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A GUIDE TO THE WESTERN AUSTRALIAN SHE-OAKS (*ALLOCASUARINA* and *CASUARINA* SPECIES)

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INTRODUCTION

Species of the Casuarinaceae commonly known as She-oaks or Bull-oaks are amongst the most widespread of Australian trees. The name *Casuarina* comes from the Cassowary, a large flightless bird native to Queensland and New Guinea, in allusion to the supposed resemblance of the drooping branches to the birds plumage. *Allocasuarina* comes from the Greek 'allos' meaning 'other' and *Casuarina*.

Until recently there were two genera *Casuarina* and *Gymnostoma* in the family Casuarinaceae. There are now four genera in this family, two, *Casuarina* and *Allocasuarina* occur in Western Australia. *Casuarina* is found throughout Australia (except for Tasmania) and in South East Asia; *Allocasuarina* is endemic to Australia; *Gymnostoma* occurs in northern Queensland, New Caledonia, Malay Archipelago and New Guinea; a fourth undescribed genus is confined to Malaysia. They are monoecious or dioecious, wind pollinated trees or shrubs with jointed branches and whorls of much reduced scale-like leaves united into a sheath in the lower part. The male inflorescences are spicate and each male flower consists of 1 stamen and 4 bracteoles (scale like perianth segments). The female flowers occur in heads, the ovary is 1-locular with 2 long (usually red) style arms and 2 ovules. In fruit the female heads develop into woody cones.

Both genera have root nodules with bacteria-like organisms (Actinomycetes) which enable the fixing of atmospheric nitrogen.

The family was considered to be amongst, or the most primitive group of angiosperms due to its reduction in vegetative and floral characters. Plant anatomists studying in particular the secondary xylem, and taxonomists studying apparent evolutionary trends, particularly in the flower, have now concluded that it is a specialised family of the Angiospermae and not a primitive one.

The common name of "Oak" was given to the trees by the early settlers who saw the resemblance to the oak of Europe in the grain and general character of the wood. The timber of *Allocasuarina fraseriana* is straight grained and splits well. The early colonists in W.A. used it as shingles for roofing, and also to make casks and kegs for the storage of liquids. When dressed and polished the She-oak timber is beautiful for furniture but unfortunately has a tendency to split. The Civic Centre at Cottesloe has some she-oak panelling. Other species which occur in the Eastern States of Australia have been used for shingles and furniture, and the foliage of some is said to be suitable as fodder for cattle and camels.

One species, *Casuarina equisetifolia* which occurs in the north of Australia (but has not as yet been recorded from Western Australia) is also widespread throughout the Malay Archipelago and tropical islands. This species has been put to many uses by natives in several countries. In some areas of New Guinea, due to the hardness of the timber, it has been used for arrow-heads; large diameter digging sticks which are sharpened on one or both sides and are used for slashing the undergrowth; crowbars for uprooting tree stumps, and as beams in home building. Natives of the south sea islands use the timber for making clubs.

In India the wood of *C. equisetifolia* was used as fuel for railway locomotives as it gave great heat and left little ash. It is employed to stabilise sand around coastal areas as the trees can grow up to the high water mark. The bark is astringent and has been used for medicinal purposes for the treatment of chronic diarrhoea in India and dysentery in Australia, and for tanning in some areas of New Guinea.

In Guam the wood has been said to be used for abortions, and can be burnt as a mosquito repellent. The roots are used as a medicinal tea; the root and trunk (without the bark) are used in a douche reputedly as an abortifacient.

In Australia *A. decaisneana* the Desert Oak is also renowned for its use as a source of water by the Aborigines and early explorers. Hollow tree trunks provide valuable water reservoirs for Aborigines travelling through the dry country and the Desert Oak is one of the best known of these reservoir trees. This tree has relatively large reservoirs often with small entrances which reduce evaporation and the possibility of pollution. The water was obtained by sucking it out with a hollow stem, tubes of bark, or by means of a sponge of grass attached to the end of a spear.

The roots of *A. decaisneana* have also been used as a water source. Aborigines dug up the roots around the base of the tree with a digging stick, or dragged it up as they moved along straddling the root. These were then cut up into short sticks which were drained in a container, usually of bark or animal skin. Temporary relief has been said to be obtained from chewing the young branchlets which actually contain negligible quantities of water, but the acid promotes salivation.

CASUARINACEAE

Trees or shrubs, dioecious or rarely monoecious. Branchlets ("foliage") wiry, articulate, ribbed or striate by the prominent leaf traces (phyllodochia). Leaves scale-like, whorled, united below to form a sheath. Male inflorescence spicate (catkin-like) usually terminal to the branchlets; bracts verticillate and resembling the scale leaves; flowers solitary in each bract; bracteoles (scale-like perianth segments) in two pairs of which the inner or both pairs are sometimes deciduous; stamen 1, anther bilocular and longitudinally dehiscent. Female inflorescence a dense ovoid or globular head (condensed spike) terminal to short lateral branches; flowers verticillate, solitary in the axil of a bract and placed between a pair of bracteoles; perianth absent; ovary bicarpellary becoming unilocular by abortion of the posterior locule; stigmas 2, linear, long, exserted. Cone (infructescence) consisting of the enlarged woody bracts and bracteoles (valves). Fruit ("seed") a samaroid nut (winged nut), sometimes wing rudimentary, released by the separation of the bracteoles, body glabrous or pubescent; wing hyaline.

About 70 species of the four genera are found in the islands of the Pacific, north to south-east Asia and Australia. The centre of diversity is Australia extending into the above countries. The habitat ranges from seashores and moist forests to arid regions.

KEY TO GENERA OCCURRING IN WESTERN AUSTRALIA

1. Samaroid nut straw-coloured to grey; bracteoles of fruiting cone thin **Casuarina**
2. Samaroid nut dark-brown or reddish-brown; bracteoles of fruiting cone thick and convex **Allocasuarina**

Notes on Keys

Three separate keys have been drawn up. These are based on (a) the female cone, (b) the male spike, (c) the samaroid nuts. The provision of separate keys is necessary since most species are dioecious and even when monoecious the male inflorescence is not always present. The key to the nuts will be of assistance when only loose cones or the nuts are collected. Species of both *Allocasuarina* and *Casuarina* are keyed together and are indicated by an A. or C. before the specific epithet.

The descriptions of the species are arranged alphabetically at the end of the keys under the two genera *Allocasuarina* and *Casuarina*. Synonymous species are given in italics after the specific name except in *Casuarina equisetifolia*.

Plate 1 is provided to clarify the terminology used in the keys. A glossary is also provided at the end of the species descriptions. Distribution maps are given in Plates 5 and 6.

KEY TO SPECIES BASED ON BRANCH AND FEMALE CONE CHARACTERS

1a	Scale leaves 4	2
1b	Scale leaves 5 or more	9
2a	Branchlets of 3-5 internodes of unequal length, 1 or 2 far exceeding length of others	3
2b	Branchlets of numerous internodes of \pm equal length	6
3a	Dorsal appendage \pm angular, long acuminate	4
3b	Dorsal appendage not apparent	5
4a	Bracteoles acute, dorsal appendage fused to bracteole near base	<i>A. pinaster</i>
4b	Bracteoles obtuse, dorsal appendage fused to bracteole near apex	<i>A. acuaria</i>
5a	Cones covered with long grey hairs which completely conceal bracts and bracteoles	<i>A. fibrosa</i>
5b	Cones not as above, bracts and bracteoles obvious	<i>A. grevilleoides</i>
6a	Bracteoles tessellately tuberculate	7
6b	Bracteoles not tessellately tuberculate	8
7a	Cones sessile, 7-15mm long	<i>A. microstachya</i>
7b	Cones pedunculate, 15-25mm long	<i>A. decussata</i>
8a	Bracteoles acute, exserted; cones 25-100mm long; tall tree	<i>A. decalsneana</i>
8b	Bracteoles not exserted; cones 12-20mm long; shrub	<i>A. ramosissima</i>
9a	Bracteole with dorsal appendage acute or acuminate	10
9b	Bracteole with dorsal appendage not as above	14
10a	Dorsal appendage long acuminate	11
10b	Dorsal appendage acute	13
11a	Scale leaves 5 or 6	<i>A. thuyoides</i>
11b	Scale leaves 10 or more	12
12a	Internodes 15-40mm long	<i>A. scleroclada</i>
12b	Internodes 8-11mm long	<i>A. corniculata</i>
13a	Scale leaves 7-9	<i>A. trichodon</i>
13b	Scale leaves 11-15	<i>A. acutivalvis</i>
14a	Bracteoles tessellately tuberculate	15
14b	Bracteoles not tessellately tuberculate	18
15a	Internodes 1.5-2.5mm long	<i>A. drummondiana</i>
15b	Internodes over 2.5mm long	16
16a	Scale leaves 5-6; cones sessile or shortly pedunculate	17
16b	Scale leaves 7-9; cones distinctly pedunculate	<i>A. tessellata</i>
17a	Bracts prominent at base of bracteoles	<i>A. humilis</i>
17b	Bracts not prominent	<i>A. helmsii</i>
18a	Cones globular or ovoid (length less than $1\frac{1}{2}$ times width of cone)	19
18b	Cones cylindrical (at least $1\frac{1}{2}$ times as long as broad)	25
19a	Internodes 150mm long or longer	<i>A. scleroclada</i>
19b	Internodes less than 50mm long	20
20a	Peduncles recurved, cones up to 35mm long	<i>A. dielsiana</i>
20b	Peduncles spreading but not distinctly recurved; cone less than 15mm long	21
21a	Cones fawn or pale brown in colour; branchlets glaucous	22
21b	Cones grey or chocolate brown; branchlets green	24
22a	Scale leaves 5-8; tropical coastal species	<i>C. equisetifolia</i>
22b	Scale leaves 8 or more. Species not tropical	23
23a	Bracteoles prominently exserted	<i>C. cristata</i> ssp. <i>pauper</i>
23b	Bracteoles not prominently exserted	<i>C. obesa</i>
24a	Outer surface of bracteoles smooth, dorsal appendage represented by tubercle	<i>A. huegeliana</i>
24b	Outer surface of bracteoles transversely rugose, no tubercle present	<i>A. fraseriana</i>
25a	Peduncles recurved, tall tree	<i>A. dielsiana</i>
25b	Peduncles erect, erect shrubs	26
26a	Internodes more than 6mm long; bracteoles prominently exserted beyond body of cone	<i>A. campestris</i>
26b	Internode 6mm or less in length; bracteoles not exserted beyond body of cone	<i>A. lehmanniana</i>

KEY TO SPECIES BASED ON MALE SPIKES

1a	All four bracteoles deciduous and falling together due to apices being hooked together	<i>A. huegellana</i>	2
1b	2 or all 4 bracteoles persistent		3
2a	Spikes moniliform		5
2b	Spikes ovoid or cylindrical		4
3a	Bracts 4	<i>A. acuarla</i>	4
3b	Bracts 6 or 7		4
4a	Bracts pale brown. South-west area, often coastal	<i>A. lehmanniana</i>	4
4b	Bracts yellow. Occurs near and east of Kalgoorlie	<i>A. helmsii</i>	4
5a	Spikes ovoid, or if cylindrical less than 15mm long; mainly sessile at nodes but sometimes terminating branchlets		6
5b	Spikes cylindrical, more than 15mm long, terminal, or sessile on old wood		15
6a	Bracts 4 or 5		7
6b	Bracts 6 or 7		13
7a	Outer bracteoles distinctly 2-lobed; male spikes surrounded by grey peeling fibrous material; only 1 spike per node	<i>A. fibrosa</i>	8
7b	Outer bracteoles entire		8
8a	Spikes terminal		9
8b	Spikes at base of branchlets or branchlet nodes, occasionally with a few terminal ones		10
9a	Bracts 4, spikes moniliform	<i>A. decussata</i>	11
9b	Bracts (4) 5-7, spikes not moniliform	<i>A. thuyoides</i>	11
10a	Spikes ovoid		11
10b	Spikes cylindrical, sessile at base of branchlets		12
11a	Spikes sessile at branchlet nodes; usually solitary but may be in clusters of 2 or 3	<i>A. microstachya</i>	12
11b	Spikes in clusters of up to 6 or on branchlet nodes, or terminal	<i>A. ramosissima</i>	12
12a	2 bracteoles persistent	<i>A. grevilleoides</i>	12
12b	4 bracteoles persistent	<i>A. pinaster</i>	12
13a	Bracts 6; spikes cylindrical, to 12mm long, terminal		14
13b	Bracts 6, 7 or 8; spikes globular to 6mm long, sessile at nodes or terminal	<i>A. dielesiana</i>	14
14a	Bracts dark	<i>A. drummondiana</i>	14
14b	Bracts pale	<i>A. thuyoides</i>	14
15a	Spikes arising at nodes on old wood		16
15b	Spikes terminating ends of branchlets (or occasionally nodal in <i>A. campestris</i>)		19
16a	Bracts 4, 7, 8 or 9		17
16b	Bracts 9, 10 or 11		18
17a	Bracts 4, long acuminate	<i>A. pinaster</i>	17
17b	Bracts 8 \pm 1, dark ciliate, shortly acuminate	<i>A. campestris</i>	17
18a	Bracts 9 \pm 1, pale with darker tips	<i>A. corniculata</i>	18
18b	Bracts (9), 10 or 11, pale all over	<i>A. scleroclada</i>	18
19a	2 bracteoles persistent		20
19b	All 4 bracteoles persistent		31
20a	Bracts 4		21
20b	Bracts 5 or more		22
21a	Bracts 1.5-2mm long, exceeding internode of spike; filaments very short so that anthers appear sessile	<i>A. decussata</i>	22
21b	Bracts less than 1mm long, prominently angled; filaments half length of bracteoles	<i>A. decussata</i>	23
22a	Bracts 5 or 6		23
22b	Bracts (6) 7 or more		25
23a	Bracts pale, more than 1mm long		24
23b	Bracts dark, less than 1mm long	<i>A. drummondiana</i>	24
24a	Filaments at least twice the length of bracteoles; bracteoles linear	<i>A. thuyoides</i>	24
24b	Filaments only slightly exceeding bracteoles; bracteoles obovate	<i>A. humilis</i>	24
25a	Bracts (6) 7-10		26
25b	Bracts 11 or more		30
26a	Bracts 7 \pm 1, pale, rather broad, shortly acute, ciliolate; spikes terminal, to 12cm long	<i>A. fraseriana</i>	26
26b	Bracts 8-10 (occasionally <i>A. campestris</i> has 7), fawn to dark brown; spikes terminal, up to 4 cm long		27

