SOME CANTERBURY PINES AND THEIR ORIGIN

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INTRODUCTION

Trees of the genus Pinus L. are now so familiar a part of the Canterbury scene that it is difficult to imagine that beyond a century and a quarter ago there were none. The earliest pines were introduced by private owners to their estates; notably the Rhodes family on the Port Hills and at The Levels, Timaru, the Acland family at Mt Peel Station, the Deans family of Riccarton and the Homebush area, and Mr T.W. Adams of Greendale near Hororata. Barnett (1946) gives details of their introduction as well as other information on the early planting of trees generally in Canterbury.

The following notes and key include all the most likely species to be found in the Province. This excludes some of the rare species in such comprehensive arboreta as the Botanic Gardens, Christchurch and its annex Victoria Park, the Adams Estate at Greendale and the Lake Coleridge Pinetum of the New Zealand Electricity Department. At the last there is a collection of pines which is probably unequalled in New Zealand and about half of the hundred or so species in the genus are there. Local specimens have been used as far as possible in compiling the key. For some species a wide range of material was available, whereas for others it was limited. Consequently, future introductions of these rarer species to Canterbury could result in them being more variable here than at present. Although an attempt is made to account for most of the variation likely to be found here, occasional departure from the general range are ignored; e.g. with the exception of Pinus ponderosa, there is no mention of the occasional fascicles of needles with fewer or greater than the usual number. Also, hybrids are not included, but a few such trees may be expected with P. radiata as one parent usually P. attenuata or P. muricata as the other. Thus a hybrid origin may be suspected if the characters seem to be intermediate. However, generally the surprising amount of variation in the cultivated and few wild populations of P. radiata does not seem to be attributable to introgressive hybridisation with other species (Forde 1964).

A standard work on conifer taxonomy which is often used in New Zealand is Dallimore & Jackson (1966). Unfortunately, although a key is given there to most of the species of Pinus, it is unsatisfactory in parts. The key to the cultivated and indigenous pines of North America by Rehder (1947) is also sometimes consulted. Although it is preferable to the previous work, it has two important defects for New Zealand users.

(1) The subtropical species are excluded; e.g. four are mentioned here;

(2) The single main lead to the 2 needle pines uses a shoot branching character which seems to be of very limited importance here.

Origin of the Species growing in Canterbury

Pines occur naturally across the Northern Hemisphere in the temperate zone and extend southwards into tropical regions of Central America, the West Indies and S.E. Asia. Apart from some of these southern species, there are very few which have not been tried in Canterbury over the past century.

The Californian Pinus radiata D. Don is easily the commonest species, and from Hanmer southwards it is cultivated in plantations and forests for timber and also as a windbreak. The more ornamental golden-needled cultivar 'Aurea' is occasionally seen. This was first described by Mr T.W. Adams. Radiata pine grows naturally only in a tiny coastal strip of Monterey County, central California, with a variety on Guadalupe Island. The Pacific states of the U.S.A., particularly California, are also the home of several other successful Canterbury pines. P. attenuata Lemm. and P. muricata D. Don (the latter common in coastal Canterbury), are related to P. radiata and are likely to hybridise with it. P. attenuata occurs from Oregon to Baja California in lower montane areas, whilst P. muricata is a coastal tree from northern California to Baja California. The soledad pine, P. torreyana Parry ex Carr., is a relic species like P. radiata, and is limited to a small area of the Southern Californian coast and an offshore island. The closely related pair, P. coulteri D. Don and P. sabiniana Dougl. are more widespread Californian species with the former extending to Baja California and the latter to northern California.

