. New Caledonia, type from Mois de Mai, 300-1050 m..

A. COLUMNARIS (Forst.) Hook. Cook or Coral Reef Araucaria
=A. cookii R. Brown ex Endl.

A narrowly conical tree to 60 m. tall. Trunk clear, then later with numerous short shoots. Bark gray, papery, exfoliating in thin strips. Branchlets cord-like, growing in one plane, 9-10 mm. in diameter. Juvenile leaves needle-like, imbricate, lanceolate, 4-7 mm. long by 2-3 mm. wide, apex incurved. Adult leaves scale-like, imbricate, triangular, acuminate, obtuse, midrib faint, 5-7 mm. long by 3-5 mm. wide, apex incurved. Male cone oblong-cylindrical, 5-10 cm. long by 15-22 mm. wide; scales triangular, finely teethed, pollen sacs 10; microsporophylls cuspidate. Female cone 10-15 cm. long by 7-11 cm. wide, with short bracts to 7 mm. long. Seeds 3-3.5 cm. long, nut ovate, wings broadly rounded. Germination epigeal.
S. New Caledonia: Ouinne to Prony and Isle of Pines, 0-50 m..

A. CUNNINGHAMII Aiton ex D.Don Australian Hoop Araucaria

An asymetrical tree to 60 m. tall, 4 m. in girth. Bark rough, in horizontal bands, exfoliating in fine circular bands. Branches long, branchlets in tufts at the ends. Seasonal branchlets to 2 cm. in diameter. Juvenile leaves spirally arranged, green or glaucous, margins entire, flattened, stomata on both surfaces. Adult leaves scale-like, 0.8-2 cm. long, incurved,acute, imbricate, keeled on both sides, stomata on both surfaces. Male cone cylindrical, 2-3 cm. long by 5-7 mm. wide, with short involucral leaves, with 10 scales; microsporophylls rhombic, obtuse. Female cone ovoid, symetrical, 8-10 cm. long by 6-8 cm. wide, scales with longer reflexed spines than the New Guinea plants. Seeds 1.5 cm. long by 6-7 mm. wide, with narrow wings. Cotyledons 2, germination epigeal.
Australia: E. Queensland; New South Wales, Macleay River, 0-1000 m..

A. CUNNINGHAMII var. PAPUANA Laut. New Guinean Hoop Pine
=A. beccari Warb.

A tree 22-60 m. tall, to 1 m. in girth, with symmetrical branches. Bark peeling off in thin rolls. Leaves acute, 1 cm. long by 2.5 mm. wide, keeled on both faces, apex recurved and spine-tipped. Male cone relatively short, 2.5 cm. long by 0.5 cm. wide. Female cone to 11 cm. long, bracts black and longer. Seeds shorter and broader with larger wings, nut 8 mm. wide, wing 10 mm. wide, entire seed 2.5 cm. long by 3.5 cm. wide.
W. New Guinea: Papua New Guinea westwards, 610-2400 m..

A. HETEROPHYLLA (Salisb.) Franco Norfolk Island Araucaria
=A. excelsa (Lamb.) R. Br. ex Aiton, in part.

A conical tree 50-70 m. tall, 1.25-1.75 m. in girth. Bark gray-brown, exfoliating in fine scales. Branches in a flat horizontal plane, sometimes pendent, branchlets in whorls of 4-7. Foliage dimorphic. Juvenile leaves awl-shaped, incurved, green, needle-like, to 1.2 cm. long. Adult leaves scale-like, 4-5 mm. long, incurved, densely arranged, bright dark green; on fertile branchlets overlapping, broadly ovate, spine-tipped, 6 mm. long by 4-6 mm. wide. Male cone in clusters, elongated, 4 cm. long, yellowish-brown or reddish; microsporophylls acute, margins ciliate, denticulate. Female cone broader than long, 12-15 cm. long, with triangular scales and a long incurved bract. Seeds 2.5-3 cm. long by 1.2 cm. wide, with broad wings. Cotyledons 4, epigeal.
Australia: Norfolk Island endemic, low tropical areas.

A. HUMBOLDTENSIS Buchholz Humboldt Araucaria

A tree 6-15 m. tall, with a candelabra-like crown. Bark exfoliating in quadrangular scales or in thin strips, bright brown turning gray. Branches somewhat in one plane, in a V-like pattern, 8-10 mm. in diameter. Juvenile leaves scale-like, triangular, 2.5-4 mm. long by 2-3 mm. wide, apex incurved. Adult leaves scale-like, midrib prominent, keeled, ovate, apex acuminate and incurved, 5-6 mm. long by 4-5 mm. wide. Male cone cylindrical, to 6 cm. long by 15 mm. wide, twisted, microsporophylls triangular, pollen sacs 6. Female cone subglobose, 9 cm. long by 8 cm. wide; bracts erect to 6 mm. long. Seed to 3 cm. long with a broad nut and with broad wings. Germination epigeal.
S. New Caledonia: Mt. Humboldt; Mt. Mou and Mt. des Sources, 750-1500 m..

A. HUNSTEINII K. Schumm. et Hollr. Hunstein Araucaria
=A. klinkii Lauterb. ex Engl.,=A. schumanniana Warb.

A pyramidal tree to 85 m. tall, to 3 m. in girth, becoming open and flat-topped with age. Bark dark brown, fissured, exfoliating in corky plates, resinous. Bark on branchlets deep red. Branchlets whorled. Juvenile leaves awl-shaped. Adult leaves lanceolate, 6-15 cm. long by 1-2 cm. wide, needle-like, flattened, attenuate, with linear venation, clustered near ends of branchlets. Male cones cylindrical, 20 cm. long by 1.8-2.5 cm. wide, microsporophylls lanceolate. Female cone ovoid-oblong, 15-20 cm. long by 12.5 cm. wide, scales with small recurved bracts. Seeds triangular; nut to 2.5 cm. long , relatively narrow; wings broad to 2.5 cm. wide. Cotyledons 2, germination epigeal.
N.E. New Guinea: Bulolo Valley, 600-2000 m..

A. LAUBENFELSII Corbasson De Laubenfels Araucaria

A columnar tree 10-50 m. tall, branches dense and spreading. Bark gray, exfoliating in thin strips or irregular scales. Branchlets somewhat twisted, 18-28 mm. in diameter. Juvenile leaves spreading, needle-like, non-flattened, apex incurved, 10-15 mm. long. Adult leaves scale-like, triangular, imbricate, apex acuminate and incurved, midrib prominent, 1.2-2 cm. long by 8-10 mm. wide. Male cone cylindrical, curved, 12-15 cm. long by 22-28 mm. wide, scales ovate, microsporophylls triangular, pollen sacs 12. Female cone globular, 10-12 cm. long by 8-9 cm. wide, with long erect bracts 8-10 mm. long recurved at the tips. Seed to 3 cm. long, wings rounded, nut broad. Cotyledons 4, germination epigeal.
S. New Caledonia: Mt. Mou; Mt. des Sources; Mt. Dzumac, 400-1400 m..

A. LUXURIANS (Brong. et Griseb.) De Laub. Coast Araucaria

A columnar tree to 30 m. tall, with a dense rounded crown. Bark gray, exfoliating in thin strips. Twigs multi-stemmed at ends forming a fan-shaped branchlet, branchlets 10-18 mm. in diameter. Juvenile leaves scale-like, ovate, non-flattened, spreading, 6-12 mm. long. Adult leaves imbricate, scale-like, ovate, 5-7 mm. long by 4-5 mm. wide, midrib prominent. Male cone cylindrical, 12-17 cm. long by 25-28 mm. wide, scales triangular and acuminate, microsporophylls oval, pollen sacs 12-15. Female cone 10-12 cm. long by 8-10 cm. wide; bracts short and stout, to 10 mm. long. Seed 3-3.5 cm. long, with an elongated nut and with triangular wings. Germination epigeal.
S. New Caledonia: along the coast, type near Canala, 0-200 m..

A. MONTANA Brong. et Griseb. Mountain Araucaria

A columnar tree 10-40 m. tall. Branches numerous and spreading, 15-22 mm. in diameter. Bark dark brown or gray, exfoliating in thin strips or scaly. Juvenile leaves scale-like, non-flattened, ovate, lanceolate, 10 mm. long by 4-5 mm. wide, apex incurved. Adult leaves scale-like, bluntly acute to obtuse, ovate, 11-14 mm. long by 7-8 mm. wide, loosely imbricate, apex incurved, midrib prominent. Male cone cylindrical, 8-13.5 cm. long by 20-28 mm. wide, scales triangular, pollen sacs 12, microsporophylls triangular. Female cone 8-9 cm. long by 6-8 cm. wide; bracts short and acuminate, 5-10 mm. long. Seed to 3.2 cm. long, with oval wings and an elongated nut. Germination epigeal.

N. New Caledonia, type near Canala, 200-1400 m..

A. MUELLERI (Carr.) Brong. et Griseb. Mueller Araucaria

A tree 10-25 m. tall, with a candelabra-like crown. Bark gray, exfoliating in scales or thin strips. Juvenile leaves triangular, somewhat flattened, 2-2.5 cm. long, scale-like, sharply acute. Branches spreading, lanceolate, branchlets 3-5 cm. in diameter. Adult leaves scale-like, triangular, imbricate, stomata on both surfaces, midrib prominent, 3-3.5 cm. long by 1.5-2 cm. wide, apex acuminate and incurved. Male cone cylindrical, 13-25 cm. long by 28-37 mm. wide, scales acuminate at the apex, microsporophylls cuspidate, pollen sacs 20 per scale. Female cone 11-15 cm. long by 8-10 cm. wide; with short, erect bracts 10-20 mm. long. Seeds 3-3.2 cm. long, with narrow, triangular nuts; wings short and broad. Germination epigeal.

S. New Caledonia: Mt. Koghis to Mt. des Sources, 150-1400 m..

A. NEMOROSA De Laub. Boise Araucaria

A tree to 15 m. tall, with an oval or conical crown. Branchlets 8-12 mm. in diameter. Juvenile leaves needle-like, lanceolate, curved inwards, relatively thick. Adult leaves imbricate, lanceolate, narrow, scale-like, midrib prominent, keeled dorsally, 6-10 mm. long by 1.5-3 mm. wide, apex bluntly acute and incurved. Male cone cylindrical, 8 cm. long by 14 mm. wide, microsporophylls triangular, pollen sacs 6. Female cone ovoid, 11 cm. long by 5-9 cm. wide, with long reflexed bracts 12-20 mm. long. Seeds to 30 mm. long, nut somewhat rectangular, wings broadly ovate. Cotyledons 4, germination epigeal.

S. New Caledonia : Port Boise, endangered, to 10 m. altitude.

A. RULEI Muell. Rule Araucaria

A tree to 30 m. tall, with a spider-like crown.Bark dark brown, exfoliating in thin strips or scaly. Juvenile branches distichous. Adult branchlets 2-2.5 cm. in diameter, in long whip-like cords. Juvenile leaves narrow, scale-like, incurved, sharply acute. Adult leaves scale-like, dark green, twisted, imbricate, lanceolate, midrib prominent, apex incurved, 2-2.5 cm. long by 1.1-1.4 cm. wide. Male cone cylindrical, 13 cm. long by 30 mm. wide, scales triangular, pollen sacs 15, microsporophylls triangular. Female cone to 12 cm. long by 8 cm. wide; bracts erect, triangular to 15 mm. long with a wide base. Seeds to 3 cm. long, nut with an elongated tip, wings ovate. Germination epigeal.

New Caledonia: central and southern areas, type near Presque de Bogota, at 150-1150 m..

A. SCHMIDII De Laub. Schmid Araucaria

A tree to 30 m. tall, with numerous ascending branches. Bark gray, exfoliating in long strips 10-15 cm. wide. Primary branches spreading, pinnate, in a multi-stemmed U-like pattern. Branchlets in 2-ranks, 6-9 mm. in diameter. Juvenile leaves lanceolate, keeled, 18 mm. long by 2 mm. wide by 1.5 mm. thick, needle-like, pungent, apex incurved. Adult leaves imbricate, lanceolate, keeled, 7-10 mm. long by 1.5-2 mm. wide, needle-like, apex incurved. Female cones not seen. Germination reportedly epigeal.
N.E. New Caledonia: Mount Panie, rare, 1500-1630 m..

A. SCOPULORUM De Laub. Rock Araucaria

A tree 4-20 m. tall, with an oval crown. Bark exfoliating in thin strips, light gray, nearly white. Juvenile branches spreading. Adult branchlets pinnate, forming a wide U-like pattern in one plane, 6-8 mm. in diameter. Juvenile leaves needle-like, 7 mm. long, curved inwards. Adult leaves imbricate, in dense sets, ovate, midrib prominent, scale-like, apex slightly incurved, 3-4 mm. long by 2.5-3 mm. wide. Male cone cylindrical, twisted, 3-5 cm. long by 7-11 mm. wide, scales ovate, pollen sacs 6, microsporophylls triangular. Female cones not seen; scales with an triangular bract to 5 mm. long. Seeds to 3 cm. long, with an oblong nut with an elongated tip, wings broadly acuminate. Germination epigeal.
N.E. New Caledonia: Poum; Dothio; Cap Bocage, 0-300 m..

A. SUBULATA Vieill. Narrow-leaf Araucaria
=A. balansae Brong. et Griseb.

A columnar tree to 50 m. tall. Bark gray, exfoliating in thin strips. Branches in one plane in a sharp V-like pattern or in a U-like pattern, 5-9 mm. in diameter. Juvenile leaves needle-like, narrowly lanceolate, curved inwards. Adult leaves scale-like, midrib prominent, lanceolate, curved inwards, 4-6 mm. long by 2-2.5 mm. wide, keeled dorsally. Male cone cylindrical, 5-10 cm. long by 1.2-1.3 cm. wide, pollen sacs 10, microsporophylls triangular. Female cone globose, 11-12 cm. long by 7-9 cm. wide, bracts short, to 6 mm. long. Seeds to 3 cm. long, nuts ovate, wings nearly rectangular. Germination epigeal.
New Caledonia: Ignambi; Canala; Mt. Dzumac; Mt. des Sources, 320-1900 m..

ATHROTAXIS D. Don (Taxodiaceae)

A genus of two species and one hybrid from W. Tasmania. Monoecious evergreen trees with bark peeling off in thin, long strips. Branchlets spreading, thick, ultimate branchlets deciduous. Buds inconspicuous. Leaves homomorphic, scale-like and appressed or lanceolate and loosely disposed, uniform in shape and size, thick, with faint or prominent stomata. Male cones solitary, catkin-like, with imbricate spirally arranged aments, anthers 2-celled. Female cones woody, globose, maturing in one year, with many triangular scales; scales with a small, recurved apical umbo or the scales are thin, papery and without umbos. Seeds 3-6 per scale, oblong, thin, with 2 narrow even wings. Cotyledons 2.

A. CUPRESSOIDES D. Don Smooth or Little-leaf Athrotaxis
=A. imbricata Maule ex Gord.

A broadly columnar tree 6-15 m. tall, with ascending branches. Bark brownish-gray, slightly shreddy. Branchlets thick,somewhat fleshy, produced in whorls of 3. Leaves scale-like, dark green, closely imbricate, obtuse, 3-4 mm. long, keeled, with numerous microscopic stomata, margins translucent and denticulate. Male cone at tips of branchlets,globular, 3 mm. long, with 2-4 pollen sacs. Female cone produced on terminal side shoots,pendent, orange, globose, 0.5-1.5 cm. long by 0.6 cm. wide; scales thickened, with a flattened, small, triangular, recurved, apical umbo. Seeds with 2 even wings. Cotyledons 2, germination epigeal.
Australia: W. Tasmania; Launceston, Lake Saint Clair, 640-1067 m..

A. x LAXIFOLIA Hook. Summit or Yellow-twig Athrotaxis
=A. doniana Henk. et Hochst.

A conical tree 12-21 m. tall. Bark dark orange-brown, deeply fissured, flaky, exfoliating. Seasonal branchlets pale or bright yellow. Trees sparsely branched. Leaves ovate-lanceolate, slightly spreading, acute, 6 mm. long, with 2 white bands of stomata below, margins entire and translucent, apex incurved. Male cone with 2 pollen sacs. Female cone produced in pairs, densely clustered on ends of short shoots, ovoid, bright yellow or pale, 1.5-3 cm. wide, on a peduncle 2-3 mm. long; scales thin, triangular, papery, wavy, glaucous at the base, without prominent umbos. Seeds with 2 narrow wings.
Australia: W. Tasmania, on mountain summits, to 1219 m..

A. SELAGINOIDES D. Don King William or Longleaf Athrotaxis
=A. alpina Van Houtte ex Gord.

A conical tree 27-30 m. tall. Bark dark orange-red, slightly furrowed, exfoliating in long strips. Branchlets upright, tufted near the crown, smooth, bright light green. Leaves spirally arranged, shiny green, free and spreading, acute, awl-shaped, lanceolate, pointing forwards, apex incurved and sharply acuminate, 8-13 mm. long, keeled on back with 2 small glaucous depressions, with two bright bluish-white bands beneath, margins entire. Male cones terminal on short branchlets, with 2 pollen sacs. Female cones on a peduncle 2-3 mm. long, globular, 2.5-3 cm. long, orange turning brown; scales papery, triangular, acuminate, denticulate. Seeds 2-4 per cone scale.
Australia : W. Tasmania; Launceston, Hartz Mts., 914-1219 m..

AUSTROTAXUS Compt. (Taxaceae)

A monotypic genus from New Caledonia. A monoecious tree with distinct elongated,acuminate buds with few, long, triangular scales. Leaves spirally arranged, narrowly lanceolate, Podocarpus-like , acute, leathery, grooved above, with a prominent midrib below, keeled below, margins revolute, with a narrow petiole. Male strobili on a scaly peduncle, in dense axillary spikes, with acuminate scales, peltate microsporophylls and 2-4 pollen sacs. Female cone oblong, solitary, borne on a scaly peduncle; ovule nearly enclosed except near the tip by a fleshy orange aril. Seeds one per cone, with a pointed apex, wingless.

A. SPICATA Compton New Caledonian Flowering Yew

A tree 3-25 m. tall, with a densely branched crown. Bark fibrous, flaky, brown-red. Buds globular, tapering to an acute apex, to 3 mm. long, with few triangular scales. Leaves spirally arranged, linear lanceolate, 5-10 cm. long by 3.5-5 mm. wide, dark green above, grooved above, midrib prominent below, apex acute. Male strobili in dense axillary spikes 10-15 mm. long, on a scaly peduncle, with 12-18 fertile scales, microsporophylls peltate, pollen sacs 2-4. Female cone solitary, borne on a scaly peduncle. Seed to 12 mm. long by 6-7 mm. wide, acorn-like, enclosed except at the tip in a fleshy orange aril, seed crested at the apex.
New Caledonia: northeast and central areas, type near Ignambi, 500-1350 m..

CALLITRIS Vent. (Cupressaceae)

A genus of fourteen species from Australia and New Caledonia. Monoecious shrubs or trees with distinct joint-like branchlets. Branches short and erect. Branchlets rigid, with closely pressed, sheath-like leaf bases. Juvenile seedlings with needle-like foliage with stomata. Adult leaves minute, usually scale-like or sometimes needle-like, in whorls of 3-4, imbricate, without stomata below; apex triangular, sometimes slightly thickened and incurved. Male cones ovoid to cylindric, at ends of branchlets, stamen in whorls of 3-4. Female cones borne on short thick peduncles, usually ripening in 2 years, persistent for many years, opening in the center upon maturity, usually with 6-8 unequal triangular scales, without basal bracts, scales of the outer whorl usually smaller than the inner whorl. Seeds 2-9 per scale, with 2-3 narrow or broad even or sometimes uneven wings. Cotyledons 2, rarely 3.

C. BAILEYI C.T. White Bailey Cypress-Pine

A small, slender tree 6-15 m. tall, to 20 cm. in girth. Bark dark gray, slightly fissured. Bark of branchlets whitish-brown. Branchlets relatively thick, obtuse, finely divided, green. Leaves 2-5 mm. long by 2 mm. wide, green, prominently and often acutely keeled on the dorsal side. Female cone rather small, ovoid to oblong, often distorted, warty, not persistent, 1.3 cm. wide, with 6 scales; scales grooved in the center, relatively thick, with a small thin umbo on upper half of the scale to 1 mm. long. Seeds few, with 2 relatively unequal wings.
Australia: S.E. Queensland; type near Benarkin; N.E. New South Wales, Tabulam, 365-900 m..

C. CANESCENS (Parl.) S.T. Blake Kellerberrin Cypress-Pine
=C. morrisonii R.T. Bak.

A shrub or small tree 6-9 m. tall, with short branches. Branchlets tiny, with Cupressus-like foliage, finely divided, cylindrical. Leaves light green or glaucous, 4 mm. long, obtuse, partially free at the apex, partially decurrent, not keeled below, flattened. Male cone terminal, usually solitary, with few whorls of scales. Female cone subglobose, dark brown, persistent, wrinkly, to 2 cm. in diameter,with 6 very thick scales; scales with one or more smooth grooves, with thin umbos on upper half of the scale to 0.5 mm.

long; cone somewhat flattened on top. Seeds nearly black, with 2 wings usually 2 mm. wide.
Australia: S.E. Western Australia, type near Kellerberrin to S. South Australia.

C. COLUMELLARIS F. Muell. Richmond Cypress-Pine
=C. arenosa A. Cunn. ex R.T. Bak. et H.G. Sm.

A tree 12-18 m. tall, with spreading, ascending or fastigiate branches. Bark gray-brown, furrowed. Branches divided into small branchlets. Leaves very dark green to glaucous, 1-3 mm. long, acute, free and incurved at the apex. Male cone cylindrical, in groups of 2-4, to 5 mm. long. Female cone ovoid to depressed-globular, smooth, not too wrinkly, quickly deciduous, 1.2-2 cm. in diameter, with 6 scales; scales thin, angled, with a short, thin, spiny umbo on the upper half of the scale. Seeds chestnut-brown, with 2 wings, often 4 mm. wide.
Australia: S.E. Queensland, coastal plains; N.E. New South Wales, type near Richmond River, to 255 m..

C. COLUMELLARIS var. CAMPESTRIS Silba White Cypress-Pine
=C. glauca R. Br. ex R.T. Bak. et H.G. Smith, = C. glaucophylla Johns. et Thomps.,= C. hugeli Hort..

A shrub or tree 18-30 m. tall, 1-2 m. in girth, with ascending, horizontally spreading, occasionally pendulous or fastigiate branches. Bark brown, hard, furrowed. Branches divided into fine branchlets. Branchlets short, cylindrical, non-grooved. Juvenile leaves in whorls of 3, linear, 7-8 mm. long. Adult leaves glaucous, 1-3 mm. long, in whorls of 3, bluntly acute, non-keeled below, free at the apex.Male cone cylindrical-oblong, 5-10 mm. long by 2-5 mm. wide, scales oblong or ovoid. Female cone ovoid to depressed-globular, on a peduncle 7-8 mm. long, quickly deciduous, dark brown, 1.2-2 cm. wide, with 6 scales; scales thicker with fewer teeth at the margins, umbos smaller. Seeds chestnut-brown, with 2-3 wings, 4-5 mm. long.
Australia: all states, common in New South Wales, in dry temperate areas.

C. COLUMELLARIS var. INTRATROPICA (Bak. et Sm.) Silba Arnhem Cypress-Pine

A tree 12-24 m. tall, with spreading or rather erect branches. Trunk 0.75-1.5 m. in girth. Bark rough and thick. Branchlets relatively fine. Juvenile leaves linear, in whorls of 3, 7-15 mm. long. Adult leaves in whorls of 3, 2 mm. long, glaucous, bluntly acute, non-keeled below. Male cone cylindrical, in groups of 2-3, scales oblong or ovoid in whorls of 3. Female cone usually depressed-globular, quickly deciduous, 1.2-1.8 cm. wide, with 6 scales, gray-brown, wrinkly; scales thin, teethed on the margins; umbos absent or to 0.5 mm. long on upper half of the scales, not at apex of the scale. Seeds chestnut-brown, with 2 wings often 4-5 mm. wide.
Australia: N.E. Western Australia; N. Northern Territory, Arnhem's Land (type); N.W. Queensland, tropical areas.

C. DRUMMONDII (Parl.) F. Muell. Drummond Cypress-Pine

A shrub or small tree to 12 m. tall, with rigid branches and with a rounded crown. Bark hard, furrowed. Branchlets angular, long, prominently robust. Leaves 3-4 mm. long, bright green, bluntly acute, imbricate, acutely keeled below, apex somewhat free. Male cone terminal, frequently solitary. Female cone globose, wrinkly, persistent, on a thick peduncle, angled towards the base, 1.27-1.5 cm. wide, glaucous at first turning brown, with 6 scales; scales very thick with small, thin umbos on the upper half of the scales. Seeds usually 6 per cone, chestnut-brown to blackish-brown, with 2 unequal wings, the larger one to 3 mm. wide.
Australia: S. Western Australia, between Albany and Esperance.

C. ENDLICHERI (Parl.) J. Garden Endlicher Cypress-Pine
=C. calcarata (A. Cunn. ex Mirb.) F. Muell.

A pyramidal tree 9-25 m. tall, to 90 cm. in girth, with spreading branches. Bark dark brown to black, deeply furrowed. Branches divided into short, small branchlets. Leaves occasionally glaucous, 2-4 mm. long, with few stomata, acute to obtuse, prominently and bluntly keeled below, partially free at the apex. Male cone ovoid to globular, wrinkly, on a peduncle 6-12 mm. long, blackish, cone 1.3-2 cm. wide with 6 thin scales; scales Cupressus-like with a thin umbo on the upper half of the scales to 0.5 mm. long. Seeds numerous, dark brown to black, with 2 large wings to nearly 3 mm. wide.
Australia: S.E. Queensland; E. New South Wales; N.E. Victoria, type from Futter's Range, 600-900 m..

C. MACLEAYANA (F.Muell.) F. Muell. Macleay Cypress-Pine
=C. parlatorei F. Muell. ex Seem.

A pyramidal tree 10-45 m. tall, 2.7-3.6 m. in girth, with spreading branches. Bark gray or gray-brown to reddish-brown, stringy, vertically furrowed, scaly, inner-bark purplish. Branchlets slightly triangular. Juvenile leaves usually present, even on fertile branchlets. Adult leaves 3-6 mm. long, in whorls of 3-4, acutely keeled below, bright green. Male cone terminal, oblong, 4-8 mm. long. Female cones large, ovoid to conical, often distorted, often glaucous, on thick branchlets, on a recurved peduncle 2.5 mm. long, persistent, 2.5-3 cm. in diameter, with 6-8 large triangular scales; scales chestnut-brown, grooved in the center, thick, tapering to a sharp point, with thin umbos on the upper half of the scales. Seeds chestnut-brown, one wing rather larger, another shorter.
Australia: S.E. Queensland, Kuranda to Port Macquarie (type), N.E. New South Wales, 107-823 m., rainforest.

C. MONTICOLA J. Garden Wallangarra Cypress-Pine

An erect, bushy shrub to 2.5 m. tall. Leaves glaucous, 2-4 mm. long, prominently and bluntly keeled below. Female cone broadly ovoid to globular, persistent, 1.5-2.5 cm. wide, with 6 thick to thin scales; scales closely wrinkled with a thin protuberant umbo near the apex of each scale. Seeds numerous, dark brown, with 2 wings 2-3 mm. wide.
Australia: S.E. Queensland, Wallangara; N.E. New South Wales, S. Glen Innes.

C. MUELLERI (Parl.) F. Muell. Mueller Cypress-Pine

A columnar or fastigiate tree to 15 m. tall, the branches angled outwards from the trunk. Bark hard, compact, blackish. Branchlets dense, long, angled. Juvenile leaves present sometimes on fertile branchlets. Adult leaves 4-10 mm. long, olive green, prominently and obtusely keeled below, partially free at the apex. Male cone in groups of 2-3, ovoid to obovoid, 3-5 mm. long, with 6 whorls of orbicular scales. Female cone globose, wrinkly, persistent, borne on 2 year old branchlets, 2-3 cm. wide, rounded and flattened at the apex, with 6 oblong and obtuse scales; scales usually thick with a small blunt umbo on the upper half of the scale to 0.5 mm. long. Seeds numerous, dark brown, with 2 wings 2-4 mm. wide.
Australia: S.E. New South Wales, type near South Head.

C. NEOCALEDONICA Dummer Humboldt Cypress-Pine
=C. sulcata var. alpina R.H. Compton

A tree 3-7 m. tall, with dense branches and a candelabra-like crown. Bark brown, exfoliating in thin strips. Branchlets relatively thick, 2-3 mm. in diameter, angular. Wood aromatic. Juvenile leaves verticillate, 5-9 mm. long by 0.8 mm. wide, bluntly acute, apex incurved. Adult leaves 2-4 mm. long, acute, keeled; margins opaque, finely denticulate. Male cone globular, 2-3 mm. long by 2-2.5 mm. wide. Female cone ovoid, 1.5-1.8 cm. long, with 6 thin scales; scales narrowly oblong, slightly overlapping, grooved with a small umbo near the apex of the scale. Seeds with short wings, nut 6-7 mm. long, wings 1 mm. wide.
S. New Caledonia: Mt. Humboldt to Mount des Sources, 950-1550 m.

C. OBLONGA A. et L.C. Rich. Tasmanian Cypress-Pine

A shrub or tree to 8 m. tall, with numerous, erect, dense branches. Bark compact, thick. Branches divided into a dense mass of fine angled branchlets. Juvenile leaves sometimes present on fertile branchlets. Adult leaves 4-5 mm. long, narrow, prominently but not acutely keeled below, glaucous-green, partially free at the apex. Male cone ovoid to obovoid, 2-2.3 mm. long with few whorls of scales. Female cone on short branchlets, ovoid, prune-like, wrinkly, shiny black, persistent, 1.5-2 cm. in diameter with 6-8 small alternate scales; scales very thick, with a small thin umbo near the apex of the scale. Seeds numerous, dark brown, with 2 wings 2 mm. wide.
Australia: N.E. Tasmania; South Esk.

C. PREISSII Miq. ex Lehm. Preiss Cypress-Pine
=C. robusta (A. Cunn. ex Parl.) F.M. Bail..

A shrub or tree to 30 m. tall, with long, erect or spreading, slender branches. Bark dark brown, rugged, furrowed. Branches divided into numerous finely divided branchlets. Leaves bright green, obtuse, 2-4 mm. long, not keeled below, closely imbricate. Male cone terminal, in groups of 3 or more, cylindrical, 4.5-6 mm. long. Female cone globose or broadly ovoid, wrinkly, slightly glaucous at the base when young, persistent, in groups up to 12, 2.5-3 cm. in diameter, with 6 thin scales; scales pointed at the apex, with frequently scattered or absent tubercules that are often large; umbos usually absent. Seeds with 2 brown wings.
AUSTRALIA: S.W. Western Australia to E. New South Wales, 150-400 m..

C. PREISSII var. MURRAYENSIS (J.Gard.) Silba Wentworth Cypress-Pine
=C. propinqua R. Br. ex R.T. Bak. et H.G. Sm.

A tree to 18 m. tall, with spreading branches. Bark dark, hard, thick, compact. Branchlets short, cylindrical. Leaves bright olive-green, smooth, acute, decurrent, partially free at the apex, 2-3 mm. long. Male cones numerous at apex of branchlets, scales short and small. Female cone ovoid-oblong, maturing in 2 years, glaucous when young, turning blackish or gray, smooth, with 6 thick scales, tubercules usually absent on scales. Seeds dark brown, with 2 wings.
Australia: S. New South Wales, Wentworth to S. South Australia.

C. PREISSII var. VERRUCOSA (A. Cunn. ex Endl.) Silba Knobcone Cypress-Pine

A stunted or multi-stemmed shrub or small tree to 10 m. tall. Bark dark brown, thick. Branches short, bulky, erect, compact, divided into fine branchlets. Leaves bright green, bluntly acute, closely imbricate, 2-3 mm. long, partially free at the apex. Male cone in groups of 2-3, ovoid or cylindrical, 2.2 mm. long, scales ovoid-orbicular. Female cones broadly ovoid to globose, 1.3-3 cm. in diameter, blackish, on a short peduncle, scales thick, densely covered with tubercules, umbos absent. Seeds with 2 wings.
Australia: S. Western Australia to New South Wales, Lachlan River.

C. RHOMBOIDEA (R. Br.) A. et L.C. Rich. Oyster-Bay Cypress Pine
=C. tasmanica (Benth.) R.T. Bak. et H.G. Sm.

A shrub or tree 9-15 m. tall, 0.8-1.1 m. in girth, with horizontally spreading, erect or fastigiate branches. Bark thick, compact, furrowed. Branches divided into a mass of small, short branchlets. Leaves bright green to glaucous, 2-3 mm. long, prominently and bluntly keeled below, apex spine-tip tipped. Male cone ovoid to obovoid, to 2 mm. long. Female cone usually several to a cluster, ovoid to globular, persistent, gray-brown, on a peduncle, 0.8-2 cm. wide, extremely wrinkly, with 6 thick scales; umbos thick, erect, on upper half of the scale, but not at the apex. Seeds numerous, dark brown, with 2 wings 1 mm. wide. Cotyledons 2.
Australia: S.E. Queensland to S. South Australia.

C. ROEI (Endl.) F. Muell. Roe Cypress-Pine

A bush 1.5-2.5 m. tall, with numerous twisted, spreading branches. Branchlets relatively thick, angular, 3-4.5 mm. in diameter. Leaves usually glaucous, 3-5 mm. long, obtuse, grooved, acutely keeled, partially free at the apex. Female cone on a short peduncle, subglobose, slightly wrinkly, broader than long, persistent, 1.2-2 cm. in diameter, with 6 thick scales; scales grooved near the base; umbos thin, erect, on upper half of the scales, 1.5-2 mm. long. Usually 6 fertile seeds per cone, chestnut-brown, with 2 unequal wings, the larger wing to 4 mm. wide.
Australia: S.W. Western Australia, Collie to Esperance.

C. SULCATA (Parl.) Schlecht. ex Engl. Camboui Cypress-Pine
=C. balansae (Brongn. et Gris.) Schl. ex Engl.

A tree 5-12 m. tall, densely branched. Bark smooth, hard. Wood has an odor of camphor. Branchlets to 5 mm. in diameter. Juvenile leaves linear-lanceolate, sharply acute, 2.6 cm. long by 1.2 mm. wide; juvenile branches in whorls of 3-4. Adult leaves 4-6 mm. long, prominently and obtusely keeled, margins transparent. Male cone ovoid, 3-5 mm. long by 1.5-2 mm. wide. Female cone wrinkly, small, subglobose, recalling Tetraclinis, with 6 ovoid scales; scales grooved near the base, sharply acute; umbos erect, on upper halves of the scales; cone 10 mm. long by 10 mm. wide. Seeds 6 per cone, 4-5 mm. long, wing 6-7 mm. long.
S. New Caledonia: Camboui to Tontouta to Dumbea, 15-300 m..

CALOCEDRUS Kurz. (Cupressaceae)

A genus of three species from W. North America and E. Asia. Monoecious trees with distinctly flattened branchlets and Thuja-like foliage, distichously arranged. Ultimate branchlets often pointing forwards. Leaves scale-like, decussate, strongly flattened, somewhat equal in length, with or without stomata below, closely appressed except near the acute apex, often spine-tipped; lateral pairs overlap the facial pairs which are longer and decurrent. Male and female strobili terminal, solitary, often on different branchlets of the same tree. Male cones oblong or ovoid, with 6-16 decussate, sub-peltate, broadly ovate microsporophylls; borne on short branchlets. Female cone pendent, on a scaly short peduncle, subtended at the base by a few reflexed scaly appendages, oblong-elliptic, woody, maturing in one year, with 6 erect imbricate scales, only the middle pair are fertile; lower scales ovate, recurved; middle pair oblong; upper pair linear, fused together into a woody plate; scales with small, recurved umbos; opening widely at maturity. Seeds flattened, 2 per fertile scale, with 2 unequal wings projecting backwards nearly blending into each other to almost appear as one. Cotyledons 2.

C. DECURRENS (Torr.) Florin California Calocedar
=Libocedrus decurrens Torr.

A narrowly columnar tree 18-46 m. tall, 0.9-5.5 m. in girth, with an irregularly angled trunk and an open, irregular, rounded crown at maturity. Bark light or reddish-brown, deeply furrowed into shreddy ridges. Branches short, erect or spreading, flattened, same color on both sides, in fan-like sprays, pointing forwards. Juvenile leaves glaucous on both surfaces, to 12 mm. long. Adult leaves 4-ranked, opposite, scale-like, 2-3 mm. long by 0.5 mm. wide, resin-scented, shiny dark green on both sides, oblong-ovate, adnate; dorsal-ventral pair slightly keeled, overlapping, long pointed, with a long decurrent base; lateral pair free at the apex, acuminate, glandular on the back, acuminate, apex spiny and yellowish, without prominent stomata below. Male cone globular, yellowish, on a short branchlet, with 12-16 scales. Female cone pendent, oblong, maturing in one year, with 3 pairs of scales, 1.8-2.5 cm. long, with reflexed umbos on the scales. Seeds 2 per scale, to 2 cm. long, tan, oblong-lanceolate, with narrow wings. Cotyledons 2, 1.8 cm. long by 2.5-3.5 mm. wide.
U.S.A.: W. Oregon to N. Baja California, Mexico, 366-2134 m..

C. FORMOSANA (Florin) Florin — Formosan Calocedar
=Libocedrus formosana Florin

A tree to 30 m. tall, with a slightly curved trunk. Bark soft, red-brown. Branches compressed, slender. Foliage homomorphic on the branches, dimorphic on the branchlets. Facial leaves obtuse, serrulate, margins scariose, partially decurrent in an angle. Lateral leaves acutely keeled, slightly incurved at the apex, dark green above with narrow stomata above, pale green below with continuous stomata, 1.5-2.5 mm. long. Male cone on short branchlets, subcylindric, with 12-16 oblong scales, to 5 mm. long. Fertile branchlets relatively short. Female cone ovoid and elongated, slightly incurved on a short quadrangular branchlet 1-2 mm. long, cone 1-1.5 cm. long with 4-6 scales, columella with a bifid apex. Seeds 1-2 per scale, seed with a long wing, 8-12 mm. long.
N. Taiwan, at 300-1900 m..

C. MACROLEPIS Kurz. — Chinese Calocedar
=Libocedrus macrolepis (Kurz.) Benth. et Hook. f.

A broadly conical tree 30-35 m. tall. Bark whitish, scaly. Branchlets relatively large, alternately distichous, tetragonal or subcylindric, non-compressed, whitish below. Adult leaves on main branchlets fine, in whorls of 4, acute, equal in length, 1.2 mm. long, margins scariose, with a long pointed apex; leaves on lateral branchlets 6-8 mm. long by 3 mm. wide, scale-like, strongly keeled, with a visible gland, enlarged at the denticulate apex, with 2 white bands of stomata below; facial leaves obovate, apiculate, conspicuously flattened. Male cone on straight or curved branchlets, subtetragonal, with 14-20 scales. Female cone on a quadrangular shoot 1-3 cm. long, cone obovate-oblong to elliptic, 1.2-1.8 cm. long, purplish or dark brown, with 6 scales; scales ovate, mucronate, with small umbos; columella acute. Seeds 2 per fertile scale, nut ovate-lanceolate, with broad wings.
N.E. Burma; China: S. Yunnan and Hainan, 1000-2000 m..

CEDRUS Link (Pinaceae)

A genus of two species from the Mediterranean region and the Himalayas. Dioecious or monoecious. Branches spreading horizontally. Branchlets with grayish pubescence when young. Buds minute, ovoid, with persistent brown scales. Leaves needle-like, angular, stiffish, single and alternate on young main branchlets, clustered in whorls on spurs on older side branchlets, spine-tipped, with stomata on each surface, with 2 marginal resin canals on the inner surface, persist 3-6 years. Male strobili terminal on the spurs, borne erect, cylindrical, catkin-like, with numerous crowded anthers, to 5 cm. long or more; pollen grains golden, wingless. Female cones erect, ovoid to ovoid-oblong, woody, resinous, maturing in 2-3 years, with thin flattened imbricate scales without umbos, scales falling apart from the central axis soon after maturity; bracts minute, ovate. Seeds 2 per scale, with one thin broad wing projecting backwards. Cotyledons 8-10.

C. DEODARA (Roxb. ex Lamb.) G. Don Deodar Cedar

A conical tree 50-75 m. tall, to 3 m. in girth, with drooping branches. Bark dark gray, smooth then shallowly fissured and blackish to pinkish-gray. Branchlets long, thin, pinkish-brown to yellowish-gray, pubescent, pendent, grooved. Buds rounded, chestnut-brown to yellowish-gray, 1 mm. long, scales free at the apex. Leaves spirally arranged on terminal branchlets, 4-5 cm. long by 1.5 mm. wide, gray-green or dark bluish-green, long pointed; leaves on short side branchlets 2-3 cm. long by 0.7-1.8 mm. wide, acute, with 2-4 inconspicous lines of stomata that are broader below, nearly quadrangular in the cross-section, 10-20 per spur. Male strobili erect, at apex of side branchlets, blue-green then pinkish-violet, 2.5-4.6 cm. long by 1.5 cm. wide at first. Female cone rounded at the apex, ovoid, in groups of 1-2, 7-12 cm. long by 5-7 cm. wide, purplish or blue-green turning reddish-brown, maturing in 1-2 years; scales angled at the base, smooth or slightly pubescent. Seed ovoid, 1.6-1.7 cm. long by 6-7 mm. wide, nut whitish, with a long wing.
Afghanistan; N. West Pakistan; N. India: Garhwal; Nepal, 1676-3048 m..

C. LIBANI A. Rich. Cedar of Lebanon
=C. libani var. stenocoma (Schw.) Davis

A narrow pyramidal tree 24-40 m. tall, to 0.9 m. in girth or more, with a pointed crown, becoming irregular and broad or flat-topped with age. Longevity to 1500 years. Crown with spreading horizontal branches. Bark dark gray, furrowed into scaly plates. Branchlets long, slightly pubescent, grayish, spreading. Buds ovoid, gray-brown 2-3 mm. long; scales free, papery, dark brown at the apex. Leaves on terminal branchlets fine, pointed forwards, curved outwards; leaves on side shoots in whorls of 10-15 or more, acute, dark green, 1.5-3.5 cm. long by 1 mm. wide, 3-angled or quadrangular in the cross-section, widened in the cross-section, with few broken lines of stomata, apex translucent and green. Male strobili pale gray-green, 1.5 cm. long, later to 5 cm. or longer, deciduous. Female cone barrel-shaped, resinous, flattened at the apex, maturing in 2 years, 7-12 cm. long by 4-7 cm. wide, purplish-violet then gray-green to reddish-brown; scales finely pubescent, narrowed at the base. Seeds triangular, 1.5-1.8 cm. long by 3.5 mm. wide or wider, with long wings.
Turkey: Anatolia; Syria; Lebanon, 1311-3048 m..

C. LIBANI var. ATLANTICA (Endl.) Hook. Atlas Cedar
=C. atlantica (Endl.) Carr.

A narrowly pyramidal tree 36-40 m. tall, to 0.9 m. in girth, becoming broad and flat-topped with age, with a straight trunk. Bark gray, smooth, becoming irregularly furrowed into narrow plates. Branchlets grooved, shortly pubescent, gray-green, with blackish pubescence.Branchlets stout, upright. Buds ovoid-conical to globular, yellowish-gray-brown to reddish-brown, 2-3 mm. long, with small scales, blackened at the apex. Leaves on terminal branchlets slightly acute, dark green, 1-3 cm. long by 1 mm. wide, thick, 3-angled or nearly quadrangular in the cross-section, apex spiny and yellowish-white to translucent. Leaves on spurs linear, slightly acute, dark green, 0.8-2 cm. long, stomata in irregular bands on all surfaces. Male strobili greenish-yellow then violet-brown, to 2 cm. long, deciduous. Female cone ovoid-elliptic, cylindrical, yellowish-green then light brown or purplish, flattened on top,

5-12 cm. long by 4-6 cm. wide, scales triangular and rounded, bracts minute. Seeds with a long wing.
Morocco; Algeria: Atlas Mountains, 1372-2195 m..

C. LIBANI var. BREVIFOLIA Hook. f. Cyprian Cedar

A narrowly conical tree 12-30 m. tall, with horizontal branches, becoming flat-topped with age. Bark dark gray, smooth, with blackish fissures, forming square plates. Branchlets pale greenish-brown, finely pubescent with orange pulvini. Buds pointed, greenish, non-resinous. Leaves with a pointed apex, dark green, 1.5 cm. long, with 2-3 fine lines of stomata on each surface. Male strobili cylindrical, yellowish, 5 cm. long by 1 cm. wide. Female cone ovoid-cylindric, apex with a nipple, 4-8 cm. long by 4 cm. wide, scales shortly pointed at the base, bracts nearly absent. Seeds pointed, brown, 9 mm. long by 4 mm. wide, wing 1.5 cm. long by 1.3 cm. wide.
Cyprus: Pahos Main Forest, 914-1524 m..

CEPHALOTAXUS Sieb. et Zucc. (Cephalotaxaceae)

A genus of three species from E. Asia. Evergreen shrubs usually dioecious or rarely monoecious. Branchlets opposite, with a resin canal in the center of the pith. Buds visible, with many scales, ovoid, non-resinous. Leaf phyllotaxy similar to Torreya. Leaves spirally arranged on main branchlets, linear, pointed, 2-ranked on side branchlets, with a prominent midrib above and with 2 broad stomatal bands below, grooved below with a resin duct in the middle, flattened, soft, acute. Male cone short-stalked, 1-8 stamens in a globular cluster, enclosed in a bract. Female cone similar to Torreya. Female strobili a small cone with several opposite cup-shaped bracts, each bearing 2 naked ovules. Female cone pendent, globose or oblong, on a long peduncle, drupe-like, with a few scales at the base of the cone, maturing in 2 years. Seeds completely covered by a hard fleshy envelope, reddish or greenish-brown, thick-shelled or thin-shelled, one per cone, wingless. Cotyledons morphologically very similar to most other representatives of the Taxaceae, 2 in number.

C. FORTUNEI Hook. F. Chinese Plum-Yew
=C. fortunei var. alpina Li, =C. lanceolata K.M. Feng.

A tree 12-20 m. tall, to 40 cm. in girth, or a multi-stemmed shrub, with a rounded crown. Bark purple-red-brown, smooth, exfoliating in thin papery flakes. Buds 6-8 mm. long, red-brown to green, globular, shiny, scales acute. Leaves lanceolate, alternate, horizontally spreading, nearly 2-ranked, linear, acute, pointing forwards, 4-13 cm. long by 3.5-4.5 mm. wide, dark green above, paler below with two bands of stomates in 18-24 lines, apex bluntly acute. Dioecious. Female cones 1-2 per group on a peduncle, obovoid, 2.2-4.5 cm. long by 1.2 cm. wide, whitish-green to olive-green turning purplish.
N. Burma; China: Yunnan to Shensi to Chekiang, 200-3000 m..

C. HARRINGTONIA (Knight ex Forbes) K. Koch. Assam or Harrington Plum-Yew
=C. griffithii Hook. f.,= C. hainanensis Li, = C. mannii Hook. f.
=C. wilsoniana Hayata.

A shrub or small tree to 10 m. tall, to 40 cm. in girth, with a spreading crown. Bark purplish, smooth,flaky, exfoliating, cinnamon-brown underneath . Branches sometimes pendent. Buds globose, green, 1-2 mm. long, some basal scales with a free apex. Leaves alternately spreading horizontally, nearly 2-ranked, fairly widely spaced, linear, narrowly acute, 2-5 cm. long by 2-3.5 mm. wide, thin, bright green to bluish-green, with 2 bands of gray-white or pale yellow-green bands of stomata below, margins slightly revolute, apex acute. Male cones in groups of 2-5, on a peduncle 4-20 mm. long, green, globose, 2 mm. long, with 5-8 stamens. Female cone narrowly ovoid, 1.8-2.5 cm. long, on a peduncle 1.5 cm. long, olive-green turning shiny brown. Seed to 1.5 cm. long.
N.E. India: Assam; N. Burma; N. Thailand; Malaysia: Penang; Cambodia; Laos; Vietnam: Annam; China: Hainan; Taiwan, 1500-3000 m..

C. HARRINGTONIA var. DRUPACEA (Sieb. et Zucc.) Koidz. Japanese Plum-Yew
=C. koreana Nak., =C. sinensis (Rehd. ex Wils.) Li, = C. sinensis var. latifolia Cheng et Fu.

A multi-stemmed shrub or small tree 10-20 m. tall. Bark brown, papery, flaky, inner-bark orange-brown. Branchlets somewhat curved, with erect leaves forming a V-like trough. Buds ovoid, 3 mm. long; scales acute, keeled, green. Leaves somewhat curved, broadly acute, apex acuminate and spiny, relatively thick, 2-5 cm. long by 2.5-3.5 mm. wide, dark green to yellowish green, with 2 faint bluish-white bands of stomata below with 13-15 lines. Male cone on a short curved scaly peduncle 2-4 mm. long, cone 6-10 mm. long. Female cone subglobose or obovoid, 1.8-2.5 cm. long by 1.4-2 cm. wide, reddish-brown, apex rounded, on a peduncle 6-12 mm. long.
China: Tibet to Hopeh; N. Korea; Japan, 600-2200 m..

C. OLIVERI Mast. Oliver Plum-Yew

A shrub to 4 m. tall. Bark scaly, yellowish. Branchlets green turning yellowish-green. Buds globular, smooth, 5 mm. long, scales imbricate. Leaves thick, closely set, nearly opposite, spreading horizontally, somewhat falcate, nearly parallel and straight, 1.5-3.2 cm. long by 3-4.5 mm. wide, dark green, paler below with 2 faint bands of stomata, apex sharp-pointed and acuminate. Male cone in groups of 5-7, 5 mm. long, with 7 stamens. Female cone ovoid, on a peduncle 1 cm. long, to 2.5 cm. long, apiculate at the apex.
China: Yunnan to Hupeh, 300-1800 m..

CHAMAECYPARIS Spach. (Cupressaceae)

A genus of seven species from E. Asia and North America. Monoecious trees with much flattened branchlet systems. Buds inconspicuous. Branchlets often pendent and frond-like, often rounded, usually not quadrangular, usually evenly disposed in one plane. Leaves small, scale-like, entire, opposite and decussate, paler below or often with white stomata below, margins entire; lateral pair smaller, boat-shaped; facial pair flattened, acuminate to obtuse, with obscure glands. Male cone ovoid to subglobose with suborbicular scales.

Female cones globular, usually ripening in one year, usually opening upon maturity, relatively small, with 6-12 peltate scales. Seeds 2-5 per scale, somewhat flattened, with 2 narrow even wings. Cotyledons 2.

C. FORMOSENSIS Matsum. Formosan Chamaecyparis

A broadly conical tree to 53 m. tall, to 6 m. in girth, with spreading branches. Bark red-brown to pale gray-brown, shallowly fissured. Branchlets flattened, distichous, pendent at the extremities, with brownish bark. Leaves in 4 ranks, scale-like, keeled, overlapping, partially free, dull green and tinged brownish above, pale yellow-green below or with a few lines of stomata, strongly aromatic, 1.5 mm. long, obscurely glandular, apex incurved , shortly mucronate. Male cone ovoid to subglobose, with suborbicular scales. Female cone short-ellipsoid, brownish, 8-12 mm. long by 6-9 mm. wide, with 10-13 scales, maturing in one year, scales with a small triangular umbo. Seeds 2 per scale, with 2 narrow wings and with conspicuous resin pockets, oval, brown.
Taiwan: Mount Morrison, 1000-3048 m..

C. FUNEBRIS (Endl.) Franco Chinese Weeping Chamaecyparis
=Cupressus funebris Endl.

A broadly conical tree 25-35 m. tall, with wide spreading branches, becoming somewhat wider or round-topped with age. Bark gray-brown, smooth, finely fissured in long thin strips. Branchlets pendent, flattened, fine, bipinnate, gray-green. Leaves 1-2 mm. long, deltoid-ovate, acute, pale green, keeled, glands obscure and sometimes translucent, slightly spreading and free at the apex, somewhat denticulate at the margins with a blackish spot near the apex. Male cone ovoid-oblong, 3-5 mm. long, with 12-16 scales. Female cone globular, maturing in 2 years, opening upon maturity, 8-15 mm. long, blue-green turning dark brown and somewhat glaucous, with 6-8 scales with a short blunt umbo. Seeds 3-5 per scale, dark brown, irregular, smooth, 3-3.5 mm. long, with 2 narrow wings. Cotyledons 2, 7-9 mm. long by 1-1.2 mm. wide, bluntly acute.
C. China: Anwhei to Yunnan, Yangste River drainage, 1100-2000 m..

C. LAWSONIANA (A. Murr.) Parl. Lawson Chamaecyparis

A tree 21-61 m. tall, 0.8-1.2 m. in girth, with a narrow, spire-like crown. Bark reddish-brown, deeply furrowed. Branchlets slender, flattened, distichous, spreading horizontally, pendulous at the extremities, bark purplish-brown. Leaves scale-like, dull green in 4 ranks, to 1.5 mm. long, closely appressed with a translucent gland, indistinctly whitish below, resin-scented, apex pointed or slightly spreading. Male cone red to violet-brown, with 12-16 ovate scales, pollen sacs 2-4. Female cone globular, maturing in one year, bluish-green turning glaucous then reddish-brown, to 10 mm. wide, with 8-10 scales with small acute reflexed umbos. Seeds 2-4 per scale, reddish-brown, 4 mm. long, broadly winged.
U.S.A.: S.W. Oregon, coastal plain to N.W. California, Mt. Shasta,to 1524 m..

C. NOOTKATENSIS (D. Don) Spach. Nootka Chamaecyparis

A conical tree 15-30 m. tall, 0.3-1.2 m. in girth, with a narrow crown and horizontal or slightly drooping branches. Bark orange-brown to gray-brown, divided into long narrow fissures. Branches ascending, distichous, dark green above, pale green below, flattened or 4-angled, spreading horizontally, bark reddish-brown, branchlets pendent at the extremities. Leaves in 4 ranks, densely

imbricate, dark green, without stomata below, 2-3 mm. long, glands visible but usually absent, margins pale green, rarely with a white line near the apex, oily-scented, spreading at the apex, lateral leaves partially free. Male cone yellowish-green, with 2-3 pollen sacs. Female cone maturing in 1-2 years, globular, yellowish-green then glaucous-brown to reddish-brown, 8-14 mm. in diameter, with 4-6 oval or rounded scales with a fairly prominent acute umbo. Seeds 2-4 per scale, tan, glaucous, oval to round, 5 mm. long,with 2 broad wings to 2 mm. wide.

W. Canada; U.S.A.: S. Alaska to N.W. California, 610-2134 m..

C. OBTUSA (Sieb. et Zucc.) Endl. Japanese Hinoki Chamaecyparis

A broadly conical tree to 40 m. tall, with horizontal branches and a rounded crown. Bark smooth, red-brown to gray-brown, slightly furrowed, peeling off in thin long strips. Branchlets disposed in one plane, flattened, pendent at the extremities, tripinnate, short and club-like. Leaves dimorphic, scale-like, opposite decussate, obtuse, dark bright green, resin-scented; lateral leaves 2 mm. long, with x-shaped white stomata below, free at the apex; facial leaves rhombic-ovate, closely appressed, 1.5 mm. long, apex incurved, with a gland dot on the back. Male cone violet then yellowish, 3 mm. long with 12 scales. Female cone maturing in one year, globular, green then bright red-brown, 8-12 mm. in diameter, with 8-10 peltate scales with a small umbo. Seeds 2 or rarely 3-5 per scale, 3-4 mm. long, with 2 narrow wings.

Japan: Hondo to Yaku Island, 400-2000 m..

C. OBTUSA var. FORMOSANA (Hayata) Rehd. ex Bail. Formosan Hinoki Chamaecyparis

A tree 30-40 m. tall. Branchlets slenderer and thinner. Foliage Thuja-like. Leaves light shiny green on both sides, 1-1.5 mm. long, broadly obtuse, overlapping, apex more incurved and acuminate. Female cone subglobose to nearly oblong, 9-11 mm. in diameter, with 8-10 scales with small umbos. Seeds smaller than the type, to 2 mm. wide.

Taiwan: north and central areas, 1300-2800 m..

C. PISIFERA (Sieb. et Zucc.) Endl. Sawara Chamaecyparis

A narrowly pyramidal tree 40-50 m. tall, 0.6-2 m. in girth, with an open crown with horizontal branches and with a straight trunk. Bark reddish-brown, shreddy, exfoliating in long thin strips. Branches slender, flattened, in short fern-like sprays, somewhat pendent. Juvenile leaves to 6 mm. long, needle-like, 4 ranked, blue-green above, whitish below. Adult leaves scale-like, to 3 mm. long, acute, ovate-lanceolate, sharp pointed, top pair flattened, side pair keeled, shiny green above to yellowish-green, whitish-green below with stomata, slightly spreading, obscurely glandular, resin scented. Male cone violet then yellowish, with 12-20 scales. Female cone maturing in one year, on a short scaly peduncle, globular, 6-8 mm. in diameter, with 8-12 scales, whitish-green turning dark brown; scales with a small umbo at the depressed center. Seeds 1-2 per scale, 2-3 mm. long, with resin pockets; wings transparent, relatively broad.

Japan: S. Hondo and C. Kyushu, to 2400 m..

C. THYOIDES (L.) B.S.P. White Chamaecyparis
=C. henryae Li

A narrowly conical tree 15-27 m. tall, 0.5-0.6 m. in girth, with a spire-like crown. Bark reddish-brown, thin, fibrous, becoming scaly and loose. Branches slender, erect, spreading horizontally. Branchlets very slender, slightly flattened or nearly quadrangular, irregularly disposed. Leaves dull blue-green or gray-green, acute, 1.5-3 mm. long, incurved, keeled, imbricate, spreading at the apex with white stomatal markings near the base, with glands, ginger scented. Male cone oblong, quadrangular, 3 mm. long, with 10-12 scales. Female cone maturing in one year, bluish-purple then dark red-brown, to 6 mm. wide, with 6-8 scales with short umbos. Seeds 1-2 per scale, shiny, dark brown, somewhat warty, without glands, to 2 mm. long, with small wings.
E. United States: C. Maine to N. Florida, to 30 m. .

CRYPTOMERIA D. Don (Taxodiaceae)

A monotypic genus from C. China and Japan. Monoecious trees with a tapering trunk and with well-defined buttresses. Branches irregularly whorled, spreading, ascending at the ends. Branchlets spreading or drooping, eventually deciduous. Buds inconspicuous. Leaves needle-like, spirally arranged, acute, loosely imbricate, decurrent at the base, persistent 4-5 years, curving inwards, pointing forwards, turning reddish in the autumn, first leaves of the season shorter than later ones, keeled on both sides, with faint stomata on each surface, margins entire. Male cones axillary, in clusters of 20 or more, oblong, yellowish, forming short racemes at tips of branchlets, 6-8 mm. long. Female strobili appearing as greenish rosettes of leaves at tips of branchlets in the winter. Female cones maturing in one year, persistent, globular, woody, with thick wedge-shaped scales with recurved umbos and with few teeth near the margins of the scales; bracts combined with the scale for most of its height, appearing as a recurved point on its outer surface. Seeds 3-5 per scale, borne erect, with 2 narrow even wings. Cotyledons usually 3, occasionally 2.

C. JAPONICA (Linn. f.) D. Don Japanese Cryptomeria

A conical tree 40-60 m. tall, 2-6 m. in girth with short branches. Bark cinnamon-brown to red-brown, peeling in thin long strips. Branches smooth, slender, in whorls or pendent. Leaves 1.2-2.5 cm. long by 1 mm. wide, quadrangular, spirally arranged, decurrent, bluntly keeled dorsally, sharply keeled ventrally, bluish-green turning reddish in the autumn, persistent 4-5 years, apex conical, loosely imbricate, with few stomata on the four faces. Male cone axillary, subterminal, pinkish-gray or orange, 6-8 mm. long by 2-2.5 mm. wide, with 14 scales. Female cone globose, brownish-red, 1.6-3 cm. long , with 20-30 scales, cones prolificly produced on long branchlets; scales with 3-6 long teeth on the margins. Seeds 3-6 per scale, dark brown, broadly ovoid, 4-8 mm. long by 2.5-3 mm. wide.
Japan: Honshu; Shikoku and Kyushu, 150-1800 m..

C. JAPONICA var. SINENSIS Sieb. ex Sieb. et Zucc. Chinese Cryptomeria
=C. fortunei Hooibr. ex Otto et Dietr.

A tree 17-40 m. tall, 0.76-2 m. in girth, with a straight trunk, with a large crown and with a looser habit. Bark cinnamon-brown to gray-brown, longitudinally furrowed. Branches slender, long, pendent at the extremities. Bark of branchlets orangish. Leaves 0.6-1.3 cm. long by 1 mm. wide, shiny green, somewhat more imbricate, apex incurved. Male cones oblong-cylindric, at tips of the branchlets, axillary, 4 mm. long, with 12 acuminate scales. Female cone on a scaly transitional leaved branchlet, globular-ovoid, 12 mm. long by 12 mm. wide, broadened at the base, with 20 scales with 3-4 shorter teeth on the margins, cone yellowish brown. Seeds 2 per scale, narrowly ovoid.
China: Anwhei to Yunnan, 900-2900 m..

CUNNINGHAMIA R. Br. ex Rich. (Taxodiaceae)

A genus of two species from C. China and Taiwan. Monoecious trees with whorled branchlets, opposite and 2 ranked branchlets. Lateral branchlets deciduous. Buds round, flattened, covered by leafy scales. Leaves linear-lanceolate, rigid, spirally arranged, flattened, serrulate on the margins, with stomata more numerous below; persistent for five years or more, then persistent as dry branches even much longer, curving backwards. Male cones catkin-like, oblong, in clusters of about 12, at ends of the branchlets. Female cone globular-ovate, with long, thin, incurved, serrulate, papery, spine-tipped scales, without distinct bracts or umbos. Seeds 3 per scale, somewhat flattened, with 2 narrow even wings. Cotyledons 2-3, germination epigeal.

C. KONISHII Hayata Formosan Cunninghamia

A broadly pyramidal tree to 50 m. tall, 1-2.5 m. in girth. Bark cinnamon-brown, shallowly furrowed, becoming grayish-white. Branches smooth. Leaves spirally arranged, not twisted, obtusish, lanceolate, falcate, persist 8 years, stiff, rigid, thick, grooved, shiny bronzy-green then gray-green, bronzy in the winter months, 1.9-2.2 cm. long by 1.5-2.5 mm. wide; with faint stomata on both surfaces, more conspicuous below; pale greenish-white below, margins finely denticulate, apex shortly pointed, base decurrent, petiole absent. Female cone ovoid, 1.9-2.3 cm. long by 1.25 cm. wide; scales rounded, sharply mucronate at the apex, with a distinct claw at the base; scales irregularly serrulate, somewhat reflexed. Seeds 2-3 per scale, ovate, 3-5 mm. long with 2 narrow wings.
Taiwan: Mount Randai, 1300-2000 m..

C. LANCEOLATA (Lamb.) Hook. f. Chinese Cunninghamia
=C. unicanaliculata Wang et Liu

A narrow tree to 30 m. tall, to 5 m. in girth, with a rounded crown. Trees capable of regeneration if cut to the ground. Bark exfoliating in long reddish-brown strips, smooth. Branches disposed in whorls, with numerous branchlets, smooth. Lateral branchlets deciduous. Bark of branchlets shiny green then orange-brown above. Leaves lanceolate, spirally arranged, spiny pointed, somewhat distichous and recurved, base broadly decurrent, 3-7 cm. long by 4-7 mm. wide,

with a raised midrib and raised margins, light shiny green above, margins finely denticulate; stomata usually absent above, in 2 broad white bands below, stomates flattened; leaves persist 5 years or more, apex narrowly acute. Male cone oblong, in whorls of 12 by a terminal bud; surrounded by the base by green obtusely imbricate scales, each scale with 3-4 anthers; cone yellowish-brown. Male buds rounded, somewhat flattened, hidden by the leaves. Female cone terminal on a short branchlet, maturing in one year, globular, green then tan, 3-5 cm. long by 2.5-3 cm. wide; scales rigid, acuminate, triangular, margins denticulate, flattened, apex with a long spine, apex somewhat incurved. Seeds 3 per scale, oval, flattened, reddish-brown, 6-7 mm. long, with thin membraneous wings.
China: E. Yunnan to Chekiang, 700-2500 m..

x CUPRESSOCYPARIS Dallimore (Cupressaceae)

An artificial generic cross between Chamaecyparis and Cupressus.Three main taxa have been raised in England. Evergreen trees of rapid growth. Branches often ascending. Branchlets flattened. Leaves scale-like, small, imbricate, keeled, bluntly acute, paler below or with white stomata below, faintly aromatic when crushed. Male cones ovoid, to 3 mm. long. Female cone globular, 1.2-2 cm. long, maturing in 1-2 years, with 6-8 scales, scales with small central umbos. Seeds 5 per scale or more, often flattened, often warty, with 2 broad even wings.

C. x LEYLANDII (A.B. Jacks. et Dallim.) Dallim. Leyland Cupressocyparis

A hybrid of Cupressus macrocarpa and Chamaecyparis nootkatensis. A dense columnar tree 15-27 m. tall. Bark dark brown, stringy. Branchlets flattened, or irregularly disposed, slightly drooping. Leaves scale-like, acute to finely obtuse, slightly incurved, dark green above, yellowish-green below, 1.5-2 mm. long, with a central gland, apex mucronate. Female cone 1.5-2 cm. wide, globular, dark shiny brown, with 8 scales with a small umbo. Seeds about 5 per scale, flattened, somewhat warty, 5 mm. wide, with 2 even broadly ovate wings.

C. x NOTABILIS A.F. Mitchell Noble Cupressocyparis

A hybrid between Chamaecyparis nootkatensis and Cupressus arizonica var. glabra.A narrowly conical tree 7.5-9 m. tall or more, with curved, upswept branches. Bark dark purple, flaky. Branches sinuous, with flattened, doubly pinnate branchlets. Leaves scale-like, light gray-green, blue-green near the base, acute, free, pointing forwards, 1.5-2 mm. long. Male cone ovoid, 3 mm. long. Female cone 1.2 cm. long, globular, purplish-blue, bloomed blue-white, with 6-7 scales, scales with a small curved umbo.

C. x OVENSII A.F. Mitchell Ovens Cupressocyparis

A hybrid between Chamaecyparis nootkatensis and Cupressus lusitanica. A tree of vigorous, upright habit. Branchlets in long, flattened, drooping sprays. Bark of branchlets reddish-brown to pink. Leaves dark glaucous-green, spreading forwards, with a long free acute spine-tipped apex, 1.5-2 mm. long, with fine white stomata below. Crushed foliage has a lemony scent.

CUPRESSUS L. (Cupressaceae)

A genus of 13 species from the W. United States, Mexico, the Mediterranean, the Himalayas and W. China. Branches spreading or ascending. Branchlets quadrangular or nearly terete, same color on both sides, irregularly disposed, rarely flattened. Buds inconspicuous. Juvenile leaves needle-like, with white stomata. Adult leaves scale-like, small, opposite, appressed, imbricate, with a gland on the back, without prominent stomata, 4-ranked, with narrow transparent margins; often fragrant when crushed. Male cones ovate or oblong, yellowish, with 6-12 decussate scales, with 2-6 globose anther cells. Female cones borne erect, ripening in 2 years, persistent, usually remaining closed after maturity, with 3-7 pairs of woody peltate even scales, each scale bearing a central umbo; ovules 8-20 per scale or more. Seeds with 2 narrow even wings. Cotyledons 2 in the Old World species, 3-4 in the New World species.

C. ARIZONICA Greene — Rough-bark Arizona Cypress

A narrowly conical tree 25-30 m. tall, to 90 cm. in girth, with short dense horizontal branches. Bark greenish-brown, finely fissured, then grayish and furrowed. Branchlets irregularly disposed, quadrangular, nearly at right angles. Leaves scale-like, pale gray-green, ovate, sharply acute, grooved on the back, 1.5-2 mm. long by 1-1.5 mm. wide, glands usually inconspicuous, margins fimbriate, lemon scented if crushed. Male cone 2-5 mm. long, with 8-20 scales. Female cone globose or oblong, 15-25 mm. long, rarely opening at maturity, glaucous turning dark reddish-brown to gray-brown, with 6-12 scales; scales with a small thick prominent umbo in the center; ovules 8-10 per scale. Seeds 90-120 per cone, irregular to oblong, 4-5 mm. long, tan or reddish-brown, sometimes glaucous, with 2 narrow wings.Cotyledons 3-4, 10-14 mm. long, acute.
U.S.A.: S.W. Arizona to S.W. Texas to Durango, Mexico, 900-1830 m..

C. ARIZONICA var. GLABRA (Sudw.) Little — Smooth-bark Arizona Cypress
=C. montana Wigg.,=C. stephensonii Wolf

A conical tree 10-20 m. tall, 40-60 cm. in girth, with branches from the base. Bark thin, smooth, red or purplish, exfoliating, scaly. Branches ascending. Branchlets irregularly disposed, subcylindrical, bark of branchlets orange-brown to purplish-brown. Leaves blue-gray, acute, 1-2 mm. long, grooved above, distinctly glandular, glands forming a whitish dot, terete, strongly lemon scented. Male cone 3-5 mm. long, scales 10-18. Female cone subglobose, 2-3 cm. long, glaucous turning red-brown or grayish, with 6-10 scales with a small prominent thick umbo. Seeds 90-100 per cone, 10-15 per scale, dark brown, often glaucous, 4-5 mm. long, narrowly to broadly winged. Cotyledons 3-5, 9-13 mm. long, greenish, apex acute.
U.S.A.: C. Arizona; S. California; Mexico: N. Baja California, 450-2825 m..

C. ARIZONICA var. NEVADENSIS (Abrams) Little — Pioute Cypress

A stately conical tree 10-11 m. tall, to 80 cm. in girth, with a dense crown, often branched to the ground. Bark gray, furrowed. Branchlets nearly quadrangular, irregularly disposed. Leaves light gray-green, grooved above, to 2 mm. long, distinctly glandular, glands leave a clear reddish dot, acute, margins finely fimbriate. Male cone 3-5 mm. long, scales 10-16. Female cones obovoid, elongated, 2-3.5 cm. long, gray-brown, sometimes glaucous, with 6-8 scales, scales with a small thick umbo. Seeds 10 per scale, irregular, tan,

often slightly glaucous, 90 per cone, broadly winged. Cotyledons 3-5, 7-15 mm. long, bluntly acute.
U.S.A.: California: N. Kern and S. Tulare Counties, 1524-1830 m..

C. BAKERI Jeps. Baker or Modoc Cypress
=C. bakeri subsp. matthewsii Wolf

A conical tree 9-30 m. tall, to 60 cm. in girth, with an open crown. Bark reddish-brown, smooth, peeling, scaly. Branchlets irregularly disposed, quadrangular, bark dark red-brown. Leaves gray-green, sharply acute, 1-2 mm. long, grooved above, distinctly glandular, glands leaving a whitish dot, margins paler, apex spreading, foliage lemon scented. Male cone 2-3 mm. long, scales 8-12. Female cone globular to ovoid, 1.2-2 cm. long, warty, green turning dull brown to shiny gray or silvery, with 4-8 scales, scales with short thick umbos to 1.5 mm. high. Seeds about 50 per cone, irregularly rounded, brown or light tan, non-warty, 3-5 mm. long, with narrow wings. Cotyledons 3-4, 8-10 mm. long, bluntly acute.
U.S.A.: S.W. Oregon to Plumas County, E. California, 1160-2100 m..

C. CHENGIANA Hu Cheng or Min Cypress
=C. fallax Franco, =C. jiangeensis Zhao

A conical tree 20-30 m. tall, to 1 m. in girth, with a narrowly rounded crown. Bark brown-gray, deeply fissured. Branchlets irregularly disposed, often in a fishbone-like pattern, sometimes somewhat flattened, rounded. Leaves gray-green, broadly ovate, obtuse, 4 ranked, grooved above, with distinct glands, 1-1.5 mm. long, faintly resin scented. Male cone oblong, 2-3 mm. long, with 8-12 broadly ovoid scales. Female cone globose, gray-brown, sometimes glaucous, 1.5-2.5 cm. long, with 6-10 scales, scales with a small thick umbo. Seeds round, tan, smooth, flattened, 3.5-5 mm. long with narrow to broad wings. Cotyledons 2, 9-13 mm. long, light grayish-green, bluntly acute.
China: S.E. Kansu to N.W. Szechuan, Min River drainage, 1300-3000 m..

C. DUCLOUXIANA Hickel ex Camus Ducloux or Yunnan Cypress

A narrowly conical tree 25-60 m. tall, with upswept branches. Bark dark red-brown, finely fissured. Branchlets irregularly disposed, divided into thin shred-like segments, quadrangular, non-pendent. Leaves green to blue-gray-green, somewhat obtuse, grooved above, glands obscure, 1-1.5 mm. long, margins gray, apex slightly incurved, faintly resin-scented. Male cone 4-6 mm. long, with 12-16 scales. Female cone globular, shiny red-brown, sometimes faintly glaucous, 15-30 mm. long, with 6-8 scales , scales with a small thick umbo. Seeds ovoid, red-brown, densely warty, 5 mm. long, somewhat flattened, narrowly winged. Cotyledons light green , 2, 13-18 mm. long, notched at the apex.
China: S.E. Tibet,Pome; N.W. Yunnan, 1950-2100 m..

C. GIGANTEA Cheng et Fu Giant or Tsangpo Cypress

A conical tree 30-45 m. tall, 1-6 m. in girth. Bark gray-purple-brown, slightly fissured. Branchlets irregularly disposed, quadrangular or occasionally cylindrical, densely arranged in rows, non-flattened, bark orange-brown. Leaves gray-green, often bloomed white on the margins, 1-2 mm. long, bluntly acute to obtuse, grooved above, distinctly glandular, faintly resin scented.

Female cone oblong-spheroidal, shiny dark brown, 1.6-2 cm. long, with 12 scales, with thin small umbos. Seeds narrowly oblong, slightly warty, shiny chestnut-brown, with narrow wings to 1 mm. wide. Cotyledons 2, 11-13 mm. long, obtuse, glaucous-green.

China: S.E. Tibet; Tsangpo River Valley, Linchih westwards, 3000-3400 m..

C. GOVENIANA Gord. Gowen Cypress

=C. goveniana var. pigmaea Lemm.

A shrub or pyramidal tree 12-60 m. tall, 0.15-1 m. in girth or more, with a conical or broad, open, spreading crown. Bark pale gray-brown, shallowly furrowed, bright reddish-brown and scaly on young trees. Branchlets irregularly disposed, slender, quadrangular, bark purplish-brown. Leaves dark green to blackish-green, 1-2 mm. long by 1 mm. wide, ovate, bluntly acute to obtuse, not grooved above, glands usually absent, margins pale with a faint whitish bloom, apex incurved, faintly oily-scented when crushed. Male cone 3-4 mm. long, with 12-14 scales. Female cone globular or oblong, warty, 15-20 mm. long, dark brown or dull dark gray, with 6-10 scales with a thin small umbo. Seeds 90-110 per cone, 10-13 per scale, dark brown to black, warty, 3-4 mm. long, with narrow wings. Cotyledons 3-5, thin, 8-12 mm. long, acute, 3-angled, greenish-red.