27a	Kimberley species; bracts 8, fawn, densely ciliate	C. equisetifolia
27b	Species from the eastern and southern parts of W.A.	28
28a	Bracts 8-10. dark pink to yellow, ciliate. Anther tips with short dark protrusions	C. cristata ssp. pauper
28b	Bracts 8 ± 1, tips brown. Anthers without protrusions	29
29a	Bracts shortly acuminate, ciliate, tips grey; vegetative branchlets green, occasionally glaucous	A. campestris
29b	Bracts acuminate, glabrous, tips dark coloured with pale edges; vegetative branchlets glaucous	A. tessellata
30a	Bracts erect, pale with dark ciliate tips	A. obesa
30b	Bracts dark brown with long recurved tips, readily broken off, margins ciliate	A. acutivalvis
31a	Bracts 4	32
31b	Bracts 6 or more	33
32a	Bracts ciliate; spikes nodal, sessile	A. pinaster
32b	Bracts not ciliate; spikes terminal	A. decalveana
33a	Bracts 6 or 7, short, pale yellow-brown, pubescent at edges, bracteoles visible at side of bracts	A. helmsii
33b	Bracts 7 or more	34
34a	Bracts 7-10	35
34b	Bracts 11 or more	37
35a	Bracts with long acuminate twisted points	A. trichodon
35b	Bracts with short points	36
36a	Tips of bracts dark coloured with pale edges; vegetative branchlets glaucous	A. tessellata
36b	Tips of bracts grey; vegetative branchlets green, occasionally glaucous	A. campestris
37a	Bracts 11 or 12, dark reddish brown with long acuminate points that are readily broken	A. acutivalvis
37b	Bracts 12 or 13, pale coloured, closely appressed, tips short C. obesa	

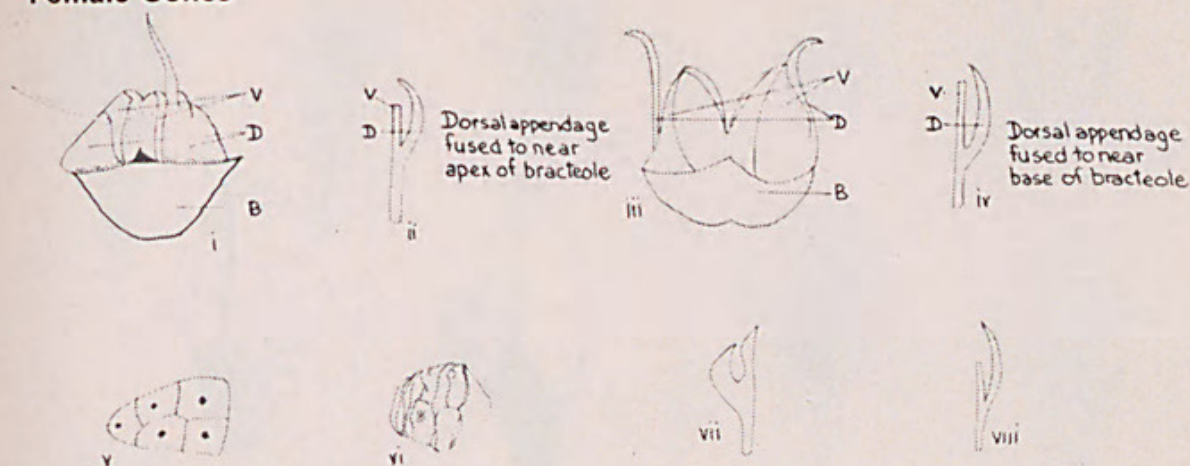
KEY TO SPECIES BASED ON FRUIT (SAMAROID NUT)

(letter beside species name is reference to diagram in plate 2)

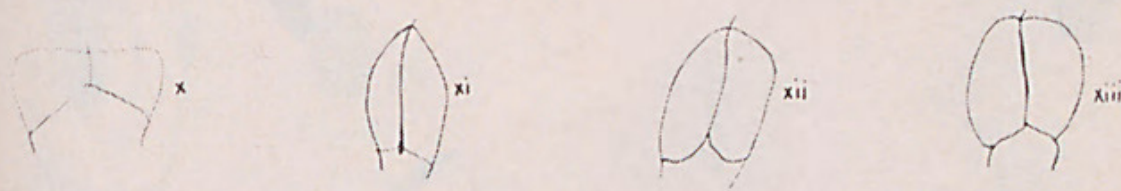
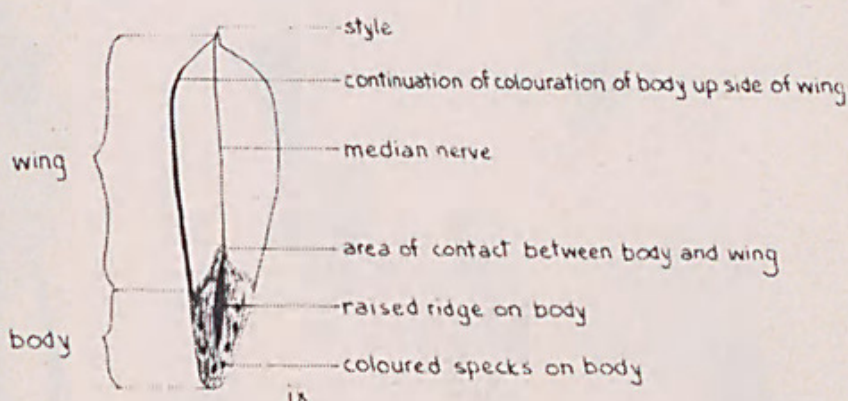
1a	Nut with rudimentary wings, concealed in a dense coma of golden hairs	2
1b	Wing well developed	3
2a	Nut ca. 6mm long, hairs of uniform colour throughout; body covered with short closely appressed hairs	A. grevilleoides (A)
2b	Nut ca. 3mm long; hairs white at base becoming golden towards apex; body with central portion of dense short hairs ..	A. microstachya (B)
3a	Body sparsely or densely pubescent	4
3b	Body glabrous	5
4a	Body and margin of wing densely pubescent ..	A. drummondiana (C)
4b	Body slightly pubescent towards base, wing glabrous	A. ramosissima (D)
5a	Body and wing predominantly straw-coloured	6
5b	Body grey, reddish-brown or dark brown; wing hyaline	8
6a	Median vein of wing close to margin; wing frequently reddish-brown; nut ca. 4.5mm long	C. cristata ssp. pauper (F)
6b	Median vein of wing central or subcentral	7
7a	Body straw-coloured to grey; nut ca. 6mm long (south-western species)	C. obesa (E)
7b	Body straw-coloured to reddish-brown; nut ca. 6.5mm long (tropical species)	C. equisetifolia
8a	Body grey to yellow with dark shining depressions; wing slightly yellow	A. thuyoides (H)
8b	Body reddish-brown to dark-brown	9
9a	Wing apex truncate	10
9b	Wing apex retuse or acute	13
10a	Body dark brown	11
10b	Body reddish-brown	12
11a	Colouration of body continuous up side of wing ...	A. campestris (O)
11b	Colouration not continuous up side of wing	A. humilis (G)
12a	Nut ca. 5mm long, cuneate	A. helmsii (J)
12b	Nut ca. 10mm long, linear	A. dielsiana (I)
13a	Body reddish-brown	14

13b	Body dark brown, with or without areas of lighter colouration	16
14a	Wing apex retuse, body pale reddish-brown	15
14b	Wing apex acute, body dark reddish-brown	<i>A. corniculata</i> (N)
15a	Body pale reddish-brown, wing tinged with yellow and pink; nut ca. 9mm long	<i>A. dielsiana</i> (I)
15b	Body straw-coloured to reddish-brown; nut ca. 6.5mm long	<i>C. equisetifolia</i>
16a	Transparent depression in body for median nerve	<i>A. acuaria</i> (L)
16b	No depression in body for median nerve	17
17a	Colour of body not uniform	18
17b	Colour of body uniform	24
18a	Markings white	19
18b	Markings not white	23
19a	Colouration of body not continuous up margin of wing	20
19b	Colouration of body continuous up margin of wing	22
20a	Wing dark tan; body reddish-brown	<i>A. corniculata</i> (N)
20b	Wing hyaline or pale pink; body dark brown	21
21a	Wing pale pink, occasionally hyaline; nut cuneate, ca. 6mm long	<i>A. huegelliana</i> (M)
21b	Wing hyaline; nut obovate, ca. 9mm long	<i>A. decussata</i> (T)
22a	Wing yellow to brown with faint median nerve	<i>A. scleroclada</i> (K)
22b	Wing hyaline, median nerve prominent	<i>A. fraseriana</i> (X)
23a	Colouration of body continuous up one margin of wing and for short distance up second margin	<i>A. acutivalvis</i> (R)
23b	Colouration of body continuous up both margins of wing	<i>A. decalsneana</i> (U)
24a	Colouration of body continuous up one or both margins of wing	25
24b	Colouration of body not continuous up margin of wing	29
25a	Colouration continuous up both sides of wing. Body with raised ridge	<i>A. decalsneana</i> (U)
25b	Colouration continuous up one side of wing and occasionally for short distance up second side	26
26a	Body with raised ridge which is usually very prominent towards base	<i>A. acutivalvis</i> (R)
26b	Body convex but with no raised ridge	27
27a	Wing red, median nerve faint; body without prominent ridge	<i>A. scleroclada</i> (K)
27b	Wing hyaline, median nerve prominent	28
28a	Body biconvex over whole surface	<i>A. trichodon</i> (V)
28b	Body biconvex in central area only, surrounding area flat but of same colour	<i>A. campestris</i> (O)
29a	Body with prominent raised ridge	30
29b	Body without prominent ridge	33
30a	Wing with reddish tinge; \pm hyaline	31
30b	Wing very dark red-brown, scarcely transparent	<i>A. fibrosa</i> (S)
31a	Median nerve of wing not very prominent, continuing as slight ridge on body; body reddish-black; nut ca. 7mm long	<i>A. corniculata</i> (N)
31b	Median nerve of wing prominent, continuing as prominent ridge on body; body dark-brown	32
32a	Nut ca. 12mm long	<i>A. pinaster</i> (W)
32b	Nut ca. 8mm long	<i>A. acuaria</i> (L)
33a	Wing dark red-brown scarcely transparent	<i>A. fibrosa</i> (S)
33b	Wing transparent with sometimes a reddish-tinge	34
34a	Junction between body and wing of the same colour as the body	<i>A. tessellata</i> (P)
34b	Junction between body and wing of a different colour to the body	35
35a	Junction between body and wing light chocolate brown or grey in colour; wing slightly yellow-brown	<i>A. lehmanniana</i> (Q)
35b	Junction between body and wing light reddish-brown in colour	36
36a	Apex of wing acute or obtuse; median nerve continuous	<i>A. decussata</i> (T)
36b	Apex of wing retuse; median nerve swollen or discontinuous just before it meets the body	<i>A. huegelliana</i> (M)

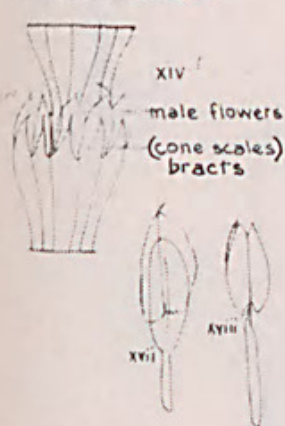
Female Cones



Samaroid Nut



Male Flowers



Vegetative Branchlet

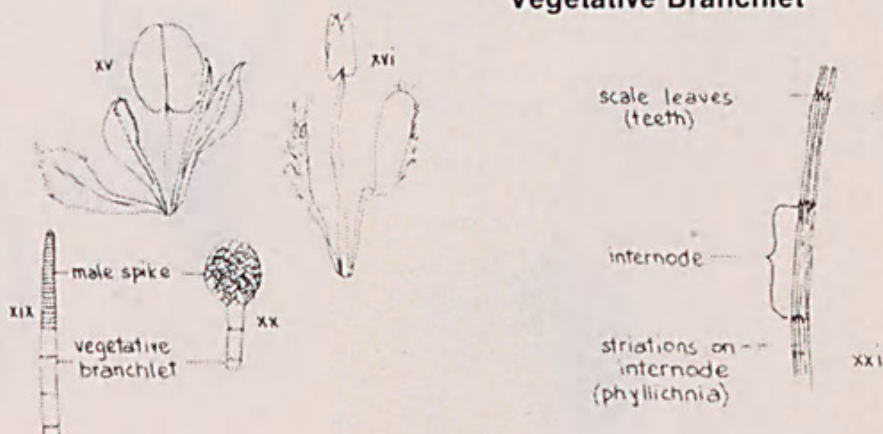


Plate 1: V = bracteole (valve); D = dorsal appendage; B = bract

i-viii **Female cones**, i-ii *A. acuaria* i front surface, ii L.S.; iii-iv *A. pinaster*, iii front surface, iv L.S.; v-vi Bracteole surface, v tessellately tuberculate, vi transversely tuberculate: vii-viii Apex of dorsal surfaces, vii acute, viii long acuminate; ix **Samaroid nut**; x-xiii Wing apices, x truncate, xi acute, xii obtuse, xiii retuse: xiv Position of male flowers in cone; xv-xviii **Male flowers**, xv 4 bracteoles persistent, xvi 2 bracteoles persistent, xvii young flower with all four bracteoles hooked together at apex and falling entire, xviii mature flower - all four bracteoles deciduous: xix cylindrical male spike; xx ovoid male spike; xxi **Vegetative branchlet**.