P. jeffreyi Grev. & Balf. (P. ponderosa var. jeffreyi (A. Murr.) Vasey extends from Oregon to Baja California. This is very closely related to P. ponderosa Laws., a common Canterbury pine and of minor importance as a timber tree. This variable species, including the montane var. scopulorum Engelm,, is widespread from British Colombia to the Mexican border and extends eastwards to the Prairie States. Another widespread and variable species, from the Yukon to Baja California and eastwards to Colorado, is P. contorta Dougl. In Canterbury the usual variety is the montane lodgepole pine, P. contorta var. latifolia S. Wats. (P. murrayana Balf.) which has been extensively planted in the High Country. Var. contorta from the Pacific coast is uncommon. In the south of this Pacific region P. patula Schlecht. & Cham occurs in the highlands of southern Mexico, and is being commonly planted as an ornamental tree in Canterbury now. P. montezumae Lamb. (considered in the wide sense, e.g. including P. durangensis Martinez) is from subtropical and temperate areas from northern Mexico to Guatemala with an isolated population in San Salvador.

Next in importance is the region round the Mediterranean Sea. P. halepensis Mill. extends round most of its shores whilst P. pinaster Ait, is a western Mediterranean species with ssp. atlantica D. del Villar. occurring along the west coast of France. P. pinea L. probably once occurred naturally along the European coasts of the Mediterranean but has been long planted so much for its edible seeds that its original distribution is in doubt. The most widespread pine in this area is P. nigra Arn. and this very variable species occurs from Spain and Spanish Morocco to the Crimea and northwards to Austria.

The Austrian pine, ssp nigra (var. austriaca (Hoess) Badoux) is rather uncommon in Canterbury and of the other subspecies of P. nigra, only ssp. laricio Poir.]) is significant here. This subspecies is the well-known Corsican pine and in Canterbury is next in importance for timber to P. radiata. In addition to the Corsican populations, the southern Italian and Sicilian form of P. nigra is often considered as belonging to ssp. laricio.

Although found near the European coasts of the Mediterranean, P. mugo Turra (P. montana Mill.) and its very close relative (possibly not really specifically distinct) P. uncinata Mill. ex Mirb. (P. mugo var rostrata (Ant.) Hoopes P. mugo var. uncinata Ramond) are really montane pines. They have a scattered and overlapping distribution northwards in the mountains of western and central Europe with P. uncinata occurring further west. Several shrubby varieties or cultivars of P. mugo are likely to be found in Canterbury. The Scots pine, P. sylvestris L. which is related to the P. mugo complex occurs sporadically in the mountains of the Mediterranean region but is mainly a more northern species and occupies a huge area from Scotland and Norway to the Pacific coast of Asia, i.e. the largest natural area of any pine. It is fairly common in the older Canterbury arboreta and probably most of the seed was imported from N.W. Europe. By contrast, P. canariensis Smith is a sub-tropical endemic of the Canary Islands which is rather uncommon in Canterbury. Although these islands are outside the Mediterranean it is well known that their climate and flora have much in common with this region.

Pines from the eastern sides of the North American and Eurasian continents are uncommon or rare in Canterbury, but a few species are keyed out here. P. strobus L. is a very important American timber tree which occurs over a wide region in the east of the U.S.A. and Canada as far west as Manitoba and Iowa. P. rigida Mill. has a smaller range and grows from Maine and southern Ontario to the southern end of the Appalachians. The remaining American pine is P. banksiana Lamb., which is the most northerly species in that continent and occurs over a great region extending from N.E. British Colombia to Nova Scotia. In eastern Asia the Japanese P. thunbergii Parl. is found in southern Korea and central and southern Japan. Finally, there are two species from the Himalaya. P. wallichiana A.B. Jacks. (P. excelsa Wall., P. griffithii McClell.) occurs in the temperate region from eastern Afghanistan to western Yunnan and Upper Burma, and is especially abundant in the drier, western part of this range, whilst P. roxburghii Sarg. (P. longifolia Roxb.) grows in the subtropical region from eastern Afghanistan to Bhutan, and is again commoner towards the west. The last species is so closely related to P. canariensis that cones are needed to be absolutely sure of an identification (Sykes 1970). However, nearly all mature trees in Canterbury are of P. canariensis.