U.S.A.: California: Mendocino, Sonoma and Monterey Counties, 60-300 m..

C. GOVENIANA var. ABRAMSIANA (Wolf) Little Santa Cruz Cypress

A broadly conical tree 12-18 m. tall, to 5 decimeters in girth, often branched from the base. Bark purplish-orange-brown to gray-brown, ridged, broken into vertical strips or plates, or fibrous. Branchlets irregularly disposed, short, fine, tetragonal, bark purplish-red. Leaves bright green, bluntly acute, 1-1.5 mm. long, with an obscure gland, tips forward spreading, free, incurved to a minute mucro, strongly lemon scented. Male cone ovoid, 3-4 mm. long, with 10-16 scales. Female cone ovoid, 20-30 mm. long, green turning gray-brown, somewhat glaucous, with 8-10 scales, scales with a small thick protuberant umbo. Seeds 7-8 per scale, 62 per cone, non-warty, flattened, brown, often glaucous, with broad wings 2-3 mm. wide. Cotyledons 3-5, 9-12 mm. long, wider than the type.

U.S.A.: California, Santa Cruz and San Mateo Counties, 487-762 m..

C. GUADALUPENSIS S. Wats. Guadalupe Cypress

A tree 15-20 m. tall, 1.5 m. in girth, with a broad, wide-spreading, rounded crown of ascending branches. Bark gray-brown to red, exfoliating, scaly. Branchlets irregularly disposed, bark pale red-brown. Leaves acute, gray-blue to blue-green, 1.5-2 mm. long by 1.5 mm. wide, glands obscure, margins fimbriate and pale, apex free and spreading, foliage lemon or resin scented. Male cone 3-6 mm. long, scales 14-18. Female cone subglobose to globose, 25-40 mm. long, light gray, with 6-8 thick swollen somewhat flattened scales, umbos inconspicuous. Seeds 100 or more per cone, glaucous-brown, 6 mm. long, finely warty, with wings to 1 mm. wide. Cotyledons 3-6, 7-13 mm. long.

Mexico: Guadalupe Island, somewhat endangered, to 900 m..

C. GUADALUPENSIS var. FORBESII (Jeps.) Little Forbes or Tecate Cypress

A tree to 10 m. tall, with an irregular, spreading, rounded crown. Trunk often branched from the base. Bark red or red-brown, thin, scaly, smooth. Branchlets irregularly disposed, bark dark chestnut-red. Leaves rich light green, sharply acute, 1.5 mm. long by 1 mm: wide, glands usually absent, appressed, with an abrupt mucro at the apex, margins bloomed white, foliage strongly lemon scented. Male cone 3-4 mm. long, with 10-14 scales. Female cone gray-brown, 20-30 mm. long, with 6-10 thick swollen scales, umbos inconspicuous. Seeds brown, angular, non-glaucous, 6 mm. long, with narrow wings. Cotyledons 3-6, 6-15 mm. long.
U.S.A.: S.W. California; Mexico: N. Baja California, 460-1524 m..

C. LUSITANICA Mill. Mexican Cypress
=C. corneyana (Knight et Perry) Carr. in part, =C. lindleyi Klotzsch.

A narrowly conical tree 10-30 m. tall, 40-60 cm. in girth, with ascending branches and pendulous branchlets. Bark reddish-brown to gray-brown, furrowed or shredding in long narrow strips. Branchlets short, irregularly disposed, quadrangular, bark reddish, vigorous branchlets sinous. Leaves acute, gray-green to glaucous, 1.5-2 mm. long by 1 mm. wide, glands inconspicuous, acuminate, margins denticulate, spreading, apex partially free, faintly lemon or resin scented. Male cones 3-4 mm. long, with 14-16 scales. Female cones subglobose, whitish turning reddish or glaucous-brown, opening upon maturity, with 6-10 thin scales with a small thin umbo. Seeds yellowish-brown to chestnut-brown, 4-5 mm. long, with narrow wings, non-warty. Cotyledons 3-4, 8-10 mm. long.
N.W. Mexico to S.W. Guatemala to N.W. Honduras, 490-1065 m..

C. LUSITANICA var. BENTHAMII (Endl.) Carr. Bentham Cypress

A narrowly conical tree to 20 m. tall, 40-60 cm. in girth, with ascending branches. Bark gray-brown to dark red, divided into thin plates or scales. Branchlets short, flattened into even fern-like pinnate sprays, bark pinkish, minor branchlets sinous. Glands abundant on foliage of young trees. Leaves bright light pale green, 1-1.5 mm. long, glands apparent, foliage somewhat dimorphic; apex sharp pointed, scarcely spreading, minutely mucronate, somewhat incurved; foliage faintly resin scented. Male cone 2-4 mm. long,with 16 scales. Female cone subglobose, opening upon maturity, glaucous then brown, 10-15 mm. long, wrinkly, with 4-8 thin scales with small thin erect umbos. Seeds 8-10 per scale, elliptic, 3-4 mm. long, yellowish-brown, wings to 1 mm. wide. Cotyledons 3-4, 10-13 mm. long, bluntly acute.
Mexico: Hidalgo; Puebla and Vera Cruz, 2100-2300 m..

C. MACNABIANA A. Murr. Macnab Cypress

A shrub or tree 10-25 m. tall, to 0.3 m. in girth, with a broad, spreading crown. Bark reddish-brown and scaly, becoming gray-brown and furrowed. Branchlets fine, rounded, evenly disposed in small flattened sprays, bark bright brown. Leaves ovate, obtuse, dark green to glaucous-green; glands distinct, leaving a whitish dot; 1.2-1.5 mm. long, gibbose at the apex. Male cone 2-3 mm. long, scales 6-8. Female cone variable, globose to oblique, dark shiny reddish-brown to gray-brown, 18-25 mm. long, with 6-8 scales, scales without umbos or with a thick prominent umbo, ovules 10-12 per scale. Seeds angular, 75-105 per cone, 3-4 mm. long, red-brown, sometimes glaucous,

smooth, sometimes warty, narrowly winged. Cotyledons 3-5, 10-12 mm. long.
U.S.A.: N. California; N. Coast Ranges and N. Sierra Nevada, 300-790 m..

C. MACROCARPA Hartweg ex Gord. Monterey Cypress

A symmetrical tree 20-25 m. tall, 0.6-1.2 m. in girth, with horizontally spreading branches and with a rounded crown, becoming flat-topped with age. Bark dark reddish-brown, scaly,becoming gray-brown and furrowed. Branchlets irregularly disposed, short, cylindrical, bark reddish-brown. Leaves rhombic-ovate, obtuse, to 1.8 mm. long, dark green, glands obscure, not grooved above, swollen near the apex; margins paler, faintly bloomed white; foliage strongly lemon scented. Male cone to 6 mm. long, scales 12-14. Female cone subglobose, 20-40 mm. long, shiny reddish-brown to dark gray, wrinkly, with 8-12 scales with small thick umbos. Seeds 20 per scale, warty, dark brown, 5-6 mm. long, narrowly winged, 140 per cone. Cotyledons 3-5, 10-12 mm. long, acute, greenish.
U.S.A.: Monterey County, Point Cypress, nearly at sea level.

C. SARGENTII Jeps. Sargent Cypress

A shrub or tree 10-25 m. tall, to 0.9 m. in girth, with a narrow or broadly rounded crown. Bark gray or brown, furrowed. Branchlets irregularly disposed, thickly quadrangular to nearly terete. Juvenile leaves 3-6 mm. long. Adult leaves bluntly acute, 1.6-2 mm. long by 2 mm. wide, dusty gray-green, sometimes glaucous, not grooved above; glands small and apparent, seldom active; foliage lemon scented. Male cone 3-5 mm. long, scales 10-12. Female cone on a short peduncle, reddish or shiny purplish turning gray-brown, variable, subglobose, 15-30 mm. long, with 4-10 scales; umbos absent or prominent, thick and long. Seeds 20 per scale, 100 per cone, angular, reddish-brown, often glaucous, irregular, 3.2 mm. long, non-warty, narrowly winged. Cotyledons 3-5, 9-20 mm. long.
U.S.A.: California, Coast Ranges, 60-1120 m..

C. SEMPERVIRENS L. Mediterranean Cypress
=C. horizontalis Mill., =C. sempervirens var. numidica Trab.

A broadly conical tree 35-40 m. tall, to 60 cm. in girth, with horizontally spreading branches. Bark reddish-brown and flaky, then gray-brown and furrowed, interior bark brown. Branchlets irregularly disposed,subtetragonal to quadrangular, bark purplish-brown. Leaves dull dark green, imbricate, ovate, obtuse, grooved above, glands apparent but obscure, 1.3-1.8 mm. long, margins denticulate, apex incurved, foliage faintly resin scented. Male cone 2.5-3 mm. long, with 12-14 scales. Female cone oblong to subglobose, green turning yellowish-brown to red-brown, wrinkly, 20-35 mm. long, with 6-14 scales with thin inconspicuous umbos.Seeds 8-20 per scale, dull dark brown, oval, 3-6 mm. long, relatively smooth, with narrow wings 1 mm. wide. Cotyledons 2, 10 mm. long, glaucous-green, seedlings bear adult foliage within one year.

The above description is applicable to the wild spreading form. The columnar form grown as 'stricta' is a cultivar and does not occur in the wild.

C. Tunisia; N.W. Libya; Greece; Cyprus; N. Iran; Turkey; Syria; Lebanon and Jordan, 500-1800 m..

C. SEMPERVIRENS var. ATLANTICA (Gaussen) Silba Atlas or Moroccan Cypress

A conical tree to 40 m. tall, often with a candelabra-like crown. Bark gray, furrowed.Branchlets evenly disposed into flattened sprays, short, slightly quadrangular. Leaves blue-green, 1-1.5 mm. long, obtuse, glands distinct, foliage resin scented. Male cone 2.5 mm. wide, scales 10. Female cone globose, yellowish-brown, 18-22 mm. long, usually with 8 scales with small thin umbos. Seeds dull brown, rounded, 4 mm. long, with narrow wings. Cotyledons 2-3, blue-green, 15-20 mm. long, seedlings retain juvenile foliage for 2-3 years.
Morocco: Oued N'Fis, 1000-2000 m.

C. SEMPERVIRENS var. DUPREZIANA (Camus) Silba Tamrit or Duprez Cypress

A tree 10-20 m. tall, 3-4 m. in girth, with a broad rounded, irregular crown. Bark gray, deeply furrowed. Branchlets short, evenly disposed into a flattened spray. Juvenile leaves glaucous. Adult leaves dark green, 1-1.5 mm. long, slightly keeled, obtuse, margins denticulate, glands distinct, foliage somewhat lemon scented. Male cone 3-4 mm. long, with 12 scales; pollen grains much smaller than the typical species. Female cone ovoid-oblong, reddish-brown, 18-22 mm. long, with 10-12 scales with small thin umbos. Seeds somewhat flattened, with broad wings. Cotyledons 2, to 15 mm. long, seedlings retain juvenile foliage for 2-3 years.
S.E. Algeria: Tassili Plateau, Tamrit, endangered, 1600-1900 m..

C. TORULOSA D. Don ex Lamb. Himalayan Cypress

A conical tree to 50 m. tall, with a rounded crown, with short horizontal branches. Bark gray-brown, peeling off in long thin strips. Branches ascending; branchlets short, flattened, cylindrical to subtetragonal, slender, pendent, bark purplish-gray.Leaves bluntly acute, dark green, grooved above, glands inconspicuous, 1.6-2 mm. long, incurved, appressed or slightly spreading at the apex; margins pale and denticulate, slightly bloomed white; foliage grassy scented. Male cone 3-5 mm. long, scales 12-16. Female cone subglobose to oblong, whitish-green turning shiny reddish-brown, 13-20 mm. long, with 10-12 scales, scales with a small thin stout umbo. Seeds 6-8 per scale or more, reddish-brown, rounded, 4 mm. long, somewhat flattened, relatively smooth, with narrow wings. Cotyledons light blue-green, with numerous stomata, 2, rarely 3, 6-10 mm. long, bluntly notched at the apex, seedlings with adult foliage in 1-2 years.
N.E. India: Chamba to N.W. Nepal, 1500-3300 m..

C. TORULOSA var. CASHMERIANA (Carr.) Kent Kashmir Cypress

A broadly conical tree to 45 m. tall, with ascending branches. Bark finely fissured, brownish-red then gray-brown, fissured or shreddy. Branchlets divided into long, pendulous, flattened, chain-like segments, bark pinkish. Leaves sharply acute, 1.5-2 mm. long, silvery-blue to gray-green, flattened, grooved above, apex free, margins pale, foliage grassy scented, foliage sometimes appearing green after rainy weather. Male cone 3-5 mm. long, scales 14-18. Female cone glaucous becoming red-brown or gray-brown, oblong-ellipsoidal, 12-20 mm. long, with 10-12 scales with a thin stout umbo. Seeds red-brown, 10 per scale, rounded, flattened, smooth, 3-4 mm. long, with narrow wings. Cotyledons 2, 8 mm. long, bluntly acute, pale blue-green.
Sikkim; Bhutan; China: S.E. Tibet; N.W. India: Balipara Frontier, 2500-3000 m..

DACRYCARPUS (Endl.) De Laub. (Podocarpaceae)

A genus of nine species from Burma to New Zealand, in rain forest, mostly 1000-3000 m. elevation. Trees with flattened branchlet systems. Buds inconspicuous. Leaves dimorphic, bilaterally flattened,falcate and distichous when young; adult leaves awl-shaped, Dacrydium-like, needle-like, spirally arranged, somewhat reduced near the base of the branchlets. Male cones axillary, elongated, oval to cylindrical, anther-like. Female cone subtended at the base by involucral leaves, cone with a swollen bract united with the seed; receptacle fleshy, warty, sometimes with a protruding umbo, reddish, bract as long as the seed. Seeds inverted, completely covered by the leathery scale, usually one per cone, wingless.

D. CINCTUS (Pilg.) De Laub. Busu Dacryberry
=Podocarpus cinctus Pilg., =Podocarpus dacrydiifolia Wassch..

A shrub or tree 4-30 m. tall. Bark brown or black, exfoliating, scaly, inner-bark red. Branchlets 3-4 mm. in diameter. Juvenile leaves slightly flattened and distichous at first, becoming falcate, to 12 mm. long by 8 mm. wide, with a pungent apex. Adult leaves slightly flattened, lanceolate, falcate, 2-6 mm. long by 4-6 mm. wide, adpressed, glaucous, spreading. Male cone terminal or lateral, globose, 4-10 mm. long by 2-3 mm. wide, on a branchlet 2-3 mm. long; microsporophylls acuminate. Female cone lateral, on a branchlet 5-15 mm. long; receptacle warty, 3-4 mm. long with 1-2 projecting bracts, red; involucral leaves much longer than the foliage leaves, 6-7 mm. long. Seed with a small asymmetrical crest, 6-7 mm. wide by 6-7 mm. long.
Indonesia: Celebes; New Guinea to Papua, 900-3600 m.

D. COMPACTUS (Wassch.) De Laub. Albert-Edward Dacryberry
=Podocarpus compactus Wassch.

A shrub or small tree 2-20 m. tall, with numerous branches and an irregular trunk. Juvenile trees conical. Bark dark gray, scaly, inner-bark straw-red. Juvenile leaves flattened, lanceolate, falcate, acute, strongly keeled,non-distichous, 2.5-6 mm. long by 0.5-1.5 mm. wide. Adult leaves flattened, spreading slightly, falcate, not dimorphic, lanceolate, keeled, 2-3 mm. long by 0.6-1 mm. wide. Male cone lateral on a branchlet 3 mm. long, but generally terminal; 7-8 mm. long by 3 mm. wide; microsporophylls lanceolate, acute. Female cone terminal, on a branchlet 6-17 mm. long; receptacle warty, 3-4 mm. long, with a protruding sterile bract; involucral leaves robust, 4-5 mm. long by 0.8-1.2 mm. wide, clasping the receptacle; ovule purplish with a glaucous bloom. Seed globular, with a blunt crest, 7-8 mm. long by 7 mm. wide, somewhat resinous, gray or glaucous-green.
New Guinea to Papua, type near Mt. Albert-Edward, 3200-3900 m..

D. CUMINGII (Parl.) De Laub. Cuming Dacryberry
=Podocarpus cumingii Parl.

A tree to 20 m. tall, or more. Juvenile leaves flattened, distichous, to 12 mm. long by 1.25 mm. wide, apex curved and parallel with the branch. Adult leaves flattened, spreading, somewhat falcate, weakly dimorphic, acute with a fine upcurved spine, to 6 mm. long by 0.6-1 mm. wide. Male cone lateral, on a short branchlet 2-5 mm. long, oval, 8-10 mm. long by 2-3 mm. wide; microsporophylls lanceolate. Female cone on a short, generally lateral branchlet 6-10 mm. long; receptacle 2-3 mm. long, with 1-2 apical fertile bracts; involucral leaves

curved, surrounding the seed, 10 mm. long by 0.5 mm. wide. Seed 5-6 mm. long by 4-5 mm. wide, with a distinct asymmetrical crest.
Philippines: Luzon; Indonesia: Sumatra and Borneo, 1860-3000 m..

D. DACRYDIOIDES (Rich.) De Laub. New Zealand Dacryberry
=Podocarpus dacrydioides Rich.

A large tree 50-63 m. tall, girth to 1.50 m.. Trunk usually straight and clear of branches for 18 m. or more. Crown narrowly conical. Bark gray-brown, smooth. Branches pendent, fine. Juvenile leaves 2-ranked, flat, linear, soft, 4-6 mm. long, bronze or bronzy-green, decurrent, apex pointed or mucronate. Adult leaves scale-like, spirally arranged, imbricate, keeled, 2-3 mm. long, dimorphic, green or bronzy-green, apex pointed and incurved. Main branches dressed with triangular, bract-like leaves. Dioecious. Male cone solitary, terminal, linear, in groups, 10 mm. long; microsporophylls somewhat compressed. Female cone on a short terminal branchlet, with 3-4 ovules; receptacle red, bloomed glaucous; involucral leaves short, free from the seed. Seeds round, 4 mm. wide, apex apiculate.
New Zealand: scattered throughout, lowland, swampy areas, to 700 m..

D. EXPANSUS De Laub. Yobobos Dacryberry

A tree to 25 m. tall. Bark scaly. Juvenile leaves dimorphic, compressed bilaterally, spreading, falcate, pungent, to 12 mm. long by 1.5 mm. wide. Adult leaves compressed bifacially, spreading, expanding, falcate, acute, keeled dorsally, 2-4 mm. long by 0.6-1 mm. wide. Male cone lateral, on branchlets 1-2 mm. long, ovoid, 6 mm. long by 3 mm. in diameter. Female cone on short branchlets 4-5 mm. long; receptacle small, warty, 2-3 mm. long; involucral leaves bifacially flattened, clasping the receptacle, 3-4 mm. long by 0.6 mm. wide. Seed globose, cristate, 4 mm. in diameter, 5-6 mm. long.
New Guinea: Irian Jaya to Papua, 2600-2607 m..

D. IMBRICATUS (Blume) De Laub. Java Dacryberry
=Podocarpus imbricatus Blume

A tree 30-60 m. tall, with a cylindrical trunk to 2 m. in girth. Bark dark brown or blackish, resinous, scaly, inner-bark reddish. Branches compact, spreading, often pendulous; with long, slender, whip-like branchlets, 0.75-1.25 mm. in diameter. Foliage dimorphic. Juvenile leaves flattened, triangular, somewhat falcate, nearly 2-ranked, 3-5 mm. long by 0.7-0.8 mm. wide, sessile, decurrent, midrib prominent, apex mucronate. Adult leaves imbricate, scale-like, strongly appressed, slender, flattened, green, distichous, 1-1.7 mm. long by 0.6 mm. wide, apex acute and incurved. Male cone lateral, greenish, 0.7-1.2 cm. long by 2-2.5 mm. wide, on a branchlet 1-3 mm. long; microsporophylls triangular. Female cone terminal at tips of short branchlets; receptacle glaucous, 3-4 mm. wide, with 2 bracts; involucral leaves acuminatem acicular, 2.5-5 mm. long, quadrangular or laterally flattened, spreading horizontally, abruptly fine-tipped. Seed globose, red, slightly ribbed on the back with a blunt crest, 5-6 mm. long by 4-6 mm. wide.
Malaysia: Malaya; Indonesia: Java and Lesser Sunda Islands, 700-3000 m..

D. IMBRICATUS var. CURVULUS (Miq.) De Laub. Sumatran Dacryberry

Branchlets drooping, relatively stout, usually curved to one side, 1-1.25 mm. in diameter. Foliage relatively coarse. Leaves strongly adpressed, robust, 1.2-2 mm. long by 0.8-1 mm. wide. Male cone 2.5-3.5 mm. wide. Female cone with erect, adpressed, dorsiventrally flattened involucral leaves 2.5-4.5 mm. long, somewhat clasping the receptacle. Seed with a short, free apex and somewhat curved below.

Indonesia: Sumatra and Java,1500-3300 m..

D. IMBRICATUS var. PATULUS De Laub. Kawa or Common Dacryberry
=Podocarpus kawaii Hayata

A tree with a straight trunk for 30 m. or more, to 1 m. in girth, with most main branches at the top . Bark red-brown, thick, fissured. Branchlets 1-2 mm. in diameter. Leaves spreading, acicular, falcate, keeled, acute, 8-15 mm. long by 4-6 mm. wide, apex incurved, base sessile and decurrent. Female cone solitary, terminal; receptacle cylindrical, fawn-green then orange-red to purple, 1-1.5 mm. long by 1 mm. wide; ovule obovate, 2 mm. long by 1 mm. wide; involucral leaves 1-3 mm. long. Seed at apex of the receptacle, glaucous then yellow-brown, with a crest.

Indochina; Malaysia; Philippines; Indonesia; Melanesia; Fiji, 700-1700 m..

D. IMBRICATUS var. ROBUSTUS De Laub. Wilhelm Dacryberry
=Podocarpus papuanus Ridley

A tree 15-20 m. tall, with a large trunk. Branches pendent, spreading, foliage fine, branchlets 1.5-2.5 mm. in diameter. Leaves small, spreading, acute, apex incurved, strongly keeled, robust, 1.2-1.8 mm. long by 0.6-0.8 mm. wide, base narrowed and decurrent. Male cone cylindrical, obtuse, on a short lateral branchlet, 6 mm. long by 2 mm. wide, scales oval. Female cone on a short lateral branchlet; receptacle with 2-4 bracts, 1-2 of which are fertile, cylindrical, 3-4 mm. long by 2.5-3 mm. wide; involucral leaves 2-3 mm. long, flattened laterally, with a blunt narrow apex. Seed with an oblique apex.

Malaysia: Sarawak; Sabah; Philippines; New Guinea, 1000-3300 m..

D. KINABALUENSIS (Wassch.) De Laub. Kinabalu Dacryberry
=Podocarpus imbricatus var. kinabaluensis Wassch.

A compact shrub or small tree to 2 m. tall, with sparse branches. Juvenile leaves flattened, distichous, 10 mm. long by 1.2 mm. wide, falcate, with a long upturned acuminate apex. Adult leaves flattened, stiff, falcate, dimorphic, 1-2 mm. long by 0.5-1 mm. wide, quadrangular, apex curved upwards and pungent, spine not projecting. Male cone lateral on a short branchlet 3 mm. long; globose, 8 mm. long by 3 mm. wide. Female cone terminal on short lateral branchlets 0.5-1.5 mm. long; receptacle blue or brown, cylindrical, with 2 bracts; involucral leaves 5-8 mm. long, much longer than the receptacle, flattened. Seed subglobose, 7 mm. long by 5.5 mm. wide, with a distinct asymmetrical crest.

Malaysia: Sabah; Mount Kinabalu, 2700-4000 m..

D. STEUPII (Wassch.) De Laub. Steup Dacryberry
=Podocarpus steupii Wassch.

A tree 12-36 m. tall, with compact branches. Bark brown or gray, exfoliating in thin strips. Juvenile leaves bifacially flattened and distichous, acicular, decurrent, apex pungent. Adult leaves 2-ranked, falcate, rigid, 2-2.5 mm. long, flattened, keeled dorsally, quadrangular, spreading. Female cone on a branchlet 3-5 mm. long, lateral; receptacle warty, 2-3 mm. long, with a sterile protruding bract and 1-2 fertile bracts; involucral leaves elongated, nearly quadrangular, widely spreading- 3-5 mm. long. Seeds globular, 5-6 mm. long by 4.5-5 mm. wide, with a small crest.
Indonesia: E. Borneo; Celebes; New Guinea, 780-2350 m..

D. VIEILLARDII (Parl.) De Laub. Vieillard Dacryberry
=Podocarpus vieillardii Parl.

A asymmetrical tree 12-25 m. tall, with a narrow crown. Bark hard, gray-brown to red, scaly, with scattered lenticels. Branches horizontal, foliage fine and dimorphic. Juvenile leaves 2-ranked, flattened, distichous, 10 mm. long by 1 mm. wide, spreading, acute with a minute upturned spine. Adult leaves acicular, spirally arranged, spreading, overlapping, glaucous, loosely arranged, non-distichous, scale-like, 2-4 mm. long by 0.4-0.6 mm. wide, with a minute spine on the incurved apex. Male cone lateral, subtended by a short scaly stalk, cone 7-12 mm. long by 1 mm. wide; microsporophylls triangular and acute. Female cone on a lateral or terminal scaly branchlet 6-8 mm. long; receptacle 2-3 mm. long, with one projecting sterile bract; involucral leaves spreading, 6-10 at the base of the cone, 1-2 mm. long, keeled, acute. Seed oval or globular, 5.5-6 mm. long by 4 mm. wide, with a blunt double crest.
S. New Caledonia: type near Paita, 200-800 m..

DACRYDIUM Soland. (Podocarpaceae)

A genus of 26 species occuring mainly in subtropical regions in S.E. Asia to Australasia and in W. South America. Dioecious, rarely monoecious (New Zealand species). Buds inconspicuous. Juvenile foliage needle-like, similar to Dacrycarpus, falcate, scarcely distinguishable from the adult foliage in some species. Adult leaves usually with resin ducts, appressed, sharply keeled, scale-like or needle-like and spreading, spirally arranged. Male cones in axils of upper leaves, oblong-cylindrical. Female cones borne erect, axillary, at tips of branchlets, sometimes nearly hidden by the foliage; bracts scarcely different from the foliage leaves, reddish; ovule seated in a basal cup-shaped aril. Pollen grains winged. Seeds usually oblique to the cone axis, projecting beyond a membraneous epimatium, compressed, keeled laterally, one per cone,ovoid, wingless; micropyle short and blunt.

D. ARAUCARIOIDES Brong. et Griseb. Araucaria-leaf Dacrydium
=D. arthrotaxoides Carr.

A small tree 3-8 m. tall, with a candelabra-like crown. Bark fibrous, brown, scaly, with lenticels. Branches erect,fastigiate. Branchlets short, thick, cylindrical, 4-6 mm. in diameter. Juvenile leaves linear, erect or slightly spreading, to 1.2 cm. long, apex incurved. Adult leaves scale-like, linear-oblong, imbricate, 3-5 mm. long by 1.1-1.4 mm. wide, densely overlapping in many rows,

rigid, strongly curved, keeled, apex obtuse and free. Male cones terminal, oblong-cylindric, 9-18 mm. long by 2-3 mm. wide; microsporophylls longly triangular. Female cones terminal on branchlets 3 mm. long, becoming purplish and fleshy at maturity. Seeds 1-3 per cone, ovoid, 7-8 mm. long, apex obtuse.
New Caledonia: eastern and southern coasts, type near Canala, 150-1000 m..

D. BALANSAE Brong. et Griseb. Balansa Dacrydium

A tree 4-12 m. tall, with ascending fastigiate branches. Bark fibrous, breaking into brown plates with numerous lenticels, finally turning gray. Branches dense, with spreading branchlets. Juvenile leaves to 13 mm. long, needle-like, acute. Adult leaves scale-like, narrowly lanceolate, 3-4.5 mm. long by 1-2 mm. wide, keeled, thick, rigid, arranged in many rows, densely overlapping, glaucous, apex incurved. Male cone solitary or in pairs, cylindrical, 8-15 mm. long by 2 mm. wide, with triangular microsporophylls. Female cone with 1-2 elongated scales, 3.5-4 mm. long. Seeds reddish, ovoid, compressed, keeled, to 5 mm. long, apex obtuse.
New Caledonia: local, type near Bourail, 10-900 m..

D. BECCARII Parl. Beccar Dacrydium
=D. beccarii var. subelatum Corn.

A shrub 3-4 m. tall, or an umbrella-shaped tree to 35 m. tall and to 7 m. in girth. Bark smooth, gray, fissured, inner-bark brown. Branches erect, bushy. Juvenile leaves 8-20 mm. long. Adult leaves crowded, curved, sharp-pointed, needle-like, 5-10 mm. long by 0.4-0.8 mm. wide, keeled, triangular or quadrangular in the cross-section. Male cone ovoid, 2-2.5 cm. long by 5-7 mm. wide, lateral or on a short terminal branchlet; microsporophylls lanceolate. Female cone terminal or lateral; cupule smooth, red; bracts longer than the leaves. Seeds solitary or in pairs, broadly ovoid, 4 mm. long, well exposed at maturity.
Malaysia; Philippines; Indonesia; New Guinea to Solomon Islands, 600-1676 m..

D. COLENSOI Hook. Colenso Dacrydium
= Lagarostrobus colensoi (Hook.) Quinn

A conical tree 12-18 m. tall, 1-2 m. in girth, with a relatively straight trunk. Bark scaly, fibrous, blackish or purple internally, brown externally . Juvenile branchlets slender, 1-1.5 mm. in diameter. Adult branchlets cord-like, quadrangular. Juvenile leaves lax, spreading, linear, sessile, 6-30 mm. long, persistent. Adult leaves scale-like, densely overlapping, closely pressed, 1.5-2.5 mm. long, leathery, obtuse, keeled, apex often incurved. Male cones solitary, terminal, 3-4 mm. long; microsporophylls triangular, numerous. Female cone at tips of branchlets, solitary or in pairs of 2-3, cupule white. Seeds 1-3, 2.5 mm. long, oblong, obtuse, 1/3 of seed enclosed by the cupule.
New Zealand: W. North Island and in Westland, South Island, 1219-1830 m..

D. COMOSUM Corner Malayan Dacrydium

A tree 4-12 m. tall, densely branched, crown umbrella-shaped. Bark in small flakes, red-brown. Foliage branches bushy, densely leafy, branchlets squirrel-tail-like. Juvenile leaves up to 33 mm. long. Adult leaves needle-like, progressively attenuate, spreading at an angle, lanceolate-pungent, distinctly flattened, 12-20 mm. long by 0.7-1.3 mm. wide, incurved near the base. Microspo-

rophylls of male cones elongated and lanceolate. Female cone on a short lateral branchlet, often with 2 seeds, cupule smooth or slightly reticulate. Seeds 4-5 mm. long.
Malaysia: Malaya; Pahang and Selangor, 1200-2000 m..

D. CORNWALLII De Laub. Wissel or Cornwall Dacrydium
=D. nidulum var. araucarioides De Laub.

A tree with gray-brown, flaky bark. Branchlets densely clothed,in a U-like pattern. Leaves Araucaria-like , spirally arranged in sets, crowded, imbricate, acute, apex incurved, dorsal surface rounded and exposed, 1.5-3 mm. long by 0.2-0.5 mm. wide, midrib prominent. Male cone with triangular microsporophylls, apex non-elongated, only slightly imbricate. Female cone green then orange-red; involucral leaves to 3 mm. long . Seeds brown, ovoid, 4 mm. long by 2.5 mm. wide, apex flattened.
New Guinea : type from near Wissel Lake, 750-2770 m..

D. CUPRESSINUM Sol. ex Forst. Rimu Dacrydium

A tree to 50 m. tall, to 4.5 m. in girth, with a pyramidal crown when young, becoming round-topped when mature. Trunk clear of branches for 12-15 m. Bark dark red-brown or gray, scaly, inner-bark red. Branches long and pendent. Juvenile leaves loosely arranged, awl-shaped, dark green, linear, 4-6 mm. long by 0.5-1 mm. wide, spreading, decurrent, gradually changing to the adult form. Adult leaves scale-like, linear, sharp pointed, yellow-green, 2-3 mm. long, keeled on back, apex obtuse and incurved. Dioecious. Male cone terminal, 1-2 per cluster, green, at tips of short subterminal branchlets, 5-10 mm. long; microsporophylls lanceolate. Female cone at tips of branchlets, solitary, red, curved,erect, bracts occasionally enlarged, epimatium membraneous. Seeds solitary, ovoid, 3-4 mm. long, dark brown or black, slightly compressed.
New Zealand: C. North Island and W. South Island, scattered, to 800 m..

D. ELATUM (Roxb.) Wallich Junghuhn Dacrydium
=D. junghuhnii Miq.,=D. pierrei Hickel

A pyramidal tree to 40 m. tall, with dense, erect branches, becoming round-topped with age. Bark reddish-brown, furrowed, flaky. Branchlets cord-like, 1-2 mm. in diameter, pendent. Juvenile leaves spreading, deeply grooved, acicular, to 12 mm. long.Adult leaves imbricate, densely overlapping, acute, sharply keeled, 1-1.5 mm. long by 0.4-0.6 mm. wide, apex obtuse or minutely pointed. Male cone on a short lateral branchlet, cylindrical, 4-5 mm. long by 1.2 mm. wide; microsporophylls triangular, acute. Female cone scattered on sides of fertile branchlets, terminal, bracts of cones becoming slightly enlarged, red, cupule reticulate. Seeds solitary, nearly erect, ovoid, 4-4.5 mm. long, apex obtuse.
Thailand to Vietnam; Malaysia; Philippines; Indonesia, 500-1700 m..

D. ERICIOIDES De Laub. Meruong Dacrydium

A tree to 17 m. tall, with drooping branchlets. Leaves linear, straight, spread out more or less perpendicular to the branchlet except on new growth, narrowing abruptly to an apiculate apex, 5-10 mm. long by 0.7-1 mm. wide, 0.2 mm. thick, keeled dorsally. Strobili usually lateral; male 7-10 mm. long, 2-2.5 mm. in diameter, microsporophylls with a spur 1 mm. long.

Malaysia: Sarawak; Mt. Dulit and Meroung Plateau; Indonesia: Borneo, 1036-1500 m..

D. FONKII (Phil.) Benth. et Hook. f. Chilean Dacrydium
=Lepidothamnus fonkii Philippi

A shrub to 30 cm. high, usually 15.3-20.3 cm. high, with dense, short, erect branches. Bark dark brown, with few scales. Branches often rooting on the ground and reproducing new plants. Branchlets long, joint-like, whip-like. Juvenile leaves triangular, decurrent, somewhat distichous. Adult leaves scale-like, imbricate, keeled on the back, apex blunt and incurved, 1-1.5 mm. long by 0.5-1 mm. wide. Male cones hidden by the foliage; pollen grains 36-38 microns in diameter. Female cone with an epimatium with the scales, 6 mm. long, crimson. Seeds at apex of short scaly branchlets, ovoid, smooth, 2 mm. long, orange.

S. Chile: Valdivia and the Cordillera Pellado, to Chiloe Island, to 2000 m.

D. FRANKLINII Hook. f. Huon Dacrydium
=Lagarostrobus franklinii (Hook. f.) Quinn

A pyramidal tree 20-30 m. tall, to 1 m. in girth, with a dense crown of fine, slender, pendent branches. Surprisingly seedlings have no true juvenile form of leaves. Leaves small, scale-like, 1 mm. long, closely pressed, dark green, blunt and concave, strongly keeled, Cupressus-like, with scattered white stomata on the dorsal side. Male cone with 12-15 stamens; pollen grains 26-38 microns in diameter. Female cones very small, at apex of branchlets, each cone with 4-8 scales. Seeds globose, thick, 2 mm. in diameter, with a cupule ana a fine, membraneous base.

Australia: Tasmania, southern and western coasts, 91-700 m..

D. GIBBSIAE Stapf. Gibbs Dacrydium
=D. beccarii var. kinabaluense Corner

A tree to 12 m. tall, with many branches. Branchlets cord-like, dimorphic, to 8 mm. in diameter. Juvenile leaves acicular, 1.2-2 cm. long, spreading, slightly falcate. Adult leaves imbricate, distinctly flattened, acute, 5-7 mm. long by 1-1.3 mm. wide, rigid, keeled, incurved. Male cones terminal or lateral, cylindrical, 2-2.5 cm. long by 5-7 mm. wide; microsporophylls lanceolate. Female cone terminal, on a very short lateral branchlet, with 1-2 fertile bracts, cupule reddish. Seeds nearly erect, surrounded but spreading apart from the involucral leaves, oval, 4.5 mm. long.

Malaysia: Sarawak, Mount Kinabalu, 1500-3300 m..

D. GRACILLIS De Laub. Kinabalu Dacrydium

A tree 7-30 m. tall. Juvenile leaves at least 12 mm. long, curved so that the tip is nearly parallel to the branchlet, pungent, triangular in the cross-section, lanceolate, up to 0.4 mm. wide at the base, 0.2 mm. thick. Adult leaves linear-lanceolate, keeled dorsally, apex apiculate, 3-9 mm. long by 0.4 mm. wide, by 0.2 mm. thick. Male cones 6-7 mm. long by 2 mm. in diameter, apex of microsporophylls lanceolate. Female cones not seen.
Malaysia: Sabah; Mt. Kinabalu, Silau Silau Trail & Liwago Trail, 1463-1524 m..

D. GUILLAUMINII Buchholz Guillaumin Dacrydium

A shrub 1-2 m. tall, with an enlarged base, often a rheophyte. Bark dark brown, fibrous, fissured longitudinally, roughened by large numerous lenticels. Branchlets 3.5-4.5 mm. in diameter, corymbose, with terminal tufts of squirrel-tail-like branchlets, densely covered with foliage. Juvenile leaves terminate gradually into the adult. Adult leaves persistent for 9-12 years, needle-like, imbricate, curved, acute, 1.3-1.7 cm. long by 1 mm. wide, apex incurved. Male cones terminal, sessile, 8-14 mm. long; microsporophylls long and lanceolate. Female cones terminal, on short lateral branchlets, bracts of cone unmodified or slightly reduced leaves. Seeds up to five per cone, subterminal, oval, 4.5 mm. long, keeled, apex rounded, micropyle projected.
S. New Caledonia: type from near Riviere des Lacs, to 145 m..

D. INTERMEDIUS T. Kirk Red Dacrydium
=Lepidothamnus intermedius (T.Kirk) Quinn

A small tree to 12 m. tall, 1-2 m. in girth. Bark gray. Branches spreading, branchlets relatively thick. Juvenile leaves narrowly linear, acute, curved, to 1 cm. long, persistent. Adult leaves scale-like, densely crowded, overlapping, obtuse, keeled, leathery, 3-angled, 1.5-2.5 mm. long. Male cones numerous, 6 mm. long, with numerous triangular microsporophylls. Female cones at tips of branchlets, cupule at base of the seed. Seeds oblong, 3-4 mm. long, obtuse or apiculate.
New Zealand: scattered throughout islands, mainly in bog forests on west coast of the South Island, to W. Stewart Island, 518-762 m., subalpine.

D. LAXIFOLIUM Hook. f. ex Hook. Tongoriro Dacrydium
=Lepidothamnus laxifolius (Hook. f.) Quinn.

The smallest Conifer species, a prostate or sub-erect shrub 7-12 cm. high, with slender, spreading branches to 1 m. long. Branchlets fine and filiform. Juvenile leaves lax, spreading, narrowly linear, acute, curved, 3-8 mm. long. Adult leaves scale-like, linear-oblong, bluntly acute to obtuse, keeled, to 1.5 mm. long, spreading or overlapping, green, turning reddish in the winter. Male cones with triangular microsporophylls. Female cone on a dry or occasionally fleshy and swollen cupule, with 3-4 green bracts. Seeds to 3 mm. long, with a small curved point .
New Zealand: Mount Tongoriro and near Nelson, 762-2134 m..

D. LEPTOPHYLLUM (Wassch.) De Laub. Goliath Dacrydium
=Podocarpus leptophylla Wassch.

A tree with slender, erect, filiform branches. Branchlets 0.25-4 mm. in diameter. Young branches nearly horizontal. Leaves adpressed, narrowly awl-shaped, dorsiventrally flattened, sharply acute or acuminate, 2-3 mm. long by 0.6-0.7 mm. wide, slightly keeled below. Female cone with dorsiventrally flattened involucral leaves 2-3 mm. long.
N.W. New Guinea: W. Irian, Mount Goliath, to 3000 m..

D. LYCOPODIOIDES Brong. et Griseb. Mou Dacrydium

A graceful fastigiate tree 9-25 m. tall, with numerous erect branches. Bark fibrous, brown, plate-like, with numerous small lenticels. Juvenile leaves filiform, to 1 cm. long. Adult leaves needle-like, flattened, narrowly lanceolate, 3-4.5 mm. long, rigid, keeled, sharply pointed, twisted, acute, densely arranged. Male cone terminal, cylindrical, 4-7 mm. long by 1.2 mm. wide; microsporophylls triangular. Female cone terminal, on a short branchlet, cupule at base of cone, apex of cone with a beak. Seed ovoid, chocolate-brown, 3-3.5 mm. long, apex obtuse.
S.E. New Caledonia: Mount Mou and Mount Humboldt, 800-1400 m..

D. MAGNUM De Laub. Obi Dacrydium
=D. beccari var. rudens De Laub.

A tree to 30 m. tall, densely branched. Branchlets 6-7 mm. in diameter. Juvenile leaves to 17 mm. long. Adult leaves spreading, rigid, acicular, needle-like, acute, falcate, keeled dorsally, 4-6 mm. long by 0.3-0.4 mm. wide, spirally arranged, incurved, tips not exposed. Fertile branchlets have unreduced leaves, slender bracts, non-flattened, less than half as wide. Female cone on tips of branchlets, with short involucral leaves surrounding a solitary seed. Seed to 5 mm. long, surrounded by slender bracts no longer than the foliage leaves.
Indonesia: Moluccas: Obi Island and Sudest Island, 500-600 m..

D. MEDIUM De Laub. Pahang Dacrydium

A shrub or tree 1-20 m. tall, densely branched. Juvenile leaves acicular, to 20 mm. long. Adult leaves robust, apiculate, dense, 3-8 mm. long by 0.5-0.6 mm. wide. Short fertile branchlets are only slightly modified from the foliage branches. Male cones terminal or lateral, cylindrical, 7-9 mm. long by 2.5 mm. in diameter; scales elongated with a linear tip beyond the pollen sacs, apex of elongated tip is sharply incurved making tip appear rounded and blunt. Female cones on short branchlets; involucral leaves small, at base of a long seed, 2-3 mm. long. Seed protruding, 5 mm. long, subtended by a dark red cupule.
Malaysia: Malaya; Indonesia: Sumatra, 975-2600 m..

D. NAUSORIENSIS De Laub. Nausori Dacrydium

A tree 12-25 m. tall, densely branched. Bark in thick flakes, fibrous, brown, smooth, becoming grayish, with lenticels. Juvenile leaves acicular, to 9 mm. long, abruptly changing to the adult form. Adult leaves small, spreading, acute, dorsally keeled, dense, 1 mm. long by 0.4 mm. wide. Male cones cylindrical, terminal or lateral, to 2.5 mm. long. Female cones at tips of branchlets that are short, involucral leaves to 2 mm. long, cupule purplish or brownish,

becomin black. Seed protruding, 3.5-4 mm. long, rich brown, with a slight marginal keel.
Fiji: Vitu Levu, Nausori Highlands; Vanua Levu, Lambassa, Sarava, 120-600 m..

D. NIDULUM De Laub. Vogelkop Dacrydium

A tree 6-35 m. tall, 1-2 m. in girth. Bark brown, flaky, with lenticels. Leaves dispersed, needle-like, linear, oblique, keeled, 2-5 mm. long by 0.4-0.8 mm. wide, slightly incurved, bluntly acute, triangular in the cross-section. Male cone terminal, cylindrical, 9-12 mm. long by 2 mm. wide, microsporophylls triangular with an elongated apex. Female cone at tips of branchlets, light green turning brown, bracts of cone longer than the leaves, keeled, 1-2 fertile bracts at the apex. Seeds erect, rising above the leaves at maturity, 3.5-4 mm. long, with a protruding apex.
Indonesia: Celebes, Moluccas, New Guinea; Fiji, 0-1800 m..

D. NOVO-GUINEENSE Gibbs New Guinea Dacrydium

A tree to 10 m. tall, with rigid, erect, ascending branches forming a rounded crown. Branchlets 1-2 mm. in diameter. Juvenile leaves plumose, needle-like, acicular, triangular, lanceolate, closely pressed, keeled, 7 mm. long by 0.7 mm. wide, abruptly changing to the adult form. Adult leaves imbricate, scale-like, acute, sharply keeled, 1-1.5 mm. long by 0.4-0.6 mm. wide. Male cone terminal on short lateral branchlets, cylindrical, 8 mm. long, microsporophylls triangular. Female cone terminal, on short curved lateral branchlets; bracts long and spreading, to 3 mm. long, at apex of cone, red. Seeds solitary, apical, nearly erect, well extended beyond bracts, borders slightly keeled, 5 mm. long, with a small blunt apex.
Indonesia: Celebes, Moluccas, New Guinea, 1120-2750 m..

D. PECTINATUM De Laub. Chinese Dacrydium
=D. pectinatum var. robustum De Laub.

A tree to 40 m. tall, densely branched. Bark gray or reddish, fissured. Branchlets with whitish bark. Juvenile leaves to 20 mm. long. Adult leaves short, oblique, spreading, needle-like, ascending, openly pectinate, dorsally keeled, 2-5 mm. long by 0.4-0.8 mm. wide, apex slightly incurved. Male cones terminal, cylindrical, 9-12 mm. long by 2 mm. wide, microsporophylls long and triangular. Female cone at tips of branchlets, with 1-2 fertile bracts, bracts not even passing the epimatium and no longer than the foliage leaves; cupule red, slightly crested. Seed to 4.5 mm. long.
China: Hainan; Malaysia; Philippines; Indonesia : Borneo, 1000-1400 m..

D. SPATHOIDES De Laub. Idenberg Dacrydium

A tree to 34 m. tall. Bark blackish, plate-like. Leaves linear, margins parallel, apex subacute, keeled dorsally, spreading, 4-7 mm. long by 1-1.2 mm. wide. Male cones cylindrical, lateral, subtended at the base by small scales, cone 10 mm. long by 2.5 mm. wide, microsporophylls triangular. Female cone at tips of branchlets with shortened foliage 2 mm. long; bracts flat, cover half of the seed; involucral leaves to 3 mm. long. Seed protruding, to 4 mm. long.
Indonesia: New Guinea, Idenberg River, S.W. Barnhard Camp, 2150-2200 m..

D. XANTHANDRUM Pilg. Morobe Dacrydium

A tree to 30 m. tall. Bark chocolate brown or reddish, exfoliating in thick scales, with lenticels. Branches stout and erect. Leaves needle-like, spreading obliquely, narrowly linear lanceolate, slightly incurved, 6-10 mm. long by 0.6-0.8 mm. wide, not crowded, acute, flattened, keeled. Male cones lateral or terminal, subtended by several reduced leaves, oval to cylindrical, 5-13 mm. long; microsporophylls narrowly triangular to lanceolate. Female cone terminal, on a very short lateral branchlet; fertile bracts in the form of reduced leaves, not exceeding the epimatium. Seeds rich tan, 2-angled, 5 mm. long, ovoid, pointed, slightly compressed, somewhat protruding when mature.
Philippines; Indonesia: Sumatra, N.E. New Guinea to Solomon Islands, 180-600 m..

DECUSSOCARPUS De Laub. (Podocarpaceae)

A genus of twelve species from subtropical areas or rainforest, 0-2000 m. elevation, from S. Africa, S.E. Asia to Fiji, and W. South America. Branchlets opposite or flattened into one plane. Buds acute, visible, often free from the leaves. Leaves ovate to lanceolate, alternate to opposite, decussate or nearly pinnate, parallel, flattened, without accessory transfusion tissue, with few or many parallel nerves, stomata sometimes present on both sides, distichous, amiphistomatic, with a hypoderm. Male cone reminiscent of the Pinaceae in general shape, terminal, sometimes in groups. Female cone produced on the end of a scale-leaved branchlet on a naked peduncle, usually lacking a swollen basal receptacle, cone often detaches with the fertile shoot. Seeds globular with a curved beak, one per cone, wingless; micropylar end of inverted seed extends distinctly downward.

D. COMPTONII (Buchh.) De Laub. Compton Decussoberry
=Podocarpus comptonii Buchh.

A tree 10-30 m. tall, to 0.80 m. in girth. Bark gray or brown, fissured, shreddy. Branches erect or ascending. Branchlets flattened, pinnate-like. Foliage polymorphic. Juvenile leaves distichous, lanceolate, 3 cm. long by 6 mm. wide, twisted at the base. Adult leaves on main branchlets, acute, triangular, ovate-elliptic, 3-6 mm. long on other main branchlets and lower parts of branchlets, elsewhere lanceolate to elliptic, pinnate or decussate, 2.5-15 mm. long by 2-5 mm. wide, midrib prominent, apex bluntly acute. Male cone axillary, in clusters of 2-5, sessile, terminal, ovoid, 4-12 mm. long by 2.5-3 mm. wide, on short lateral branchlets. Female cone terminal or on lateral branchlets; subtended by 3-4 pairs of sterile bracts, the upper pair unite to form a smooth globular cone.Seeds globose or obovoid, red, 2.5 cm. long by 1.8-2 cm. wide, with a crest.
New Caledonia: local, type from Mount Mou, 750-1450 m.

D. FALCATUS (Thunb.) De Laub. South African Decussoberry
=Podocarpus falcatus (Thunb.) R. Br. ex Mirb.,= Podocarpus gracilior Pilg.,
=Podocarpus gaussenii Woltz.

A tree 18-34 m. tall. Bark brown, thin, exfoliating in thin scales. Branchlets dense, green. Juvenile leaves scattered, to 10.2 cm. long by 7 mm. wide. Adult leaves spirally arranged or in two opposite ranks, 1.8-5 cm. long by 2-3 mm. wide, narrow, tapering to an acute apex, petiole short and slightly

twisted , midrib prominent. Male cone usually in threes, 6-8 mm. long by 2 mm. wide. Female cone with globose seeds, solitary or in pairs, 6-13 mm. wide by 13-19 mm. long, with a glaucous green leathery covering, petiole 6-13 mm. long.
Ethiopia; Kenya; Uganda; Mozambique; Bechuanaland, South Africa, 400-3000 m..

D. FLEURYI (Hickel) De Laub. Fleury Decussoberry
=Podocarpus fleuryi Hickel

A tree to 10 m. tall. Buds large, scales lanceolate, acute, erect. Leaves acuminate, elliptic, leathery, opposite, tapering, hypostomatic, without a midrib, 8-18 cm. long by 3.5-5 cm. wide, petiole rather short. Male cone long and cylindrical, 3.5 cm. long by 4 mm. wide, scales keeled; microsporophylls small, triangular, acute. Female cone 15-20 mm. long; ovule inverted; epimatium dry, nono-fleshy; peduncle scaly. Seeds globular, 15-18 mm. wide.
S. China: Kwangtung; N. Vietnam: Tonkin, 1300-1400 m..

D. MANNII (Hook.) De Laub. Mann Decussoberry
=Podocarpus dawei Stapf., = Podocarpus mannii Hook.

A tree 10-30 m. tall, with dense, short, ascending branches. Young plants with loosely disposed branchlets. Juvenile leaves 10.2-15.3 cm. long by 6 mm. wide. Adult leaves spirally arranged, 1.3-7.5 cm. long by 3-11 mm. wide, linear or nearly falcate, with a midrib, apex bluntly acute, petiole usually absent. Male cone solitary or in pairs, cylindrical, to 2.5 cm. long, unstalked; microsporophylls largely triangular. Female cone on a short few-leaved branchlet 2.5 cm. long, sessile, terminal, with 1-2 recurved bracts. Seeds solitary, pyriform, 3-4 cm. long by 4-7 mm. wide, narrowed at the base, petiole usually absent.
Gabon; Cameroon; Congo; Zaire; Uganda; Rwanda; Tanganyika, 400-2500 m..

D. MAXIMUS De Laub. Indonesian Decussoberry

A small tree to 4.5 m. tall. Buds small, acuminate. Leaves decussate, elliptic, amphistomatic, acuminate, flattened, without a midrib, 20-34 cm. long by 6-9 cm. wide, base rounded, petiole short and narrow. Female cone on axillary branchlets 12 mm. long, branchlet falling off with the cone. Seeds borne on a branchlet that is not fleshy, seed globose, 16-18 mm. in diameter.
Indonesia: Sarawak, Sibu, low swampy areas.

D. MINOR (Carr.) De Laub. Arnaud Decussoberry
=Podocarpus minor(Carr.) Parl.,= Podocarpus palustris Buchh.

A shrub or small tree 2-3 m. tall. Trunk often with a swollen base when growing in shallow water (a rheophyte). Bark fissured, dark brown or gray. Branches ascending. Foliage polymorphic. Juvenile leaves distichous, 3.9-4 cm. long by 3-4 mm. wide. Adult leaves on main branchlets triangular-obtuse, 1 mm. long, often deciduous; becoming elliptic and up to 4 mm. long; foliage leaves on short branchlets, decussate, ascending obliquely in 4 vertical ranks, oval to elliptic, obtuse, 1-2 cm. long by 3.5-5.5 mm. wide, without a midrib, base decurrent. Male cone solitary or in groups of 3-5, 5-8 mm. long by 2.5-3 mm. wide, terminal on leafy short branchlets, peduncle relatively short. Female cone terminal on lateral branchlets, with 3-4 pairs of decussate bracts. Seeds globular, with a pointed apex, reddish, obliquely pyriform, 2.8 cm. long by 1.7 cm. wide, with a curved crest.
S. New Caledonia: type from near Lake Arnaud, to 200 m..

D. MOTLEYI (Parl.) De Laub. Motley Decussoberry
=Podocarpus beccarii Parl.,= Podocarpus motleyi (Parl.) Dumm.

A conical tree to 40 m. tall, to 90 cm. in girth. Bark dark brown, scaly or plate-like, resinous. Buds compact, 3-5 mm. long, scales lanceolate. Leaves opposite or subopposite, overlapping, distichous, elliptic, acuminate, 3-7.5 cm. long by 1.5-2.8 cm. wide, without a midrib, petiole short and broad 2-3 mm. long. Male cone cylindrical, axillary, sessile, 1.5-2 cm. long by 5-6 mm. wide; microsporophylls lanceolate, keeled. Female cone on a peduncle 2-2.5 cm. long, cone with 5-9 sterile bracts, bright or dark green with a glaucous bloom. Seed smooth, globose, 1.3-2 cm. wide, with a small beak.
S. Thailand; Malaysia; Indonesia: Sumatra, Borneo, to 500 m..

D. NAGI (Thunb.) De Laub. Japanese Decussoberry
=Podocarpus nagi (Thunb.) Pilg.

A tree to 25 m. tall. Bark smooth, exfoliating, flaky, dark brown turning gray. Buds 1-2 mm. long, acuminate, scales long and lanceolate. Leaves decussate, distichous, hypostomatic, multi-veined, acuminate, without a midrib, 4.5-5 cm. long by 10-20 mm. wide, dark green above, glaucous underneath. Male cone 1-5 on an axillary scaly peduncle 3-10 mm. long, cylindrical, 10-20 mm. long; microsporophylls acuminate, widely spreading. Female cone bluish-black, leathery scale 2 mm. thick; one to two seeds developing from inverted ovules in the axils of subterminal bracts, completely covered by the seed scale; globular, elongated into a hooked beak at the micropylar end, peduncle 5-10 mm. long with deciduous lanceolate scales. Seed 12-13 mm. wide by 15-16 mm. long.
S. Japan, to Ryukyu Islands and Taiwan, to 800 m..

D. NAGI var. FORMOSENSIS (Dummer) Silba Kankao Decussoberry
=Podocarpus formosensis Dummer, = Podocarpus koshunensis (Kaneh.) Kaneh.

A tree to 50 m. tall, to 50 cm. in girth, with rigid branches. Bark dark brown or gray, scaly. Branches short. Leaves opposite, decussate, narrowly elliptic or lanceolate elliptic, dark green, 2.5-3.5 cm. long by 7-15 mm. wide, without a midrib; apex obtusely truncate, blackened, usually without a cusp. Male cone globular, in groups of 5-10. Female cone on a peduncle to 7 mm. long. Seed globular, smooth, 1.2-1.4 cm. wide.
Taiwan: South Cape, Kankao and Koshun, to 762 m..

D. PIRESII Silba Pires Decussoberry

A tree to 30 m. tall, to 2.5 m. in girth. Primary branches appearing 15 m. above the base of the trunk. Branchlets flattened. Leaves obovate, bluntly acute, nearly parallel to each other, 9.5-11 mm. long by 2-3 mm. wide, midvein prominent, green with glaucous stomata below. Female cone oblong, wrinkled, 2 cm. long by 0.8-1.2 cm. wide, pecan-brown tinted red.
Brazil: Territorio de Rondonia, Serra Pacas Novos, Seringal San Luiz, 500-800 m..

D. ROSPIGLIOSII (Pilg.) De Laub. Rospiglios Decussoberry
=Podocarpus rospigliosii Pilg.

A tree 30-45 m. tall. Bark smooth, bluish-black, scaly. Branchlets flattened. Buds naked. Foliage dense, pinnate-like. Leaves 2-ranked, broadly ovate-lanceolate, opposite, 11-22 mm. long by 2.5-5 mm. wide,amphistomatic, dark green, with stomata on both surfaces, apex bluntly acute, base decurrent. Male cone solitary, axillary, in groups of 3-5, on short lateral branchlets; microsporophylls imbricate. Female cone on a short axillary branchlet 1-1.5 cm. long; ovule solitary, inverse; fleshy outer layer crested, edible; apex with a small point. Seed blue-black, tinted red, somewhat globose, 2-3 cm. long by 12-20 mm. wide, crested.

W. Venezuela; E. Columbia and C. Peru, 1700-2600 m.

D. VITIENSIS (Seem.) De Laub. Vitu Decussoberry
=Podocarpus vitiensis Seem.

A tree 18-43 m. tall, to 1 m. in girth, with a spreading, compact crown. Trunk sometimes buttressed.Bark red-brown, fissured. Branchlets flattened, decussate. Buds globose or ovoid; scales obtuse, 1.5-2 mm. long. Juvenile leaves 4 cm. long by 8 mm. wide. Adult leaves in opposite pairs, narrowly lanceolate, 1.5-3 cm. long by 3-5.5 mm. wide, sessile, broadly decurrent,midrib prominent, apex obtuse, base twisted. Male cone solitary or in groups of 2-3, cylindrical, on leafy branchlets or bracted peduncles, axillary, cone 1.2-2.4 cm. long by 2-2.5 mm. wide; microsporophylls triangular. Female cone solitary or in pairs, on a peduncle 2-8 mm. long, subtended by 6-10 pairs of scale-like leaves; ovule with a beak-like apex. Seed pear-shaped, bluish-red, 1.3-1.6 cm. long by 8-10 mm. wide, obliquely attached to the peduncle, apex obtuse with a sharp or curved point.

Celebes; New Guinea; New Britain; Solomon Islds.; Fiji, 0-1800 m..

D. WALLICHIANUS (Presl.) De Laub. Wallich Decussoberry
=Podocarpus wallichianus C. Presl.

A conical tree to 48 m. tall. Bark smooth, brown or tan, plate-like, with large lenticels. Buds conical, 2-3 mm. long, scales acuminate. Juvenile leaves to 23 cm. long by 7 cm. wide, glaucous. Adult leaves decussate, flexible, nearly alternate, at tips of branchlets, ovate or lanceolate-ovate, 9-16 cm. long by 3-5 cm. wide, pale green, narrowed at the apex to a long, fine point, midrib absent, flattened, with numerous parallel nerves; petiole 5-10 mm. long by 3-4 mm. wide, flattened. Male cone 1-7 on a scaly axillary peduncle 2-10 mm. long, cylindrical, cone 8-21 mm. long by 5-7 mm. wide, microsporophylls lanceolate. Female cone solitary, on a peduncle 1-2 cm. long, green turning black, with 4-7 sterile bracts. Seed smooth, globose, 1.5-2.8 cm. long by 1.4-1.5 cm. wide.

N.E. India; Indochina; Malaysia; Indonesia; Philippines, New Guinea; New Britain, 100-2100 m..

DISELMA Hook. f. (Cupressaceae)

A monotypic genus from W. Tasmania. A dioecious shrub with finely divided, quadrangular branchlet systems. Buds inconspicuous. Leaves scale-like, small, obtuse, overlapping, often with white stomata below. Male cones terminal, oblong, with 6-8 scales, with 2 pollen sacs. Female cones globose, with 2 pairs of scales with small apical umbos, upper pair of scales fertile with 2, 3-winged seeds. Seeds with 3 narrow even wings.

D. ARCHERI Hook. f. Tasmanian Diselma

An erect shrub or small tree 2-8 m. tall, of spreading habit, with a straggly or compact crown. Bark gray-brown to dark gray, scaly. Branchlets finely divided, quadrangular. Leaves scale-like, rich green, newer growth reddish, opposite, closely pressed, overlapping, 1 mm. long, shortly keeled, margins membraneous and narrow below, with white stomata below, apex obtuse. Male cone terminal, oblong, with 6-8 scales, pollen sacs 2. Female cone globose, 8-12 mm. wide, with 2 pairs of scales with small apical umbos, upper pair of scales fertile with two three winged seeds, with a long central columella. Seeds slightly larger than the scales, 2 mm. long.

Australia: W. Tasmania, Cradle Mt., Lake Saint Clair, 1000-1350 m..

FALCATIFOLIUM De Laub. (Podocarpaceae)

A genus of five species from Malaysia to the Philippines and New Caledonia. Dioecious shrubs or trees more similar to Podocarpus than Dacrydium. Buds visible, usually free from the leaves. Leaves distinctly sickle-like or falcate, bilaterally flattened, linear, spreading out distichously, lacking vascular fibers, spirally arranged. Strobili produced on specialized axillary branchlets. Male cones elongated, more or less in clusters, anther-like. Female cone produced on a curved pendent scaly peduncle, axillary, receptacle often having a swollen thorny basal appendage, cone reddish with a single ovule; epimatium free of the integument, with a pronounced hump, projecting laterally. Seeds wingless.

F. ANGUSTUM De Laub. Sarawak Sickle-Pine

A tree to 20 m. tall. Bark purplish-brown, irregularly flaky to scaly, turning gray. Juvenile leaves acicular, as thick as wide, lanceolate, falcate, base curving outwardly, to 7 cm. long, base 1.2 mm. thick, apex curving upwards. Adult leaves small, curved or straight, narrow, pungent, keeled laterally, 18-35 mm. long by 2-3.5 mm. wide. Male cones terminal or lateral, ovate when young, 8 mm. long by 2 mm. wide. Female cones not seen.

Malaysia: Sarawak, coastal areas, Bintulu and Kuching, 120-244 m..

F. FALCIFORME (Parl.) De Laub. Common or Malaysian Sickle-Pine
=Dacrydium falciforme (Parl.) Pilg.,=Podocarpus falciformis Parl.

A tree 3-25 m. tall, with spreading branches. Bark smooth, purple-brown, fibrous, inner-bark dark red. Leaves in two opposite ranks, thick, falcate, 2-6.5 cm. long by 5-7 mm. wide, midrib distinct, apex acute, petiole angled and becoming decurrent. Male cone axillary or terminal, on a scaly branchlet 2-3 mm. long; cylindrical, 2-3 cm. long by 2-3 mm. wide, microsporophylls triangular. Female cone on a scaly branchlet to 5 mm. long, cone with 12 acuminate bracts. Seeds oval, with a humped epimatium at the base, flattened and narrowed to a blunt apical ridge, 6 mm. long by 5 mm. wide.
Malaysia: Malaya; Sarawak; Sabah; Brunei; Indonesia: Borneo; Moluccas, 600-1650 m..

F. GRUEZOI De Laub. Gruezo Sickle-Pine

A mountain heath shrub 4-12 m. tall. Juvenile leaves to 7.5 cm. long by 7 mm. wide, falcate, apex curved, lanceolate. Adult shade leaves small, 3.5 cm. long by 6-7 mm. wide; sun leaves larger, 13-20 mm. long by 3.5-6 mm. wide; acute, apiculate, glaucous. Male cone 1.7-6 cm. long by 1.5-3 mm. in diameter. Female receptacle to 2 mm. Seed to 7 mm. long.
Philippines: Mindanao to Luzon; Indonesia: Celebes to Obi Island, 700-1400 m.

F. PAPUANUM De Laub. Papuan Sickle-Pine

A shrub or tree to 22 m. tall. Bark gray to dark brown, flaky, with large lenticels, inner-bark reddish-brown. Juvenile leaves to 22 mm. long by 4 mm. wide. Adult leaves spreading, open, linear or ovate-linear, 12-17 mm. long by 2-3.5 mm. wide, apex apiculate. Male cone terminal or lateral, 5 mm. long by 2 mm. wide; microsporophylls acuminate, widening abruptly to a globular pollen sac. Female cones on short branchlets, scales lanceolate 1-1.5 mm. long, bract of cone to 2 mm. long. Seed laterally and terminally keeled, to 6 mm. long by 4.5 mm. wide and 3.5 mm. thick.
Indonesia: New Guinea to Papua, 2000-2400 m..

F. TAXOIDES (Brong. et Griseb.) De Laub. Yew-leaf Sickle-Pine
=Dacrydium taxoides Br. et Griseb., = Podocarpus taxodioides Carr.

A conical shrub or small tree 2-15 m. tall. Bark reddish-brown, fibrous, with lenticels. Bark of young branchlets purplish. Juvenile leaves 1.5-3 cm. long by 1.5 mm. wide. Adult leaves alternate, more or less 2-ranked, oblong-lanceolate, flattened bilaterally, 2-3 cm. long by 5-6 mm. wide, bright green, keeled, apex acute, petiole decurrent. Male cone axillary, cylindrical, 3-5 per cluster, 1.5-2.5 cm. long by 1.5-2 mm. wide, microsporophylls acuminate. Female cone on a scaly branchlet 6 mm. long. Seed ovoid, obtuse, 7 mm. long by 3-4 mm. wide, keeled, laterally compressed.
C. New Caledonia: type near Balade, 800-1400 m..

FITZROYA Hook. f. (Cupressaceae)

A monotypic genus from Chile and Argentina. A dioecious tree with angled branchlets. Buds inconspicuous. Leaves scale-like, ternate, grooved above, small, decurrent, bluntly acute, loosely imbricate, with sunken bands of stomata, apex partially free and spreading. Strobili sometimes monoecious or hermaphroditic, hermaphroditic strobili have more numerous scales. Male cones cylindric, solitary, axillary, with 15-24 scales in ternate whorls. Female cones globose, maturing in one year, with 9 scales in 3 alternating whorls, lower pair of scales sterile, middle pair sometimes fertile, upper pair fertile. Seeds 2-6 per scale, somewhat warty, with 2-3 narrow, even wings.

F. CUPRESSOIDES (Molina) Johnston Patagonian Fitzroya
=F. patagonica Hook. f.

A shrub or asymmetrical tree 15-55 m. tall, to 10 m. in girth. Bark deep reddish-brown, furrowed, exfoliating in long strips. Branches flexible, slender, pendent, turning reddish with age. Leaves in whorls of 3, persistent, dark green above and concave above, 2-3 mm. long, bluntly acute, spreading, keeled on back, with 2 sunken white bands of stomata on back, decurrent, base flattened, partially free and spreading, apex somewhat incurved. Male cone solitary, axillary, cylindrical, with 15-24 scales in whorls of 3, with 4 pollen sacs. Female cone globose, maturing in one year, resinous, fragrant, with 9 scales in whorls of 3, brown, 6-7 mm.in diameter, lower pair of scales sterile, scales with small thin curved umbos. Seeds 2-3 per scale, dark brown, somewhat warty, with 2-3 narrow even wings. Cotyledons 2.
S. Chile: Valdivia, W. La Union; Argentina: Patagonia, 500-1000 m..

FOKIENIA Henry et Thomas (Cupressaceae)

A monotypic genus from S.E. Asia. A monoecious small tree with flattened branchlets. Branchlets tripinnate, flattened in one plane and Thuja-like. Internodes longer on older branchlets. Buds inconspicuous. Juvenile foliage sharp-pointed, much flattened, acute, spreading, lateral leaves much larger than the facial leaves, Calocedrus-like.Newer growth reddish. Adult leaves 4-ranked, flattened, bluntly acute; facial leaves oblanceolate, grooved above; lateral leaves ovate, with white stomatal depressions below, lacking a noticeable gland. Male cone cylindrical, with 6-10 scales. Female cone globular, Chamaecyparis-like , ripening in 2 years, opening upon maturity, with 12-16 scales; scales grooved near the base with small fine umbos. Seeds 2 per fertile scale, angular, pointed, with 2 large resin blisters above and below, with 2 very unequal wings.

F. HODGINSII (Dunn.) Henry et Thomas Hodgins Fokienia

A shrub or tree 15-17 m. tall, to 1 m. in girth. Branchlets flattened, tripinnate, Thuja-like, branchlets tapering above. Young leaves reddish at first. Leaves in 4 ranks, very flattened, 7-8 mm. long; lateral leaves ovate, compressed, spreading, green above with white stomatal depressions below, apex acute; facial leaves oblanceolate with a triangular apex, grooved above, to 2 mm. long. Male cone cylindrical, 2-3 mm. long, with 6-10 scales. Female cone on a short peduncle, subglobose, maturing in 2 years, 2-2.5 cm. long by 5 mm. wide, with 12-16 peltate scales, scales grooved near the base,

scales with small thin umbos. Seeds 2 per scale, 3-4 angled, acute, obtuse at the base, with prominent resin blisters, nut to 4 mm. long, with 2 unequal wings, the larger wing to 5 mm. long and rounded.
China: Chekiang to Yunnan; N. Vietnam: Tonkin; Laos, 600-2000 m..

GINKGO L. (Ginkgoaceae)

A monotypic genus from S. China. A deciduous, dioecious or rarely monoecious tree with distinct conical buds and with short spur-like branchlets bearing numerous leaf scars. Branches irregularly whorled, branchlets horizontal or somewhat pendent. Leaves alternate on main branchlets, clustered in whorls of 3-5 on side branchlets or spurs, flattened, multi-veined,fan-shaped, two-lobed, toothed on the margins; stomata mostly on the lower surface, rarely above; with long petioles. Male strobili on side branchlets, in short racemes, pendent, in groups of 3-6. Distinct by its mode of fertilization by motile male sperms, a characteristic shared with Vascular Cryptograms (ferns and fern-like plants). Female cone globose, maturing in one year, on a long pendent petiole on side branchlets, ovule completely covered by a fleshy orange leathery scale, with a disagreeable odor when crushed. Seed ovoid-globular, one per cone, thin-shelled, wingless.

G. BILOBA L. Chinese Ginkgo

A pyramidal tree 15-40 m. tall, 0.6-4 m. in girth, eventually becoming wide-spreading, with an irregular spider-like crown. Bark pale gray, deeply furrowed. Branches irregularly whorled. Buds light brown, broad, flat, conical, 6 mm. long, with ovate scales. Branchlets light brown, smooth, with many spurs or short side branchlets bearing crowded leaf scars. Leaves oddly fan-shaped, often 2-lobed, 3-5 in whorls on spurs , or alternate, with fine parallel lines or veins, midvein absent, toothed on ends, 2.5-12 cm. long by 4-11 cm. wide, dull light green on both sides, turning yellow in the autumn, on petioles 2-4.5 cm. long. Male strobili to 19 mm. long, thick, pale yellow, emerge before leaves are fully developed. Female cone in pairs or solitary, ovoid-globular, on a peduncle 4-5 cm. long, to 3 cm. long, fleshy, pale orange, with a disagreeable odor. Seeds one per cone, to 2.5 cm. long, elliptical, pale tan to yellowish, with a point at the apex.
S. China: Chekiang; Kweichow and Yunnan, 40-2000 m..

GLYPTOSTROBUS Endl. (Taxodiaceae)

A monotypic genus from S. China. A dioecious or monoecious, deciduous shrub with polymorphic foliage. Branchlets alternate, lateral branchlets deciduous.Buds usually hidden by the leaves or inconspicuous. Juvenile foliage with falcate, alternate, acicular, quadrangular leaves. Sterile branchlets with somewhat flattened, needle-like leaves disposed in 2-3 ranks. Fertile branchlets with obtuse, overlapping, scale-like leaves, with numerous stomata. Male strobili on a scaly branchlet 3 mm. long and a scaly peduncle, in long racemes 5-10 cm. long, solitary, globular at first, Taxodium-like; with ovoid-obtuse or acute, incurved, imbricate scales. Female cone borne on a long scaly peduncle, usually somewhat pendent, oblong-ovoid, opening at maturity, maturing in 2 years, with 20 alternate scales; scales obovate with a central decurved umbo and with

protuberant teeth near the margins of the scales. Seeds 2 per scale, woody, thin-shelled, with even small oblong or oval curved wings projecting backwards.

G. PENSILIS (Staunt.) K. Koch Chinese Swamp Cypress

A shrub or small tree 8-20 m. tall, 60-120 cm. in girth, often fastigiate. Bark brown, stringy, fissured into irregular plates, brown turning grayish, inner-bark red-brown. Trunk with horizontal branches at the base. Foliage polymorphic, pale green turning brown in the autumn. Juvenile branchlets with falcate, acicular, quadrangular leaves. Sterile branchlets with needle-like leaves, disposed in 2-3 ranks, 6-13 mm. long by 0.5 mm. wide, twisted, in flattened fern-like sprays. Fertile branchlets with scale-like leaves, overlapping, obtuse, with numerous stomata, free at the apex, with a median crest,to 4 mm. long . Male strobili with acute, imbricate, incurved scales, borne on a scaly branchlet. Female cone oblong-ovoid, on a long scaly peduncle 1.2-1.8 cm. long, maturing in 2 years, opening upon maturity, resinous, 1.8 cm. long by 1.2 cm. wide, with 20 alternate scales; scales obovate, with 7-9 protuberant teeth on the margins, with a small triangular central umbo. Seeds 2 per scale, 1.3 cm. long by 3 mm. wide, thin-shelled, wings hatchet-shaped to 3 mm. wide.

China: Fukien; Kiangsi; Kwangtung; Kwangsi Chuang; Szechuan and Yunnan; N.E. Ban Methout, Vietnam, to 1000 m..

HALOCARPUS Quinn (Podocarpaceae)

A genus of three species from New Zealand. Dioecious shrubs or small trees. Buds inconspicuous. Juvenile leaves are linear, bifacially flattened, 2-ranked, distichous, similar to Podocarpus. Adult leaves spirally arranged, scale-like, overlapping, bluntly keeled, small. Male cone solitary, terminal. Immature female cone with lax, spreading bracts, separated by distinct internodes, becoming fleshy but not brightly colored. Female cone with one to several dark striated seeds, pendent. Seed is completely covered by the scale and remains inverted, not erect, seeds wingless.