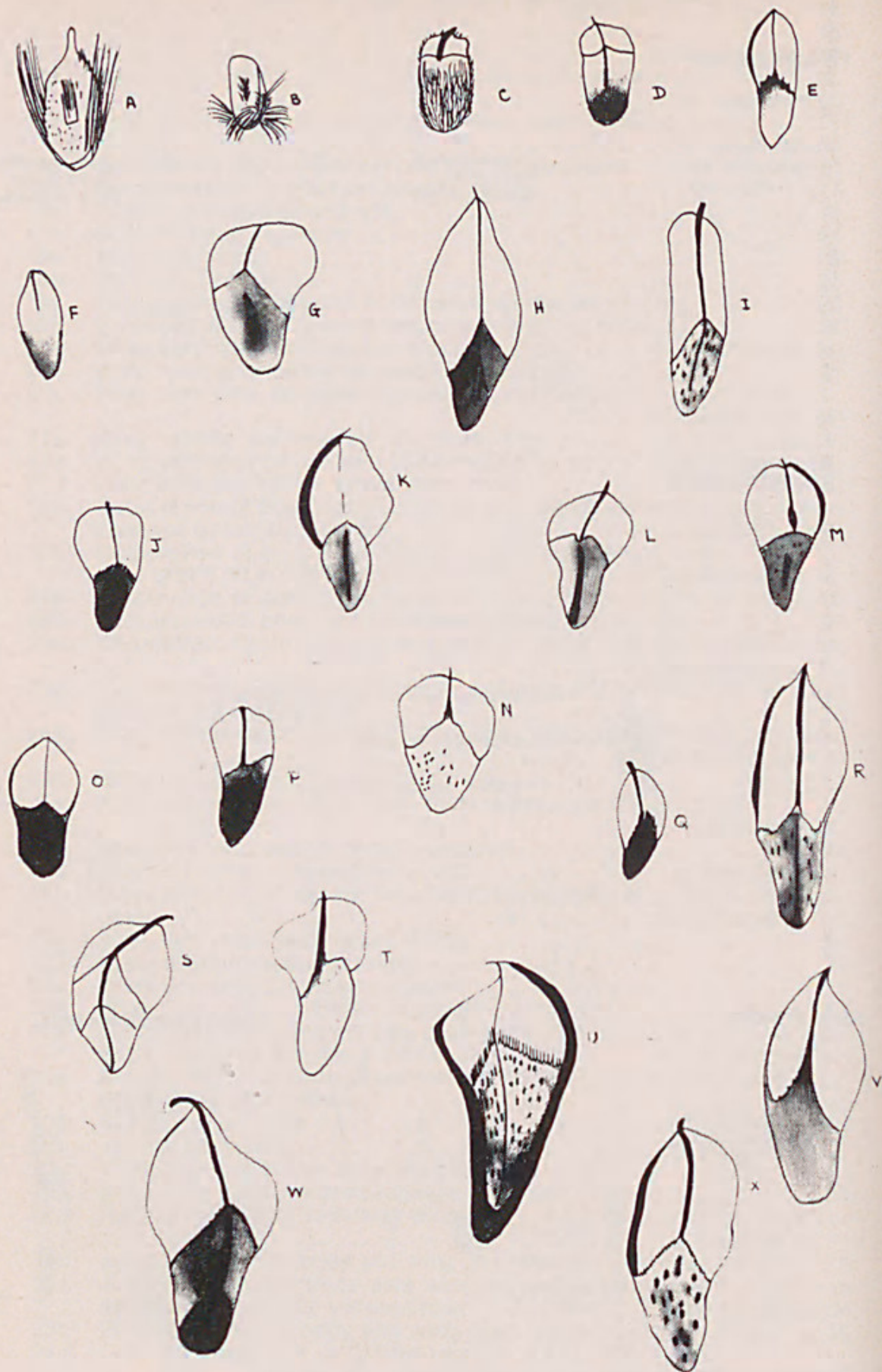


Plate 2: Samaroid Nuts: A. *A. grevilleoides*; B. *A. microstachya*; C. *A. drummondiana*; D. *A. ramosissima*; E. *C. obesa*; F. *C. cristata* ssp. *pauper*; G. *A. humilis*; H. *A. thuyoides*; I. *A. dielsiana*; J. *A. helmsii*; K. *A. scleroclada*; L. *A. acuaria*; M. *A. huegeliana*; N. *A. corniculata*; O. *A. campestris*; P. *A. tessellata*; Q. *A. lehmanniana*; R. *A. acutivalvis*; S. *A. fibrosa*; T. *A. decussata*; U. *A. decaisneana*; V. *A. trichodon*; W. *A. pinaster*; X. *A. fraseriana*.

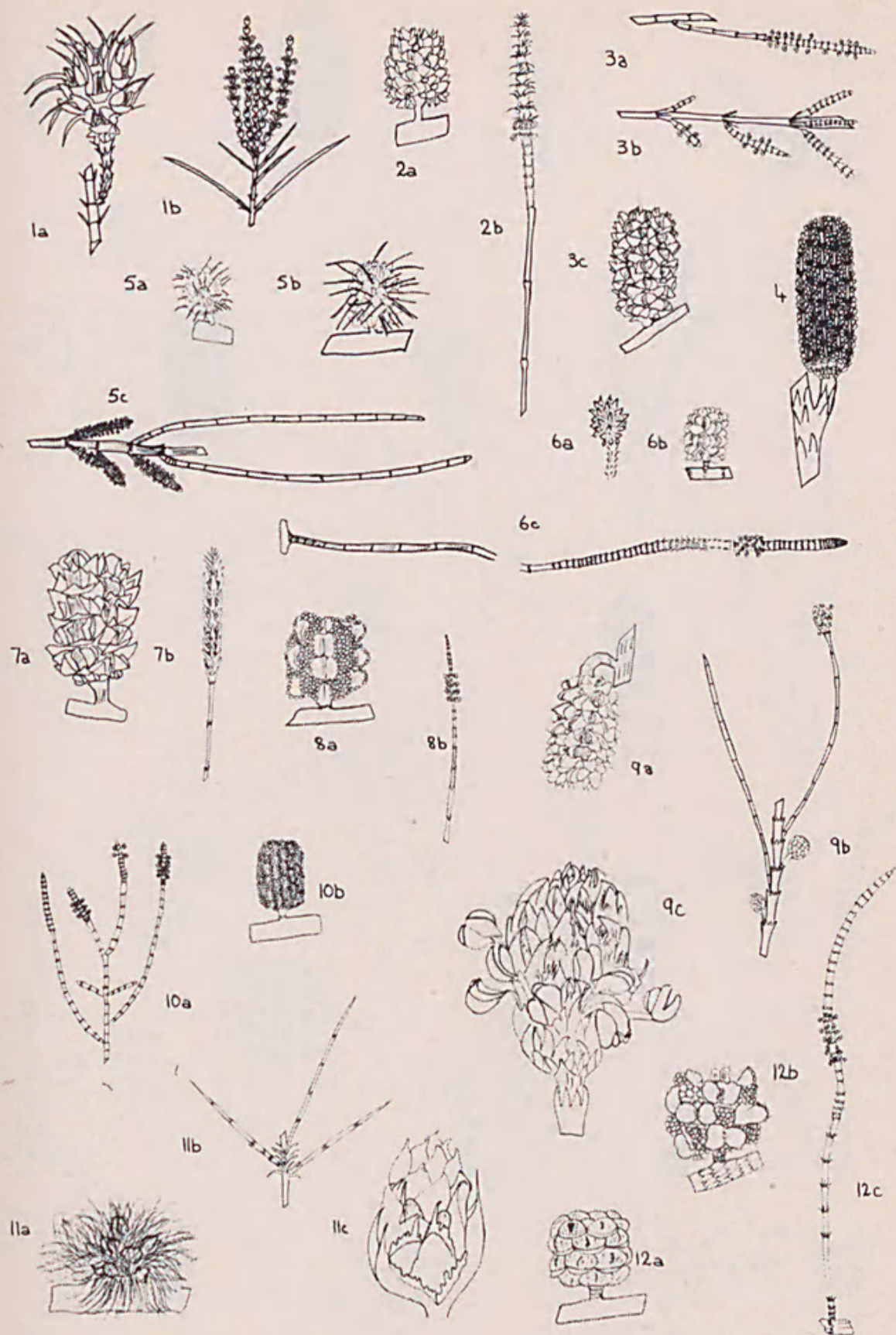


Plate 3: 1. *A. acuaria*, a. Q cone $\times \frac{1}{2}$; b. O spike $\times \frac{1}{2}$; 2. *A. acutivalvis*, a. Q cone $\times \frac{1}{2}$; b. O spike; 3. *A. campestris*, a, b, O spike $\times \frac{1}{2}$, c. Q cone $\times \frac{1}{2}$; 4. *A. tessellata* Q cone $\times \frac{1}{2}$; 5. *A. corniculata*, a. cone of small form $\times \frac{1}{2}$; b. cone of large form $\times \frac{1}{2}$; c. O spike $\times \frac{1}{2}$; 6. *C. cristata* ssp. *pauper* a. young Q cone $\times \frac{1}{2}$; b. mature Q cone $\times \frac{1}{2}$; c. O spike $\times \frac{1}{2}$; 7. *A. decaisneana*, a. Q cone $\times \frac{1}{2}$; b. O spike $\times \frac{1}{2}$; 8. *A. decussata*, a. Q cone $\times \frac{1}{2}$; b. O spike $\times \frac{1}{2}$; 9. *A. dielsiana*, a. Q cone $\times \frac{1}{2}$; b. O spike $\times \frac{1}{2}$; c. detail of O cone $\times 5$; 10. *A. drummondiana*, a. O spike $\times \frac{1}{2}$; b. Q cone $\times \frac{1}{2}$; 11. *A. fibrosa*, a. Q cone $\times \frac{1}{2}$; b. vegetative branchlet $\times \frac{1}{2}$; c. detail of O cone; 12. *A. fraseriana*, a. Q cone unopened $\times \frac{1}{2}$; b. Q cone opened $\times \frac{1}{2}$; c. O spike $\times \frac{1}{2}$.

