An Illustrated Key to the Identification of Gymnosperms

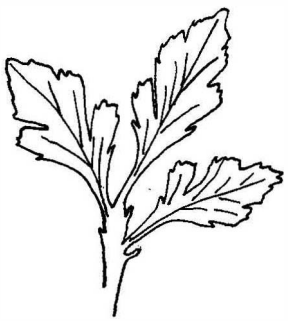
In some circumstances, to assist the determination of the treated genera, it seemed to be appropriate to list one species of the respective genus.

1. Leaves not acicular or squamiform **2**
-- Leaves acicular or squamiform **7**

2. Leaves not pinnate **3**
-- Leaves pinnate, palm-like, cones up to 60 cm long and weighing up to 30 kg (subtropical to tropical) **Cycas**

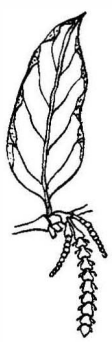
3. Leaves opposite **5**
-- Leaves alternate **4**

4. Leaves in spirals, arranged as leaf-like phylloclads (subtropical and tropical) **Phyllocladus**

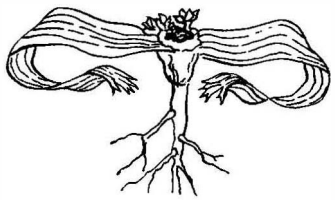


-- Leaves on spurs in tufts of 3-5, alternate on shoots, fan-shaped, leathery, on long petiole. Seed a drupe attached to a long stalk, plum-like, yellow-green. **Ginkgo**

5. Leaves shaped otherwise **6**
-- leaves simple with reticulate venation and undulate leaf margin (tropical) **Gnetum gnemon**



6. Two leaves, opposite, up to 100 cm wide and surviving throughout the plants life
(continuously growing , tropical) **Welwitschia**



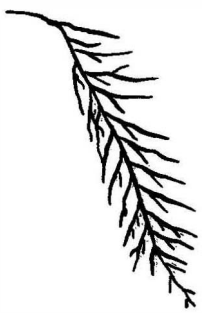
--. Leaves more or less connate and usually reduced to a membraneous sheath. Broom-like shrubs resembling horsetails **Ephedra**

7. Leaves acicular or only squamiform **8**
-- Leaves always acicular **29**

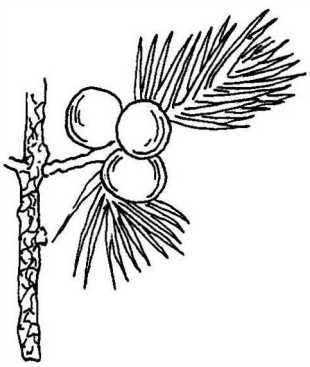
8. Shoots round or square-shaped **9**
-- Shoots flattened **21**

9. Shoots round, partly due to scale arrangement seemingly angular **11**
-- Shoots multi-angular, seldom round **10**

10. Shoots almost angular, sprays of plume-like shoots in two planes squamiform leaf-tips above the facial leaves. In lower parts margin of the facial leaves coming into contact with each other.Hybrid **Cupressocyparis**

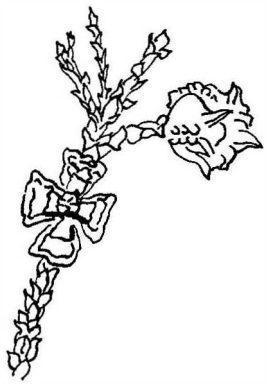


-- Shoots angular, triangular or partly round. Juvenile leaves always acicular, adult leaves acicular as well as squamiform. Fleshy, cone-scales united to form a globular berry **Juniperus**

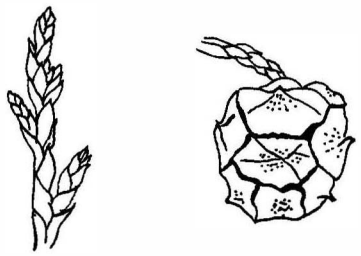


11. Scale-leaves arranged opposite or alternate rows **13**
-- Cones with 4-12 scales **12**

12. Cones with 4 scales, needles opposite or alternate 3 to 4, however, never in whorls. Juvenile, adult and intermediate needles all on the same tree (subtropical) **Widdringtonia**