Canterbury conifers and the Mediterranean Climate

Thus, most of the commoner and more successful pines in Canterbury originate from areas having a Mediterranean type climate, i.e. western North America and the region round the Mediterranean Sea. In both regions the winters are relatively cool and wet in comparison with the dry and warm to hot summers. The coastal area of California has a

modified Mediterranean climate because the summer heat is tempered by cool onshore winds and this is where several of our most successful pines originate.

The cultivation of other conifers reinforces this evidence for the suitability of species from Mediterranean climates for Canterbury conditions. Within the Pinaceae there are only 4 species of Abies or silver fir likely to be considered as anything more than fairly common. Abies concolor (Gord.) Hillebr. and A. grandis Lindl. are from California and neighbouring states, and A. pinsapo Boiss., Spanish fir, and A. nordmanniana (Stev.) Spach, Caucasian fir, are from opposite ends of the Mediterranean region. The relic genus Cedrus, comprising the true cedars, has 3 or 4 species, only one of which is found outside the Mediterranean region, and this species, Cedrus deodara (Roxb.) G. Don, deodara, originates in the north-western Himalaya where the summer is still fairly dry. Pseudotsuga menziesii (Mirb.) Franco, Douglas fir or Oregon pine, is a western North American species. In the Taxodiaceae there are the two Californian redwoods, Sequoia gigantea Dcne and S. sempervirens (D. Don) Endl. Finally, in the Cupressaceae many of the cyresses of the genus Cupressus are from Mediterranean type climates. Outstanding in New Zealand is Cupressus macrocarpa Hartw., known simply as macrocarpa, with a natural distribution on the Californian coast resembling Pinus radiata and almost certainly the next most common conifer in Canterbury. Further inland in Arizona, New Mexico and North Mexico, grows Cupressus arizonica Greene, which is becoming increasingly popular as a shelter belt species here, whilst the fastigiate cultivar 'Stricta' of the Mediterranean cypress, C. sempervirens L. is a popular garden tree.

Artificial Key to the commoner pines in Canterbury

The Key uses vegetative characters as much as possible although very young plants are not catered for. More emphasis is given to reproductive parts in the 2 and 3- needle pine group but most of the species in them freely produce cones. 5-needle pines of the Pinus cembra and P. strobus groups cone much more sparingly usually, but they are not prominent in Canterbury. Difficulties in identification are most likely to occur with some of the closely related 2-needle pines. When using the key, the various parts of a couplet, often numbering more than three (apart from major leads) should be considered as a whole if possible before making a decision.

Bark characters have not been used very much because they are often not useful until the trees are fairly old. The shoot characters mentioned concern the appearance of the surface in the first and second seasons of growth, except for tissue under about 2 months. The glaucous bloom which may be diagnostically important, and is best seen on vigorous shoots, can be rather sparse and is easily rubbed off the shoot by artificial means, or by natural means such as wind causing rubbing. It often disappears during the second year.

The bud characters used refer to the terminal winter resting buds. These may be seen from about January to September although there is some variation according to the species, habitat and climate, e.g. often P. radiata buds grow in August. Both shoot and bud characters

are more difficult to see in trees growing under severe conditions of exposure, and the stunted specimens which may be found in very cold or windy situations often have strongly atypical features. Needle measurements attempt to give the general range which may be expected but there can be occasional longer or shorter needles which are obviously atypical even for the plant on which they occur. Care must be taken to consider only mature needles.

It is important to note if the cones remain on the tree for a year or more after maturity, i.e. persistent cones, or if they fall off soon after maturity i.e. deciduous cones. The basal cone scales of certain species are normally left behind when the cone falls but this useful character should be used with caution because after a severe gale intact cones may lie on the ground. Measurements of length and width are from open cones (including cone stalks) except for those that long persist unopened. The terms applied to the thickened ends of the cone scales are best illustrated by a sketch Fig. 1. The umbo (boss) may or may not have a prickle and in some pines this is small and becomes detached after maturity, particularly if the cone has been lying on the ground for long. Although anatomical characters, especially of the needles, are very important, they are not used here for the key is intended to be workable with no more than a ruler and a hand lens.