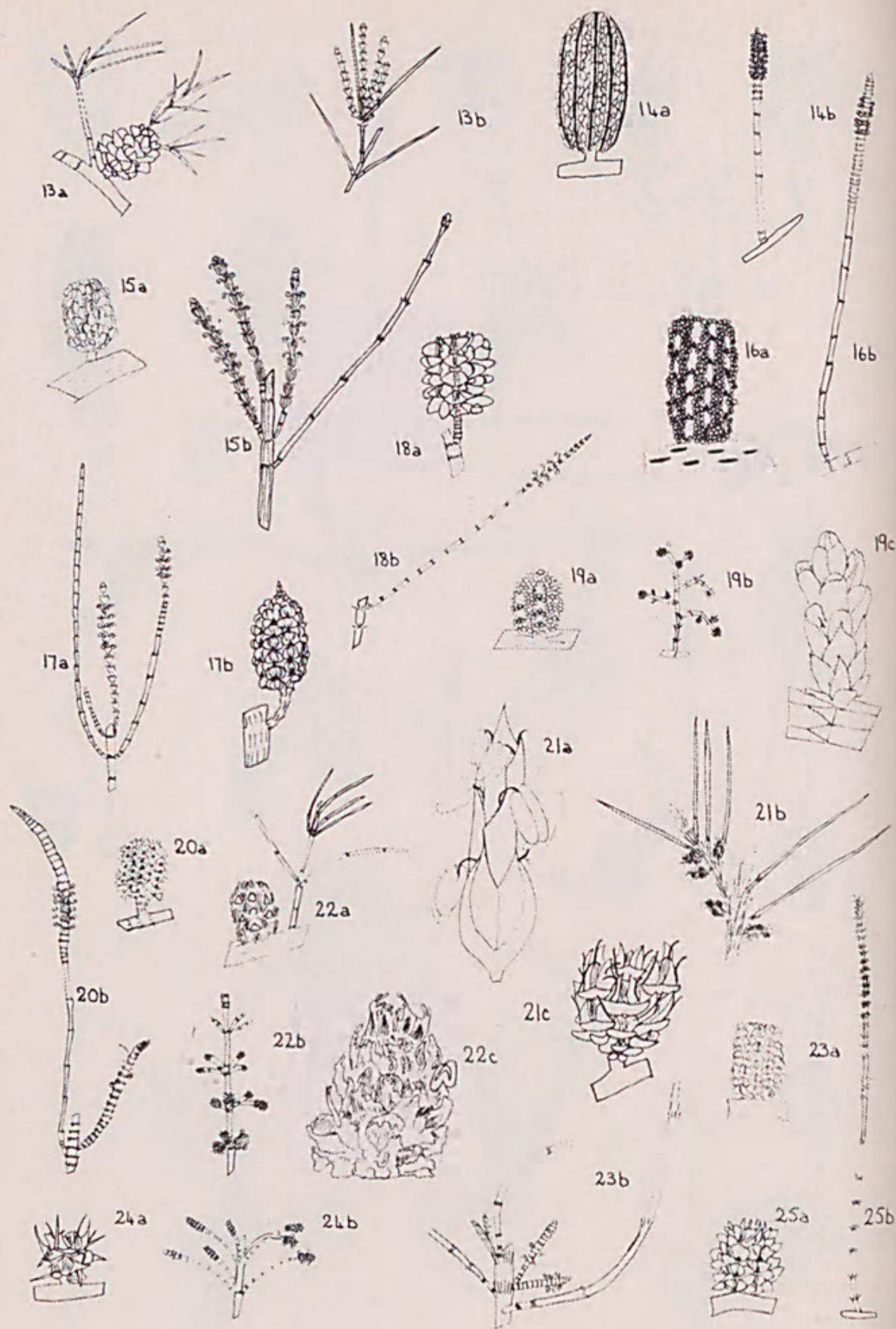


Plate 4: 13. *A. grevilleoides*, a. ♀ cone $\times \frac{1}{2}$; b. ♂ spikes $\times \frac{1}{2}$; 14. *A. helmsii*, a. ♀ cone $\times \frac{1}{2}$; b. ♂ spike $\times \frac{1}{2}$; 15. *A. huegeliana*, a. ♀ cone $\times \frac{1}{2}$; b. ♂ spike $\times \frac{1}{2}$; 16. *A. humilis*, a. ♀ cone $\times \frac{1}{2}$; b. ♂ spike $\times \frac{1}{2}$; 17. *A. lehmanniana*, a. ♂ spike $\times \frac{1}{2}$; b. ♀ cone $\times \frac{1}{2}$; 18. *C. equisetifolia*, a. ♀ cone $\times \frac{1}{2}$; b. ♂ spike $\times \frac{1}{2}$; 19. *A. microstachya*, a. ♀ cone $\times \frac{1}{2}$; b. ♂ spike $\times \frac{1}{2}$; c. details of ♂ cone; 20. *C. obesa*, a. ♀ cone $\times \frac{1}{2}$; b. ♂ spike $\times \frac{1}{2}$; 21. *A. pinaster*, a. details of ♂ cone $\times 5$; b. ♂ spike $\times \frac{1}{2}$; c. ♀ cone $\times \frac{1}{2}$; 22. *A. ramosissima*, a. ♀ cone $\times \frac{1}{2}$; b. ♂ spike $\times \frac{1}{2}$; c. details of ♂ cone $\times 5$; 23. *A. scleroclada*, a. ♀ cone $\times \frac{1}{2}$; b. ♂ spike $\times \frac{1}{2}$; 24. *A. thuyoides*, a. ♀ cone $\times \frac{1}{4}$; b. ♂ spike $\times \frac{1}{2}$; 25. *A. trichodon*, a. ♀ cone $\times \frac{1}{4}$; b. ♂ spike $\times \frac{1}{2}$.

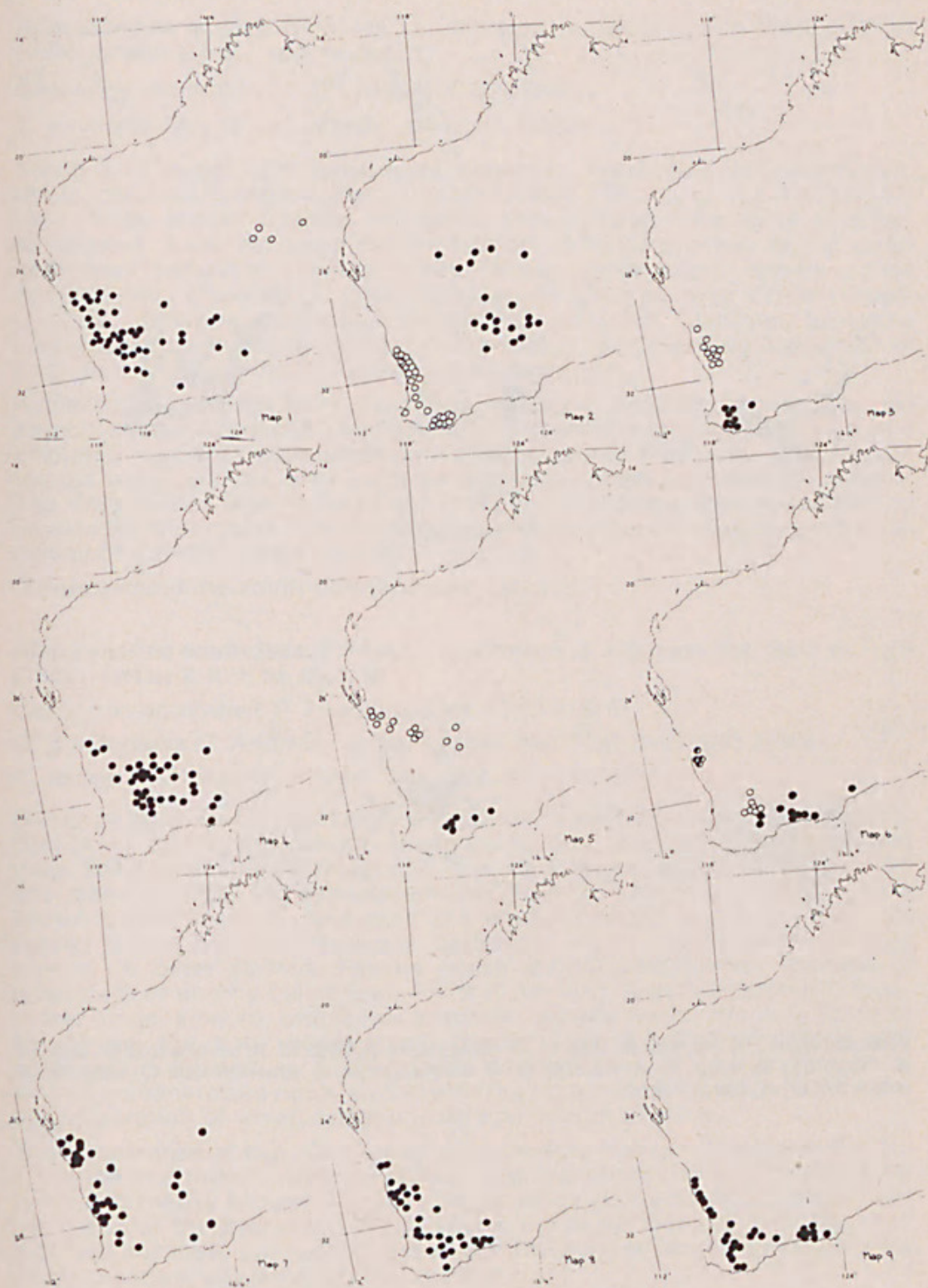


Plate 5: Map 1. *A. acutivalvis* ●, *A. decaisneana* ○; Map 2. *C. cristata* ssp. *pauper* ●, *A. fraseriana* ○; Map 3. *A. decussata* ●, *A. drummondiana* ○; Map 4. *A. corniculata* ●; Map 5. *A. acuaria* ●, *A. dielsiana* ○; Map 6. *A. scleroclada* ●, *A. pinaster* ○, *A. ramosissima* ○; Map 7. *C. obesa* ●; Map 8. *A. microstachya* ●; Map 9. *A. lehmanniana* ●.

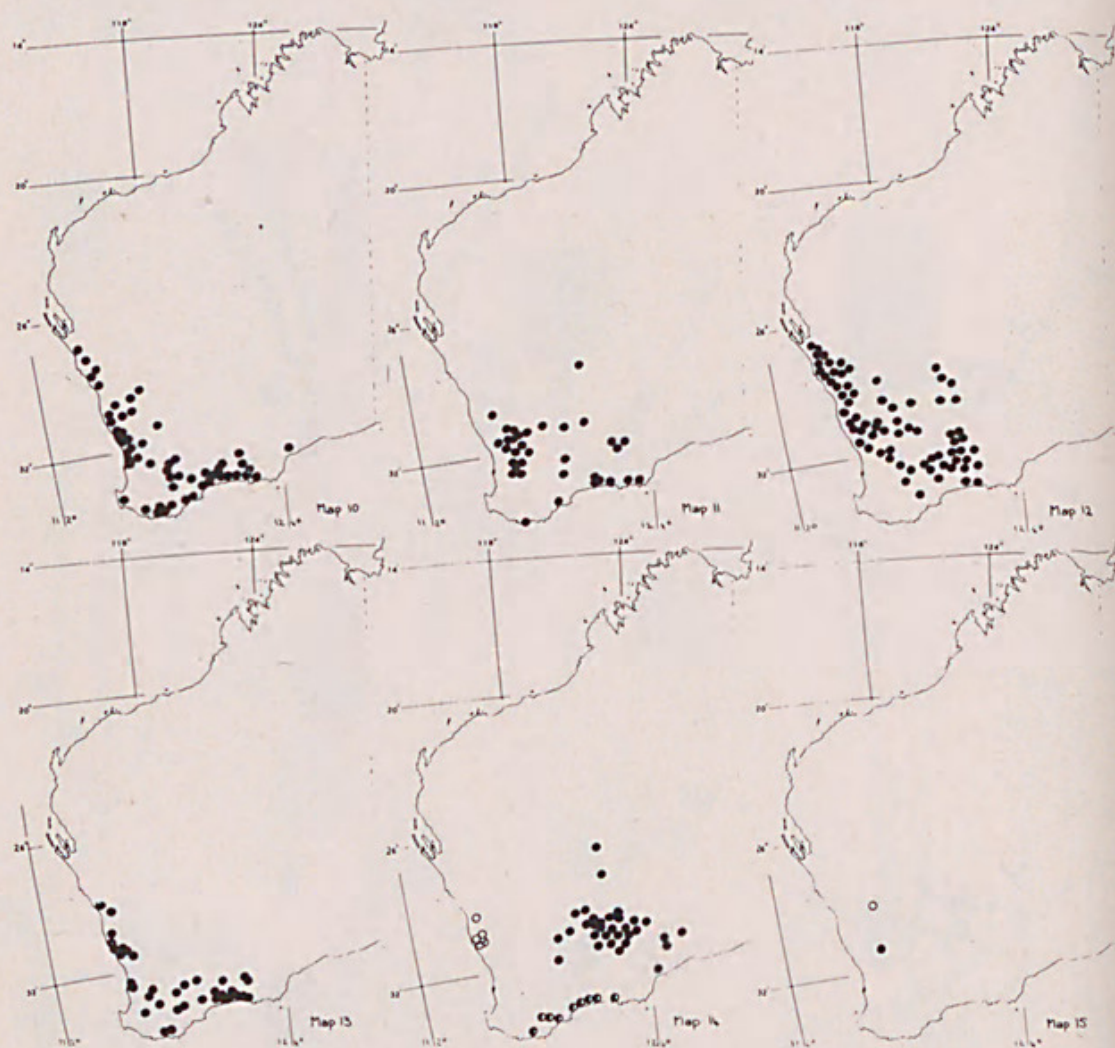


Plate 6: Map 10. *A. humilis* ●; Map 11. *A. huegeliana* ●; Map 12. *A. campestris* ●; Map 13. *A. thuyoides* ●; Map 14. *A. helmsii* ●, *A. trichodon* ○, *A. grevilleoides* ○; Map 15. *A. tessellata* ○, *A. fibrosa* ●.

Allocasuarina L. Johnson, J. Adelaide Bot. Gard. 6(1):73 (1982). Type species *A. torulosa* (Ait.) L. Johnson

This genus is endemic to Australia, ca. 46 species occur in the southern part of Australia, N.E. Queensland and tropical and subtropical parts of the Eremaean region. Twenty two species occur in Western Australia of which 20 are endemic to this state.

Allocasuarina acuaria (F. Muell.) L. Johnson, J. Adelaide Bot. Gard. 6(1):74 (1982). (Plates 1; i-ii: 2, L: 3; 1a, 1b)

Casuarina acuaria F. Muell., Fragm. 6:16 (1867).

C. oxyclada Miq. in DC., Prodr. 16(ii):344 (1868)

Shrub 3-12 m tall with dense erect branches. Branchlets of 3 internodes, terete, glabrous, pungent; lower 2 internodes 1-2 mm long, upper 10-25 mm long. Scale leaves 4, erect, triangular ovate, acute. Male spike terminal, moniliform, 1.5-4 cm long; bracts 4, erect, triangular-ovate, acute; outer bracteoles persistent, keeled, ciliate along upper edge. Female cones pedunculate, globular or ovoid-globular, 10-24 mm long; bracts broad, truncate, glabrous; bracteoles prominently exerted, glabrous, grey, the dorsal appendage long acuminate, 4-9 mm long. Nut 6 mm long; wing hyaline; body dark brown with the median nerve prominent.