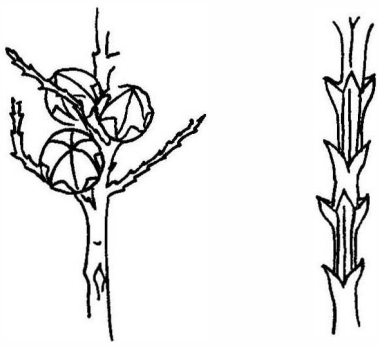


-- Cones with 6-12 scales **Cupressus**

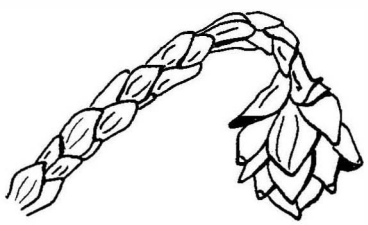


13. Scale-leaves arranged in regular, opposite rows or in whorls **15**
-- Scale-leaves arranged in alternate rows **14**

14. Scale-leaves arranged in 3 regular, alternate rows. Juvenile needles 8-15 mm, adult needles 3-4 mm long (subtropical) **Actinostrobus**

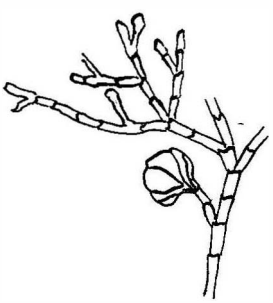


-- Scale-leaves arranged in 4-5 spiral rows. Needles 2,5 mm long with white stomatal bands above (subtropical) **Microstrobos fitzgeraldii**

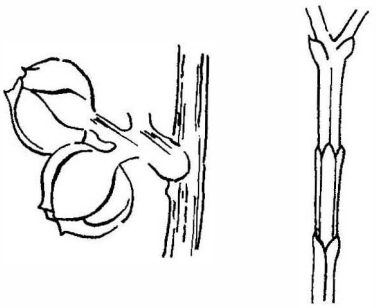


15. Scale-leaves arranged in regular rows **18**
-- Scale-leaves arranged in regular whorls **16**

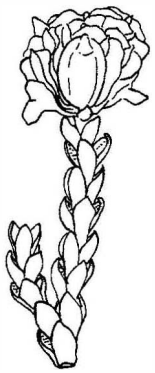
16. Scale-leaves arranged in 3 whorls **17**
-- Scale-leaves arranged in 4 whorls. Cones with 4 scales. Flattened, Thuja-like shoots (subtropical) **Tetraclinis**



17. Cones with 6-8 scales, persisting on the branch for some years (subtropical) **Callitris**

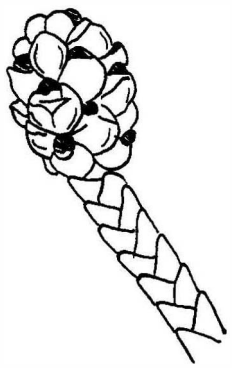


-- Cones with 9 whorled. erect cone-scales. Needles with conspicuous stomata **Fitzroya**



18. Scale-leaves arranged in 4 regular rows **19**
-- Scale-leaves arranged in 8 regular rows, shoots seemingly octagonal (tropical) **Neocallitropsis**

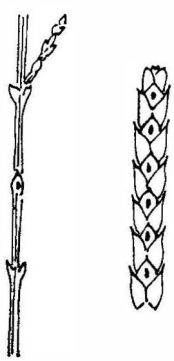
19. Cones with less than 20 scales **20**
-- Cones with 20-28 scales, mulberry-like, red. Needles 2-3 mm long, stomata not visible **Microcachrys**



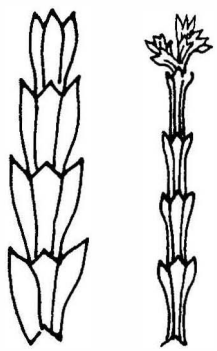
20. Cones with 4 stiff scales, which are extended by a central thorn. Needles approx. 2 mm long. Shoots seemingly angular **Pilgerodendron**