H. BIDWILLII (Hook. f. ex T. Kirk) Quinn Bidwill Haloberry
=Dacrydium bidwillii Hook. f. ex T. Kirk

A densely branched erect or prostrate shrub to 4 m. tall, the lower branches sometimes root to form prostate mats up to 6 m. across. Branchlets fine, cylindrical, 1.5 mm. in diameter. Juvenile leaves linear, spirally arranged, sessile, 6-10 mm. long, petiole absent. Adult foliage scale-like, triangular, shiny yellowish-green, finely speckled white, leathery, imbricate, keeled, obtuse, 1-2 mm. long. Male cone terminal, solitary, 2.5-3 mm. long, pollen grains 46 microns in diameter. Female cone solitary, on short lateral branchlets, cupule white. Seeds 1-2 per cone, striated, compressed, obtuse, 1-3 mm. long.

New Zealand: South Island to Stewart Island, 640-1311 m..

H. BIFORMIS (Hook.) Quinn Two-leaf Haloberry
=Dacrydium biforme (Hook.) Pilg.

A tree to 10 m. tall, with a short trunk, 0.9-1.8 m. in girth, or reduced to a shrub 1 m. tall in alpine areas. Bark gray or red-brown. Branchlets quadrangular, stout, 2-2.5 mm. in diameter, covered with persistent leaves. Juvenile leaves Taxus-like , 2-ranked, spreading, linear, 5-20 mm. long, with a short twisted petiole. Adult leaves scale-like, imbricate, prominently keeled, densely overlapping, 1-2 mm. long, obtuse, very thick, closely pressed. Male cones solitary, terminal, at tips of branchlets 3 cm. long, cone 4 mm. long, with 4-6 stamens. Female cone at tips of branchlets, cupule white. Seeds 1-2 per cone, oblong, blunt, striated, 1-2.5 mm. long, compressed.
New Zealand: Tongariro to Stewart Island, subalpine areas, 0-671 m..

H. KIRKII (F. Muell. ex Parl.) Quinn. Kirk Haloberry
=Dacrydium Kirkii F. Muell.

A tree to 25 m. tall, 1-2 m. in girth. Bark bright brown. Lower branches spreading, upper ones erect. Branchlets cylindrical, 1.5 mm. in diameter. Juvenile leaves Podocarpus or Taxus-like , linear, 1.5-3.5 cm. long, with a short petiole. Adult leaves scale-like, imbricate, obtuse, keeled, 2.5-4 mm. long, thick, leathery, margins membraneous. Male cones solitary, sessile, 3-6 mm. long, at tips of branchlets. Female cone terminal, shortly oblong, 6-13 mm. long, cupule orange. Seeds 1-5 per cone, oblong, obtuse, compressed, 3.5-4 mm. long, striated, keeled at the apex.
New Zealand: North Island, between Hokiana and Manukau Harbor, to 610 m..

JUNIPERUS L. (Cupressaceae)

A genus of 50 species from N. America, Europe, N. Africa, E. Africa, Asia and Japan. Trees or shrubs usually dioecious, rarely monoecious, evergreen, with a multiple branched trunk.Branchlets irregularly disposed, rarely flattened in one plane, rounded, sometimes quadrangular. Buds usually inconspicuous on scale-leaved branchlets, often conspicuous with few imbricate scales on needle-like branchlets. Juvenile leaves needle-like, spirally arranged, with white stomata above, persistent. Foliage dimorphic, opposite or in threes; needlelike, acute, sharp-pointed with whitish stomata above or more often scale-like, bluntly acute, appressed, sometimes with glands; occuring separately on different species or both forms may occur on the same adult tree. Male cones yellowish, ovoid or oblong, with many scales on a central axis, with ovate or peltate scales, each scale with 2-6 globose pollen sacs. Female cones subtended at the base by minute scale-like bracts or leaves, globular, often warty, berry-like, with 3-8 opposite or ternate united fleshy bracts or scales that do not separate or open upon maturity, female cone usually maturing in 2 years, sometimes in 1-3 years. Seeds 1-6 per cone, ovoid, often grooved, wingless.

J. ASHEI Buchh. Ashe Juniper

A multi-stemmed shrub or a small tree 6-9 m. tall, to 0.3 m. in girth, with an open, rounded or irregular crown. Trunk often grooved, twisted, or branched from the base. Bark light ashy-gray, fissured into long, narrow strips. Branches spreading to erect. Branchlets 4-angled, recurved at the tips, bark reddish-gray. Juvenile leaves awl-shaped, acuminate, spreading, 8 mm. long. Adult leaves scale-like, triangular-ovate, acute, dark blue-green to gray-green, appressed, 1-2 mm. long, opposite, in 4-rows, margins finely toothed, glands usually absent but present on older leaves. Female cone globose to ovoid, 7-8.5 mm. long by 6-7.5 mm. wide, resinous, somewhat warty, suture lines faint, dark bluish-black, bloomed white, umbos small. Seeds usually one per cone, ovate, acuminate, 5-6 mm. long by 3-5 mm. wide, light brown with shallow grooves, hilium ivory-white to 1 mm. long.
U.S.A.: S. Missouri to C. Texas to N.W. Coahuila, Mexico, 244-1800 m..

J. ASHEI var. SALTILLENSIS (Hall) Silba Saltillo Juniper

A broad shrub or small tree to 7 m. tall. Bark ashy-gray, divided into long narrow strips. Branches erect, terminal branches recurved at the tips with smooth gray bark. Leaves scale-like, light gray-green, triangular-ovate,obtuse, 0.5-1.5 mm. long, apex appressed, glandular, margins finely denticulate. Female cone resinous and pulpy, somewhat ellipsoid to globose, dark bluish-black, bloomed white, 4.5-8 mm. wide. Seeds usually one per cone, ovoid, obtuse, dark brown, 4-5 mm. long; hilium 1.5 mm. long, light or dark brown.
Mexico: Chihuahua; Coahuila; W. Zacatecas; Neuvo Leon, 1500-2900 m..

J. BARBADENSIS L. West Indies Juniper
=J. gracilior Pilg.,=J. lucayana Britt., = J. saxicola Britt. et Wils.

A tree 6-15 m. tall, with an open crown and with fine, pendent branches. Bark red-brown, fine, divided into long fine scales. Branchlets rounded, slender, 1 mm. in diameter. Juvenile leaves narrow, needle-like, 1-1.5 cm. long, acute, with white stomata below. Adult leaves scale-like, light bright green, opposite or in pairs, obtuse, 1 mm. long by 0.7 mm. wide, prominently grooved above, with an elongated or linear gland. Dioecious. Male cones oblong, 2-3 mm. long. Female cone reniform, subglobose, bluish-brown with a glaucous bloom, 4 mm. long by 3 mm. wide, ripening the first year, on a stout peduncle. Seeds 1-2 per cone, ovate-acuminate, 4 mm. long by 2 mm. wide, with 6-7 longitudinal furrows.
Bahamas; Cuba; N. Haiti; Barbados, 400-500 m..

J. BARBADENSIS var. URBANIANA (Pilg.) Silba Haitian Juniper
=J. ekmanii Florin

A creeping shrub to 30 cm. high, or a small tree to 5 m. tall, with many short branches. Branches as in the type, sometimes weeping. Branchlets fine, distinctly quadrangular. Leaves scale-like, acuminate, apex acute to sharply acute, imbricate, 4-ranked, 1-1.5 mm. long, faintly grooved near the base, with an obscure dorsal gland. Male cone elliptic, 2 mm. long, scales semi-orbicular. Female cone globose, resinous, bluish-brown, scales triangular, with faint suture lines, 4-5 mm. long, umbos inconspicuous. Seeds 1-2 per cone, elliptic to ovate-elliptic, 3-3.5 mm. long.
S.W. Haiti: Marne de la Selle; W. Dominican Republic: La Vega Province, Constanza, rare, 1000-2600 m..

J. BERMUDIANA L. Bermuda Juniper

A broadly conical tree 12-15 m. tall, 2.70-3.60 m. in girth. Bark dark red, finely fissured. Branchlets thick, distinctly quadrangular. Juvenile leaves sometimes present on adult trees, 2.7-3.6 mm. long, with 2 lines of stomata. Adult leaves scale-like, in sets of 4-6, obtuse, gray-green or glaucous, with a dorsal gland, incurved at the apex, 1.2 mm. long; on main branchlets triangular, pointed, in whorls of 3, to 5 mm. long. Dioecious. Male cone 4-5 mm. long, with 3 anthers. Female cone ripening in one year, globose, blackish-blue with a glaucous bloom, slightly resinous, with 4 scales, with a marked depression. Seeds 2-3 per cone, shiny chestnut-brown, ovoid, grooved, 6-8 mm. long.
Bermuda, rare, many trees died from local blight.

J. BLANCOI Mart. Blanco Juniper

A shrub or tree 2.5-15 m. tall, with an erect trunk and a very irregular crown, or conical. Bark chestnut-brown, exfoliating in thin strips. Ultimate branchlets distichous, 1 mm. in diameter, nearly tetragonal, bark violet colored. Leaves scale-like, ovate or elliptical, green with a bright border, 1.5-2 mm. long by 0.5-0.7 mm. wide, with a linear or elliptic glandular depression, entire, apex obtuse. Female cone scattered or in groups, on a peduncle 3-5 mm. long, irregularly lobed, glaucous-green turning dark violet with a glaucous bloom, resinous, aromatic, 5-9 mm. long by 3-6 mm. wide. Seeds 1-2 per cone, angular, pale chestnut-brown, irregular, with many grooves, 2-5 mm. long by 3-4 mm. wide.
Mexico: N.E. Sonora; Durango, El Salto, 2600-2900 m..

J. BREVIFOLIA (Hochst.) Antoine Azores Juniper
=J. oxycedrus var. brevifolia Hochst.

A small tree 2.5-3 m. tall, to 1.5 m. in girth. Bark red-brown. Branches short, numerous, densely covered with foliage. Branchlets 3-angled. Leaves in whorls of three, bluish-green, needle-like, 6-9 mm. long by 2 mm. wide, apex bluntly acute to acute, with a prominent green midrib above, with white stomata below, glaucous, jointed and swollen at the base. Dioecious. Female cone subglobose, dark red-brown, 6-9 mm. wide, suture lines visible. Seeds 3 per cone, ovoid, 3-angled, with 2-3 longitudinal grooves, markedly keeled.
Azores Islands (Portuguese Administration), to 1500 m..

J. CALIFORNICA Carr. California Juniper

A shrub or small tree to 12 m. tall, 0.3-0.6 m. in girth, with a broad, irregular crown. Bark gray, fibrous, furrowed, shreddy. Branchlets vigorous, rounded, 1-1.3 mm. in diameter. Leaves scale-like, usually in threes, with a large gland dot, 1.5-3 mm. long, margins finely denticulate, turning brown in 2-3 years, obtuse, ovate to oblong, slightly keeled on back, closely appressed. Male cone with 18-20 scales. Female cone globose or ovoid, maturing in 2 years, bluish with a bloom then red-brown with a glaucous bloom, 8-19 mm. long, with 6 scales with faint suture lines, with small umbos. Seeds 1-2 per cone, angular, 7-12 mm. long, marked at the base with a bright hilium.
U.S.A.: W. California to W. Arizona to N. Baja California, Mexico, 305-1524 m..

J. CEDRUS Webb. et Berth. Canary Island Juniper

An erect tree 20-30 m. tall, with a stout trunk. Branches wide spreading, horizontal, tufted. Branchlets finely divided, pendent, numerous, shortly angled and glaucous. Buds distinct from the foliage, scaly. Leaves needle-like, narrowly lanceolate, in whorls of three, sharp pointed, very glaucous above, midrib green, 8-19 mm. long, erect, pointing forwards, with white stomata below. Dioecious. Female cone globular, warty, 8-14 mm. wide, reddish-brown with a glaucous bloom, shiny, suture lines obscure, with small stout umbos. Seeds one per cone.

Canary Islands: Palma, to 2100 m..

J. CENTRASIASTICA Kom. Kuen-luen Juniper

A tree to 12 m. tall, to 60 cm. in girth, with erect branches. Branchlets quadrangular, about 2 mm. in diameter. Leaves scale-like, 1.5-2.5 mm. long, dense, gray-green, triangular from a broad base, obtuse, keeled, usually without glands. Male cone to 2 mm. long, on long branchlets. Female cone 9-11 mm. long, blackish-red or purplish, globular or oblong. Seeds solitary, one per cone, oval, bluntly keeled, rounded at the apex, 8-9 mm. long.

China: Sinkiang; Kuen-luen Mountains, 3000-4000 m..

J. CHINENSIS L. Chinese Juniper
=J. gaussenii Cheng

A conical tree 20-25 m. tall, to 3.5 m. in girth, with ascending branches, or sometimes a procumbent shrub. Bark gray-red, exfoliating. Branchlets slender, rounded, marked with white spots, to 1 mm. in diameter. Foliage dimorphic. Juvenile leaves usually ternate, awl-shaped, spreading, 8.3 mm. long, spiny pointed, with 2 white bands above. Adult leaves scale-like, 4-ranked, narrowly rhombic, closely appressed, bluntly acute to obtuse, overlapping, 1.5 mm. long, with a glandular depression, margins white, apex incurved . Usually dioecious. Male cones often on branchlets with juvenile leaves, bright yellow, with 8 pairs of stamens. Female cone subglobose, 6-8 mm. wide, brownish-black, with a thick glaucous bloom, with 4-8 scales, with protuberant umbos at the apex, cone ripens in 2 years. Seeds 2-5 per cone, broadly ovoid, grooved, bright brown, 5 mm. long by 2 mm. wide.

China and Japan, abundant, 500-1000 m. or more.

J. CHINENSIS var. SARGENTII Henry et Elwes Sargent Juniper

A trailing prostrate shrub with a long main stem and with a dense mass of ascending lateral branches. Juvenile leaves lanceolate, convex below, stiffly pointing forwards, grassy-green.Adult leaves scale-like, light green or glaucescent, obtusish, entire, markedly glandular, 1.2-1.5 mm. long, slightly swollen, terpentine scented. Predominantly dioecious. Female cone globose, warty, on a fine pendent peduncle, dark blue or black, 5-7 mm. long, umbos inconspicuous. Seeds 2-3, rarely 4-5 per cone, oblong, glossy brown.

N.E. China: Korea; U.S.S.R.: Sakhalin; Japan.

J. COMITANA Mart. Chiapas Juniper

A bushy tree 7.6-10.6 m. tall, with an irregular rounded or broadly conical crown. Trunk irregularly ribbed. Bark light ashy-brown, exfoliating in long strips. Branches ascending or spreading. Branchlets scaly, nearly quadrangular, 1 mm. in diameter or less, bark dark reddish-brown. Leaves opposite, bright green, denticulate, ovate-acuminate, to 1 mm. long; with an oval dorsal gland, glands usually absent on youngest leaves; leaves on older branchlets 2-3 mm. long, distinctly glandular. Male cones oblong, orange, to 6 mm. long, with 12 scales. Female cone globose, resinous, with one whorl of scales, 5-10 mm. long by 5-8 mm. wide, dark violet-blue with a glaucous bloom. Seeds 1-2 per cone, ovate-acuminate, 4-8 mm. long by 3-4 mm. wide.
Mexico: S.E. Chiapas; Guatemala: Baja Verapaz, 1300-2300 m..

J. COMMUNIS L. Common or Northern Juniper
=J. communis var. depressa Pursch.,=J. sibirica Burgsd.

A pyramidal shrub or small tree 4.6-15 m. tall, to 20 cm. in girth, with an open irregular crown. Bark reddish-brown, shreddy, papery, scaly. Branchlets small, triangular, grooved, somewhat flattened, bark light yellowish to chestnut-brown. Leaves needle-like, linear-subulate to linear-lanceolate, awl-shaped, grooved above, in whorls of three, attenuate, 5-15 mm. long by 2 mm. wide, shiny yellow-green with a green midrib, with a broad white band below, bluntly keeled below, jointed at the base, apex acute. Male cone ovoid, cylindrical, 4-5 mm. long. Female cone globose or broadly ovoid, short-stalked, maturing in 2-3 years, 5-6 mm. long, bluish or black, slightly bloomed white, with 6 scales, with conspicuous umbos and with prominent apical suture lines. Seeds 1-3 per cone, ovoid, elongated, bright brown, grooved.
N. America; Europe; N. Africa; N. Asia to Siberia and Japan, 2438-3505 m..

J. COMMUNIS var. OBLONGA (Bieb.) Loud. Caucasian Juniper
=J. albanica Penzes

A low multi-stemmed shrub to 1.2 m. tall. Bark dark gray. Branches straggly, numerous, curved upwards at the tips. Branchlets slender, often drooping. Leaves lax, 3-angled, narrowly lanceolate, flattened, 1.6-2.5 cm. long by 1-1.5 mm. wide, keeled, with a clear prominent midrib, bright green above, with broad white bands below, strongly reflexed from the base, margin obtuse. Female cone oblong, in threes, blackish-brown, often with a glaucous bloom, suture lines obscure, to 7 mm. wide, apex somewhat depressed and crested. Seeds 2-3 per cone, 3.4-4.1 mm. long by 2.5-3.6 mm. wide.
Albania; Turkey; U.S.S.R.: Azerbaydzhan to N.W. Iran, to 1200 m..

J. CONVALLIUM Rehd. et Wils. Mekong Juniper
=J. mekongensis Kom.,=J. ramulosa Florin

A tree 4.5-12 m. tall, with erect or spreading branches. Bark gray-brown, smooth, peeling in long thin strips. Branches short, thick. Branchlets fine, somewhat pendent, twisted, rounded, 1 mm. in diameter. Leaves scale-like, in 4-ranks, obtuse, thick, with a long narrow groove with a linear gland, hump-backed, gray-green or glaucous, 1-1.5 mm. long, denticulate, apex incurved. Female cone subglobose or ovoid, maroon-brown or black, bloomy, 4-8 mm. long, with one whorl of scales. Seeds broadly ovoid, apex acuminate and with a projected point, one per cone, 5-7 mm. long by 4-5 mm. wide, grooved.
China: Tibet, Zsachju, also in Ndrome, N.W. Szechuan, 2500-3700 m..

J. CONVALLIUM var. MICROSPERMA (Cheng et Fu) Silba Smallberry Mekong Juniper

A tree with branchlets less twisted than the type. Leaves smaller, more acute to bluntly acute, 1-1.5 mm. long, closely pressed, glandular, without a deep groove under the glands. Female cone ovoid, glaucous, 5 mm. long. Seed ovoid, compressed, 4 mm. long without a projected apex.
China: S.E. Tibet, to 4000 m..

J. DAVURICA Pall. Dahurian Juniper

A trailing shrub with ascending branches and with a short trunk to 50 cm. in girth. Branchlets fine, nearly quadrangular, 1 mm. in diameter. Foliage dimorphic, adult and juvenile foliage on fertile branchlets. Juvenile foliage more abundant on branchlets exposed to the sun, leaves 3-9 mm. long. Adult leaves scale-like, bluntly acute, hump-backed, entire, 1-3 mm. long, with a long distinct glandular depression on the back, loosely imbricate, apex incurved. Dioecious. Male cone 4-5 mm. long, with 12-18 scales. Female cone on juvenile foliage branchlets, globose, 5-6 mm. in diameter, isolated on a pendent peduncle, dark brown with a glaucous bloom. Seeds narrowly ovoid to ovoid-oblong, 2-4 per cone, often exserted from the scales of the cone, to 5 mm. long.
N. Mongolia; N. China: Heilungkiang; Korea, 400-1400 m..

J. DEPPEANA Steudal Eastern Alligator Juniper
=J. deppeana var. zacatecensis Mart.,=J. patoniana Mart.

A shrub or small tree 3-10 m. tall, with a twisted trunk 25-40 cm. in girth, and with an open irregular crown. Bark brown, plate-like, inner-bark violet. Branchlets fine, nearly tetragonal, 1-1.5 mm. in diameter. Adult leaves scale-like, bright green, ovate-acuminate, finely denticulate, 1-2 mm. long by 0.7 mm. wide, glands absent or rarely at the base of the leaf, apex mucronate. Monoecious. Male cone ovoid, 2.5 mm. long, with 8 scales. Female cone globose, somewhat deformed, maturing in 2 years, with 6-8 scales, yellowish-green turning red, with a glaucous bloom, aromatic, with apical umbos, suture lines visible, 10-12 mm. in diameter.Seeds visible and slightly protruding outwards between scales of the cone. Seeds usually 3 per cone, angular, 6-7 mm. long by 4-6 mm. wide.
U.S.A.: S.E. Arizona to W. Texas to Michoacan, Mexico, 1372-2438 m..

J. DEPPEANA var. PACHYPHLAEA (Torr.) Mart. Western Alligator Juniper

A dense pyramidal tree to 20 m. tall, to 5 m. in girth. Bark whitish, in rectangular scales. Foliage relatively dense. Juvenile leaves awl-shaped, very glaucous, lanceolate, in threes, 3-6 mm. long, with white stomata below. Adult leaves scale-like, in opposite pairs, broadly oval, distinctly glandular, conspicuously marked with white dried resin, 1-2 mm. long, margins finely denticulate. Dioecious. Male cone 3 mm. long, with 10 scales. Female cone subglobose, maturing in 2 years, red-brown with a glaucous bloom, warty, 1.2 cm. long, with 2 whorls of scales. Seeds usually 4 per cone, angular, shiny brown, with a thin shell.
U.S.A.: Arizona to W. Texas to Sonora, Mexico.

J. DRUPACEA Labill. Syrian Juniper
=Arceuthos drupacea (Labill.) Ant. et Kotschy

A narrowly conical tree to 20 m. tall, with upright branches. Bark orange-brown to gray, peeling in long strips. Branchlets triangular, with prominent ridges or wings.Leaves needle-like, linear-lanceolate, decurrent, 1.5-2.5 cm. long by 1.5-4 mm. wide, spreading, in whorls of three, sharply pointed, keeled below, flattened, green, with a broad green midrib and 2 white bands below, jointed at the base. Dioecious. Male cone pale green, in groups of 3-6, with 9-10 stamens on each scale. Female cone ripening in 2 years, ovoid, brown or bluish-black, bloomy, 1.5-3 cm. long by 1.5-2.3 cm. wide; with 9 scales with distinct raised borders or suture lines. Seeds 3 per cone, 1.5 cm. long, germinate in 2-3 years.
Greece; Turkey; Syria; Lebanon, 300-2000 m..

J. DURANGENSIS Mart. Durango Juniper

A shrub or small tree 2.5-5 m. tall, to 25-35 cm. in girth. Bark gray, fibrous, exfoliating in thin strips. Branches twisted, irregularly arranged. Branchlets quadrangular, rather dense with numerous short compact side branchlets, to 1.5 mm. in diameter. Branchlets spreading out at wide angles. Leaves scale-like, obtuse, broadly ovate, dull yellowish-green, 1-2 mm. long, glandular, margin finely toothed. Male cone subglobose to oblong-ovoid, to 2 mm. long, with 12 scales. Female cone irregular, subglobose to oblong, 5 mm. wide, orange to reddish with a glaucous bloom. Seeds mostly 2-3 per cone, narrow, ovoid-acuminate, curved, striated, 4 mm. long by 2-2.5 mm. wide, dark reddish-brown.
Mexico: Sonora to S.W. Zacatecas; N. Jalisco; Aguascalienties, 1600-2900 m..

J. EXCELSA Bieb. Grecian Juniper

A narrowly pyramidal tree 10-20 m. tall, with upright or spreading branches. Bark brown to dark gray, exfoliating in thin strips. Branchlets rather fine and thin, rounded to nearly quadrangular, 1 mm. in diameter, irregularly disposed. Juvenile leaves opposite, 5-6 mm. long, with 2 glaucous bands below. Adult leaves usually scale-like,opposite, rhombic-ovate, closely appressed, acuminate, with an oblong gland, bluish-green, 0.5-1.5 mm. long, spreading at the tips, entire, apex spiny and incurved. Monoecious. Female cones globose, maturing in 2 years, dark purplish-brown with a bluish bloom, 9-12 mm. wide, with 4-6 scales, suture lines obscure. Seeds usually 5-8 per cone, mostly 3-4 per cone, oblong-ovate, obtusely striated, glossy, chestnut-brown, wrinkled.
Yugoslavia; Albania; S. Bulgaria; Greece; Turkey; Lebanon; Iran; U.S.S.R..

J. EXCELSA var. POLYCARPOS (C.Koch) Silba Persian Juniper
=J. isophyllos C. Koch, =J. macropoda Boiss.,=J. seravschanica Kom.,
=J. turcomanica B. Fedtsch.

A conical tree 5-10 m. tall, or a low shrub with a dense crown. Bark reddish-gray, scaly. Branchlets relatively thick, short, firm. Juvenile leaves ovate or deltoid, long pointed, 5-7 mm. long. Adult leaves scale-like, dark green, obtusish, rhombic or ovate-rhombic, slightly keeled, 1.5-2 mm. long, with an ovate inflated gland, finely denticulate. Dioecious. Female cone short-stalked, solitary or in groups, globose, blackish-blue, bloomy, 10 mm. wide. Seeds 4-5 per cone, ovate-oval, ribbed, brownish.
Turkey; U.S.S.R.; Iran; Afghanistan; Pakistan.

J. FLACCIDA Schlecht. Mexican Weeping Juniper

A shrub or small tree to 9 m. tall, 0.3-0.6 m. in girth, with a rounded crown and with distinctly pendent branches. Bark reddish-brown, furrowed into long, narrow, shreddy ridges. Branchlets long, pendent, 0.8 mm. in diameter, drooping. Juvenile leaves in whorls of three, with an elongated gland at the base, with 2 fine lines of stomata below. Adult leaves scale-like, opposite, 4-ranked, 1.5-3 mm. long, acuminate, yellow-green to gray-green, often with a sunken resin gland, margins finely denticulate, apex spreading. Monoecious. Male cone 2.5 mm. long, with 16 scales. Female cone on a short scaly peduncle, maturing in 2 years, subglobose, resinous, finely warty, dark reddish-brown, bloomy, 1-1.2 cm. long, with 6-8 scales, suture lines faint, with small umbos. Seeds 4-12 per cone, irregular, 4-8 mm. long.

U.S.A.: S. Texas; Mexico: Sonora to Oaxaca, 900-2900 m..

J. FLACCIDA var. MARTINEZII (Perez de la Rosa) Silba Martinez Juniper

A shrub or small tree 4-8 m. tall, crown rounded or conical. Bark gray, fissured, inner-bark blackish-purple. Foliage sparse, terminal branchlets pendent. Leaves scale-like, ashy-green or gray-green, ovate or long-ovate, 1.5-2.5 mm. long by 1-1.5 mm. wide, acuminate, with a dorsal gland, margins translucent with fine teeth. Crushed foliage has a soapy-resinous scent. Male cones ovoid, 3-5 mm. long by 1.5-3 mm. wide, yellow-chestnut, with 8-14 microsporophylls. Female cone ovoid or globose, 5-8 mm. long by 5-9 mm. wide, greenish-yellow tinted gray with a purplish bloom, turning dark red, on a peduncle 1-2.5 mm. long. Seeds 1-3 per cone, ovoid, dark brown, 3-5 mm. long by 3-4 mm. wide, hilium yellow.

Mexico: N.E. Jalisco, N. Sierra Cuatralba (type); S. Aguascalientes; S. San Luis Potosi; N. Puebla, 2000-2500 m..

J. FLACCIDA var. POBLANA Mart. Bigberry Weeping Juniper

A shrub 4-6 m. tall. Branches numerous, pendent, markedly distichous, alternating, nearly Thuja-like. Adult leaves scale-like, ovate or subelliptic and acuminate, sharply acute, apex spreading, 1-1.5 mm. long, not pungent. Female cone 2 cm. long, yellowish-white, with marked suture lines from fusion of the cone scales.

Mexico: Pueblo; Morelos; Jalisco; Guerrero; Oaxaca, 1200-2300 m..

J. FOETIDISSIMA Willd. Crimean Juniper

A shrub or a pyramidal tree 3-25 m. tall, to 1 m. in girth. Bark gray; brownish-red on young trees. Branches often arched-recurved. Branchlets relatively thick, distinctly quadrangular, short, 1 mm. in diameter. Juvenile leaves spiny pointed. Adult leaves scale-like, acute to acuminate, loosely appressed, entire, non-glandular, 1.2-2 mm. long, green or blue-gray, apex incurved. Monoecious or dioecious. Male cone ovoid-globose, 3.5 mm. long, scales orbicular. Female cone on a short straight peduncle, globose or ovoid, 6-12 mm. long, reddish-black, bloomy, suture lines relatively faint. Seeds 1-3 per cone, ovoid, obtuse, slightly fused into one.

Yugoslavia; Albania; Greece; Turkey; U.S.S.R; Syria; Lebanon, 1500-2000 m..

J. FORMOSANA Hayata Formosan Juniper
=J. formosana var. concolor Hayata

A multi-stemmed tree 12-25 m. tall, with spreading or ascending branches and often with pendent branchlets. Bark gray-brown, fibrous, exfoliating in thin strips. Branchlets 3-angled. Buds distinct. Leaves more or less pointing forwards, needle-like, linear, spiny pointed, loosely spreading, 1.2-2.5 cm. long by 1.5-2 mm. wide, in threes, midrib green, with two broad white bands, keeled below, not decurrent. Female cone on a short peduncle, subglobose or broadly ovoid, 8 mm. wide, reddish or orange-brown, maturing in 2 years, with 3 distinct grooves at the apex, with prominent apical mucronate umbos, suture lines visible. Seeds 3 per cone, oval-triangular, elongated, 3-4 mm. long, with 3-4 resin glands.
China: Tibet to Anwhei; Taiwan, 1300-4000 m..

J. GAMBOANA Mart. Gamboa Juniper

A tree 8-12 m. tall, 40-90 cm. in girth, with a slender, irregular crown of branches. Bark dark brown or gray, divided into quadrangular plates . Branchlets fragile, roughly scaly, rounded, 0.1 mm. in diameter. Adult leaves scale-like, ovate or elliptic, bright green or yellowish-green, 1.5-2 mm. long by 0.5-1 mm. wide, with a dorsal gland, denticulate, sharp pointed, loosely imbricate. Male cone orange, 6 mm. long by 2 mm. wide, with 12-16 scales. Female cone globular, bluish-green turning yellow-red to dark red, with a glaucous bloom, resinous, with one whorl of scales, 5-9 mm. long, on a peduncle 3-4 mm. long. Seeds one per cone, subglobose, chestnut-brown, grooved, 5-6 mm. long.
S. Mexico: Chiapas to Sierra de los Cuchumatanes, Guatemala, 1600-2300 m..

J. HORIZONTALIS Moench. Creeping Juniper

A procumbent shrub, rarely to 1.2 m. tall, with long trailing branches and with numerous short branchlets. Branchlets rounded or nearly quadrangular. Foliage dimorphic, spreading, aromatic, entire. Juvenile leaves in opposite pairs or in threes, 2-6 mm. long. Adult leaves acute to cuspidate, 4-ranked, bluish-green or steel blue, 2 mm. long, with a depressed gland, mucronate, imbricate, slightly spreading. Female cone 6-8 mm. wide, on short recurved stalks, light blue, scarcely bloomed, quite resinous, with umbos, 1-4 seeded.
S. Canada: British Columbia: U.S.A.: Montana; Illinois; W. New York to E. Maine.

J. JALISCANA Mart. Jalisco Juniper

A dense tree 5-10 m. tall, to 50 cm. in girth, with a broadly conical or rounded crown and with an erect trunk. Bark fibrous, soft, spongy, cinnamon-brown, exfoliating in strips. Branchlets rounded or subtetragonal, 1 mm. in diameter, pointing upwards at wide angles. Leaves scale-like, dark green, 0.7-1 mm. long, with a linear dorsal gland, finely denticulate; apex obtuse, shortly mucronate, free. Female cone on a peduncle 4 mm. long, irregularly globular, yellowish-green turning red-brown, bloomy, 7-8 mm. long. Seeds 5-7 per cone, acuminate, angular, grooved, 3-4 mm. long by 2 mm. wide.
Mexico: Durango, Pueblo Nuevo; Jalisco, Cuale, 1450-2670 m..

J. KOMAROVII Florin Komarov Juniper
=J. glaucescens Florin

A dense small tree 3-10 m. tall, with spreading or pendent branches. Bark in thin strips. Branchlets slender, erect, nearly rounded to somewhat quadrangular. Juvenile leaves ternate, subulate, 6 mm. long, ovate-triangular. Adult leaves bluntly acute, scale-like, 1-1.5 mm. long, in whorls of 3, triangular-ovate to lanceolate, keeled, with a conspicuous round gland at the base of the leaf, apex incurved. Monoecious. Male cone 2-2.5 mm. long, with 10 orbicular scales. Female cone ovoid to subglobose, pale blue to bluish-black, bloomy, 9-10 mm. long by 6-8 mm. wide, resinous, scales visible at the base. Seeds one per cone, obovoid, 6-7.5 mm. long, rounded at the apex.
China: N.W. Szechuan, Tsipula; S. Kansu, 3200-4000 m..

J. MONOSPERMA (Engelm.) Sarg. One-seed Juniper
=J. gymnocarpa (Lemm.) Cory

A shrub or small tree 3-15 m. tall, 35-75 cm. in girth, with a short trunk and with a dense, spreading, scraggly crown. Bark gray, fibrous, shreddy. Branches ascending, curving upwards. Branchlets nearly quadrangular, 1.2-1.5 mm. in diameter. Leaves scale-like, opposite, 4-ranked, gray-green to yellow-green, in whorls of three, 1.2-1.7 mm. long, glands fairly visible, margins finely denticulate, acute, apex slightly spreading, thickened and rounded on back. Juvenile leaves in threes, 13 mm. long, inconspicuously glandular. Monoecious. Male cone with 8-12 oval-acuminate scales. Female cone globose or oblong, warty, dark blue, resinous, bloomy, 5-7 mm. long, with one whorl of scales, suture lines faint, umbos inconspicuous. Seeds one per cone, chestnut-brown, finely grooved, 5-6 mm. long by 4-5 mm. wide, quadrangular, slightly exposed between the scales of the cone, sometimes flattened.
U.S.A.: C. Colorado to W. Texas; N. Mexico: Tamaulipas, 914-2134 m..

J. MONOSPERMA var. GRACILIS Mart. Slender One-seed Juniper

A shrub 3-8 m. tall, 30-45 cm. in girth, branched from the base. Branches twisted, crown rounded. Bark in thin strips or long oblong plates, dark. Ultimate branchlets 6-12 mm. long, 1-1.3 mm. in diameter, very slender. Leaves broadly ovate to oblong-rhomboid, 1 mm. long by 0.75 mm. wide, apex rounded or obtuse, minutely mucronate. Male cone oblong, reddish, 2.5-3 mm. long. Female cone oval, smaller, attenuate, dark red-glaucous, 4-4.5 mm. long by 3-4 mm. wide. Seeds one per cone, ovate-acuminate, keeled, 4 mm. long.
Mexico: S. Nuevo Leon to N. Hidalgo, 1050-2800 m..

J. OCCIDENTALIS Hook. f. Western Juniper
=J. occidentalis var. australis (Vasek) Holmgren

A shrub with several upright stems or a tree 4.6-20 m. tall, 0.3-3 m. in girth, with a short trunk and a broad crown with spreading branches. Bark reddish-brown, finely fissured into long thin strips. Branchlets relatively thick, rounded, to 1.5 mm. in diameter. Juvenile leaves rarely present on mature trees. Adult leaves scale-like, in twos or threes, in six ranks, gray-green, 1.5-3 mm. long, bluntly acute, conspicuosly glandular on back, margins finely denticulate. Monoecious, sometimes dioecious. Male cone 3 mm. long, with 12-18 oval scales. Female cone maturing in 2 years, ovoid, blue-black

with a glaucous bloom, resinous, with 6-9 scales, 6-9 mm. long by 5-8 mm. wide; ovules partially visible between the scales of the cone, slightly projecting outwards. Seeds 2-3 per cone, 6 mm. long, thick shelled, profusely grooved.
U.S.A.: S. Washington; W. Idaho; N.W. Nevada; E. California, to 3048 m..

J. OTEOSPERMA (Torr.) Little — Utah Juniper
=J. utahensis (Engelm.) Lemm.

A bushy tree 4.6-12 m. tall, with a short trunk and erect or ascending branches forming an open, rounded crown. Bark gray, furrowed, shreddy. Branchlets short, slender, slightly quadrangular, stiff, to 2 mm. in diameter. Juvenile leaves usually in threes. Adult leaves usually scale-like, in whorls of 2 , light yellowish-green, 1.5 mm. long, closely appressed, short pointed, somewhat acuminate, glands usually absent, margins finely denticulate. Monoecious. Male cone subglobose or ovoid, 2.5 mm. long, with 18-24 scales. Female cone globular or broadly ellipsoidal, bluish-black with a whitish bloom, becoming red-brown at maturity, 7-15 mm. in diameter, with one whorl of scales, with small umbos; ovules visible and slightly protruding outwards between the scales. Seeds 1-2 per cone, ovoid, pointed, 7 mm. long, keeled.
U.S.A.: E. Idaho to W. New Mexico, 914-2438 m..

J. OXYCEDRUS L. — Mediterranean Juniper
=J. macrocarpa Sibth. et Sm.

A shrub or small tree 6-10 m. tall, to 1 m. in girth. Bark pale red-brown to light gray, smooth, then peeling in long strips. Branches erect, spreading or ascending. Branchlets rather slender, short, obtusely 3-angled, bark yellowish-brown. Buds scale-like, distinct from the leaves. Leaves needle-like, linear, spreading, green, 1.2-1.8 cm. long by 1-1.5 mm. wide, in whorls of three, with a long spiny apex, margins greenish, with 2 white bands below, prominently keeled, non-glandular. Dioecious. Male cone subglobose, 1 mm. long, at tips of branchlets. Female cone solitary, globose, subsessile with 6 scales, 6-12 mm. in diameter, reddish-brown, sometimes with a glaucous bloom, umbos with a short spine, suture lines faint. Seeds mostly 3 or 2 per cone, rarely 1-4 seeds per cone, broadly ovate, red-brown, with 2 keeled resin glands at the base.
Mediterranean Region: Portugal to N. Iran, 2100-3150 m..

J. OXYCEDRUS var. TRANSTAGNA (Franco) Silba — Portuguese Juniper

A fastigiate shrub with quadrangular branchlets. Leaves needle-like, smaller, 4-8 mm. long by 1-1.5 mm. wide, olive-green with a prominent midrib, silvery-glaucous below, concave, spine-tipped. Male cone axillary, 1.5-2 mm. long with 8-10 acute scales. Female cone ovoid, bluish-brown at first then maturing reddish, to 10 mm. long by 6 mm. wide, suture lines faint, with small apical umbos.
S.W. Portugal, between Azeitao and Coina, maritime areas, mostly south of the river Tejo.

J. PHOENICEA L. Phoenicean Juniper
=J. canariensis Guyot

A dense pyramidal shrub or a tree 2-6 m. tall, with upright or ascending branches. Branchlets rounded, fine, 1 mm. in diameter, non-flattened, nearly pinnate. Juvenile leaves in threes or fours, 6 mm. long, with 2 bands of stomata. Adult leaves usually scale-like, in threes or opposite, rhombic-ovate, 1 mm. long, obtuse, dull dark or bluish-green, appressed, rounded on back, with an obscure glandular depression, margins finely denticulate, apex pointed. Monoecious or rarely dioecious. Male cone on short branchlets, with 10-12 orbicular scales. Female cone ripening in 2 years, usually globose, 8 mm. wide, on a curved peduncle, shiny yellow or reddish-brown, with 6-8 opposite scales, suture lines obscure, with recurved obtuse umbos. Seeds 3-6 per cone, sometimes to 12 per cone, nearly triangular.
Mediterranean Region: Canary Islands to Isreal, 1000-2400 m..

J. PINCHOTII Sudw. Eastern Pinchot Juniper

A small tree or shrub to 6 m. tall, to 0.3 m. in girth, branching from the base. Trunk mult-stemmed or with a broad, irregular crown. Bark light brown or gray, furrowed into thin, fine, scaly ridges. Branchlets usually somewhat rounded, slender, thick. Juvenile leaves 6-8 mm. long. Adult leaves usually in threes, scale-like, 1.5-2.5 mm. long, yellowish-green, conspicuously glandular-pitted, rounded on back, margins denticulate. Dioecious. Female cone subglobose, 6-10 mm. in diameter, reddish-brown, slightly resinous, suture lines faint, umbos inconspicuous, with 1-2 seeds. Seeds somewhat spherical, obtuse, prominently angled, 6 mm. long by 5 mm. wide, light brown.
U.S.A.: S.W. Oklahoma to W. Texas; Mexico: Chihuahua, 305-1524 m..

J. PINCHOTII var. ERYTHROCARPA (Cory) Silba Western Pinchot Juniper

A shrub or small tree to 5 m. tall, to 20 cm. in girth. Crown with an open, irregular habit and spreading branches. Bark reddish-brown, furrowed, shreddy. Branchlets quadrangular, seasonal branchlets 1 cm. long. Leaves scale-like, gray-green to bright green, in 4 rows, to 1.5 mm. long, finely denticulate, glands obscure, glands more apparent on secondary branchlets. Male cone subglobose or oblong, 2 mm. long, with 12 scales. Female cone bright red with a faint glaucous bloom, globose or bilobed, 5-8 mm. in diameter, suture lines faint, with small umbos. Seeds ovate to pyriform, striated, acuminate, one per cone, 5 mm. long by 4 mm. wide, brown.
U.S.A.: S. Ariz. to S.W. Texas to N. Zacatecas, Mexico, 914-1524 m..

J. PINGII Cheng Ping Juniper

A tree 10-30 m. tall, 1-3 m. in girth. Bark gray-brown, fissured. Branchlets quadrangular, thread-like, slightly curved, often pendent. Leaves needle-like, acute, loosely imbricate, slightly keeled, 3 mm. long, green, with white stomata below, decurrent. Female cone ovoid, on short peduncles, 7-9 mm. long, one-seeded, blackish, shiny, with 6 scales, 8 mm. long by 4 mm. wide. Seeds ovoid, rounded at the base, acute at the apex, 6 mm. long by 3 mm. wide.
China: Yunnan to Szechuan, 2600-3000 m..

J. PINGII var. WILSONII (Rehd.) Silba Wilson Juniper

An upright shrub to 2 m. tall, densely clothed with short crowded branchlets that are recurved at the tips. Branchlets quadrangular. Leaves needle-like, relatively short and broad, crowded, broadly lanceolate, 4-8 mm. long, dark green, densely imbricate. Female cone 6-7 mm. long by 5-6 mm. wide, nearly black, apex oblique, with 3 scales with small recurved umbos. Seeds ovoid, 4-5 mm. long by 3-5 mm. wide, apex oblique with a small point.
China: Tibet to Hupeh, 3000-4900 m..

J. PREZWALSKII Kom. Prezwalskii Juniper
=J. zaidamensis Kom.

A tree 8-12 m. tall, with a dense crown. Bark gray-brown or chestnut-brown, exfoliating in thin strips. Branchlets short, nearly quadrangular or angled, fine, 1 mm. in diameter, tips somewhat recurved. Juvenile foliage narrowly-lanceolate, incurved, with globular buds. Adult leaves acute to obtuse, gray-green, loosely imbricate, slightly keeled, to 3 mm. long, with an obscure elongated gland, margins denticulate. Monoecious. Male cone ovoid or globose, 2-2.5 mm. long, with orbicular scales. Female cone broadly acuminate with a br-ad base, dark green turning dark bright red, 0.5-1.5 cm. long, with one whorl of scales. Seeds one per cone, 7-10 mm. long, warty, with 2 grooves, irregularly globose.
China: Tsinghai; Kansu; Szechuan, 2600-4000 m..

J. PROCERA Hochst. ex Endl. East African Juniper

A large tree to 40 m. tall, to 10 m. in girth. Bark papery, red-brown. Branchlets irregularly disposed, quadrangular, feather-like, 0.8 mm. in diameter . Juvenile leaves in threes, 10 mm. long, rarely present on adult trees. Adult leaves scale-like, fine, ovate-lanceolate, narrowly acute, 0.5-1 mm. long, with a linear gland, yellowish-green, grooved on back, margins entire. Male cone long-elliptic, scales with 2-3 pollen sacs. Female cone rounded, 6-8 mm. long by 5 mm. wide, violet-brown with a glaucous bloom, umbos inconspicuous. Seeds 2-3 per cone, ovoid, brown, 5 mm. long.
Ethiopia; Somali; Kenya; Tanganyika, Kasanga, 1200-3000 m..

J. PROCUMBENS (Endl.) Miq. ex Sieb. et Zucc. Japanese Juniper

A low spreading shrub 50-75 cm. high, with stiff ascending branches. Branchlets with glaucous ridges, stiff, turning upwards at the ends. Buds naked, indistinct from the leaves. Leaves needle-like, linear-lanceolate, 6-8 mm. long, spiny pointed, concave above and glaucous with a green midrib, bluish below with 2 white spots near the base from which 2 glaucous lines run down the edges of the pulvini. Dioecious. Female cone on a short peduncle, subglobose, 8-9 mm. wide, blackish-blue, 3-4 lobed, 2-3 seeded.
Japan: Kyou-Shou.

J. PSEUDOSABINA Fitsch. et Mey. Sinkiang Juniper

A low shrub, sometimes 3-4 m. tall. Bark ashy-gray. Branchlets thick, rounded or nearly quadrangular, 2 mm. in diameter. Juvenile leaves with white lines. Adult leaves bluntly acute, hump-backed, gray-green, keeled, 1.5-2 mm. long, with an elongated gland, with a deep groove near the base, margins denticulate, apex incurved and free. Male cone ovoid or subglobose, pale yellow. Female cone globose to obovoid, on a recurved peduncle, purple or nearly black, non-glaucous, 1-1.2 cm. long by 5-8 mm. wide, with 4-6 scales, umbos pointed at the apex. Seeds obovoid, grooved, obtuse, 1-2 per cone, 5 mm. long by 3 mm. wide.
U.S.S.R.: Uzbek to Sinkiang Uighur, China, 2500-3300 m..

J. PSEUDOSABINA var. TURKESTANICA (Kom.) Silba Turkestan Juniper

A tree to 12 m. tall, or a shrub less than 2 m. tall with a dense crown. Branches erect or spreading. Branchlets fine, 2 mm. in diameter. Leaves scale-like, about 2 mm. long, with strongly impressed glands, obtuse, slightly keeled, yellowish-green. Female cone globular, or more frequently oblong, 12.5-16.5 mm. long by 12.5 mm. wide, blackish, shiny, somewhat glaucous, very fleshy. Seeds oblong or spathulate, 6 mm. long by 3 mm. wide, grooved, thick shelled, rounded at the apex, narrowed at the base.
U.S.S.R.: Kazakhistan to W. Sinkiang Uighur, China, 2800-4000 m..

J. RECURVA Buch.-Hamilt. ex D. Don Himalayan Drooping Juniper

A broadly pyramidal tree to 10 m. tall, with spreading curved branches and pendulous branchlets. Bark gray-brown, exfoliating in thin flakes or strips. Leaves needle-like, densely imbricate, awl-shaped, ternate, loosely appressed, pointing forwards, linear-lanceolate, 3-6 mm. long by 0.5-1 mm. wide, gray-green, margins pale, sharply pointed, very concave below and whitish, grooved below the middle above. Monoecious or dioecious. Male cone bright yellow to brown, axillary,4 mm. long, with 12-16 scales. Female cone ripening in 2 years, ovoid, 8-10 mm. long by 3-6 mm. wide, dark violet-blue or black-purple-brown, with 3-6 scales, suture lines visible, with an acute triangular umbo on the scales. Seeds one per cone, ovoid, blunt, thick, pitted.
Afghanistan to Bhutan to N. Burma to S.China: Tibet, 3000-4000 m..

J. RECURVA var. COXII (Jackson) Melville Cox Juniper

A large tree 5-12 m. tall or more, with a narrow trunk and with pendent branchets. Bark thick, orange-gray, prominently exfoliating in long strips. Branchlets longer and more pendent. Leaves needle-like, 3-5 mm. long by 1 mm. wide, more loosely arranged, widely spaced, more acuminate,with 2 greenish-white bands below, convex above with a fine midrib, sharply acute, margins white, apex spine-tipped and whitened. Female cone ovoid, purple, nearly black, slightly bloomed glaucous, shiny, 8 mm. in diameter. Seeds one per cone.
N. Burma to Yunnan, China, 3000-3400 m..

J. RIGIDA Sieb. et Zucc. Temple Juniper

A shrub or tree 8-12 m. tall, with a pyramidal or conical crown. Bark fine, scaly, dull brown or gray and furrowed on old trees. Branches ascending, branchlets pendulous, young branchlets slender and tri-angled. Buds distinct from the foliage, scaly, scales acute. Leaves needle-like, widely spreading, linear-subulate, in whorls of 3, 1.2-2.5 cm. long by 1 mm. wide, deeply sulcate below and with a narrow white band, keeled prominently above, yellowish-green, apex spiny-pointed. Dioecious. Male cone ovoid, yellowish-green, tinted violet, scales ovoid-acuminate. Female cone on a short peduncle, maturing in 2 years, globose, 6-10 mm. long by 8 mm. wide, brownish-black, bloomy, slightly shiny, with 6-9 scales, suture lines visible and thickened, with distinct umbos. Seeds 2-3 per cone, angular, red-brown, 5-7 mm. long by 3-4 mm. wide, with 3-4 resin pockets at the base.
N.E. China; Korea; Japan, to 1500 m..

J. SABINA L. Savin Juniper
=Sabina vulgaris Ant.

An upright shrub 1-5 m. tall, or more often low and spreading. Branchlets slender, twisted, rounded to nearly quadrangular, 1 mm. in diameter, with a strong offensive scent when crushed. Juvenile leaves slightly spreading, to 4 mm. long, concave, glaucous, midrib prominent. Adult leaves scale-like, rhombic-ovate, appressed, obtuse or bluntly acute, 1 mm. long, closely imbricate, dark green, with a small round gland near the center of the leaf, leaves in whorls of 3. Monoecious or dioecious. Male cone pale yellow, with 10-15 ovoid or sub-orbicular scales.Female cone on a scaly recurved peduncle, subglobose or ovoid, ripening in one year, 5 mm. wide, resinous, with 4-6 scales, brownish-blue, bloomy, with apiculate umbos. Seeds usually 2 per cone, grooved, shiny brown, margins obtuse.
Central and southern Europe to U.S.S.R. and China, 1100-3300 m..

J. SABINIOIDES (H.B.K.) Nees Mountain Juniper
=J. monticola Mart.

A shrub 2-4 m. tall, with a twisted trunk, branched from the base, and with an irregular crown. Bark fibrous, inner-bark violet. Branchlets tetragonal, distichous or subdistichous, 1.5 mm. in diameter. Leaves scale-like, ovoid or ovoid-rhombic, bluish-green, 1.5 mm. long, without glands or with a gland near the base, margins finely denticulate. Male cone yellowish-green, 4 mm. long, with 12 suborbicular scales. Female cone globular, on a long peduncle, dark blue, aromatic, resinous, 7-9 mm. long, umbos conspicuous. Seeds 3-4 per cone, angular, acuminate, 4-5 mm. long by 1.5-3 mm. wide.
Mexico: Hidalgo; Jalisco; Michoachan, 2400-4300 m..

J. SALTAURIA Rehd. et Wils. Szechuan Juniper

A pyramidal tree to 15 m. tall, to 1 m. in girth or more. Bark gray-brown, in thin strips. Branches dense, erect or spreading. Branchlets nearly quadrangular, short, slightly recurved, 1 mm. in diameter. Leaves scale-like, acute to bluntly acute, obscurely glandular, non-grooved, dark green, 1-2 mm. long, closely appressed, apex not incurved. Monoecious. Male cone terminal on short branchlets, subglobose, with 8-10 decussate scales. Female cone erect, black, not bloomy, ovoid or subglobose, 5-6 mm. long, with one whorl of scales. Seeds one per cone,

smooth, 3-5 mm. long, ovoid or subglobose, grooved, sometimes with a pointed apex.
China: Kansu; N.W. Szechuan; Yunnan; Tibet, 2400-4300 m..

J. SCOPULORUM Sarg. Rocky Mountain Juniper

A narrowly conical tree 6-15 m. tall, to 0.5 m. in girth, with a straight trunk, becoming broader, with stout branches and a multi-stemmed trunk. Bark reddish-brown, shredding in thin strips. Branchlets nearly quadrangular, angular, often pendent, short, 1 mm. in diameter. Foliage with a disagreeable odor when crushed. Leaves scale-like, gray-green to yellowish, acute, 4-ranked, 1.5 mm. long, with a glandular depression at the base. Monoecious. Male cone with 6 stamens. Female cone globular, bright blue with a whitish bloom, resinous, 6-8 mm. in diameter, maturing in 2 years, with one whorl of scales, suture lines faint, umbos small. Seeds generally 2 per cone, red-brown, angular, grooved, thick shelled, with 2 lobes at the apex.
S.W. Canada; W. United States: Rocky Mt. Region; N. Mexico, 1524-2743 m..

J. SEMIGLOBOSA Regel. Russian Juniper
=J. drobovii Sumnev,=J. jarkendensis Kom.,=J. schuganica Kom., =J. talassica Lipsay, =J. tianschanica Sumnev

An erect tree 10-12 m. tall, with a loose,narrow,often weeping crown. Branchlets slender, pendent, quadrangular, 1-2 mm. in diameter. Juvenile leaves terete, with a white median band below, shiny, long pointed. Adult leaves scale-like, imbricate, rhombic, obtusish, gray-green, 1.2 mm. long, closely appressed, with an oblong dorsal gland. Dioecious. Female cone semi-globose, flatly truncate at the apex, black, with a scattered bloom, 6-7 mm. in diameter, with 4 scales. Seeds 4 per cone, 5 mm. long by 3 mm. wide, flattish, cuneate or with a convex abaxial surface and with lateral grooves.
Afghanistan; U.S.S.R.: Kazakhistan to Sinkiang, China.

J. SQUAMATA Buch.-Hamilt. ex Lamb. Flaky Juniper
=J. morrisonicola Hayata, =J. squamata var. fargesii Rehd. et Wils.

A prostate shrub or small tree 1-3 m. tall, with decumbent branches and ascending branchlets. Young branchlets green, grooved. Branchlets thick, short, rounded or trigonal. Buds naked, indistinct from the leaves. Leaves needle-like, ternate, loosely appressed or slightly spreading, bluntly acute, linear, finely pointed, 3-5 mm. long by 1.2 mm. wide, grayish or bluish-green, concave below and whitened, concave above and with a long groove from the base to near the apex, apex incurved. Female cone ellipsoid to globose-ovoid, 6-8 mm. long by 5-6 mm. wide, reddish-brown turning purplish-black, maturing in 2 years, with 3-6 scales, with a short recurved umbo. Seeds one per cone, ovoid, 4-5 mm. long by 3-5 mm. wide, with 3-4 grooves, apex pointed.
Afghanistan; India; China: Tibet to Anwhei; Taiwan, 1600-4000 m..

J. STANDLEYI Steyerm. Standley Juniper

A low shrub or small tree 0.50-2 m. tall, rarely to 15 m. tall, with dense foliage. Branchlets dense, distichous, 1-1.4 mm. in diameter. Juvenile leaves 8-9 mm. long by 1.5-1.7 mm. wide. Adult leaves scale-like, bright green, ovate or obtuse, 1.5 mm. long, usually without glands, margins minutely toothed. Male cone somewhat globose, 2 mm. in diameter. Female cone on a short recurved peduncle, globose to sub-conical, dark brown, very resinous, 7-9 mm. long,

scales visible. Seeds 3-4 per cone, subconical, grooved, 4-5 mm. long, base opaque, apex bright chestnut-brown.
Mexico: Chiapas; Guatemala, 3000-4600 m..

J. TAXIFOLIA Hook. et Arn. Yew-leaf Juniper
=J. lutchuensis Koitz.

A shrub or tree 12-15 m. tall, with a somewhat crooked trunk. Bark red-brown. Branches horizontal, spreading, branchlets pendent. Young branchlets angular, narrowly winged. Leaves needle-like, obtuse, bright green, narrow, 1-1.3 cm. long by 1.3-1.6 mm. wide, with 2 broad bands of stomata below, keeled above, not decurrent. Male cone cylindrical, 5 mm. long. Female cone globose, 6-10 mm. wide, bright light chestnut-brown, umbos prominent at the apex. Seeds 3 per cone, with 2-3 resin glands.
S. Japan: Bonin and Ryukyu Islands.

J. THURIFERA L. Spanish Juniper

A narrowly conical tree 12-20 m. tall, to 3 m. in girth, with a dense rounded crown and ascending branches. Bark dark brown, scaly, exfoliating in vertical strips. Branchlets pinnately divided, mostly in one plane, slender, aromatic, subquadrangular, 1-2 mm. in diameter. Foliage dimorphic. Juvenile leaves 2-6 mm. long, opposite, glaucous with a green midrib, frequently on mature trees. Adult leaves always opposite, appressed, scale-like, ovate, with a glandular depression, 1.5 mm. long, entire, keeled, bluish-green, free at the acuminate apex. Dioecious. Female cone maturing in 2 years, subglobose, 7-12 mm. long by 8 mm. wide, on a curved peduncle, dark blue, slightly bloomy, with 6 scales, suture lines visible, with small umbos. Seeds 2-6 per cone, oval, slightly angular, wide at the base, bright brown, 5 mm. long, with 2-3 resin pits at the base.
N. Algeria; C. Spain and S.E. France.

J. TIBETICA Kom. Tibetian Juniper
=J. distans Florin, =J. potanini Kom.

A shrub to 2 m. tall, or a tree to 30 m. tall, with a dense tufted yellowish-green crown. Bark gray-brown, papery, exfoliating. Branchlets relatively thick, somewhat curved, nearly quadrangular, 1 mm. in diameter. Juvenile leaves needle-like, lanceolate, glaucous, 8 mm. long by 1 mm. wide. Adult leaves scale-like, opposite, deltoid, dark green, obtuse, 1.5-3 mm. long, with a conspicuous oblong or linear dorsal gland. Monoecious. Male cone 1.5-2 mm. long, globular, with 6-8 scales. Female cone dark brown to red-brown, shiny, 15 mm. wide. with one whorl of scales. Seeds one per cone, globose, 8-10 mm. long, grooved and gibbous on the sides, obtusely 4-angled at the apex.
China: Kansu; Tsianghai; Szechuan; Tibet, 2800-4600 m..

J. VIRGINIANA L. Eastern Red Juniper

A narrowly conical tree 12-18 m. tall, 0.3-0.6 m. in girth, with a compact crown and with a buttressed base.Trunk often angled. Bark reddish-brown, peeling in thin long strips. Branches spreading or upright. Branchlets rounded to nearly quadrangular, fine, 1 mm. in diameter. Juvenile leaves 1-2 cm. long, green above, concave and glaucous below, rarely on adult trees. Adult leaves scale-like, dark green, opposite, in 4 rows, 1.5 mm. long, imbricate, acute, spreading, with a glandular depression at the base, margins not toothed, free at the apex. Dioecious.

Male cone yellowish-brown, with 10-12 scales. Female cone maturing in one year, globular or ovoid, dark blue with a whitish bloom, 6-10 mm. wide, resinous, with 2 whorls of scales, suture lines faint, umbos inconspicuous. Seeds 1-2 per cone, bright brown, grooved.
S.E. Canada; E. United States: S.W. Maine to N. Florida.

J. VIRGINIANA var. SILICICOLA (Small) Silba Southern Red Juniper

A small broadly or narrowly conical tree to 15 m. tall, to 0.6 m. in girth, with a broad spreading sometimes flattened crown. Trunk often branched from the base, the lower branches drooping. Bark reddish-brown, thin, furrowed, shreddy. Branchlets 4 angled, slender, numerous, erect, spreading or slightly drooping. Juvenile leaves to 10 mm. long. Foliage aromatic. Adult leaves scale-like, light to dark green, 1.5 mm. long, in 4 rows, overlapping, acute, with an ovoid gland, margins smooth, spreading, free at the apex. Dioecious. Male cones ellipsoid-cylindric, 5-6 mm. long. Female cone ovoid-globular to nearly elongated, resinous, 7-10 mm. in diameter, dark blue with a white bloom, maturing in one year, suture lines faint, with small umbos. Seeds 1-2 per cone, 2-3 mm. wide, brown, acuminate, ridged on back.
S.E. United States: E. North Carolina to S.E. Texas, near sea level.

J. WALLICHIANA Hook. f. Wallich Juniper
=J. indica Bertol.

A shrub 1-2 m. tall, or a narrowly conical tree to 20 m. tall, with ascending spreading branches. Bark red-brown, exfoliating in strips or scales. Branchlets slender, nearly quadrangular, 1.2 mm. in diameter. Foliage dimorphic. Juvenile leaves in threes, acute, whitened above, 4 mm. long, channeled below, often present on mature trees. Adult leaves scale-like, opposite, 4-ranked, closely appressed, narrowly ovate, acute, 1.5 mm. long, bright green, with a long groove and glandular on the back, margins whitened and finely denticulate, apex incurved. Dioecious. Female cone at the end of short curved peduncles, erect, ripening in 2 years, ovoid, 10 mmm. long by 8 mm. wide, dark purplish-brown becoming blue, with one whorl of scales. Seeds one per cone, oblong to ovoid, flattened, grooved, 6-9 mm. long by 4-5 mm. wide, with 2-3 glandular depressions.
N. India; Nepal; Bhutan; China: Tibet and Yunnan, 3000-5200 m..

KETELEERIA Carr. (Pinaceae)

A genus of two species from S.E. Asia to Taiwan. Evergreen trees with whorled spreading branches, pyramidal when young, becoming flat-topped with age. Branches horizontal. Buds ovoid or globose, non-resinous, later persistent at base of seasonal branchlets. Juvenile leaves leathery, rigid, sharp-pointed. Adult leaves appearing 2-ranked by a twisted petiole at the base, but spirally arranged, linear, not grooved above or with a prominent midrib, pale green below with a ridge or midrib, shiny, flattened, persistent on dried specimens, with 2 indistinct bands of stomata, leaving a circular scar when falling off. Male strobili on a short scaly peduncle, axillary or terminal, arranged in clusters of 5-10, with many anthers, anthers with 2 pollen sacs. Female cones borne erect, maturing in one year, cylindrical, elongated, with persistent woody scales, not shedding or breaking apart from the central axis; bracts lobed, about 1/2 size of the scale or smaller and usually hidden. Seeds 2 per scale, with one long wing projecting backwards, as long as the scales. Cotyledons 2, germination often hypogeal.

K. DAVIDIANA (Betr.) Beissn. David Keteleeria
=K. calcarea Cheng et Fu, =K. chien-peii Flous, =K. dopiana Flous, =K. evelyiana Mast., =K. formosana Hay.,=K. hainanensis Chun et Tsiang, =K. pubescens Cheng et Fu, = K. roulletii (A. Cheval.) Flous

A tree 10-50 m. tall, with an irregular crown. Bark dark gray, furrowed. Branchlets yellow-gray to red-brown, slightly pubescent. Buds ovoid-globular, slightly resinous, reddish. Leaves linear, dark green, 2.5-5 cm. long by 2.5-4 mm. wide, glaucous below with 12-15 lines of stomata, with few stomata above, elliptic in the cross-section, apex bluntly acute or acuminate and notched. Female cones narrowly ovoid-cylindrical, 8-21 cm. long by 3.5-6 cm. wide, reddish then green then chestnut-brown to yellowish-brown; scales ovoid or nearly triangular, often reflexed at the tips; bracts about 2/3 height of the scale, 3-lobed. Seeds triangular, 1.5 cm. long, with a long wing projecting backwards. Cotyledons 2-4.
S. Vietnam; S. Laos: W. China: Yunnan to W. Hupeh, also on Hainan; Taiwan, 300-2600 m..

K. FORTUNEI (a. Murr.) Carr. Fortune Keteleeria
=K. cyclolepis Flous,=K. oblonga Cheng et Fu

A pyramidal tree 11-30 m. tall, with horizontal branches, becoming flat-topped with age. Bark corky, light brown, relatively smooth. Branchlets orange-red, smooth to slightly pubescent. Buds ovoid, with many scales, slightly resinous, reddish. Juvenile leaves spiny. Adult leaves linear, keeled, 1.2-3 cm. long by 2-4 mm. wide, bright dark green, paler below; stomata absent above, in 15-20 lines below; margins revolute, apex obtuse. Female cone oblong-cylindric, 6-18 cm. long by 5-6.5 cm. wide, greenish-purple then reddish-brown; scales broadly rounded, not reflexed; bract about 1/2 size of the scale. Seeds short and broad, nut 13 mm. long, with a broad wing to 23 mm. long or more. Cotyledons 2. Monoecious.
S. China: S. Chekiang to Kwangsi Chuang, 340-1400 m..

LARIX Mill. (Pinaceae)

A genus of nine species from N. America, Europe, Asia and Japan. Resinous trees with irregularly whorled spreading branches. Monoecious, deciduous trees of cooler higher elevations. Terminal branchlets grooved, roughened by fallen leaf bases. Buds ovoid, free from the leaves. Leaves linear, spirally arranged on terminal branchlets, crowded in whorls on short spurs on side branchlets, needle-like, usually flattened, usually keeled below, bluntly acute, bright green turning yellow in the autumn, stalkless, stomata more numerous below; with 2 resin canals near the outer margin of each leaf. Male strobili in small globose to oblong solitary catkins with numerous short-stalked spirally arranged anthers, enclosed at the base by brown fimbriated scales. Bracts of female strobili greatly exceeding the scales before pollinization. Female cones usually erect, maturing in one year, persistent on the tree, green or reddish or purplish turning brown, scales persistent; scales numerous, rounded, flattened; bracts triangular or lobed, usually hidden, sometimes exserted. Seeds 2 per scale, with a large thin wing projecting backwards. Cotyledons 6-8.

L. DECIDUA Mill. European Larch
=L. europaea DC. ex Lamb. et DC.

A broadly pyramidal tree 35-55 m. tall, 0.6-1 m. in girth, becoming irregular, with short slender branches. Bark dark grayish-brown, furrowed and scaly. Branchlets slender, smooth, yellowish; side branchlets dark brown, pubescent when young. Buds ovoid, golden-brown to chestnut-brown, smooth, scales acute; side buds rounded, slightly pubescent, 2 mm. long. Leaves slightly flattened, 1-3.5 cm. long by 0.5 mm. wide, keeled below, soft, bright light green above, not keeled above; stomata above, more numerous below in 2 faint bands; apex pointed. Side branchlets with leaves in whorls of 30-40. Male strobili rounded, pale yellow, 5-10 mm. long, bract margins fimbriate. Female cone ovoid, on a slightly twisted thick peduncle, 1.5-6 cm. long by 2 cm. wide, red-brown turning gray; with 40-50 suborbicular scales, loosely appressed at maturity; scales rounded, somewhat reflexed, light brown, margins wavy, smooth or slightly pubescent, sometimes notched at the apex; bracts hidden, trident, at base of the scale; seed wings extending to upper margins of scales. Seeds 4-5 mm. long, grayish.
S.E. France; Switzerland; N. Italy; S. Germany; Austria.

L. DECIDUA var. POLONICA (Racib.) Ostenf. et Syr. Lars. Polish Larch
=L. sudetica Domin

A narrowly conical tree 15-24 m. tall. Bark dark brown-gray, widely fissured. Branchlets slender, generally pendent, fine, whitish to tan. Buds smaller, ovoid to subglobose, closely pressed to the branchlet, chestnut-brown, slightly to densely pubescent, 1.2-1.5 mm. long, non-resinous, slightly shiny; side buds flattened and somewhat depressed on top of short spurs. Leaves flattened, bluntly acute to nearly spine-tipped, 1.5-2.3 cm. long by 0.75-1.2 mm. wide, usually 1.6-1.8 cm. long on side branchlets. Female cone on a thick peduncle, ovoid or flat-topped, green then dull light brown, smaller, 1.5-2 cm. long by 1.2-1.5 cm. wide, truncate, with fewer scales; scales more rounded, incurved and less emarginate; bracts erect, longer and slightly exserted, about 1/2 size of the scales or more. Seeds ovoid, 3 mm. long, wings light brown 3 mm. long, wings extending slightly above upper margins of the cone scales.
S.E. Poland: Lysa Gora Region; N. Czechslovakia: Altvater Mts.; U.S.S.R.: N.W. Ukraine, 137-1900 m..

L. GMELINI (Rupr.) Rupr. Dahurian Larch
=L. dahurica Laws.

A pyramidal tree 20-30 m. tall, becoming irregular, with wide-spreading branches. Bark dark reddish-brown, finely scaly. Branchlets red-brown, smooth or pubescent, bloomy. Buds yellow-brown to dark violet-brown, non-resinous, pointed, scales free; side buds pubescent at the base, dark blackish-brown, slightly resinous. Leaves flattened or slightly keeled below, rounded at the apex, bright green; with few stomata above, stomata numerous below; slightly falcate, 2-4 cm. long, cross-section triangular-flattened. Male strobili globular, yellowish, 4 mm. long. Female cone 2-4 cm. long, with 20-40 scales; scales ovate or orbicular, notched at the apex; bracts hidden, lobed or ovate-lanceolate, darker than the scale.
U.S.S.R.: Siberia, E. Yenisei River.

L. GMELINI var. JAPONICA (Reje.) Pilg. Kurile Larch
=L. gmelini var. olgensis (Henry) Ostenf. et Syr.-Lars.

A broadly conical tree 15-30 m. tall, to 70 cm. in girth. Bark dark gray, deeply fissured. Branches short, perpendicular to the trunk. Branchlets pubescent, violet-yellowish to reddish-brown, bloomy. Buds blackish-brown or red-brown, ovoid; exterior scales keeled, ovate-lanceolate; interior scales rounded, ciliate. Leaves on terminal branchlets 2-3 cm. long, on side branchlets 1-2.8 cm. long, bluish-green, rounded at the apex, slightly keeled below, with 2 bands of stomata, cross-section diamond-shaped; leaves on side branchlets in whorls of 15-30. Male strobili subglobose, 4-7 mm. long, scales apiculate, with 2 pollen sacs. Female cone 1.5-2.5 cm. long by 1.5-2 cm. wide, with 15-25 scales; scales broadly ovate, slightly notched and somewhat reflexed at the apex, denticulate,slightly pubescent; bract oblong, 1/2-3/4 height of the scale. Seed 4 mm. long, wing to 8 mm. long.
U.S.S.R.: Siberia; Sakhalin; Olga Bay region.

L. GMELINI var. PRINCIPIS-RUPPRECHTII (Mayr.) Pilg. Prince Rupprech Larch

A tree 20-30 m. tall, to 2 m. in girth. Branchlets pubescent at first, then smooth, bright red-brown to bright yellowish. Terminal buds dark brown, pubescent, slightly resinous, scales free, colored at the base; side buds dark shiny brown, pointed or rounded, interior scales pubescent. Leaves fine, falcate, keeled below, clear green, 3-4 cm. long, apex obtuse, cross-section elliptic; leaves on side branchlets 2-3.5 cm. long, in whorls of 20-35. Male strobili globular, yellowish or slightly greenish, 5 mm. long by 4 mm. wide. Female cone ovoid or elliptic, 2-3.5 cm. long by 2.5 cm. wide, on a peduncle 2 cm. long, with 20-40 scales; scales ovate, notched at the apex, finely denticulate, with a small lobed bract about 1/2 size of the scale. Seeds whitish-brown, 4 mm. long, wing 10-11 mm. long.
China: Heilungkiang (Manchuria); N.W. Korea, 1400-2800 m..

L. GRIFFITHII Hook. f. Himalayan Larch
=L. speciosa Cheng et Law

A tree 20-25 m. tall, becoming broad crowned, with long wide-spreading pendent branches. Bark thick, purple-gray to brown. Branchlets pubescent, yellowish-green or dull red-brown, pendent, slightly glaucous the 2nd year. Terminal buds conical, non-resinous, scales pubescent at first; side buds ovoid, non-resinous, red-brown. Leaves slightly keeled, bright green; stomata near the apex above, in ranks below; apex obtuse or pointed, 1.5-3.5 cm. long by 2 mm. wide; side branchlets with leaves in whorls of 50. Male strobili 7-10 mm. long, on a short peduncle, bright brown. Female cones narrowly cylindrical, 5-11 cm. long by 2.2-3 cm. wide, bright brown, margins purplish, with 25-40 scales; scales heart-shaped or rounded, notched, pubescent at the base, margins denticulate; bracts long exserted, reflexed, lanceolate, purplish-brown. Seed 8 mm. long, wing to 1.2 cm. long.
E. Nepal; Sikkim; Bhutan; N. Burma; China: Tibet and Yunnan, 1800-4100 m..

L. GRIFFITHII var. MASTERIANA (Rehd. et Wils.) Silba Masters Larch

A tree to 25 m. tall, to 80 cm. in girth. Bark grayish-brown, fissured. Branches spreading horizontally, branchlets pendent. Branchlets pale yellowish-brown, slightly pubescent. Buds ovate, obtuse, scales pubescent at the base. Leaves bright green, 1.2-3.5 cm. long, keeled on both sides, slightly recurved, with 2 bands of stomata below, short pointed, apex acute; side branchlets with leaves in whorls of 25-40. Female cones erect, on short stalks, oblong-cylindric, 2.5-4 cm. long by 1.5-2 cm. wide, pale brown; scales orbicular, heart-shaped, notched at the apex; bracts long exserted, triangular, red, reflexed. Seeds 2-2.5 mm. long, wing 6-8 mm. long, obovoid.

China: W. Szechuan, Wassu Tribal State, Niu-tou-shan, 2300-3500 m..

L. KAEMPFERI (Lamb.) Carr. Japanese Larch
=L. leptolepis (Sieb. et Zucc.) Gord.

A narrowly conical tree 25-40 m. tall, 3-5 m. in girth, with numerous, short, spreading, horizontal branches. Bark gray to rose-brown, fissured, exfoliating in narrow strips. Branchlets red-brown or yellowish or chestnut-brown, smooth or pubescent, slightly shiny. Side buds thick, short, red; terminal buds shiny, red-brown, resinous, elongated or conical, scales fringed at the margins. Leaves bright blue-green to light green, non-keeled above, slightly flattened, prominently keeled below, 1.5-4 cm. long by 0.7-1 mm. wide, apex acute, with 5 lines of stomata on both surfaces, cross-section nearly triangular. Female cone ovoid to ovate, on a short peduncle or sessile, yellowish-green at first then brown, 1.5-3.5 cm. long by 2-3 cm. wide; scales rounded to ovate, apex notched and scarcely reflexed, with a hidden lobed bract about 1/2 size of the scale. Seeds bright brown, 3-4 mm. long by 2 mm. wide, wing to 8 mm. long and dark brown.

Japan: C. Honshu and Mt. Fujiyama, 1219-2800 m.