Symbols

> = greater than

< = less than

c. = about

± = more or less

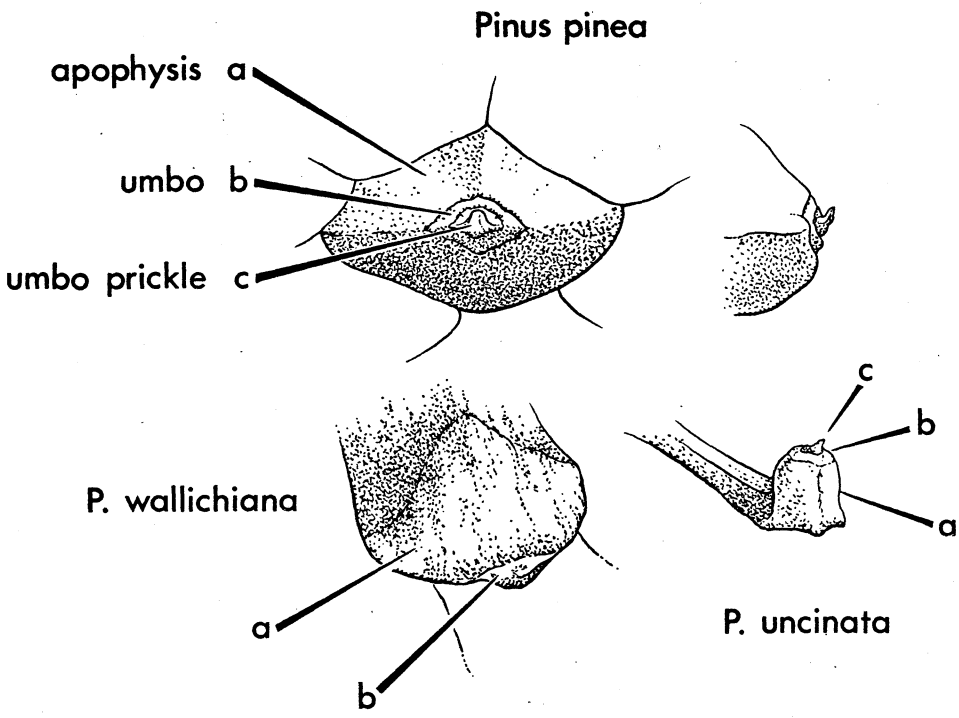

Fig 1 Illustrations of the exposed part of a cone scale in 3 pines to demonstrate terms used in the key.

1 Needles in fascicles of five. 2
Needles in fascicles of two or three. 5

2 Needle sheaths deciduous. Buds up to 1 cm long. Cones narrow cylindrical, scales thin and not very woody. 3
Needle sheaths persistent. Buds > 1 cm long, usually much more. Cones broad cylindrical-broad ovoid, scales thick and woody. 4

3 Shoots glabrous, glaucous in first year. Cones usually (16) 20-25 cm long.

P. wallichiana

Shoots usually ± pubescent at first, never glaucous. Cones usually 5-12 (15) cm long.

P. strobus

4 Bud scales retained on shoot for at least 1 season. Needles c. 1mm wide, needle sheaths brown or greyish-brown. Cones cylindrical to narrow ovoid, scales moderately woody, umbo without or with rudimentary prickle.

P. montezumae

Bud scales deciduous in first season. Needles c. 2mm wide, needle sheaths black or greyish black, cones broad ovoid, scalscales thick and woody, umbo with stout prickle.