-- Cones with 4 stiff scales without a central thorn. Needles approx. 1 mm long. Shoots seemingly angular **Diselma**

21. Terminal shoot of common plants erect **22**
-- Terminal shoot of common plants drooping. Facial leaves clearly larger than lateral leaves, with thin, white stomatal streaks beneath. Cones globular with 8 scales. **Chamaecyparis lawsoniana**



22. Facial leaves not covering the lateral leaves, (i.e.,spreading leaves are almost visible at the base); facial leaves not coming into contact with each other over the surface **23**
-- Facial leaves covering the lateral leaves **25**

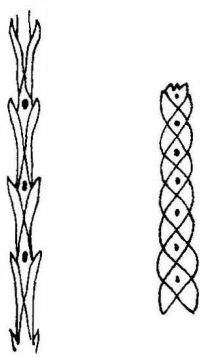


23. Cones 12-18 mm long **24**
-- Cones 20-25 mm long, with 6 scales. Shoots twisting screw-like from the stem outwards away **Calocedrus decurrens**

24. Cones with 6-10 scales. Facial and lateral leaves approx.of similar length, shiny dark green above, with conspicuous white stomatal bands beneath **Thujopsis**

-- Cones with 12-16 scales. Conspicuous stomatal bands beneath (tropical) **Fokienia**

25. Lateral leaves in comparison to facial leaves very small **27**
-- Lateral leaves of adult shoots in comparison to facial leaves equally large. Facial and lateral leaves dark green above, light green beneath **26**



26. Facil and lateral leaves without long tapering tips. Depending on the species with or without visible, conspicuous stomatal bands. **Thuja plicata**

-- Facial and lateral leaves of juvenile shoots with long tapering tips. Shrub-like, of a broad habit, up to 1 m high **Microbiota**

27. Juvenile facial leaves colliding in the centre **28**
-- Juvenile facial leaves not colliding in the centre, i.e. the margin of the facial leaves are covered by lateral leaves (subtropical) **Libocedrus plumosa**

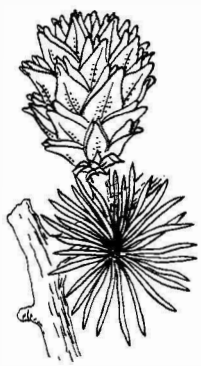
28. Juvenile facial leaves opposite, but the lamina up to 15 mm (tropical) **Papuacedrus papuana**

-- Juvenile facial leaves opposite, but the lamina up to 4 mm **Austrocedrus**

29. Needles deciduous **30**
-- Needles evergreen **34**

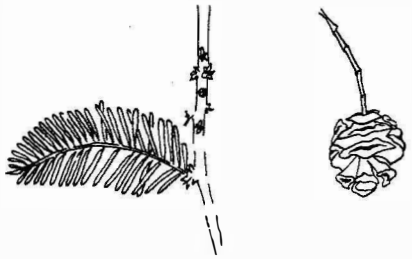
30. Needles on spurs arranged in tufts **31**
-- Needles not arranged in tufts **32**

31. Cones disintegrating after maturity. Needles 2-3 mm wide, arranged singly on shoots **Pseudolarix**



-- Cones not disintegrating after maturity. Needles 0,5-1 mm wide, arranged singly on shoots **Larix**

32. Needles and buds alternate **33**
-- Needles and buds opposite. Linear needles and a proportion of the shoots are shed in the autumn **Metasequoia**

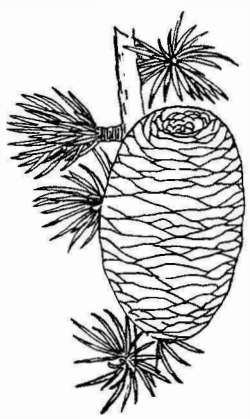


33. Cones globular-ovate, on short stalks. Needles are shed with spurs. Tree hardy **Taxodium**

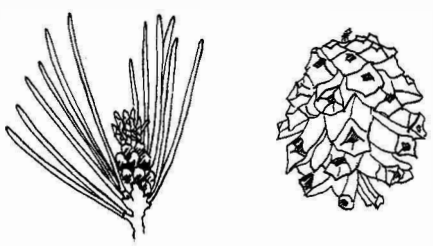
-- Cones small-obovate. Needles are shed with spurs. Tree is not hardy (tropical) **Glyptostrobus**