L. LARICINA (Du Roi) K. Koch Tamarack Larch

A conical tree 12-24 m. in girth, 0.3-0.6 m. in girth, with an open crown with horizontal branches. Bark reddish-brown, scaly, thin. Branchlets orange-brown or bluish, smooth to pubescent, grooved, with resin pockets; side branchlets blackish. Terminal buds rounded, shortly pointed, resinous, with 10 smooth scales; side buds dark brown, pubescent. Leaves 3-angled, bright green or bluish-green, 1.5-3.5 cm. long by 0.5-1 mm. wide, non-keeled above, slightly flattened, very slender, narrow, later yellowish-green, stomata present on the upper surface, apex acute. Female cone 12-19 mm. long by 0.8-1 cm. wide, stalkless, red-brown turning yellowish-brown, with 12-20 scales; scales broadly rounded, hump-backed, smooth, overlapping, with a small acuminate basal bract; bract 1/4-1/2 size of the scale, hidden, terminated by 2 points. Seeds red-brown to brown.

C. Canada to Newfoundland; U.S.A.: Alaska to W. Maryland, 518-1219 m..

L. LYALLII Parl. Subalpine Larch

A broadly conical tree 9-15 m. tall, 0.3-0.6 m. in girth, with a straight trunk and with an irregular, spreading crown of remote long branches. Bark dark red-brown, fissured into irregular scaly plates. Branches short, stout. Branchlets with dense whitish or brown pubescence, with resin pockets, yellowish-brown or gray. Buds brown, rounded, with yellowish pubescence. Leaves pale blue-green, 2.5-3 cm. long by 1 mm. wide, 4-angled, stiff, short-pointed, cross-section

rhombic, rigid, acute; side branchlets with leaves in whorls of 40-50. Female cones elliptical, nearly stalkless, 3.5-5 cm. long by 2-2.5 cm. wide, dark reddish-purple; scales ovate, pubescent, reflexed; bracts long exserted, rigid, erect, acuminate, lobed, reddish. Seeds triangular, wing 9-11 mm. long, rose-colored.
N. Idaho; W. Montana, 1219-2438 m..

L. OCCIDENTALIS Nutt. Western Larch

A narrowly conical tree 24-46 m. tall, 0.5-0.9 m. in girth, with horizontal branches. Bark reddish-brown, furrowed into flat overlapping plates. Branchlets orange-brown, pubescent at first, side branchlets chestnut-brown. Buds rounded, with 20 pubescent fringed scales, dark shiny chestnut-brown, resinous. Leaves 3-angled, 2.5-4 cm. long by 0.5-1.3 mm. wide, light green, stiff, sharp-pointed, keeled below, linear, apex acute, with 2 lines of stomata on each surface; side branchlets with leaves in whorls of 14-40. Female cones elliptical, 2.5-4.5 cm. long by 1.5-3 cm. wide, on short peduncles, brown; scales rounded to orbicular, pubescent, with long exserted erect lobed bracts. Seeds triangular, pointed, wing 2 times larger than the seed.
S.W. Canada; U.S.A.: N. Washington to W. Montana, 610-2134 m..

L. POTANINII Batal. Chinese Larch
=L. chinensis Beissn., =L. himalaica Cheng et Fu

A narrow tree 25-50 m. tall. Bark gray or gray-brown, fissured. Branches short, horizontal, pendent. Branchlets sparsely pubescent to smooth, red-brown or orange-brown turning gray. Buds ovoid, resinous, dark reddish-brown. Leaves gray-green to glaucous, fine, slightly keeled on 2 faces, stomata on most faces in 1-2 lines, 1.5-3 cm. long by 1-1.5 mm. wide, apex bluntly acute or obtuse, mucronate, cross-section nearly quadrangular; leaves in whorls of 50 on side branchlets. Female cone ovoid-oblong, sessile, red-purplish then violet-brown or gray-brown, 3.5-4.5 cm. long by 2.5 cm. wide; scales thick, rounded to suborbicular, margins entire; bracts exserted beyond the scales, erect, long-acuminate, reddish to black, to 12 mm. long and relatively broad. Seed to 3 mm. long with a wing 6 mm. long.
China: Tibet; Szechuan; Kansu; Shensi, 2500-4200 m..

L. RUSSICA (Endl.) Sab. ex Trautv. Siberian Larch
=L. sibirica Ledeb., =L. sukaczewii Dylis

A pyramidal tree to 40 m. tall, to 1.5 m. in girth, with a straight or slightly twisted trunk, and with short ascending branches. Bark bright brown, fissured into plates. Branchlets light yellowish-gray, pubescent, nearly smooth in the 2nd year. Terminal buds dark grayish-brown, scales fringed, nearly black at the base; side buds grayish, pubescent and blackish near the base. Leaves flexible, non-keeled above, slightly flattened, dark green, with 2 faint bands of stomata below, with faint stomata above also, 2.5-5 cm. long, cross-section flattened, apex pointed; leaves on side branchlets in whorls of 20-35. Male strobili yellowish, 8 mm. long by 5 mm. wide. Female cone ovoid or ovoid-cylindric, 2.4-4.5 cm. long, with 30 scales; scales bluntly ovate, incurved, finely pubescent on the back, with a hidden lobed bract about 1/2 size of the scale. Seed wings not extending to the upper margin of the scales.
U.S.S.R.: Siberia, Altai Mountains, 762-1524 m..

LIBOCEDRUS Endl. (Cupressaceae)

A genus of eight species from Australasia and South America. Bark thin, exfoliating in long strips. Branchlets distichously divided and flattened into fern-like sprays. Buds inconspicuous. Juvenile leaves relatively long and spreading. Adult leaves scale-like, flattened, decussate, facial pairs short-decurrent, small, acute, paler below or with stomata, glands absent or obscure. Monoecious. Male cones oblong with 6-10 decussately arranged peltate sporophylls, with generally 4 pollen sacs on each sporophyll. Female cones erect or pendent, stalkless, often subtended at the base by a few elongated scaly leaves, cone ovoid, ripening in one year, with 4 decussate valvate scales, outer pair of scales smaller and sterile, inner pair fertile with 1-2 seeds with 2 very unequal wings on both sides of the nut.

L. ARFAKENSIS Gibbs. Arfak Libocedar

=Papuacedrus arfakensis (Gibbs) Li

A conical tree 27-35 m. tall. Bark red, scaly. Branchlets articulate, flattened. Juvenile leaves light green, the outer pair larger than and slightly overlapping the facial pair, to 2 cm. long. Adult leaves blunt, broadly obtuse, dark green, 4-5 mm. long, broader towards the apex which is not spreading, with few faint stomatal lines below. Male cone 1.6 cm. long, with 20 scales. Female cone ovoid, 7-8 mm. long by 5 mm. wide, with 4 scales, outer pair ovoid, inner pair of scales elongate-ovate, with small umbos near the base of the scales. Seeds tan, with 2 large uneven wings.

New Guinea: Dutch New Guinea, Arfak Mountains, 2300-2600 m..

L. AUSTRO-CALEDONICA Humboldt Libocedar

A shrub or small conical tree 1-6 m. tall, with an open crown. Bark brown, fibrous, scaly. Branchlets fine, flattened, Selaginella-like, in a V-like pattern. Juvenile leaves linear, acute, 5-6 mm. long by 1 mm. wide, widely spaced. Adult leaves obtusely triangular, 2 mm. long, incurved, imbricate; facial leaves acuminate, 1 mm. long, keeled; marginal leaves flattened, spreading, 4-6 mm. long, bluntly acute, hump-backed. Male cone shortly ovate to oblong, quadrangular, 5-6 mm. long by 2 mm. wide, with 16-24 decussate scales. Female cone 10-12 mm. long, marginal scales ovate-lanceolate and 6-7 mm. long; facial scales spoon-shaped and 4-5 mm. long; with long prominent umbos. Seeds 1-2 per scale, nut ovoid, with 2 unequal wings, the larger wing obtuse, the smaller wing is just at the base of the nut.

S. New Caledonia: Mt. Koghis; Mt. Humboldt; Mt. des Sources, 700-1300 m..

L. BIDWILLII Hook. f. Bidwill Libocedar

A dense pyramidal tree 20-25 m. tall, to 1 m. in girth. Bark light brown, peeling in long strips. Juvenile branchlets flattened and feathery, adult branchlets distinctly 4-sided. Leaves deep green to dull blue-green, acute, appressed, 2.1 mm. long, nearly uniform in size, triangular, paler beneath, apex slightly incurved, resin scented. Male cone cylindrical, 5.5 mm. long, with 7-12 sporophylls, with 4 pollen sacs. Female cone ovoid, 6-8 mm. long, with 4 scales; umbos long pointed and projecting outwards. Seeds 2 fertile per cone.

New Zealand: W. North Island, Thames and N.W. South Island, 300-2000 m..

L. CHEVALIERI Buchholz Chevalier Libocedar

A shrub or small tree 2-5 m. tall, densely branched. Bark dark brown, exfoliating in thin strips. Branchlets fern-like, distichous, tetragonal, diamond-shaped in the cross-section. Juvenile leaves linear-lanceolate, 3-9 mm. long, bluntly acute, spreading. Adult facial leaves 1-1.5 mm. long, triangular, imbricate, acute, apiculate, keeled; marginal leaves free for 2/3 of their length, 2-3 mm. long, flattened, spreading, attenuate at the base, bluntly acute. Male cone cylindrical, 8-10 mm. long, with 16-18 decussate scales; microsporophylls spreading, apiculate, broadly triangular. Female cone subtended at the base by acute leaves, 10-12 mm. long; marginal scales ovate-lanceolate, 7-10 mm. long with a recurved lip; facial scales obovate to spathulate, 4-6 mm. long, with long prominent umbos. Seeds 6 mm. long by 2-3 mm. wide, the larger wing is curved and obtuse, the smaller wing surrounds one side of the nut.

S.E. New Caledonia: W. Mount Humboldt, rare, 1400-1600 m..

L. CHILENSIS Endl. Chilean Libocedar
=Austrocedrus chilensis (D. Don) Florin

A narrowly conical tree 24-30 m. tall. Trunk slightly fluted, shortened, with few branches at the base. Bark dark brown to coppery-gray, exfoliating into curly plates. Branches curving upwards and forming a slightly rounded crown. Young plants glaucous. Branchlets fine, compact, flattened, obscurely pinnate, directed forwards, widely spreading. Leaves dimorphic, in 4-ranks, overlapping, with a prominent raised gland on the facial leaves; facialleaves 0.8 mm. long, minute, obtuse, glandular near the apex, nearly concealed by the lateral leaves which are much larger, boat-shaped, keeled, acute, spreading at the apex, with a silvery broad line below,with a narrow white band above, 1.5-4.5 mm. long, incurved at the apex. Male cone globose to oblong, 1-3 mm. long, with 8-10 broadly ovate decussate scales, each with 3 pollen sacs. Female cone ovate-oblong, 1.2-1.5 cm. long, with 4 scales, 2 fertile upper scales ovate-oblong, light brown, with small umbos near the tips of the scales. Seeds 1-2 per fetile scale, with 2 narrow unequal wings.

S. Chile: Antuco; Valvidia; S. Argentina: Questrihue, 950-2400 m..

L. PAPUANA F. Muell. Papuan Libocedar
=Papuacedrus papuana (F. Muell.) Li, =Papuacedrus torricellensis (Schl.) Li

A tree 16-50 m. tall, with an open crown and horizontally spreading branches. Bark blackish-gray, longitudinally grooved, inner-bark pinkish-brown. Branchlets flattened, with no marked differences between upper and lower surfaces. Foliage dimorphic to homomorphic, tips of branchlets curved. Lateral leaves only partially covering the facial leaves, 2.7-3 mm. long by 1-1.5 mm. wide; facial leaves partially exposed, 1.7 mm. long by 1.5 mm. wide, apex bluntly acute, shiny dark green, with faint stomata below. Male cone with 4 whorls of scales. Female cone to 13 mm. long, conical, glaucous-brown, with 4 scales, scales reflexed when ripe, with inconspicuous umbos in the center of the scales. Seeds elliptic, often oblique, 1.5-2.5 mm. long, with 2 uneven wings; the larger wing broadly oblong, often oblique 4-6 mm. long by 2-3 mm. wide .

Moluccas; New Guinea to Papua, 1300-3600 m..

L. PLUMOSA (D. Don) Sarg. Kawaka Libocedar

A densely conical tree 18-30 m. tall, to 3.6 m. in girth. Bark light brown, loose, in long stringy strips to 12 cm. wide. Branchlets distinctly joint-like, Selaginella-like, flattened, distichous, 2.5-3 mm. in diameter, much compressed, pinnately divided. Foliage dimorphic in 4-ranks. Juvenile leaves very unequal, to 5 mm. long. Adult leaves scale-like; lateral leaves spreading, acute at the apex, 3 mm. long by 1 mm. wide, overlapping and appressed, with a white band below; facial leaves 0.8 mm. long, grooved, ovate, acute, with an obscure gland. Male cone to 5 mm. long, with 8-12 scales. Female cone ovoid, 0.8-1.5 cm. long, with 4 scales, scales with a long curved umbo. Seeds one per fertile scale, generally one per cone, one wing is oblique, the other wing much smaller.
New Zealand: N.W. North Island to Westhaven, S. Island, 800-3800 m..

L. YATEENSIS Guillaumin Yate Libocedar

A shrub or tree 2-12 m. tall, with long horizontal branches. Bark fibrous, exfoliating in thin strips, tan or red-brown; wood very fragrant. Branchlets in a V-like pattern. Juvenile leaves linear, acute, 5-10 mm. long, loosely imbricate, spine-tipped. Adult facial leaves closely imbricate, triangular, apiculate, keeled, 1-1.5 mm. long; marginal leaves flattened, spreading, 4-6 mm. long, pungent, attenuate at the base. Monoecious. Male cone with 14-20 decussate scales, pointed, with 4 pollen sacs, cone cylindrical, 6-10 mm. long; microsporophylls spreading, acuminate. Female cone 9-10 mm. long, with 4 scales; marginal scales lanceolate 6-7 mm. long, subtended by acutely pointed leaves; facial scales oval, 3.5 mm. long, rounded at the apex. Seeds with an acuminate apex on the nut, the larger wing narrowed and somewhat curved, the smaller wing is just at the base of the nut.
S.E. New Caledonia: Riviere Bleue and Ouinne River , 150-250 m..

METASEQUOIA S. Miki (Taxodiaceae)

A monotypic genus from China. A deciduous, usually dioecious tree of conical habit, eventually becoming round-topped. Trunk with a broadened base, often buttressed. Lateral branchlets deciduous. Branchlets opposite, flattened, in a pinnate fern-like spray, bark reddish-brown on the branchlets. Buds ovoid, free from the leaves, non-resinous, later persistent scales at the base of branchlets. Leaves flattened, pectinately arranged, somewhat pointing forwards, obtuse, midrib slightly raised above, green turning pinkish and golden in the autumn, with 2 bands of white stomata below. Male strobili in long racemes or panicles, with 15-20 decussately arranged scales. Female cone subglobose, woody, on a long peduncle, maturing in one year, with 22-24 ovate scales that shrinken somewhat after maturity, umbos inconspicuous. Seeds 5-8 per scale, flattened, rounded, with 2 broad and somewhat uneven wings. Cotyledons 2.

M. GLYPTOSTROBOIDES Hu et Cheng Dawn Redwood

A conical tree 35-50 m. tall, with a butttressed trunk, becoming round-topped with age. Bark reddish-brown, becoming grayish, finely fissured into exfoliating, thin strips. Branches ascending; branchlets smooth, dimorphic; either persistent or deciduous. Older branchlets and terminal branchlets persistent, bark reddish-brown. Seasonal or side branchlets green, deciduous, 7.5 cm. long. Buds non-resinous, usually opposite, ovoid to ellipsoid, 2-5 mm. long, light reddish or yellow-brown, scales ovate and keeled. Leaves decurrent, flattened, greenish above,

yellowish below, with 2 bands of stomata below, 1.5-2 cm. long by 1.5-2 mm. wide, pectinately arranged, obtuse, midrib slightly raised. Male strobili 7-8 mm. long, with 15-20 decussately arranged scales on long spikes. Female cone subglobose, dark red-brown, 1.8-2.5 cm. long by 1.6-2.3 cm. wide, maturing in one year, deciduous, with 22-24 ovate scales which shrinken after maturity, without prominent umbos. Seeds 5-8 per scale, brown, 5 mm. long by 4 mm. wide, with 2 broad and thin uneven wings. Cotyledons 2.

China: E. Szechuan, Zhonglu; S.W. Hupeh, Xiahoe; N.W. Hunan, Longshan, 750-1500 m..

MICROBIOTA Komarov (Cupressaceae)

A monotypic genus from S.E. Siberia. A monoecious or perhaps sometimes dioecious shrub with flattened branchlets curving downwards at the tips. Leaves small, all-alike, scale-like, not differentiated into facial and lateral pairs, light green, turning reddish in the winter, glandular, without prominent stomata, resin scented. Male cones terminal, ovaloid, pale yellow. Female cone globular, non-fleshy, scales separating at maturity, cone with 2-4 scales with a minute spiny umbo. Seeds one per cone, wingless. Cotyledons 2.

M. DECUSSATA Kom. Suchan Microbiota

A small shrub to 1 m. tall, densely branched. Bark gray-brown, scaly. Branchlets flattened. Leaves nearly scale-like, ovate, acute, 2 mm. long by 1 mm. wide, light green, glandular. Female cone globular, 6 mm. long by 3 mm. wide, at apex of short branchlets, purplish, with 2-4 scales with a minute central umbo. Seeds round-ovate, smooth, wingless, dry, apex obliquely rounded.

U.S.S.R.: S.E. Siberia, Sikhote Alin Province, Suchan River Valley, above the timber line.

MICROCACHRYS Hook. f. ex Hook. (Podocarpaceae)

A monotypic genus from W. Tasmania. A monoecious shrub with snake-like, quadrangular branchlets. Buds inconspicuous. Leaves scale-like, small, without prominent stomata, 1.5-3 mm. long, dark green, margins finely pubescent, apex acuminate. Male strobili oblong, with 20 scales. Female cone bright red, ovoid, with 20-88 rounded scales; ovules inverted, partially covered by an epimatium; cone bracts becoming succulent and scarlet at maturity. Seeds minute, wingless.

M. TETRAGONA Hook. Tasmanian Microcachrys

A prostrate shrub, seldom to 1 m. tall. Bark smooth. Branchlets whip-like, quadrangular, curved outwards. Leaves 4-ranked, dark green, decussate, imbricate, 1.5-3 mm. long, margins finely pubescent, apex acuminate. Male cone terminal, oblong, 3 mm. long, with 20 scales. Female cone ovoid or spherical, in whorls of 4 groups each, bright red, fleshy and translucent, 6-8 mm. long, with 20-88 round scales or bracts. Seeds inverted, enclosed by a scarlet aril, minute.

Australia: W. Tasmania, Mount Lapeyrouse, 1173-1346 m..

MICROSTROBUS Gard. et Johns. (Podocarpaceae)

A genus of two species from S.E. Australia and Tasmania. Dioecious shrubs to 2 m. high or less, with dense, spirally arranged, overlapping, often 4-ranked, scale-like leaves, 1.2-2.5 cm. long, Dacrydium-like, apex incurved. Male cone erect, 2-3 mm. long, with 8-15 stamens. Female cone erect or nearly so at maturity, thickened at the base, apex obtuse, without an ovuliferous scale or epimatium. Seeds several per cone, light brown or gray, minute, hard, each seed at the base of an equally sized glume-like scale, wingless.

M. FITZGERALDII (F. Muell.) Gard. et Johns. Australian Pherosphaera
=Pherosphaera fitzgeraldii F. Muell. ex Hook.

A small, semi-prostrate, densely branched shrub seldom to 2 m. tall, with long slender branches. Branchlets to 2 mm. in diameter, densely clothed, semi-pendent. Leaves needle-like, spirally arranged, in 4-5 ranks, loosely imbricate, keeled, olive-green, 2.5 mm. long, with numerous white stomata; apex incurved and free from the branchlet. Male cone terminal, ovoid or subglobose, 2-3 mm. long, with 8-15 stamens. Female cone terminal, with 4-8 scales or bracts, 2.5-3 mm. long, apex obtuse. Seeds about equal in length to its subtending bract.
Australia: New South Wales, Blue Mountains, 600-900 m..

M. NIPHOPHILUS Gard. et Johns. Tasmanian Pherosphaera
=Pherosphaera hookeriana Archer et Hook.

A densely branched shrub 1.5-2 m. tall, with stiff, short branches. Bark purplish-gray, scaly, thinly furrowed. Leaves scale-like, 1.2 mm. long by 1.2 mm. wide, strongly keeled, imbricate, overlapping, in 4-5 ranks, relatively thick, obtuse, green, apex incurved. Male cone ovoid or subglobose, 2-3 mm. long, with 8-15 stamens. Female cone terminal, with 4-8 scales, 2.5 mm. long, apex obtuse, with numerous seeds.
Australia: Tasmania, Mount Field and Lake Saint Clair, 1000-1300 m..

NEOCALLITROPSIS Florin (Cupressaceae)

A monotypic genus from New Caledonia. A shrub with a candelabra-like crown and with Araucaria-like foliage. Buds inconspicuous. Juvenile leaves needle-like, acute, spirally arranged, spreading, non-imbricate, gradually changing into the adult form. Adult leaves scale-like, Araucaria-like, loosely imbricate, in dense rows or nearly 4-ranked, acute, with a prominent midrib. Male cones globular, at tips of branchlets, with 12 pollen sacs. Female cones ovoid, on a short branchlet, with 8 lanceolate scales in 2 whorls of 4; scales slightly overlapping, slightly swollen, with a longitudinal ridge on the back, and with apical reflexed narrow umbos. Seeds 1-4 per cone, ovoid, with 2 narrow even wings.

N. PANCHERI (Carr.) De Laub. Pancher Neocallitropsis
=N. araucarioides (Compton) Florin, =Callitropsis araucarioides Compton

A conical shrub 2-12 m. tall, with a straight trunk to 80 cm. in girth, developing a candelabra-like habit with age. Bark smooth, gray, resinous, furrowed into long exfoliating strips. Branchlets long and somewhat quadrangular. Juvenile leaves needle-like, lanceolate, acute, 8-14 mm. long by 0.8 mm. wide. Transitional leaves 6-15 mm. long by 1.8-2.5 mm. wide. Adult leaves Araucaria-like, midrib prominent, keeled, acute, lanceolate, imbricate, 4-5 mm. long by 2 mm. wide, apex incurved, margins finely denticulate. Male cone at tips of long branchlets, 8-10 mm. long by 6 mm. wide, scales disposed in 8 ranks; microsporophylls peltate, acuminate, with 12 pollen sacs. Female cones on short branchlets, stalkless, 10 mm. long by 8 mm. wide, with 8 lanceolate scales; scales overlapping, narrowly lanceolate, scales in 2 whorls of 4, with a small conical columella, umbos projecting outwards at the apex of the cone. Seed ovoid, 6 mm. long, usually 4 seeds per cone, seed to 2 mm. wide, with 2 narrow even wings to 0.6 mm. wide.
S. New Caledonia: Yate Dam; Plaine des Lacs to Prony, 150-950 m..

PARASITAXUS De Laub. (Podocarpaceae)

A monotypic genus from New Caledonia. A compact, monoecious, parasitic shrub A parasite on the roots of Falcatifolium taxoides. Leaves succulent, reddish, scale-like, loosely imbricate, spirally arranged, overlapping, small, acute. Male cone similar to Cupressus in general appearance, with relatively few, acuminate scales. Female cone produced directly on a fertile branchlet, subtended at the base by a few spreading scaly involucral leaves, cone borne on the end of a non-specialized branchlet, completely covering the seed, without a fleshy basal receptacle, glaucous, globular, bract shorter than the seed and free. Seed terminal, solitary, one per cone, enguifed by a fleshy scale, stalkless, wingless.

P. USTUS (Vieill.) De Laub. Red Parasitaxus
=Dacrydium ustum Vieill., = Podocarpus ustus (Vieill.) Brongn. et Gris.

A small dense shrub 1-1.5 m. tall. Trunk finely clothed with small dark gray scales and numerous lenticels. Leaves scale-like, triangular, copperish, red or purplish, 1 mm. long, keeled, recurved, apex acute and incurved. Male cone on a peduncle 6 mm. long that is scaly, cone oval, 3-3.5 mm. long by 1.5-2 mm. wide; microsporophylls triangular, free at the tips. Female cone on a shorter, leafy peduncle, with 4-6 spreading glaucous bracts, globular, 3-4 mm. wide. Seed globose, to 2.5 mm. wide, purple to glaucous.
New Caledonia: Pouebo: Riviere Bleue; type from Poila, 400-1100 m..

PHYLLOCLADUS L.C. et A. Rich. (Podocarpaceae)

A genus of five species from the Philippines, Indonesia, New Zealand and Tasmania. Monoecious or dioecious shrubs or trees with unique flattened branches (phylloclades) which represent the foliage. Branches often in whorls. Ultimate branchlets flat and leaf-like, opposite, pinnated, or fan-shaped and serrulate or sometimes lobed on the margins. Juvenile foliage spirally arranged, linear, uninerved. Adult foliage represented by small scales on the margins of the phylloclades (branchlets), keeled dorsally, triangular in the cross-section. Male

strobili often clustered, at tips of branchlets, in catkin-like spikes. Pollen grains winged, as most typical Podocarpaceae. Female cones with a receptacle covering the ovule another characteristic typical of the Podocarpaceae, with one to several seeds borne on the margins of the phylloclades, cone swollen, fleshy, globose. Seeds erect, one per fertile bract, half enclosed at the base by a symmetrical aril, seed ovoid, flattened longitudinally, wingless .

P. ALPINUS Hook. f. Mountain Celery Pine

A shrub or small tree 1.5-10 m. tall, with numerous short erect branches. Trunk relatively short, to 40 cm. in girth. Bark smooth, purplish-gray, with few, thin, exfoliating scales. Branchlets numerous, short. Juvenile phylloclades linear, pointed, 1.5 cm. long. Adult phylloclads green or blue-green, 8-18 mm. wide by 0.8-4 cm. long, margins entire or teethed, serrulate or irregularly lobed, short-stalked, alternate, or almost opposite. Male strobili in groups of 2-5, at tips of lateral branchlets, 5-6 mm. long, reddish, peduncles short or absent. Monoecious. Female cone globose, on modified phylloclades, 8 mm. long by 8 mm. wide, with 3-4 ovules, cone crimson-red. Seeds small, black, with a protruding nut, 3 mm. long, with a white cupule and an iregularly lobed margin.
New Zealand: North Island; in Westlands and Southlands of S. Island, 0-1900 m..

P. ASPLENIFOLIUS (Labill.) Hook. f. Tasmanian Celery Pine

A tree 18-20 m. tall, 1.2-1.8 m. in girth, or reduced to a shrub in alpine areas. Bark dark, scaly, 2-3 cm. thick. Branches thick, short, irregularly divided. Phylloclades rhomboid, glaucous, fan-shaped, 2.5-8 cm. long by 1.5-2 cm. wide, not pinnately compound, margins toothed or lobed, apex acute. Male strobili 2-5 per cluster, 3-5 mm. long, sulphur-yellow, peduncle usually absent. Female cone solitary, or 2-4 at the base of a modified phylloclade, pinkish-red, 8 mm. long, with 3-4 ovules. Seeds ovoid, 5 mm. long, greenish-black to black, pointed; aril white; receptacle purplish-red.
Australia: W. Tasmania, moist areas, 500-800 m..

P. GLAUCUS Carr. Blue Celery Pine

A tree 6-15 m. tall, 0.9-1.5 m. in girth. Bark dark brown, fissured. Branches in whorls. Juvenile phylloclades glaucous, 4-6 cm. long by 2-4 cm. wide. Foliage dimorphic. Phylloclades on main stems solitary, fan-shaped, 1.8-5 cm. long by 3 cm. wide, margins coarsely-toothed; phylloclades on branchlets arranged in whorls, pinnate-like, 7.5-4.0 cm. long with 9-17 coarsely-toothed, fan-shaped or diamond-shaped secondary phylloclades, blue-green, glaucous underneath. Dioecious, sometimes monoecious. Male strobili in groups of 10-20, at tips of short branchlets, cylindrical, 1-2.5 cm. long, with a stout peduncle. Female cone globose, in groups of 8-20, on a peduncle, pinkish-red, 1-1.2 cm. long by 6-8 mm. wide. Seeds 10-20 per cone, project beyond the scales, compressed, black, 3-4 mm. long, with a white cupule.
New Zealand: N.W. North Island, Auckland to Mt. Tarawera, 850-1000 m..

P. HYPOPHYLLUS Hook. f. Indonesian Celery Pine
=P. major Pilg.,=P. protractus (Warb.) Pilg..

A shrub or tree 2-30 m. tall, with whorled branches. Bark red-brown to dark brown, scaly, smooth, with large lenticels. Buds globular, enclosed by thin bracts. Phylloclades dark green or yellowish-green, glossy, sometimes glaucous below, elliptic to triangular, 3-10 cm. long by 1.8-5 cm. wide, deeply lobed to almost entire along apical margin, with a petiole 6-12 mm. long; or pinnately compound with 5-10 secondary phylloclades. Male strobili on a peduncle 3-10 mm. long, cylindrical, in groups of 2-3 or sometimes to 15, yellowish turning reddish, 10-15 mm. long by 2-3 mm. wide; microsporophylls oblong or squamiform. Female cone in groups of 2-3, on a short peduncle or a slightly modified phylloclade, 10 mm. long, light green then reddish-brown or dark brown, with 15 scales, 1-3 scales are fertile. Seeds chestnut-brown, 5-8 mm. long, flattened, cupule whitish, receptacle yellowish-brown.
E. Malaysia; E. Indonesia; Philippines; Papua New Guinea, 900-4000 m..

P. TRICHOMANIOIDES D. Don Tanekaha Celery Pine
=P. rhomboidalis L.C. et A. Rich.

A broadly conical tree 12-25 m. tall, 90-270 cm. in girth. Bark greenish-gray turning red-brown, fissured. Branches whorled and spreading. Phylloclades pectinate, 2.5-7.5 cm. long on juvenile plants. Adult phylloclades pinnately-compound, with 10-15 secondary phyllocladioles, light green, 6-25 mm. long by 6-30 mm. wide, fan-shaped, broadly ovate or rounded, margins deeply lobed, serrulate or almost entire. Dioecious. Male strobili 5-10 per cluster, on short peduncles 3-10 mm. long, cone 8-10 mm. long by 2-3 mm. wide; microsporophylls narrow and elongated. Female cones in clusters of 6-8 on the margins of terminal phylloclades, with 2-3 fertile scales. Seeds dark blue to black, compressed, to 3 mm. long, half projected beyond the cupule, short-pointed.
New Zealand: North Island, North Cape; N. South Island, 0-1000 m..

PICEA Dietr. (Pinaceae)

A genus of 34 species from N. America, Mexico, Europe, Asia to Japan. Branches whorled, horizontally spreading, often short. Branchlets covered with numerous raised leaf stalks after leaves shed. Buds ovoid, distinct from the leaves, sometimes resinous. Leaves usually 4-angled or quadrangular or sometimes flattened, with numerous white stomata arranged in rows on all four sides, or compressed and stomatiferous only on the upper or central side, angled or square in the cross-section, spirally arranged, apex spine-tipped or bluntly acute, with 1-2 resin ducts. Male strobili yellow or reddish, with numerous spirally arranged anthers, erect or pendent, axillary, on 2 year old branchlets. Female cones pendent, maturing in one year, opening upon maturity, with persistent flattened scales, with hidden minute ovate bracts, cones persistent on the trees for several years. Seeds 2 per scale, with one thin obovate or oblong wing projecting backwards. Cotyledons 4-15.

P. ABIES (L.) Karst. Norway Spruce

A narrowly conical tree 50-60 m. tall, 0.6-2 m. in girth, with spreading branches. Bark red-brown turning gray, smooth, with few irregular scales. Branches long, slender, reflexed and pendent. Branchlets orange-brown to reddish-brown, mostly smooth. Buds ovoid, 7 mm. long by 4.5 mm. wide, short pointed, pubescent at the base, reddish or light brown, non-resinous, scales rounded. Leaves spirally arranged, 1.5-2.4 cm. long, dark shiny green on both sides with faint whitish stomata on both sides, with a short blunt point, cross-section diamond-shaped to quadrangular, short-stalked. Male strobili bright purple. Female cone oblong-cylindric, 10-17.5 cm. long by 4.5 cm. wide, light brown to yellowish-brown; scales rhombic-ovate to ovate-acuminate, wavy, irregularly denticulate, notched at the apex; bract minute, long, narrow, purplish, apex pointed. Seeds with an ovoid nut to 5 mm. long and a rounded wing that is relatively long.

C. Europe; Scandinavia; W. U.S.S.R, to 2300 m..

P. ASPERATA Mast. Dragon Spruce
=P. aurantiaca Mast.,=P. retroflexa Mast..

A tree to 30 m. tall or more, with few spreading branches. Bark grayish-brown, peeling in thin flakes. Branchlets pale yellowish-gray, pubescent at first, with prominent spreading or recurved petioles. Buds conical-ovoid, yellowish-brown, slightly resinous . Leaves spirally arranged, quadrangular, often curved, 1-1.5 cm. long, acute or acutish, variably dark green, beveled at the apex, with an elongated spine, stomata variable but usually faint on all surfaces. Female cone oblong-cylindric, 7.5-10 cm. long by 2.5-3.5 cm. wide, fawn brown turning chestnut-brown or yellowish-brown; scales rounded , entire or slightly notched at the apex. Seeds with long wings.

China: Kansu; Szechuan; Shensi, 2400-3900 mm..

P. BICOLOR (Maxim.) Mayr. Alcock Spruce
=P. alcoquiana Parl.

A broadly conical tree 25-40 m. tall, with stiff spreading or ascending branches. Bark gray-brown to pinkish-brown, fissured into thin rounded plates. Branchlets slender, short, shiny, bright yellowish or whitish, smooth or slightly pubescent. Buds conical to spherical, 4 mm. long, slightly resinous, brown, scales bluntly acute. Leaves spirally arranged, pointing forwards, dark shiny blue-green above, 1.5-2 cm. long by 1.5 mm. wide, stomata in 2-4 rows on 2 faces in bluish-white bands below, quadrangular, somewhat curved, sharply acuminate, apex shortly pointed. Female cones ovoid-cylindric to oblong-cylindric, 6.5 cm. long by 3 cm. wide, purplish brown at first; scales obovate to rounded, slightly wavy, finely denticulate, somewhat reflexed; bract elliptic, minute, denticulate at the apex, purplish. Seeds blackish, wing purplish and to 9 mm. long.

Japan: C. Honshu, subalpine areas, 700-2180 m..

P. BRACHYTYLA (Franch.) Pritz. Northern Sargent Spruce
=P. sargentiana Rehd. et Wils.

A tree 10-30 m. tall, 1-3 m. in girth, with a rounded crown and with sparse pendent branches. Bark gray, scaly, becoming dark brown and deeply fissured. Branchlets slender, short, with prominent pulvini, smooth or with short hairs, somewhat glandular, whitish then bright purplish or orange-yellow. Buds 4 mm. long by 3 mm. wide, ovoid, pointed, light chestnut-brown, non-resinous; scales purplish, slightly pointed, bluntly acute. Leaves spirally arranged, pointing forwards, somewhat pointed with a mucronate spine, shiny bright green above, bright white below with a prominent vein; stomata absent above, in 8 ranks below, leaves somewhat flattened, 1-3.5 cm. long by 1 mm. wide. Female cone oblong-cylindric, gray-purplish-brown, 7-9 cm. long by 4-5 cm. wide; scales obovate, acuminate, notched at the apex, slightly denticulate; bract minute, rounded, obtuse at the base, purplish or gray. Seeds oval, nut 2 mm. long by 1 mm. wide; wing to 8 mm. long, purplish.
China: Kansu; W. Szechuan; Shensi; W. Hupeh, 1500-3500 m..

P. BRACHYTYLA var. COMPLANATA (Mast.) Cheng ex Hu Southern Sargent Spruce

A pyramidal tree 30-40 m. tall. Bark pale gray, smooth, exfoliating in thin irregular plates.Branches short, horizontal, pendent. Branchlets slender, orange-brown to yellowish-gray-white then somewhat purplish, with swollen pulvini and very short petioles, smooth or pubescent. Buds spherical-conical, 5 mm. long, reddish to dark brown, scales rounded. Leaves spirally arranged, 1-2.5 cm. long, somewhat flattened, green, keeled above, with broad white stomatal bands below, pungent, sharply acute, apex acuminate, with 2-4 resin canals. Female cone oblong-cylindric, brown or purplish, 13 cm. long by 3 cm. wide; scales truncate or rounded, notched at the apex; bracts minute, long-acuminate, shortly pointed. Seed with a long purplish wing.
China: Tibet; Yunnan; Szechuan, 2000-3800 m..

P. BREWERIANA S. Wats. Brewer Spruce

A broadly conical tree 21-40 m. tall, 0.5-0.9 m. in girth, with long slender horizontal branches and with long rope-like pendent branchlets 2-2.5 m. long. Trunk enlarged and buttressed near the base, branched to the ground. Bark purple-gray to reddish-brown, thin, scale-like. Branchlets long, slender, finely pubescent, purplish tinted green to reddish-brown. Buds bluntly conical, chestnut-brown to purplish, slightly resinous, 7 mm. long by 3 mm. wide, scales pointed and papery. Leaves flexible, spirally arranged, straight or slightly falcate, apex obtuse, dark bluish-green above, silvery-white below with 4-6 stomatal lines, stomata absent above, cross-section diamond-shaped and nearly flattened. Male strobili purplish. Female cone straight, ovoid-conical, shiny purplish to dull orange-brown, 7-10 cm. long by 3.5 cm. wide; scales obovate to obovoid, rounded, margins entire, non-toothed; bracts minute, rectangular, acute at the apex, purplish, borders finely denticulate. Seed with a nut to 3 mm. long, wing to 13 mm. long.
U.S.A.: S.W. Oregon; N.W. California: Siskiyou Mts., 1006-2286 m..

P. CHIHUAHUANA Mart. Chihuahuan Spruce

A tree to 30 m. tall. Bark gray or whitish, scaly. Buds ovoid, 7-8 mm. long, scales acute with laciniate margins. Leaves spirally arranged, bright green, 1.5-2.1 cm. long by 1.7 mm. wide, quadrangular, with 4-5 lines of stomata on all surfaces, rigid, slightly falcate, apex pungent. Female cone on a peduncle 1 cm. long, cylindrical or cylindrical-oblong, bright chestnut-brown, 10-14 cm. long by 4 cm. wide; scales obovate, convex at the apex, margins entire, rounded; bracts minute, oval, chestnut-brown, laciniated at the borders. Seeds dark fawn-brown, nut elliptic and attenuate at the base with a long yellowish wing.

Mexico: Chihuahua to Durango: W. Sierra Madre, 2300-3200 m..

P. CRASSIFOLIA Kom. Tsinghai Spruce

A tree to 23 m. tall, to 30-60 cm. in girth. Branchlets pinkish-orange with prominent petioles that are glaucous, pubescent. Buds ovoid, 3 mm. long, orange-brown, non-resinous, scales round, basal scales glaucous. Leaves spirally arranged, very thick, bluntly acute, 1.2-3.5 cm. long by 2-3 mm. wide, curved, quadrangular, with numerous stomata, stomata more conspicuous below, apex obtuse with a short blunt spine. Female cone 7-11 cm. long by 2-3.5 cm. wide, purplish then yellow-brown or orangish; scales round, slightly wavy, broadly obovate. Seeds with long wings.

Much confused with P. asperata, most herbarium specimens from S. Kansu labeled as P. asperata are probably this species.

China: Tsinghai, S. Tsi-Lien-Shan; Kansu, Holan-Shan; Inner Mongolia, Ningsia Hui, 2600-3100 m.; possibly in S.W. Tachienlu, Szechuan and Jupar Valley, E. Tibet at 3658 m..

P. ENGELMANNII (Parry) Engelm. Engelmann Spruce

A narrowly conical tree 24-30 m. tall, 0.5-0.8 m. in girth, with dense short branches spreading in close whorls or rows. Bark grayish or purplish-brown, with loose scales. Buds non-resinous, spherical to conical, acute, shiny red-brown to purplish-yellow-brown, 5 mm. long by 3.5 mm. wide, scales rounded and recurved at the apex. Branchlets pubescent, glandular, bright to pale yellowish-brown. Leaves spirally arranged, short-stalked, straight or slightly falcate, pointing forwards, dark glaucous-green, 1.5-2.5 cm. long, whitish stomata on both faces but broader below, resin canals absent, cross-section diamond-shaped to 4-angled, skunk scented. Female cone ovoid-cylindric to oblong-cylindric, slightly curved, shiny light brown to purplish brown, 2.5-7.5 cm. long by 2-2.5 cm. wide; scales oblong-rhombic, elongated, thin, irregularly toothed; bracts minute, diamond-shaped, blunt, grayish, obtuse at the base. Seeds dark gray to blackish, with a long purplish wing .

S.W. Canada; U.S.A.: Washington to W. Montana south to E. New Mexico, 619-3659 m..

P. ENGLEMANNII var. MEXICANA (Mart.) Silba Mexican Spruce

A conical tree 25-28 m. tall, 50-60 cm. in girth. Bark thin, scaly, whitish. Branchlets light yellowish-brown, densely and minutely pubescent. Leaves quadrangular, spreading forwards, 1.9-3.9 cm. long by 1 mm. wide, curved, sharp pointed, without resin canals. Male strobili subterminal in groups of 3, ovoid, 1.5 cm. long by 1 cm. wide, with orbicular scales. Female cone oval-oblong,

yellowish, 5-6.4 cm. long; scales sub-rhombic, thin, outer margins finely toothed; bract elliptic-acuminate, about 1/2 length of the scale. Seeds obovate, nut 3 mm. long, wing 7-7.5 mm. long.
Mexico: Coahuila; Saltillo and Nuevo Leon, to 2700 m..

P. FARRERI Page et Rushf. Burman Spruce

A tree to 30 m. tall, with a broadly conical crown. Bark grayish, scaly. Branches spreading, slender. Branchlets pendulous, olive-brown to orange-brown, sparsely pubescent. Buds ovoid, chestnut-brown, with white resin on the lower scales. Leaves sparse, spirally arranged, pointing forwards, blue-green, bright niveous-white below, 1.5-2.5 cm. long, dorsal-ventral side flattened, acute, apex somewhat pungent. Male strobili cylindric-conic, 2-2.5 cm. long by 0.3 cm. wide. Female cone oblong-cylindric, dark brown, 7-9.5 cm. long by 3-4 cm. wide; scales irregularly rounded, not notched at the apex. Seeds acute, nut dark brown and 3-4 mm. long, wings to 12 mm. long and light brown. Cotyledons 8, 13-16 mm. long, acute, blue-green.
N. Burma: Feng-Shui Ling Valley, 2438-2591 m., possibly also in S. Yunnan, China and E. Assam, India.

P. GEMMATA Rehd. et Wils. ex Sarg. Tapao-Shan Spruce

A broadly conical tree 20-40 m. tall, 0.5-1 m. in girth. Bark gray or gray-brown, fissured in thin papery strips. Branches horizontal, spreading. Branchlets pubescent, gray-brown. Buds conical, yellowish-brown, 6 mm. long, resinous, scales ovate-acuminate; leaves surrounding buds are pubescent. Leaves linear, quadrangular, erect and spreading, slightly glaucous, pungent, 8-15 mm. long by 1-2 mm. wide, with 4-6 stomatal lines. Female cones oblong-cylindric, 8-12 cm. long by 3.5 cm. wide, yellowish-brown; scales broad and rounded; bract with an elongated acute apex. Seeds oblong-obovate, nut dark brown and 2 mm. long, wing pale brown and 10-15 mm. long. Resembles P. polita in foliage.
China: W. Szechuan, Tapao-Shan, 2200-3600 m..

P. GLAUCA (Moench.) Voss. White Spruce
=P. glauca var. porsildii Raup., =P. canadensis (Mill.) Britt.

A conical tree 12-30 m. tall, 0.3-0.6 m. in girth, with rows of horizontal branches. Bark gray or brown, smooth or scaly, inner-bark whitish. Branchlets slender, short, smooth, gray-red to orange-brown, somewhat drooping. Buds ovoid-obtuse,non-resinous, 5 mm. long; scales bifid at the apex, slightly reflexed. Leaves spirally arranged, 0.8-1.8 cm. long, shiny bluish-green, with whitish stomata on both faces, sharp pointed, spreading mainly on upper side of the branchlet, acute, slightly curved, cross-section diamond-shaped to 4-angled, skunk scented. Female cone oblong-cylindric, 3-6 cm. long by 2 cm. wide, shiny tan to pale light brown; scales broadly rounded, finely denticulate, with a somewhat thickened curved lip; bracts spathulate-elliptic. Seeds brown, nut to 2 mm. long, wing to 8 mm. long.
Canada; N. United States: Minnesota to Maine, 610-1700 m..

P. GLAUCA var. ALBERTIANA (S.Brown) Sarg. Alberta Spruce

A narrowly pyramidal tree to 50 m. tall. Bark purple-gray, very flaky. Branchlets smooth, yellowish-brown at first, sometimes glandular, with more prominent wide-spreading leaf stalks, pulvini bright orange. Buds with entire scales, slightly resinous, 4 mm. long, bloomed white. Leaves spirally arranged, more crowded near the apex, slightly longer, less glaucous below, denser, more forward pointing, to 2 cm. long, dark green above, incurved, cross-section diamond-shaped to 4-angled, apex with a round-tipped spine. Female cones smaller, ovate, orange-brown, 2.5-3.5 cm. long by 2.8 cm. wide; with stiffer rounded, entire scales; bracts shorter, rectangular, narrowed at the apex or acute. Seeds gray-red, nut 2.5 mm. long, wings slightly fringed.
S.W. Canada: U.S.A.: Montana to Wyoming, Rocky Mts..

P. GLEHNII (Fr. Schmidt.) Mast. Sakhalin Spruce

A narrow pyramidal tree to 40 m. tall, 3-4.5 m. in girth, with slender, short, spreading branches. Bark purplish-brown or chocolate, fissured into thin flakes. Branchlets pubescent, reddish-brown, non-glandular. Buds ovoid-conical, elongated, chestnut-brown to purplish-brown, 5 mm. long, slightly resinous; scales acute and elongated. Leaves spirally arranged, ascending forwards, thick, somewhat bicolored, shiny deep green above, 6-17 mm. long; stomata slightly visible on both faces, in one row above, in 2 rows below; quadrangular, obtuse or mucronate. Female cone ovoid-cylindric to oblong-cylindric, shiny brown, somewhat violet colored at maturity, 4.5-7 cm. long by 2.5 cm. wide; scales suborbicular to obovate, notched at the apex; bract oval, reddish-purple, with a broad base. Seeds with a nut 3 mm. long, with broad rounded wings that are reddish-purple.
U.S.S.R.: S. Sakhalin: Japan: N. Honshu; E. Hokkaido, 0-1600 m..

P. JEZOENSIS (Sieb. et Zucc.) Carr. Yezo Spruce
=P. ajanensis Fisch. et Trautv., =P. komarovii V. Vassil.

A narrowly pyramidal tree 30-50 m. tall, 5-6 m. in girth, with slender branches. Bark dark gray, scaly, becoming furrowed with age. Branchlets yellowish-gray to yellowish-brown, shiny, smooth, thick and long, with recurved petioles. Buds conical, elongated, shiny purplish or yellowish-brown, slightly resinous, 10 mm. long by 3 mm. wide, scales loose at the apex. Leaves spirally arranged, dense, slightly falcate, mucronate, non-pungent, shiny dark green above, silvery-white below, slightly keeled on both sides, stomata absent above, 1.5-2 cm. long by 2 mm. wide, cross-section diamond-shaped. Male strobili carmine. Female cones oblong-cylindric, shiny, purplish to light brown, 4.5-8 cm. long by 2 cm. wide; scales oval-oblong, erose; bract with a long apex, acute, denticulate, purplish. Seeds elongated, nut 2.5 mm. long, wing to 7 mm. long, purplish.
N.E. China; Korea; U.S.S.R.: Siberia; Japan: Hokkaido, 1000-1300 m..

P. JEZOENSIS var. HONDOENSIS (Mayr.) Rehd. Hondo Spruce

A tree 20-30 m. tall, 50-60 cm. in girth. Bark purplish-gray, shallowly fissured. Branchlets light reddish-brown, pulvini much swollen, short, non-pubescent. Buds spherical, slightly mucronate, dark purplish-red to orange-brown, scales pointed at the apex, 3.5 mm. long. Leaves shorter, acutish to obtuse, spirally arranged bicolored, dark shiny green above, brilliantly white below, 1.4-1.7 cm. long, stomata absent above, cross-section diamond-

shaped, apex with a minute spine. Female cone ovoid-cylindric, bright purplish, 5-7 cm. long by 2 cm. wide; scales diamond-shaped, wrinkly, notched at the apex, denticulate at the margins; bract rectangular, purplish, denticulate, acute. Seed with a nut 3 mm. long, with a purplish wing to 6 mm. long.
Japan: C. Honshu, subalpine areas, 1100-2650 m..

P. KORAIENSIS Nakai — Korean Spruce

A shrub or small tree 16-25 m. tall. Bark rusty-gray. Branchlets spreading, hanging, olive-brown, sparsely glabrous. Buds ovate, slightly resinous, 4-12 mm. long by 3 mm. wide, chestnut-brown. Leaves erect, pungent, 8-12 mm. long by 2.5-3 mm. wide, curving-ascending, compressed, quadrangular, apex acute. Female cones 4-8 cm. long by 2-2.5 cm. wide, olive-brown; scales round, imbricate; bracts obovate, elongated. Seeds with a nut 4 mm. long, wing 8-13 mm. long.
N.E. China; N. Korea; U.S.S.R.: Ussuri, 400-1800 m..

P. KORAIENSIS var. INTERCEDENS (Nakai) Lee — Tonai Spruce
=P. tonaiensis Nakai

A shrub or small tree 7-10 m. tall. Bark gray, in long strips. Branches erect, ascending, compressed, quadrangular, 2-2.5 mm. in diameter. Branchlets orange or yellowish, densely pubescent. Buds ovate, whitish, slightly resinous, 5-8 mm. long. Leaves 10-13 mm. long by 1.2-2 mm. wide, bright green, glaucous underneath, apex acuminate. Male strobili to 15 mm. long; sporophylls ovate, margins denticulate. Female cone 4.7-8.6 cm. long by 2-2.6 cm. wide; scales yellow-brown, margins sulphur yellow, apex obtuse or somewhat emarginate. Seed with a nut 4 mm. long, dark brown, with an oblique wing.
N. Korea: Kanhoku Province, Mozan District, near Tonai; Kannan Province, Hozan District, Yotokurei, to 1400 m..

P. KOYAMAI Shirasawa — Koyama Spruce

A narrowly pyramidal tree 10-20 m. tall, with ascending long-tipped branches. Bark gray-brown to purplish-brown, slightly fissured, exfoliating in oblong scales or flakes.Branchlets orange to reddish-brown, glandular, grooved, smooth. Buds resinous, ovoid-conical, 4 mm. long, brown to reddish, rounded at the apex. Leaves somewhat falcate, spirally arranged, shiny green, somewhat glaucous, 1-1.7 cm. long, stomata more numerous on the upper surface, shortly mucronate, sharply pointed, cross-section diamond-shaped to quadrangular. Female cone ovoid-cylindrical to oblong-cylindric, 4-10 cm. long by 3.5 cm. wide, pale brown to reddish-brown; scales broadly rounded, somewhat hump-backed; bracts rectangular, purplish-brown, margins denticulate. Seeds with a blackish nut 3 mm. long, with an oblong brown wing.
Japan: C. Honshu, Mt. Yatsuga-dake, 1500-2000 m..

P. LIKIANGENSIS (Franch.) Pritz. — Southern Likiang Spruce
=P. likiangensis var. linzhiensis Cheng et Fu, =P. yunnanensis Hort. ex Wils.

A broadly conical tree 15-50 m. tall, 2.6-3 m. in girth, with ascending branches. Bark gray, divided into thick plates. Branchlets gray-yellowish tinted green, somewhat pubescent. Buds ovoid-conical, bright purplish, slightly resinous, 5 mm. long, scales acute. Leaves loosely spirally arranged, straight or slightly falcate, with a long peduncle scar, dark shiny green above, whitish below, stomata more numerous below, 1-2 cm. long, a distinctly bicolored leaf, apex with a long

pointed spine, cross-section diamond-shaped. Female cone ovoid-cylindric, bright purplish then light brown, 5-7.5 cm. long by 5 cm. wide; scales ovate, wavy, apex denticulate and notched; bract oval, blunt, purplish. Seed purplish-brown, nut to 3 mm. long, wing to 8 mm. long.
China: Tibet; N.W. Yunnan; S.W. Szechuan, 2500-3900 m..

P. LIKIANGENSIS var. BALFOURIANA (Rehd. et Wils.) Hill. ex Slav. Balfour Spruce
=P. likiangensis var. hirtella (Rehd. et Wils.) Cheng ex Chen

A narrowly conical tree 15-40 m. tall, 0.3-1 m. in girth, with short horizontal branches. Bark gray to brown, scaly, becoming deeply furrowed into thick irregular plates.Branchlets slender, grooved, pubescent, yellowish-gray tinted green, with spreading pubescent petioles. Buds reddish-brown, slightly resinous, 3.5 mm. long, shiny, scales bluntly acute. Leaves spirally arranged, usually obtuse, dark gray-green above, dull gray-green below, 0.8-1.5 cm. long; with few stomata above in 1-4 rows, in 2 white bands below; cross-section diamond-shaped to quadrangular. Female cones purplish at first turning light brown,ovoid-cylindric, 5-9 cm. long by 2.5 cm. wide; cone scales triangular-ovate, acuminate, notched at the apex, denticulate; bract acute, purplish. Seed with a brown nut and a yellowish wing.
China: S. Tsinghai; N.W. Yunnan, Likiang Snow Range; W. Szechuan, Kangting, 3600-4100 m..

P. LIKIANGENSIS var. MONTIGENA (Mast.) Cheng ex Chen Northern Likiang Spruce

A narrowly conical tree to 30 m. tall, with horizontal branches which ascend or are upturned at the ends. Bark in irregular scales, orange-brown to purple-brown. Branchlets pubescent, yellowish-brown. Buds conical, to 8 mm. long, slightly resinous, lower scales acuminate and keeled. Leaves spirally arranged, bluntly acute to obtuse, 8-15 mm. long, deep bluish-green, linear, somewhat pungent, obtusely keeled below; with 2 white bands of stomata below in five rows, stomata inconspicuous above in 2-3 rows; cross-section diamond-shaped to quadrangular. Female cones ovoid-cylindric, cinnamon-brown, 7-10 cm. long by 2.5 cm. wide; cone scales rhombic-ovate, slightly denticulate, apex notched.
China: N.W. Yunnan, Likiang; W. Szechuan, Kangting, 3600-4000 m..

P. MARIANA (Mill.) B.S.P. Black Spruce

A conical tree 6-18 m. tall, 0.1-0.3 m. in girth, with an open, irregular crown and with short horizontal or slightly drooping branches. Bark gray or blackish, scaly, inner-bark yellowish-brown. Branchlets red-brown, slender, pubescent. Buds ovoid or conical, non-resinous, 3.5 mm. long, basal scales with a long point. Leaves spirally arranged, obtuse, 7-18 mm. long, ashy-blue-green tinted white, with whitish stomata more numerous below, short-stalked, cross-section diamond-shaped to 4-angled. Female cone often clustered at tops of trees, broadly ovoid or rounded, red-brown to dull gray, 2-4 cm. long by 1.5 cm. wide; scales rounded, finely denticulate, with an incurved yellowish outer lip; bracts rectangular, dark purplish. Seeds brown, nut 2.5 mm. long, wing to 6 mm. long.
Canada; U.S.A.: Alaska; Minnesota to Maine, 600-1524 m..

P. MAXIMOWICZII Regel ex Mast. Maximowicz Spruce

A compact conical tree 10-42 m. tall, to 1.5 m. in girth, with horizontal branches. Bark orange-brown, flaky, becoming gray and fissured. Branchlets smooth, yellowish or shiny reddish-brown. Buds ovate to globose, 2-2.5 mm. long, red-brown to whitish-brown, resinous. Leaves spirally arranged, pointing slightly forwards, pungent, shiny dark green, 8-11 mm. long, stomata on both surfaces, apex acute, cross-section diamond-shaped to quadrangular. Female cone oblong-cylindric, green then gray-brown, 3.5-4.5 cm. long; scales rounded, entire, greenish, relatively small, margins slightly wavy; bracts purplish. Seeds whitish, spotted brown; wings small, 8-10 mm. long.
Japan: Mount Fujiyama.

P. MAXIMOWICZII var. SENANENSIS Hayashi Senan Spruce

A bush or small tree 15-20 m. tall, 20-40 cm. in girth, with a single trunk and with horizontally spreading branches.Bark grayish-brown, slightly furrowed. Buds long pointed, acute, 4-6 mm. long. Leaves longer, 12-18 mm. long.Female cones larger with fewer scales, oblong-cylindric to ovate, 4-7.5 cm. long; scales fewer, bigger and harder; bracts acute. Seeds with a nut 3-5 mm. long, wing 10-12 mm. long.
Japan: Honshu, Mts. Fuji San and Yatsuga-dake, 1100-2000 m..

P. MEYERI Rehd. et Wils. Meyer Spruce

A tree to 30 m. tall, to 60 cm. in girth. Branches short. Branchlets yellowish or fawn-brown, grooved, pubescent then smooth. Buds ovoid-conical, 4 mm. long, resinous, shiny light brown to red-brown; scales bluntly acute, shortly pubescent. Leaves spirally arranged, glaucous to bluish-green, quadrangular, 8-20 mm. long, stomata more numerous below, rigid, slightly falcate, apex bluntly acute. Female cone oblong-cylindric, shiny brown to reddish-brown, 6-7.5 cm. long by 3.5 cm. wide; scales obovate, rounded, margins entire, base blackish; bract diamond-shaped to awl-shaped, blackish at the base. Seed with a gray nut 2.5 mm. long, wing 10-11 mm. long.
China: Shansi; Hopei; Inner Mongolia, 1600-2700 m..

P. MORRISONICOLA Hayata Formosan Spruce

A conical tree 36-50 m. tall, to 1.5 m. in girth, with an open crown. Bark brown to gray, exfoliating in rounded platy scales, with prominent pale lenticels. Branchlets slender, smooth, whitish to dull yellow to red-brown, with prominent leaf stalks. Buds ovoid, resinous, 3 mm. long, reddish to chestnut-brown, scales rounded. Leaves spirally arranged, quadrangular, 1-2 cm. long, dark shiny green, with more stomata below, fine, slender, acuminate, long pointed, cross-section diamond-shaped. Female cone ovoid-oblong, 5.5 cm. long by 3 cm. wide, reddish then brown; scales orbicular-ovate, rounded, rarely notched at the apex; bract rectangular, purplish, apex bifid. Seed with a wing to 9 mm. long.
Taiwan: Mount Morrison, 1900-2800 m..

P. NEOVEITCHII Mast. Hupeh Spruce

A tree 8-15 m. tall, to 50 cm. in girth, of pyramidal habit, with short ascending branches. Bark yellowish-gray-brown, exfoliating, with small flakes. Branchlets yellow-brown, grooved, smooth or sparsely pubescent, with short petioles, slender. Buds oblong-ovoid, slightly pubescent, 5 mm. long, non-resinous, chestnut-brown, basal scales glaucous. Leaves spirally arranged, pectinate below, dark green, 15-20 mm. long, keeled, pungent, curved, quadrangular, with stomata on most surfaces, apex acute and pointed. Female cone oblong-cylindric, fawn-brown to yellowish-brown, 7-13 cm. long; scales obovate, rounded, spoon-shaped, margins wavy, apex entire. Seeds with a nut 5 mm. long and with a rounded wing to 15 mm. long.

China: S. Kansu; S. Shensi; W. Hupeh, 1300-2000 m..

P. OBOVATA Ledeb. Siberian Spruce
=P. obovata var. alpestris (Bruegg.) Henry ex Elwes

A broadly conical tree 30-50 m. tall, to 60 cm. in girth, with ascending branches. Bark purplish-gray, with white spots, flaky, inner-bark red-brown. Branchlets short and glandular, shiny, pale brown to purplish, somewhat pendent, scarcely pubescent. Buds ovoid-conical, 4 mm. long, orange-brown; scales rounded, acuminate, keeled, ciliate at the base, free at the tips. Leaves spirally arranged, 1-2 cm. long, dark shiny green, mucronate, stomata on 2 faces in 4-5 ranks, leaves sometimes bluish-green above, cross-section diamond-shaped to quadrangular, resin scented. Female cone ovoid-cylindric, light brown to reddish-brown, 5-8 cm. long by 3 cm. wide; scales broadly rounded, obovate, somewhat denticulate; bract elongated and narrow, acute, purplish. Seed with a nut 2 mm. long, blackish-brown, with a long oval wing.

N. Europe; U.S.S.R. to N.E. China, Shansi, 1200-1800 m..

P. OBOVATA var. FENNICA (Reg.) Henry ex Elwes Scandinavian Spruce

A pyramidal tree to 15 m. tall. Branchlets strongly pubescent. Leaves short, dark green, 9-14 mm. long by 1-1.5 mm. wide, straight, rhombic, apex blunt. Female cone oval, 7-10 cm. long; scales rhombic, rounded, finely denticulate. Seeds obovate, with a blunt wing.

S. Sweden; S. Norway to near Leningrad, U.S.S.R..

P. OMORIKA (Pancic) Purk. Serbian Spruce

A narrowly conical tree 30-40 m. tall, with short ascending branches. Bark orange-brown, divided into flaky papery plates.Branchlets somewhat pendent, brown to reddish-purple, shiny, with long hairs. Bud ovoid-conical, pointed, purplish to red-brown, slightly resinous; scales acute, pubescent at the base. Leaves spirally arranged, flattened dorsiventrally,mucronate, non-pungent, dark shiny green above, whitish below, stomata in 8 ranks below, 9-23 mm. long, cross-section diamond-shaped. Female cone conical-cylindric, shiny purplish, 3-6.5 cm. long by 2.5 cm. wide; scales rounded, finely denticulate, red-brown at the base, apex bright brown; bract diamond-shaped, truncate at the apex. Seeds with a blackish nut to 3 mm. long, wings purplish to 10 mm. long.

Yugoslavia, Drina Valley, 800-1600 m..

P. ORIENTALIS (L.) Link — Oriental Spruce

A narrow conical tree 40-55 m. tall, 1.5-2.3 m. in girth, branched from the base. Bark pinkish-brown to pink-gray, scaly. Branches ascending, spreading, irregularly whorled, erect or somewhat pendent, dense. Branchlets slender, short, pale brown to yellowish-red-brown, pubescent. Buds conic-acute, chestnut-brown to reddish-brown, non-resinous; scales elongated-acute, scales at the base keeled, acuminate. Leaves spirally arranged, thick, quadrangular, shiny dark green, overlapping, pointing forwards, concealing the branchlet, obtuse, 4-14 mm. long, with 1-4 lines of stomata on each surface, stomata more numerous below, apex shiny and rounded. Male strobili carmine. Female cone ovate-cylindric, tapering, gray-purple turning brown, resinous, 5-9 cm. long by 2-3 cm. wide; scales orbicular to obovate, margins rounded and entire; bract elliptic. Seeds with a blackish nut 5 mm. long, wing to 12.5 mm. long.

Turkey: N.E. Anatolia to Caucasus, U.S.S.R., 0-2400 m..

P. POLITA (Sieb. et Zucc.) Carr. — Tigertail Spruce
=P. torano E. Koehne

A broadly conical tree 20-40 m. tall, 1-3 m. in girth. Bark pale gray to purplish-brown, slightly furrowed into exfoliating scaly plates. Branches numerous, horizontal, sometimes somewhat pendent. Branchlets stout, smooth, thick, shiny yellowish-brown, grooved. Buds ovoid-conical, 10 mm. long, reddish-brown to nearly blackish-brown, resinous, sharply pointed; scales obtuse, closely pressed. Leaves spirally arranged, pungent, shiny dark green, rigid, slightly falcate, 1.5-2.6 cm. long, somewhat flattened, with faint stomata on all surfaces, prominently spine-tipped, cross-section diamond-shaped. Male strobili yellowish. Female cone oblong-cylindric, resinous, red-brown then yellowish-brown, glossy, to 9.5 cm. long by 2.5-3 cm. wide; scales obovate to rounded, finely denticulate; bracts minute, obtuse, denticulate, cuneiform at the base. Seeds with a gray nut to 3 mm. long or more, with long wings.

Japan: Honshu; Shikoku and Kyushu, 400-1850 m..

P. PUNGENS Engelm. — Colorado Spruce

A broadly conical tree 21-30 m. tall, 0.5-0.9 m. in girth, with stout horizontal branches in remote whorls or rows. Bark gray or brown, furrowed and scale-like. Branchlets bright yellow-brown to purplish-red, stout, smooth, slightly grooved. Buds conical, elongated, yellow-brown, acute, non-resinous, 8 mm. long; scales bluntly acute, often reflexed. Leaves spirally arranged, dense, slightly falcate, dull blue-green or bluish, 1.5-3 cm. long, incurved, pungent, apex spiny, stomata in 4-5 ranks on 2 faces, cross-section diamond-shaped. Female cones oblong-cylindric, pale yellowish to shiny light brown, 7-10 cm. long by 2.5-3 cm. wide; scales flexible, rhomboidal, narrowed and notched at the apex, finely denticulate, wavy; bract triangular, prominently denticulate. Seed with a grayish nut 3 mm. long and a yellowish wing to 6 mm. long.

U.S.A.: S. Idaho to W. New Mexico, Rocky Mts., 1829-3353 m..

P. PURPUREA Mast. Purple-cone Spruce

A compact conical tree 20-50 m. tall, to 1 m. in girth, with wide-spreading branches, with numerous branchlets. Bark dark gray to orange-brown, fissured into fine thin scaly plates. Branchlets pubescent with long hairs, with short spreading petioles, bright orange-yellowish tinted green. Buds broadly ovoid, shortly acute, resinous, reddish-brown, 4 mm. long, scales rounded. Leaves spirally arranged, fine, obtuse or acute, densely arranged, curved, dark green above, gray-green below; stomata in 2 incomplete gray bands below; 8-14 mm. long, apex pungent, triangular in the cross-section. Female cone ovoid-cylindric, reddish-brown to purple, 3-6 cm. long by 2.5-3 cm. wide; scales rhombic-oblong, acuminate, not notched at the apex, denticulate; bracts small, rounded. Seeds with a grayish nut 2 mm. long and with a broad long wing.

China: C. & S.W. Kansu; N.W. Szechuan; E. Tsinghai, 2600-3800 m..

P. RUBENS Sarg. Red Spruce

A tree 15-24 m. tall, 0.3-0.6 m. in girth, with a broad or narrow conical crown. Bark reddish-brown,thin, fissured, scaly. Branchlets finely pubescent, shiny brown or yellowish-brown. Buds conical, acute, bluntly pointed, non-resinous, reddish, with long narrow scales, scales at the base pubescent. Leaves spirally arranged, short pointed, dark green to glaucous, 1-1.7 cm. long; stomata on both surfaces, in 3 lines above, broader below in 6 lines; cross-section diamond-shaped to 4-angled, aromatic when crushed. Male strobili purplish. Female cones cylindric to broadly ovoid, 3-5 cm. long by 2 cm. wide, shiny, reddish-brown to light brown; scales obovate to rounded, hump-backed, finely denticulate; bracts diamond-shaped, reddish-purple. Seeds with a dark brown nut to 2 mm. long , wing to 6 mm. long .

S.E. Canada: e. Quebec to E. United States, to N. Georgia, 1000-1500 m..

P. SCHRENKIANA Fisch. et Mey. Schrenk Spruce
=P. prostrata Isakov.

A narrow cylindric tree 30-40 m. tall, 70-100 cm. in girth, with pendent branches. Bark dark purple-gray, fissured, inner-bark orange-brown. Branchlets slender, short, smooth, grayish. Buds subglobose to conical, pointed, 4 mm. long, slightly resinous; scales rounded, somewhat glaucous and pubescent at the base. Leaves spirally arranged, pointing forward, non-flattened, dark dull or shiny green, finely pointed, 1.8-4 cm. long, stomata on 2 faces, cross-section diamond-shaped. Female cone cylindric-ovate, dark reddish-brown then brown, 7-9 cm. long by 2.5 cm. wide; scales rounded and entire at the apex or finely denticulate; bract rectangular. Seed with a nut 3.5 mm. long, with a broadened wing to 16 mm. long.

U.S.S.R.: Kirghiz, E. Tien-Shan, Pa-Li-Kun-Shan; China: Sinkiang Uighur, Tarbagatai, 1000-3600 m..

P. SCHRENKIANA var. TIANSCHANICA (Rupr.) Cheng et Fu Tien-Shan Spruce
=P. orientalis var. longifolia Ledeb.

A conical tree. Branchlets light yellowish, smooth, grooved, with short petioles. Buds relatively small, hidden by leaf stalks at the apex of the branchlet, nearly globular, yellowish, slightly pubescent; scales triangular, bluntly acute. Leaves curved upwards, 1.2-1.5 cm. or longer by 1.5 mm. wide, bluntly acute with fewer stomata. Female cone oblong-cylindric, 5.5-6.8 cm. long; scales broadly rounded, more convex, nearly square-tipped, margins distinct and reddish. Seeds with a gray nut and with a narrow oblong pinkish wing.
U.S.S.R.: W. Tien-Shan, Talass Ala-Tau and Alajskij Range; China: Sinkiang Uighur, Mol'da-asu S. of Lake Son-kul, 1250-2750 m..

P. SHIRASAWAE Hayashi Shirasawa Spruce
=P. bicolor var. acicularis Sh. et Koy.

A conical tree 20-30 m. tall, 40-80 cm. in girth, with ascending branches, branches curving upwards at the ends. Bark dark gray, thin, scaly, fissured. Branchlets finely pubescent, reddish-brown, slightly glandular. Buds conical, brown, acute at the apex, swollen at the base. Leaves bluish, incurved, densely arranged, 13-18 mm. long, curved upwards, falcate, hard, often pruinose on fertile branchlets. Female cone cylindrical, shiny brown, 8-12 cm. long by 2.5-4 cm. wide, obtuse at the apex; scales smooth, subentire, horse-shoe shaped, rounded at the apex, finely serrulate. Seeds with a nut 3 mm. long and a wing 8-9 mm. long.
Japan: Honshu, W. Mount Yatsuga-dake and Mount Mikobuchi, Nagano Perfecture, 1200-1950 m..

P. SITCHENSIS (Bong.) Carr. Sitka Spruce

A broadly conical tree to 49 m. tall, 0.9-1.5 m. in girth, with an open crown of horizontal branches. Trunk often buttressed at the base. Bark gray, smooth, becoming dark purplish-brown and scaly. Branchlets yellowish-gray to light brown, smooth, slender. Buds ovoid-conical, light brown to purplish, nearly smooth, 5 mm. long, with obtuse scales. Leaves spirally arranged, densely arranged, flattened dorsiventrally, slightly keeled, narrowed at the apex, bright to dark green, slightly ridged and silvery-white below, with a long sharp pointed apex, 1-2.5 cm. long, mucronate, stomata absent above, numerous below, cross-section triangular, sharply acute or acuminate. Male strobili reddish. Female cone oblong-cylindric, light brown or pale yellowish-brown, 5-9 cm. long by 2 cm. wide; scales thin, papery, oblong-oval, rounded at the apex, margins irregularly toothed; bracts lanceolate, about 1/2 height of the scales. Seeds with a nut 3 mm. long, wing to 11 mm. long and purplish-brown.
S.W. Canada: U.S.A.: S. Alaska to N.W. California, 366-914 m..

P. SMITHIANA (Wall.) Boiss. West Himalayan Spruce
=P. morinda Link

A broadly conical tree 30-60 m. tall. Bark dark gray-brown, fissured into small rounded or rectangular plates. Branches wide-spreading, slender, pendulos. Branchlets yellowish-gray, shiny, smooth. Buds ovoid, acute, dark reddish, slightly resinous, surrounded by the leaves. Leaves spirally spreading, pointing forwards, slender, 2-4 cm. long, sharply pointed, straight or incurved, bright or dark green, stomata on both surfaces, quadrangular, bluntly rounded or spine-tipped. Female cones cylindrical, 9-18 cm. long by 4 cm. wide, dark shiny brown; scales broad-ovate to suborbicular, rounded and entire at the apex, margins wavy; bracts rectangular, purplish-brown, finely denticulate. Seeds red-brown, nut 4 mm. long, wing to 9 mm. long.
Afghanistan; N.W. India; Nepal; S.W. China: Tibet, 2400-3600 m..

P. SPINULOSA (Griff.) Henry East Himalayan Spruce

A broadly conical tree to 60 m. tall, with spreading branches. Bark pinkish-gray, exfoliating in squarish scaly plates. Branches long, fine, pendent. Branchlets slender, smooth, yellowish becoming gray. Buds ovoid, pale brown, slightly resinous, with obtuse scales. Leaves imperfectly spirally arranged, dense, flattened dorsiventrally, shiny green above, stomata more numerous below in 2 glaucous bands, 2.5-3.5 cm. long, keeled, pungent, apex with a short mucronate spine, cross-section diamond-shaped. Female cones oblong-cylindric, somewhat resinous, 7-10 cm. long by 3.5 cm. wide, green with purple scale margins turning shiny brown; scales broadly rounded, finely toothed, acuminate at the base, apex slightly notched; bract rounded, purplish, pointed at the apex. Seed with a nut 3 mm. long, wing 8-12 mm. long, purplish-brown.
Sikkim; Bhutan; China: S.E. Tibet, 2400-3600 m..

P. WILSONII Mast. Wilson Spruce

A narrowly conical tree 25-50 m. tall, to 1.3 m. in girth, with short spreading horizontal branches. Bark grayish-pink, divided into flakes. Branchlets smooth, gray-white, with minute leaf stalks. Buds ovoid-conical, slightly resinous; scales rounded, chestnut-brown. Leaves spirally arranged, pointing forwards, glossy dark green, pungent, mucronate, 1-2.3 cm. long by 1 mm. wide, with more stomata below, stout, straight or curved, cross-section diamond-shaped to quadrangular. Female cone oblong-cylindric, brown, 3.5-9 cm. long by 2-3 cm. wide; scales suborbicular, hump-backed, spathulate, acuminate, finely incurved at the margin; bract linear-oblong, rounded and denticulate at the apex. Seed with a nut 3.5 mm. long, wing 6-7 mm. long.
China: Tsinghai to W. Hupeh, 1400-2800 m..

PILGERODENDRON Florin (Cupressaceae)

A monotypic genus from S.W. South America. A dioecious tree with quadrangular branchlets and four-ranked leaves. Close to Fitzroya in foliage aspects and perhaps a hybrid between that species and Libocedrus chilensis, thus it may be a polypoid. Leaves adpressed at the base, free above and spreading at a wide angle from the axis, nearly flattened, more or less uniform in size, broad based, tapering near the apex, needle-like, bluntly acute to obtuse. Male cones with 4-8 pollen sacs on each sporophyll. Female cone typical of Libocedrus , ovoid, erect, stalkless, with 4 scales, opening in the center upon maturity; lower pair of scales sterile, oblong-lanceolate, upper pair obovate-oblong about 3 times longer than the lower pair and with long pointed umbos. Seeds 2 per fertile scale, very unequally winged, yellowish-brown.