P. torreyana

5 Needles in fascicles of three (P. ponderosa and P. jeffreyi sometimes fours). 6
Needles in fascicles of two 17

6 Needles 2.5-4 cm long, sheaths rolled back at base of needle cluster 2nd year. Cones opening widely, length < width, scales thin, 20-40. P. cembroides[1]

Needles > 5 cm long, sheaths never rolled back at base of needle cluster. Cone not opening widely, length usually > width, scales never thin and always much > 40. 7

7 Bud scales free and spreading or reflexed. Needles slender, not sparsely arranged along the shoot, = or < 1.5 mm wide and > 15 cm long. 8

Bud scales appressed or with free but not spreading or reflexed apices. Needles either not slender, or if so are sparsely arranged along the shoot, either > 1.5 mm wide or if less, < 15 cm long. 10

8 Shoots brown, with glaucous bloom. Buds usually < 2 cm long, scales without prominent white fringe. Needles pendulous. Cones asymmetric, 6-8 cm long, umbo often prickly.

P. patula

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1. Included here are var. cembroides and var. edulis (Engelm.) Voss. The latter has its needles in twos sometimes but this is very rare in Canterbury.

Shoots yellow, yellowish-brown or pale brown, without bloom. Buds usually > 2 cm long, (often much longer), scales with prominent white fringe. Needles not pendulous. Cone symmetric, 8-16 cm long, umbo never prickly. 9

9 Vigorous shoots in first and second year yellow or nearly so. Cone apophyses rounded or obtusely convex.

P. canariensis

Vigorous shoots in first and second year yellowish-brown or pale brown. Cone apophyses strongly elongated and forming a blunt hook.

P. roxburghii

10 Shoots with glaucous bloom. 11
Shoots without glaucous bloom. 14

11 Shoots slightly to moderately glaucous when young. Bud scales appressed. Needles < 17 cm long, sheaths rarely > 1 cm long. Cone asymmetric, = or < 12 cm long, falling intact[1]

P. radiata

Shoots markedly glaucous when young. Bud scales rarely appressed. Needles > 15 cm long, sheaths rarely < 1 cm long, often much more. Cone symmetric, > 12 cm long, falling to leave basal scales except sometimes when cones > 24 cm long. 12

12 Buds usually < 3 cm long, acute. Needles in terminal clusters. Cone with moderately thick woody scales, dehiscent soon after maturity, umbo flattened, with a slender recurved prickle < 5 mm long.

P. jeffreyi

Buds often massive, acute or acuminate, but if acute and < 3 cm long needles not in terminal clusters. Cone with very thick woody scales, not dehiscent, soon after maturity, umbo not flattenned, forming a stout spine, > 8 mm long, recurved or not. 13

13 Needles in large terminal clusters, c. 2 mm wide. Cones massive, 25-30 cm x c. 15 cm.

P. coulteri

Needles sparsely arranged along shoot, to 1.5 mm wide. Cones 13-20 cm x 12-15 cm.

P. sabiniana

14 Branches tending horizontal with tufts of needles on short shoots back towards the trunk. Cones 3.5-7.5 cm long, persistent, symmetric, dehiscent.

P. rigida

Branches not usually horizontal, but if so without tufts of needles on short shoots back towards the trunk (excluding abnormal trees). Cones > 8 cm long[1] either deciduous or persistent, but if the latter, asymmetric and remaining closed for some time after maturity 15

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1 Pinus radiata does not generally have glaucous shoots but in Canterbury a small percentage of trees has this character.

1 Occasionally some cones, especially on young trees are < 8 cm long

15 Bud scales usually thinly resinous with free apices. Needles confined in terminal clusters and therefore habit very open, except if tree is fastigiate with short branches. Cones ± symmetric, soon deciduous and dehiscent after maturity, falling to leave basal scales.

P. ponderosa
(partly including var. *scopulorum*)

Bud scales strongly resinous and appressed. Needles not confined in terminal clusters and thus habit not open. Cones strongly asymmetric, generally persistent. 16

16 Bark of middle area of trunk shallowly fissured, rarely > 1.5 cm deep. Needles ± grey-green. Cones yellowish at maturity, apophyses on upper side forming large spinelike protuberances. Umbo always prickly.

P. attenuata

Bark of middle area of trunk strongly fissured, usually at least 2 cm deep. Needles usually grass green-dark green. Cones varying shades of brown at maturity, apophyses with ± enlarged and rounded protuberances on the upper side. Umbo usually not prickly.