A neat bush where the short branchlets, which are verticillate around the main branch, all point upwards. The tip of each branchlet is prickly and as these are clustered together it is an unpleasant plant to collect. The cones are found on the old wood, and are grey in colour with long coarse points on the surface. The male bushes when in flower are rusty in colour as the male spikes extend beyond the branchlets. If the male spikes are looked at closely they are seen to resemble a short string of beads.

Grows around the south coastal areas. (Map 5).

Allocasuarina acutivalvis (F. Muell.) L. Johnson, J. Adelaide Bot. Gard. 6(1):74 (1982). (Plates 2; R: 3; 2a, 2b: 7: 8)

Casuarina acutivalvis F. Muell., Fragm. 10:61 (1876).

C. prinsepiana C. Andrews, J. W. Austral. Nat. Hist. Soc. 1:43 (1904).

C. stowardii S. Moore, J. Linn. Soc. Bot. 45:193 (1920).

Shrub or small tree 3-10 m high with rough black bark and erect branches. Branchlets terete, finely striate, green \pm glaucous; internodes 11-18, 7-20 mm long. Scale leaves 11-13, linear, ciliolate, dark brown; apices long, recurved and readily broken. Male spikes terminal terete, to 5 cm long; bracts 11, dark brown, ciliate, the tips recurved and \pm equal in length to spike, internodes readily broken; outer bracteoles persistent, linear-oblongate, densely hirsute on outer surface. Female cones shortly pedunculate, globose to ellipsoidal or shortly cylindrical, 1.5 to 4 cm long; bracts prominent, thick, ovate, acute, smooth; bracteoles exerted, usually entire, abruptly acute to acuminate, the apex occasionally divided into 2 collateral points with sometimes a third present below these terminal ones. Nut 6 mm long; body with prominent raised ridge, dark brown but occasionally speckled with fawn, the colouration of which continues up one margin of wing.

The appearance of this plant varies considerably from a rounded bush often 1.5 m tall to a rather untidy small tree. The branchlets are very brittle at the joints and readily broken. The dark brown scale leaves make a contrast with the green of the branchlet. When young the scale leaves are slender and recurved but these are readily broken off. The cone is very prickly due to the many exerted bracteoles on the surface.

L. Johnson (1982) recognises two subspecies: ssp. **acutivalvis**, the typical one has entire bracteoles and ssp. **prinsepiana**, which has the apex of bracteole on the female cone divided into two collateral points with sometimes a third one below these terminal ones.

I do not recognise this subspecies as I have collected plants where the number of points on the bracteoles of the cone ranges from one to two on the same plant. A range of one to three has been found on different plants.

Throughout the SW as far east as Queen Victoria Springs (Map 1.)



Plate 7: *Allocasuarina acutivalvis*, showing the female fruiting cones. The acute tips to the bracteoles can be seen to be exerted beyond the smooth, broad bracts. This plant was photographed near Newdegate.

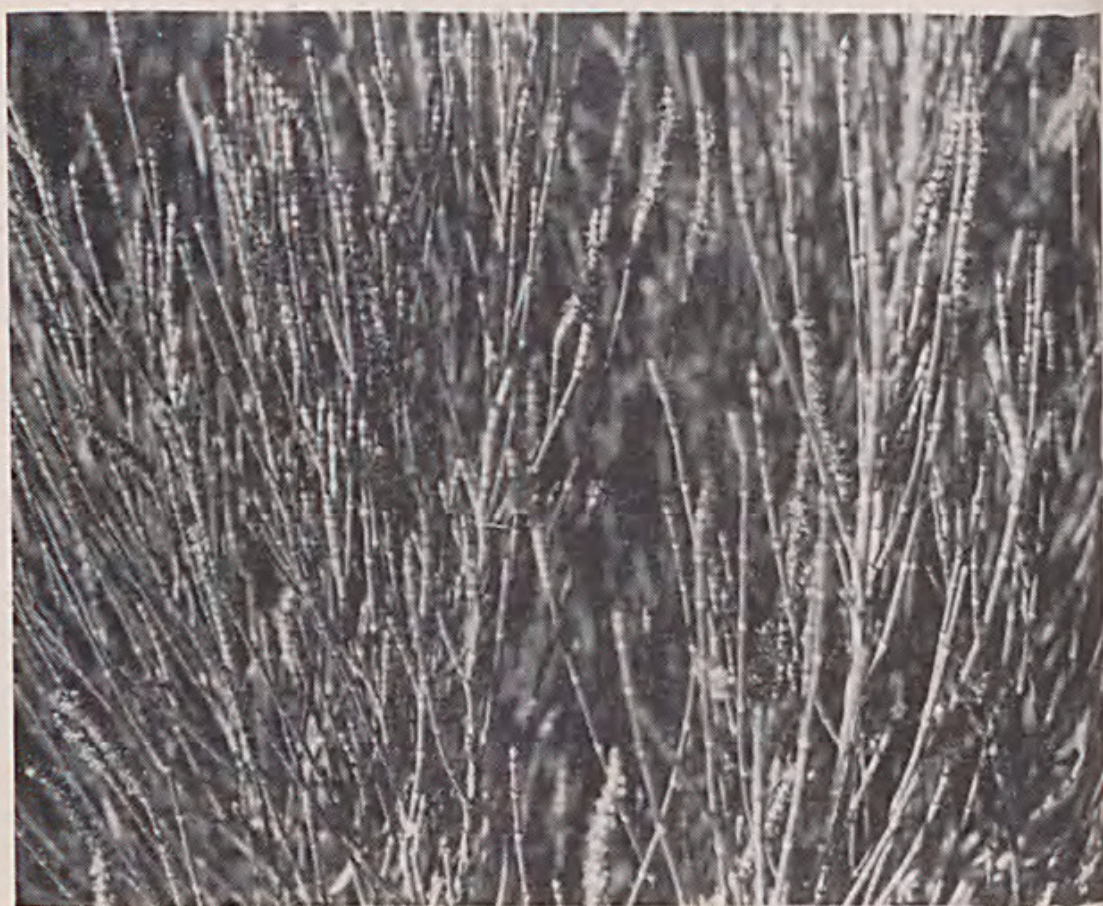


Plate 8: *Allocasuarina acutivalvis*, showing the male spikes. These are terminal to the branchlets, with long recurved tips to the cone scales. The exserted anthers are visible along the spikes.

Allocasuarina campestris (Diels) L. Johnson, J. Adelaide Bot. Gard. 6(1):74 (1982). (Plates 2; O: 3; 3a, 3b, 3c)

Casuarina campestris Diels, Bot. Jahrb. 35:126 (1905)

Shrub to 3 m tall with dense, erect branches. Branchlets faintly striate, \pm glaucous; internodes 6-13, 1cm or less long. Scale leaves 7-9, deltoid, appressed, brown and yellow. Male spikes terminal terete, to 4 cm long, bracts (4)7-9, dark, ciliate, shortly acuminate, outer bracteoles persistent, ovate shortly ciliate at apex. Female cones narrow-ellipsoidal to cylindrical, 2-3(5) cm long; bracts small, thick, obtuse with setaceous deciduous points; bracteoles exerted beyond bracts, entire, thick, obtuse, dorsal surface smooth or rugose striate. Nut 5-7 mm long; body dark brown; wing hyaline, with colouration of nut \pm continuous up margin of wing.

This plant may occur singly or a few together but it is commonly found forming dense thickets. The branchlets all point upwards and can form quite a nice bush. The most characteristic feature is the cone which typically is long in relation to width, is smooth to feel, and when the bracteoles open have the appearance of many small "beaks" just protruding beyond the surface.

This species shows variation in the size and thickness of the cones and internodes, and presence or absence of tomentum on the mature cone.

Widely distributed throughout the south-west. (Map 12).

Johnson, L.A.S. (1972) recognises two subspecies in addition to the typical ssp. **campestris**.

1. ssp. **eriochlamys** from Comet Vale which differs from the typical ssp. mainly by having a tawny to greyish tomentum on the cones at maturity.

2. ssp. **grossa** from around granite tors in the Norseman area and differs from the typical ssp. by having thicker branchlets, longer and broader mature female cones on longer peduncles.

However, I do not at present recognise these two subspecies as there are many collections intermediate between the typical and these. The amount of tomentum on the cones and the size for the cones and internodes varies considerably in the collections made. However after further collections are made these subspecies may well prove to be valid.

Allocasuarina corniculata (F. Muell.) L. Johnson, J. Adelaide Bot. Gard. 6(1):74 (1982). (Plates 2; N: 3; 5a, 5b, 5c)

Casuarina corniculata F. Muell., Fragm. 10:62 (1876).

C. horrida D.A. Herbert, J. Roy. Soc. W. Austral. 7:87 (1921).

C. spinosissima C.A. Gardn., J. Roy. Soc. W. Austral. 9:38 (1923).

Shrub 2-4 m with rough black bark and erect branches. Branchlets terete, finely striate, internodes numerous, 8-11 mm long. Scale leaves 10-11, appressed, rigid, acute. Male spikes terminal or axillary on branches, terete, to 2 cm long; bracts 9 ± 1 , triangular, dark brown, margins ciliate; 2 outer bracteoles persistent, ellipsoidal, apical margins ciliate. Female cones shortly pedunculate, globular to globular-ellipsoidal, 0.8-2 cm long; bracts thin, narrow, acute; bracteoles prominently exerted, broadly ovate, thick, glabrous, mucronate, base fibrous, dorsal appendage dilated at base and terminating in a stout, pale, rigid spine. Nut 4-5 mm long; body reddish-brown; wing \pm translucent, red, apex acute.

This plant can be a neat bush or a small spreading tree. The cones are the distinctive feature of this species, as they are rounded with many fine or coarse prickles over the surface.

This species shows variation in the size of the cone and in the length and appearance of the cone spines, also the branchlet internodes vary in thickness. In the collections there appears to be a continuous gradation between the extreme forms.

Widely distributed throughout the south-west (Map 4).

Allocasuarina decaisneana (F. Muell.) L. Johnson, J. Adelaide Bot. Gard. 6(1):74 (1982). "Desert Oak" (Plates 2; U: 3; 7a, 7b)

Casuarina decaisneana F. Muell., Fragm. 1:61 (1858).

Tree 15 m high with drooping branches. Branchlets finely sulcate, obtusely quadrangular, glaucous; internodes 25-35, 12-70 mm long. Scale leaves 4, acuminate, pale yellow, apices \pm recurved. Male spike terminal, 3.5 cm long, bracts 4, fawn, glabrous, long acuminate, bracteoles persistent, sessile, ovate, upper margins ciliate, the inner pair narrower and shorter than the outer pair. Female cones ellipsoidal to cylindrical, 2.5 to 10 cm long; bracts broad and thin, splitting down centre as cone opens, bracteoles acute shortly tomentose, the dorsal surface thick and transversely fissured, apex acute. Nut 12 mm long; body dark brown with lighter brown areas, wing hyaline, but with colouration of body continuous up both margins of wing; median nerve prominent and forming a raised ridge on body of nut.

A very elegant tree with drooping branches, often being the only tree in the area where it grows. The cones are a rusty brown colour and are the largest of all the species.

Found in the eastern Eremaean area of Western Australia (Map 1). Also occurs in Central Australia and northern South Australia.

Allocasuarina decussata (Benth.) L. Johnson, J. Adelaide Bot. Gard. 6(1):75 (1982). "Karri Oak" (Plates 2; T: 3; 7a, 7b)

Casuarina decussata Benth., Fl. Austr. 6:200 (1873).

Tree 15 m or more high with thick, deeply fissured grey corky bark and erect or spreading branches. Branchlets quadrangular; internodes 15-20, 5 mm long. Scale leaves 4, triangular, acute. Male spikes terminal, moniliform, \pm 2 cm long; bracts 4, triangular, glabrous, with prominent keel, 2 bracteoles persistent, ciliate on upper margin. Female cones pedunculate \pm globose, 15-25 mm long, bracts thin, pubescent with short triangular erect point; bracteoles shortly exserted, very thin, dorsal surface prominently keeled and with up to 6 tubercles, tomentose between tubercles. Nut 9 mm long; body dark brown speckled with white; wing hyaline.

This is an elegant tree with deeply fissured bark. The branchlets consist of many internodes but there are only 4 scale leaves, per whorl. The cone resembles a small *A. fraseriana* cone, but there would be no chance of mistaking the two species. In *A. decussata* the branchlets are slender and the scale leaves are in 4's.

Found in the Karri areas of Western Australia and the Stirling Ranges. (Map 3).

Allocasuarina dielsiana (C.A. Gardn.) L. Johnson, J. Adelaide Bot. Gard. 6(1):75 (1982). (Plates 2; I: 3; 9a, 9b, 9c)

Casuarina dielsiana C.A. Gardn., J. Roy. Soc. W. Austral. 22:119 (1936).