P. UVIFERUM (Pilg.) Florin Patagonian Pilgerodendron
=Libocedrus uvifera Pilg.

A compact narrowly conical tree 25-50 m. tall, or rarely a shrub. Bark fine, exfoliating in long strips. Branches erect. Leaves needle-like, four-ranked, 2-5 mm. long by 1.2 mm. wide, loosely imbricate, obtuse, keeled below, narrowed and adpressed at the base, dark green, inner surface bright white with stomata, spreading, ovate or ovate-lanceolate, free at the apex. Male cone subcylindric, at the base of 2 large leaves, with 4-10 pollen sacs. Female cone borne directly on branchlets, stalkless, ovoid, brown, 8-13 mm. long, with 4 scales, scales reflexed when ripe, with a very short columella, lower 2 scales are smaller and sterile, larger scales with long incurved umbos to 3 mm. long at the apex of the scales. Seeds with 2 uneven wings, obtusely triangular.

Chile: Valdivia to near Tierra del Fuego, S. Argentina, 330-1100 m..

PINUS L. (Pinaceae)

A genus of 91 species from N. America, Mexico, the Caribbean, Europe, N. Africa, Asia, Japan, Philippines to Sumatra. Monoecious evergreen trees with whorled branches. Branches often horizontally disposed in tiers. Buds elongated, with numerous imbricate scales, often resinous; buds elongate to form branchlets with a single internode or sometimes with 2 or more internodes; scales not persistent at the base of the branchlets. Juvenile leaves spirally arranged, borne singly and lacking a basal sheath, serrulate. Adult leaves needle-like, slender, in groups of 2-5 joined together at the base by a thin sheath, semi-circular to triangular in the cross-section, persistent 2 or more years, with 2 or more resin canals, margins often minutely serrulate. Male strobili in yellow, orange, or reddish catkin-like spikes in clusters at base of the branchlets, somewhat persistent through the summer, composed of spirally arranged 2-celled anthers, sessile. Female cone subglobose to cylindrical, woody, maturing in 2 years, pendent, with many persistent overlapping scales in 2 series; scales ovate or rounded with swollen or flattened apophyses and with central or apical umbos; bracts minute and hidden. Seeds 2 per scale , nut-like, with a long thin wing projecting backwards or sometimes wingless. Cotyledons several to many.

P. ALBICAULIS Engelm. Whitebark Pine

A tree 6-15 m. tall, 0.3-0.6 m. in girth, with an irregular, spreading crown, often with a short twisted trunk. Bark whitish-gray, smooth, then scaly. Branchlets pubescent when young, stout, flexible, reddish-brown. Buds ovoid, sharply pointed, resinous, yellowish or red-brown, scales elongated. Sheath deciduous in the first year, orange-brown. Needles five in a bundle, crowded at ends of the branchlets, 4-7 cm. long by 1.5 mm. wide, dull green, with faint stomata on all surfaces; resin canals marginal, 1-3. Female cone in groups of 1-3, ovoid or subglobose, nearly stalkless, 4-8 cm. long by 4-6 cm. wide, purple to brown, remaining closed after maturity; apophses ovate, swollen, thick, with a thick incurved apical umbo. Seeds elliptical, dark brown, wingless, 8-12 mm. long.

S.W. Canada; N.W. United States, Northern Rocky Mts., 1372-3658 m..

P. ARISTATA Engelm. Eastern Bristlecone Pine

A small bushy tree 3-15 m. tall, 0.3-1 m. in girth, often gnarled, with an open, irregular crown. Bark reddish-brown, fissured into flat ridges. Trunk often short and multi-stemmed. Branches erect, somewhat fastigiate. Branchlets pubescent, scaly, grooved, orange-brown then blackish. Buds ovoid, pointed,slightly pubescent, 7 mmm. long, slightly resinous, chestnut-brown, scales fringed. Sheath 5-6 mm. long, fringed, chestnut-brown, pubescent, curling to form a basal rosette. Needles in fives, persist 12-15 years, shiny dark green, curved, crowded at tips of branchlets, 2.5-3.8 cm. long, stiff, inner surfaces whitish , with conspicuous resin deposits; resin canals marginal, tangential, one. Female cone oval, 7.6-8.8 cm. long, dark buff to gray-brown, with purplish-brown scales; apophyses ovate, slightly swollen, with a long slender central spine. Seed with an ovoid, blackish nut 6 mm. long by 3 mm. wide; wings transparent,7-11 mm. long. Longevity 1500-2000 years.

U.S.A.: W. Colorado; N. New Mexico; N. Arizona, 2500-3400 m..

P. ARISTATA var. LONGAEVA (D.K. Bailey) Little Western Bristlecone Pine

A tree 7-15 m. tall, with an open, irregular crown. Bark dark brown, scaly. Branches hanging and twisting. Branchlets pubescent, scaly, yellowish-brown. Buds conical, 10-12 mm. long, shiny chestnut-brown, slightly pubescent, scarcely resinous, scales fringed. Sheath light chestnut-brown, 5-6 mm. long, curling to form a basal rosette, pubescent, transparent. Needles 5 per cluster, 2.5-3 cm. long by 1.1 mm. wide, non-resinous, persistent up to 30 years, inner surfaces with whitish stomata; resin canals marginal, tangential, 2. Female cone rich rusty red-brown, 7.5-9 cm. long, broadest near the base; apophyses ovate, slightly swollen, with a stout central umbo. Seeds broadly rounded, nut tan spotted black, 3.5 mm. lon; wings transparent, tan, 6-12 mm. long, rounded.

U.S.A.: C. Utah; S.Nevada; E. California, 1700-3400 m..

P. ARMANDII Franch. Armand Pine
=P. amamiana Koidzu, =P. dabeshanensis Cheng et Law, =P. masteriana Hayata

A broadly conical tree 20-35 m. tall, with wide-spreading horizontal branches. Bark pale gray, smooth, becoming fissured and plate-like and purplish-gray. Branchlets greenish, pubescent becoming smooth, with a faint whitish bloom. Buds cylindrical, blunt, slightly resinous, 1-1.8 cm. long, scales free and transparent at the margins. Sheath quickly deciduous, short. Needles in fives, 8-15 cm. long by 1-1.5 mm. wide, drooping or spreading, persist 2-3 years, bright green, finely serrulate, bent near the base, stomata in 4-7 ranks on the 2 inner faces; resin canals 2 marginal and 1 median. Female cone in groups of 1-3, resinous, oblong-cylindric, 6-20 cm. long by 3-8 cm. wide, yellowish-brown, opening upon maturity; apophyses ovoid, rounded, thick, lip slightly curved , with a small blunt apical umbo. Seeds wingless or nearly so, nut obovoid-oblong, 1-1.2 cm. long by 9-11 mm. wide, pale gray-brown.
N.E. India; N. Burma; C. China; E. Taiwan; S. Japan, 600-3300 m..

P. ATTENUATA Lemm. Knobcone Pine

A narrowly conical tree 9-24 m. tall, 0.3-0.8 m. in girth, with horizontal branches, becoming irregular with age. Bark gray, smooth, becoming dark gray and fissured into scaly ridges. Branches curve upwards at the ends. Branchlets smooth, red-brown. Buds cylindrical, resinous, 1.8-3 cm. long, dark red-brown. Sheath persistent, 10 mm. long. Needles usually in threes, persist 3-4 years, 7.5-18 cm. long, slender, stiff, yellow-green, finely toothed; resin canals median, 2. Female cone ovoid, clustered in whorls, curved, shiny yellow-brown, 8-15 cm. long by 5-6 cm. wide, remaining closed for many years; apophyses ovate, swollen, protuberant at the base on one side of the cone, with a small thick central umbo. Seeds with a blackish nut 6 mm. long by 4 mm. wide, wing to 18 mm. long or more.
U.S.A.: S.W. Oregon; W. California; Mexico: N. Baja California, 305-1219 m..

P. AYACAHUITE Ehrenb. ex Schlecht. Mexican White Pine

A conical tree 20-50 m. tall, with an irregular, spreading crown. Bark smooth, reddish, becoming blackish, scaly, then fissured. Branches horizontal or somewhat pendent. Branchlets pale gray or yellow-brown, finely pubescent. Buds conical, resinous, 1.2 cm. long, pale brown to reddish, scales free at the apex. Sheath quickly deciduous, 1-1.5 cm. long, shiny. Needles in fives, slender, spreading, somewhat pendent, at tips of branchlets, 10-20 cm. long, glaucous-green or gray-green, serrulate, stomata on 2 ventral faces; resin canals marginal, 2-4. Female cones in groups of 1-4, on a peduncle 2.5-5 cm. long, cylindrical, 10-30 cm. long or longer, by 6-14 cm. wide, pale orange-brown, opening upon maturity; apophyses flattened, triangular, apex strongly recurved,with a small apical umbo. Seeds ovoid, nut dark gray 9 mm. long, wing to 2.5 cm. long or more.
S.E. Mexico: W. Vera Cruz to C. Chiapas; S. Guatemala; N.W. El Salvador; W. Honduras, to 3050 m..

P. BALFOURIANA Grev. et Balf. ex A. Murr. Northern Foxtail Pine

A broadly conical tree 6-15 m. tall, 0.3-0.6 m. in girth, with an irregular crown of short spreading branches. Bark smooth, whitish-gray, then gray and ridged. Branches downswept. Branchlets scaly, orange-brown, somewhat glaucous, densely pubescent. Buds ovoid, 3.5 mm. long, resinous, chestnut-brown. Sheath 4 mm. long, soon curling. Needles frequently in fours, spine-tipped, 2-2.8 cm. long by 1 mm. wide, curved, dark green, persisting 10-20 years, with faint stomata on the inner surfaces. Female cone oblong-cylindric, 9.58 cm. long by 6.14 cm. wide, purplish-brown; apophyses ovate, with a swollen ring around an inconspicuous central umbo. Seed with a nut 8.82 mm. long, wing to 17.36 mm. long .

U.S.A.: N. California, W. Siskiyou, E. Trinity and W. Tehama Counties, 2408-2652 m..

P. BALFOURIANA var. AUSTRINA (Mastr. et Mastr.) Silba Southern Foxtail Pine

A tree 10-17 m. tall, branches stout and upright. Bark furrowed, cinnamon-orange, plate-like. Branchlets slightly pubescent, scaly, orange. Buds slightly resinous, ovoid, pointed, yellowish-orange, pubescent, 7 mm. long. Sheath curls to form a basal rosette, 2 mm. long. Needles 5-6 per bundle, persist 25 years or more, 2-2.5 cm. long by 1 mm. wide, without dorsal grooves, stomatal bloom prominent on the inner faces; apex curved, acute, yellowish. Male strobili bluish, oblong-cylindric. Female cones elliptic, resinous, purple turning rusty red-brown, 7.7 cm. long by 5.6 cm. wide, with 80 scales; apophyses ovate, slightly swollen, umbos indented and inconspicuous. Seeds with pale tan nuts, 7.3 mm. long; wings transparent, to 13.8 mm. long.

U.S.A.: C. California, E. Tulare, S. Fresno and W. Inyo Counties, 1524-3018 m..

P. BANKSIANA Lamb. Jack Pine

A shrub or broadly conical tree 9-21 m. tall, to 0.3 m. in girth, with an open, spreading crown. Bark orange-gray or dark brown, with thin scales. Branchlets fine, flexible, smooth, greenish-purple or yellowish-brown. Buds ovoid, 8 mm. long, resinous, bright light brown, scale margins not fringed. Sheath short, 3-6 mm. long, quickly deciduous. Needles usually in twos, persist 2-4 years, 2-4 cm. long, stout, slightly flattened and twisting, widely forking, shiny green, finely serrulate, with fine stomata on most surfaces; resin canals marginal, 0-2. Female cone in groups of 2-3, narrow, curved, shiny light yellowish-gray, 3-5 cm. long, usually remaining closed, persists 12-15 years; apophyses rounded, slightly swollen, with an inconspicuous central umbo. Seeds with a blackish-brown nut 4 mm. long, wing to 12 mm. long and brown.

C. Canada: S. Mackenzie to Nova Scotia; N.E. United States: Minnesota to Maine, 350-850 m..

P. BHUTANICA Grierson, Long et Page Eastern Himalayan Pine

A tree to 25 m. tall, with an open, irregular crown, with pendent branches. Bark thin, smooth, wrinkly. Branchlets bluish-white, glandular pubescent. Sheath 1.8-2.3 cm. long, chaffy, bright golden-brown, persistent. Needles 5 in a bundle, drooping, 15-24 cm. long, silvery-glaucous, persist 2 years or more, with 4-7 ventral stomata; resin canals 2, marginal or submarginal. Female cones on a peduncle 4.5-6 cm. long, cone oblong-cylindric, narrow,, 12-20 cm. long by 3-4 cm. wide, brown; apophyses rounded, flattened, with a blunt apical umbo. Seeds with a nut 6-8 mm. long, brown; wings to 20 mm. long.

E. Bhutan: Kenga to Lao; N.E. India: Arunachal Pradesh, 1750-2400 m..

P. BRUTIA Ten. Calabrian Pine

A tree 10-18 m. tall.Branchlets scaly, orange-brown,fine. Buds elongated, non-resinous, 1-2 cm. long, scales free and reflexed. Sheath gray, 5-6 mm. long, persistent. Needles in twos, 12-16 cm. long by 1-1.5 mm. wide, dark green, fine, serrulate, slightly twisted, somewhat spreading; resin canals marginal or submarginal, 6-8. Female cone almost sessile, spreading, in groups of 2-6, on a short peduncle 1 cm. thick, cone ovoid, 5-11 cm. long, somewhat serotinous; apophyses broadly ovate, slightly swollen, with an inconspicuous central umbo. Seeds with a nut 8-9 mm. long, with a longer wing.

E. Greece; W. Turkey; N.W. Iraq; W. Syria; Lebanon, 500-1500 m..

P. BRUTIA var. ELDARICA (Medw.) Silba Eilar Pine

A tree 12-15 m. tall, with a broad-topped crown. Bark brownish-gray. Needles in twos, stiff, thick, green, 6-9 cm. long. Male strobili with rounded scales, margins denticulate. Female cone ovoid-conical, on a short peduncle, cone 5-6 cm. long, reddish-brown; scales irregularly rhombic, glossy, smooth; apophyses whitish-gray, concave. Seeds with a blackish nut 6-7 mm. long, with a reddish brown wing 18-28 mm. long.

U.S.S.R.: E. Georgian SSR, Mt. Eilar Ugi, 450-600 m..

P. BRUTIA var. PITHYUSA (Stev.) Silba Black Sea Pine
=P. stankewiczii(Suk.) Fomin

A tree 8-24 m. tall, with an erect crown, becoming round-topped and spreading with age. Bark brownish-gray, fissured. Branchlets scaly, brownish-red or brownish-yellow, glandular. Buds conical, 11 mm. long, dark brown tinged white, pubescent, non-resinous, scales reflexed. Sheath yellowish-gray, 7-13 mm. long. Needles in twos, 12-17 cm. long by 1 mm. wide, dark green, very twisted, acute, margins scabrous. Female cones on a short peduncle, ovoid-conical, red or yellowish-brown, 6-10 cm. long; apophyses flattened, with an inconspicuous indented umbo. Seeds with an ovate, blackish nut, 7 mm. long; wings obtuse, brown, 25-27 mm. long.

U.S.S.R.: S.E. Ukraine, Yalta eastwards, to 300 m. or more.

P. BUNGEANA Zucc. ex Endl. Lacebark Pine

A tree 25-30 m. tall, often multi-stemmed, with long vertical branches. Bark smooth, chalky-white, becoming multicolored, green-purple-brown, with small few scales. Branchlets smooth, gray-green. Buds spindle-shaped, 1.2 cm. long, non-resinous, purplish to red-brown, scales free and fringed at the margins. Sheath short and deciduous. Needles in threes, 5-10 cm. long by 1.5-2 mm. wide, thick, rigid, dark green, serrulate, persistent 3-4 years, with faint stomata on the back; resin canals marginal or submarginal, 1-7. Female cone in groups of 1-2, ovoid, subsesile, 5-7 cm. long by 4-5 cm. wide, tan to dark brown, opening upon maturity; apophyses thick, swollen, ovate, with a long central sharp pointed decurved umbo . Seeds with an ovoid, dark brown nut 8-13 mm. long, wings 5-12 mm. long.

China: E. Szechuan to C. Shansi, 500-1800 m..

P. CANARIENSIS C. Smith ex Buch. Canary Island Pine

A narrow tree to 30 m. tall, to 3 m. in girth, with a broad rounded crown. Bark gray-brown-red, fissured into irregular scales. Branches often with scattered short leafy branchlets. Branches spreading and drooping. Branchlets smooth, yellowish. Buds large, oblong-ovoid, pointed, red-brown, non-resinous, scales free. Sheath persistent, 1.8 cm. long. Juvenile foliage glaucous. Needles in threes, 20-30 cm. long by 1 mm. wide, spreading, bright green, pendent, persist 2 years, stomata on 3 faces, apex acute; resin canals median. Female cones ovoid-cylindric, 15-23 cm. long by 7.5 cm. wide, shiny light brown; apophyses ovate, slightly flattened, sometimes with an elongated apex, with a small central umbo. Seeds with a blackish nut 10-12 mm. long by 7 mm. wide, with a wing to 23 mm. long.

Canary Islands: Teneriffe and Grand Canary Island, 1524-2195 m..

P. CARIBEA Morelot Caribbean Pine
=P. caribea var. hondurensis (Senecl.) Barr. ex Golf.

A slender tree 10-45 m. tall, to 70 cm. in girth. Bark thick, reddish, deeply fissured into fine, large scales. Branchlets scaly, smooth, orange-brown. Buds cylindrical, attenuate at the apex, pale chestnut-brown, scales fringed white at the margins. Sheath persistent, 1-1.5 cm. long. Leaves in threes to fives, mostly in threes, persist 2 years, serrulate, shiny dark green, 12-30 cm. long by 1-1.3 mm. wide, stomata on most surfaces; resin canals internal, 3-6. Male strobili with aments 20-32 mm. long. Female cone reflexed on a long peduncle, deciduous, asymmetrical,conical, 5-13 cm. long by 2.5-3.5 cm. wide, yellowish-brown; apophyses broadly ovate, slightly flattened, with a small fine central umbo. Seeds with a nut 6 mm. long by 2 mm. wide, dark brown; wing to 15 mm. long, remains attached. Cotyledons 4-9.

W. Cuba, Pinar del Rio; E. Guatemala; British Honduras; Honduras and . Nicaragua, 0-853 m..

P. CARIBEA var. BAHAMENSIS (Griseb.) Barr. ex Golf. Bahaman Pine

A tree 8-20 m. tall, to 50 cm. in girth. Bark gray, scaly, rough. Branchlets scaly, smooth, orange-brown. Buds 1.2-2 cm. long, ovoid, dark brown; scales long-triangular, reflexed, fringed yellow. Sheath 8-11 mm. long, gray-brown, pubescent, margins fringed gray. Needles mostly in twos, 19-25 cm. long, 1-1.5 mm. wide. Female cone on a curved peduncle 1-2 cm. long, cone broadly ovoid, 4-12 cm. long, apophyses with a minute erect central umbo. Seeds with a narrowly triangular nut 5-6 mm. long by 2 mm. wide, with a long deciduous wing. Cotyledons 4-7.

Bahama Islands: Grand Bahamas; Andros Island, 0-30 m. or more.

P. CEMBRA L. Swiss Stone Pine

A narrowly conical tree 25-40 m. tall, with short spreading branches and with an irregular crown. Bark smooth, gray-green, becoming reddish-gray and divided into purplish scaly plates. Branchlets orange-brown, pubescent. Buds long-acuminate, resinous, red-brown, 6-10 mm. long, scales somewhat free at the apex. Sheath deciduous in the first year. Needles in fives, 5-8 cm. long by 1 mm. wide, densely crowded, dark blue-green, persist 3-5 years, inner surfaces blue-white, finely serrulate; resin canals median, 2-3. Female cone on a short peduncle, ovoid to nearly globose, deep blue or purplish turning light brown, 5-8 cm. long by 3.5-5 cm. wide, remaining closed for a short time after maturity; apophyses ovate, swollen, thick, with a blunt inconspicuous apical umbo. Seeds 12 mm. long by 6-10 mm. wide, red-brown, usually wingless.

Central Europe: S.E. France to W. U.S.S.R.: W. Ukraine, to 2500 m..

P. CEMBROIDES Zucc. ex K. Bayer Mexican Pinyon Pine
=P. cembroides var. lagunae Rob.-Pas., =P. cembroides subsp. orizabensis Bail.

A small resinous tree 5-6 m. tall, to 0.3 m. in girth, with a spreading crown of low, horizontal branches. Trunk short. Bark light gray, smooth, then dark gray to reddish-brown, scaly and furrowed. Branchlets smooth or finely pubescent, fine, brown. Buds cylindrical, slightly resinous, 6-12 mm. long, brown. Sheath somewhat deciduous, forming a basal rosette. Needles in threes, rarely twos to fives, rigid, curved, 2-6 cm. long, bright or dark green, stomata on all faces, margins entire; resin canals marginal, 2. Female cone quickly deciduous, globose or subglobose, 3-5 cm. long by 3-4 cm. wide, dull yellowish or orange-brown; apophyses ovate, swollen, slightly protuberant with a thick blunt central umbo. Seed dark brown, oblong to obovoid, 1-2 cm. long by 6 mm. wide, wingless, thick-shelled, oily.

S.W. United States to N. Mexico, 762-2700 m..

P. CEMBROIDES var. QUADRIFOLIA (Parl. ex Sudw.) De Laub. et Silba Parry Pinyon Pine
=P. juarezensis Lanner, =P. parryana Engl.

A small resinous tree 5-9 m. tall, 0.3-0.5 m. in girth, with a spreading rounded crown and with low, horizontal branches. Bark light gray, smooth, becoming reddish-brown and furrowed into scaly ridges. Branchlets pubescent at first, orange-brown. Buds brown. Sheath 1.2 cm. long, forming a basal rosette. Juvenile leaves may appear on old trees. Needles mostly in fours, sometimes fives, rigid, incurved, persist 3-4 years, 3-4 cm. long, bright green to bluish-green, white stomata in 3-5 ranks on the inner surfaces,

margins entire or slightly serrulate; resin canals marginal,2. Female cone ovoid to subglobose, deciduous, nearly stalkless, 6 cm. long by 5 cm. wide, dull yellow-brown to shiny chestnut-brown, resinous; apophyses ovate, largely protuberant with a small blunt central umbo. Seed dark red-brown, 1.5 cm. long by 0.8 cm. wide, wingless.
U.S.A.: S. California to N. Baja California, Mexico, 1219-1829 m..

P. CEMBROIDES var. REMOTA Little — Papershell Pinyon Pine
=P. catarinae Rob.-Pas.

A shrub or small tree 4-7 m. tall, 0.2-0.4 m. in girth, with an irregular, somewhat rounded crown, often branched from the base. Branchlets slender, gray. Buds sub-cylindrical with fine long-tapering scales. Sheath somewhat reflexed on younger mature needles. Needles in twos, rarely threes, 3-5.5 cm. long by 1.3-1.8 mm. wide, slightly resinous, somewhat glaucous ventrally, margins entire; stomata present on all surfaces, in 4-5 rows ventrally, in 3-4 rows dorsally, resin canals 2-5. Female cone on a peduncle 5-8 mm. long, yellowish-brown to reddish-brown, 2.5-3.5 cm. long by 3-5 cm. wide; apophyses ovate, slightly swollen, slightly protuberant, curved inwards at the apex; umbos inconspicuous, half the width of the apophyses. Seeds 2-5 mm. long, almond-white, with a paper-thin shell 0.1-0.3 mm. thick.
U.S.A.: S.W. Texas; Mexico: Coahuila and Nuevo Leon, 1100-1400 m..

P. CLAUSA (Chapm.) Vasey — Sand Pine
=P. clausa var. immuginata D.B. Ward

A tree 9-21 m. tall, 0.3-0.5 m. in girth, with a rounded or flat-topped crown. Bark dark gray or reddish-brown, furrowed into oblong plates; gray and smooth on young trees. Branchlets thin, pubescent, glaucous-violet then reddish-brown. Buds ovoid-cylindric, non-resinous, 6.5 mm. long, pubescent, dark brownish-purple, scales acute and spreading. Sheath persistent, 3-4 mm. long, pubescent, chestnut-brown. Needles in twos, fine, flexible, acute, serrulate, 5-9 cm. long, dark green, slender, slightly twisted, stomata on most surfaces; resin canals median, angled, 2. Female cone in tufts, on a short peduncle, serotinous, in groups of 2-3, persist 3-4 years, remaining closed, ovoid-cylindric, 5-8 cm. long, yellow-brown becoming grayish; apophyses broadly ovate, swollen, slightly protuberant, with a sharp relatively short central umbo. Seeds with a blackish nut 4 mm. long by 2.5 mm. wide, wings light brown to 17 mm. long.
U.S.A.: S. Alabama, Baldwin County to N. & S. Florida, to 61 m..

P. CONTORTA Dougl. ex Loud. — Shore Pine
=P. contorta var. bolanderi Lemm.

A bushy tree 6-10 m. tall, with a slightly twisted trunk and with a dense spreading crown, becoming columnar or nearly flat-topped. Bark fine, brown, furrowed into squarish plates, inner-bark purplish and orange. Branchlets smooth, with fine longitudinal grooves, green turning gray-purple or orange-brown. Buds ovoid-cylindric, shortly pointed, dark reddish-brown, 1.2 cm. long, resinous. Sheath persistent, 3-6 mm. long. Needles in twos, persist 3-8 years, pointed, rigid, closely set, somewhat serrulate, twisted, fine, 3-7 cm. long by 0.9-1.1 mm. wide, dark bright green, with numerous stomata on 2 surfaces; resin canals median, 0-2. Female cone in tufts of 2, persistent , usually

remaining closed, serotinous, oblique, pointing backwards, sessile, ovoid-conical, shiny yellowish-brown, 2-6 cm. long by 2-3 cm. wide; apophyses broadly ovate, slightly swollen to nearly flattened, protuberant at base of the cone, with a long fine central umbo. Seeds with an ovoid, red-brown nut 4-5 mm. long by 2 mm. wide, wings 12-14 mm. long.

W. Canada; N.W. United States, along the Pacific Coast, 0-610 m..

P. CONTORTA var. LATIFOLIA Engelm. ex Wats. Rocky Mountain Lodgepole Pine

A narrowly conical tree to 30 m. tall, with a straight trunk and with an open crown. Bark red-brown, scaly, thin, with curled flakes. Branches sparse, short, level, slightly twisted. Branchlets yellowish-brown becoming gray, scaly, slightly pubescent. Buds ovoid-rounded, dark brown, resinous, 1 cm. long. Needles in twos, 4-6 cm. or longer, by 1.4 mm. wide, bright green, loosely spreading or pointing forwards around the branchlet. Female cone stalkless, oblique, pointing outwards, somewhat serotinous, ovoid, remaining closed for many years, yellowish-gray, 3.5-4 cm. long; apophyses small, ovate, slightly swollen, sometimes protuberant near the base, with a prominent central umbo to 3 mm . long. Seeds with long wings.

S. Canada to S. Colorado, U.S.A., Rocky Mountains, 457-3505 m..

P. CONTORTA var. MURRAYENSIS (Grev. et Balf.) Engelm. Sierra Lodgepole Pine

A narrowly conical tree to 50 m. tall. Bark brown, thin, with numerous scales. Branches curving up at the ends. Branchlets smooth, yellowish-brown. Buds cylindrical, resinous, 12 mm. long, red-brown. Sheath persistent, 5-7 mm. long. Needles in twos, rigid, persist 2-3 years, shortly pointed, serrulate, fine, 5-8 cm. long by 1.3-2.2 mm. wide, dark yellowish-green, with stomata on 2 surfaces; resin canals median, 0-2. Female cones symmetrical, slightly oblique, opening upon maturity, 3-6 cm. long by 3 cm. wide, bright gray-brown; apophyses rounded, ovate, slightly swollen, with fine long central umbos. Seeds with long wings.

U.S.A.: S.W. Oregon to N. Baja California, Mexico, 457-3505 m..

P. COOPERI Blanco Cooper Pine

A tree 20-30 m. tall, with a dense, rounded crown, with branches angled to the base. Bark reddish-brown. Branchlets reddish, grooved. Buds long-acuminate, slightly resinous, red-brown, 1.4-1.7 cm. long, scales free at the tips. Sheath long, persistent. Needles in fives, clustered at tips of branchlets, serrulate, 5-9 cm. long, stomata on most surfaces; resin canals median, 5. Female cone subsessile, ovoid, semi-persistent, 5-9 cm. long, bright reddish-brown to gray; apophyses ovate, swollen, slightly protuberant, with a fine central decurved umbo. Seeds small, with a brown wing.

W. Mexico: S.W. Chihuahua to W. Durango, 2438-2743 m..

P. COOPERI var. ORNELASI (Mart.) Blanco Ornelas Pine

A tree 20-30 m. tall, 40-75 cm. in girth, with a rounded, dense crown. Bark dark gray, fissured, plate-like. Needles in fives, 10-15 cm. long, dark green; resin canals median, 3-7. Female cone narrowly ovoid, attenuate at the base, 7-10 cm. long, yellowish, on a peduncle 8 mm. long; apophyses ovate, swollen, with a long fine decurved central umbo. Seed with a chestnut-brown nut 5-7 mm. long, wing to 20 mm. long.

Mexico: Durango, El Salto (type).

P. COULTERI D. Don Coulter Pine

A broadly conical tree 12-21 m. tall, 0.3-0.8 m. in girth, with an open, irregular crown. Trunk relatively straight with rows of nearly horizontal branches. Bark dark gray, deeply furrowed, becoming blackish-gray, divided into rectangular plates on larger limbs. Branchlets smooth, violet-glaucous turning green or orange-brown. Buds ovoid, sharp-pointed, resinous, thick, 2-4 cm. long, scales fringed at the margins. Sheath persistent, 4 cm. long. Needles in threes, persist 2-3 years, crowded at tips of branchlets, stout, curved, rigid, serrulate, light gray-green to dark green, 15-30 cm. long by 2 mm. wide, stomata numerous on 3 surfaces; resin canals median, 2-10. Female cone on a short peduncle, persistent, ovoid-cylindric, bent downward, 20-35 cm. long by 10-12 cm. wide, heavy, fawn-brown; apophyses ovate, swollen, notably protuberant, basal apophyses reflexed, apophyses with a long thick broad incurved apical umbo; cone opens gradually. Seed with a dark nut 1.5-2.2 cm. long by 8-10 mm. wide, with a detachable wing to 2.5 cm. long.

U.S.A.: S.W. California to N. Baja California, Mexico, 305-2134 m..

P. CULMINICOLA Andr. et Beam. Potosi Pinyon Pine

A low wide-branching shrub 1-5 m. tall, to 0.30 m. in diameter, with a decumbent trunk and with a dense crown. Bark gray, smooth, becoming plate-like. Sheath 6 mm. long, rolling back to form a basal rosette. Needles in fives, rarely in fours to six in a bundle, 3-4.9 cm. long by 1-1.3 mm. wide, bluish-green, bluntly pointed, stomata only on the 2 inner surfaces, remotely serrulate, incurved in dense clusters at ends of thick branchlets, glaucous ventrally. Female cones subglobose, 3.2-4.5 cm. long by 3.5-4 cm. wide, with few scales; apophyses slightly swollen, ovate, subrhomboidal, chestnut-brown, with a small stout central umbo. Seeds to 9 mm. long by 6 mm. wide, wingless.

Mexico: W. Neuvo Leon, Cerro Potosi, 3353-3658 m..

P. CULMINICOLA var. DISCOLOR (Bail. et Hawksw.) Silba Border Pinyon Pine

A tree 5-12 m. tall, open branched and with a spreading, rounded crown. Dioecious trees more dominent in the wild. Buds sub-cylindric, with long-tapering scales, apex reddish. Sheaths highly reflexed, forming a conspicuous rosette at the base of the fascicle. Needles usually in threes, rarely to fives, dark green dorsally, glaucous ventrally, 3-6 cm. long by 1.3-1.6 mm. wide, stomata only on the inner surfaces, margins entire, resin ducts two. Female cone 2-3 cm. long by 2.5-4 cm. wide, bright yellowish to reddish-brown, on a peduncle 3-6 mm. long; umbos small and slightly recessed. Seeds with a shell 0.5-1.2 mm. thick, wingless.

S.W. United States: S.E. Arizona to San Luis Potosi, N. Mexico, 1300-2700 m..

P. CULMINICOLA var. JOHANNIS (M.F. Rob.) Silba Johann Pinyon Pine

A small tree 2-6 m. tall, often with several stems. Bark loose and flaky. Buds subcylindric, with long-tapering scales. Needles mostly in threes, dark green dorsally, somewhat glaucous ventrally, 3.5-6 cm. long by 0.9-1.2 mm. wide. slightly resinous, margins entire, stomata only on the inner-leaf surfaces, resin ducts 2. Female cone subglobose 2.5-4 cm. long by 3-5 cm. wide, green-gray to chestnut, on a peduncle 3-8 mm. long, umbos dull and slightly recessed. Seed shell 0.5-1 mm. thick, seeds wingless. Cotyledons 6-11.
Mexico: Coahuila, Sierra Madre Oriental; Zacatecas, Concepcion del Oro, to 2700 m..

P. DENSA (Little et Dorm.) De Laub. et Silba Dade Pine

A dense tree 8-26 m. tall, with a trunk divided into several branches and forming a rounded crown, eventually becoming flat-topped. Bark purplish-brown, furrowed into scaly plates. Branchlets relatively thick. Buds with fringed, silvery scales. Sheath yellow-brown, 7-10 mm. long, persistent. Needles in twos, 9-24 cm. long by 0.15 mm. wide, clustered at tips of branchlets; resin canals internal, 3-9. Female cone ovoid, 3.7-4.2 cm. long; apophyses ovate-rounded, slightly swollen, with an indented prickly central umbo. Seeds with long wings. Seedlings go through a distinct grass-like stage.
U.S.A.: S. Florida, Dade County to Florida Keys, nearly at sea level.

P. DENSIFLORA Sieb. et Zucc. Japanese Red Pine

A conical tree 21-37 m. tall, 1.8-3.6 m. in girth, frequently crooked, with a broad, irregular crown. Bark orange-red, divided into thin oblong scaly plates, becoming gray and slightly fissured. Branches short and horizontal. Branchlets smooth, green turning orange-red, with a glaucous bloom. Buds ovoid-oblong, 1.2 cm. long, finely resinous, chestnut-brown, scales free and somewhat reflexed. Sheath somewhat persistent, 1-1.5 cm. long, with long pale margins. Needles in twos, persist 3 years, fine, dull green to bluish-green, somewhat twisted, 6-12 cm. long by 0.7-1 mm. wide, finely serrulate, stomata on most surfaces, apex finely pointed; resin canals marginal, 2-12. Female cone singular, on a short peduncle, ovoid-conical, persists 2-3 years, 3-5 cm. long by 3 cm. wide, yellowish or pale brown; apophyses broadly ovate, slightly flattened, with an inconspicuous central umbo. Seeds with an ovoid, dark yellowish-gray nut 6 mm. long by 3 mm. wide, wing to 18 mm. long.
N.E. China: Manchuria; E. Korea; Japan, 800-920 m..

P. DENSIFLORA var. FUNEBRIS (Kom.) Liou et Wang Sikhote Red Pine

A tree 6-12 m. tall, with a spreading and bushy crown. Bark gray, reddish on branches. Wood resinous. Branchlets smooth, yellowish or reddish. Buds 3.5 mm. long, reddish-brown, slightly resinous or non-resinous; scales triangular, free, somewhat reflexed. Sheath 6 mm. long, dark brown, fringed gray. Needles in twos, dark green, 4.5-6.5 cm. long or slightly longer by 1 mm. wide, straight, scabrous on the margins, thick. Male strobili with dense aments, spire-like, with short scale-like stamens, apical appendages of connectives membraneous. Female cone gray to yellowish-brown, to 5 cm. long; apophyses rhombic, nearly flattened, with a minute fine central umbo.Seeds with a large wing, half as long as the body.
N.E. Korea; N.E. China: S.E. Kirin; U.S.S.R.: Sikhote Alin Mts., 500-1600 m..

P. DOUGLASIANA Mart. Douglas Pine
=P. martinezii E. Larsen, =P. maximinoi Moore, =P. tenuifolia Bentn.

A tree 20-45 m. tall, with a dense, heavily branched, rounded crown. Bark rough, dark brown, divided into irregular, plate-like scales. Branchlets fine, glaucous, rarely pruinose. Buds ovoid-cylindric, non-resinous, reddish-brown. Sheath persistent. Needles in fives, light green, slender, sometimes glaucous, drooping, 25-30 cm. long by 0.75-1.1 mm. wide, serrulate, stomata on most surfaces, with hypodermal intrusions; resin canals median, 3. Female cone falling intact, not leaving a few basal scales on the branchlet, on a peduncle 1.2 cm. long, quickly deciduous, 5-10.5 cm. long; apophyses ovate, somewhat flattened, with a small central umbo. Seed dark brown,small, with a long wing.
W. Mexico: S.E. Sonora to S. Mexico, D.F., 1830-2700 m..

P. DURANGENSIS Mart. Durango Pine

A tree 20-40 m. tall, to 1.20 m. in girth, with a dense, rounded crown. Bark gray-brown, prominently fissured. Branchlets slightly glaucous, greenish-brown, pubescent. Buds usually non-resinous, conical, bright red-brown, 1.5 cm. long. Sheath persistent, 2 cm. long, red-brown, fringed white. Needles in fives, sparsely arranged,sometimes up to eight per bundle, fine, flexible, 10-22.5 cm. long, serrulate, light gray-green, stomata on most faces, apex spiny and clear; resin canals median, 2-5. Female cone in groups of 1-3, on a short peduncle, ovoid-conical, 7-10 cm. long; apophyses swollen, triangular, with a thick small reflexed central umbo. Seeds with a gray nut to 5 mm. long, wing 12-14 mm. long. Seedlings go through a distinct grass-like stage for 2 years or more.
W. Mexico: E. Sonora to N. Michoacan, 2500-2800 m..

P. ECHINATA Mill. Shortleaf Pine

A tree 21-30 m. tall, 0.5-0.9 m. in girth, with a broad, open crown. Bark reddish-brown, flattened, divided into plates. Branches divided into small branchlets. Branchlets smooth, red-brown; young branchlets pale green, tinted violet with a glaucous bloom. Buds ovoid-oblong, resinous, 6 mm. long, shiny brown. Sheath persistent, 6 mm. long. Needles in twos, rarely threes, or fours sometimes, dark blue-green, slender, flexible, 7-11 cm. long by 1-1.5 mm. wide, persist 2-5 years, slightly twisted, finely serrulate, stomata on 2 faces; resin canals median, in 2 angles, 1-2. Female cone in groups, conical or narrowly egg-shaped, subsessile, symmetrical, somewhat persistent, short-stalked, 4-8 cm. long by 2.5-3 cm. wide, dull brown; apophyses ovate, slightly swollen, with a fine decurved central umbo; cones opening at maturity. Seeds with a gray-black nut to 6 mm. long by 3 mm. wide, wing to 16 mm. long.
E. United States: S.E. New York to N.W. Florida to W. Texas, 1006-3300 m..

P. ELLIOTII Engelm. Slash Pine

A narrowly conical tree 8-30 m. tall, 0.6-0.8 m. in girth, with a straight trunk, and with horizontal branches. Bark gray, fissured into large, flat, orange-brown or reddish plates; on young trees blackish-gray and furrowed. Branchlets gray-brown. Buds 1.2 cm. long by 6 mm. wide, brown; scales acuminate, whitish at the margins. Sheath slightly persistent, 9-18 mm. long. Needles in twos or sometimes threes, rigid, acute, narrowly serrulate, 18-30 cm. long, stiff, shiny green, stout; resin canals internal, 2-9, (median 1-2). Female cone on a recurved peduncle, narrowly ovoid to cylindrical, 7.5-15 cm. long by 4.5-5.5 cm. wide, bright brown to dark brown, flattened at the bottom; apophyses broadly ovate, slightly keeled, slightly swollen to nearly flattened, with a fine central umbo 1-2 mm. long. Seeds with a dark nut 6-7 mm. long, with a wing 20 mm. long.

U.S.A.: E. Louisiana to N. Florida to S. South Carolina, 0-152 m..

P. ENGELMANNII Carr. Apache Pine
=P. arizonica var. stormiae Mart., =P. engelmannii var. blancoi (Mart.) Mart.

A tree 15-35 m. tall, to 0.6 m. in girth, with a rounded, irregular crown of spreading, horizontal branches. Trunk with a straight central leader. Bark dark brown to blackish-gray, rough, deeply furrowed into scaly plates. Branchlets gray-brown. Buds conical, resinous; scales acuminate, long, laciniated. Sheath persistent. Needles in threes, rarely 5 per bundle, clustered at ends of the branchlets, dull dark green, 30-40 cm. long, rigid, serrulate, stomata on all faces, persist 2 or more years, spread widely or drooping; resin canals median, 2-8. Female cone on a short peduncle, opening and shedding at maturity but leaving a few basal scales on the branchlet, ovoid to conical, somewhat curved, shiny light brown, 10-15 cm. long; apophyses ovate, slightly protuberant and swollen; with a long, thick, decurved, apical umbo. Seed with a dark brown nut 8-9 mm. long and a wing to 20 mm. long or more.

U.S.A.: S.E. Arizona to S.W. Zacatecas, Mexico, 1524-2499 m..

P. FENZELIANA Hand.-Mzt. Fenzel Pine

A tree to 50 m. tall, to 2 m. in girth. Bark brown, flaky. Branchlets smooth, brown, 2 mm. in diameter. Buds ovoid, brown, 2.5 cm. long; scales triangular, lanceolate, ciliate; resinous. Sheath deciduous. Needles in fives, 6.5-12.5 cm. long or slightly longer, by 0.5-0.7 mm. wide, fine, slightly twisted, flexible, dark green, with 4-5 white lines of stomata on the inner surfaces; resin canals marginal, 3. Male strobili with 8-12 bracts. Female cone on a peduncle 2 cm. long, ovoid-cylindric, brown, opening upon maturity, 6-10 cm. long by 3-6 cm. wide; apophyses flattened, thin, ovate, apex slightly incurved, apophyses prominently ridged and nearly square-edged at the apex, with an inconspicuous blunt apical umbo. Seeds with a nut 8-15 mm. long by 5-8 mm. wide; with a small wing 2-4 mm. long or somewhat longer, probably not persistent on the nut.

China: N.E. Kwangsi; N.W. Kwangtung; Kweichow; Hainan Island; C. Vietnam, 1000-1600 m..

P. FLEXILIS James Limber Pine

A tree 12-25 m.tall, 1-1.50 m. in girth, with a broad, rounded crown, with rows of stout branches nearly to the base. Short-trunked and becoming a windswept deformed shrub at timberline.Bark smooth, then dark brown, furrowed into scaly ridges or plates. Branchlets flexible, covered by foliage, slightly pubescent, somewhat glandular, yellowish-green turning dark brown or gray. Buds broadly ovoid, resinous, 9 mm. long, scales free at the apex. Sheath deciduous. Needles in fives, persist 5-6 years, rigid, straight or slightly curved, 3-9 cm. long by 1 mm. wide, light gray-green to bluish, white stomata on 3 faces, margins entire or slightly serrulate; resin canals marginal, 1-3; apex long-pointed. Female cones in groups of 1-4, on a short peduncle, ovoid to nearly cylindrical, resinous, opening at maturity, glossy yellowish-brown to brown, 6-15 cm. long by 5-6 cm. wide; apophyses thick, somewhat flattened, broadly ovate to rounded, with an inconspicuous apical umbo that is not reflexed. Seed dark brown, nut 1.4 cm. long by 8 mm. wide, wingless or nearly wingless.

S. Canada; W. United States, Rocky Mountains, 1524-3658 m..

P. GERARDIANA Wall. ex D. Don Chilgoza Pine

A tree to 25 m. tall, with a dense, open, rounded crown . Trunk 1.8-3.6 m. in girth. Bark pinkish-gray, multicolored, papery, scaly, later becoming more silvery-gray and plate-like. Branchlets thick, smooth, olive-green. Buds conical, acuminate, resinous. Sheath usually deciduous in the second year. Needles in threes, 6-10 cm. long, dull green, persist 3 years, fine, serrulate, sometimes bluish-green, stomata in 4-5 ranks on 3 faces, with 3-7 marginal or submarginal resin canals. Female cones deciduous, ovoid-cylindric, 12-20 cm. long by 9-11 cm. wide, resinous; apophyses thick, protuberant, reflexed, with a small apical umbo. Seeds oblong-cylindric, oily, nut 2-2.7 cm. long by 8-9 mm. long, with a short articulate wing. Seeds have a short viability period.
E. Afghanistan; N. West Pakistan; N. India; China: S.W. Tibet, 1600-3300 m..

P. GLABRA Walt. Spruce Pine

A tree 24-27 m. tall, with a long narrow crown and horizontal branches. Bark dark gray, smooth, becoming furrowed into flat scaly ridges. Buds ovoid, brown, scales with pale fimbriate margins. Sheath short. Needles usually in twos, slightly flattened, slightly twisted, dark green, persist 2-3 years, 4-10 cm. long, slender, with numerous stomata on 2 faces; resin canals median or internal, in small 2 angles. Female cone conical or narrowly ovoid, reddish-brown, nearly stalkless , opening at maturity; apophyses ovate, slightly swollen, with a small sharp central umbo.Seeds with a triangular nut to 6 mm. long by 2 mm. wide, wing to 12 mm. long.
U.S.A.: E. Louisiana to N. Florida to S. South Carolina, to 152 m..

P. GREGGII Engelm. ex Parl. Gregg Pine

A broadly conical tree 10-15 m. tall, with somewhat ascending branches. Bark smooth, gray, becoming dark red-brown and fissured. Branchlets smooth, whitish-green and glaucous, becoming gray. Buds oblong-cylindric, 1.5 cm. long, bright chestnut-brown, acute, non-resinous, scales free at the apex. Sheath 1.5 cm. long, persistent. Needles in threes, bright green, 7.5-15 cm. long, persist 3-4 years, serrulate, with faint stomata on most surfaces; resin canals median, 2-6. Female cone narrowly ovoid-conical, stalkless, persistent, serotinous, 6-12 cm. long, yellowish to pinkish-brown; apophyses ovate, flattened or slightly swollen, with an inconspicuous central umbo. Seeds with a blackish-brown nut 6 mm. long, wing to 20 mm. long.
E. Mexico: S.E. Coahuila; W. Neuvo Leon; S.E. San Luis Potosi to W. Vera Cruz, 2000-2700 m..

P. HALEPENSIS Mill. Aleppo Pine
=P. maritima Lamb.

A tree to 20 m. tall, with a broadly rounded crown, trunk somewhat twisted. Bark silvery-gray turning red-brown, deeply fissured and plate-like, inner-bark orange. Branchlets fine, smooth, yellowish-gray and glaucous. Buds ovoid-cylindric, non-resinous, 5-10 mm. long, yellowish-brown to dark brown, scales fringed and recurved. Sheath persistent, 8 mm. long, gray-brown. Needles in twos, closely appressed to the branchlet and pointing forwards, persist 2 years, bright or gray-green, 6-15 cm. long by 0.7-1 mm. wide, serrulate,

stomata on 2 faces, fine, erect, stiff; resin canals marginal, 3-8. Female cone singular, on a recurved peduncle 1-2 cm. long, ovoid-conical, somewhat serotinous, maturing in 3 years, 5-12 cm. long by 4 cm. wide, shiny yellowish-brown; apophyses broadly ovate, somewhat flattened, with an inconspicuous central umbo. Seed with an ovoid, blackish-brown nut 6-7 mm. long, wing to 20 mm. long.
Mediterranean Region, widespread, 1500-2700 m..

P. HARTWEGII Lindl. Hartweg Pine
=P. rudis Endl.

A narrow tree 15-30 m. tall, with a large rounded crown. Bark reddish-gray, plate-like. Branchlets pale green, bloomed violet. Buds ovoid, pointed, pale pink-brown, somewhat resinous, scales free at the apex. Sheath persistent, scaly at the base. Needles in fives, sometimes in threes or fours, rigid, serrulate, 6-16 cm. long, gray-green or glaucous, with stomata on most surfaces; resin canals median, usually 6. Female cone broadly ovoid, semi-persistent, somewhat curved, 5-12 cm. long, blackish-brown to nearly black; apophyses slightly flattened, ovate, with a small central umbo. Seeds with a small blackish nut and a deciduous wing to 12 mm. long.
Mexico: central and southern areas; S. Guatemala; N.W. El Salvador, 2438-3800 m..

P. HELDREICHII Christ Heldreich Pine

A pyramidal tree to 20 m. tall, with an irregular, rounded crown and with wide-spreading branches. Bark dark gray, fissured into plates. Branchlets thick, smooth, gray-glaucous. Buds broadly ovoid, dark brown, non-resinous, scales gray-white at the apex. Sheath persistent, 1.2 cm. long. Needles in twos, rigid, somewhat incurved, persist 5-6 years, serrulate, bright green, 6-9 cm. long by 1.5 mm. wide, stomata on 2 surfaces; resin canals median, 2. Female cones in groups of 1-3, ovoid, deciduous, 7-8 cm. long by 2.5 cm. wide, yellowish or brown; apophyses ovate, slightly swollen, with a small central umbo. Seeds elliptic, nut 6-7 mm. long, wing 20 mm. long or longer.
S.W. Bulgaria: N.E. Greece, Balkan Mountains, to 2000 m..

P. HELDREICHII var. LEUCODERMIS (Ant.) Markgr. ex Fitsch. Bosnian Pine

A pyramidal tree to 30 m. tall, to 1.8 m. in girth, with ascending branches. Bark smooth, greenish-gray, becoming gray and plate-like, inner-bark yellowish. Branchlets smooth, glaucous then whitish-gray. Buds broadly ovoid, non-resinous, 1.5-2 cm. long , relatively wide, white pointed, scales brownish. Needles in twos, 6-9 cm. long by 1.2 mm. wide, in tufts at tips of branchlets, bright to dark green, serrulate, with stomata on 2 surfaces; resin canals median, 4-6. Female cone in groups of 1-4, ovoid, deciduous, 7-8 cm. long by 2.5 cm. wide, yellowish or dull orange-brown; apophyses ovate, with a small recurved central umbo. Seeds with a nut 5-7.5 mm. long, wing to 20 mm. long or more.
W. Yugoslavia; Albania; N.W. Greece.

P. INSULARIS Endl. Khasi Pine
=P. kesiya Royle ex Gord., =P. langbianensis A. Cheval.

A tree to 30 m. tall, with a large crown, with spreading horizontal branches. Bark red-brown,plate-like . Branchlets fine, smooth, bright brown. Buds oblong-cylindric, brown, scales free at the apex. Sheath persistent, gray, 8-18 mm. long, lacerated at the margins. Needles in threes, seldom in twos, persist 2 years, finely serrulate, fine, 12-24 cm. long by 0.5 mm. wide, acuminate, bright green or gray-green, somewhat twisted, stomata on most surfaces; resin canals marginal, 2-5. Female cones in groups of 1-3, on a short thick peduncle, ovoid, symmetrical or oblique, 4.5-6 cm. long, bright brown; apophyses ovate, swollen, slightly protuberant, ridged in the center, without many markings, apophyses with a small thick sharp central umbo. Seeds with a nut 5-8 mm. long, wing to 16 mm. long.
N.E. India; S.E. China: N. Burma to S. Vietnam; N.W. Philippines, 800-2300 m..

P. INSULARIS var. YUNNANENSIS (Franch.) Silba Yunnan Pine

A conical tree 18-30 m. tall, becoming flat-topped, with short branches. Bark reddish-brown, fissured, plate-like on larger limbs. Branches somewhat pendent. Branchlets rigid, robust, red-brown to pinkish. Buds ovoid, 11 mm. long, shiny red-brown, with long triangular scales, scales fringed and free. Sheath pale gray-brown or blackish, 1-1.8 cm. long. Needles in threes, sometimes twos, 10-30 cm. long by 1.2 mm. wide, pendent, serrulate, gray-green, serrulate, with 10 ranks of stomata on the inner face, finer, straighter; resin canals marginal, 6. Female cone on a short peduncle, ovoid-conical, 6-10 cm. long by 6-7 cm. wide, slightly curved, yellowish turning shiny chocolate-brown; apophyses ovate, slightly protuberant to somewhat flattened, with prominent ridges with many markings and with a minute central umbo. Seeds with an ovoid pale gray nut 8-10 mm. long, wing to 20 mm. long.
China: S. Szechuan to N.W. Kwangsi, 2200-3400 m..

P. JEFFREYI Grev. et Balf. ex A. Murr. Jeffrey Pine

A conical tree 24-39 m. tall, 0.6-1.2 m. in girth or more, with an open crown of upcurved spreading branches. Trunk straight. Bark purplish-brown, furrowed into narrow, scaly plates. Branchlets smooth, gray-green, bloomed white or glaucous, citrus scented. Buds conical, reddish, 3 cm. long, slightly resinous, scales free at the apex. Sheath persistent, 1.5 cm. long. Needles in threes, citrus-scented, finely serrulate, 12-25 cm. long by 2 mm. wide, light gray-green to dull bluish-green with broad white stomata on 3 faces; resin canals median, 2-3. Female cone on a short peduncle 1.5 mm. long or smaller, cone ovoid-conical, light reddish-brown, 14-30 cm. long by 4.5-8 cm. wide, glossy; apophyses broadly ovate, swollen, slightly protuberant, with a long thick decurved central umbo; cones opening upon maturity and leaving a few basal scales on the branchlet. Seed with an ovoid nut 1-1.4 cm. long by 6-8 mm. wide, wings to 25 mm. long.
U.S.A.: S.W. Oregon to N. Baja California, Mexico, 1067-3048 m..

P. KORAIENSIS Sieb. et Zucc. Korean Pine

A pyramidal tree 20-50 m. tall, to 3 m. in girth. Bark reddish-gray or brown-gray, smooth, divided into fine plates. Branchlets pubescent, yellowish-brown to pale orange-brown. Buds shortly pointed, oblong-cylindric, slightly resinous, dark chestnut-brown, 1-1.8 cm. long. Sheath quickly deciduous. Needles in fives, 6-12 cm. long by 1 mm. wide, persist 2 years or more, dark shiny green, bluish-white or yellowish on the internal faces, with white stomata on the two ventral faces; resin canals in angles, 2-3. Female cone on a short peduncle, ovoid-conical, yellowish-brown, 9-14 cm. long by 6-8 cm. wide, scales somewhat reflexed, opening upon maturity; apophyses thin, flattened, narrowly ovate, with a minute apical umbo. Seeds with a nut 1.25 cm. long by 9-11 mm. wide, gray-brown, wingless.

E. Korea; N.E. China; E. U.S.S.R.; C. Japan, 150-1800 m..

P. KREMPFII Lecompte Krempf Pine
=Ducampopinus krempfii (Lecompte) A. Cheval.

A tree 15-30 m. tall. Bark red-brown, smooth. Buds with short scales. Sheath minute, quickly deciduous. Needles in twos, flattened, sharply acute, 4-7 cm. long by 3 mm. wide or wider, thick, leathery, dark green, glossy; resin canals marginal, 6-12. Pollen grains 48 microns in diameter. Female cone ovoid, red-brown, opening at maturity, 7-9 cm. long; apophyses ovate, slightly swollen, with a small sharp pointed central umbo. Seed with a small nut and a wing to 7.5 mm. long or longer.

S. Vietnam, between Dalat and Nhatrang, 1300-2000 m..

P. LAMBERTIANA Dougl. Sugar Pine

A conical tree 30-49 m. tall, 0.9-1.8 m. in girth, with a long clear bole. Crown open with nearly horizontal branches, becoming flat-topped. Bark brown or gray, furrowed into scale-like ridges. Branchlets smooth to shortly pubescent, gray to reddish, thick, slightly glandular. Buds oblong-ovoid, resinous, red-brown, 3-8 mm. long. Sheath deciduous, 1.8 cm. long at first. Needles in fives, persist 2-3 years, twisted, 7-14 cm. long by 1.5-2 mm. wide, dark blue-green on 3 faces, with white stomata on all surfaces, margins finely serrulate except near the apex; resin canals marginal, 2. Female cone on a long peduncle, at ends of upper branchlets, narrowly cylindrical, shiny light brown, deciduous in the 3rd year, 25-50 cm. long by 8-11 cm. wide; apophyses thick, ovate, slightly swollen, relatively flat, basal apophyses reflexed, apophyses with a small blunt apical umbo. Seed with a dark brown nut 1.3-1.8 cm. long by nearly 1 cm. wide, wings 2-3 cm. long by 1.5 cm. wide.

U.S.A.: W. Oregon to N. Baja California, Mexico, 335-3200 m..

P. LAWSONII Roezl. ex Gord. Lawson Pine

A tree 20-25 m. tall, to 1.8 m. in girth, with an irregular crown. Bark red-brown, fissured, finely scaly. Branchlets yellowish, with a glaucous bloom. Buds cylindrical, non-resinous. Sheath persistent. Needles in threes, sometimes 4-5 per bundle, 14-24 cm. long, bluish-green, non-rigid, serrulate, slender; resin canals internal or median, 1-3. Female cone oblique, on a fine peduncle, dehiscent, ovoid, 5-7 cm. long, brown; apophyses ovate, slightly swollen or nearly flattened, with an inconspicuous flat central umbo. Seeds small, nut dark brown, with a longer dark brown wing.

S. Mexico: W. Jalisco to E. Oaxaca.

P. LEIOPHYLLA Schiede et Deppe Smooth-leaf Pine

A broadly conical tree 15-30 m. tall, with an open irregular crown and upturned branches. Bark dark brown or blackish, deeply furrowed into scaly ridges. Branches ascending, somewhat pendent later. Branchlets yellowish, leafy. Buds ovoid, small, non-resinous. Sheath quickly deciduous, 1 cm. long. Needles in fives, sometimes 3-4 per bundle, persist for 2 years, finely serrulate, 8-15 cm. long, blue-green to gray-green, stomata on all faces, apex shortly pointed, stout, stiff; resin canals median, 2-3. Female cones in groups of 1-7, on a peduncle 5-15 mm. long, serotinous, narrowly ovoid, fairly persistent, ripening in three years, 4-6 cm. long, shiny light brown to dark brown , opening at maturity, but remaining attached; apophyses narrowly ovate,flattened to slightly swollen, with a fine central umbo. Seeds with a small nut 3.5 mm. long, gray; wing to 16 mm. long, with long dark lines.

Mexico: E. Sonora to W. Oaxaca, 1524-3000 m..

P. LEIOPHYLLA var. CHIHUAHUANA (Engelm.) Shaw Chihuahua Pine

A tree 15-25 m. tall, 0.3-0.6 m. in girth, with a rounded crown. Bark gray-red becoming blackish, fissured into plates. Buds ovoid, small, non-resinous. Sheath deciduous. Needles in threes, rarely 2-5 per bundle, in tufts, thick, rigid, serrulate, 6-14 cm. long, pale green, stomata on 3 faces; resin canals median or internal, 3-7. Female cone on a peduncle 8-12 mm. long, fairly persistent, maturing in three years, broadly ovoid, 4-6 cm. long, somewhat shiny; apophyses broadly ovate, slightly swollen, with a minute central spine. Seeds with a small, gray nut, wing with dark lines.

U.S.A.: S.E. Arizona to S. Zacatecas, Mexico, 2134-2438 m..

P. LUCHUENSIS Mayr. Luchu Pine

A slender tree 15-20 m. tall, 50-60 cm. in girth, with a crooked trunk. Bark smooth, gray, becoming finely fissured and plate-like. Branchlets yellowish-brown, somewhat glaucous. Buds ovoid-cylindric, 12 mm. long, slightly or non-resinous; scales triangular, fringed white, chestnut-brown. Sheath chestnut-brown to gray, pubescent, 0.8-3 cm. long, persistent. Needles in twos, rarely threes, 12-17 cm. long by 1 mm. wide, stiff, rigid, serrulate, stomata on 2 faces in 6-9 ranks; resin canals median, 2-7, 2 angled. Male strobili bluish. Female cone ovate-conic, symmetrical, brown, 3-6 cm. long; apophyses ovate, slightly swollen with a small central umbo. Seeds with a nut 5 mm. long, wings 7-8 mm. long.

S. Japan: Ryukyu Islands; Taiwan: Nanto Province, Horisha, to 200 m. or more.

P. LUCHUENSIS var. TAIWANENSIS (Hay.) Silba Formosan Red Pine
=P. hwangshanensis Hsia ex Tsoong.

A tree to 35 m. tall, with spreading, somewhat erect branches. Bark gray to purplish, with deep fissures and scaly plates. Branchlets scaly, blackish to tawny-red, smooth. Buds conical, 7 mm. long, non-resinous, chestnut-brown, scales with free tips. Sheath 5-8 mm. long, chestnut-brown then grayish. Needles in twos, thin, somewhat twisted, 5-9.5 cm. long by 1 mm. wide, sharp-pointed, close together near the ends of the branchlets; resin canals median, 2-5. Female cone ovoid to oblong-conic, somewhat greenish, 5-7 cm. long by 3.5-4 cm. wide; apophyses somewhat flattened, more rounded, keeled. Seeds with an ovoid nut 4.5 mmm. long; wing to 12 mm. long, reddish.
S.E. China and E. Taiwan, 700-3000 m..

P. LUMHOLTZII Robins et Fern. Lumholtz Pine

A tree 15-20 m. tall, 25-40 cm. in girth, with a rounded crown. Bark reddish-brown, scaly, becoming dark gray-brown and thick with age. Branches long and pendent. Branchlets flexible, chestnut-brown. Buds oblong, slightly resinous, chestnut-brown, scales narrow and small. Sheath long, quickly deciduous. Needles in threes, sometimes 2-4 per bundle, pendent, finely serrulate, 18-30 cm. long, stomata on 3 faces; resin canals median and internal, 4-9. Female cone solitary, narrowly ovoid, symmetrical, quickly deciduous, on a peduncle 1-1.5 cm. long, cone dull pale brown, 4-6 cm. long; apophyses ovate, slightly swollen, with a fine small central umbo. Seeds with a small dark brown nut and with an articulate wing.
W. Mexico: S.E. Sonora to W. Jalisco, 1830-2438 m..

P. MASSONIANA Lamb. Masson Pine
=P. massoniana var. hainanensis Cheng et Fu

A tree 25-30 m. tall, with irregular spreading branches, eventually becoming flat-topped. Bark dark gray, fissured; reddish and plate-like on large limbs. Branchlets smooth, narrow, orange-yellow to yellowish-brown. Buds broadly and finely pointed, cylindrical, 12 mm. long, slightly resinous; scales loose, fringed and reflexed at the apex. Sheath persistent, 7-8 mm. long, chestnut-brown, fringed gray. Needles in twos, very slender, 14-20 cm. long by 0.5-1 mm. wide, bright green, finely serrulate, stomata on most surfaces, shortly apiculate, often twisted; resin canals marginal, 5-9. Female cones in groups of 1-3, on a short peduncle, dehiscent, deciduous or persisting up to 3 years, symmetrical, narrowly ovoid, 4-8 cm. long by 3 cm. wide, yellow-brown to chocolate-brown; apophyses ovate, rounded, slightly swollen, with a minute fine central umbo. Seeds with a brown nut 5 mm. long by 2.5 mm. wide, wing to 12 mm. long.
C. China; N. Taiwan; N.E. Vietnam, 300-1500 m..

P. MASSONIANA var. HENRYI (Mast.) Wu Henry Pine

A tree to 12 m. tall. Branchlets grooved, yellowish-brown, pubescent. Buds 11 mm. long, reddish-brown, non-resinous; scales triangular, reflexed. Sheath persistent, 6-10 mm. long, yellowish-gray then grayish. Needles in twos, stout, 8-11 cm. long by 1 mm. wide, straight. Female cone ovoid, yellowish-gray, 5.5 cm. long; apophyses ovate, slightly swollen with an indented blunt central umbo. Seeds with an ovoid nut 7 mm. long by 3 mm. wide, white mottled brown; wing to 13 mm. long, reddish.
China: E. Szechuan; W. Hupeh; S. Shensi, 1150-2050 m..

P. MAXIMARTINEZII Rzedowskii Bigcone Pinyon Pine

A tree 6-10 m. tall, to 0.5 m. in girth, with an open, rounded crown, frequently branched from the base. Bark irregularly checkered. Buds conical, 12-13 mm. long, non-resinous, scales acute-triangular. Sheath curls to form a basal rosette, 4 mm. long, light brown; 7-8 mm. long on young plants and chestnut-brown. Needles in fives, 9-13 cm. long, fine, light gray-green, with internal white stomata, margins entire or denticulate; apex obtuse to acute, curved, yellowish; resin canals 2. Female cone oblong-ovoid, 19-21 cm. long by 11-15 cm. wide, chestnut-brown turning gray, very resinous; apophyses ovate, prominently protuberant, with an inconspicuous central umbo, that is blunt. Seeds dark brown, 2-2.6 cm. long by 1-1.2 cm. wide, wingless. Cotyledons 18-23, the largest number of any Pinus thus far.
Mexico: S.E. Zacatecas, near Juchipila, 1700-2100 m..

P. MERKUSII Jungh. et de Vriese Merkus Pine
=P. latteri Mason

A conical tree 18-30 m. tall, often becoming round-topped. Bark gray-brown, deeply fissured. Branchlets pubescent. Sheath persistent, 1.2-1.8 cm. long, reddish. Buds deep brown, long, narrow; scales imbricate, awl-shaped, whitish on the margins. Needles in twos, sometimes in threes, 17-25 cm. long by nearly 1 mm. wide, bright green, serrulate, stomata on all faces, falling in the second year, apex shortly pointed; resin canals median, 2-3. Female cone narrowly-cylindric, on a narrow peduncle, cone 6-13 cm. long by 3-3.5 cm. wide, shiny reddish-brown, deciduous; apophyses triangular, slightly swollen, with a small central umbo. Seeds with an ovoid nut 6 mm. long; wing to 16 mm. long by 6 mm. wide, pale reddish.
E. Burma to S. Vietnam; Indonesia: N. Sumatra; E. Philippines, 300-900 m..

P. MICHOACANA Mart. Michoacan Pine
=P. michoacana var. cornuta Mart.

A tree 20-30 m. tall, with a dense,rounded crown. Bark red-brown, furrowed into scaly plates. Branchlets dark brown. Branches long, slender, horizontally spreading. Buds narrowly ovoid, resinous, red-brown. Sheath long, persistent, slightly resinous. Needles in fives, 25-30 cm. long, spreading and drooping, flexible, serrulate, stomata on all surfaces; resin canals median, 3. Female cone on a short peduncle, oblong-ovoid, 25-30 cm. long, deciduous, yellowish-brown; apophyses ovate, slightly swollen, with a small fine central umbo. Seeds with a brown nut to 8 mm. long; with a long,striated wing.
Mexico: S. Zacatecas to N. Chiapas, 914-2700 m..

P. MICHOACANA var. QUEVEDOI Mart. Quevedo Pine

A tree 15-30 m. tall, 50-75 cm. in girth, with spreading branches and an irregular habit, pyramidal becoming somewhat round-topped. Bark red-brown, fissured. Branchlets dark brown. Buds conical, resinous. Sheath persistent, 2.5 cm. long on young plants. Needles in fives, sometimes 6 per bundle, 28-38 cm. long, dark green, serrulate, stomata on most surfaces; resin canals median, 3-6. Female cone ovoid, attenuate at the base, 7-10 cm. long, bright yellowish-brown, shiny, on a peduncle 8 mm. long that is curved; apophyses narrowly ovate, slightly swollen, with a small central umbo. Seeds with a nut 5-7 mm. long by 4-5 mm. wide, wings to 20 mm. long by 8 mm. wide.
Mexico: S.W. San Luis Potosi, 2134-2286 m..

P. MONOPHYLLA Torr. et Frem. Single-leaf Pinyon Pine
=P. edulis var. fallax Little

A shrub or small tree 5-9 m. tall, 0.3-0.5 m. in girth, with a spreading, rounded crown and with low, horizontal branches. Bark dark brown or gray,smooth, later furrowed into scaly plates. Branchlets robust, orange becoming dark brown. Buds pale chestnut-brown, scales ovoid-obtuse. Sheath 1-1.2 cm. long, forming a basal rosette, deciduous after the first year. Needles singular or rarely in twos, rigid, thick, sharp pointed, 2-5.5 cm. long, straight or slightly curved, dull gray-green to bluish-green, resinous, with numerous stomata, margins entire, persist 4-6 years; resin canals marginal, 0-9. Female cone deciduous, broadly ovoid, 3-6 cm. long by 3-6 cm. wide, shiny chestnut-brown; apophyses broadly ovoid, thick, somewhat protuberant, with a small central umbo. Seeds oblong, rounded at the base, 1.5-2 cm. long by 4-10 mm. wide, wingless.
U.S.A.: S. Idaho to N. Baja California, Mexico, 1067-2134 m..

P. MONOPHYLLA var. EDULIS (Engelm.) M.E. Jones Colorado Pinyon Pine

A small, bushy tree 4.6-10.7 m. tall, 0.3-0.6 m. in girth or more, with a rounded, spreading crown. Trunk short and compact. Bark gray to reddish-brown, furrowed into scaly ridges. Branchlets robust, orange turning bluish, bloomed red. Buds ovoid, acute, 8-12 mm. long, chestnut-brown. Sheath 8-12 mm. long, forming a basal rosette. Needles in twos, rigid, persist 4 years or more, 2-3.5 cm. long, stout, light to dark green, margins entire, stomata on all faces; resin canals marginal, 1-10. Female cone deciduous, broadly ovoid, resinous, yellowish-brown, 4 cm. long by 3.5 cm. wide; apophyses ovate, swollen, somewhat protuberant, with a small incurved central umbo; cones opening and shedding upon maturity. Seeds red-brown, ovoid, 1-1.4 cm. long by 0.9 cm. wide, thick-shelled, oily, wingless.
U.S.A.: S. Wyoming to S.W. Texas, Rocky Mts., 1524-2134 m..

P. MONTEZUMAE Lamb. Montezuma Pine
=P. montezumae var. lindleyi Loud.

A slender tree 21-30 m. tall, with ascending branches, becoming round-topped with age. Bark red-brown, fissured. Branchlets smooth, thick, red-brown, rigid. Buds ovoid, 2.4 cm. long, slightly resinous, deep red-brown, scales fringed brown. Sheath 3-5 cm. long, persistent, orange-brown. Needles in fives, sometimes 3-8 per bundle, rather sparse, somewhat pendent, persist 3 years, blue-green to gray-blue, 14-24 cm. long, serrulate, stomata on all faces, thick;

resin canals marginal or median, 3-9. Female cones in groups of 1-3, on a short peduncle, semi-persistent, broadly ovoid to narrowly cylindrical, pale yellowish-brown or reddish-brown, 8-15 cm. long; apophyses ovate, slightly swollen, with a small deciduous central umbo. Seeds with a dark brown, ovoid nut to 6 mm. long, wings to 25 mm. long.

E. Mexico; Neuvo Leon to C. Chiapas; S. Guatemala, 2438-3048 m..

P. MONTICOLA Dougl. ex D. Don — Western White Pine

A narrowly conical tree to 30 m. tall, to 0.9 m. in girth or more, with an open crown of horizontal branches. Trunk relatively straight. Bark gray, smooth, later furrowed into rectangular scaly plates. Branchlets with white pubescence, slightly glandular, yellowish or red-brown. Buds ovoid, acute, resinous, 1.2 cm. long, gray-brown, with long free scale tips. Sheath deciduous, 1.5-1.8 cm. long. Needles in fives, persist 3-4 years, slightly twisted, finely serrulate, slightly stout, 4-10 cm. long, blue-green, with white stomata on the inner surfaces, apex obtuse; resin canals marginal, 1-3. Female cones isolated or in groups of 2-5, on a short peduncle 1.5 cm. long, narrowly cylindrical, dehiscent, 10-25 cm. long by 5-6 cm. wide, pale brown to yellowish-brown, resinous; apophyses flattened, narrowly ovate, with a small blunt incurved apical umbo, basal apophyses reflexed. Seeds with a triangular nut 5-6 mm. long by 4 mm. wide; wings to 25 mm. long by 7 mm. wide.

S. Canada: S. British Columbia to C. California, U.S.A., 1067-2987 m..

P. MORRISONICOLA Hayata — Formosan White Pine

A tree 30-34 m. tall. Bark grayish-brown, smooth at first. Branches drooping at the tips. Branchlets smooth, glaucous. Buds oblique, ovoid, slightly resinous; scales triangular, margins ciliate. Sheath deciduous, obtuse, 7 mm. long. Needles in fives, 4-9 cm. long by 0.6-1 mm. wide, rigid, with 6-7 inconspicuous bands of stomata on the inner faces; resin canals marginal, 2-4 . Male strobili with 8-12 bracts. Female cone on a peduncle 1 cm. long, ovoid-elliptic, pale brown, opening upon maturity, 7-11 cm. long by 5-7 cm. wide; apophyses broadly ovate, somewhat flattened and reflexed at the apex, with a thin blunt small apical umbo. Seeds with a nut 10 mm. long by 5-6 mm. wide, wings to 20 mm. long.

C. Taiwan: Mount Morrison, 300-2300 m..

P. MUGO Turra — Scrub Mugo Pine

A shrub to 2 m. tall, with ascending branches. Bark dull gray, scaly. Branchlets green turning dark brown. Buds ovoid-cylindric, resinous, 6 mm. long, scales appressed. Sheath deciduous, 1.5 cm. long, gray to dark brown. Needles in twos, persist 2-5 years, serrulate, 3-8 cm. long by 1.5-2 mm. wide, bright dark green, acutish, stout, crowded, curved forwards, widely spreading, with faint stomata; resin canals usually absent, sometimes marginal. Female cone nearly sessile, dehiscent, symmetrical, 2-5 cm. long by 1.5 cm. wide, shiny dark brown; apophyses ovate, slightly swollen, with a fine central umbo. Seeds with an ovoid, gray-brown nut 3-5 mm. long; wings broad and short, 9-12 mm. long.

C. Europe: E. Spain to Ukraine, U.S.S.R..

P. MUGO var. ROSTRATA (Ant.) Gord. Giant Mugo Pine
=P. ceciliae Lorens,=P. uncinata Ramond ex De Candolle

A conical tree 25-30 m. tall, with an erect trunk and a single stem, crown rounded at the top. Bark gray, exfoliating in reddish plates. Branchlets green turning brown. Buds cylindrical, resinous, dark red-brown, short pointed, 6 mm. long. Sheath deciduous, 1.5 cm. long, dark brown. Needles in twos, persist 2-5 years, rigid, non-twisted, serrulate, 3-8 cm. long by 1.5-2 mm. wide, dark gray-green, with faint inner stomata; resin canals marginal, 2-6. Female cone in groups of 1-4, nearly sessile, narrowly ovoid-oblong, asymmetrical, 5-7 cm. long by 2 cm. wide, yellowish or dark brown; apophyses ovate, swollen, protuberant, protuberant and reflexed on one side of the cone near the base, with a short thick apical or central umbo. Seeds with a black, ovoid nut 5 mm. long; wings to 16 mm. long, apex obtuse.
C. Spain; S. France; Switzerland; N. Italy, 600-2100 m..