34. Needles on spurs arrangd in clusters and also arranged singly **35**
-- Needles always arranged singly **38**

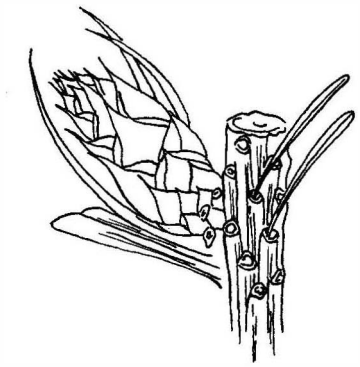
35. Cones not disintegrating after maturity **36**
-- Cones disintegrating after maturity. 10-40 needles on a spur-shoot **Cedrus**



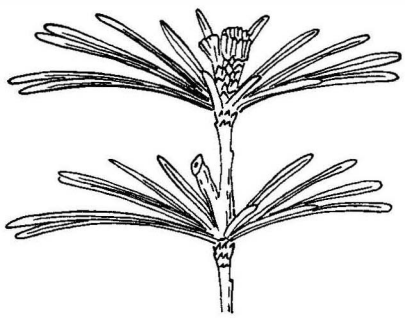
36. Needles more than 8 on a spur-shoot **37**
Needles less than 8 on a spur-shoot. Needles (1) 2-5 arranged in tufts **Pinus**



37. Needles 25-50 mm long with 2 bluish-white stomatal bands beneath. Cones 30-50 mm long, persisting for many years **Cathaya**



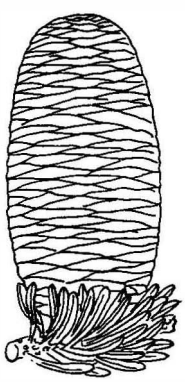
-- Needles 80-150 mm long, two-shaped, arranged at the distal end of the shoots in umbrella-like whorls **Sciadopitys**



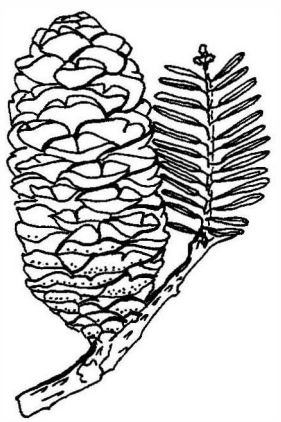
38. Needles alternate **39**
-- Needles arranged opposite or in whorls of three. Fleshy cone-scales unite to form a globular "berry" **Juniperus**

39. Needles clearly pectinate. Bark of current year shoots yellowish, brownish or reddish **40**
-- Needles not clearly pectinate. Bark of current year shoots greenish **44**

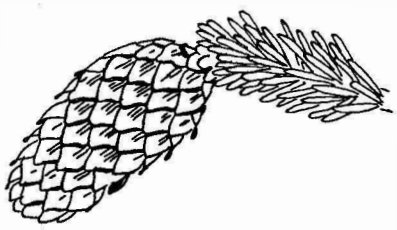
40. Cones shed after maturity **41**
-- Cones disintegrate on the shoots after maturity. Needles arise directly from sucker-like, circular, widened needle-bases **Abies**



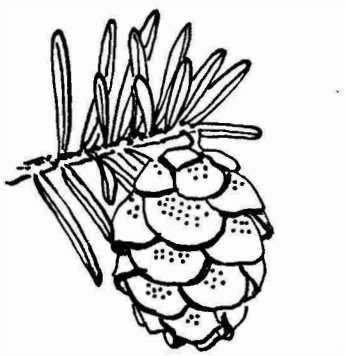
41. Needles on young plants mostly not sharp-pointed **42**
-- Needles on young plants mostly sharp-pointed. Buds round to ovate, not resinous (subtropical) **Keteleeria**