Tree 10 m tall with rough, fissured, light grey bark. Branchlets prominently ribbed, pale green; internodes 25-30, 4-11 mm long. Scale leaves 6 or 7, erect, narrow deltoid, acute, fawn to brown. Male spikes globular, terminal or sessile at nodes; bracts 6 or 7, sparsely puberulous on upper surface, ciliate; 2 outer bracteoles persistent, rigid, densely pubescent on margins; 2 inner bracteoles deciduous, hooded. Female cones shortly recurved, pedunculate, sub-globular to ellipsoidal, 8-35 mm long; bracts broad, truncate, glabrous; bracteoles prominently exserted, entire, thick, glabrous, rugose-striate when mature, the free part ovate in outline, and \pm keeled on back, apex minutely cuspidate, pale grey. Nut 10 mm long; body brown; wing hyaline tinged with brown, apex retuse.

The main distinguishing characteristic of this species is the male spike which appears as a globular swelling either at the end of the branchlet or sessile at the node. The brown female cone is recurved and has thick exserted bracteoles.

Found in the north and north-eastern areas of the south-west. (Map 5)

Allocasuarina drummondiana (Miq.) L. Johnson, J. Adelaide Bot. Gard. 6(1):75 (1982). (Plates 2; C: 3; 10a, 10b)

Casuarina drummondiana Miq., Rev. Crit. Casuar. 26 (1848).

Shrub 1-2 m high with divaricate branches. Branchlets much divided, sulcate, \pm glaucous; internodes 10-20, 1.5-2.5 mm long. Scale leaves 6 or 7, deltoid, acute, dark brown, apices readily broken. Male spikes terminal, to 12 mm long; bracts 6 or 7, glabrous, dark brown; outer bracteoles persistent, ovate, pubescent on keel and apices. Female cones sessile, shortly cylindrical or

ovoid, 6-15 mm long; bracts thin, truncate; bracteoles scarcely exerted, obtuse, the surface deeply demarcated by tomentose fissures into 4-6 areas, each of which has a short hair or tubercle. Nut 5-20 mm long, body dark brown and with short golden hairs; wing short, light to golden brown.

The habit of the plant is the most characteristic feature, looking like an entwined mass, due to the very short internodes, and much divided branchlets. The nut is also characteristic as it has a very small wing and a hairy body.

Found in the northern coastal areas of the south west of Western Australia. (Map 3)

Allocasuarina fibrosa (C.A. Gardn.) L. Johnson, J. Adelaide Bot. Gard. 6(1):75 (1982). (Plates 2; S: 3; 11a, 11b, 11c)

Casuarina fibrosa C.A. Gardn., J. Roy. Soc. W. Austral. 13:61 (1927).

Densely branched shrub less than 1 m tall with erect or spreading branches. Branchlets crowded, terete, finely striate, green; internodes (3)5(6), the lowest 1-3 mm long, the others \pm equal and 6-16 mm long. Scale leaves 4, ovate, scarious, grey. Male spikes ovoid, terminal or solitary in axils of branchlets (although appearing clustered), base usually surrounded by grey, peeling fibrous scales; bracts 4, scarious, outer bracteoles persistent, \pm sparsely hirsute; inner bracteoles normally deciduous but sometimes their basal portions persist. Female cones sessile, globular, 1.5-2.5 cm long, partly obscured by long coarse grey hairs which arise from fissures between bracts and bracteoles; bracts broad, thin, glabrous, bracteoles glabrous, dorsal surface thick, keeled. Nut 6.5 mm long; body with prominent ridge, dark brown; wing dark reddish-brown and almost opaque.

This species has been rarely collected. It can be readily recognised by the fibrous appearance of the branchlets due to the scarious scale leaves which split and form long fibres. However it is the female cone which is the most characteristic feature, as the surface is covered by long hairs, a feature seen in no other species.

The cone shows variation in the amount of fibrous material. This may be a factor with age, the older plant or cone developing more fibrous hairs than the younger cones.

Found around Tammin in Western Australia. Rare. (Map 15)

Allocasuarina fraseriana (Miq.) L. Johnson, J. Adelaide Bot. Gard. 6(1):75 (1982). (Plates 2; X: 3; 12a, 12b, 12c: 9: 10)

Casuarina fraseriana Miq., Rev. Crit. Casuar. 59 (1848).

Tree 15 m high with thick reddish-brown fibrous bark and spreading branches. Branchlets deeply sulcate, green, glabrous, internodes 25-30, 4-13 mm long. Scale leaves 6-8, narrow triangular, acute, erect or spreading, pale fawn. Male spikes terminal, up to 6 cm long; bracts 6-8, broad, ciliate, pale; outer bracteoles persistent, narrow elongate obovate, ciliate with reddish-brown hairs. Female cones pedunculate, subglobose to cylindrical, 2-4 cm long, bracts broad, truncate, thickened at centre of apex, ferruginous pubescent; bracteoles shortly exerted, entire, very thick and convex on back, dorsal surface transversely rugose. Nut up to 10.5 mm long; body dark brown speckled with white; wing hyaline, with colouration of body of nut continuous up one margin

This is the common She-oak tree around the Perth metropolitan area. It has a deeply incised bark, and when the male trees are flowering the trees take on a rusty colour. When the nuts are shed the valves open widely, the inner surface of the valve is much paler than the cone outer surface.

Found widely in the coastal areas of the south-west. (Map 2)

Allocasuarina grevilleoides (Diels) L. Johnson, J. Adelaide Bot. Gard. 6(1):75 (1982). (Plates 2; A: 4; 13a, 13b)

Casuarina grevilleoides Diels. Bot. Jahrb. 35:130 (1905).

Shrub 15-30 cm tall; female plants with large woody stock from which numerous erect branches arise; male plants slender, caespitose. Branchlets finely striate, erect, verticillate, at first densely hirsute, becoming glabrous, pale green; internodes 2-3, the terminal 8-24 mm long, central 1-4 mm (if

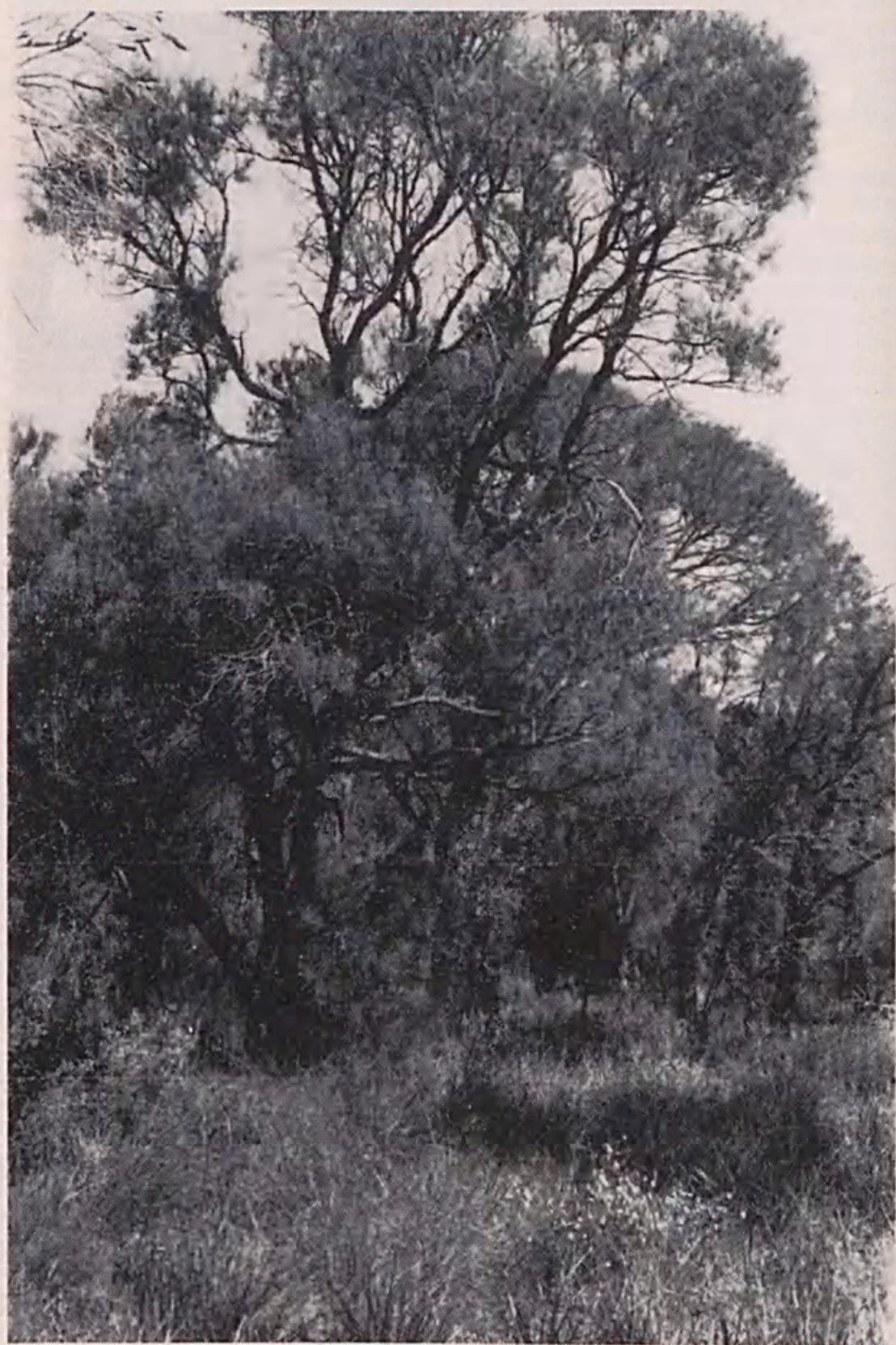


Plate 9: *Allocasuarina fraseriana*, taken in King's Park. The taller tree in the background is female and the one in the foreground is male.

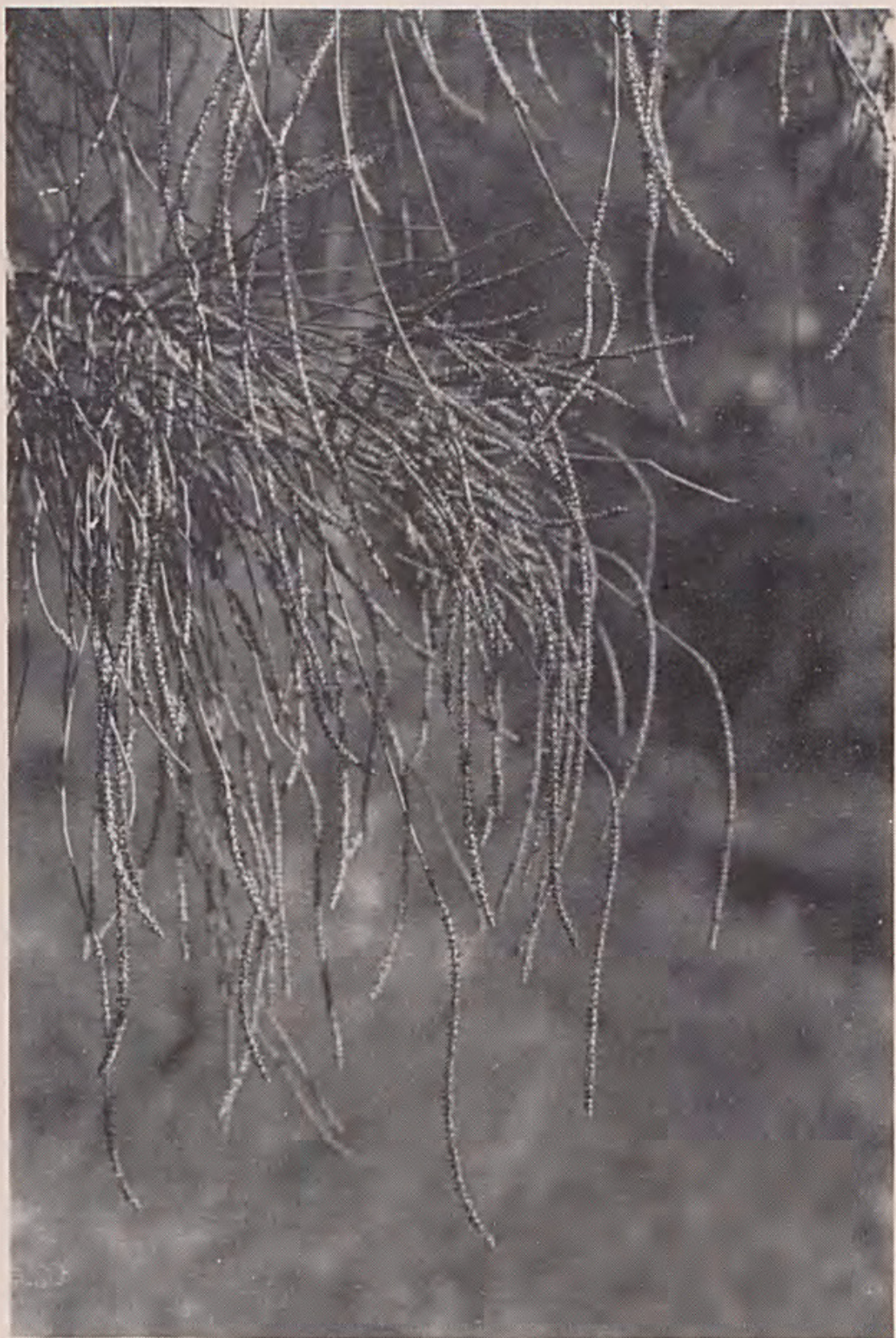


Plate 10: *Allocasuarina fraseriana*, showing male spikes. These are terminal to the branchlets. The male trees when in full flower take on a rusty colour due to the abundance of these male spikes. It is the anthers (the small structures down the side of the spikes) which are rust coloured.

present), and basal 1-2 mm long. Scale leaves 4, triangular acute, apices thin, readily broken. Male spikes sessile in whorls of 4, ovoid, 5 mm long; bracts 4, ovate, imbricate, pubescent; outer bracteoles persistent. Female cones sessile, often clustered on branches or on woody stock, ovoid to subglobular, 1-1.5 cm long; bracts broad, thick, pubescent, with the apex triangular-setaceous, eventually deciduous; bracteoles prominently exerted, with 2 lateral obtuse lobes and several short tubercles, the dorsal surface truncately obtuse and keeled. Nut 6 mm long, completely concealed in a coma of basal, uniformly coloured golden hairs; body brown, covered with short closely appressed hairs; wing rudimentary.