P. MURICATA D. Don Bishop Pine
=P. muricata var. borealis Axelrod, =P. muricata var. cedrosensis J.T. Howell, =P. muricata var. stantonii Axelrod, =P. remorata Mason

A conical tree 12-24 m. tall, 0.6-0.9 m. in girth, with a rounded or irregular crown and with stout spreading branches. Bark dark gray, furrowed into scaly plates, smooth on the branches. Branchlets thick, smooth, green turning red-brown. Buds ovoid-cylindric, dark brown, with abundant white resin, 1.2-2.4 cm. long. Sheath persistent, 12-15 mm. long. Needles in twos, rarely in threes, persist 3-4 years, twisted, bluntly pointed, stiff, dull dark green, slightly flattened, 10-15 cm. long by 2 mm. wide, serrulate, stomata on all faces; resin canals median, 2-6. Female cones numerous, in groups, sessile, conical or oblique, serotinous, remaining closed, retained on trees up to 20 years, ovoid-conical, 5-9 cm. long by 4-7 cm. wide, yellow-brown to shiny chestnut-brown; apophyses ovate, swollen, usually protuberant near the base on one side of the cone, with a stout short fine central umbo. Seeds with a black, triangular nut 6 mm. long by 3 mm. wide; wings brown. 15 mm. long by 5 mm. wide.
U.S.A.: W. California: N.W. Humboldt County to Santa Cruz Island, Santa Barbara County, and on Cedros Island, Baja California, Mexico, to 300 m..

P. NELSONII Shaw Nelson Pinyon Pine

A bushy tree 5-12 m. tall, 0.76 m. in girth, with several straight stems and an irregular crown. Bark smooth, gray, later red-brown and scaly. Branches long, glaucous, chalky-white, somewhat flexible. Buds subcylindric with long, tapering, fine scales, 1 cm. long, pale pink-brown, tips free and recurved. Sheath persistent, brown, 7 mm. long. Needles in threes, 6-9 cm. long, light green outer-surface, gray-blue inner-surface; stomata on all faces, in 1-2 ranks on the inner-faces; resin canals marginal, 0-2. Female cone on a long peduncle, symmetrical, remains 3 years on the branches, nearly globose, 6-12 cm. long, orange-red; apophyses broadly ovate, slightly swollen, with a small central spine. Seeds oblong, 1 cm. long, brown, tinted yellow, wingless.
E. Mexico: S. Coahuila to N. San Luis Potosi, to 2134 m..

P. NIGRA Arn. Austrian Pine
=P. x banatica Georgescu et Ionescu,=P. nigra var. croatica Lovril,
=P. laricio Poiret

A conical tree 30-50 m. tall, with an irregularly rounded crown. Bark dark brown to blackish, fissured into scaly plates. Branches wide-spreading, sometimes upswept. Branchlets stout, rich brown, crowded with basal sheaths. Buds broadly ovoid, 1.2 cm. long, with an abrupt, tapered, sharp pointed apex; basal scales papery, whitish; resinous. Sheath 10-16 mm. long, persistent. Needles in twos, straight, 8-10 cm. long, dark bright blackish-green, pungent, stiff ; stomata in 14-16 ranks, faint; resin canals 5-10. Female cone ovoid-conical, yellow-brown turning brown, 5-8 cm. long; apophyses ovate, slightly swollen, flexible, with a minute fine central umbo. Seeds with a narrow nut and a wing to 20 mm. long.

E. Austria; N.E. Italy; Yugoslavia; W. Romania; Albania; Bulgaria and N. Greece, 250-1800 m..

P. NIGRA var. CARAMANICA (Loud.) Rehd. Crimean Pine

A broadly ovoid tree to 30 m. tall, with numerous ascending, vertical branches close to the central stem. Bark plate-like, exfoliating in cinnamon and yellow flaky scales. Branches long and stout. Buds conical, pale, whitish-brown; tips of scales gray, fringed, sometimes recurving. Needles in twos, appressed to the branchlet, stout, hard, stiff, 12-15 cm. long, dark green, slightly shiny, with fine stomatal lines, apex abruptly narrowed to a yellow spine; resin canals submarginal, 3-8. Female cone narrowly conical, shiny purplish-green then light brown, 6 cm. long by 3 cm. wide; apophyses ovate, swollen, slightly protuberant, obtusely keeled, with a small central umbo. Seeds with long wings.

S. Greece; W. Turkey; S.W. Cyprus.

P. NIGRA var. CEBENNENSIS (Gren. ex Godr.) Rehd. Pyrenean Pine

A narrowly conical tree to 20 m. tall, with an open, rounded crown. Bark deeply fissured into brown, pinkish-brown or grayish flaky ridges. Branches long and descending. Branchlets bright orange-brown, smooth, somewhat ridged, with purple-brown pulvini. Sheath 8-15 mm. long. Needles in twos, slender, gray-green, 15-17 cm. long by 1.1-1.2 mm. wide, non-pungent, with a short brown obliquely pointed apex; resin canals median, 4-15. Female cone ovoid-conical, obtuse, 6 cm. long by 3 cm. wide, with a smoothly rounded base, dull pale purplish-brown; apophyses ovate, flattened, smooth, with a transverse ridge, with a small central umbo. Seeds with a gray-brown nut 5 mm. long, with a long wing.

N.E. Morocco; E. Spain; S. France, Pyrenean Montains.

P. NIGRA var. MARITIMA (Ait.) Melv. Corsican Pine

A narrowly conical tree to 50 m. tall, with short ascending branches, becoming broader and flat-topped with age. Bark dark gray, rigid or plate-like, pale pinkish with scales. Branches notably level, with dense foliage. Branchlets thick, shiny orange-brown to reddish-brown. Buds narrowly conical, sharp pointed, 1.5-2 cm. long, red-brown tinted gray, covered with white resin; basal scales free, erect. Sheath persistent, 1-1.7 cm. long, later forming a basal rosette. Needles in twos, less crowded, shiny dark green to gray-green, spreading widely apart

and twisting, 11-18 cm. long, persist 2-5 years, serrulate; resin canals median, 2-12. Female cone deciduous in the third year, ovoid-conical, slightly curved, 6-7 cm. long by 3.5 cm. wide; apophyses ovate, pale gray-brown, with a small red-brown center and with a very short spiny central umbo. Seeds with a gray, broadly ovoid nut 5-7 mm. long by 3.5 mm. wide; wings to 20 mm. long by 6-8 mm. wide.

S. France, Corsica; W. Italy to E. Sicily.

P. OAXACANA (Mart.) Mirov — Oaxaca Pine
=P. pseudostrobus var. oaxacana Mart.

A tree 20-40 m. tall, with a slender crown of whorled branches. Bark dark gray-brown, furrowed. Branchlets thin, glaucous. Buds small, ovoid, slightly resinous. Sheath persistent, 1.8-2.8 cm. long. Needles in fives, 20.3-30.5 cm. long, fine, flexible, pendent, serrulate, stomata on most surfaces; resin canals median, 2-4. Female cone 1-3 in a group, on a thick peduncle, oblong-conical, 10-16 cm. long by 6 cm. wide, gray-brown; apophyses triangular-ovate, swollen, protuberant, especially protuberant near the base, with a short thick central umbo; cones deciduous, leaving a few basal scales on the branchlet after falling. Seed with a small dark brown nut and with a long blackish wing.

Mexico: Vera Cruz; Puebla; Guerrero; Mexico, D.F.; Chiapas.

P. OCCIDENTALIS Sw. — West Indies Pine
=P. maestrensis Bisse

A tree to 10 m. tall. Branchlets scaly, glaucous then orange-brown, slightly pubescent. Buds ovoid-cylindric, resinous, slightly pubescent, 11 mm. long, dark brown, scales triangular. Sheath 5-13 mm. long, gray-brown, slightly pubescent, persistent. Needles in twos, rarely threes, dark gray-green, 12.5-22 cm. long by 0.7 mm. wide, slightly twisted, thin; resin canals internal. Female cone ovoid, to 6 cm. long, gray-brown; apophyses ovate, warty, slightly swollen or slightly protuberant, with a small decurved central umbo to 1.5 mm. long. Seeds with a small nut and long wings.

S. Cuba; Haiti, 900-3000 m..

P. OCCIDENTALIS var. BAORUCOENSIS Silba — Hispaniola Pine

A tree to 10 m. tall, to 29.5 cm. in girth. Branchlets glaucous at first then gray-brown, scaly. Buds dark brown, ovoid, 9 mm. long, slightly resinous; scales ovate, fringed brown. Sheath 10-11 mm. long, persistent, gray-brown to chestnut-brown. Needles in fives, rarely 4 per bundle, 13-15.5 cm. long by 1.2 mm. wide, grayish-green, straight, apex spine-tipped. Female cone ovoid-cylindric, 6.5-7 cm. long, orange-brown to light gray; apophyses ovate, swollen, slightly protuberant, often with a fine prominent upcurved spine. Seeds with a narrow nut and a long wing.

Haiti: Fonds Varettes; Dominican Republic: Sierra de Baoruco and La Diferencia, 625-1310 m..

P. OCCIDENTALIS var. CUBENSIS (Sarg.) Silba — Cuban Pine

A moderately sized tree. Bark mottled, yellow-gray-brown-purple, thinly flaky. Branchlets glaucous then gray-brown, scaly, slightly pubescent at first. Buds oblong-cylindric, dark brown, to 14 mm. long, resinous, scales not free. Sheath to 6 mm. long, persistent, gray-brown. Needles in twos,

dull green, thick, stiff, straight, 10-14 cm. long, with stomatal bloom on most surfaces. Female cone ovoid-conical, 4.5 cm. long, reddish-brown; apophyses ovate and slightly flattened, indented in the center, with a fine upright central umbo. Seeds with a narrow nut and with long wings.
E. Cuba: Oriente Province.

P. OOCARPA Scheid. ex Schlecht. Oocarpa Pine
=P. oocarpa var. manzanoi Mart., =P. oocarpa var. microphylla Shaw

A tree 12-18 m. tall, with a dense, rounded crown. Bark dark gray, fissured. Branches horizontal, somewhat pendent. Branchlets brown, slightly glaucous. Buds ovoid-conical, resinous, shiny. Sheath persistent. Needles in fives, sometimes 3-4 per bundle, 15-30 cm. long, sea-green, serrulate, stomata on all faces; resin canals internal or septal, 1-8. Female cone on a long curved peduncle, broadly ovoid, very persistent, somewhat serotinous, yellowish-green turning light gray, 5-10 cm. long; apophyses broadly ovate, slightly swollen, with a small thick central umbo. Seeds dark brown, with a wing that is thickened at the base.
Mexico; C. Guatemala; Honduras; N. El Salvador; N. Nicaragua, 1524-2500 m..

P. PALUSTRIS Mill. Longleaf Pine
=P. australis Michaux

A tree 24-30 m. tall, 0.6-0.8 m. in girth, with an open, irregular crown and with sparse, spreading branches. Bark orange-brown, furrowed into scaly plates. Branchlets orange-brown to dark brown, smooth, turpentine scented. Buds large, white, non-resinous, 3.6-6 cm. long; scales fringed, recurved and silvery white on the margins. Sheath persistent, 2-2.5 cm. long. Needles in threes, persist 2 years, flexible, serrulate, 20-25 cm. long, bright green, densely crowded, spreading to drooping, stomata on 3 faces; resin canals internal, 2-3. Female cone deciduous, opening at maturity, subsessile, narrowly ovoid or cylindrical, dull brown, 15-25 cm. long; apophyses ovate, slightly swollen, with a prominent thick reflexed central umbo. Seeds with an ovoid nut 1 cm. long by 6 mm. wide, yellowish-brown; wings to 38 mm. long by 10 mm. wide. Seedlings go through a distinct grass-like stage; juvenile leaves to 45 cm. long.
U.S.A.: S.E. Texas to C. Florida to S.E. Virginia, 183-650 m..

P. PATULA Schiede et Deppe Mexican Weeping Pine
=P. oocarpa var. ochotereneri Mart.,=P. tecumumanii Schwerdtf.

A tree 20-35 m. tall, with a divided trunk, branching from the base, and with a widely ovoid crown. Bark with persistent, rolling scales, orange-red. Branchlets slightly pubescent, blue-green turning red-brown. Buds cylindrical, 1.2-2.5 cm. long, pale brown, non-resinous; scales free, non-reflexed. Sheath persistent, to 25 mm. long. Needles in threes, rarely 4-5 per bundle, pendent, flexible, slender, fine, persist 3-4 years, lying forwards, serrulate, 15-30 cm. long by 1 mm. wide, green bloomed glaucous to gray, with faint stomata in 3-6 ranks on most surfaces; resin canals median, 3-4. Female cones in groups of 2-6, stalkless, persistent, curved, ovoid-conical, 6-11 cm. long, shiny dark brown; apophyses ovate, slightly swollen, with a small central umbo. Seeds with a blackish nut 5 mm. long, with a brown wing 12-18 mm. long.
E. Mexico: S. Tamaulipas to C. Oaxaca; N. Guatemala, 1830-3048 m..

P. PATULA var. JALISCANA (Perez de la Rosa) Silba Jalisco Pine

A tree 12-25 m. tall, to 80 cm. in girth, with a compact, irregular crown. Bark gray-red, plate-like. Branchlets scaly, red-brown or red-yellow. Sheath persistent, 8-12 mm. long. Needles 3-5 per bundle, 12-16 cm. long by 6-8 mm. wide, yellowish-green, hypoderm continuous; resin canals 2-3, septal or 1-2 internal; needles usually in fives. Male strobili 1.3-1.8 cm. long by 4-5 mm. wide. Female cone on a peduncle 8-14 mm. long, serotinous, ovoid, pointed, 4.5-8.5 cm. long by 3.5-5.5 cm. wide, yellow brown; apophyses triangular, slightly swollen, with and indented fine small central umbo. Seeds with a nut 4-6 mm. long by 2-3 mm. wide, pale chestnut-brown; wings articulate, 13-17 mm. long by 6-8 mm. wide.

Mexico: N.W. Jalisco, El Tuito to Mascota, 850-1650 m..

P. PENTAPHYLLA Mayr. Northern Japanese White Pine

A conical tree 20-25 m. tall, with short,ascending branches. Branches relatively sparse. Branchlets pale gray, grooved. Sheath curling to form a basal rosette. Needles in fives, 3-8 cm. long by 0.75 mm. wide, fine, dark green, silvery on the inner-surfaces, straight, only slightly twisted. Female cone ovate-cylindric, yellowish-brown, attenuate near the apex, 4-7 cm. long; apophyses broadly cuneate or orbicular-obovate, flattened, thin, apex incurved, with a small blunt apical umbo. Seeds with a thin nut 6-9 mm. long by 3-5 mm. wide, brown; wings to 13 mm. long.

Endemic to northern Japan, north of Honshu.

P. PENTAPHYLLA var. HIMEOKOMATSU (Miy. et Kudo) Makino Southern Japanese
=P. parviflora Sieb. et Zucc., in part.

A conical tree 20-30 m. tall, becoming flat-topped. Trunk 0.9-1.5 m. in girth, with long, irregular, horizontal branches. Bark thin, smooth, gray, becoming fissured into blackish plates, inner-bark red-brown. Branchlets gray, minutely pubescent. Bud ovoid, 6 mm. long, slightly resinous, pale orange-brown; scales free at the apex. Sheath quickly deciduous. Needles in fives, 2-6 cm. long by 1 mm. wide, thick, prominently twisted, tufted, clustered at ends of branchlets, persist 3-4 years, dark blue-green on the outer surfaces, bright blue-white on the inner surfaces, margins finely serrulate, inner flat surfaces with white stomata, apex usually blunt; resin canals marginal, 2. Female cone ovate-oblong, opening at maturity, reddish-brown, rounded at the apex, 4-7 cm. long by 2.5-3.5 cm. wide; apophyses broadly orbicular, cuneate, thickerer, flattened, with a blunt apical umbo. Seeds with a dark brown nut 7 mm. long, relatively wide; wings shorter than the seeds, soon deciduous.

Endemic to southern Japan, Honshu southwards, 0-2500 m..

P. PEUCE Griseb. Macedonian Pine

A narrowly conical tree 20-30 m. tall, to 2 m. in girth, with short ascending branches, frequently branched from the base. Bark smooth, gray-brown, later fissured into small plates and purplish-brown. Branchlets thick, 3-4 mm. in diameter, smooth, shiny, green then gray-brown to orange-brown. Buds broadly ovoid, shortly acuminate, resinous, 9-10 mm. long by 3 mm. wide, reddish-yellow. Sheath deciduous, rich brown, papery, 1.8 cm. long. Needles in fives, persist 3 years, clustered at ends of branchlets, 7-12 cm. long by 0.7 mm. wide, bluish-green, straight, stomata on the ventral surfaces, serrulate on the 2 external faces, with wide dark green margins; resin canals marginal, 2-4. Female cone in groups of 1-4, on a short peduncle, deciduous, 8-15 cm. long by 2.5-3 cm. wide, resinous, pale green to yellowish-brown then bright brown, sometimes curved, narrowly cylindric; apophyses bluntly ovate, slightly flattened, with a small blunt apical umbo. Seeds with an ovoid nut 8 mm. long by 5 mm. wide; wing to 15 mm. long, obtuse, relatively broad.

S. Yugoslavia; E. Albania; S.W. Bulgaria; N. Greece, 800-2200 m..

P. PINASTER Ait. Maritime Pine
=P. maritima Mill.,=P. mesogeensis Fiesch. et Gauss.

A pyramidal tree 27-37 m. tall, 1.8-4.2 m. in girth, with a long clear bole and with an open, rounded crown. Bark thick, purplish-tan, fissured, forming red-brown plates. Branches numerous, slender, spreading, sometimes somewhat pendent. Branchlets thick, smooth, reddish-brown. Buds oval-oblong, red-brown, non-resinous, acute, 1.3-3.5 cm. long; scales reflexed, fringed, silvery on the margins. Sheath persistent, 2-2.5 cm. long. Needles in twos, rarely threes, persist 3 years, pungent, twisted, in tufts, 10-20 cm. long by 2 mm. wide,shiny green to gray-green, serrulate, stomata on all faces; resin canals median, 2. Female cones in groups of 2-7, on a short peduncle 1.5-2 cm. long, narrowly cylindrical, 9-18 cm. long by 5-8 cm. wide, bright orange-brown; apophyses broadly ovate, slightly swollen, sometimes protuberant near the base on one side of the cone, with a short thick central umbo. Seeds with an ovoid, gray-brown nut 8 mm. long by 4 mm. wide;wings to 25 mm. long by 7 mm. wide.

Western Mediterranean Region: E. Morocco to W. Italy, to 2000 m..

P. PINCEANA Gord. Pince Pinyon Pine

A tree 6-12 m. tall, 0.2-0.5 m. in girth, with many branches and with a dense, rounded crown. Bark gray. Branches long, slender, flexible, pendent, with smooth ashy-gray bark. Buds cylindrical, non-resinous, small, brown. Sheath revolute at the base, deciduous. Needles in threes, rarely 2 per bundle, slender, straight, 4-10 cm. long, pale green to glaucous-green, stomata on interior faces only, margins entire, apex bluntly acute; resin canals submarginal,2. Female cones on a slender peduncle 1-2 cm. long, cone ovoid, shiny cinnamon-brown, deciduous, 6-10 cm. long, non-resinous; apophyses broadly ovate, slightly swollen, convex in the center, with a small central umbo. Seed shiny dark brown, pale brown below, to 1.2 cm. long, relatively wide, wingless.

C. Mexico: S. Coahuila to C. Hidalgo, to 2100 m..

P. PINEA L. Italian Stone Pine

A slender tree to 25 m. tall, to 6 m. in girth, with a long clear bole and with a umbrella-like crown. Bark dark gray-brown, fissured into long, flat, orange-red plates. Branchlets fine, smooth, gray-green turning pale brown. Buds ovoid, chestnut-brown, non-resinous, pointed, 6-12 mm. long; scales free, recurved, fringed white at the margins. Sheath persistent, 1-1.2 cm. long, bright yellow-brown to gray-brown. Needles in twos, persist 2-3 years, slightly twisted, 10-20 cm. long by 1.5-2 mm. wide, bright dark green, stomata on the interior faces, apex with a yellow spine; resin canals median, 0-10. Female cone sessile, solitary or in groups of 2-3, broadly ovoid to nearly globose, deciduous, 8-14 cm. long, bright pale brown; apophyses broadly ovate, slightly swollen, with a blunt small thick central umbo. Seeds with a brown nut 1.5-2 cm. long by 7-11 mm. wide, thick-shelled, grooved; with a short deciduous wing 4-7 mm. long.

Northern Mediterranean Region: Portugal to Lebanon, to 600 m..

P. PONDEROSA Dougl. ex Laws. Ponderosa Pine

A conical tree 18-39 m. tall, 0.8-1.2 m. in girth, with a broad, open crown and with spreading branches. Bark blackish, furrowed, later yellowish-brown and divided into large plates. Branchlets thick, smooth, glaucous-green turning blackish-red-brown, turpentine scented. Buds cylindrical, conical, resinous, 2 cm. long, red-brown . Sheath persistent, 2.2 cm. long. Needles in threes, sometimes 2-5 per bundle, persist 3 years or more, rigid, strongly pointed, terpentine scented, 10-25 cm. long by 1.5 mm. wide, serrulate, dark yellowish-green, stomata on all faces, resin canals median. Female cone singular or 3-5 in a group, subsessile, symmetrical, ovoid-conical. nearly stalkless, 8-15 cm. long by 3.5-5 cm. wide, bright brown to light reddish-brown; apophyses broadly ovate, swollen, slightly protuberant, with a short stout central umbo. Seeds with an ovoid nut 6-9 mm. long by 5-7 mm. wide, brown. blackish below; wings 15-25 mm. long by 10 mm. wide.

Canada: S. British Columbia to S. California,U.S.A., to 2300 m..

P. PONDEROSA var. ARIZONICA (Engelm.) Shaw Arizona Pine
=P. englemannii var. blancoi (Mart.) Mart.

A tree 25-30 m. tall, with a straight trunk to 1 m. in girth. Bark deeply fissured, blackish-brown. Branchlets orange-brown turning gray-brown, later glaucous. Buds ovoid, pointed, slightly resinous, chestnut-brown; scales fringed. Sheath persistent, pale brown, 2-2.5 cm. long. Needles in fives, sometimes 3-4 per bundle, clustered at ends of branchlets, dark green, 7-17 cm. long by 1 mm. wide, finely serrulate, stomata on all surfaces; resin canals median, 5-10. Female cone on a short peduncle, quickly deciduous but a few basal scales remain attached to the branchlet, ovoid-symmetrical, 5-8 cm. long by 3-4 cm. wide, yellowish-brown or reddish-brown; apophyses broadly ovate, swollen, slightly protuberant, with a small stout central umbo. Seeds with a gray or blackish nut 3-4 mm. long, wing to 15 mm. long.

U.S.A.: S.E. Arizona to C. San Luis Potosi, 2134-2438 m..

P. PRINGLEI Shaw Pringle Pine

A tree 15-20 m. tall, with a rounded crown. Bark red then dark gray, scaly. Buds large, oblique, red-brown, slightly resinous. Sheath persistent, slightly resinous. Needles in threes, rarely 4 per bundle, rigid, serrulate, 15-25 cm. long, stomata on all surfaces; resin canals internal, 2-7. Female cone in tufts, on a short thick peduncle, ovoid-conical, non-symmetrical, persistent or serotinous, 5-10 cm. long, shiny brown; apophyses broadly ovate, slightly swollen, with a short blunt central umbo. Seeds with a small nut and with a wing to 16 mm. long that is broadened at the base.
S. Mexico: N. Michoacan to C. Oaxaca, 1500-2500 m..

P.PSEUDOSTROBUS Lindl. Mexican White Pine
=P. pseudostrobus var. coaptepecensis Mart.

A tree 15-60 m. tall, with horizontally whorled branches and with an irregular crown. Bark smooth, becoming furrowed, purple-gray-brown. Branchlets glaucous, pruinose. Buds ovoid, pointed, slightly resinous. Sheath persistent. Needles in fives, light to dark green, 18-25 cm. long, somewhat pendent, flexible, stiff, stomata on all faces, hypodermal intrusions rarely present; resin canals median, 2-4 at angles. Female cone on a peduncle 1-1.5 cm. long, deciduous but with a few basal scales remaining attached to the branchlet after shedding, narrowly ovoid, symmetrical, 8-14 cm. long, brown; apophyses ovate, slightly swollen, apex acute, with a fine central umbo. Seeds with a small nut 7 mm. long, brown; wings to 25 mm. long, brown with black streaks.
Mexico: W. Neuvo Leon to C. Chiapas; S. Guatemala; N. El Salvador; S. Honduras; W. Nicaragua, 2200-3500 m..

P. PSEUDOSTROBUS var. ALPULCENSIS (Lindl.) Mart. Alpulco Pine
=P. estevesii (Mart.) Perry

A tree 15-30 m. tall. Bark red-brown, fissured. Branchlets thin, glaucous-violet. Buds ovoid, chestnut-brown, slightly resinous. Sheath persistent, 1.5-2.5 cm. long, chestnut-brown. Needles in fives, sometimes 6-7 per bundle, 17-27 cm. long, flexible, serrulate; resin canals median, 3-4. Female cone broadly oblong, broadened at the base, 10-15 cm. long, yellowish-brown; apophyses ovate, swollen, protuberant, with a small fine long central spine-tipped umbo. Seeds with a small dark brown nut and a blackish-brown wing.
Mexico: W. Vera Cruz; E. Hidalgo; N.W. Puebla; N. Tlaxcala also in S.W. Tamaulipas, S.E. Coahuila and S. Neuvo Leon, 800-2800 m..

P. PUMILA (Pall.) Regel Japanese Stone Pine
=P. hakkodoensis Makino

A shrub 3-6 m. tall, main branches usually prostrate. Branchlets vigorous, pubescent, red-brown or gray-brown. Buds shortly pointed, resinous, nearly cylindrical, 6-10 mm. long, red-brown, scales finely pointed. Sheath deciduous. Needles in fives, 4-6 cm. long by 0.7-1 mm. wide, curved, bluish-green, stomata on the ventral faces, margins entire or slightly serrulate; resin canals marginal, 1-2. Female cone on a short peduncle, broadly ovoid, orange-brown, 3-4.5 cm. long by 2.5-3 cm. wide; apophyses broadly ovate, slightly swollen, with a small blunt apical umbo. Seeds nut-like, 6-10 mm. long by 4-7 mm. wide, wingless.
N. Mongolia; N.E. China; N. Korea; E. U.S.S.R.; N. Japan, 300-3700 m..

P. PUNGENS Lamb. Table Mountain Pine

A tree 6-12 m. tall, 0.3-0.6 m. in girth, with a rounded or irregular crown of horizontal branches. Bark dark brown, thick, furrowed into scaly plates. Branchlets smooth, green then bright orange-brown. Buds cylindrical, obtuse, resinous, 1.2-1.8 cm. long, dark chestnut-brown. Sheath persistent, to 6 mm. long. Needles usually in twos, sometimes 3 per bundle, dark green, twisted, 3-8 cm. long by 2 mm. wide, stiff, persist 3 years, serrulate, stomata on all surfaces; resin canals median, 2-6. Female cone in numerous clusters along the branches, stalkless or nearly so, opening upon maturity, shiny light brown, pointing backwards or downwards, 5-9 cm. long by 5-6 cm. wide; apophyses broadly ovate, swollen, slightly protuberant, with a thick prominent upcurved central umbo. Seeds with a triangular nut 5-6 mm. long by 4 mm. wide, blackish to purplish-brown, grooved; wings 10-15 mm. long by 6-7 mm. wide.
U.S.A.: N.E. Georgia to S.E. Pennsylvania, Alleghany Mountains, 0-1350 m..

P. RADIATA D. Don Monterey Pine

A broadly conical tree 15-30 m. tall, 0.3-0.9 m. in girth, with a narrow, irregular, open crown. Bark dark reddish-brown, deeply furrowed into scaly ridges or plates. Branchlets smooth, non-glaucous, red-brown. Buds ovoid-cylindric, shortly pointed, non-resinous, 1.5-2 cm. long, chestnut-brown. Sheath persistent, 8-12 mm. long. Needles in threes, rarely 2 per bundle, dense, persist 3-4 years, fine, shiny green, 10-18 cm. long, acute, serrulate, stomata on all surfaces; resin canals median, 2-4. Female cone in groups of 1-5, sessile or on a short peduncle, reflexed, serotinous, ovoid-conical, many clustered in whorls, turned backwards, remaining closed for many years, dark shiny brown, 7-14 cm. long by 5-8 cm. wide; apophyses broadly ovoid, slightly swollen, protuberant on one side of the cone, round-like, with a small stout central umbo. Seeds with a blackish nut 5-8 mm. long by 3-5 mm. wide; wings 17-21 mm. long by 4-7 mm. wide.
U.S.A.: W. California, S.W. San Mateo Co. to N.W. San Luis Obispo County, 30-400 m..

P. RADIATA var. BINATA (Engelm.) Brewer et Wats. Guadalupe Pine

A broadly conical tree 7-15 m. tall, with ascending branches. Bark relatively smooth at first, becoming fissured. Branchlets yellowish-brown. Buds ovoid, reddish-brown, 6 mm. long, non-resinous. Sheath 3-6 mm. long, soon curling. Needles usually in twos, rarely 3 per bundle, relatively thick, 7.5-12.5 cm. long by 1.5-2 mm. wide. Female cone asymmetrical, 9-11 cm. long, yellowish-brown; apophyses broadly ovoid to broadly ovate, slightly swollen, with several markings, with an inconspicuous central umbo. Seeds with a narrow nut 8 mm. long by 3-3.5 mm. wide; wings long and narrow, 20 mm. long by 6 mm. wide.
Mexico: W. Guadalupe Island, 600-1220 m., rare.

P. RESINOSA Ait. Eastern Red Pine

A tree 21-24 m. tall, 0.3-0.9 m. in girth, with a broad, irregular or rounded crown. Bark reddish-brown or gray, divided into thick, flat, scaly plates. Branchlets smooth, narrow, orange-yellow or brown-yellow. Buds ovate-acuminate, resinous, pale brown, 1.2-2 cm. long, scales free and fringed at the apex. Sheath persistent, to 2 cm. long. Needles usually in twos, slender, dark green, 11-16.5 cm. long by 1.5 mm. wide, fine, shortly pointed, persist 4 years,

stomata on all surfaces; resin canals marginal or submarginal, 4-6. Female cone in groups of 1-2, persist on the tree 2-3 years, opening upon maturity, symmetrical, nearly stalkless, shiny light brown, 4-6 cm. long by 3-3.5 cm. wide; apophyses broadly ovate, slightly swollen, with a small central umbo. Seeds with an ovoid nut 3-5 mm. long by 2 mm. wide, brown; wing 18 mm. long by 6 mm. wide.
S.E. Canada: N.E. United States: Great Lakes Region, 213-311 m..

P. RIGIDA Mill. Pitch Pine

A tree 15-18 m. tall, 0.3-0.6 m. in girth, with a broad, rounded or irregular crown with horizontal branches. Bark dark gray, deeply furrowed into scaly ridges, inner-bark brown. Branchlets smooth, non-glaucous, yellowish-green turning darker. Bud cylindrical, conical, acute, resinous, 6-14 mm. long, chestnut-brown; scales free at the apex, not reflexed. Sheath persistent, red-brown, 9-12 mm. long. Needles in threes, persist 2 or more years, twisted, serrulate, stout, stiff, 7-14 cm. long by 2 mm. wide, bright yellowish-green then dark green, stomata on all faces; resin canals median, 2. Female cones open upon maturity but remain attached to the branches, in groups of 3-5, subsessile, symmetrical, dehiscent, serotinous, broadly ovoid-conical, 3-9 cm. long, dull yellowish-brown; apophyses broadly triangular, slightly swollen, with a fine stout central umbo. Seeds with a triangular nut 4 mm. long by 3 mm. wide; wing to 15 mm. long by 5 mm. wide, brown.
S.E. Canada; E. United States: Maine to N. Georgia, 427-1372 m..

P. RIGIDA var. SEROTINA (Michx.) Loud. ex Hoopes Pond Pine

A tree 12-21 m. tall, 0.3-0.6 m. in girth, with an open, rounded or irregular crown with crooked branches. Bark blackish-gray or reddish-brown, furrowed into scaly plates. Branchlets angular, non-glaucous, orange-brown turning dark brown. Buds very resinous, scales free and non-reflexed. Sheath persistent a long time. Needles usually in threes, slender, flexible, stiff, dark yellow green, 13-20 cm. long, stomata on all faces; resin canals median, 2-6. Female cone subglobose or broadly ovoid, serotinous, symmetrical, shiny yellowish, 5-7 cm. long, nearly stalkless, remaining closed after maturity; apophyses broadly ovate, slightly swollen, with a fine weak spiny central umbo. Seeds with a narrow nut and a long wing.
S.E. United States: S. New Jersey to C. Florida, near sea level.

P. ROXBURGHII Sarg. Chir Pine

A slender, symmetrical tree 40-54 m. tall, 2-3 m. in girth, with a rounded, spreading crown. Bark dark red-gray, fissured into plates. Branchlets gray or pale yellowish-brown. Buds non-resinous, oblong-ovoid, chestnut-brown; scales non-reflexed. Sheath persistent, 1-2 cm. long. Needles in threes, 20-35 cm. long by 1.5 mm. wide, pendent, persist 2-3 years, serrulate, bright light green, slender, stomata on all faces, apex finely pointed; resin canals marginal, 2-3. Female cone on a short peduncle, ovoid-conical, 10-20 cm. long by 6-9 cm. wide; apophyses elongated, broadly ovate, swollen, with a thick blunt central umbo. Seeds with a nut 8-10 mm. long; wing to 25 mm. long, transparent.
N. West Pakistan; N.W. India; Nepal; Sikkim; Bhutan, 400-2300 m..

P. RZEDOWSKII Madr. et M. Caball. Rzedowski Pine

A tree 15-30 m. tall, to 60 cm. in girth, with a compact, irregular crown. Bark dark, thick, gray on the branches. Branchlets scaly, grooved, gray-brown, glandular, slightly pubescent. Buds conical, chestnut-brown, slightly resinous, 3-4 mm. long by 1.5-2 mm. wide, slightly pubescent; scales acuminate, fringed white. Sheath 7-9 mm. long, pubescent, light chestnut-brown, margins fringed, soon curls and splits to form a basal rosette.Needles usually in fours, sometimes 3-5 per bundle, 6-10 cm. long by 0.7-1 mm. wide, light green, with faint stomata on all surfaces, spine-tipped; resin canals external, 2-4. Female cone ovoid, opening upon maturity, 10-15 cm. long by 6-8.5 cm. wide, yellowish-brown; apophyses triangular, slightly protuberant, distinctly lobed at the apex, with a short spiny central umbo. Seeds with a brown nut 7 mm. long, with a broad wing to 26 mm. long that is reddish.

Mexico: N.W. Michoacan, Coalcoman and Dos Aguas, 2000-2400 m..

P. SABINIANA Dougl. ex D. Don. Digger Pine

A tree 12-25 m. tall or more, 0.6-1.2 m. in girth, with an open, irregular, broad or rounded crown. Trunk often crooked and forked. Bark dark gray, deeply furrowed, later shaggy. Branchlets smooth, light gray to bluish-green. Buds narrowly cylindric, resinous, bright brown, 1.8-2.4 cm. long, pointed, scales fringed on the margins. Sheath persistent, 2.4 cm. long, bright silky-brown, later becoming a rosette. Needles in threes, fine, sparse, acute, persist 3 or more years, somewhat pendent, 16-30 cm. long by 1.5 mm. wide, blue-gray-green to dull gray-green, serrulate, stomata on all faces; resin canals median, 2-10. Female cones singular, on a peduncle 5 cm. long, persist 1-7 years, opening late, dehiscent, ovoid-conical, slightly one-sided, dark brown or somewhat reddish-brown, 13-30 cm. long by 10-15 cm. wide; apophyses ovate, swollen, protuberant, with a prominent thick upcurved umbo. Seeds with an ovoid nut 2-2.5 cm. long by 1 cm. wide, thick-shelled; with a thick detachable wing 1-1.5 cm. long.

U.S.A.: California, S.W. Siskiyou County to N.W. Los Angelos County, 30-1829 m..

P. SCOPULORUM (Engelm.) Lemm. Rocky Mountain Pine
=P. ponderosa var. scopulorum Engelm.

A tree 10-35 m. tall, to 1.2 m. in girth. Bark nearly black, fissured. Branches somewhat drooping. Branchlets scaly, orange-brown, smooth. Buds finely resinous, dark brown, ovoid, 8 mm. long. Sheath persistent, chestnut-brown turning blackish-gray, 8 mm. long, margins fringed. Needles usually in twos, rarely 3 per bundle, dark green, 10-18 cm. long by 1.2 mm. wide, serrulate, stomata on all faces; resin canals median, 3-4. Female cone ovoid, 5-9 cm. long by 4-5 cm. wide; apophyses broadly ovate, slightly swollen, with a stout upcurved central umbo. Seeds with a narrow nut 5-6 mm. long and a wing to 17 mm. long or more.

U.S.A.: E. Montana to S. Arizona, N. New Mexico and W. Texas, 1500-3100 m., ecologically distinct.

P. SIBIRICA Du Tour — Siberian Stone Pine

A narrow tree 35-40 m. tall. Branches tomentose. Buds shortly pointed, scales bright brown. Sheath deciduous, forming a rosette. Needles in fives, 6-13 cm. long by 0.8-1.2 mm. wide, dark green, stomata on the ventral faces, serrulate except at the apex; resin canals large, median, 2. Female cone cylindrical, 6-13 cm. long by 5-8 cm. wide; apophyses broadly ovate, with a small blunt apical umbo; cone with few scales reflexed at the base; apophyses swollen. Seeds nut-like, 1-1.4 cm. long by 0.6-1 cm. wide, with a fragile shell, wingless.

U.S.S.R.: N.E. Kazakhistan; Siberia; China: N.E. Sinkiang; N. Mongolia, 1000-1800 m..

P. STROBIFORMIS Engelm. — Southwestern White Pine
=P. reflexa (Engelm.) Engelm.

A narrowly conical tree 15-30 m. tall, 0.5-0.9 m. in girth, with horizontal branches. Bark gray and smooth, becoming dark gray or brown and shallowly furrowed. Branchlets smooth, gray, with a glaucous bloom. Buds oblong-ovoid, resinous, red-brown. Sheath deciduous. Needles in fives, bright or bluish-green, slender, white stomata only on the inner surfaces, 6-10 cm. long, finely serrulate near the apex, persist 3 or more years; resin canals marginal, 2-5. Female cone on a short peduncle 1.5-2.5 cm. long, quickly deciduous, cylindrical, 15-25 cm. long, resinous, yellowish-brown; apophyses ovate, swollen, protuberant, thin, strongly reflexed, with a small blunt apical umbo. Seeds with a red-brown nut 1 cm. long, wings usually reduced to a narrow collar 1 mm. long.

U.S.A.: E. Arizona to S.W. San Luis Potosi, Mexico, 1981-3048 m..

P. STROBUS L. — Eastern White Pine

A tree 33-46 m. tall, 0.9-1.2 m. in girth, with a broad, irregular crown and with horizontal branches growing in one plane. Bark gray-brown, smooth, becoming furrowed into scaly ridges. Branchlets fine, grayish-brown. Buds subcylindric, acuminate, slightly resinous, 5-10 mm. long, red-brown, margin of scales white. Sheath quickly deciduous, 1.2-1.5 cm. long. Needles in fives, persist 2-3 years, fine, flexible, blue-green, finely serrulate, 5-14 cm. long, stomata on the ventral faces, apex blunt; resin canals marginal, 2-3. Female cone 1-3 per group, on a peduncle 2-3 cm. long, dehiscent, quickly deciduous, cylindric, 8-20 cm. long by 3-4 cm. wide, slightly resinous, green then yellow-brown to fawn-brown; apophyses broadly ovate, flattened, with a small blunt apical umbo. Seeds with a dark brown nut 5-8 mm. long by 4 mm. wide, wings 18-25 mm. long.

S.E. Canada: S.E. Manitoba to N. Georgia, United States, 610-1524 m..

P. STROBUS var. CHIAPENSIS Mart. Chiapas White Pine

A broad tree 25-46 m. tall, with horizontally spreading branches. Bark dark brown, irregularly furrowed, inner-bark red. Sheath quickly deciduous, 1.3-1.5 cm. long, transparent at the margins. Needles in fives, at tips of the branchlets, fine, flexible, 8-14 cm. long, bright green or yellowish-green, serrulate, glaucous internally, with stomata on the ventral faces; resin canals marginal, 2-3. Female cones in groups of 2-3, on a peduncle 2.3-3.5 cm. long, cylindrical, attenuate at the apex, slightly resinous, yellowish-brown, 9-15 cm. long by 3-4 cm. wide; apophyses ovate,rounded, flattened, with a small blunt apical umbo. Seeds with a nut 5-6 mm. long, wing to 20 mm. long.

Mexico: C. Veracruz to W. Chiapas; W. Guatemala; S.W. British Honduras, 610-1830 m..

P. SYLVESTRIS L. Scotch Pine

=P. sylvestris var. sibirica Ledeb.,=P. sylvestris var. sylvestriformis (Taken.) Cheng et Chu

A conical tree 25-40 m. tall, to 6 m. in girth or more, with a long clear bole, becoming round-topped or flat-topped with age. Bark ashy-gray, with longitudinal cracks. Longevity to 400 years or more. Bark of branches red-brown or orangish. Branchlets light brown or yellowish, thin. Buds conical, resinous, 6-12 mm. long, red-brown, scales free at the apex. Sheath persistent, 8 mm. long, gray. Needles in twos, 4-6 cm. long by 2 mm. wide, persist 2-4 years, green in the spring, turning yellowish in the winter, slightly twisted, serrulate, with faint stomata on the interior faces; resin canals 8-12, directly adjoining the hypodermis. Male strobili yellowish, rarely pinkish. Female cones in groups of 1-3, on a short peduncle, dehiscent, opening upon maturity, ovoid, 3-6 cm. long by 2-3.5 cm. wide, dull yellowish-brown; apophyses ovate, slightly swollen, basal apophyses sometimes protuberant on one side of the cone, with a small blunt central umbo. Seeds with a gray or blackish nut 3-5 mm. long by 2 mm. wide, wing to 1.5 cm. long by 6 mm. wide.

N. Scotland; S. Scandinavia; N. Portugal to W. Bulgaria to Siberia,U.S.S.R..

P. SYLVESTRIS var. HAMATA Stev. Caucasian Scotch Pine

=P. sylvestris var. armena (K. Koch) Fitsch.

A shrub or tree 20-35 m. tall, with ascending branches. Base of trunk usually swollen, trunk usually erect or curved. Bark red-yellow, plate-like. Longevity to 200 years. Branchlets brown. Buds acuminate, resinous. Sheath persistent. Needles in twos, slightly twisted, blue-green, 7 cm. long by 1 mm. wide, finely serrulate, with few stomata, leaves do not turn yellowish in the winter; resin canals submarginal, 4-8, with adjoining hypodermis. Female cones short-stalked, yellowish-tan, 2-5.2 cm. long by 2-4 cm. wide; apophyses broadly ovate, slightly swollen, some apophyses protuberant near the base,with a thin fine short central umbo. Seeds with an ovate-oblong nut 5mm. long, buff colored; wings whitish-gray to 14 mm. long.

N. Turkey to Azerbaydzhan, U.S.S.R.; Caucasus Mountains.

P. SYLVESTRIS var. LAPPONICA Fries — Lapland Scotch Pine

A pyramidal tree to 20 m. tall, with a narrow crown, densely branched, trunk relatively straight. Branches ascending or somewhat pendent. Longevity to 300 years. Branchlets yellowish then gray, pubescent. Buds resinous. Sheath yellowish-brown, tinged white, 7 mm. long, curling to 2 mm. later.Needles in twos, gray-green, 3-3.5 cm. long, somewhat flattened, spine-tipped, turning yellow or golden-yellow in the winter, persist 4-7 years, resin canals 6-7. Female cone narrowly ovoid, 3-4 cm. long, straw yellow or yellow-brown; apophyses ovate, slightly swollen, convex, with a small central umbo. Seeds with a small brown nut and a reddish-brown wing.

N. Norway; N. Sweden; N. Finland; N.W. U.S.S.R., to 400 m. or more.

P. SYLVESTRIS var. MONGOLICA Litv. — Mongolian Scotch Pine

A tree 20-25 m. tall. Longevity to 200 years. Bark dark gray, thick. Branchlets scaly, yellowish to gray. Buds ovoid, slightly resinous, 8 mm. long, yellowish-orange, basal scales fringed. Sheath 3-5 mm. long, gray. Needles two per bundle, 5-11 cm. long, rigid, acute, persist 6-7 years, twisted, yellowish in the winter, violet on seedlings, resin canals 12-14. Female cone ovoid, 3.5-6 cm. long, light gray or dark brown, with 75-78 scales; apophyses rhombic, somewhat flattened, with a small central umbo. Seeds with a small nut and a long wing, fawn-purple.

U.S.S.R.: Kazakhistan to Chita Region; N. Mongolia; China: N.E. Manchuria.

P. TABULAEFORMIS Carr. — Northern Chinese Pine

A tree to 25 m. tall, often becoming rounded or flat-topped with age, with long level branches. Bark dark gray to orange, fissured, divided into reddish scales on the branches. Branchlets smooth, pinkish-orange, slightly glaucous, then pale gray or yellowish-brown. Buds oblong, slightly resinous, bright light brown, 7 mm. long, scales fringed at their margins. Sheath persistent, 6-10 mm. long, brown. Needles in twos, sometimes 3 per cluster, persist 4 years, acuminate, fine, serrulate, 6-15 cm. long, blue-green to shiny gray-green, relatively thick, somewhat twisted, widely spreading, stomata on all faces; resin canals marginal, 3-11. Female cone in groups of 1-3, subsessile, symmetrical or oblique, dehiscent, opening at maturity, broadly ovoid, 4-9 cm. long by 3 cm. wide, yellowish-brown to fawn-brown; apophyses broadly ovate, slightly swollen to nearly flattened, non-protuberant, with a small blunt central umbo. Seeds with an ovoid nut 4-5 mm. long, red-brown; wing to 15 mm. long, brown.

N. China: E. Szechuan to S.E. Kirin, 100-2600 m..

P. TABULAEFORMIS var. DENSATA (Mast.) Rehd. — Southern Chinese Pine

A tree 13-33 m. tall. Bark gray-orange-brown, corky, finely scaly. Branchlets smooth, yellowish-brown. Buds resinous, 13 mm. long, oblong-lanceolate, chestnut-brown; scales subcoriaceous, margins fringed, whitish. Needles in twos or rarely 3 per bundle, 6-15 cm. long by 1.2-1.5 mm. wide, slightly twisted, rigid, serrulate, glaucescent, with submarginal resin canals. Female cone oblique, ovoid-conical, 5-6 cm. long by 4 cm. wide; apophyses ovate, swollen, rounded, slightly protuberant with a relatively thick small reflexed spiny central umbo. Seeds with a dark brown ovoid nut 4 mm. long; wings obtuse-oblong,

13 mm. long, reddish-brown.
China: W. Szechuan; S.E. Tsinghai; S.E. Tibet; N.W. Yunnan, 2600-3500 m..

P. TAEDA L. Loblolly Pine

A tree 24-30 m. tall, 0.6-0.9 m. in girth, with a rounded crown of spreading branches. Bark blackish-gray, deeply furrowed into scaly ridges. Branchlets smooth, somewhat glaucous, later yellowish-brown. Buds oblong-conical, 6-12 mm. long, somewhat resinous; scales fringed, reflexed; persistant at the base of the branchlet. Sheath persistent, to 2.5 cm. long. Needles in threes, shortly pointed, slightly twisted, persist 3-4 years, serrulate, 12-25 cm. long by 1.5 mm. wide, bright green, with stomata on all faces; resin canals median, 2-6. Female cone sessile, narrow, ovoid-conical, dehiscent, persistent, opening at maturity, 6-12 cm. long, dull dark red-brown; apophyses broadly ovate, slightly swollen, with a stout central umbo. Seeds with a triangular nut 6 mm. long by 4 mm. wide, red-brown, grooved, wing to 20 mm. long.
U.S.A.: Delaware to E. Florida to E. Texas, 457-610 m..

P. TEOCOTE Schiede et Deppe Teocote Pine
=P. herrerai Mart.

A tree 10-30 m. tall, with a rounded, irregular crown. Bark gray, fissured, plate-like. Branchlets smooth, glaucous then reddish-brown. Buds ovoid-cylindric, resinous, 1.8 cm. long; scales fringed, acute point free, non-reflexed. Sheath persistent, dark brown, 5-10 mm. long. Needles in threes, sometimes 2-5 per bundle, rigid, pungent, persist 3 years, 10-20 cm. long, stomata on all faces, light green, finely serrulate; resin canals median, 2-7. Female cones in groups of 1-2, reflexed on a short peduncle 2-2.4 mm. long, soon deciduous, ovoid-symmetrical, 4-7 cm. long, dull brown; apophyses flattened, rounded, with a fine small central umbo. Seeds with a dark gray nut 3 mm. long; wings to 15 mm. long, dark brown, sometimes somewhat deciduous.
Mexico: W. Chihuahua to C. Chiapas; W. Guatemala, 1524-3048 m..

P. THUNBERGIANA Franco Japanese Black Pine
=P. thunbergii Parl.

A broadly conical tree 30-40 m. tall, with long level branches and an irregular crown. Bark blackish-purplish-gray, fissured into irregular plates. Branches spreading horizontally, somewhat pendent. Branchlets smooth, thick, yellowish turning dark orange-brown to orange-yellow. Buds pointed, oblong, non-resinous, 1-1.8 cm. long, whitish, scales fimbriate and free at the apex. Sheath persistent, 1.2 cm. long, with long white filaments. Needles in twos, pressed closely to the branchlet, sharply pointed, rigid, slightly twisted, persist 3 years, 6-18 cm. long by 1.5-2 mm. wide, dark gray-green, serrulate, with stomata in 8-12 ranks on 2 faces; resin canals median, 2-15. Female cones ingular, on a short peduncle, ovoid, 4-6 cm. long by 3-4 cm. wide, dark reddish-brown to gray-brown, deciduous; apophyses broadly triangular, slightly swollen, with a small central umbo. Seeds with a gray or yellowish-brown nut 5-7 mm. long by 3 mm. wide, wing 15-20 mm. long, shiny.
S. Korea; Japan: coastal plains, 0-1000 m..

P. TORREYANA Parry ex Carr. Torrey Pine

A tree 9-15 m. tall, 0.3-0.6 m. in girth, with a broad, rounded crown, with open, spreading branches. Bark blackish, furrowed into flat scaly ridges, gray and smooth on the branches. Branchlets smooth, glaucous turning dark purplish-gray then blackish. Buds conical 1.2-2.5 cm. long, pale brown, with a long pointed apex, non-resinous, scales fringed white. Sheath persistent, 1.8 cm. long. Needles in fives, 15-30 cm. long by 2 mm. wide, dark gray-green, persistent, thick, crowded in large clusters at tips of stout branchlets, white stomata on most surfaces, serrulate at the apex; resin canals median, 3 at angles. Female cone on a thick peduncle 3 cm. long, maturing in 3 years, somewhat persistent, bent downward, opening at maturity, 10-15 cm. long by 9 cm. wide, shiny nut-brown; apophyses broadly ovoid, swollen, protuberant, with a thick prominent central umbo. Seeds with a blackish-brown nut 2-2.5 cm. long by 1 cm. wide, with a thick shell; wings to 1 cm. long, soon detachable.

U.S.A.: S. California, W. San Diego County, near Del Mar and on Santa Rosa Island, to 152 m..

P. TROPICALIS Morelot Tropical Pine

A tree 15-20 m. tall, to 1.8 m. in girth, with ascending branches. Bark gray to blackish, tinted red, furrowed into large oblong plates. Crown open and rounded. Branchlets stout and rough. Buds large, with reflexed scales. Sheath persistent. Needles in twos, rarely 3 per bundle, 10-30 cm. long by 1 mm. wide, rigid, stomata on all faces, margins minutely toothed; resin canals marginal, 2-9. Female cone on a short peduncle, ovoid-conic, symmetrical, yellowish-brown to orange-brown, 5-8 cm. long, opening upon maturity; apophyses ovate to rounded, with a small indented central umbo. Seeds with long wings. Seedlings go through a distinct grass-like stage.

W. Cuba to Isle of Pines, to 30 m. or more.

P. VIRGINIANA Mill. Virginia Pine

A shrub or tree 9-18 m. tall, 0.3-0.5 m. in girth, with an open, broad, irregular crown and with long, spreading branches. Bark brownish-gray, smoothish, exfoliating in flakes, becoming shaggy with narrow scaly ridges. Branchlets smooth, fine, glaucous-violet then gray-brown. Buds cylindrical, very resinous, dark brown, 8-12 mm. long. Sheath fairly persistent, 4-10 mm. long. Needles in twos, loose, pointed, somewhat twisted, stout, flexible, somewhat flattened, persist 3-4 years, 4-8 cm. long by 1 mm. wide, gray-green, with few stomata, serrulate; resin canals median, 2. Female cones in groups of 1-2, nearly sessile, ovoid-oblong, dehiscent in the second year, persistent, 4-7 cm. long by 2.5-3.5 cm. wide, dark shiny red-brown; apophyses broadly ovate, swollen, slightly protuberant, with a prominent long fine central umbo. Seeds with a narrow nut and a long wing.

E. United States: S.E. New York to N.E. Mississippi, 30-850 m..

P. WALLICHIANA A.B. Jacks. Western Himalayan Pine
=P. excelsa Wall. ex D. Don, =P. griffithii McClelland

A broadly pyramidal tree 50-70 m. tall, with fine branches to the base and with a loose, open crown. Bark orange-brown to gray-brown, smooth then shallowly fissured and plate-like. Branches ascending, horizontal. Branchlets smooth, yellowish-brown. Buds conical, 6-12 mm. long, pale red-brown, resinous, acuminate, with erect, free tips. Sheath deciduous, to 1.8 cm. long, pale red-brown. Needles in fives, 10-20 cm. long by 0.7-1 mm. wide, somewhat pendent, grayish or bluish-green, acute, persist 3-4 years, finely serrulate, with white stomata in 4-6 ranks on the ventral surfaces; resin canals marginal, 2. Female cone in groups of 1-3, on a peduncle 2-5 cm. long, narrowly conical, yellowish-brown, resinous, 15-25 cm. long by 3 cm. wide; apophyses flattened, rounded, acuminate at the apex, with a small blunt incurved apical umbo. Seeds with an ovoid nut 8-9 mm. long by 5-6 mm. wide; wing 10-20 mm. long.
E. Afghanistan to Bhutan to S.E. Tibet, China to N. Burma, 2500-3000 m..

P. WALLICHIANA var. DALATENSIS (Ferre) Silba Dalat Pine

A tree 10-40 m. tall with an irregular crown. Bark brown, fissured into small plates. Branchlets smooth, brown turning gray, glaucous. Buds conical, brown, non-resinous, scales triangular. Sheath light brown, 7 mm. long, quickly deciduous. Needles in fives, 4-10 cm. long by 0.5 mm. wide, without a ventral resin canal, but with 2-3 marginal or submarginal resin canals. Male strobili narrow, 2 cm. long, violet-brown; pollen grains 44.5 microns in diameter. Female cone cylindrical, brown, 5.5-10.5 cm. long by 2.5-3.5 cm. wide; apophyses flattened, rounded, acuminate at the apex, with a small blunt apical umbo. Seeds with a small brown nut and a wing to 15 mm. long.
S. Vietnam: Dalat, Trai Mat, 1500-2400 m..

P. WANGII Hu et Cheng Wenshan or Wang Pine
=P. kwangtungensis Chun et Cheng

A tree 10-20 m. tall, to 1 m. in girth. Bark gray, flaky. Branchlets dark brown, pubescent. Buds ovoid, dark brown, 6 mm. long, non-resinous; scales triangular, lanceolate, free at the tips. Sheath 5 mm. long, chestnut-brown, quickly deciduous. Needles in fives, somewhat flattened, dark green, 2-4.5 cm. long by 1-1.5 mm. wide, with 5-7 bands of white stomata on the inner faces; resin canals median, 3. Male strobili with 8-12 bracts. Female cone on a peduncle 1.5-2 cm. long, oblong-cylindric, gray-brown, opening at maturity, 4.5-6.5 cm. long by 2-4.5 cm. wide; apophyses rhombic-ovoid, flattened, apex incurved, with a blunt small apical umbo. Seeds nut-like, nut 8 mm. long by 5 mm. wide, with a short, broad, deciduous wing.
China: S.E. Yunnan, near Wenshan (type); Hainan; Kwangtung; Kwangsi; Hunan, 500-1800 m..

P. WASHOENSIS Mason et Stockwell Washoe Pine

A pyramidal tree 18-60 m. tall, to 0.9 m. in girth, with a spreading crown. Trunk tapering, with fastigiate branches. Bark blackish-brown or yellow-brown, furrowed. Branchlets scaly, grooved, yellow-orange then gray-white, thick, smooth. Buds ovoid-acute, reddish, 1.5-2 cm. long, margin of scales fimbriate. Sheath persistent, yellowish-brown, 1.2-2 cm. long. Needles in threes, 10-15 cm. long by 1.5 mm. wide, stout, gray-green, finely serrulate, with 7-10 median resin canals. Female cone opening at maturity, leaving a few basal scales on the branchlet after falling off, stalkless, conical or ovoid, 5-10 cm. long dull brown; apophyses triangular-ovate, swollen, somewhat protuberant, with a sharp wide long reflexed apical umbo. Seeds with a nut 8 mm. long by 5 mm. wide, with a rhombic wing 12-16 mm. long.

U.S.A.: N.E. California, S.E. Modoc County to S.W. Washoe County, W. Nevada, 2134-2560 m..

PLATYCLADUS Spach (Cupressaceae)

A monotypic genus native to E. Asia. A monoecious evergren tree. Branchlets flattened, ascending, smaller branchlets deciduous, vertically arranged. Foliage non-fragrant, same color on both sides of the branchlet. Buds inconspicuous. Leaves glandular, scale-like, small, 4-ranked, bluntly acute, ovate, lateral pair keeled. Male cones subglobose, with decussate scales, anthers 3-4. Female cones borne erect, maturing in one year, oval or conical, fleshy when young, with a glaucous bloom, with 6-8 ovate scales, only the lower scales are fertile, each scale has a conspicuous decurved umbo. Seeds 1-2 per cone scale, ovoid, pointed, rounded in the cross-section, non-flattened, with a large whitened hilium, wingless. Cotyledons 2.

Embryologically distinct from Thuja by its triad of megaspores, the well developed spongy tissue, numerous free nuclei in the female gametophyte, numerous archegonia in a complex and a embryonal suspensor in the young embryo. Whereas Thuja has a tetrahedral tetrad of megaspores, lacks a spongy tissue, has a relatively small number of free nuclei and a small number of archegonia and lacks an embryonal suspensor.

P. ORIENTALIS (L.) Franco Oriental Arborvitae
=Biota orientalis (L.) Endl., =Thuja orientalis L.

A shrub or a narrowly conical tree 7.6-12 m. tall, to 15 cm. in girth or more, with slender branches, forming a rounded or irregular crown with numerous upright branches. Trunk with several stems branched to the ground. Bark finely fissured, red-brown, scaly, shreddy. Branchlets distichous, in one vertical plane or erect, fine, slightly flattened, same color on both sides, in fern-like sprays. Foliage nearly scentless. Leaves scale-like, 4-ranked, opposite, short-pointed, side pair keeled, 1.5-3 mm. long; flat pair yellow-green to bright green on both sides; leaves spreading and free at the apex on main branchlets; on lateral branchlets closely appressed, rhombic-ovate, acute, with a small glandular depression on the back. Female cone upright, on short branchlets, globose-ovate, glaucous becoming dark brown, 1-1.3 cm. long, with 6-8 fleshy scales, only the lower scales are fertile, cone opens widely at maturity, scales with a prominent curved or hooked apical umbo. Seeds dark brown, 5 mm. long, ovoid, wingless, with a large whitened hilium. Cotyledons 2.

N. Burma; China; Mongolia; Japan, 1700-3100 m..

PODOCARPUS L. Herit. ex Pers. (Podocarpaceae)

A genus of 95 species occuring in subtropical regions from S. Africa, S.E. Asia, Australasia, S. Mexico, the Caribbean and S. America. Evergreen trees or shrubs that are usually dioecious. Buds ovoid or globose, free from the leaves, with few, imbricate scales. Leaves bifacially flattened, mostly linear, spirally arranged, alternate, hypostomatic, lanceolate, with hypoderm and containing 1-5 resin ducts, with well developed transfusion tissue. Male strobili lateral, solitary or often grouped, sessile or on a naked peduncle, anther-like, elongated, in axils of leaves, subtended by basal scales. Female cone produced on a specialised axillary shoot, on a naked peduncle, reddish, with an enlarged basal receptacle formed by the fusion of two bracts, with a single inverted ovule. Seed completely covered by the leathery fertile scale, globular, wingless.

P. AFFINIS Seeman — Fijian Podoberry

A small tree 2-9 m. tall, with a dense crown. Bark thin, smooth, light reddish-brown, exfoliating in elongated scales. Branches short and spreading. Juvenile leaves glaucous. Buds 1-1.5 mm. long; scales triangular, erect. Adult leaves spirally arranged, closely set, oblong-lanceolate, erect, leathery, straight, tapering and somewhat twisted at the base, 2.5-5 cm. long by 7-8 mm. wide, red-brown underneath, midrib prominent, apex obtuse, petiole 2-3 mm. long. Male strobili solitary, sessile, 2-3.5 cm. long by 2-3 mm. wide, base subtended by several triangular sterile scales; microsporophylls with a small triangular spur on the apex. Female cone on a peduncle 5-7 mm. long; receptacle with 2 enlarged adnate bracts, subtended by 2 lanceolate involucral leaves, each involucral leaf 1.5 mm. long. Seed elliptical, 8-9 mm. long by 4-5 mm. wide, with a small distinct crest at the apex.

Fiji: Vitu Levu, Namosi, Voma Peak, 600-950 m..

P. ALPINUS R. Br. ex Mirb. — Tasmanian Podoberry

A small, densely branched shrub to 4 m. tall. Buds ovoid or globose, 2 mm. long, scales triangular. Leaves crowded, more or less 2-ranked, spreading, thick, sessile, 6-15 mm. long by 1.5 mm. wide, obtuse, blue or gray-green, broadened at the apex, midrib prominent below, flattened above, apex non-mucronate. Male strobili in groups of 3-6, on a peduncle 3-4 mm. long, cone 4-6 mm. long. Female cone sessile or on a short peduncle, receptacle 3 mm. long with 2 bracts, bright red. Seed ovoid, 5 mm. long, crested.

Australia: Victoria; New South Wales: Tasmania, 1000-1800 m..

P. ANGUSTIFOLIUS Griseb. — Narrow-leaf Cuban Podoberry
=P. ekmanii Urban

An arborescent shrub or a small tree 2-4 m. tall, with dense foliage and subverticillate branches. Terminal buds ovoid, with rounded. keeled scales. Leaves loosely arranged, linear, subcoriaceous, 2.5-7 cm. long by 3-4 mm. wide, margins revolute, apex apiculate and spine-tipped, petiole 4-7 mm. long by 3-4.5 mm. wide. Male strobili axillary, sessile, cylindrical, 1.5 cm. long by 3 mm. wide. Female cone on a peduncle 2-5 mm. long; receptacle with 2 bracts, red, 5-7 mm. long. Seed 7 mm. long, rectangular, crested.

W. Cuba: Pinar del Rio, Sierra de Organos to San Miguel, 500-900 m., humid forest.

P. ANNAMIENSIS Gray Annam Podoberry

A small, erect tree 5-12 m. tall, 0.5-3 m. in girth. Branches dense, opposite or whorled. Bud ovoid or globose, 5 mm. long; scales broadly triangular, keeled, apex acuminate. Leaves bunched at ends of branchlets, linear, usually straight, 4-10.5 cm. long by 5-10 mm. wide, apex bluntly acute to rounded, midrib somewhat prominent, stiff, petiole 2-6 mm. long. Male strobili solitary or in groups of 2-3, sessile, subglobose, greenish-white, 1.5-3 mm. wide. Female cone axillary, solitary, peduncle 2-10 mm. long; receptacle with 2 bracts, fused but free at the tips, 4-8 mm. long. Seed ovoid, 8-10 mm. long by 6 mm. wide, obtuse or apiculate.

China: Hainan Island; Vietnam: Annam and Cochin China.

P. ARCHIBOLDII Gray Archibold Podoberry

A tree to 40 m. tall. Buds 2-4 mm. long by 3-4 mm. wide, apex only slightly spreading, scales triangular. Juvenile leaves to 18 cm. long by 16 mm. wide. Adult leaves linear or linear-lanceolate, tapering to a broadly acute apex, 7-12 cm. long by 10-14 mm. wide, midrib prominent and broader below, petiole to 5 mm. long. Male strobili solitary, on a peduncle 4 mm. long, to 4 cm. long by 4 mm. wide; subtended by a few, spreading, sterile scales, apex of microsporophylls is a tiny spur. Female cone on a peduncle 5-11 mm. long; receptacle red, with 2-3 fleshy bracts, the fertile one 6-10 mm. long; 2 linear-lanceolate bracts are at the base of the cone and about 2 mm. long. Seed oval, 7-8 mm. long, with an enveloping leathery scale.

New Guinea, W: Vogelkop, Tobi Mts.; East: W. Highlands, Kopiago; Morobe : Bulolo and Wau, 720-1650 m..

P. ARISTULATIS Parl. Monte Verde Podoberry
=P. buchii Urban, =P. buchii var. latifolius Florin, =P. leonii Carabia, =P. victorianus Carabia

An arborescent shrub or small tree 6-7 m. tall. Branches sub-verticillate. Buds ovoid, scales apiculate and keeled. Leaves somewhat spreading, thick, linear, 2.5-7 cm. long by 3-4 mm. wide, broadly acute, narrowing to a spine-tipped apex, margins revolute, petiole 4-7 mm. long by 3-4.5 mm. wide. Male strobili axillary, cylindrical, sessile, 1-1.5 cm. long by 3 mm. wide. Female cone on a peduncle 2-5 mm. long; receptacle with 2 bracts, red, 5-7 mm. long. Seed to 7 mm. long, with a pronounced crest.

E. Cuba, type near Monte Verde; Haiti, 500-2500 m..

P. ATJEHENSIS (Wassch.) De Laub. Atjeh Podoberry

A small tree 4.5-15 m. tall. Terminal buds relatively large, with partially deflexed scales to 10 mm. long. Male buds relatively large, ovate-acute, with acuminate outer scales up to 5 mm. long. Young leaves reddish. Adult leaves narrowly lanceolate, deflexed, 7-18 cm. long by 5-8.5 mm. wide, apex narrowly acute, margins slightly recurved. Male strobili relatively thick, about 4 mm. wide by 5 mm. long, 2-3 cm. long at maturity, scales acute-acuminate. Female cone blunt, solitary in the leaf axils; peduncles slender, 8-16 mm. long; receptacle narrow, fleshy, 7-9 mm. long, white or bluish, subtended by long bracts up to 6 mm. long, involucral leaves 2-4 mm. long. Seeds sub-elliptical, 9-10 mm. long, 7-8 mm. wide, apex obtuse.

Indonesia: Sumatra, Atjeh and in W. New Guinea, 2250-3300 m..

P. BORNEENSIS De Laub. Bornean Podoberry
=P. polystachus var. rigidus Wassch.

A tree 2-23 m. tall. Bud 4-10 mm. long by 2-3 mm. in diameter, apex spreading; exterior scales lanceolate or linear. Leaves thick, linear or ovate, very rigid, 4-7.5 cm. long by 8-13 mm. wide, apex acute or obtuse, keeled, midrib prominent, margins not parallel. Male strobili 3-5 cm. long by 2.5-3 mm. wide, solitary or in 3's, sessile or on a short peduncle. Female peduncle 2 mm. long, involucral leaves 2 mm. long, receptacle 6 mm. long. Seed ovoid, crested, 6 mm. long by 5 mm. wide.
Malaysia: Sarawak; C. Sabah. Beratus Tawai; Indonesia: Borneo.

P. BRACTEATUS Blume Western Bristlecone Podoberry

A tree to 25 m. tall. Bark brown, scaly. Branchlets rounded, grooved longitudinally. Terminal bud scales acute. Foliage sparse, sub-verticilate and spirally arranged. Juvenile leaves 24 cm. long by 16-22 mm. wide. Adult leaves thick, subfalcate, progressively attenuate, 7-16 cm. long by 8-13 mm. wide, midrib prominent. Male flower buds relatively large, ovate-acute, imbricate, 8.3 mm. long. Male strobili solitary, ovoid, subsessile, on an elongated scaly peduncle at maturity, 5-10 cm. long at maturity, pendent. Female cone axillary, solitary, peduncle 1-1.6 cm. long; receptacle blue-black, 1-1.2 cm. long, involucral leaves 3 mm. long or more. Seed ovoid or elliptic, apex obtuse, blue-black, 1.5-1.6 cm. long.
Indonesia: N. Sumatra; Java; C. Celebes, to 1800 m..

P. BRASILIENSIS De Laub. Brazilian Podoberry

A small tree 3-15 m. tall, to 30 cm. in girth, with few ascending branches. Buds semi-globose, 3 mm. in diameter, apex straight, scales acute-triangular. Leaves linear, broadly acute or rounded, narrowing at the base to the petiole, 5-8 cm. long by 9-12 mm. wide, keeled above, midrib prominent below, somewhat glaucous, apex round or sub-acute. Female cone on a peduncle 5 mm. long; receptacle 6 mm. long, with 2 bracts. Seeds globular, to 6 mm. long by 5 mm. wide, grenish-brown.
Venezuela: Guina Highlands; E. Brazil, Rondonia Territory, Mato Grasso, high altitude.

P. BRASSII Pilg. Brass Podoberry

A tree 10-12 m. tall, with dense, whorled branches. Bark fissured, pale gray-brown. Terminal bud globular, 8 mm. long; scales keeled, ovate-lanceolate. Juvenile leaves lanceolate, 2.5-4 cm. long. Adult leaves thick, leathery, lanceolate, 1-1.8 cm. long by 5-7 mm. wide, shiny green, paler below, margins revolute, midrib prominent, apex obtuse, petiole short and wide. Male strobili axillary, solitary, cylindrical, stout, 2.5-3 cm. long by 3-7 mm. wide, scales ovoid-triangular, microsporophylls lanceolate. Female cone solitary, sub-cylindric, on a peduncle 2-9 mm. long; receptacle with 2-3 fused bracts, 5-9 mm. long by 3-7 mm. wide. Seed ovoid, obtuse and oblique, 12 mm. long by 6 mm. wide.
New Guinea: Lake Habbema to Mt. Albert Edward, 3000-3750 m..

P. BRASSII var. HUMILIS De Laub. Capella Podoberry

A prostrate shrub or a small tree to 5 m. tall. Male strobili 2.5-5 cm. long by 3.5-4.5 mm. wide, microsporophylls with a triangular apex to 1 mm. long.
New Guinea: W.Papua New Guinea, Telefomin District, Mount Capella, high altitudes.

P. BREVIFOLIUS (Stapf.) Foxw. Shortleaf Podoberry
=P. neriifolius var. brevifolius Stapf.

A shrub or small tree 2.5-7.5 m. tall, with whorled branches and dense foliage. Buds small, 3.5-4 mm. in diameter; scales triangular-acute, keeled. Leaves thick, rigid, leathery, elliptic to lanceolate, 1.5-5.5 cm. long by 4-6 mm. wide, twisted, adpressed, midrib prominent, apex bluntly acute, petiole 1-2 mm. long. Male strobili solitary, sessile, cylindrical,2-3 cm. long by 4-5 mm. wide, scales triangular; apex of microsporophylls somewhat linear and acute. Female cone solitary, peduncle 2-4 mm. long; receptacle with 2 bracts, 5-6.5 mm. long by 2.5-4 mm. wide. Seed ovoid, apex obtuse, 12 mm. long by 6.5 mm. wide, pale brown to bluish-glaucous, crested.
Malaysia: Sabah, Mount Kinabalu, 3353-3505 m..

P. BUCHHOLZII De Laub. Buchholz Podoberry

A small tree 3-7 m. tall. Buds ovoid, 3 mm. in diameter, scales triangular-acute, apex straight, base surrounded by short leaves 6-10 mm. long. Leaves ovate, 2.5-3 cm. long by 5-7 mm. wide, apex narrowly rounded, margins somewhat revolute, without a distinct groove above. Male strobili sessile, to 2.5 mm. in diameter by 1 cm. long, with a cluster of sterile scales at the base. Female cone on a peduncle 10 mm. long, receptacle 7 mm. long. Seed 8 mm. long by 4.5 mm. in diameter, crested.
S. Venezuela: Guiana Highlands; Bolivar State, Chimanta Mts., Apacara-Tepui; R. Tirica and R. Turbia, 2120-2500 m..

P. CAPURONII De Laub. Capuron Podoberry
=P. woltzii Gaussen

A small tree 3-20 m. tall. Leaves bunched at ends of the branchlets, linear, narrow, 2.5-5 cm. long by 2.5-5.5 mm. wide, acute, margins revolute, sessile, midrib prominent. Male strobili cylindrical, on a peduncle 4-9 mm. long, solitary or in groups of 2-3, 2-3 cm. wide by 3.5-4.5 long; microsporophylls acute, apex lanceolate. Female cone egg-shaped, on a peduncle 3-5 mm. long by 1 mm. thick, cone 16-18 mm. long by 10-11 mm. wide, with 2 irregular bracts; apex free and obtuse. Seed with a large symmetrical crest.
E. Madagascar, type near Mt. Ambatomenaloha, 1500-2800 m..

P. CELATUS De Laub. Moro Podoberry

A tree 6-20 m. tall. Juvenile leaves lanceolate, to 18 cm. long by 2 cm. wide. Adult leaves ovoid, semi-linear, acute, 5-7 cm. long by 1-1.4 cm. wide, prominently grooved, non-acuminate. Female cone on a peduncle 4 mm. long; receptacle small, 6 mm. long. Seed globose, 9 mm. long by 8 mm. in diameter, not crested. Related to P. trinitensis and confused with P. magnifolius.
S. Venezuela: low elevation Amazon; Peru: Andes foothills; Bolivia: Moro (type).

P. CHINENSIS (Roxb.) Wall. ex Forb. Chinese Podoberry
=P. macrophyllus var. angustifolius Blume

A small tree to 18 m. tall. Branches erect. Juvenile leaves glaucous. Adult leaves erect, linear-lanceolate, 3-7.5 cm. long by 4.5-7 mm. wide, midrib prominent, apex obtuse, petiole relatively short. Male strobili sessile or in groups of 3-5, cylindrical, 3-4.5 cm. long by 2-3 mm. wide. Female cone solitary, peduncle 5-11 mm. long; receptacle with 2-3 bracts, red bloomed violet, with 1-2 ovules. Seed elliptic, 8-10 mm. long by 6-7 mm. wide, glaucous, crested.
N. Burma; China; C. Taiwan; S. Japan.