42. Shoots smooth after the needles have been shed **43**
-- Shoots rough after the needles have been shed. Needles not tapered, stalk-like at the base, but attached by almost their whole diameter to peg-like bases **Picea**



43. Buds ovate to globular. Stalk of needles adjacently attached to shoots **Tsuga**

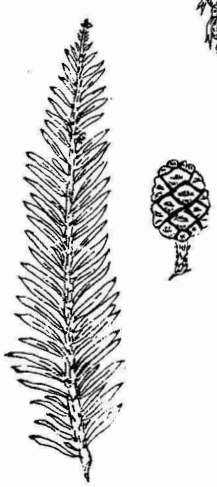


-- Buds fusiform, sharp, glabrous, not resinous. Stalk of needles bent away from the shoot at an angle **Pseudotsuga**

44. Needles with a stalk **45**
-- Needles sessile **53**

45. Strobilus fleshy **47**
-- Strobilus woody **46**

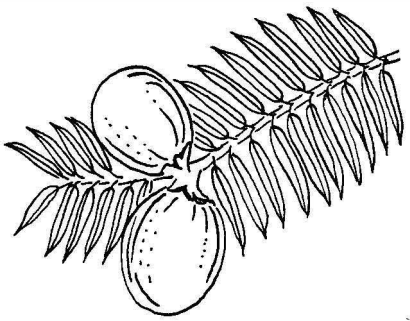
46. Needle bases arranged in spirals. Needles on lateral shoots appearing double-celled, 6-20 mm long. Cones 20-25 mm long **Sequoia**



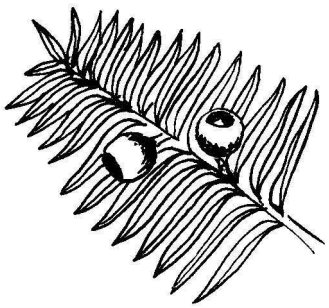
-- Needles large, leathery, short-stalked, alternate to almost opposite, persisting up to 20 years, 20-120 mm long. Cones broadly globular, up to 130 mm long and 100 mm thick. (subtropical to tropical) **Agathis**

47. Needles with conspicuous stomatal bands beneath **50**
-- Needles with inconspicuous stomatal bands beneath **48**

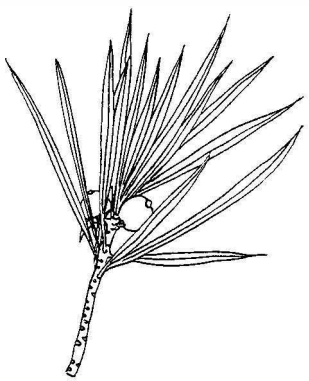
48. Aril red to orange **49**
-- Aril green to violet,enveloping the whole seed. Needles double-celled, stiff, prickly **Torreya**



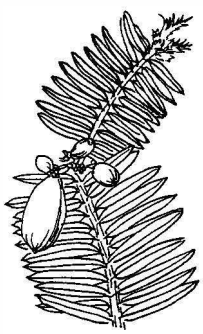
49. Needles centrally ridged above. Aril red, bell-shaped. Needles 10-30 mm long **Taxus**



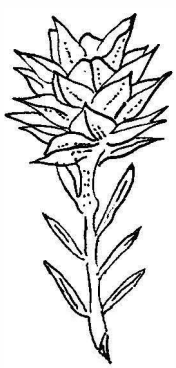
-- Needles centrally grooved above. Aril orange. Needles 80-120 mm long **Austrotaxus**



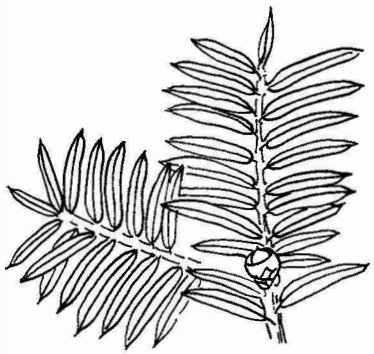
50. Stomatal bands smaller than the green margins and median bands **51**
-- Stomatal bands wider than the green margins and median-bands, white. Needles 21-90 mm long **Cephalotaxus**