P. radiata

17 Bud scales recurved, deep or reddish brown with pale margins. Cones + cone stalks mostly > 8 cm long. 18

Bud scales appressed or free but not recurved, except for the basal ones of *P. nigra* sometimes, but then they are pale brown with white margins. Cones + cone stalks mostly < 8 cm long. 21

18 Surface of bark in mature trees smooth, dark red, and forming a pattern of small plates. Buds = or > 1 cm wide. Needles c. 2 mm wide, stiff. Cones ± oblong, apophyses strongly raised (convex). 19

Surface of bark not smooth, not dark red, and either not forming a pattern of plates or else plates large. Buds < 1 cm wide. Needles < 1.5 mm wide, flexible. Cones ± globose to ovoid or oblong, but if the last, apophyses flat or nearly so. 20

19 Needles 10-20 cm long. Cones 10-19 cm long.

P. pinaster ssp. *pinaster*

Needles 7-14 cm long. Cones 8-13 cm long.

P. pinaster ssp. *atlantica*

20 Tree with dense, rounded or umbrella-shaped crown. Shoots and needles not noticeably erect. Cone stalk not prominent, < 1 cm long. Cone ± globular, occasionally broad ovoid, deciduous, falling to leave basal scales.

P. pinea

Tree with rather open crown, not rounded or umbrella shaped. Shoots and needles often erect. Cone stalk very prominent, recurved, 1-1.5 cm long. Cone cylindrical-ovoid, long persistent intact.

P. halepensis

21 Buds very resinous, scales tightly appressed, brown or purple (excluding whitish resin). Occasionally buds of P. contorta and P. muricata have free scale apices. Cones usually with umbo prickle. 22

Buds not or only moderately resinous, scales usually at least partly free, but if appressed are white or partly so. Cones without obvious umbo prickles except for P. ponderosa var. 28

22 Shoots markedly twisted or curved. Needles twisted. Cones asymmetric, < 6 cm long, width = or < 0.5 of length when closed, cylindric or cylindric below and tapered towards apex. 23

Shoots not or only slightly twisted or curved. Needles not or only slightly twisted. Cones symmetric or asymmetric, < or > 6 cm long, width usually > 0.5 of length when closed, narrow ovoid - broad ovoid or elliptic-ovoid. 24

23 Young needle shaths = or < 5 mm long, cones curved and tapering, apophyses flat, without umbo prickle.

P. banksiana

Young needle sheaths > 5 mm long. Cone not curved or tapering, apophyses convex, with umbo prickle.

P. contorta var. contorta

24 Needles mostly in terminal clusters on shoots, 6-17 cm. Cones 6-9 cm long, symmetric-asymmetric, but if latter apophyses markedly enlarged and rounded on upper side. Umbo always with prickle. Prickle base = or > 1 mm wide. 25

Needles not in terminal clusters on shoots, 1.5-7 cm. Cones 3.5-7 cm long, ± asymmetric, apophyses not markedly enlarged and rounded on upper side although they can be elongated. Umbo with or without prickle. Prickle base < 1 mm wide. 26

25 Canopy dense. Needle sheaths after first season usually = or < 5 mm long. Cones pointing backwards, long persistent, unopened, asymmetric, scales thick and rigid.

P. muricata

Canopy open. Needle sheaths after first season usually > 5 mm long. Cones not backward pointing, deciduous soon after maturity apart from basal scales, dehiscent, ± symmetric, scales thin and flexible.

P. ponderosa var scopulorum

26 Bark smooth or with thin scales. Needles not twisted. Cones with or without an umbo prickle, but if present is inconspicuous owing to its smallness and ± parallel alignment to the apophyses. 27

Bark rough and fissured. Needles usually slightly twisted. Cones always with a slender but prominent prickle directed outwards.