P. CHINGIANUS (Gray) S.Y. Hu Ching Podoberry
=P. chingii Gray, =P. macrophyllus var. maki Sieb. ex Endl.

A small columnar tree to 8 m. tall, to 10 cm. in girth or more. Buds small, conical; scales 3 mm. long, keeled. Leaves rigid, oval-lanceolate, 1.2-3 cm. long by 3-4 mm. wide, dark green above, yellowish below, midrib prominent, margins somewhat revolute, apex bluntly acute. Male strobili in clusters of 1-3, to 2.5 cm. long at maturity, scales long-triangular. Female cones rarely seen.
China: Chekiang, Ching Yean Shun and S. Kwangsi Chuang, to 100 m..

P. CONFERTUS De Laub. Silam Podoberry

A tree 36-60 m. tall. Buds ovoid, 6-10 mm. long by 2-3 mm. wide, scales lanceolate. Branchlets yellowish-brown. Leaves acute, linear-lanceolate, olive-green, yellow or paler below, 5-12 cm. long by 7-11 mm. wide, pointing forwards, narrowed, petiole 1 mm. long. Male strobili solitary or in twos, sessile, 3-4.5 cm. long by 2.5-3.5 mm. wide, apex of microsporophylls triangular. Female cone on a peduncle 5-13 mm. long, receptacle 8-12 mm. long, involucral leaves 5-6 mm. long. Seed 10-11 mm. long by 6-6.5 mm. wide, not crested.
Malaysia: Sabah, E. Slope of Mt. Silam; Sarawak, dominant in Kerangas forest, to 550 m..

P. CORIACEUS L.C. Rich. Yacca Podoberry
=P. coriaceus var. sulcatus Pilg.

A tree to 20 m. tall, 0.60-1 m. in girth. Branches alternate, opposite or whorled. Buds with long acuminate scales. Juvenile leaves 4-22 cm. long by 1.7 cm. wide. Adult leaves thick, alternate, linear-lanceolate, attenuate, falcate, 7-17 cm. long by 1-1.8 cm. wide, midrib prominent and with a weak raised groove, apex long and obtuse, petiole 6-12 mm. long. Male strobili axillary, solitary, sessile, cylindrical, 6 cm. long by 6 mm. wide. Female cone solitary, axillary, peduncle 7-10 mm. long; receptacle red to bluish, with 2-3 bracts, 6-7 mm. long, ovule solitary. Seed ovoid, 9 mm. long by 6-7 mm. wide, with

a distinct obtuse crest.
Puerto Rico; Montserrat; Guadalupe; Dominica; St. Kitts; Martinique, 600-762 m..

P. COSTALIS C. Presl. Formosan Podoberry

A small tree to 3 m. tall, with dense branches. Buds ovoid; scales obtuse, keeled, 2-2.5 mm. long. Leaves thick, sub-lanceolate, 3.8-7 cm. long by 7-15 mm. wide, midrib prominent, margins slightly revolute, apex obtuse or emarginate, petiole relatively short. Male strobili sessile, solitary, 2-2.5 mm. long, cylindrical, scales obtuse. Female cone solitary, axillary, peduncle 2 mm. long; receptacle with 2 fused bracts with rounded tips, 7 mm. long. Seeds elliptic, 7-9 mm. long, with an obtuse crest.
Taiwan: Orchid Island; Philippines: Luzon, Polillo Islands, to 300 m..

P. CRASSIGEMMIS De Laub. Asaro Podoberry

A tree 4-38 m. tall. Buds thick, globose, 3-5 mm. long by 4-5 mm. wide, scales acute and triangular. Juvenile leaves to 16 cm. long. Adult leaves thick, lenticulate, 3-11 cm. long by 4.5-12 mm. wide, margins revolute, midrib narrow and fairly prominent, apex acute, petiole to 5 mm. long. Male strobili solitary or in twos, 3-4 cm. long by 5-8 mm. wide; apex of microsporophylls elongated, broadly acute. Female cone on a peduncle 5-14 mm. long; receptacle with 2 bracts, fertile bract 10-15 mm. long, deep red to black, not crested, with 2 linear-lanceolate bracts at the base of the cone to 2 mm. long.
New Guinea: Lake Habbema to Upper Asaro Valley (type), 1800-3500 m..

P. CUNNINGHAMII Colenso Cunningham Podoberry
=P. hallii T. Kirk

A tree 8-25 m. tall, with slender, somewhat drooping branches. Bark thin, papery, red-brown. Branchlets blackish-purple. Terminal bud oval, scales obtuse and somewhat apiculate. Juvenile leaves 2-ranked, 2-6.8 cm. long by 4-5 mm. wide. Adult leaves brownish-green, narrowly linear, rigid, leathery, thick, 2.5-4.5 cm. long by 1-5 mm. wide, midrib prominent, apex sharply acute, with a short flat petiole. Male strobili solitary or in groups of 2-5, peduncle relatively short. Female cone solitary or in twos, peduncle 2-3 mm. long; receptacle with 2-4 bracts fused at the base, red, subglobose. Seed narrowly ovoid, 1-1.2 cm. long, apex acute, with a crest.
New Zealand: Kaitaia, N. Island to Stewart Island, montane and subalpine, to 950 m..

P. DECUMBENS Gray Decumbent Podoberry

A decumbent shrub to 40 cm. high. Bark fine, red-brown, exfoliating in fibrous bands. Terminal buds to 10 mm. long, scales lanceolate. Leaves narrowly obovate, 5-8 cm. long by 6-8 mm. wide, apex bluntly acute, petiole to 5 mm. long. Male strobili solitary, sessile, 10-30 mm. long by 3 mm. wide; microsporophylls small, triangular. Female cone axillary, peduncle to 6 mm. long; receptacle with 3-4 bracts, 6-7 mm. long, accompanied by 2-3 linear scales 3-4 mm. long by 1 mm. wide. Seeds ovoid, 6-7 mm. long by 4 mm. wide, crested.
S. New Caledonia, type from Mt. des Sources, 800-1000 m..

P. DEFLEXUS Ridley Malaysian Podoberry

A small tree 5-12 m. tall, with robust, whorled branches that often spread at right angles to the trunk. Bark gray-brown, shallowly fissured. Buds globular, 1.2 cm. long, scales triangular and reflexed. Leaves densely arranged at tips of branchlets, strongly deflexed, thick and rigid, linear-lanceolate, 10-27 cm. long by 7-12 mm. wide, bright green, midrib prominent, margins recurved, pale and channeled below, apex blunt. Male strobili solitary or in threes, globular, on a short peduncle. Female cone solitary, at tips of branchlets, peduncle 9-15 mm. long; receptacle to 8 mm. long, glaucous. Seeds 1-2 per cone, obovoid, 1.1-1.2 cm. long by 8-9 mm. wide.
Malaysia: Malay Peninsula, Pahang, Gunong Tahan, 1650-2300 m..

P. DEGENERI (Gray) De Laub. Degener Podoberry
=P. neriifolius var. degeneri Gray

A shrub or a small tree 3-25 m. tall, to 50 cm. in girth or more. Branches sparse and subverticillate, drooping. Buds large, ovoid, apex acuminate to long-attenuate. Juvenile leaves to 18 cm. long by 1.7 cm. wide. Adult leaves narrowly acuminate, 5-10.8 cm. long by 6-10 mm. wide, shiny, petiole short. Male strobili axillary, cylindrical, 3 cm. long by 3-3.5 mm. wide, surrounded at the base by numerous broadly ovate scales. Female cone on a slender peduncle 7-12 mm. long; receptacle with fused bracts, 8 mm. long, with small, spreading free tips, bright red; ovules 1-2; involucral leaves 4-10 mm. long. Seeds elongated, 9-12 mm. long by 5 mm. wide, bluntly crested.
Fiji: Vitu Levu, Nausori Highlands, dry forest, 40-900 m..

P. DISPERMUS White Atherton Podoberry

A tree 13.5-18 m. tall, to 12.5 cm. in girth or much more. Bark light brownish-gray, slightly flaky. Buds small, 6 mm. long. Leaves broadly linear to narrowly lanceolate, dark shiny green, acute, 10.2-25.4 cm. long by 2-3 cm. wide, midrib prominent, petiole relatively short. Male strobili sessile, 1-3 per cluster, 3 cm. long by 3 mm. wide. Female cone axillary, on a peduncle 5-15 mm. long; with a very fleshy cherry-red or scarlet receptacle, receptacle with 2 small, deciduous bracts. Seeds ellipsoid, 2.5 cm. long by 8 mm. wide, usually in pairs, bluish-green.
Australia: N.E. Queensland, Atherton Tableland, rain forest.

P. DROUYNIANUS F. Muell. Drouyn Podoberry

A shrub or small tree 1-2 m. tall, with erect branches. Bark gray-brown, scaly. Buds ovoid, 5 mm. long, scales attenuate. Leaves grass-like, green, linear, spirally arranged, 7.6 cm. long by 2.5 mm. wide, glaucous below, midrib prominent, margins strongly recurved, sharply acute, base broadened. Male strobili on a peduncle 10-25 mm. long, solitary or in small groups, 6-13 mm. long by 4 mm. wide. Female cone solitary, on a slender peduncle; receptacle 13-25 mm. long, with 2-3 bracts, rounded at the apex, waxy, purple. Seed to 19 mm. long, not crested.
Australia: S.W. Western Australia, Warren District, Manjimup.

P. ELATUS R. Brown ex Endl. Rockingham or Giant Australian Podoberry

A tree to 40 m. tall, to 90 cm. in girth or much more, trunk often fluted. Bark dark brown, fissured and scaly. Branchlets smooth, greenish-brown. Leaves oblong-linear or linear-lanceolate, shiny dark green, smooth, 4-18 cm. long by 13-18 mm. wide, midrib prominent, paler below, mucronate, with a short sharp point at the apex, petiole to 3 mm. long. Male strobili in clusters of 2-10, to 12 mm. long, scales obtuse. Female cone on a peduncle 3-10 mm. long; receptacle bluish-black, to 2.5 cm. wide, with 2 bracts, edible. Seeds singular, resinous, globular, 8-12 mm. long.

Australia: E. Queensland, Cape York Peninsula to Illawara, New South Wales, originally described from Rockingham, 500-1100 m..

P. ELONGATUS (Ait.) L'Her. ex Pers. South African Podoberry

A shrub 3-6 m. tall or a tree to 36 m. tall. Bark gray-brown to pinkish-brown, fissured into thin strips or flakes, glaucous on young branches. Juvenile leaves 13 cm. long by 1.5 cm. wide. Leaves lanceolate, alternate or nearly opposite, relatively narrow, dark green to glaucous, 2.5-6.5 cm. long by 3.5-5 mm. wide, stomata on both surfaces in short rows, apex obtuse, petiole relatively short.Male strobili solitary or in groups of 3-5, sessile, 1-2 cm. long, subtended by 2 scales at the base. Female cone on a short peduncle 7-9 mm. long; receptacle with a bifid apex, red or purple, 9-15 mm. wide by 10-16 mm. long. Seed ovoid or globose, dark blue-green, often in pairs, 6-8 mm. wide.

South Africa: S.W. Cape Province; Zimbabwe: Chimamieanie Mts., to 500 m..

P. FASCICULUS De Laub. Tai-Shu Shan Podoberry

A tree 9-20 m. tall. Bark thin, smooth, brown, exfoliating, flaky. Branchlets olive-green. Buds ovoid, 4-9 mm. long by 1.5 mm. wide; exterior scales lanceolate, keeled. Juvenile leaves linear-lanceolate, 9-16 cm. long by 9-13 mm. wide, acute. Adult leaves linear-lanceolate, spreading vertically, sharply acute, olive-green, paler below, 5-12 cm. long by 5-12 mm. wide, midrib prominent, petiole 3-6 mm. long. Male strobili in groups of 1-5, oblong, on a scaly peduncle 2-10 mm. long, cone 2-3 cm. long by 2-2.5 mm. wide; microsporophylls triangular. Female cone on a peduncle 6-13 mm. long; receptacle 9-16 mm. long, reddish; involucral leaves 2-3 mm. long, early deciduous. Seed 10 mm. long by 7 mm. wide.

S. Japan and Ryukyu Islands; Taiwan: Tai-Shu Shan Forestry District, to 2000 m..

P. GIBBSII Gray Gibbs Podoberry

A tree 10-20 m. tall, with erect branches. Buds ovate, 15 mm. wide; scales lanceolate, keeled, 6 mm. long. Juvenile leaves 5.2 cm. long by 9 mm. wide. Adult leaves thick, spathulate, elliptic or lanceolate, 1.3-2 cm. long by 4-6 mm. wide, with a continous upper hypoderm, with no extra resin canals, flattened, midrib prominent, margins slightly recurved, apex obtuse, petiole relatively short. Male strobili axillary, solitary or in pairs, stamens deltoid with a long acuminate apex. Female cones not seen.

Malaysia: N. Sabah , Mt. Kinabalu, Marai Parai, 1600-2300 m..

P. GLAUCUS Foxw. Blue Podoberry

A shrub or tree 5-17 m. tall, with dense, twisted, whorled branches. Bark colored. Buds small, external scales 3 mm. long, with an acuminate apex. Juvenile foliage glaucous. Adult leaves erect, crowded, thick, rigid, oblong-lanceolate, 1-2.5 cm. long by 3.5-6 mm. wide, pale green, midrib prominent, margins recurved, apex obtuse and usually apiculate; petiole relatively indistinct, 1-2 mm. long. Male strobili cylindrical, solitary, 1-3 cm. long by 2.5-6 mm. wide, stamens densely imbricate. Female cone solitary, on a short peduncle to 6 mm. long; receptacle with 2 curved bracts, 9 mm. long. Seeds ovoid, 1.2 cm. long by 6 mm. wide, with a blunt, oblique apex.

W. Phillipines; Indonesia: E. Celebes; New Guinea; Solomon Islands, to 2400 m..

P. GLOBULUS De Laub. Sabah Podoberry

A tree 3.5-27 m. tall. Branchlets somewhat drooping, greenish-brown. Buds globular, 2-3 mm. long by 2-3 mm. wide. Leaves linear, 3.5-8.5 cm. long by 9-15 mm. wide, apex acute or rounded, midrib prominent, broadly oval, olive-green, yellowish below, petiole 3-5 mm. long. Male strobili sessile or on a short peduncle to 1 mm. long, solitary or sometimes in threes, 2.5-4.5 cm. long by 3-4 mm. wide; apex of microsporophylls triangular. Female cone on a peduncle 3-4 mm. long; receptacle 9 mm. long; involucral leaves 2 mm. long. Seed 9 mm. long by 5.5 mm. wide, with a short crest.

Malaysia: C. Sabah, Mt. Silam; N.E. Sarawak, to 853 m., on mossy forest ridge, rare.

P. GLOMERATUS D. Don ex Lamb. Huanuco Podoberry

A shrub or small tree 9-12 m. tall, with whorled branches. Bark smooth, dark yellow-brown. Buds subglobose, 7 mm. long; scales lanceolate, acuminate; apex erect. Leaves erect, spirally arranged, thick, 2-5 cm. long by 2-5 mm. wide, linear-lanceolate, bright green, very glaucous below, broadly linear, midrib not prominent, margins revolute, apex sharply acute, petiole relatively short. Male strobili in groups of 6, on slender peduncles 8-12 mm. long, cylindrical, 6 mm. wide by 15 mm. long, scales imbricate. Female cone sessile, peduncle 3-5 mm. long; receptacle 5-6 mm. long, fleshy. Seed 6-8 mm. long, usually without a crest.

Peru: Huanuco-panao; N.C. Bolivia, 2500-4000 m..

P. GNIDIOIDES Carr. New Caledonian Podoberry

A decumbent shrub to 2 m. tall. Bark thin, fibrous, red-brown. Terminal buds somewhat globose, 1 mm. long by 2 mm. wide, scales keeled. Leaves densely arranged, linear, glaucous below, 8-22 mm. long by 2-2.5 mm. wide, margins revolute, apex obtuse, with a short petiole. Male strobili solitary, on a peduncle 2-4 mm. long, cone 8-14 mm. long by 2-2.5 mm. wide, with obtuse scales at the base. Female cone solitary, on a peduncle 1 mm. long; receptacle with 2 bracts, 3-7 mm. long, bright red. Seed ovoid, 6-7 mm. long by 3.5 mm. wide, with a rigid surface and an erect crest.

S. New Caledonia: Mt. Humboldt to Mt. des Sources, 400-1600 m..

P. GRAYI De Laub. Cape York Podoberry

A tree to 20 m. tall, to 35 cm. in girth or much more. Bark brown, fibrous. Branchlets grooved. Buds globose to ovoid, somewhat pubescent, 2-3 mm. long by 2-3 mm. wide, scales triangular, dark brown, edges fringed; exterior scales somewhat curved at the apex, closely imbricate. Juvenile leaves linear-lanceolate, 16-23 cm. long by 14-19 mm. wide. Adult leaves linear-lanceolate, bluntly acute, 9-18 cm. long by 8-14 mm. wide, slightly falcate, midrib widened, gray-green, brownish underneath with longitudinal streaks, apex acute to bluntly acute, petiole twisted and 4-10 mm. long. Male strobili sessile or on a peduncle 1 mm. long, 1-4 per cluster, 2-3 cm. long by 3-4 mm. wide, apex of microsporophylls triangular. Female cone on a peduncle 6-8 mm. long; receptacle oblong, 9-12 mm. long by 3 mm. wide, involucral leaves 1 mm. long. Seeds globular,black with a glaucous bloom, 10-12 mm. long by 7-9 mm. wide.
Australia: N. Queensland, Annan River, to 400 m..

P. GUATEMALENSIS Standley Guatemalen Podoberry
=P. guatemalensis var. allienii (Standl.) Buchh. et Gray, =P. guatemalensis var. pinetorum (Bartl.) Buchh. et Gray

A tree to 20 m. tall, with upright branches and a spreading crown. Bark smooth, red-brown, scaly. Buds ovoid, scales apiculate and broadly ovate. Juvenile leaves 14 cm. long by 1-1.2 cm. wide. Adult leaves lanceolate, 10 cm. long by 1 cm. wide, with a distinct blunt ridge on the midrib above, narrowed at the apex. Male strobili cylindrical, axillary, on 2 year old branchlets. Female cone axillary, peduncle 4-6 mm. long, receptacle 6-7 mm. long. Seed ellipsoid, 8 mm. long, with a distinct, small conical crest.
Guatemala; British Honduras; Panama; W. Columbia; N. Venezuela, 400-700 m..

P. HENKELLII Stapf. Henkell Podoberry
=P. ensisculus Melv.

A tree 30-35 m. tall, with pendent branches. Bark dark gray, exfoliating in long strips. Leaves opposite or subopposite, falcate, dark green above, 7-12 cm. long by 8-13 mm. wide, with 20-35 lines of stomata below, glaucous-green, midrib prominent, apex attenuate, petiole relatively short. Male strobili solitary or in pairs, 1.3-4.5 cm. long, pollen grains 33-42 microns in diameter. Female cone solitary, axillary, on a peduncle 7 mm. long; receptacle with 2 bracts, glaucous green. Seeds globose, glaucous-green, 1.7-3.5 cm. long by 1.4-2.8 cm. wide, thick-shelled.
E. South Africa: Natal; E. Tanganyika, highlands, 1900-2000 m..

P. HISPANIOLENSIS De Laub. Hispaniola Podoberry

A tree to 10 m. tall, to 1 m. in girth. Buds globose, 2-3.5 mm. wide by 2-3 mm. long, with imbricate scales. Leaves linear-elliptic, 3.5-8 cm. long by 6-11 mm. wide, narrowing at the apex, midrib prominent, petiole 1-3 mm. long. Male strobili sessile, solitary. Female cone on a peduncle 7 mm. long, cone 7 mm. long by 4 mm. wide, with a distinct apical crest; receptacle 8 mm. long, red. Related to P. purdieanus.
Dominican Republic: Peravia Province, Nacimiento del Rio Mahoma; La Vega Province, La Sal, 800-1100 m., humid forest.

P. HUMBERTII De Laub. Humbert Podoberry

A small tree 3-15 m. tall. Juvenile leaves 25 cm. long by 8 mm. wide. Adult leaves oval, twisted, bluntly acute, 8-12 mm. long by 2.5-5.5 mm. wide, margins revolute and recurved, midrib prominent, petiole relatively short. Male strobili cylindrical, solitary or in pairs, 8-20 mm. long by 2.5-3 mm. wide, on a peduncle 3-6 mm. long; apex of microsporophylls triangular. Female cone on a peduncle 2-3 mm. long, beak-shaped; enlarged at the base by 2 unequal bracts, 3-5 mm. long. Seed 15 mm. long by 8-10 mm. wide, cristate.
N.E. Madagascar: Anjanaharibe Mts., W. Andapa, 1600-2000 m..

P. INSULARIS De Laub. Sudest Podoberry

A tree 3-39 m. tall. Buds 2.5-3 mm. long by 2.5-3.5 mm. wide, apex spreading, exterior scales triangular. Leaves lenticulate, bluntly acute, paler below, 5.5-9 cm. long by 7-9 mm. wide, elliptic, midrib prominent, petiole twisted. Male strobili solitary or 2-3 in a group, sessile or on a short peduncle, cone 3-3.5 cm. long by 4 mm. wide. Female cone on a peduncle 7-10 mm. long; receptacle 8-10 mm. long, with 2 bracts; involucral leaves 2 mm. long; cone ovoid, 9-10 mm. long by 6-7 mm. wide.
Indonesia: Sudest Island, Tagula; E. New Guinea; New Hebrides.

P. LAMBERTII Klotzsch. ex Endl. Lambert Podoberry

A large tree to 6 m. or much more, with numerous, subverticillate branches. Foliage dense, Taxus-like, erect. Buds globose; scales ovoid, obtuse at the smooth margins. Leaves narrowly oblong or linear-lanceolate, broadly acute, 2.5-4 cm. long by 2-4 mm. wide, bright green, pale and keeled below, midrib prominent, non-revolute, with a continuous hypoderm, apex acuminate. Male strobili numerous, axillary, in groups of 3-6, at the tip of a peduncle 5-15 mm. long, bract at base of cone deciduous. Female cone solitary, on a peduncle 5-8 mm. long; receptacle with 2 fused bracts and one free scale, 4 mm. long. Seed solitary, globose or nearly oblong, 4 mm. long by 4 mm. wide.
E. Argentina; Brazil: Serra de San Hose; Campos do Jordao, 500-2300 m..

P. LATIFOLIUS (Thunb.) R. Brown Kenya Podoberry
=P. milanjianus Rendle,=P. ulgurensis Pilg., =P. leukelii Hort.

A tree 30-35 m. tall, to 3 m. in girth. Bark dark gray, fibrous, exfoliating in thin, long strips. Branchlets dense, stiff, erect. Buds ovoid to globose, 5 mm. long, brown. Juvenile leaves 17 cm. long by 1.5-1.7 cm. wide. Adult leaves spirally arranged, alternate, dark green or bright blue-green, oblong or lanceolate, midrib prominent, rarely with a few isolated stomates above, 2.5-10 cm. long by 5-11 mm. wide, margins somewhat revolute, apex mucronate, petiole relatively short. Male strobili solitary or in pairs, cylindrical, stalkless, 2.5-5 cm. long by 4.5-5 mm. wide. Female cone solitary, peduncle 6-13 mm. long, with 2 pairs of scales with fused bracts on the receptacle; receptacle 8-14 mm. long by 8-14 mm. wide, green turning red, notably scented. Seed subglobose, glaucous-green, 7-13 mm. long, slightly apiculate and curved at the apex.
Cameroon; S. Sudan; Congo; Zaire; Uganda; Kenya; Tanganyika; Malawi; Rhodesia; South Africa, 400-1800 m..

P. LATIFOLIUS var. LATIOR Pilg. Table Mountain Podoberry

A tree 9-15 m. tall, 0.30-1.8 m. in girth. Young branchlets slightly glaucous. Buds yellowish-brown, ovoid, 3 mm. long, scales recurved. Juvenile leaves 7-18 cm. long. Adult leaves crowded near tips of the branchlets, broadly lanceolate, apex rounded with a spiny apex, 2.8-3.5 cm. long by 8-9 mm. wide, relatively broad, slightly glaucous underneath, margins recurved, broadened near the upper half. Male strobili in groups of 4-6, 1.5 cm. long by 5 mm. wide. Female cone axillary, singular, on a thin peduncle 3 mm. long; cone egg-shaped, yellowish, 7-8 mm. long by 6-7 mm. wide, glaucous at the base; basal receptacle purplish, 6 mm. long.

South Africa: Cape Province, Table Mountain, below reservoir, 1524 m..

P. LAUBENFELSII Tiong De Laubenfels Podoberry

A tree to 37 m. tall. Bark nearly smooth, soft, light brown. Branchlets dark greenish-brown. Bud ovoid, 2 mm. long, scales free and spreading at the tips. Adult leaves acuminate, 7-19 cm. long by 1-1.8 cm. wide, linear or linear-lanceolate, midrib fairly prominent and blunt, narrowing abruptly at the base, apex acuminate or acute; petiole relatively long, 6-14 mm. long. Male strobili on a peduncle 6 mm. long, or rarely sessile, 3-5 in a group, cylindrical, subtended at the base by sterile triangular scales; pollen sacs elongated. Female cone on a peduncle 10-16 mm. long, receptacle 9 mm. long, with 2 basal bracts to 1.5 mm. long.

Malaysia: Sabah, Mt. Kinabalu, Bukit Burong; Sarawak, Lawas, Bumbong Rumah;
Indonesia: E. Borneo, W. Kutei, Mt. Palimasan, 660-1620 m..

P. LAWRENCII Hook. f. ex Hook. Lawrence Podoberry
=P. acutifolius Kirk

A spreading shrub or an erect small tree to 10 m. tall, with thin bark and slender branches. Leaves alternate, narrowly linear, 1-2.5 cm. long by 1-3 mm. wide, bronze-green, tapering to a sharp pointed apex. Male strobili solitary or in groups of 2-4, on a peduncle 8 mm. long, cone 15-18 mm. long by 2.5 mm. wide. Female cone solitary or rarely paired, on a short peduncle; receptacle with 2 red, obtuse bracts. Seeds narrowly ovoid.

New Zealand: S. Island, Malboro Straits to S. Westland, 1000-1400 m..

P. LEDERMANNII Pilg. Ledermann Podoberry
=P. idenburgensis Gray

A tree 4-33 m. tall. Buds rather long, 4-8 mm. long by 3-4 mm. wide, reddish; scales linear-lanceolate and spreading. Leaves relatively large, linear, acute, 11-18 cm. long by 1.7-2.1 cm. wide; midrib fairly prominent, broad and rounded; apex acuminate; petiole to 5 mm. long. Male strobili in groups of 3, on a peduncle 3-4 mm. long, cone 4.5 cm. long by 4 mm. wide, subtended at the base by a cluster of triangular scales; exposed part of microsporophyll about 1 mm. long. Female cone on a peduncle 4-15 mm. long; receptacle with 2 linear-lanceolate bracts at the base to 2 mm. long; receptacle with 2 bracts, the fertile one 9-16 mm. long; red. Seed oval, 11-13 mm. long by 9-10 mm. wide.

New Guinea: West, Wissel Lake; E. Highlands, Morobe, Ilaru; Central, Woitape;
New Britain: Cape Glaucester and Mt. Talawe, 1000-2400 m., rainforest.

P. LEVIS De Laub. Mariatu Podoberry

A tree to 25 m. tall. Bark brown, peeling. Buds ovoid, 4 mm. in diameter, with spreading scales. Leaves narrowly lanceolate, 10-14 cm. long by 10-14 mm. wide, upper surface smooth, midrib weak, with continuous hypoderm, apex narrowly rounded. Male strobili solitary, cylindrical, 3-4 cm. long by 4 mm. in diameter, scales triangular, microsporophylls more or less overlapping. Female cone on a peduncle 7 mm. long; receptacle 5-6 mm. long, with 2 bracts, reddish, scales swollen, bract about twice the size of P. rumphii; bearing 1-2 ovules. Seeds to 8 mm. long.

Indonesia: E. Borneo; Celebes; Moluccas; New Guinea, type from Japen Island, West Irian, 200-700 m..

P. LONGIFOLIOLATUS Pilg. Mou Podoberry

A tree 10-20 m. tall. Bark dark brown, fibrous, plate-like or in bands. Terminal buds globose, 10 mm. long by 1.5 mm. in diameter, scales lanceolate. Juvenile leaves 14 cm. long by 1.1 cm. wide. Adult leaves linear, bright green, attenuate at the base, 6-8 cm. long by 7-8 mm. wide, apex bluntly acute, petiole to 10 mm. long. Male strobili solitary or in threes, sessile or on a peduncle 5 mm. long; cone 1.5-2.6 cm. long by 2.5-3.5 mm. in diameter; microsporophylls triangular. Female cone on a peduncle 9-17 mm. long by 1-2 mm. wide; receptacle with 3-4 bracts, each bract 8 mm. long, scales lanceolate and 3.5-5 mm. long. Seeds 2 per cone, obovoid, 8-9 mm. long by 5-7 mm. in diameter, crested.

New Caledonia, along the coasts, type near Mt. Mou, 1100-1450 m..

P. LOPHATUS De Laub. Tapulao Podoberry

A small tree. Buds small, about 3 mm. long and 2 mm. in diameter, scales lanceolate and slightly spreading at the apex. Leaves densely crowded, somewhat leathery, long-elliptical, acute, to 3 cm. long by 5 mm. wide, slightly revolute; midrib marked by a sharp narrow rib on the upper surface, more broadly and almost indistinct below; narrowed at the base to a short petiole about 2 mm. long. Female cone on a peduncle about 5 mm. long; receptacle formed of 2 enlarged fused bracts, slightly spreading at the apex, the fertile bract only slightly shorter. Seed globose, about 7 mm. long by 4 mm. in diameter, tapering to the apex to a distinct crest.

Philippines: Luzon, Zambales Province, Mt. Tapulao, to 1800 m..

P. LUCIENII De Laub. Lucien Podoberry

A dioecious tree to 12 m. tall. Bark light brown, turning gray, with longitudinal fissures. Branchlets subverticillate, 2-2.5 mm. in diameter. Buds ovoid; with imbricate, keeled, ovate-obtuse scales. Juvenile leaves to 17 cm. long by 2 cm. wide, obtuse. Adult leaves spirally arranged, linear-oblong, 7-11 cm. long by 10-14 mm. wide, lustrous green, with an obtuse apex and a short petiole. Male strobili in threes, on a peduncle 2 mm. long. Female cone solitary, axillary; receptacle 9-11 mm. long with 2 unequal, coalescent bracts or scales; peduncle 12-17 mm. long. Seeds elongated, to 15 mm. long by 10 mm. wide, with a small crest.

S. New Caledonia: Mt. Panie, type near Riviere Bleue, 220-900 m..

P. MACROCARPUS De Laub. Bigcone Philippine Podoberry

A tree 10-20 m. tall. Buds globular to cylindrical, 3 mm. long by 2-4 mm. in diameter; scales triangular, slightly spreading. Leaves thick, linear-lanceolate, 8-15 cm. long by 9-14 mm. wide, midrib prominent, upper hypoderm nearly continous, apex bluntly acute, petiole about 6 mm. long. Female cone takes 2 years to ripen; on a peduncle 3-12 mm. long; receptacle purple, with 2 enlarged united bracts, fertile bract 10-12 mm. long. Seed globular, but distinctly raised at the base by a broad peduncle 2 mm. long. Seed about 13 mm. long by 10 mm. wide, abaxial side less curved.
Philippines: Luzon, Mt. Pico de Loro to Mt. Binuang, 50-2040 m..

P. MACROPHYLLUS (Thunb.) Don Japanese Podoberry
=P. forrestii Craib. et Smith

A shrub or tree 8-20 m. tall, with numerous horizontal branches. Bark ashy-gray, rugose, 6-8 cm. thick. Buds conical, scales acuminate and recurved. Juvenile leaves to 17 cm. long by 1.2 cm. wide. Adult leaves densely and spirally arranged, thick, leathery, linear-lanceolate, 5.3-10.3 cm. long by 6-10 mm. wide, bright green, glaucous below, midrib prominent, apex obtuse. Male strobili in groups of 3-5, sessile, cylindrical, 3-3.5 cm. long. Female cone solitary, on a peduncle 13-18 mm. long; receptacle with 2-3 bracts, reddish-purple, with 2 basal scales 3-4 mm. long. Seeds ovoid, attenuate at the base, 1.2-1.5 cm. long by 7-8 mm. in diameter, glaucous-green, with a slight crest.
S. Japan: Mt. Maya; China: Chekiang, Szechuan and Yunnan, 2500-3500 m..

P. MADAGASCARIENSIS Baker Madagascar Podoberry

A small pyramidal tree 4-13 m. tall, with numerous branches. Bark gray, fissured. Buds globular, compact, 4-6 mm. long, with rounded scales. Leaves spirally arranged, narrow, linear, 9-12 cm. long by 11-12 mm. wide, reflexed, pendulous on upright shoots, midrib prominent, channeled on the upper surface, margins revolute, apex bluntly acute, petiole narrow. Male strobili on a peduncle 2-3 mm. long, in groups of 2-3, 3-5 cm. long by 3.5-5 mm. wide. Female cone on a peduncle 1.5-4 cm. long; receptacle with 3 bracts, spreading at the apex, 4-7 mm. long. Seed ovoid, 2 cm. long by 8 mm. wide, with a small crest.
E. Madagascar, local, type near Ranomena, 800-2400 m..

P. MADAGASCARIENSIS var. PROCERUS De Laub. Mahatalaky Podoberry

Leaves narrow, linear, 5-13 cm. long by 4-6 mm. wide, strongly reflexed, pendulous on upright shoots, apex acute. Male strobili on a peduncle 3 mm. long, solitary or in groups of 2-3, 3 cm. long by 4 mm. wide.
E. Madagascar, type near Fort Dauphin, Mahatalaky, low altitudes.

P. MADAGASCARIENSIS var. ROTUNDUS Laurent Tsaratanana Podoberry

Terminal buds small, 2 mm. in diameter. Leaves lanceolate, erect not pendent, 4-7 cm. long by 5.5 mm. wide, bluntly acute. Male strobili sessile, solitary or in groups of 2-3, 1.5 cm. long by 3-4 mm. wide. Seeds relatively large, to 2.8 cm. long.
N.E. Madagascar, type near Tsaratanana, 1500-2000 m..

P. MAGNIFOLIUS Buchh. et Gray Larecaju Podoberry

A tree 20-25 m. tall, with dense, sub-erect branches. Bud scales shortly acuminate. Juvenile leaves 17 cm. long by 2.4 cm. wide. Adult leaves leathery, erect or spreading, green, paler below and with channeled margins, lanceolate, 5-12 cm. long by 1.2-1.7 cm. wide, midrib distinctly grooved above, apex narrowly rounded to acuminate, petiole 3-5 mm. long. Male strobili sessile, solitary, axillary, with numerous scales, stamens with an obtuse-denticulate apex. Female cone on a peduncle to 12 mm. long; receptacle narrow, to 5 mm. long. Seed ovoid, 8 mm. long by 3 mm. wide.

S.E. Venezuela: Bolivar; Bolivia: Larecaju Province, 1580-1600 m..

P. MATUDAI Lundell Matuda Podoberry
=P. matudai var. macrocarpus Buchh. et Gray,=P. reichei Buchh. et Gray

A large tree to 20 m. tall or more, to 1.5 m. in girth. Bark gray, furrowed. Buds attenuate, 4-10 mm. long, reflexed at the apex, scales lanceolate. Juvenile leaves to 16 cm. long by 1.9 cm. wide. Adult leaves leathery, lanceolate, somewhat falcate, 4-9 cm. long by 1-1.6 cm. wide, with a distinct ridge above the midrib, apex acute. Male strobili sessile, cylindrical, 3-3.5 cm. long by 4 mm. wide; subtended at the base by broad, keeled, apiculate scales. Female cone on a peduncle 4-6 mm. long; receptacle with 2 fused bracts, 4-6 mm. long, apex obtuse. Seed ovoid, 8-10 mm. long by 7-8 mm. wide, with an obscure, blunt crest.

Mexico: Vera Cruz; Puebla; Chiapas; Guatemala: Dept. Huehuetenango, 1000-3500 m..

P. MICROPEDUNCULATUS De Laub. Marudi Podoberry

A small erect tree 1-13 m. tall, often reproducing by rhizomes. Branchlets yellowish-brown. Buds 6-15 mm. long by 1.5-3 mm. in diameter, exterior scales lanceolate, scales at the base spreading. Leaves linear-acuminate, spreading, 8-17 cm. long by 1-1.5 cm. wide, green, yellowish below, acute, keeled, petiole 3-6 mm. long. Male strobili solitary or 3 per cluster, on a short peduncle or sessile, 3.5-7.5 cm. long by 2.5-3.5 mm. wide. Female cone on a peduncle 1 mm. long; receptacle 8-10 mm. long, red; involucral leaves 3-4 mm. long. Seed ovoid, 8-10 mm. long by 6 mm. wide, slightly crested.

Malaysia: N.W. Sabah; N. Sarawak, Marudi Forest Reserve, to 18 m. or more.

P. NAKAII Hayata Nakai Podoberry
=P. macrophyllus var. nakaii (Hay.) Li et Keng

A tree 10-18 m. tall, to 0.60 cm. in girth. Bark gray, grooved. Buds globose, 3 mm. long. Branchlets smooth, fawn-brown. Leaves erect or spreading, crowded in tufts at tips of branchlets, linear-lanceolate, 5-10 cm. long by 8-14 mm. wide, midrib prominent, non-revolute, apex acute, petiole to 5 mm. long. Male strobili 2.8-3.2 cm. long. Female cone solitary, on a peduncle 2-4 mm. long; receptacle red, 5-12 mm. long. Seed globose, oblique, 10 mm. long by 8 mm. wide, with a large crest.

N. Taiwan: Shin Chiku Province, to 833 m..

P. NERIIFOLIUS Don ex Lamb. Oleander Podoberry
=P. decipiens Gray, =P. junghuhniana Miq., =P. neriifolius var. membranacea Wassch., =P. neriifolius var. polyanthus Wassch.

A tree 25-40 m. tall, with spreading branches that are more or less whorled. Bark reddish-brown, fibrous, exfoliating in thin strips. Buds conical, 5-7 mm. long by 2-4 mm. in diameter, with ovoid, triangular scales. Juvenile leaves to 19 cm. long by 1.9 cm. wide. New growth green to reddish. Adult leaves alternate, linear-lanceolate, leathery, 6.5-12 cm. long by 1-1.2 cm. wide, dark green, paler below, midrib prominent; margins parallel, sometimes recurved; apex narrowly acute to acuminate, non-apiculate; petiole to 6 mm. long. Male strobili sessile, in groups of 3, cylindrical, 2.5-3.5 cm. long by 3.5 mm. wide, subtended at the base by a cluster of sterile bracts, pollen sac globular. Female cone solitary, on a peduncle 3-24 mm. long; receptacle with 2 fused bracts to 2 mm. long, red. Seed ellipsoid, 9-16 mm. long, narrowed at the base.
Nepal to N. Burma; China: S. Yunnan; Indochina; Malaysia; Indonesia; Philippines; Solomon Islands; Fiji, 200-1600 m..

P. NIVALIS Hook.f. Snow Podoberry

A low, dense, prostrate plant or an erect shrub 1-2 m. tall, with short branches. Terminal buds globular, green, scales keeled. Leaves closely and irregularly arranged, narrow, leathery, olive-green, 5-15 mm. long by 2-4 mm. wide, midrib fairly prominent, apex with a minute mucro, petiole stout. Male strobili solitary or in groups of 2-4, on a thin peduncle, with small decurrent bracts at the basc, cylindrical, 10 mm. long by 3-5 mm. wide. Female cone solitary, on a peduncle 10 mm. long; receptacle with 2 bracts, red, 3-7 mm. long. Seed ovoid, 5-7 mm. long.
New Zealand: N. Island, Mt. Tongariro to Foveaux, S. Island, 800-1800 m..

P. NOVAE-CALEDONIAE Vieillard Dore Podoberry

A shrub 1-3 m. tall, with dense, erect branches, often growing in shallow water (a rheophyte). Bark dark red-brown, divided into thin plates. Buds ovoid, 2-3 mm. long, apex acuminate, scales triangular. Juvenile leaves glaucous, linear, 4-11 cm. long by 3-5 mm. wide. Adult leaves crowded, linear, 4-9 cm. long by 3-5 mm. wide, dark green, margins recurved, apex acute, petiole short and obscure. Male strobili axillary, solitary or 3 per cluster, sessile, 8-18 mm. long by 2 mm. wide, subtended at the base with obtuse scales. Female cone solitary or in pairs, on a peduncle 7-10 mm. long; receptacle with 2-3 bracts, 5 mm. long, scarlet or purple with translucent borders. Seeds elliptic, bright colored, 7-8 mm. long by 4 mm. wide, with a distinct crest.
S. New Caledonia: Thio to Prony, type near Mount Dore, 50-600 m..

P. NUBIGENUS Lindl. ex Paxt. Chile Mountain Podoberry

A bushy, ovoid tree 15-30 m. tall, 0.40-1.50 m. in girth. Bark purple-brown, exfoliating spirally. Branches short, subopposite or subverticillate. Buds ovoid-conical, 1 mm. long, purplish-brown, scales thick and lanceolate. Leaves spirally arranged or in 2 ranks, thick, dark green, glaucous with stomata below, leathery, linear-lanceolate or somewhat falcate, 2.5-4.5 cm. long by 3-5 mm. wide, midrib prominent, apex short-pointed. Male strobili solitary, axillary, or in fascicles, on a peduncle 3-6 mm. long at tips of branchlets, apex of stamens, obtuse. Female cone axillary, on a peduncle 1.5-2 cm. long; receptacle

with 2 bracts with a triangular apex, 7 mm. long by 3 mm. wide. Seeds subglobose, 9 mm. long by 7 mm. wide, with a blunt crest.
S. Chile: Santiago: Argentina: Patagonia, 50-780 m..

P. OLEIFOLIUS D. Don ex Lamb. Olive-leaf Podoberry

A tufted tree with dense branches. Bark yellowish-brown. Leaves lanceolate, acute, leathery, 2.5-3.8 cm. long by 4-6 mm. wide, very entire, with a sunken channel on the upper surface along the midrib, reflected on the edges, slightly tapering to the base. Male strobili solitary, cylindrical, stalkless, to 25 mm. long. Female cone with a filiform peduncle to 19 mm. long; receptacle with 2 bracts, oval, solitary, 8.3 mm. long.
Restricted to north central Peru: Monzon, to 2000 m..

P. OLEIFOLIUS var. MACROSTACHYUS (Parl.) Buchh. et Gray Aragua Podoberry
=P. oleifolius var. costaricensis Buchh. et Gray, =P. oleifolius var. trujilensis Buchh. et Gray

A tree 15-28 m. tall, to 1.85 m. in girth. Bark reddish-gray, fibrous. Juvenile leaves to 15 cm. long by 1.5 cm. wide. Adult leaves spirally arranged, oblanceolate or oval, 2-5 cm. long by 7-12 mm. wide, broadly acute or obtuse, grooved above, margins slightly revolute, with a short petiole. Male strobili on a peduncle 3-5 mm. long, cone 3.5 cm. long by 2.5-3.5 mm. wide; microsporophylls broadly triangular at the apex. Female cone on a peduncle 5 mm. long; receptacle 12 mm. long, reddish, with 2-3 unequal bracts. Seeds 10-12 mm. long by 5-6 mm. wide, with a distinct obtuse crest.
Mexico; Guatemala: Latin America; Venezuela; Equador; N. Peru, 1700-3200 m..

P. PALLIDUS Gray Tongan Podoberry

A shrub or small tree to 6 m. tall, with whorled branches. Buds narrowly ovoid, 2 mm. in diameter; apical scales triangular, keeled, 2-6 mm. long. Foliage clustered at ends of branchlets. Leaves lanceolate, light green, 2.5-10 cm. long by 6-10 mm. wide, margins slightly revolute, apex acute or acuminate and mucronate or apiculate, midrib fairly prominent and broader below, petiole short and stout. Male strobili solitary, sessile, to 12 mm. long by 4 mm. wide. Female cone solitary, on a peduncle 6-15 mm. long that is stout; receptacle fleshy, to 9.5 mm. long. Seeds somewhat globose, 10-12 mm. long.
Polynesia: E. Tongan Islands, rainforest.

P. PARLATOREI Pilg. Parlatore Podoberry
=P. curvifolius Carr.

A tree or shrub to 12 m. tall. Bark brown, fissured. Crown with numerous, short branches, trunk often branched from the base. Buds globose, scales keeled and apiculate. Leaves ovate or oblong, long-attenuate, thick, leathery, shiny and smooth above, 3-8 cm. long by 2-4 mm. wide, margins thickened, apex bluntly acute, petiole relatively short. Male strobili in groups of 3-6, on a peduncle 5-10 mm. long, stamens with a triangular apex. Female cone on a peduncle 5-10 mm. long, solitary, axillary; receptacle with 3 fused bracts with 1-2 ovules, 3-4 mm. long. Seeds globular, 5-6 mm. long by 4-5 mm. wide, with a small crest.
S. Bolivia: Cochabamba; N. Argentina: Tucuman Province, 1000-3000 m..

P. PENDULIFOLIUS Buchh. et Gray Venezuelan Weeping Podoberry

A small tree 6-25 m. tall, with a rounded crown and with stout branches. Bark reddish-brown, rough. Buds globular, with large, oval, keeled scales. Leaves pendent, thick, bright pale green, falcate-lanceolate, acuminate, 5-11 cm. long by 7 mm. wide, with a raised groove on the upper surface, margins swollen and revolute. Male strobili sessile, cylindrical, 2 cm. long by 6-7 mm. in diameter, with numerous broadly ovate scales, stamens with an obtuse apex. Female cone axillary, on a peduncle 7-18 mm. long; receptacle glaucous, 12-14 mm. long. Seed glaucous-green, globose, with a small, blunt crest.

W. Venezuela: Tachira; Merida, 1800-3000 m..

P. PILGERII Foxw. Pilger Podoberry
=P. wangii Cheng

A small tree 2-15 m. tall,with scattered branches or with branches in whorls of five. Bark brown or red-brown. Buds ovoid, 3 mm. long by 2 mm. in diameter, scales lanceolate and slightly spreading. Leaves scattered or clustered at ends of branchlets, thick, linear-lancolate, 1.5-8 cm. long by 4-12 mm. wide, keeled or channeled below, midrib narrowly prominent, apex obtuse or sometimes apiculate. Male strobili solitary, subsessile, cylindrical, 1.5-5 cm. long by 2-4 mm. wide, stamens triangular and apiculate. Female cone solitary, axillary, on a peduncle 3-13 mm. long; receptacle with 2 fused bracts, blunt and free at the tips, 5-12 mm. long by 3-7 mm. wide, subtended by 2 strap-shaped bracts 1.5-2 mm. long; green and blue-black. Seed elliptic-globose, obtuse, green, 8-8.5 mm. long by 7 mm. wide.

S. China: S.E. Yunnan; Indonesia: Celebes; New Guinea; Philippines; Solomon Islands, 1400-3000 m..

P. POLYSPERMUS De Laub. Two-seed Podoberry

A tree 5-15 m. tall. Bark brown, fibrous, plate-like. Terminal bud 10-15 mm. long; scales lanceolate, erect. Leaves narrowly lanceolate, thick, gray-green, 8-12 cm. long by 6-8 mm. wide, midrib prominent, apex acute, petiole to 10 mm. long. Male strobili solitary, sessile, 2-2.5 cm. long by 3.5-5 mm. wide; microsporophylls lanceolate, acute. Female cone on a peduncle 8-11 mm. long by 2 mm. wide; receptacle dark red, with 4 bracts, 10-13 mm. long; involucral leaves to 5 mm. long. Seeds 2-3 per cone, nearly globose, 8 mm. long by 6 mm. in diameter.

N. New Caledonia; type near Me Maoya, 650-900 m..

P. POLYSTACHUS R. Brown ex Endl. Indonesian Podoberry
=P. littoralis Teysm., =P. thevetifolia Blume

A tree to 20 m. tall, with a rounded,irregular crown, often branched to the base. Branches short and subverticillate or in groups of five. Buds conical, 2-4 mm. long; scales acute, keeled. Bark pale gray or gray-brown, fissured or scaly. Leaves crowded at ends of branchlets, thick, rigid, more or less erect, linear-lanceolate with parallel margins, 4-8 cm. long by 6-12 mm. wide, midrib prominent, apex acute, petiole relatively short. Male strobili in groups of 3-5, sessile, cylindrical, 2-4.5 cm. long by 2.5-3 mm. wide, greenish-white, surrounded at the base by small scales. Female cone solitary, on a peduncle 3-6 mm. long; receptacle with 2 fused bracts, dark purple. Seeds globose or

elliptic, 10 mm. long.
S. Thailand; Malaysia; Philippines; Indonesia: Borneo; W. New Guinea, 50-1000 m., mostly at low altitudes.

P. PSEUDOBRACTEATUS De Laub. Eastern Bristlecone Podoberry
=P. archiboldii var. crassiramosus Gray, in part.

A small tree to 15 m. tall. Buds elongated, 5-14 mm. long by 3-5 mm. in diameter; scales spreading, lanceolate, to 1 mm. thick. Juvenile leaves to 20 cm. long by 1.4 cm. wide. Adult leaves thick, lanceolate or lenticulate, 6-15 cm. long by 8-12 mm. wide, midrib distinctly raised, petiole to 4 mm. long. Male strobili sessile, solitary, 4 cm. long by 3 mm. wide, basal scales distinctly smaller than the upper scales; microsporophylls triangular, apex to 1 mm. long. Female cone on a peduncle 4-12 mm. long; receptacle 7-10 mm. long, dark red to nearly black, basal bracts 2-3 mm. long. Seed 10-12 mm. long by 7-9 mm. wide, crested.
W. New Guinea to Papua New Guinea, type from Tari, Mt. Ambua, 1700-3500 m..

P. PURDIEANUS Hook. Purdie Podoberry
=P. jamaicensis Hort. ex Gord.

A tree to 40 m. tall, to 1 m. in girth, with spreading, whorled branches. Bark thick, gray, furrowed. Branches relatively short. Juvenile leaves to 11.5 cm. long by 1.9 cm. wide. Adult leaves spirally arranged, subspathulate-lanceolate, 4-10 cm. long by 8-16 mm. wide, thick, shiny green, bright green below, margins revolute, with a ridge above the midrib, apex bluntly acute or mucronate to apiculate, petiole short and broad. Male strobili solitary, axillary, cylindrical, 1.5 cm. long. Female cone on a peduncle 2-4 mm. long; receptacle with 2 fused bracts, with a keeled apex. Seeds oblong-ovoid, 8 mm. long by 5 mm. wide, with a short,conical, obtuse crest.
C. Jamaica: Mount Diablo, 732-1068 m..

P. RIDLEYI (Wassch.) Gray Ridley Podoberry

A small tree to 10 m. tall, with short, dense, whorled branches. Bark in several layers of long, adherent scales. Buds ovoid, 13 mm. long, scales acuminate and elongated. Leaves thick, stiff, narrowly linear-lanceolate, acute, twisted, yellowish-green, 10-15 cm. long by 9-12 mm. wide, with 5 vascular resin canals in the transverse sections, apex elongated or acuminate, petiole relatively short. Male strobili axillary, sessile, without a scaly peduncle, in groups of 2-3, to 8 cm. long by 4 mm. wide at maturity, external scales keeled. Female cone solitary, axillary, on a peduncle 9 mm. long; receptacle red, subtended by 2 short bracts that are 2.5 mm. long each.
Malaysia: Malay Peninsula, Gunong Blumut, 1000 m..

P. RORAIMAE Pilg. Roraima Podoberry

A tree 6-15 m. tall, with numerous, dense, short branches. Buds globular, external scales leaf-like, enlarged at the base. Juvenile leaves 3-6 cm. long by 6-8 mm. wide. Adult leaves leathery, oval to lanceolate, bright dark green, dull green below, 1-3 cm. long by 4-6 mm. wide, with a distinct groove along a ridge above the midrib, margins slightly recurved, apex rounded, petiole relatively short. Female cone on a peduncle 4-5 mm. long, receptacle 6 mm. long by 4 mm. wide. Seeds elongated, 6 mm. long by 4 mm. wide, with a small ridge and a small

crest.
Venezuela: Bolivar, Mt. Roraima, 2000-3000 m..

P. ROSTRATUS Laurent — Andringitra Podoberry
=P. perrieri Gaussen et Woltz

A small, compact tree 8-30 m. tall. Bark red then gray, fibrous, exfoliating in thin long strips. Juvenile leaves attenuate at the apex, 5 cm. long by 2 mm. wide. Adult leaves twisted, linear, midrib prominent, 7-20 mm. long by 8-15 mm. wide, bluntly acute, apex apiculate, with a supplementary resin canal at the margin. Male strobili solitary or in groups of 2-3, 1-2 cm. long by 3 mm. wide; microsporophylls triangular. Female cone on a peduncle 3-5 mm. long by 1 mm. in diameter; receptacle with 2 bracts, 2-4 mm. long. Seed oval, 14 mm. long by 8 mm. wide, apex crested.
E. Madagascar, type near Mt. Tsaratanana, to 1200 m..

P. ROTUNDUS De Laub. — Banahao Podoberry

A small tree 5-15 m. tall. Juvenile leaves to 10 cm. long. Buds 2-3 mm. long by 2 mm. in diameter, with lanceolate, somewhat spreading scales. Adult leaves somewhat scattered, oval, 2.5-5.5 cm. long by 9-11 mm. wide, midrib prominent, apex rounded and sometimes with a small mucro, petiole to 2 mm. long. Male strobili cylindrical, 3 cm. long by 3-4 mm. wide, apex of microsporophylls short-triangular. Female cone on a peduncle 10 mm. long; receptacle with 2 enlarged fused bracts, fertile bract to 7 mm. long, subtended by 2 lanceolate sterile scales to 2 mm. long; red. Seed globose, to 8 mm. long by 6 mm. wide.
Philippines: Luzon, Mount Banahao (type); Indonesia: E. Borneo, 1200-2100 m..

P. RUBENS De Laub. — Red Podoberry
=P. neriifolius var. timorensis Wassch.

A tree 2-30 m. tall. Bark scaly on the larger limbs. Branchlets gray-brown, slightly pendent. Buds ovoid, 2-3 mm. long by 2-3 mm. in diameter, exterior scales triangular. Emerging foliage red. Leaves crowded near tips of branchlets, 3-6 cm. long by 6-10 mm. wide, linear or lenticulate, green, glaucous below, margins revolute, midrib prominent, apex bluntly acute to obtuse or apiculate, petiole 1.5-3 mm. long. Male strobili sessile or on a short peduncle, solitary or 3 per cluster, 2-3.5 cm. long by 2.5-3.5 mm. wide. Female cone on a peduncle 4-9 mm. long; receptacle 6-8 mm. long, purplish; involucral leaves 1.5 mm. long. Seed ovoid, 8-9 mm. long by 5-6 mm. wide.
Malaysia: S. Sabah; Indonesia: Sumatra; Celebes; New Guinea; Solomon Islands, to 2134 m..

P. RUMPHII Blume — Rumphius Podoberry
=P. koordersii Pilg., =P. philippinensis Foxw.

A tree to 40 m. tall. Bark smooth, exfoliating in red-brown flakes. Buds small, ovoid, scales closely imbricate and overlapping. Leaves thick, leathery, rigid, linear, 15-25 cm. long by 1.1-2.3 cm. wide, with a continuous hypoderm, leaf margins parallel, midrib weak, apex acute or slightly acuminate. Male strobili sessile, in clusters of 3-8, cylindrical, 3.5-4.5 cm. long by 2-3 mm. wide. Female cone axillary, on a peduncle 7-10 mm. long; receptacle with 2-3 thickened fused bracts, subtended by 2 lanceolate bracts 1.5 mm. long; red or violet. Seeds 1-2 per cone, ellipsoid, globose, gray, crested, 10-13 mm. long

by 7-11 mm. wide.
China: Hainan; Malaysia; Philippines; Indonesia, near sea level.

P. RUSBYI Buchh. et Gray Rusby Podoberry

A shrub or a small tree 6-8 m. tall. Buds with elongated, attenuate scales to 1.6 mm. long. Branchlets yellowish-green. Leaves leathery, lanceolate, thick, wavy, 2-3.5 cm. long by 4-7 mm. wide, grooved on the midrib, with continuous upper hypoderm; apex acuminate, darkened; petiole short, darkened. Female cone on a short peduncle 3-4 mm. long; receptacle 6-7 mm. long with 2 ovules. Seed to 7 mm. long, with an obtuse crest.
Bolivia: Mapiri; Cocopunco, high, humid, foggy forest, 3000-3050 m..

P. SALICIFOLIUS Klotzsch et Karts. Venezuelan Willow-leaf Podoberry
=P. pittieri Buchh. et Gray

A tree to 10 m. tall, with elongated branches. Bark greenish. Buds 5-15 mm. long, with elongated, acuminate scales. Leaves linear-lanceolate, often pendent, falcate, 7-15 cm. long by 8-11 mm. wide, thick, pale green, flat, apex elongated and attenuate, petiole with a slight ridge. Male strobili solitary, sessile, cylindrical, 2 cm. long, with numerous imbricate scales. Female cone on a peduncle 1.2-2.4 cm. long; receptacle with 2-3 fused bracts, 6-10 mm. long by 5-7 mm. wide, with one ovule. Seed broadly ovoid, 7-12 mm. long by 6-9 mm. wide, with a ridge on the back and with a small crest.
N. Venezuela: Caracas, 1400-2100 m..

P. SALIGNUS D. Don ex Lamb. Chilean Willow-leaf Podoberry

A tree 15-20 m. tall, with slender, drooping branches. Bark red-brown, peeling in purplish or gray vertical strips. Juvenile leaves glaucous. Buds small, ovoid, scales elongated and attenuate. Adult leaves narrowly lanceolate, somewhat falcate, 5-12 cm. long by 3-8 mm. wide, willow-like, bright dark green to gray green, with a narrow raised midrib above, petiole relatively short. Male strobili sessile, at tips of branchlets, in small groups, drooping, cylindrical, 2-3.5 cm. long by 1-1.5 mm. wide. Female cone solitary, axillary, on a peduncle 8-20 mm. long; receptacle 6-8 mm. long, with 1-2 ovules and 2-3 fused bracts; dark violet or black. Seed solitary or in pairs, oblong, green or dark violet, 5-8 mm. long by 3-3.5 mm. wide, with a prominent blunt crest.
S. Chile: Maule to Valdivia, to 900 m..

P. SALOMONIENSIS Wassch. Solomon Islands Podoberry

A tree to 20 m. tall, with rigid, spreading, pendent branches. Bark pale brown, fissured and scaly. Bud ovoid, 11 mm. long; scales elongated, attenuate and keeled. Leaves spreading, rigid, thick, linear-lanceolate, 12-18 cm. long by 6.5-9 mm. wide, midrib prominent, bright green, paler below, with extra resin canals in the transfusion tissue only, margins revolute, apex acuminate, petiole short and distinct. Male strobili solitary, 4-5 mm. wide, with broadly triangular scales. Female cone solitary, on a peduncle 10-15 mm. long; receptacle with 4 decussate bracts, 8-9 mm. long, subtended by 2 basal scales 4 mm. long. Seed rounded, elongated, 11 mm. long by 8 mm. wide.
E. Solomon Islands, San Cristobal Island, Hinuahaoro, 400-900 m..

P. SELLOWII Klotzsch ex Endl. Sellow Podoberry
=P. sellowii var. angustifolius Pilg.

A tree to 9 m. tall, with subopposite or subverticillate branches in groups of 3-4.Buds with elongated acuminate scales. Juvenile leaves to 15 cm. long by 1.2-1.8 cm. wide. Adult leaves thick, lanceolate, leathery, 5-10 cm. long by 5-12 mm. wide, with a slight ridge above the midrib, apex with a short spine, petiole relatively short. Male strobili solitary or 3-6 in a group, subsessile, on a peduncle 8-15 mm. long, cylindrical, 1.7 cm. long by 2-2.5 mm. wide, scales ovoid and keeled. Female cone axillary, solitary, on a peduncle 4-7 mm. long; receptacle with 2-3 fused bracts, 5-8 mm. long, with one ovule. Seeds round, elongated, smooth, 7-9 mm. long by 5-7 mm. wide, with a small conical crest.
S. Brazil: Parana, Roca Nova, 830-900 m..

P. SMITHII De Laub. Smith Podoberry

A tree to 30 m. tall. Branchlets dark glaucous-brown. Buds globose-ovoid, tan, 2-3 mm. long, scales triangular or rounded. Juvenile leaves 16 cm. long by 2.1 cm. wide. Adult leaves bluntly acute, ovate, 6-11 cm. long by 1-1.4 cm. wide, green, glaucous below, midrib prominent, petiole 2-4 mm. long. Male strobili on a peduncle 2-9 mm. long, cone 3-4.5 cm. long by 4-6 mm. wide, in groups of 1-3; microsporophylls spreading, falcate, elongated. Female cone on a peduncle 6-9 mm. long; receptacle with 2 bracts, 5-6 mm. long; with 1-2 apiculate ovules; cone 3 cm. long by 1.5 cm. wide. Seeds globose, 15 mm. long by 10 mm. wide, apex acute.
Australia: Queensland, Mt. Lewis, 914-1000 m., rainforest.

P. SPATHOIDES De Laub. Malaysian Bristlecone Podoberry

A tree 3-20 m. tall. Buds 2-6 mm. long by 2-3 mm. in diameter, exterior scales triangular. Leaves linear, blunt, 5-13 cm. long by 8-20 mm. wide, apex acute or rounded, midrib prominent, base abruptly attenuate, petiole 3-5 mm. long. Male strobili in clusters of 3, on a short peduncle. Female cone on a peduncle 2-6 mm. long; receptacle 5 mm. long; involucral leaves 1.5 mm. long. Seed 7 mm. long by 5 mm. wide.
Malaysia: Malaya, Gunong Ledang; Indonesia: Kepulauan Talaud; Solomon Islands.

P. SPINULOSUS (Smith) R. Brown ex Mirb. Spiny-leaf Podoberry

A shrub or a small tree to 1.5 m. tall, with scattered or dense subverticillate branches and yew-like foliage. Buds small, scales triangular. Leaves spirally arranged, thick, linear, 2-7.5 cm. long by 2-4.5 mm. wide, gray-green above, pale green below, apex acuminate with an elongated spine, petiole absent or small and twisted. Male strobili in groups of 3-5, axillary, 5-6 mm. long, on a peduncle 1-3 mm. long. Female cone on a peduncle 10 mm. long; receptacle with 2-3 fused bracts, subtended by 2 scales, 1-4 mm. long; deep purple, bloomed glaucous, edible. Seed ovoid, 8-20 mm. long by 7-10 mm. wide, with a stout beak.
Australia: S.E. New South Wales, sandy areas.

P. SPRUCEI Parl. Chimborazo Podoberry

A shrub or a tree 7-10 m. tall, with numerous short branches. Bark red-brown, exfoliating in thin, long strips. Buds relatively large, globose; scales thick, keeled, external scales lanceolate. Juvenile leaves to 7 cm. long. Adult leaves thick, broadly linear, linear-elliptic, dark deep green, 2.5-4 cm. long by 3-3.5 mm. wide, with a ridge above the midrib, nonglaucous below, margins revolute, with interrupted hypoderm, apex without a prickle, petiole relatively short. Male strobili in groups of 6-10, axillary, 1.5-2.5 cm. long, on a peduncle 1 mm. long by 2-2.5 mm. in diameter, apex of stamens obtuse, bracts below cone are persistent. Female cone axillary, on a peduncle 7-10 mm. long; receptacle glaucous; cone 1.2-1.4 cm. long. Seeds glaucous-green, globular, with a small blunt crest.

W. Equador: Chimborazo; N. Peru, 3250-3900 m..

P. STEYERMARKII Buchh. et Gray Steyermark Podoberry

A small tree 7-12 m. tall. Buds relatively large, 5-16 mm. long; with elongated attenuate, external scales, subfoliaceous. Leaves thick, linear-lanceolate, stiff, spreading, curved, 4-8 cm. long by 6-11 mm. wide, gren, paler and silvery below, midrib distinctly impressed on the upper surface, margins revolute, apex acuminate. Female cone on a stout peduncle 7-12 mm. long; receptacle 7-8 mm. long, brown, with 3 bracts; cone glaucous-brown. Seeds silvery-green, streaked, with a small crest.

S.E. Venezuela: Bolivar, Carrao-Tepui, 2100-2400 m..

P. SUBTROPICALIS De Laub. Subtropical or Omei Podoberry

A tree 18-24 m. tall, to 0.30 m. in girth. Buds 4-7 mm. long by 1.5-2.5 mm. in diameter, apex straight; exterior scales lanceolate, keeled. Juvenile leaves linear-lanceolate, to 18 cm. long by 1.4 cm. wide. Adult leaves thinly linear or linear-lanceolate, midrib prominent, apex acute; petioles relatively long, 3-6 mm. long. Male strobili sessile, 1-5 in a group, 3-6 cm. long by 3-3.5 mm. wide, apex of microsporophylls triangular. Female cone on a peduncle 8-14 mm. long; receptacle 7-12 mm. long, involucral leaves 1-1.5 mm. long; cone globose, red to purple. Seeds 12-14 mm. long by 8-10 mm. wide, green.

China: Szechuan; S.W. Yunnan; S. Kwangtung; E. Chekiang, to 1000 m. or more.

Cultivated in Singapore as a street tree under the name P. nerifolius.

P. SYLVESTRIS Buchh. et Gray Woodland Podoberry
=P. novae-caledoniae var. colliculatus Gray

A tree 4-30 m. tall. Bark fibrous, red-brown, plate-like. Branchlets slender and subverticillate. Terminal buds globular, 1-2 mm. in diameter. Juvenile leaves to 16 cm. long by 1.5 cm. wide. Adult leaves crowded at tips of branchlets, linear-lanceolate to oblong, 5-9 cm. long by 7-9 mm. wide, midrib flat or broadly prominent, apex bluntly and broadly acute, petiole relatively short. Male strobili solitary or in groups of 3, sessile or on a peduncle to 1 mm. long, cylindrical, subtended at the base by 7-9 imbricate scales, apex of stamens obtuse. Female cone axillary, on a slender peduncle 5-9 mm. long; receptacle with 2 fused bracts, 6-9 mm. long, red, subtended by a pair of deciduous scales. Seeds one per cone, elongated, 16 mm. long by 8-9 mm. wide, with or without a small blunt crest.

New Caledonia: coastal areas, type near Mois de Mai, 200-1300 m..

P. TEPUIENSIS Buchh. et Gray Ptari-Tepui Podoberry

A tree 10-15 m. tall, to 0.30 m. in girth. Buds small, 2 mm. long, scales broadly triangular. Leaves dense, broadly lanceolate, bright green, 1.5-2 cm. long by 4-5 mm. wide, acute, grooved above the midrib, margins sub-revolute, petiole short or sessile. Male strobili solitary, axillary, always sessile, 10 mm. long by 1.5 mm. wide, apex of stamens deflexed. Female cone with a peduncle 2 mm. long. Seeds to 7 mm. long by 4 mm. wide, with a beak-like crest.
Venezuela: Bolivar, Mount Ptari-Tepui, 1700-1800 m..

P. TEYSMANNII Miquel Teysmann Podoberry
=P. neriifolius var. teysmanii (Miq.) Wassch.

A small tree to 6 m. tall or more, with stout twigs. Terminal buds globose, obtuse, flattened. Male buds relatively large, up to 3 mm. long. Leaves scattered or somewhat whorled, straight or somewhat falcate, broadly lanceolate, leathery, shortly acuminate, 8.5-17 cm. long by 1.6-2.6 cm. wide, midrib prominent, tapering to the petiole, somewhat twisted at the base, petiole short and thick. Male strobili in clusters of 2, nearly stalkless, oblong-cylindric, 3-4 cm. long by 4 mm. wide, scales ovate-acuminate. Bract at base of female receptacle less than 1 mm. long.
Malaysia: Malaya; Indonesia: N. Sumatra, Tapanoeli, low altitudes.

P. TIXIERI Gaussen Tixier Podoberry

A shrub or small tree 1-8 m. tall. Foliage in crowded bunches near the tips of the branchlets. Buds 2-3 mm. long by 1.5-2.5 mm. wide; scales triangular, erect, slightly spreading at the apex. Leaves fasciculate, broadly oval to linear, 2-3.5 cm. long by 4-10 mm. wide, with a prominent midrib, channeled below, margins revolute, bluntly acute, apex obtuse, petiole 2-3 mm. long. Male strobili solitary or 2 in a group, on a peduncle 5 mm. long, cone 3-4 cm. long; apex of microsporophylls nearly linear and somewhat rounded at the apex. Female cone on a peduncle 10 mm. long. Seed globose, 8 mm. long by 5 mm. wide, reddish-purple, with a large blunt crest.
S.E. Thailand: Krat, Kao Kuap; S.W. Kampuchea (Cambodia): Kampot, Bokor Plateau, 900-1000 m..

P. TOTARA D. Don ex Lamb. Totara Podoberry
=P. totara var. waihoensis Wardle

A tree to 40 m. tall, to 2.5 m. in girth. Bark gray-brown, furrowed, exfoliating in long strips. Terminal buds globose or ovoid, 3 mm. long, with 2 series of scales, brown, external scales lanceolate. Juvenile leaves 1.5-3.5 cm. long. Adult leaves alternate, brownish-green to yellowish-green, scattered or 2-ranked, 1.2-3.3 cm. long by 2.5-4 mm. wide, leathery, sharp-pointed, petiole very short. Male strobili axillary, solitary or in groups of 2-3, sessile or with a short peduncle 1-2 mm. long, cylindrical, 1.5 cm. long by 3 mm. wide, base subtended by 4 large fimbriate scales. Female cone axillary, solitary, on a peduncle 2-3 mm. long; receptacle subglobose, orange-red to crimson, 4-5 mm. long. Seeds 1-2 per cone, subglobose, 4-5 mm. long, rounded at the apex.
New Zealand: N. Island, Tongariro and S.E. Itago, also scattered in the S. Island, at low altitudes.

P. TRANSIENS (Pilg.) De Laub. Transien Podoberry
=P. lambertii var. transiens Pilg.

A moderately sized tree. Buds with apiculate-rounded or triangular, imbricate scales. Leaves oblong-lanceolate to broadly linear-lanceolate, 2.5-5 cm. long by 3.5-5 mm. wide, bluntly acute, margins slightly recurved, with a continuous hypoderm, non-revolute, apex rounded. Male strobili at tips of branchlets, numerous, in groups of 3-6, cylindrical, 1-1.5 cm. long by 2.5 mm. wide, peduncle 10-14 mm. long, bracts at base of cone are deciduous. Female cone globular, somewhat glaucous; receptacle purplish, oblong, 3-4 mm. long by 2 mm. wide; peduncle thin, 2-2.5 mm. long.
S.C. Brazil: Serra de San Jose and Serra do Cipo.

P. TRINITENSIS Gray Trinidad Podoberry

A small tree 15-20 m. tall, to 0.80 m. in girth. Bark dark gray. Buds globose, 3 mm. long; scales attenuate, apiculate. Leaves thick, lanceolate or oblong-lanceolate, 3-6 cm. long by 7-10 mm. wide, groove on leaf weak and raised, margins slightly revolute, apex narrowed, base attenuate near the wide petiole. Female cone axillary, peduncle 7-8 mm. long. Seed 7-8 mm. long, crested.
Trinidad: Mount Tucuche; Tobago, dry forest, to 400 m..

P. URBANII Pilg. Urban Podoberry

A small tree 10-15 m. tall, with short branches, resembling a Yew. Buds globose; scales broadly obtuse, keeled. Juvenile leaves 5 cm. long by 6 mm. wide. Adult leaves lenticular, 2.5-3.5 cm. long by 4-7 mm. wide, rigid, erect, leathery, narrowly linear-lanceolate, midrib raised above, obtuse to apiculate. Male strobili solitary, sessile, cylindrical, 1.2-1.5 mm. wide by 4 mm. long, scales apiculate, peduncle relatively short, microsporophylls obtuse. Female cone on a peduncle 2-4 mm. long; receptacle 7 mm. long, with 2 bracts. Seeds ovoid, 7 mm. long by 4 mm. wide, with a blunt conical crest.
Jamaica: Cinchona, Blue Mts.; Mossman's Peak, 370-2225 m..

PRUMNOPITYS Philippi (Podocarpaceae)

A genus of ten species from Malaysia to New Zealand and in Costa Rica and W. South America. Dioecious, evergreen trees. Buds distinct from the leaves, small, globular or ovoid. Leaves spirally arranged or 2-ranked, lacking a hypoderm and containing a single resin duct below the vein, linear, hypostomatic, with or without transfusion tissue, distichous, bifacially flattened, uninerved. Male strobili somewhat reminiscent of Cupressus in general appearance, with relatively few acuminate scales, oval or cylindrical, solitary or grouped, on a somewhat specialized lateral branchlet or shoot. Female cone produced on a curved, upright, specialized scaly peduncle, lacking an enlarged basal receptacle, containing a single ovule, subtended by a few linear involucral leaves, with one to several fertile bracts. Seeds often more than one in one spike, without a beak, completely covered by a leathery scale. Seeds subglobose, wingless.

P. AMARA (Blume) De Laub. Indonesian Prumnopitys
=Podocarpus amara Blume

A tree 45-60 m. tall, to 125 cm. in girth or more. Bark gray, flaky. Young trees with reddish-brown bark speckled white. Branches erect, subverticillate, trunk often branched to the base. Buds globular, 2 mm. long, scales ovoid. Juvenile leaves 25 cm. long. Adult leaves alternate, distichous or subdistichous, linear-elliptic, dark green, pale green below, 5-15 cm. long by 9-15 mm. wide, margins recurved, channeled below, without hypoderm, stomata mainly confined to the abaxial surface, with accessory transfusion tissue, apex attenuate. Male strobili cylindrical, solitary or in groups, 3 cm. long by 3.5 mm. wide. Female cone on a branchlet 3-5 cm. long, axillary, on a peduncle 1-2 mm. long, cone orange-red with a glaucous bloom, leathery. Seed subglobose, 1-2 per cone, 2.5-3 cm. long, purplish-black, red or bloomed blue, with a small blunt crest.

E. Malaysia; Philippines; Indonesia: New Ireland; Australia: N. Queensland, 600-2000 m..

P. ANDINA (Poep. ex Endl.) De Laub. Chilean Prumnopitys
=P. elegans Phil., =Podocarpus andina Poep. ex Endl.

A shrub 6-7 m. tall, or a pyramidal tree to 12 m. tall. Bark smooth, red-brown. Buds small, whitish-green; scales valvate, non-imbricate. Leaves spirally arranged, linear, bright green above, twisted to show the glaucous undersurface, 1.5-2.4 cm. long by 1.5-2 mm. wide, midrib absent, with a very short petiole. Male strobili in groups of 12-20, sessile, spreading, 1.5-2.5 cm. long, apex of stamens denticulate. Female cones at tips of a branchlet 2-2.5 cm. long, subtended by basal scales, ovules 3-5 or 1-2 maturing in the axil of the leaves; leathery scale edible and rather tasty. Seed ovoid, prune-like, 2 cm. long by 1.3-1.4 cm. wide, blue-black, with a beak.