51. Strobilus with testa **52**
-- Strobilus cone-like with soft, thorny, fleshy, seed-scales. Needles leather-like, sharply pointed, with two bluish-white stomatal bands **Saxegothaea**



52. Aril white, bell-shaped. Needles 12-25 mm, stomatal bands bluish-white **Pseudotaxus**



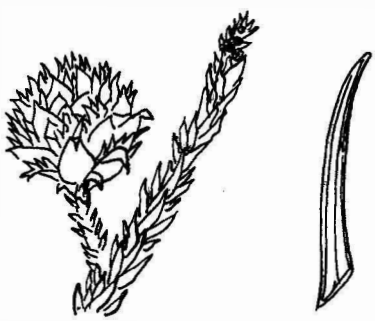
-- Aril reddish-yellow. Needles 35-120 mm long. Stomatal bands broad, white (subtropical to tropical) **Amentotaxus**

53. Needles not arranged in double lines **54**
-- Needles arranged in double lines on lateral shoots, needle-bases arranged in spirals **60**

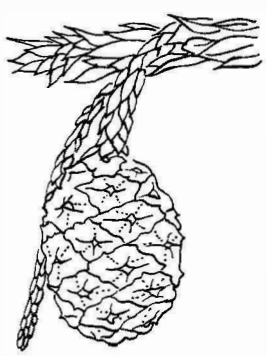
54. Needles without a grooved midrib above **55**
-- Needles with a grooved midrib above. Seeds ovate with a fleshy, red pedicel **Podocarpus nivalis**

55. Needles arranged in rows **56**
-- Needles not arranged in rows, but in spirals **57**

56. Needles arranged in 5 longitudinal rows, 6-20 mm long, sickel-shaped not prickly. Cones 10-30 mm long **Cryptomeria**

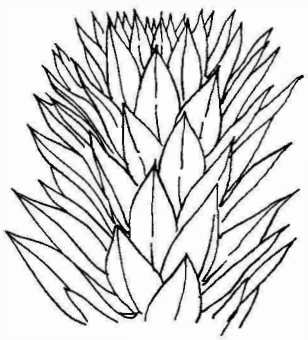


-- Needles arranged in 3 longitudinal rows, 3-8 mm long, not sickel-shaped, sharply.pointed, prickly. Cones 50-80 mm long **Sequoiadendron**



57. Needles sickel- shaped, bent inwards **58**
-- Needles not sickel-shaped, not bent inwards. Needles small, 5 mm long, gradually merging into 2-3 mm long adult leaves. Seeds only 3 mm large. Aril red. (subtropical) **Dacrydium cupressinum**

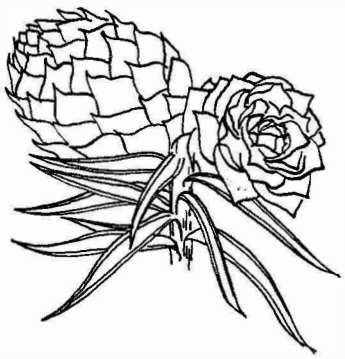
58. Cones smaller than 18 mm **59**
-- Cones larger than 18 mm. Needles 3-60 mm long. Cones up to 300 mm tall and 230 mm thick. Seeds up to 60 mm long. (temperate to tropical) **Araucaria**



59. Cones smaller than 12 mm. Juvenile needles thin-linear, sickel-shaped, constricted at the margins, prickly, up to 17 mm long (subtropical) **Taiwania**

-- Cones larger than 12 mm. Juvenile needles sharply-pointed,sickel-shaped, 8-12 mm long. Cones globular **Athrotaxus selaginoides**

60. Needles 30-70 mm long, tapering to sharp, prickly points.
Cones 30-40 mm large **Cunninghamia**



-- Needles 8-20 mm long with two broad, bluish stomatal bands.
Strobilus with conical seeds (tropical) **Acmopyle**