P. contorta var. latifolia[1]

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1 In the vegetative state the Pinus contorta varieties can be difficult to distinguish from P. mugo and P. uncinata. However, a strong hand lens reveals that P. contorta has median resin canals in the needles whereas the other two have marginal resin canals.

27 Shrub with multiple trunks. Cone ± symmetric; apophyses on upper side sometimes slightly elongated; umbo not prickly.

P. mugo[1]

Tree, usually with a single trunk. Cone asymmetric; apophyses, especially on upper side, strongly elongated towards the base; with or without a small prickle.

P. uncinata[1]

28 Needles in terminal clusters only (excluding young and vigorous trees) and thus canopy very open. Umbos of cone scales with prominent prickles; basal scales left when cone falls.

P. ponderosa var. scopulorum

Needles not solely in terminal clusters, although habit can be open. Umbos of cone scales either without prickles or with a rudimentary one; cone falling intact. 29

29 Canopy rather open because of the ± erect needles scattered along the shoots; needles c. 1 mm wide. Bud scales without obvious white margins. Cone stalk very prominent, curved 1-1.5. cm long. Cones long persistent, closed, 7-11 cm long.

P. halepensis

Canopy not open and needles ± dense on shoots. Needles usually = or > 1.5 mm wide. Bud scales noticeably white or with white margins. Cone stalk not prominent. Cones deciduous, < 8 cm long. 30

30 Bark of upper trunk grey or brown. Vigorous shoots > 1 year old with decurrent leaf bases clearly separated into ± diamond-shaped plates which eventually dehisce. Needles not twisted, green. Cones ovoid or broad-ovoid symmetric. 31

Bark of upper trunk reddish. Vigorous shoots > 1 year old without decurrent leaf bases clearly separated into diamond-shaped plates. Needles ± twisted, usually bluish-green. Cones oblong or oblong-ovoid, symmetric or rather asymmetric with apophyses above tending to curve towards base.

P. sylvestris

31 Buds ± ovoid, ± acuminate, usually thinly resinous. Needle sheaths on vigorous shoots without obvious white filaments in first year. Cone apophyses usually yellowish brown when first mature, shining, without prominent striations radiating from the umbo. 32

Buds oblong or oblong-ovoid, obtuse-acute, not resinous. Needle sheaths on vigorous shoots with white filaments (mostly 2) at the apex in first year. Cone apophyses brown at maturity, not noticeably shining, with prominent striations radiating from the umbo.

P. thunbergii

32 Needles densely arranged towards shoot ends, very stiff, ± parallel aligned and appearing like a brush.

P. nigra ssp. nigra

Needles not markedly densely arranged towards shoot ends, moderately stiff, usually not obviously parallel aligned.

P. nigra ssp. laricio

I should be grateful for information concerning rarer species of conifers generally in Canterbury, and also for details of individual trees of pines dealt with here which seem to have one or more characters generally (i.e. excluding the occasional departure from the normal) outside the range given here.

I am indebted to many people throughout Canterbury for permission to examine and collect pines. Without their willing co-operation this study would not have been possible.

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BUNYA PINE

When I walk in the Botanical Gardens
I like to look at the Bunya Pine tree
It brings me back to the Bunya Mountains
Where flying foxes feast on the Morton Bay figs
And bower birds play near the Lillypillies.
I become a child picking up prickly Bunya branchlets
And nibbling boiled Bunya nuts.

"Wogwog"

FRONTISPIECE

Mr Cecil H. Dunn has for the frontispiece of this edition of the Journal drawn a further plant that can be found growing in Lyttelton Reserve 101, Carex vacillans.

A specimen returned in 1964 from the Botany Division after naming bore the following remarks "First recorded finding in the South Island".

The upper track in the Reserve, following the foot of the upper cliffs, leads to a shallow cave where the cliff rocks overhang. Water seeps down the rear wall of this cave forming a small, shallow, muddy pool.

It is in this pool that Carex vacillans can be found. It shares the pool with Carex solandri. The two sedges can easily be distinguished. C. vacillans is a stout plant whilst C. solandri is longer very slender and graceful.