A very small plant with a woody stock, and few internodes to each branchlet. The female cones are small and occur on the old wood near the base of the plant. The nut is completely concealed in golden hairs.

Found near Dandaragan in Western Australia. (Map 14)

Allocasuarina helmsii (Ewart et Gordon) L. Johnson, J. Adelaide Bot. Gard. 6(1):75 (1982). (Plates 2; J: 4; 14a, 14b)

Casuarina helmsii Ewart et Gordon, Proc. Roy. Soc. Vic. n.s. 32:192 (1920).

Shrub 3-4 m tall with smooth dark-grey bark and erect branches. Branchlets striate, glaucous; internodes 15-20, 3-8 mm long. Scale leaves 5, erect, deltoid, rigid, fawn to yellow. Male spikes terminal, up to 3 cm long; bracts 5-7; bracteoles all persistent and visible at side of spike. Female cones shortly pedunculate, ellipsoidal to cylindrical, rounded at both ends, 10-28 mm long; bracts inconspicuous, truncate, thin; bracteoles triangular, glabrous, with 5-7 tubercles, of which 3 are at its apex. Nut \pm 5 mm long; body reddish-brown; wing with reddish tinge, truncate.

This shrub resembles *A. campestris*, and can often be found in thickets, but the patterning on the surface of the female cone is completely different. Also it has a reddish-brown nut whereas *A. campestris* has a black nut.

Found in the Eremaean area of Western Australia. (Map 14). Also occurs in South Australia.

Allocasuarina huegeliana (Miq.) L. Johnson, J. Adelaide Bot. Gard. 6(1):76 (1982). (Plates 2; M: 4; 16a, 16b)

Casuarina huegeliana Miq. in Lehm., Pl. Preiss. 1:640 (1845).

C. dorrienii Domin, J. Linn. Soc. Bot. 41: 246 (1912)

Tree 10 m high with dark, longitudinally fissured bark and drooping or widely spreading branches. Branchlets terete, striate puberulous; internodes \pm 20, 6-13 mm long. Scale teeth 8-9, deltoid, acute, reddish-brown, slightly spreading or erect. Male spikes terminal, 4-10 cm long; bracts 10, glabrous; bracteoles all hooked together and falling as one group. Female cones shortly pedunculate, globose to shortly ellipsoidal, 12-28 mm long; bracts narrow, thick, obtuse, \pm tuberculately 2-lobed; bracteoles exerted, entire, thick, glabrous, convex, smooth on dorsal surface. Nut 6 mm long; body dark brown \pm speckled with white; wing pale pink to yellow, occasionally hyaline.

A very nice looking tree with drooping branches. Appears to be a favourite resting place for kangaroos. When the male plants are in flower the spikes hang downwards and the trees take on a rusty colour. The cones are a chocolate-brown colour, round and with very shortly exerted bracteoles.

Found associated with granite throughout the south-west of Western Australia. (Map 11)

Allocasuarina humilis (Otto et Dietr.) L. Johnson, J. Adelaide Bot. Gard. 6(1):76 (1982). (Plates 2; G: 4; 16a, 16b)

Casuarina humilis Otto et Dietr., Allgem. Gartenz. 9:163 (1841).

C. ramuliflorum Otto et Dietr., loc. cit.

C. selaginoides Miq. in Lehm., Pl. Preiss. 1:643 (1845).

C. preissiana Miq. in Lehm., Preiss. 1:640 (1845).

? *C. tephrosperma* Miq., Rev. Crit. Casuar. 31 (1848). (Note: original description insufficient it may be *C. lehmanniana*)

Casuarina leptotrema S. Moore, J. Linn. Soc. Bot. 45:193 (1920)

Shrub to 2 m high with erect or spreading branches. Branchlets deeply sulcate, glaucous, internodes 20-25, 1-6 mm long. Scale leaves 6, acutely deltoid, erect. Male spikes terminal, 3-20 mm long; bracts 5 or 6, pale fawn, \pm ciliate; outer bracteoles persistent, ovoid-deltoid, ciliate, visible at side of bracts. Female cones sessile, ellipsoidal to cylindrical, rounded or truncate at apex, 2-4 cm long; bracts ovate-triangular, thin, tomentose, bracteoles tomentose, not exserted, dorsal surface, tessellately tuberculate with \pm flat tubercles. Nut 6 mm long; body dark brown, biconvex sides; wing hyaline, truncate.

This species is usually a low spreading shrub. The surface of the cone is smooth with intricate patterning, and when the bracteoles are open, they are not exserted, but occur in neat rows along the length of the cone. The collections from the south coast have longer and broader cones and shorter internodes than is found in other collections.

Widespread throughout the south west of Western Australia. (Map 10)

Allocasuarina lehmanniana (Miq.) L. Johnson, J. Adelaide Bot. Gard. 6(1):76 (1982). (Plates 2; Q: 4; 17a, 17b)

Casuarina lehmanniana Miq. in Lehm., Pl. Preiss. 1:639 (1845).

C. baxteriana Miq. Rev. Crit. Casuar. 37 (1848).

C. suberosa Otto et Dietr. var *baxteriana* (Miq.) Miq. in DC., Prodr. 16, ii:338 (1868).

C. microstrobilus C.A. Gardn., J. Roy. Soc. W. Austral. 9:37 (1923).

Shrub 1-4 m high with erect or spreading branches. Branchlets deeply sulcate green, erect; internodes 13-15, 2.5-7 mm long. Scale leaves 7-8, triangular, erect, pale. Male spikes terminal, up to 4 cm long, becoming moniliform with age; bracts 6-7, incurved at apices, shortly ciliate; outer bracteoles (or occasionally all 4) persistent. Female cones subglobose to cylindrical, rounded at both ends, often with the apical portion remaining small and undeveloped, 11-35 mm long; bracts small, hyaline, broad, with the broadly triangular apex ending in a short deciduous point; bracteoles exserted, transversely fissured, with the inner surface obtuse, glabrous and yellow to brown, the outer surface broad, keeled, thicker and shorter than inner surface, red-brown. Nut \pm 5 mm long; body dark brown, convex on both sides; wing hyaline, apex acute, tinged yellowish-brown.

This species may occur singly as a low to medium height shrub or may occur in dense thickets. Probably the most characteristic feature of the species is the female cone which has a varying shape dependent upon the development of fertile nuts. In all plants the tip is infertile but often some flowers down the side do not develop, resulting in a mis-shapen cone.

Found in the coastal areas of the south-west. (Map 9)

Allocasuarina microstachya (Miq.) L. Johnson, J. Adelaide Bot. Gard. 6(1):76 (1982). (Plates 2; B: 4; 19a, 19b)

Casuarina microstachya Miq. in Lehm., Pl. Preiss 1:642 (1845).

Shrub 1 m high with spreading or erect intricate branches. Branchlets quadrangular with intervening sulci, green or glaucous; internodes up to 15, 3-7 mm long. Scale leaves 4, deltoid, dark brown, apices long, fine, recurved and readily broken. Male spikes ovoid, arising at nodes, usually solitary but occasionally up to 3 together; bracts 4, pubescent at margins; outer bracteoles persistent, ciliate at apex. Female cones sessile, ovoid or shortly cylindrical, 7-15 mm long; bracts thin, broad, apex broadly triangular, erect or incurved, bracteoles not exserted, narrow, truncate, convex, dorsal surface verrucose \pm tuberculately tessellate with each tubercle produced into a soft setose process which withers with age leaving a small cusp. Nut ovate, \pm 3.5 mm long; body dark brown, densely long pubescent at base with white to golden hairs, and densely puberulous in centre; wing rudimentary.

A small shrub with much divided branchlets and short internodes and only 4 scale leaves. The female cones are dark brown with prominent bracts. The nut has white or golden hairs covering its surface.

Widespread throughout the south-west. (Map 8)

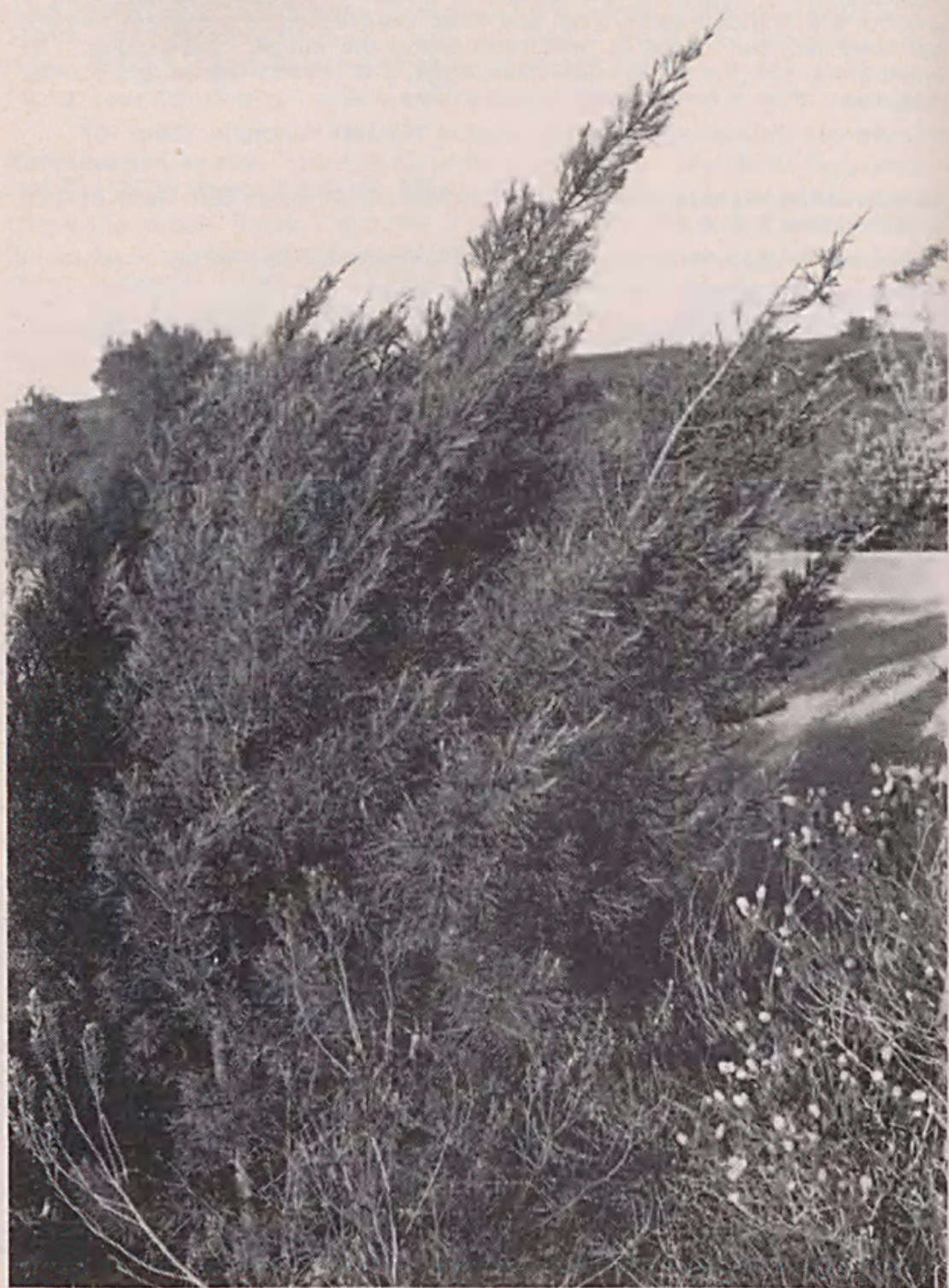


Plate 11: *Allocasuarina pinaster*, photographed west of Lake Grace. It shows the "Pine-like" appearance of this plant, hence the reason for the specific name. This is a female plant and has a southerly lean, a characteristic of this species.

Allocasuarina pinaster (C.A. Gardn.) L. Johnson, J. Adelaide Bot. Gard. 6(1):77 (1982). (Plates 1; iii-iv: 2; W: 4; 21a, 21b, 21c: 11)

Casuarina pinaster C.A. Gardn., J. Roy. Soc. W. Austral 27:166 (1942).

Erect shrub 2-4 m high with spreading branches. Branchlets of 3 internodes, distinctly 4 angled, glabrous or pubescent, green, lower 2 internodes 1-2 mm long, the upper 15-45 mm long and terminating in a pungent point. Scale leaves 4, large, ovate-acuminate. Male spikes sessile at branch nodes, 5-10 mm long; bracts 4, long acuminate, ciliate; bracteoles all persistent, pubescent. Female cones shortly pedunculate, ovoid, 1.5-2.5 cm long; bracts broad, thick, truncate, hoary at apex and with a short deciduous point; bracteoles prominently exserted, thick, convex the dorsal appendage a stout triquetrous incurved spine 6-10 mm long. Nut 12 mm long; body dark brown with prominent ridge; wing hyaline.