S. Chile: Valdivia, Cordillera de la Costa, 1219-1830 m..

P. EXIGUA De Laub. Cochabamba Prumnopitys

A small tree 2-10 m. tall. Leaves semi-linear, sessile, decurrent, somewhat narrowed at the base, 10-15 mm. long by 2 mm. wide, with a weak groove above the midrib, apex short and round, leaves straight or slightly falcate. Fertile branchlet of female cone 1-2 cm. long, with reduced leaves. Ovules of female cone solitary, axillary, 1-2 per fertile shoot, leaves on fertile shoot 2 mm. long. Seed globose, 10 mm. long by 11 mm. wide, with a short crest.

N. Bolivia: Cordillera Oriental, Cochabamba, Sehuenka-Totora, 2600-3300 m..

P. FERRUGINEA (D. Don) De Laub. New Zealand Prumnopitys
=Podocarpus ferruginea Don ex Lamb.

A tree to 25 m. tall. Bark gray-brown, exfoliating in scales, inner-bark purplish. Juvenile leaves to 3 cm. long. Adult leaves yew-like, alternate, dark green, yellowish below, falcate, nearly 2-ranked in a flattened spray of foliage, leaves 1.3-2.5 cm. long by 2 mm. wide, midrib narrow, margins revolute, apex bluntly acute, petiole 2-3 mm. long. Male strobili solitary or in pairs, cylindrical, sessile, 8-12 mm. long by 3 mm. wide, on a short peduncle. Female cone solitary, on different trees, subtended by scales at the base, peduncle relatively short. Seeds oval, 1.5-2 cm. long, bright

purplish-red, with a waxy, glaucous bloom, apex with a short point.
New Zealand: scattered on both islands, lowland forests, to 1000 m..

P. FERRUGINIOIDES (Compt.) De Laub. New Caledonian Prumnopitys
=Podocarpus distichus Buchh. et Gray, =Podocarpus ferruginioides Compt.

A tree 5-15 m. tall, with an irregular crown. Bark dark gray, scaly. Juvenile leaves distichous, revolute, 2-3 cm. long by 4-5 mm. wide, apex mucronate. Adult leaves spirally arranged, leathery, usually erect, 9-19 mm. long by 3-4 mm. wide, yellowish-green, margins slightly recurved, apex obtuse or short-pointed. Male strobili solitary, axillary, on a scaly peduncle 1 mm. long, ovoid, 3-4 mm. long by 1.3-1.6 mm. wide, stamen triangular. Female cone on a branchlet 5-8 mm. long, subtended at the base by triangular scales, 3-5 mm. long by 1 mm. wide, obtuse; peduncle to 1 mm. long, scaly; ovule obtuse, inverse. Seeds ovoid, glaucous-red, 8-14 mm. long, apex not pointed.
New Caledonia: local, type near Mount Nekando, 200-1500 m..

P. HARMSIANA (Pilg.) De Laub. Harms Prumnopitys
=Podocarpus harmsiana Pilg., =Podocarpus utilior Pilg. ex Fedde

A tree 6-20 m. tall, to 40 cm. in girth or much more. Leaves yew-like, spirally arranged, unstalked, thick, lanceolate, linear, 0.8-2.7 cm. long by 2-4.5 mm. wide, margins recurved, with a slight ridge above the midrib, with 2 bands of stomata below, apex spine-like. Male strobili in groups of 10-15, 10 mm. long; with small, imbricate, basal scales. Female cones in groups of 1-3, 1.5-3 cm. long; bracts ovoid, 5-7 mm. long by 2 mm. wide, ovule inverse; leathery scale edible, tasty. Seed ovoid, 10 mm. long by 8 mm. wide, slightly crested.
Columbia; Venezuela; C. Peru; W. Bolivia, 1000-1200 m..

P. LADEI (Bailey) De Laub. Lade Prumnopitys
=Podocarpus ladei Bailey

An erect tree to 30 m. tall, to 2 m. in girth. Bark smooth, reddish-brown, exfoliating in papery scales. Leaves spirally arranged, usually sessile, green on both surfaces, 1.2-1.6 cm. long by 2.5-4 mm. wide, stomata more numerous below, apex obtuse. Male strobili solitary, sessile, at tips of branchlets. Female cone sessile, solitary, ellipsoid, 2.5 cm. long by 1.5 cm. wide, purple with a glaucos bloom.
Australia: N.E. Queensland, Mount Sturgeon, 1067-3290 m..

P. MONTANA (Humb. et Bonpl. ex Willd.) De Laub. Mountain Prumnopitys
=Podocarpus taxifolia Kunth., =Taxus montana Humb. et Bonpl. ex Willd.

A tree 20-25 m. tall, to 1.5 m. in girth, with wide-spreading branches. Bark smoothish, gray, with lichen. Branches scaly, rusty fawn-brown. Foliage yew-like, arranged in two sub-opposite rows. Leaves dark green, paler below, grooved above the midrib, usually linear, thick, 1.2-2.5 cm. long by 2.5-4 mm. wide, with 2 large bands of stomata below, apex acute or mucronate; petioles short, dark brown. Male strobili in groups up to 25 in number, to 10 mm. long, disposed on a branchlet 3-5 cm. long, peduncle 3-5 mm. long. Female cone solitary, subglobose, on a fertile branchlet 4-6 cm. long. Seed ovoid, sessile, 1.5 cm. long, black-violet, with a flattened crest 3-4 mm. long.
W. Venezuela; Columbia; Equador; N. Peru, 1900-3290 m..

P. STANDLEYI (Buchh. et Gray) De Laub. Costa Rican Prumnopitys
=Podocarpus standleyi Buchh. et Gray

A tree to 25 m. tall, with numerous, pendent, alternate, spreading branches and with yew-like foliage. Branchlets greenish to red-brown. Leaves spirally arrnged or in two sub-opposite ranks, linear, sometimes falcate, 1.2-1.8 cm. long by 2.5-3.5 mm. wide, hypostomatic, very glaucous below, grooved above the midrib, apex acute or mucronate. Male strobili numerous, in groups up to 25 in number, 10-13 mm. long, spirally arranged on a branchlet 2-7.5 cm. long, stamen triangular with denticulate margins. Female cone numerous, at tips of branchlets 1.5-2.5 cm. long, subtended by scales leaves 2.5 mm. long. Seeds one per cone, ovoid, streaked, 10 mm. long by 6 mm. wide, with a cylindrical crest 2 mm. long.
C.Costa Rica: Volcan de Poas, also near Cerro las Vueltas, 1800-2800 m..

P. TAXIFOLIA (Sol. ex D. Don) De Laub. Yew-leaf Prumnopitys
=Podocarpus spicata R. Br. ex Mirbel

A tree 36-60 m. tall, with erect branches and a rounded crown. Bark bluish-black to purplish-brown, exfoliating in large plates. Young plants with numerous, pendulous branchlets. Juvenile leaves narrow, bronze-green, crowded at ends of branchlets. Adult leaves linear, dark green above, glaucous-bronze below, midrib prominent, 2-3 cm. long by 2 mm. wide, margins non-revolute, obtuse, petiole 1-1.5 mm. long. Male strobili in groups of 20-30, unstalked, cylindrical, 2.5-5 cm. long by 4 mm. in diameter, on a branchlet 2.5 cm. long. Female cone on a branchlet 4 cm. long, in groups of 4-8. Seeds rounded, to 8 mm. long, black with a glaucous bloom, shortly mucronate.
New Zealand: N. Island, also scattered in the S. Island, swampy regions, to 550 m..

PSEUDOLARIX Gord. (Pinaceae)

A monotypic genus from C. China. A deciduous, monoecious tree with horizontally ascending branches. Branches irregularly disposed. Terminal branchlets roughened by permanent leaf scars, smooth, reddish-brown. Buds ovoid, not hidden by the leaves, scales free at the tips. Leaves spirally arranged on terminal branchlets, in dense whorls on short spurs on side branchlets, leaves with 3-7 resin canals, keeled below, with 2 conspicuous gray stomatal bands below in 5-7 lines, slightly flattened, bluntly acute, linear, margins somewhat recurved.Strobili on different branches of the same tree. Male strobili catkin-like, slender stalked, clustered at ends of short spurs, in groups of 8 or more. Female cone on a short, thickened peduncle, subtended by a few recurved scale-like appendages at the base, borne pendent, ovoid-conical, with long ovate-triangular scales which fall apart and break away from the central axis upon maturity; bracts hidden, triangular, about 1/2 the hieght of the scales. Seed wings as long as the scales and extending beyond the scale margins as the cone expands at maturity. Seeds 2 per scale, with a long triangular wing projecting backwards. Cotyledons 5-7.

P. AMABILIS (Nelson) Rehd. Golden Larch
=P. pourteti Ferre, =Chrysolarix amabilis (Nelson) Moore

A broadly conical tree 20-40 m. tall, to 3 m. in girth, with wide-spreading, ascending, horizontal branches. Bark red-brown becoming gray, fissured into narrow scales, later divided into thick plates. Branches in an upright V-like pattern from the trunk. Branchlets fine, smooth, grayish, but pale yellow-brown or pinkish when young. Buds ovoid; scales acuminate, brown, filamented, free, side buds yellowish-green.Leaves spirally arranged on terminal branchlets, in whorls on long curved spurs on side branchlets, 2-5.5 cm. long by 1.5-4 mm. wide, keeled below, margins very thin, apex pointed, stomata absent above but in 5-7 lines below, linear, slightly flattened, acuminate, soft, light green, bluish-green below, with pale margins, turning bright yellow then brown in the autumn. Male strobili grouped at tips of side branchlets, on a slender peduncle 8-10 mm. long, yellowish, 6-10 mm. long, with 20 scales. Female cone pendent, ovate, green then reddish-brown, 6-7.5 cm. long by 2.8-3.5 cm. wide, with long triangular scales that are slightly opened; bracts ovate-lanceolate, much smaller than the scales, falling with the scales upon maturity. Seeds 2 per scale, seed with an ovoid nut 7 mm. long, with a triangular wing 25 mm. long.
China: Szechuan to Anwhei, 100-1500 m..

PSEUDOTAXUS Cheng (Taxaceae)

A monotypic genus from China. A dioecious shrub with whorled branches. Branchlets surrounded at the base with persistent, ovate, slightly keeled bud scales. Leaves spirally arranged, but appearing 2-ranked, linear, short-stalked, slightly falcate, apex with an elongated spine, with 2 glaucous stomatal bands below. Stomatal openings of leaves are rounded, with strongly cutinized guard cells, unlike Taxus which has a wall of papillae surrounding each opening and the guards cells are thinly cutinized in Taxus. Male strobili with sterile scales, pollen grains having a more definite aperature bordered by a protruding collar. Ovuliferous buds contain only the short unbranched flower axis, with more numerous sterile scales at the base than the secondary flower shoot in Taxus. Female cone axillary, on undersides of branchlets, subtended by ovate basal bracts, on a short peduncle; with 14-16 sterile, decussate scales, upper bract nearly 5 mm. long and nearly concealing the young ovule except at the tip by a white aril. Seeds oblong-ovoid, one per cone, with a pointed apex, wingless.

P. CHIENII (Cheng) Cheng Chien White-berry Yew
=Nothotaxus chienii (Cheng) Florin

A shrub 2-4 m. tall. Branches in whorls. Branchlets subopposite or single or in threes, surrounded at the base by bud scales.Buds 2-4 mm. long; scales yellow or gray, lanceolate-triangular, slightly keeled and cuspidate at the apex. Leaves spirally arranged, though often appearing 2-ranked, linear or slightly falcate, dark green, 1.2-2.5 cm. long by 3 mm. wide, with 2 whitish or glaucous bands below with 13-19 stomatal lines, leaves lack microscopic papillae, apex cuspidate, petiole short. Male strobili axillary, to 3 mm. long, with 8-10 sterile, decussate, oval scales. Female cone axillary, ovule terminal on a short peduncle, subtended at the base by ovate bracts, ovule nearly concealed by a fleshy white aril. Seeds 5 mm. long by 4 mm. wide, apex pointed, hilium rhombic-elliptic.
China: Chekiang, Lungtsuan; Kiangsi; Hunan; Kwangtung; Kwangsi, to 1000 m..

PSEUDOTSUGA Carr. (Pinaceae)

A genus of four species from W. North America, China and Japan. Tall, monoecious trees with irregularly whorled branches. Buds distinct from the leaves, ovoid, acute, elongated, sharp pointed, non-resinous. Branchlets nearly smooth, marked with slightly raised, small, oval scars after the leaves have fallen. Leaves more or less 2-ranked, linear, flattened, green and grooved above, with 2 white stomatal bands below, with only one vascular bundle in the center and with 2 subepidermal resin canals, midrib prominent, apex often notched. Male strobili axillary, stalked, cylindrical, with numerous spirally arranged, short-stalked rounded anthers. Female cone axillary, on a short peduncle, maturing in one year, opening at maturity, pendent, ovate-oblong; with many flattened, rounded cone scales; with elongated, protruding, erect or more often reflexed 3 lobed bracts. Seeds 2 per scale, with a wing shorter than the scale, nut of seed gradually blends into the wing so as to appear one-pieced. Cotyledons 6-12.

P. JAPONICA (Shirasawa) Beissn. Japanese Douglas Fir

A conical tree 23-30 m. tall, with numerous horizontal branches. Bark dark gray-pink, irregularly cracked. Branchlets smooth, pale yellowish-gray. Buds ovoid, shiny brown or reddish-brown, slightly resinous. Leaves shiny light green, 1.5-2.5 cm. long by 1.5 mm. wide, linear, pointing forwards, slighty curved, keeled to the apex, bright white below with 12 lines of stomata, apex notched. Female cones ovoid-globular, dark gray-brown, with 20 scales, 3.5-5 cm. long by 2.5-3.5 cm. wide, bracts exserted and spreading to 5 mm. long. Seed with an ovoid nut 6 mm. long, wing to 13 mm. long.

S.E. Japan: Tosa, Kii and Yamato, 305-914 m..

P. MACROCARPA (Vasey) Mayr. Bigcone Douglas Fir

A broadly conical tree 12-25 m. tall, 0.6-0.9 m. in girth, with long, spreading branches. Bark dark reddish-brown, furrowed. Buds ovoid-conical, shiny red-brown, 8-10 mm. long. Branchlets finely pubescent, reddish-purple to dark reddish-brown, often drooping. Leaves flattened, 2-ranked, sharply pointed, nearly stalkless, blue-green or blue-gray, 2.5-4.5 cm. long by 2.2 mm. wide, slightly falcate, grooved above except near the apex, gray-white below with 5-7 stomatal lines, apex acutely mucronate. Female cone narrowly ovoid, brown, with 50-70 scales, 10-18 cm. long by 5-7 cm. wide, scales thick and finely striated; bracts straight or slightly sinous, exserted. Seeds with a large nut to 11 mm. long and a wing to 23 mm. long.

U.S.A.: S. California, W. Santa Barbara County to N.C. San Diego County, 274-2438 m..

P. MENZIESII (Mirb.) Franco Coast Douglas Fir
=P. taxifolia (Poir.) Britt. ex Sudw.

A narrowly conical tree 24-100 m. tall, 0.6-1.5 m. in girth, with a pointed crown of horizontal, slightly drooping branches. Bark gray, then dark red-brown and fissured, with resin blisters, often corky. Branchlets slightly pubescent, orange turning brown. Buds ovoid-acute, slightly resinous, smooth; scales red-brown, margins bright and fringed. Leaves straight, linear, grooved above even to the apex, dark yellow-green to bright green above, 1.5-3 cm. long by 2 mm. wide, more or less pectinate, with 2 white bands of stomata below with 5-8

stomatal lines, apex notched, apple or pineapple scented when crushed. Male strobili elongated, cylindrical, orange-yellow, 1.2-2.3 cm. long.Female cone ovoid-conical, green then brown, 7-10 cm. long by 2.5-3.5 cm. wide, with 40-50 scales, scales rounded; bracts straight, erect, exserted and spreading. Seeds with a grayish nut 7 mm. long and a dark brown wing 15-17 mm. long.
S.W. Canada to N. California, U.S.A., 823-1829 m..

P. MENZIESII var. GLAUCA (Beissn.) Franco Rocky Mountain Douglas Fir
=P. menziesii var. caesia (Schwer.) Franco

A compact tree to 45 m. tall. Branches more ascending. Branchlets grooved, pubescent, maroon or brown. Buds ovoid-acute, slightly resinous, 10 mm. long, scales fringed. Leaves straight, dark glaucous-green, 1.5-2.5 cm. long, grooved above, thick, with 4-8 whitish lines of stomata below; apex rounded and somewhat truncate. Female cone ovoid, 4.5-6 cm. long by 2-3 cm. wide, with 30 scales, bracts long exserted and prominently reflexed downwards. Seeds with a nut 3.4 mm. long and a bright brown wing 11 mm. long.
U.S.A.: Utah to W. New Mexico; N. Mexico, 610-2896 m..

P. SINENSIS Dode Chinese Douglas Fir
=P. brevifolia Cheng et Fu,=P. forrestii Craib, =P. gaussenii Flous,
=P. wilsoniana Hayata

A pyramidal tree 30-50 m. tall, to 2 m. in girth. Branchlets reddish-brown, pubescent at first. Buds ovoid, smooth, reddish-brown. Leaves 1.5-3.5 cm. long by 2 mm. wide, arranged in two ranks, yellowish green, with a long prominent groove above, with whitish stomata below in 10-15 lines. Female cones ovoid, dark brown, 3.5-6 cm. long by 2.5-4 cm. wide; bracts variable in length, usually exserted and reflexed, 3-8 mm. long. Seeds with a brown nut 6 mm. long and a pointed wing 25 mm. long.
China: Tibet; Yunnan; Szechuan; Kwangsi; Kweichow; Hupeh; Hunan; Anwhei and in Taiwan, 600-3300 m..

SAXAEGOTHAEA Lindl. (Podocarpaceae)

A monotypic genus from South America. A monoecious tree with Taxus-like foliage, but with white bands below. Buds globose, distinct from the leaves, with few ovoid scales. Leaves nearly 2-ranked, alternate, closely arranged, linear, flattened, with a prominent midrib, leathery, apex spine-tipped. Male strobili cylindrical, spike-like, in groups at bases of the leaves. Female cone subglobose, an aggregate structure with several openings surrounded by out-curved scales, each cone containing 6-12 seeds. Seeds round, 2 per scale, inverted, wingless. Cotyledons 2.

S. CONSPICUA Lindl. Prince Albert's Saxaegothaea

A slender conical tree to 17 m. tall or more. Bark smooth, purple-brown, flaky. Trunk deeply fluted. Branches drooping, branchlets pendent. Terminal branchlets in whorls. Buds globose, green, scales ovoid. Leaves twisted, dark gray-green, alternate, 1.5-3 cm. long by 2-4 mm. wide, linear, midrib prominent, whitish below, apex spine-tipped. Male strobili on a short branchlet 4-7 mm. long, in groups of 10-20, 1-6 mm. long, dark purple, with many triangular scales, anthers

spirally arranged. Female cone ovoid, bright blue-gray to glaucous-brown, 10 mm. long by 5 mm. wide, with decurved bracts to 2 mm. long. Seeds round, tan, 2 mm. wide by 2 mm. long, flattened, 6-12 seeds per cone.
S. Chile: Valdivia, Hueicoila; Argentina: W. Patagonia, to 600 m..

SCIADOPITYS Sieb. et Zucc. (Taxodiaceae)

A monotypic genus native to Japan. A monoecious tree with unique spirally arranged foliage occuring in whorls at ends of each year's seasonal growth. Buds distinct from the leaves, with loose outer scales. Foliage dimorphic, plastic-like, consisting of 2 leaves fused together. Leaves linear, deeply grooved, borne in whorls of 10-30 on swollen nodes, paler below with 2 bands of white stomata, apex notched. Male strobili globular, compact, in clusters of 12 or more, with spirally arranged 2-celled anthers. Female cone borne upright, Sequoiadendron-like, emiting a milky sap if broken, ovoid-globose, with many scales, each scale with a decurved margin and with a blunt, inconspicous central umbo. Seeds round, with 2 even wings. Seeds 5-9 per cone scale. Cotyledons ovate, usually 2.

S. VERTICILLATA (Thunb.)Sieb. et Zucc. Japanese Sciadopitys

A dense, narrowly conical tree to 40 m. tall, with short, slender, spreading, horizontal branches. Bark gray-brown, inner-bark red-brown, smooth, exfoliating in thin strips. Buds small, red-brown, with loose outer scales. Branchlets dense, with pale brown bark. Leaves linear, deeply grooved, in whorls of 10-30 on swollen nodes, dark glossy green, yellowish-green below with 2 white stomatal bands, 10-14 cm. long by 3-4 mm. wide, apex notched. Male strobili on small shoots, yellowish, with 10-15 scales with 2 pollen sacs each. Female cone ovoid to ovate-oblong, dark reddish-brown, 5-10 cm. long by 3-5 cm. wide; scales fleshy, grooved, loose, with small central umbos; cone emits a milky sap if broken.Seeds 5-9 per scale, chestnut-brown or reddish-brown, slightly flattened, 10-12 mm. long, with 2 narrow even wings, milky when crushed.
C. Japan: C. Hondo and Shikoku, 200-1700 m..

SEQUOIA Endl. (Taxodiaceae)

A monotypic genus from S.W. Oregon and N.W. California, U.S.A.. A monoecious tree distinguished by having buds that are distinct from the leaves. Buds with loose scales. Foliage dimorphic; leaves scale-like and spirally arranged on main and fertile branchlets; linear, spreading, flattened, 2-ranked, forming a pinnate spray of foliage on lateral branchlets, acuminate, with 2 large bands of stomata below. Male strobili globular, terminal or subterminal, in groups of 1-4 on side shoots. Female cone borne on a scaly peduncle, pendent, maturing in one year, elliptical to nearly subglobose, with 12-20 scales, scales slightly shrinking after opening at maturity, with inconspicuous central umbos. Seeds relatively small, 2-9 per scale, somewhat flattened, with 2 narrow, even wings. Cotyledons 2.

S. SEMPERVIRENS (D. Don) Endl. Coast Redwood

A narrowly conical tree 61-112 m. tall, trunk 3-4.6 m. in girth or much more, with an open, irregular crown of horizontal or drooping branches. Bark reddish-brown, deeply furrowed. Trunk often buttressed at the base, with rounded swellings or burls. Branchlets flattened. Buds pinkish-green on terminal branchlets, pointed, scales incurved. Leaves dimorphic, usually linear, dark green, flattened, 1-2.5 cm. long by 2 mm. wide, 2-ranked, with 2 large bands of greenish-white stomata below, apex acuminate and spine-tipped. Leaves on terminal and fertile branchlets scale-like, 6 mm. long, keeled, spirally arranged, concave. Male strobili terminal on a short branchlet, cone 2.5 mm. long, with 2-5 pollen sacs. Female cone elliptical, dark reddish-brown, 1.2-3 cm. long, with 12-20 scales, scales somewhat shrinking after opening at maturity, with small inconspicous central umbos. Seeds elliptic, 2-5 per scale, 5 mm. long by 4 mm. wide, light brown, with 2 narrow, even wings on each side of the nut. Cotyledons 2.
U.S.A.: S.W. Oregon to W. Monterey Co., W. California, 0-914 m..

SEQUOIADENDRON Buchholz (Taxodiaceae)

A monotypic genus occuring in central California, U.S.A.. A monoecious tree with inconspicuous buds. Leaves spirally arranged, scale-like, overlapping, small, with few stomata above, with 2 lines of stomata below, apex acute. Male strobili solitary or in groups, on a scaly peduncle, ovoid, whitish. Female cone borne on a scaly peduncle, ripening in 2 years, ovoid, pendent, with thick woody, ovate scales, with an inconspicuous central umbo; cones opening upon maturity. Seeds 2-9 per scale, flattened, with a narrow nut and with 2 narrow, even wings. Cotyledons 3-5.

S. GIGANTEUM (Lindl.) Buchh. Giant Sequoia
=Seqoia gigantea (Lindl.) Decne

A narrowly conical tree 46-100 m. tall, to 6 m. in girth or much more, with short, stout, horizontal branches, branched nearly to the base. Old trees have an irregular, open crown with a long clear bole. Trunk enlarged, buttressed and fluted. Bark reddish-brown, furrowed deeply. Branchlets slender, drooping, cord-like, blue-green then brown, much-branched. Leaves scale-like, rigid, dark green to blue-green, 3-8 mm. long by 1.5 mm. wide, crowded, overlapping, with 2 bands of stomata below, with few stomata above, apex acute and pointed. Male strobili terminal, yellowish-brown, with 25-40 scales, with 2-5 pollen sacs. Female cone pendent, maturing in 2 years, on a short branchlet, ovoid-oblong, 4-8 cm. long by 3-4.5 cm. wide, reddish-brown, opening at maturity; scales flat, thickened, with inconspicuous central umbos. Seeds 3-9 per scale, oblong or nearly ovate, bright light brown, 3-7 mm. long, with 2 narrow even wings to 4 mm. long.
U.S.A.: E. California, S. Placer County to C. Tulure Co., 914-2286 m..

TAIWANIA Hayata (Taxodiaceae)

A monotypic genus from S.E. Asia and Taiwan. Monoecious trees with inconspicuous buds. Juvenile leaves awl-shaped, flattened laterally, acute. Adult leaves Crytomeria-like, scale-like, triangular, spirally arranged, with white stomata on all surfaces, apex spine-tipped and incurved. Male strobili solitary, short-stalked, oblong-cylindric, scales acuminate. Female cone pendent, on a scaly peduncle, Picea-like, oblong-cylindric; scales rounded, flattened, acuminate at the apex, lacking an umbo, with minute ovate bracts. Seeds 2 per scale, surrounded by 2 broad, relatively equal wings on a central nut, somewhat flattened. Cotyledons 2.

T. CRYPTOMERIOIDES Hay. Formosan Taiwania

A conical tree to 60 m. tall, 3-6 m. in girth, with a long clear bole and with short branches. Bark pale reddish-brown, scaly. Young plants broadly pyramidal, sparsely branched, with ascending, pendent branches. Juvenile leaves 1.7 cm. long, 2-angled, pointed, narrowed. Adult leaves spirally arranged, dimorphic, 3-6 mm. long by 1-1.5 mm. wide, faintly keeled, pungent, falcate, stomata on all faces, triangular in the cross-section, glaucous-green, apex incurved and free. Female cone ovoid-cylindric to subglobose, chestnut-gray, 8-12 mm. long, with 15 leathery scales, scales narrowly spathulate and prominently acuminate at the apex. Seeds 1-2 per scale, oblong, with rounded nuts and even, rounded, narrow, smooth-edged wings, flattened, 4-5 mm. long.
N.E. Taiwan: Mount Morrison, western slopes, 1800-2600 m..

T. CRYPTOMERIOIDES var. FLOUSIANA (Gauss.) Silba Chinese Taiwania
=T. yunnanensis Koidz.

A tree to 75 m. tall, to 2 m. in girth. Juvenile leaves 2-angled, 1.4 cm. long. Adult leaves pectinate in one plane, imbricate, notably green, acute, keeled, 4-5 mm. long by 1-1.5 mm. wide, less rigid, softer, spiny. Female cones oblong, purplish-gray at first, 1.4-2.1 cm. long by 1.7 cm. wide, scales broadly spathulate with a bluntly acuminate apex. Seeds oblong; nut narrow, ovoid; wings narrow, somewhat uneven, denticulate on the ends; flattened, gray-brown, 3-4 mm. long by 2 mm. wide.
N.E. Burma; China: W. Yunnan to N.W. Hupeh, 500-2700 m..

TAXODIUM Rich. (Taxodiaceae)

A genus of 2 species from the E. United States and Mexico, often growing in damp or wet climates. Monoecious, generally deciduous or rarely evergreen trees. Trunks often with erect, woody, knee-like projections rising from the tops of the roots when growing in water. Branches erect or spreading. Branchlets alternate, lateral branchlets generally deciduous. Buds small, round, scaly, distinct from the leaves on terminal branchlets. Leaves spirally arranged or more often 2-ranked, flat, linear, often with stomata below, turning brown in the autumn and falling off. Male strobili borne in long, terminal panicles, borne on 2 year old branchlets, with spirally arranged anthers with 2-9 anther cells. Female cones at tips of 2 year old branchlets, pendent, maturing in one year, opening upon maturity and quickly deciduous; with relatively few spirally arranged scales, with an inconspicuous central umbo. Seeds 2 per scale, irregularly triangular, hard, 3-angled, with 3 narrow, thick, even wings.

Seedlings with 4-9 cotyledons.

T. DISTICHUM (L.) Rich. Common Bald Cypress

A pyramidal tree 30-37 m. tall, 0.9-3 m. in girth, with wide-spreading branches, becoming broad and rounded or flat-topped with age. Trunk enlarged at the base, spreading into ridges or buttresses, often with cone-shaped knees projecting from submerged roots. Bark brown or gray, finely shreddy, peeling off in long, fine, thin strips. Branchlets greenish, slightly pendent. Leaves spirally arranged on terminal branchlets, but mostly 2-ranked on side branchlets, needle-like, flat, soft, 1-1.7 cm. long by 1 mm. wide, dull light green, with 2 whitish bands of stomata below, turning brown and shedding with the branchlet in the autumn, apex acuminate. Male strobili at tips of 2 year old branchlets, 10 cm. long, in a drooping cluster, purplish, opening in the spring, with 4-5 pollen sacs. Female cone globose, smooth, light purplish-tan to gray-brown, on a peduncle 3 mm. long, with 20 scales, 2-3.5 cm. long by 1.8-2.8 cm. wide. Seeds 1-3 per scale, with large resin pockets, reddish-brown or yellowish, irregular, 1-1.5 cm. long by 5-6 mm. wide, with 3 narrow even wings.

U.S.A.: S. Delaware to S. Florida to E. Texas, 152-518 m..

T. DISTICHUM var. IMBRICARIUM (Nutt.) Croom Pond Bald Cypress
=T. distichum var. nutans Sw.,=T. ascendens Brongn.,=Glyptostrobus lineatus (Poir) Druce in part.

A narrowly conical tree to 25 m. tall, with short, erect, irregular branches, forming a rounded crown. Trunk enlarged at the base. Bark reddish-brown profusely furrowed. Branches spreading, erect, sometimes somewhat pendent. Branchlets long, erect, upright. Juvenile leaves 5-10 mm. long, narrow, flattened. Adult leaves dimorphic, spirally arranged, scale-like, 2-4.5 mm. long by 0.5 mm. wide, curved, awl-shaped, appressed, incurved, subulate, acute, loosely imbricate, ridged on the back. Male strobili globular, on long raceme-like branchlets, in groups, scales acuminate. Female cone globular, glaucous-light brown, smooth, 1.8-3 cm. long by 1.6 cm. wide, at ends of thick branchlets, scales rounded. Seeds tan, oblique, triangular, woody, 12 mm. long by 11 mm. wide.

U.S.A.: S.E. Virginia to S. Florida to S.E. Louisiana, near the coast, to 121 m. or more.

T. MUCRONATUM Ten. Montezuma Bald Cypress

A tree 15-43 m. tall, 12-52 m. in girth or more, with a broad crown of spreading branches. Bark reddish-brown, shallowly furrowed. Trunk enlarged at the base, with ridges, sometimes with small knees projecting from submerged roots. Foliage usually evergreen, sometimes deciduous when grown in colder climates. Leaves 2-ranked, needle-like, 6-12 mm. long, dull light green, usually persistent, but sometimes turning yellow or brown in the spring and falling as new growth emerges; apex obtusish and mucronulate. Male strobili in open drooping clusters, 5-15 cm. long, opening in the autumn. Female cone oblong, prominently warty, gray or brown, to 2.5 cm. in diameter, with 20-28 scales, sometimes somewhat glaucous, scales crested. Seeds 2 per scale, dark reddish-brown, 3-angled, to 6 mm. long or more.

U.S.A.: S.W. Texas; Mexico: Tamaulipas; Oaxaca; Chiapas; Guatemala; Honduras, 427-2100 m..

TAXUS L. (Taxaceae)

A genus of 7 species occuring in N. America, Europe, Asia, Japan and the Philippines and Sumatra. Shrubs or trees that are usually dioecious. Buds distinct, minute, scale-like, persisting at the base of seasonal branchlets. Leaves mostly 2-ranked, linear, sometimes radially arranged, somewhat spreading, flattened, acute, with microscopic papillae, marked with 2 yellowish-green or grayish-green bands below. Male strobili globose, borne along the undersides of seasonal branchlets, axillary, opening up in the center to expose a group of 4-8 sporophylls that are surrounded by basal scales; microsporophylls peltate, with a circle of 6-8 inverted pollen sacs. Female cone generally erect, on a short peduncle with basal scales, generally maturing in 1 year, globose, acorn-like, bearing a single ovule. Seeds covered by a fleshy red aril except at the tip, seeds rounded, poisonous, pointed at the apex, wingless.Cotyledons two and short.

T. BACCATA L. English Yew

A shrub or small tree 17-20 m. tall, to 7 m. in girth, with wide-spreading branches and with a rounded crown.Bark reddish to gray-brown, furrowed and flaky. Branchlets greenish. Buds numerous, ovoid, greenish-brown, 2-3 mm. long, scales rounded. Leaves spreading horizontally and nearly opposite, linear, 1-2.5 cm. long by 2-2.5 mm. wide, shiny dark green, with 2 pale green bands below, persist 8 years, flattened, midrib and margins darkened, apex spine-tipped. Dioecious. Male strobili in the axils of 1 year old branchlets, with 6-14 stamens. Female cone at tips of branchlets, ovule short; aril 2-3 mm. long, at the base of the ovule, bright red to scarlet. Seeds ellipsoid, angular, purplish-brown, oblong, 5-6 mm. long, apex with a blunt point.

British Isles; S. Scandinavia; Europe; N.E. Africa; N. Persia, 100-2000 m.

T. BREVIFOLIA Nutt. Western Yew

A broadly conical tree 10-25 m. tall, 15-48 cm. in girth or more, with an open, irregular crown of slender, horizontal branches. Trunk ridged or fluted. Bark dark reddish-brown to purplish-brown, papery, scaly. Branchlets slender, spreading, drooping, green to bright reddish-brown. Bud scales shortly acute. Leaves spirally arranged on main branchlets, mostly pectinate or 2-ranked on side branchlets, 1-1.6 cm. long by 1.5 mm. wide, shortly linear, somewhat falcate, flattened, dark yellowish-green above, light green below with 2 broad whitish bands, thick, leathery, pointed at both ends, apex acute, petiole yellowish. Dioecious. Male strobili globular, with 6-14 stamens. Female cone singular, on leafy branchlets, broadest at the base, aril bright coral-red to scarlet-red, ovule nearly enclosed by the aril. Seed elliptical to ovoid, 5-10 mm. long, dark bluish, 2-4 angled, blunt pointed.

S.W. Canada; U.S.A.: S.E. Alaska to N. Idaho to N. California, 0-2134 m..

T. CANADENSIS Marsh. Canadian Yew

A small, densely branched shrub 1-2 m. tall, with a crown having a spread of 3-4 m. wide. Branchlets short, not disposed horizontally. Bark of seasonal branchlets green turning reddish-brown. Buds globular, yellowish-brown, scales lanceolate. Leaves 2-ranked, horizontally spreading outwards, dark yellow-green, 1.3-2 cm. long by 1.5-2 mm. wide, narrowly acute, closely arranged, with 2 pale bands of green stomata below, margins green, apex bluntly acute or shortly pointed, on a thin, yellowish petiole 0.5-1 mm. long. Monoecious. Female cone in groups of 2-3; aril bright red, 2-3 mm. long. Seeds slightly flattened, globose, wider than long, 3 mm. long by 3.5 mm. wide, apex bluntly pointed.
Endemic to southeast Canada and in the northeast United States, 365-415 m..

T. CANADENSIS var. FLORIDANA (Nutt. ex Chapm.) Silba Florida Yew

A densely branched tree or a large shrub 4-10 m. tall, to 0.3 m. in girth, with a short trunk. Bark purplish-brown, smooth, exfoliating in thin plates. Branchlets yellowish-green turning reddish-brown. Leaves 2-ranked, linear, flat, slightly falcate, dark green above, 2-2.6 cm. long by 1.5 mm. wide, with 2 gray bands below, acute at the apex, petiole very short, aromatic when crushed. Male strobili 3 mm. in diameter, pale yellow, on a short peduncle, borne singly. Female cone borne singly, stalkless, aril light red to scarlet. Seeds egg-shaped to elliptical, brown, 10 mm. long, blunt pointed, nearly enclosed by the aril.
U.S.A.: N.W. Florida, Gadsen and Liberty Counties, E. Appalacichola River, to 30 m..

T. CUSPIDATA Sieb. et Zucc. Japanese Yew

A tree 16-20 m. tall, with upright, widely-spreading branches. Bark reddish-brown, flaky. Branches short, not disposed horizontally. Branchlets reddish-brown. Buds oblong, chestnut-brown; scales generally ovate, keeled. Leaves irregularly distichous; spreading in an irregular, partially upright, V-like trough, often falcate or curving, 1.5-2.5 cm. long by 3 mm. wide, green with 2 large yellow-green or golden-green bands below, shiny blackish green above, apex with a pungent blackish mucron; petiole yellowish,1 mm. long. Female cone with a scarlet red aril. Seeds ovoid, 3-4 angled, compressed, 6 mm. long.
Korea; N.E. China; S.E. U.S.S.R.; Japan: Hondo, Shikoku, 500-2400 m..

T. GLOBOSA Schlecht. Mexican Yew

A slender tree 6-15 m. tall, 3-3.6 m. in girth, with a rounded crown. Bark reddish-brown, peeling off in long flakes. Branches long, spreading, finely divided. Branchlets yellow-brown. Buds conical, 0.5-1 mm. long; scales obtuse, keeled. Leaves spreading horizontally, dark glossy green, linear, slightly falcate, 1.5-3.5 cm. long, margins slightly recurved, silvery below, sharply pointed, spine-tipped, petiole long and twisted. Female cone on a scaly peduncle 1.5 mm. long, cylindrical, bell-shaped, aril red and 2.5-3 mm. long. Seeds globular, flattened, projected well beyond the aril after maturity, 6 mm. long by 4 mm. wide, light brown, broadly oblong, apex pointed.
C. Mexico; S. Guatemala; S. El Salvador; N. Honduras, 1690-3333 m..

T. SUMATRANA (Miq.) De Laub. Chinese Yew
=T. chinensis (Pilg.) Rehd.,=T. celebica (Warb.) Li,=T. mairei Lemee et Levl., =T. speciosa Florin

A large broad shrub or a small tree 15-30 m. tall, to 1 m. in girth, with short, fine branches. Bark reddish-purple, smooth, thin, fissured. Branchlets yellowish-green at first. Buds with obtuse, deciduous, non-keeled scales. Leaves disposed in 2-ranks, somewhat sparse, linear-lanceolate, keeled, 2-4 cm. long by 2-2.5 mm. wide, dark shiny green above, bright green below with 2 large gray bands of stomata, usually falcate and curved, shortly pointed, base oblique and decurent. Male strobili on a short stalk above a basal cluster of sterile scales, globular, to 4 mm. in diameter. Female cones in groups of 2-3, with a red aril. Seed broadly ovoid, somewhat flattened, 3-angled, distinctly keeled on both sides, 6-7 mm. long by 3-4 mm. wide.
N.E. India: Assam; N. Burma; C. China; S. Vietnam, Indonesia: Sumatra and Celebes; Philippines; Taiwan, 457-2450 m..

T. WALLICHIANA Zucc. Himalayan Yew
=T. yunnanensis Cheng et Fu

A large shrub or a tree 9-20 m. tall, 0.6-1.2 m. in girth. Branchlets light brown. Buds ovoid, 2 mm. long; scales bluntly acute, keeled. Leaves spirally arranged, spreading forwards in a V-like pattern, straight, 1.5-4.7 cm. long by 2-3 mm. long, not at all falcate, relatively closely pressed to the branchlet, deep glossy green, paler below, margins definitely recurved, apex spine-tipped, petiole twisted. Male strobili with 8-10 stamens. Female cone with a red aril which is papillose and loose, and at least 3 mm. long after drying. Seeds narrowly oblong, rounded, pointed, purplish-tan, angular, 6 mm. long. Cotyledons 2.
N.E. Afghanistan; N. India; Bhutan; China: S. Tibet and possibly in Yunnan, 1600-3300 m..

TETRACLINIS (Vahl.) Mast (Cupressaceae)

A monotypic genus from the Mediterranean Region. A monoecious shrub or small tree with distinctly flattened, joint-like branchlets. Branches erect and compact. Leaves minute, scale-like, acute, in whorls of 4, with a small transparent gland near the apex, on articulate branchlets. Male cones terminal, globular. Female cone ovoid, with 4 scales, opening in the center upon maturity, cone with 2 pairs of valvate scales, 2 scales oval-shaped, 2 scales squarish, scales grooved near the base, with a small spiny umbo on the upper half of the scales. Seeds 1-2 per scale, with 2 broad, uneven wings. Cotyledons 4-5.

T. ARTICULATA Mast. Mediterranean Sandarac-Cypress

A multi-stemmed shrub or a pyramidal tree 12-15 m. tall, 0.6-1.2 m. in girth, with an irregular crown and a fluted trunk. Bark reddish-brown, exfoliating in thin, scaly plates. Branches slender, spreading horizontally, with numerous lateral branchlets. Branchlets flattened, articulate, smooth, distinctly jointed and straight, with pinkish bark. Buds inconspicuous. Leaves in joint-like segments, in 4-ranks, scale-like, pale green to glaucous, with a small transparent gland near the apex, minute, 0.5 mm. long by 0.5-1 mm. wide, triangular, ovate-acute to

acuminate; lateral leaves slightly larger, partially covering the facial leaves, with long attached bases; apex free. Female cones ripening in 1 year and opening in the center upon maturity, cone ovoid, glaucous-brown, on a thin peduncle 5 mm. long, cone 12 mm. long by 11 mm. wide, with 2 pairs of thin, valvate scales; 2 scales square, 2 scales oval-shaped and grooved near the base, with a small, spiny umbo on the upper half of the scales to 1 mm. long. Seeds light tan and glaucous, nut 5 mm. long by 3 mm. wide, with 2 long, decurved wings, each wing at least 3.5 mm. wide. Cotyledons 4-5, 12-22 mm. long, obtuse at the apex, seedlings with glaucous leaves with white stomata below.

S. Spain; Morocco; Algeria; Tunisia; 500-1800 m..

THUJA L. (Cupressaceae)

A genus of 5 species native to North America and E. Asia. Monoecious trees with horizontal, spreading or ascending branches. Branchlets slender, flattened, relatively short, more or less in the same plane, smaller branchlets deciduous with the leaves intact after several seasons. Foliage quite fragrant. Buds inconspicuous. Leaves small, scale-like, closely overlapping, 4-ranked or in 2 opposite sets, ovate, bluntly acute, often with white stomata below. Male cones on branchlets near the base of the branches, with 3-6 pairs of stamens. Female cones woody not fleshy, usually borne erect, maturing in one year, ovoid to globular, with 4-6 pairs of oval-oblong scales; scales thin and tapering, only the middle scales are fertile; with 2-3 ovules per fertile scale; scales with small apical umbos. Seeds thin, flattened, with 2 narrow, even wings on both sides of the nut. Cotyledons 2.

T. KORAIENSIS Nakai Korean Thuja

A low spreading shrub with decumbent branches, or a small narrowly pyramidal tree 8-10 m. tall, 30-75 cm. in girth or more, with branches ascending at the ends. Bark red or chocolate-brown, exfoliating in fine scales. Branchlets very flattened, bright green above, with a visible gland, greenish-white below, almond-scented. Leaves acute, triangular, 1-2 mm. long; on main branchlets triangular-ovate, acuminate, glandular; on lateral branchlets deltoid or rhombic, acutish or obtuse, glandular, bright green above and bloomed bluish-white, glaucous below, concave or grooved below. Female cone elliptic-ovoid, reddish-brown and slightly glaucous, 8-10 mm. long by 6-8 mm. wide, with 4 pairs of scales, 2 middle pairs of scales fertile, scales oval to narrowly obovate with a small, recurved umbo. Seeds 4 mm. long by 3 mm. wide, wings rounded at the apex.

N. Korea: Kogen Province, Diamond Mts., Miroku-ho to Laoling-san, S. Kankeyo Province, 800-2000 m..

T. OCCIDENTALIS L. Western Thuja

A narrowly conical tree 12-21 m. tall, 0.3-0.9 m. in girth, with short, spreading branches. Trunk angled, often buttressed. Bark light red-brown, shreddy, fissured into narrow ridges. Branchlets distinctly flattened, much divided, with short lateral branchlets, foliage colored differently on both sides, aromatic, jointed, disposed in a horizontal plane. Leaves in 4-ranks; flat pair with a visible gland near the apex, 1.5-3 mm. long, scale-like, short-pointed, with white stomata below; side pair keeled, dull yellow-green above, paler blue-green below, ovate, acute, turning dull brownish-green in the

winter, apple scented. Male cone violet, 1 mm. long, ovoid, black-tipped, with 4 anthers. Female cone terminal on a short branchlet, maturing in one year, on a short curved peduncle, oval-oblong to elliptical, light brown, 8-12 mm. long, with 8-10 thin, blunt-pointed scales, with an acute columella and with small apical umbos; inferior pair of scales sterile, 4 scales bearing 2 tiny narrow winged seeds each. Seeds 3-5 mm. long by 1 mm. wide

Canada, S.E. Manitoba to W. North Carolina, U.S.A., to 914 m..

T. PLICATA Donn. ex D. Don — Giant Thuja
=T. gigantea Nutt.

A narrowly conical tree 30-53 m. tall, 0.6-2.4 m. in girth, with short, spreading, horizontal branches, drooping at their tips. Trunk tapering, buttressed at the base. Bark reddish-brown, thin, shreddy.Branchlets flattened in one plane, slender, closely set, divided into small branchlets, jointed. Leaves opposite in 4 rows, scale-like, 1.5-3 mm. long, short-pointed; side pair keeled; bright dark green above, glands absent, with white stomata below; leaves of main branchlets widely spaced, apex ending in a long free point, acute and scarcely glandular, very fragrant. Male cone 1-2 mm. long, dark red, with 6-8 stamens. Female cones numerous at apex of branchlets, on a curved peduncle, light brown, cylindric-ovoid, 1.2-1.8 cm. long by 5-6 mm. wide, with 8-12 elliptic-oblong scales, with 6 fertile middle scales; scales flattened, mucronate at the apex, with small umbos, with 2-3 ovules. Seeds 18 per cone, oval-elongate, 5-7 mm. long, narrowly winged, notched at the apex.

S.W. Canada; U.S.A.: S.E. Alaska to W. Montana to N.W. California, 914-2134 m..

T. STANDISHII (Gord.) Carr. — Japanese Thuja
=T. japonica Maxim., =Thujopsis standishii Gord.

A broadly pyramidal tree 9-18 m. tall, 0.9-2 m. in girth, often branched to the base. Bark reddish-brown, spotted gray, exfoliating in plates. Branches horizontal, spreading, somewhat ascending. Branchlets thick, 3-4 pinnate, somewhat pendent, thick, compressed. Leaves obtuse, glands absent, with triangular white stomata below, 1.5-2.5 mm. wide by 1.5-2 mm. long, bright green above; leaves on main branchlets with rigid, free points; those of lateral branchlets obtuse, ovate, lemon-scented. Male cone dark red. Female cone broad-ovate to somewhat oblong, green turning bright brown, 9-13 mm. long, with 8-10 scales, two middle pairs of scales fertile, with small umbos. Seeds 3 per scale, with narrow wings, notched at the apex.

C. Japan: N. Hondo; Shikoku, 500-2500 m..

T. SUTCHUENENSIS Franch. — Szechuan Thuja

A slender shrub or a small tree 6-9 m. tall, with a dense crown of spreading branches. Bark dark gray. Branchlets short, flattened, densely set, overlapping, very thick and somewhat pendent. Leaves bright silvery-glaucous on young plants, 1.5-3 mm. long by 1.2-1.5 mm. wide, obtuse, boat-shaped, without glands; lateral leaves curved at the apex; facial leaves grooved. Female cones borne on tips of short branchlets, 6 mm. long by 3 mm. wide, with 8 obovate, overlapping scales, with small umbos, the apex is scarcely free and only slightly thickened.

China: N.E. Szechuan, near Tchen-Kioe, at 1400 m., rare .

Recently introduced into cultivation in New Zealand, a beautiful plant.

THUJOPSIS (Linn.f.) Sieb. et Zucc. (Cupressaceae)

A monotypic genus from Japan. A monoecious evergreen tree with inconspicuous buds. Branchlets broad, very thick, much flattened, frond-like, disposed in horizontal planes. Leaves axe-shaped, opposite, in 4 rows, with prominent white stomata below, slightly swollen, apex acute and incurved; facial leaves obovate; lateral leaves boat-shaped, glands absent. Foliage faintly scented of terpentine. Male cones with 12-20 decussate scales, anthers broadly rounded, with 3-5 pollen sacs. Female cone ripening in one year, woody, subglobose, with 6-10 scales, upper scales usually sterile, fertile scales with 3-5 seeds, scales often with short, blunt umbos. Seeds with 2 narrow, even wings. Cotyledons 2.

T. DOLABRATA (Linn. f.) Sieb. et Zucc. Southern Japanese Hiba-Arborvitae

A pyramidal tree to 15 m. tall, with a slender trunk and a dense crown. Bark reddish-brown, scaly, fissured into long strips. Branches irregularly whorled or scattered, spreading horizontally. Branchlets flattened, thickened, dark green above, with white stomata below. Leaves thick, decussate, scale-like, bright green, keeled, lateral leaves incurved at the apex, 4-6 mm. long, marked with a broad white band below, obovate-oblong, obtuse, adnate except near the apex. Male cone cylindrical, dark violet, scales decussate and in 4-ranks, anthers broadly rounded, with 3-5 pollen sacs. Female cone broadly ovoid to globular, brown-glaucous, 1.3-1.9 cm. long, with 6-10 scales; with thick, prominent, upcurved umbos 2-3 mm. long by 2 mm. wide. Seeds 3-5 per scale. Cotyledons 2.

S. Japan: Hondo; Shikoku Islands; Kiu-shiu Island, 1800-2000 m..

T. DOLABRATA var. HONDAI Makino Northern Japanese Hiba-Arborvitae

A tree 8-30 m. tall, 1-3 m. in girth, with a straight trunk. Bark brownish-gray and purplish, exfoliating in thin, long strips. Branches more dense, partially overlapping. Leaves smaller, obtuse, non-recurved at the apex, blunt, swollen at the apex, 2-3 mm. long by 1.5-2.5 mm. wide; lateral leaves incurved, more whiter below. Female cones globose, smooth, yellowish-brown, slightly glaucous, with 8 scales, 1.5-1.8 cm. long; scales wrinkly, less thickened at the apex, umbos inconspicuous and not at all protuberant or rarely to 0.5 mm. long. Seeds tan, 4.5 mm. long, with 2 even, broad wings 1 mm. wide.

N. Japan: Hiyama; Matsumae; Nishi; Kamiiso and Kameda Districts, 850-1100 m..

TORREYA Arn. (Taxaceae)

A genus of five species from North America and E. Asia. Dioecious or seldom monoecious trees with fissured bark, whorled branches and subopposite branchlets. Buds ovoid-acute, with few shiny scales in opposite pairs. Leaves spirally arranged on main branches, more often 2-ranked on lateral branchlets, linear, thick, plastic-like, leathery, spine-tipped, somewhat hump-backed, without a distinct midrib above, with 2 narrow stomatal bands below sunken in longitudinal grooves, with a resin duct in the middle. Crushed foliage has a pungent odor. Male strobili ovoid or oblong, with 6-8 whorls of stamens, subtended at the base by bud scales. Female strobili consisting of a solitary ovule surrounded at the base by a fleshy aril and several scales. Female cone with a disagreeable odor, ripening in 2 years, drupe-like, ovoid, with a large thick-shelled seed completely covered by a thin, hard, leathery scale. Seeds one per cone, thick-shelled,

wingless. Cotyledons 2, remaining below the ground in germination (hypogeal).

T. CALIFORNICA Torr. California Torreya

A tree 5-30 m. tall, 0.2-0.6 m. in girth, with spreading branches and a conical or rounded crown. Bark gray-brown, thin, fissured. Branches in horizontal whorls, spreading, subopposite, subdistichous, yellowish-green turning red brown in the second year. Foliage strongly aromatic. Buds green tinted gray, scales in opposite pairs. Leaves 2-ranked, thick, rigid, subdistichous, linear-lanceolate, acuminate, bright dark green above, green with 2 narrow whitish lines below, 3-6 cm. long by 2.5-3 mm. wide, flattened, slightly curved, short-pointed, persist 4 years, petiole short and twisted. Dioecious. Male strobili subsessile, oblong, pale yellowish, 10 mm. long. Female cone green tinted violet-brown to purplish, borne singly. Seed ovoid, 2.8-5 cm. long by 2 cm. wide, flattened at the base with 3 grooves, bluish-brown, with a short point at the apex.

U.S.A.: N. California, C. Coast Ranges and W. Sierra Nevada, 914-1981 m..

T. GRANDIS Fort. ex Lindl. Grand Torreya

A tree 20-25 m. tall, with a straight trunk. Bark gray-brown, fissured. Branchlets subopposite, whorled, yellowish-brown in the second year. Buds green, shiny, scales opposite. Leaves straight, 1.1-2.5 cm. long by 2.5-3.5 mm. wide, thick, rigid, bright shiny green, with 2 large impresssed bands of stomata below in 8-10 lines; with a short-pointed, pungent apex; with a short, reddish, contorted petiole. Male strobili pale yellow. Female cone obovate, 2-4.5 cm. long by 1.5-2.5 cm. wide. Seed obovoid-oblong to oval, brownish, 2.5-3.2 cm. long, profusely grooved, reticulate at the ends, mucronate.

China: Anwhei to Kweichow, to 1400 m..

T. GRANDIS var. FARGESII (Franch.) Silba Farges Torreya
=T. yunnanensis Cheng et Fu

A shrub or a small tree 8-20 m. tall, 0.6-1.5 m. in girth. Branchlets yellowish-brown in the second year. Leaves straight or somewhat falcate, 1.3-3 cm. long by 2-3 mm. wide, shiny dark green above with 2 grooves along the midrib, green below with 2 bands of stomata in 6-7 lines each,slightly flattened below, with a narrow pungent spine-tipped apex, base rounded. Male strobili subsessile. Female cone globular, 1.5-2 cm. long, terminated by a small short spine, endosperm thick, ruminate.

China: Yunnan, Salouan Valley; Szechuan; Hupeh; Shensi, 1000-3400 m..

T. JACKII Chun Chekiang Torreya

A tree 9-12 m. tall, to 20 cm. in girth or more, with erect branches and an irregular or rounded crown, or frequently a multi-stemmed shrub. Bark gray-brown, exfoliating in fine scales. Branchlets ascending with spreading or somewhat pendent branchlets. Branchlets greenish-brown turning red-brown, then finally dull gray. Leaves disposed in a wide V-like pattern, linear, falcate, gradually tapering to an acute apex, 3.5-9 cm. long by 3-5 mm. wide, green above, yellowish-green below with 2 bands of whitish stomata, margins non-revolute, base slightly twisted, notably scented when crushed. Female cone obovoid, usually stalkless, 2-3 cm. long, glaucous-green, endosperm very ruminate.

China: Chekiang, Hsien-Chu Hsien, 400-900 m..

T. NUCIFERA (L.) Sieb. et Zucc. Japanese Torreya

A tree 6-25 m. tall, 3.6-4.6 m. in girth. Bark grayish-brown, shallowly fissured and flaky. Branches horizontally disposed, wide-spreading.Branchlets alternate, somewhat pendent, green turning reddish-brown in the second year. Buds 2.5 mm. long, with shiny membraneous scales. Leaves 2-ranked, linear-lanceolate, rigid, curved, pungent, 1.9-3.2 cm. long by 3-4 mm. wide, dark green above, with 2 stomatal bands below, apex ending abruptly in a spiny point, with a short contorted petiole, with a disagreeable odor when crushed. Male strobili in axils of leaves, to 8.3 mm. long, with numerous stamens, with 4 pollen sacs. Female cone in groups of 2, in axils of small leaves, on a rudimentary peduncle. Seeds narrowly obovoid to oblong, 1.9-2.5 cm. long, green with a purplish bloom, longitudinally striated, flattened at the base, edible.

Japan: central Honshu.

T. TAXIFOLIA Arn. Florida Yew

A small tree to 9 m. tall or sometimes larger in cultivation, to 0.30 m. in girth, with an open, conical crown of spreading, horizontal branches. Bark brown, tinged orange, shallowly furrowed, shredding in thin strips. Branchlets stout, sometimes slightly pendent, green or yellow-green. Leaves 2-ranked, narrow, lance-shaped, 2.5-4 cm. long by 2-4 mm. wide, somewhat falcate, thick, pungent, bright dark green above, flattened below, light green below with 2 white bands of stomata, margins obtuse, apex acute and spiny, with a short petiole, with a strongly disagreeable scent when crushed. Male strobili 6-8 mm. long by 3 mm. wide, pale yellow, solitary, subglobose. Female cone maturing in 2 years, dark green, striped purple, 2.5-3.2 cm. long by 1.8-2.5 cm. wide, with a whitish bloom. Seeds reddish-brown, 2-2.5 cm. long by 1.3-1.6 cm. wide.

U.S.A.: S.W. Georgia, Decatur County to Jackson County, N.W. Florida, to 30 m., many trees died from a recent local blight.

TSUGA (Endl.) Carr. (Pinaceae)

A genus of ten species native to North America and E. Asia. Monoecious trees with slender, horizontal branches, often pendent at the tips. Branchlets often grooved, with cushion-like leaf stalks. Buds minute, distinct from the leaves, usually non-resinous. Leaves usually 2-ranked or sometimes spirally arranged, linear, flattened or angular, short-stalked, apex rounded or more often notched, persistent, closely set; with white stomata usually below, rarely above; with one resin canal per leaf, located between the vascular bundle and the lower surface. Male strobili axillary, subglobose, on 2 year old branchlets, with rounded clusters of spirally arranged, 2-celled anthers. Female cones maturing in one year, pendent, sometimes shedding the seeds in the second year, opening upon maturity, small, ovate or oblong; with thin, flexible, persistent, rounded, overlapping, leathery scales that are usually much longer than the bracts, bracts triangular and usually hidden. Seeds 2 per scale, with a small ovoid nut with resin pockets, and with one long wing projecting backwards. Cotyledons 3-6.

T. ARGYROPHYLLA (Chun et Kuang) De Laub. et Silba Cathaya or Longleaf Hemlock
=Cathaya argyrophylla Chun et Kuang, =Cathaya nanchuensis Chun et Kuang

A tree to 20 m. tall, to 40 cm. in girth or more. Bark gray, relatively smooth, with few flakes. Branches disposed horizontally. Branchlets pubescent. Buds ovoid, reddish-brown, relatively large. Leaves 2-ranked, densely set, 4-6 cm. long by 2.5-3 mm. wide, glaucous-white below, margins revolute and pubescent, apex bluntly acute, not notched. Male strobili oblong-ovoid, 2 cm. long. Female cone ovoid, 3-5 cm. long by 1.5-3 cm. wide, reddish-brown, with 13-16 scales; scales round or ovate; bracts triangular-acuminate, covering juvenile cones then generally hidden when mature, broadened at the base; peduncle very short. Seeds with a brown, obovoid nut 5-6 mm. long, with a reddish-brown wing 10-15 mm. long. Close in many aspects to T. mertensiana.

China: SE.E. Szechuan, Nanchuan; N.E. Kweichow, Taochen; S.W. Hunan, Hsinning; N.E. Kwangsi Chuang, Lungsheng, 1400-1800 m., rare.

T. CANADENSIS (L.) Carr. Canadian Hemlock

A tree 18-21 m. tall, 0.6-0.9 m. in girth, with a conical crown of long, slender, horizontal, somewhat drooping branches. Bark cinnamon-brown, deeply furrowed into broad scaly ridges. Branchlets reddish to yellow-brown, shortly pubescent. Buds ovoid, pointed, 2 mm. long by 1.3 mm. wide; scales narrow, keeled, shortly pubescent, margins laciniated, slightly resinous.Leaves 2-ranked, straight, flattened, shiny dark green above, obscurely grooved above, glaucous below with 4-8 stomatal lines, 8-15 mm. long by 1.5 mm. wide, margins finely toothed, enlarged at the base with a long narrow petiole, apex entire and rounded. Female cone ovoid or ovoid-elongated, brown, 1.5-3.5 cm. long by 1-1.5 cm. wide, deciduous; scales rounded, orbicular-ovate, longer than wide; bracts small, 1/3 height of the scale, narrowed, finely denticulate. Seeds with a light brown nut 3 mm. long, with few resin pockets; wing to 8.5 mm. long, enlarged at the base.

Canada: S. Ontario to N. Alabama, U.S.A., 610-1700 m..

T. CAROLINIANA Engelm. Carolina Hemlock

A compact, conical tree 12-18 m. tall, to 0.6 m. in girth, with short, drooping branches and with a pendulous, slender leader. Bark red-brown, deeply furrowed into flat, scaly ridges. Branchlets bright brown to orange-brown, slightly pubescent and with numerous blackish hairs. Buds ovoid-obtuse, 2.5 mm. long by 1.5 mm. wide; scales acute, keeled, pubescent; slightly resinous. Leaves 2-ranked, straight, linear, grooved nearly to the apex above, flattened, dark shiny green above, whitish below with 5-10 stomatal lines, 2 cm. long by 1.8 mm. wide, margins parallel, non-toothed, apex largely entire and slightly notched, short-stalked. Female cone on a short peduncle, ovoid to narrowly elliptical, 2.5-3.7 cm. long by 1-3.5 cm. wide; scales oblong, nearly at right angles, elongated, finely pubescent; bracts petite, with 3 points at the apex. Seeds with a nut 4.3 mm. long, with slightly visible resin glands; wing to 13 mm. long, narrowed at the apex.

U.S.A.: S.W. Virginia to N.E. Georgia, 762-1219 m..

T. CHINENSIS (Franch.) Pritz. Chinese Hemlock
=T. forrestii Downie, =T. tchekiangensis Flous

A tree 30-50 m. tall, to 1 m. in girth, with long, fine branches. Bark orange-brown, with gray-green flakes. Branchlets yellowish, minutely pubescent, grooved. Buds ovoid-obtuse, dark red-brown, 2-4 mm. long by 1.5-2 mm. wide, scales rounded and slightly pubescent. Leaves 2-ranked, straight, linear, shiny dark green above, paler below with 6-9 faint stomatal lines, 2-2.2 cm. long by 2.5-3 mm. wide, not grooved to the apex, margins entire, apex notched or rarely acute, with a relatively long petiole. Female cone ovoid, yellowish-brown, 1.5-2.9 cm. long by 1.2-2 cm. wide; scales suborbicular to nearly oblong, slightly pentagonal; bract triangularly contoured, finely denticulate, with 2 short points. Seeds with a nut 3.5 mm. long, with 1-2 large resin pockets, wing to 8.5 mm. long.
China: Anwhei to Szechuan, 600-3962 m..

T. CHINENSIS var. FORMOSANA (Hayata) Li ex Keng Formosan Hemlock
=T. chinensis var. daibuensis Ying

A tree 36-50 m. tall. Branchlets yellowish to somewhat purplish, smooth. Buds ovoid, 3-5 mm. long by 2-3 mm. wide, slightly resinous; scales obtuse, keeled. Leaves 2-ranked, 4-16 mm. long by 1.2-2 mm. wide, linear, with faint whitish stomata below in 6-9 lines, apex shortly notched, petiole relatively short. Female cones ovoid, 1.7-2.5 cm. long by 1.3-1.8 cm. wide, on a short peduncle, cone with 20 scales; scales rounded, orbicular, finely denticulate; bract finely denticulate, notched at the apex. Seeds with a nut 4 mm. long, with numerous small resin glands, wing to 9 mm. long.
Taiwan: Mount Niitaka; Arizan and Nanto, 1300-3000 m..

T. DIVERSIFOLIA (Maxim.) Mast. Northern Japanese Hemlock

A multi-stemmed shrub or a pyramidal tree 16-26 m. tall, 2-4 m. in girth. Bark dark orange-brown, ridged, pinkish in the fissures. Branchlets dark reddish-brown to orange-brown, with fine, erect pubescence. Buds globular, flattened, 2-2.5 mm. long by 2 mm. wide, minutely pubescent; scales acute, keeled; slightly resinous. Leaves 2-ranked, straight, grooved to the apex above, dark green above, whitish below with 10 lines of stomata, 6-12 mm. long by 1-1.2 mm. wide, margins entire, non-denticulate, apex notched, petiole fine. Female cone spherical, 2 cm. long by 2 cm. wide, shiny brown; scales orbicular-ovate, shiny, finely striated, with 2 dents at the base; bracts nearly rectangular with 2 small points at the apex. Seeds with a narrow nut to 4 mm. long with numerous resin pockets, wing to 10 mm. long.
N. Japan: C. Hondo; Nikko and Chichibu Alps, 600-2700 m..

T. DUMOSA (D. Don) Eichl. Himalayan Hemlock
=T. yunnanensis (Franch.) Pritz

A tree to 40 m. tall, to 2.7 m. in girth, with an irregular crown of wide-spreading branches. Bark shallowly fissured, scaly, pinkish-brown. Branchlets light brown to reddish-gray, pubescent, drooping. Buds rounded-globular, flattened on top, 2-2.5 mm. long by 2.5 mm. wide; scales slightly resinous, shortly pubescent, keeled. Leaves 2-ranked, linear or slightly falcate, green above, prominently white below with 10 stomatal lines, to 3.5 cm. long by 2.5 mm. wide, denticulate; apex narrowed, obtuse or slightly acute; petiole relatively short. Female cone ovoid, sessile, glossy brown, 2-2.5 cm. long by 1.3-2 cm. wide; scales rounded, longer than wide; bracts short, diamond-shaped, with 2 points at the apex. Seeds with a nut 3 mm. long, with large resin pockets, wing 9-10 mm. long.
N. India; Nepal; Bhutan; China: Tibet to W. Szechuan, 2300-3500 m..

T. HETEROPHYLLA (Raf.) Sarg. Western Hemlock

A tree 30-46 m. tall, 0.9-1.2 m. in girth, with a narrowly conical crown of short, slender, horizontal branches that are slightly drooping. Bark reddish-brown, deeply furrowed. Branchlets yellow-brown, pubescent. Buds ovoid, brown, 3 mm. long by 1.6 mm. wide, obtuse, slightly pubescent; scales acute, lanceolate. Leaves 2-ranked, straight, lanceolate, grooved nearly to the apex above, shiny dark green to yellowish-green above, with 2 broad whitish bands below with 6-10 stomatal lines; margins parallel, finely denticulate, margins greenish to yellowish; 2.3 cm. long by 1.8 mm. wide, flat, flexible, persist 4-7 years, apex entire or bluntly acute, with a short petiole. Female cone ovoid, reddish-brown, opening widely at maturity, 1.1-2.5 cm. long by 0.9-2.2 cm. wide; scales nearly elliptical to oval, margins undulate; bracts pentagonal, non-lobed. Seeds with a nut 4 mm. long, with 2-3 large resin pockets; wings to 10 mm. long, broadened at the base.
W. Canada; U.S.A.: S.W. Alaska to N.W. Montana to N.W. California, 610-1829 m..

T. LONGIBRACTEATA Cheng Bristlecone Hemlock
=Nothotsuga longibracteata (Cheng) Hu

A tree 10-30 m. tall, to 115 cm. in girth or more. Branchlets yellowish-brown or brown turning gray, non-pubescent. Buds acuminate, bright brown, 2-4 mm. long by 2 mm. wide, smooth, oval. Leaves 2-ranked, dark green above, grooved above, paler green below with 5-8 whitish lines of stomata, 1.1-2.7 cm. long by 1.5-2 mm. wide, stomata numerous on both surfaces but more prominent below, apex bluntly acute, margins revolute, not toothed, with a long petiole. Female cone cylindrical, chestnut-brown, 2-5.8 cm. long by 1.2-2.5 cm. wide; scales ovate, semi-orbicular; bracts long-exserted, about 2/3 height of the scales, upright, triangular. Seeds with a nut 4 mm. long, with a large resin gland, wing to 10 mm. long.
China: Hunan; Kweichow; Kwangtung; Kwangsi Chuang, 300-2300 m..

T. MERTENSIANA (Bong.) Carr. Mountain Hemlock

A tree 9-30 m. tall, 0.3-0.9 m. in girth, with a conical crown of slender, horizontal or somewhat drooping branches. Trunk tapering, leader drooping, branches short and upright. Bark gray to dark brown, furrowed. Branchlets light reddish-brown, finely pubescent. Buds conical, pointed; scales keeled and pubescent. Juvenile leaves larger than most other species of Tsuga and in this respect resembling T. argyrophylla. Adult leaves uniquely spirally arranged and curved upwards, elliptic or nearly triangular in the cross-section, not conspicuously flattened, half-rounded, blue-green to gray-green above, crowded at ends of branchlets, stomata on both surfaces, stomata in 2-8 lines below, 1.3-2.5 cm. long by 1.3-1.8 mm. wide, grooved nearly to the apex above, not denticulate; apex entire and rounded; petiole short, to 1 mm. long. Female cone ovoid-cylindric, purplish turning brown, 3.5-7.5 cm. long by 2 cm. wide; scales obovate; bracts hidden, about 1/2 height of the scales. Seeds with a nut 3 mm. long, with 2 large glands; wings to 8 mm. long, rounded at the apex.

W. Canada; U.S.A.: S.W. Alaska to C. California, 1067-3353 m..

T. SIEBOLDII Carr. Southern Japanese Hemlock

A broadly conical tree 26-30 m. tall, to 6 m. in girth, with short, horizontal branches, trunk sometimes multi-stemmed. Bark cracked into pinkish-gray squarish scales. Branchlets smooth, light shiny-brown, prominently grooved, with red petioles. Buds ovoid, 2.5 mm. long, slightly resinous, scales acute at the apex. Leaves 2-ranked, straight, linear, grooved above to the apex, bright dark green above, paler below with 10 lines of stomata, 8-18 mm. long by 2.5 mm. wide, broader at the apex, margins non-denticulate, apex notched. Female cone ovoid-globular, dark brown, flat-topped, 1.8-2.7 cm. long by 2.2 cm. wide; scales orbicular; bracts notched, bifid. Seeds with a nut 4 mm. long, with numerous resin glands, with a wing to 8 mm. long.

S. Japan: Shikoku; S. Hondo and Kyushu, 300-1800 m..

WIDDRINGTONIA Endl. (Cupressaceae)

A genus of three species from Malawi to South Africa. Monoecious or sometimes dioecious trees with terete branchlets. Juvenile leaves linear, flattened, spirally arranged, bluish-green. relatively long, with stomata below. Branchlets rounded to nearly tetragonal. Buds inconspicuous. Adult leaves scale-like, alternating in opposite, decussate pairs, imbricate, small, bluntly acute, usually without noticeable glands or stomata. Male cone terminal, solitary, sessile, on short branchlets. Female cones axillary, ripening in 2 years, subglobose, resinous, opening in the center upon maturity, nearly stalkless, warty, with 4 thick, valvate, equally sized scales; scales rounded or nearly rectangular, grooved near the base, with small central umbos. Seeds one to several per scale, dark brown to black, with 2 narrow, even wings and with a relatively large, whitened hilium. Cotyledons 2.

W. CEDARBERGENSIS J.A. Marsh Clanwilliam Widdringtonia
=W. juniperioides (L.) Endl.

A tree 12-18 m. tall, 0.9-1.2 m. in girth, with wide-spreading branches and a rounded crown. Bark dark brownish-gray, rough, scaly, exfoliating. Juvenile leaves spirally arranged, blue-green, 1-1.8 cm. long. Branchlets thick, somewhat rounded, with orange bark. Adult leaves scale-like, in decussate pairs, covering the branchlets, obtuse, keeled, incurved, hump-backed, 1.2-2 mm. long by 0.5-1 mm. wide, slightly pubescent. Female cones in clusters, subglobose, 1.5-2.5 cm. long, dark brown, with 4-6 thick scales, resinous, warty, scales grooved at the base and tuberculed near the margins, with a small, blunt umbo near the bottom of the scale. Seeds 4-8 per cone, blackish-brown to black, nut-like, triangular, 8-10 mm. long by 6 mm. wide, nearly wingless, with a large whitish hilium to 5 mm. wide. Cotyledons 2, 32-35 mm. long by 2-3 mm. wide, light green, notched at the apex.
South Africa: S.W. Cape Province, Cedarberg, 914-1981 m..

W. NODIFLORA (L.) Powrie Mountain Widdringtonia
=W. cupressoides (L.) Endl., =W. dracomontana Stapf.,=W. whytei Rendle

A tree 9-43 m. tall, with a dense, columnar, conical crown. Branches erect and compact. Bark gray, exfoliating in thin, long strips, inner-bark red. Branchlets finely divided into distinct, joint-like segments, nearly tetragonal, with reddish-gray bark. Juvenile leaves spirally arranged, glaucous-green, lanceolate, flattened, widely spreading, 2.5 cm. long by 2 mm. wide. Adult leaves rhombic, decussate, 1-1.2 mm. long by 0.5 mm. wide, bluntly acute, keeled, apex incurved, scarcely glandular sometimes. Male cone broadly ovoid, with 16 subpeltate scales, with 2-4 pollen sacs. Female cone subglobose, smooth or wrinkly, dark brown, 1.8-2 cm. long, not markedly tuberculed on the scale margins. Seeds relatively small, somewhat flattened, dark brown to blackish, oval to nearly round, 5-7 mm. long by 3.5-6 mm. wide; wing to 2 mm. wide, rounded on both sides of the nut; hilium to 1.5 mm. wide. Cotyledons 2, 13-32 mm. long, apex obtuse.
South Africa; Mozambique; Rhodesia; Malawi, to 2590 m..

W. SCHWARZII (Marloth.) Mast. Willomore Widdringtonia

A tree 15-36 m. tall, to 3 m. in girth, with a columnar or conical crown, but often gnarled and stunted. Bark reddish-gray, flaky. Branches dense, ascending. Branchlets rounded, thread-like, somewhat twisted, with reddish-brown bark.Leaves scale-like, thick, obtuse to bluntly acute, slightly keeled, 4-ranked, imbricate, densely covering the branchlet, with a central gland sometimes, 1-1.5 mm. long by 0.5 mm. wide, incurved, apex lightened. Male cones aggregated at the apex of branchlets. Female cone dark brown, smooth, resinous, 1.9-2.5 cm. long, with 4 thick scales, scales heavily tuberculed at the margins, umbos inconspicuous and near the apex of the scales. Seeds 12-14 per cone, somewhat flattened, dark brown to black, 6-10 mm. long by 6 mm. wide; wings 2 mm. wide, notched at the apex; hilium whitish, 2 mm. wide. Cotyledons 2, 13-25 mm. long by 1-2 mm. wide, light green, apex obtuse. Seedlings apparently have a shorter juvenile stage than the other species, juvenile leaves prominently glaucous.
South Africa: S. Cape Province, Bavianskloof and Kouga Mts., 792-1219 m..

Silba, John/Encyclopaedia Coniferae
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