In appearance it resembles a small *Cedrus* type pine. It is a very prickly plant, but the typical "Christmas Tree" appearance makes it readily identified. The female cones are rather elegant with a dark surface and paler spine.

Found near Lake Grace in Western Australia. (Map 6)

Allocasuarina ramosissima (C.A. Gardn.) L. Johnson, J. Adelaide Bot. Gard. 6(1):78 (1982). (Plates 2; D: 4; 22a, 22b, 22c)

Casuarina ramosissima C.A. Gardn., J. Roy. Soc. W. Austral. 47:54 (1964).

Shrub 1 m high, with much divided verticillate branches. Branchlets of 2 to 3 internodes, rigid, deeply sulcate, grey tomentose, becoming \pm glabrous with age; basal internode 1-2 mm long, upper internodes 6-22 mm long. Scale leaves 4 or 5, erect, deltoid, obtuse, ciliate, apex black. Male spikes ovoid, up to 6 clustered at branch nodes in axils of branchlet bases, or on branchlet nodes, or terminal; bracts 5, almost ovate, hyaline, scarious, margins pubescent; outer bracteoles persistent. Female cones sessile, opposite or verticillate, cylindrical to ovoid, 12-20 cm long; bracts large, broadly ovate, fimbriate, outer surface tomentose, apex broadly ovate; bracteoles broad, dorsal surface verrucose areolate and densely fibrous-pilose. Nut 4.5 mm long; body dark brown, fawn pubescent at base; wing short, obtuse.

This small shrub has a very neat, yet irregular appearance. The verticillate branchlets are short, with only a few internodes and tomentum on the surface. The female cones may sometimes be verticillate around the node, and differ from most species in having a tomentose surface.

Found near Dandaragan in Western Australia. (Map 6)

Allocasuarina scleroclada (L. Johnson) L. Johnson, J. Adelaide Bot. Gard. 6(1):78 (1982). (Plates 2; K: 4; 23a, 23b)

Casuarina scleroclada L. Johnson, Nuytsia 1:261 (1972).

Shrub 2-6 m tall with spreading branches which are drooping in the female plants. Branchlets glabrous, glaucous; internodes 4-12, 1.5-4 cm long. Scale leaves 11, triangular, erect, grey. Male spikes sessile at nodes, bracts 11, short, pale; outer bracteoles persistent. Female cones sessile, globular, 2-2.5 cm long; bracts small, thin, abruptly acuminate; bracteoles entire, exserted, obtuse, thick, outer surface smooth. Nut 8 mm long; body dark brown with white markings; wing obtuse, translucent, red with the colouration of the body of the nut continuous up one margin.

The main distinguishing feature of this species is the long twisted internodes which give the shrub a rounded appearance. The internodes are slightly to prominently glaucous.

Found in the south coastal areas of Western Australia. (Map 6)

Allocasuarina tessellata (C.A. Gardn.) L. Johnson, J. Adelaide Bot. Gard. 6(1):78 (1982). (Plates 2; P: 3; 4)

Casuarina campestris ssp. *tessellata* (C.A. Gardn.) L. Johnson, Nuytsia 1, 3:263 (1972).

C. tessellata C.A. Gardn., J. Roy. Soc. W. Austral. 22:119 (1936).

Shrub to 4m tall, erect branches. Branchlets deeply striate, glaucous; internodes 6-10, 1cm or less long. Scale leaves 8-9, ovate, appressed, tips dark.

Male spikes terminal, terete, to 4cm long, bracts dark with pale edges, 8-9 glabrous, shortly acuminate; outer bracteoles or all 4 persistent, ovate, shortly ciliate at apex. Female cones cylindrical, 2-3cm long; bracts broad, truncate, triangular at apex, with setaceous, deciduous points; bracteoles not exerted beyond bracts, entire, thick obtuse, dorsal surface tessellate with 5-7 warts or tubercles. Nut 5-7mm long, body dark brown; wing hyaline.

The patterning on the fruiting cone is very characteristic and could not be confused with any other species.

Found only on Mt. Singleton, which is south of Paynes Find. (Map 15).



Plate 12: *Allocasuarina thuyoides*, photographed near Hopetoun. A low intricately branched shrub with short branchlets. The plants always have this semi-tangled appearance.

Allocasuarina thuyoides (Miq.) L. Johnson, J. Adelaide Bot. Gard. 6(1):78 (1982). (Plates 2; H: 4; 24a, 24b: 12)

Casuarina thuyoides Miq. in Lehm., Pl. Preiss. 1:641 (1845).

Shrub to 2 m high with slender spreading branches. Branchlets short divaricate, terete, sulcate, dull green \pm glaucous, internodes 4-10, 1.5-2.5 mm long. Scale leaves 5 or 6, erect, triangular, appressed, acute, pale yellow. Male spikes terminal, up to 6 mm long; bracts 4-7, triangular, acute, pale brown, ciliate; outer bracteoles persistent, linear, visible at side of spike; filament length at least twice that of bracteoles. Female cones shortly pedunculate, subglobose; bracts broad, thin, glabrous or puberulous, retuse with a short, acute, triangular mucro in notch; bracteoles prominently exerted, deeply and transversely fissured, thick, keeled and with a narrowly acuminate dorsal appendage which is produced into a slender subpungent spine \pm 8 mm long. Nut 10 mm long; body greyish yellow with dark shining central depression; wing acute hyaline with yellow tinge, apex acute.

This is generally a neat shrub with a grey-green coloured appearance. The main distinguishing feature would be the grey cone with long elegant spines and deeply fissured bracteoles. The internodes are several, but very short. Widespread throughout the south-west of Western Australia. (Map 13)

Allocasuarina trichodon (Miq.) L. Johnson, J. Adelaide Bot. Gard. 6(1):79 (1982). (Plates 2; V: 4; 25a, 25b)

Casuarina trichodon Miq. in Lehm., Pl. Preiss. 1:641 (1845).

Casuarina bicuspidata Benth., Fl. Austr. 6:202 (1873).

Shrub 3 m high with dense erect to spreading branches. Branchlets distinctly green; internodes 10-25, 9-16 mm long. Scale leaves 9, linear, erect, 1-2.5 mm long, grey with deciduous spreading or recurved points. Male spikes terminal, 5-8 cm long; bracts 7-9, narrow, ciliate, 1-2.5 mm long, apices narrowly-acuminate, spreading or recurved; bracteoles all persistent, ciliate at apex. Female cones sessile, ellipsoidal to shortly cylindrical, 2.5 to 5 cm long; bracts small, thin, apex acute, closely pubescent; bracteoles exserted, acute, thick, dorsal surface convex + keeled, transversely fissured. Nut up to 10 mm long; body dark brown, biconvex sides; wing hyaline.

The scale leaves of this species are long and grey with recurved tips, but are brittle and readily broken with age. The apical tip of the branchlet where the internodes have not as yet expanded takes on a hairy appearance. The female cones are large with several exserted valves over its surface.

Found in the south-west and southern coastal areas of Western Australia. (Map 14)

Casuarina L. ex Adans., Fam. Pl. 2:481, 534 (1763)

Type species: *C. equisetifolia* Forst. et Forst. f., Char. Gen. 103 (1776). (See Johnson, 1980). This genus occurs in all Australian States except Tasmania; S.E. Asia to Pacific Islands. Two, possibly three, species occur in Western Australia.

Casuarina cristata* ssp. *pauper (F. Muell. ex Miq.) L. Johnson, Nuytsia 1:265 (1972). "Black Oak" (Plates 2; F: 3; 6a, 6b, 6c.)

C. cristata Miq., Rev. Crit. Casuar. 70 t. 10 (1848).

C. pauper F. Muell. ex Miq., Neder. Kruidk. Arch. 4:100 (1859).

C. lepidophloia F. Muell., Fragm. 10:115 (1877).

Tree 10 m high with rough dark grey bark and spreading to drooping branches. Branchlets finely sulcate, glaucous; internodes 25-30, 4-12 mm long. Scale leaves 8-13, deltoid, shortly acuminate, \pm appressed, pale fawn. Male spikes terminal terete, \pm 4 cm long; bracts 8-13, ciliate, tips dark; outer bracteoles persistent, ovate, upper margin ciliate; anthers pale coloured with pink tips. Female cones shortly pedunculate, globose or broadly ellipsoidal, 9-13 mm long; bracts short, thick, truncate, tomentulose, bracteoles conspicuously exserted, entire, with the free part narrow-ovate, keeled, acute. Nut 4.5 mm long; body straw coloured; wing opaque, reddish brown, with the median nerve close to margin.

The typical subspecies does not occur naturally in Western Australia.

The internodes are covered with a glaucous layer, are brittle and readily snap. The cones are pale brown or grey in colour, and the amount of exsertion shown by the bracteoles varies considerably. The nuts are straw coloured.

Found in the Eremaean area of Western Australia (Map 2), often near the edges of salt lakes. Occurs also in far S.W. Queensland, New South Wales, N.W. Victoria and South Australia. *Casuarina cristata* ssp. *cristata* occurs in Queensland and inland New South Wales.

Casuarina equisetifolia Forst. et Forst. f., Char. Gen. 103, t 52 (1776) (Plate 4; 18a, 18b.)

Tree 11-17 m high with a grey fibrous bark. Branchlets terete, markedly striate, green \pm glaucous, internodes 15-35, 2-9 mm long. Scale leaves 5-8, acuminate,

pale yellow. Male spikes terminal, 9-18 mm long; bracts 7-8, fawn, glabrous to densely ciliate, acute. Female cones pedunculate, peduncles \pm 5 mm long, ellipsoidal or cylindrical, 13-20 mm long, truncate at both ends; bracts broad, obovate-cuneate, thick, pubescent; bracteoles exserted, entire, outer surface convex, 2-3 nerved, tomentose. Nut 5-7 mm long; body straw coloured; wing slightly translucent, acute, with \pm central vein.

No collection of this species has been made within Western Australia, but it is widespread in the coastal areas of the Northern Territory so may occur within the Kimberley area. If it is collected in the north of W.A. it will be the only *Casuarina* species found in the Kimberley. This species occurs around the sea coasts of tropical Australia, southern Queensland, New South Wales, Malaysia, Melanesia, Polynesia and New Caledonia

Casuarina obesa Miq. in Lehm., Pl. Preiss. 1:640 (1845). (Plates 2; E: 4; 20a, 20b: 13)

Tree to 12 m high with thick fissured bark and erect or spreading branches. Branchlets terete, finely striate, glaucous; internodes \pm 20, 8-20 mm long. Scale leaves 12-20, narrowly triangular, appressed, acute, brown to grey. Male spikes terminal, also occasionally on old wood, up to 6 cm long, bracts 11 \pm , pale with dark tips; 2 or occasionally all 4 bracteoles persistent, outer bracteoles ciliate. Female cones shortly pedunculate or sessile, ellipsoidal or cylindrical, 12-16 mm long, truncate at both ends, pubescent when young becoming glabrous with age; bracts narrowly, obovate-cuneate, thin but firm, terminating in a short rigid, erect point, bracteoles slightly exserted, entire, the outer surface convex, keeled, and tomentose. Nut \pm 6 mm long; body straw-coloured to grey; wing often translucent, obtuse, with a \pm central median nerve.

This is a tall tree commonly found growing beside water, and is very common along the Swan and Canning Rivers near Perth. On some trees a mistletoe parasite is very common. The pale fawn coloured cones and straw coloured nuts are characteristic for this species, as is the glaucous bloom to the branchlets.

Widespread throughout the south-west and Eremaean areas of Western Australia near the coast and inland salt lakes. (Map 7). Also occurs in the south-west of New South Wales, N.W. Victoria and South Australia.

ACKNOWLEDGEMENTS

Dr. L.A.S. Johnson, Director of the National Herbarium of New South Wales, is thanked for providing me with the manuscript of the names of the new genera and combinations prior to their publication.

Most of this work was carried out whilst I was a member of the staff of the Western Australian Herbarium (PERTH).

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Plate 13: *Casuarina obesa*, taken on the edge of a salt-lake just east of Wagin. These trees are common around salt-lakes and water courses in the south-west of the state.

GLOSSARY

Refer also to Grieve, B.J. and W.E. Blackall (1975): "How to Know Western Australian Wildflowers" Part IV. Univ. of W.A. Press.

- areolate — divided into distinct areas
- articulate — jointed; the branches made up of individual segments
- bicarpellary — of 2 carpels
- caespitose — growing in tufts
- coma — tuft of hairs at base of nut
- cylindrical — shaped like a cylinder
- demarcated — distinctly outlined
- dilated — widened
- fibrous — with long coarse hairs
- fissure — split
- globular — spherical
- hooded — shaped like a hood
- incurved — curved inwards
- internode — distance between two whorls of leaves
- intricate — entangled
- keel — ridge on outside of fold
- protrusions — short outgrowths
- puberulous — slightly hairy
- scale-like — small, thin scarious structure
- sheath — tubular base to whorl of scale-leaves
- tomentulose — with a sparse covering of short hairs
- translucent — transparent
- unilocular — one celled

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