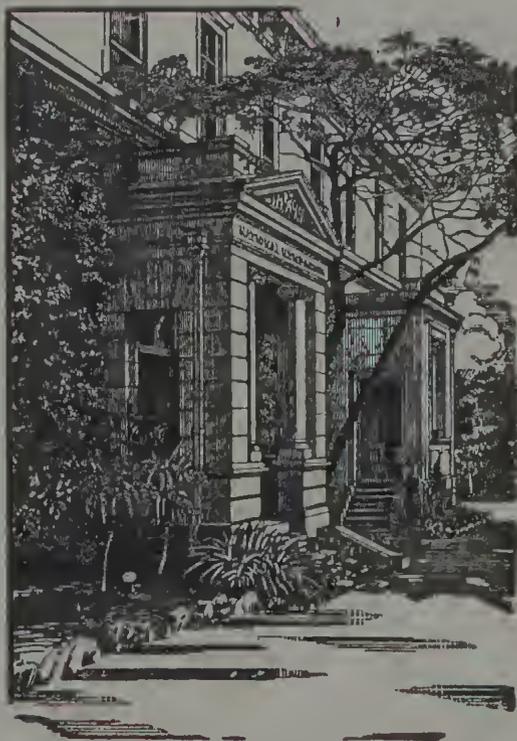


NEW SOUTH WALES
DEPARTMENT OF AGRICULTURE

CONTRIBUTIONS
FROM THE
NEW SOUTH WALES
NATIONAL HERBARIUM



Vol. 4. No. 1

1966

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EDITOR: JOYCE W. VICKERY

The *Xyris gracilis* Complex

O. D. EVANS

SUMMARY

Two subspecies are distinguished in *Xyris gracilis* R. Br. In New South Wales, subspecies *gracilis* occurs in the Coast District from north to south and extends in places to the Tablelands; it is found also in Victoria. Subspecies *laxa* O. Evans ssp. nov., in apparently pure populations, is found only in a portion of the Coast District extending from the vicinity of Port Jackson southward to Jervis Bay; it co-exists in places with ssp. *gracilis*. Intermediate forms are known from a considerable range north and west of Port Jackson and their variation and occurrence are discussed. In Tasmania *X. gracilis* is replaced by a closely allied unnamed species, the characters of which are discussed together with less closely related species which have been confused with *X. gracilis*.

In dealing with the genus *Xyris* for the Flora of New South Wales, investigation of material referred to *X. gracilis* R. Br. has shown that, in the Central Coast and the northern part of the South Coast District, two taxa are readily distinguishable over a considerable area but in other areas are merged into a range of intermediate forms. Robert Brown recognised two principal forms as species, which he described as *X. gracilis* and *X. bracteata*, but later authors, excepting Kunth (1843), Rendle (1899) and Malme (1927), did not uphold the latter. Some confusion has also arisen because of Bentham's misplacement of *X. bracteata* R. Br. as a variety of *X. operculata* Labill. At the same time he described a plant from Tasmania (now *X. muelleri* Malme) as *X. gracilis* R. Br. var. *bracteata* Benth.

The present study has shown that plants corresponding to the description of *X. bracteata* R. Br. are present in considerable numbers in the coastal area extending from Botany Bay and the Royal National Park southward to the nearer coastal highlands as far as the Bulli district, and re-appear on the coast at Jervis Bay. Normal *X. gracilis* R. Br. *sensu stricto*, in smaller numbers, also grows in these areas but no evidence of intergrading has so far been found there, although plants of the two forms may be found growing close by each other. On the other hand, in the areas between Port Jackson and Broken Bay and near Linden on the lower Blue Mountains, the populations are almost entirely intermediate and variable in character, though some individuals may approximate to the end-forms. Some collections from the King's Tableland, from the upper Macdonald River near Howe's Valley and from the North Coast are also intermediate.

Fig. 1 shows some of the more useful discriminatory characters in specimens of samples drawn from the whole of the New South Wales portion of the geographic range. It will be noted that in this diagram no single character shows a break in variation between the end-forms and those designated as intermediate; nevertheless the two end-forms show greater correlation of characters than do the intermediate plants, in which a wider scatter is evident. This is not the whole picture, however, as can be seen from the distribution pattern as shown in Fig. 2. In the region south of Botany Bay the individuals examined all fall into one or other of the two terminal

clusters as shown in Fig. 1, and if this area alone were taken into account the two groups could be considered as a pair of sympatric species. On the other hand, in view of the very extensive intergrading elsewhere it seemed best to recognise only a single species consisting of two subspecies, although these do not show a clear geographic replacement pattern. The subspecies may be recognised where applicable, but where this would not result in a workable classification the species may be taken as a whole. The nature of the apparently effective barrier in the southern region and the reason for its absence elsewhere are at present obscure. There is no difference in chromosome numbers (Briggs, 1965) or flowering period.

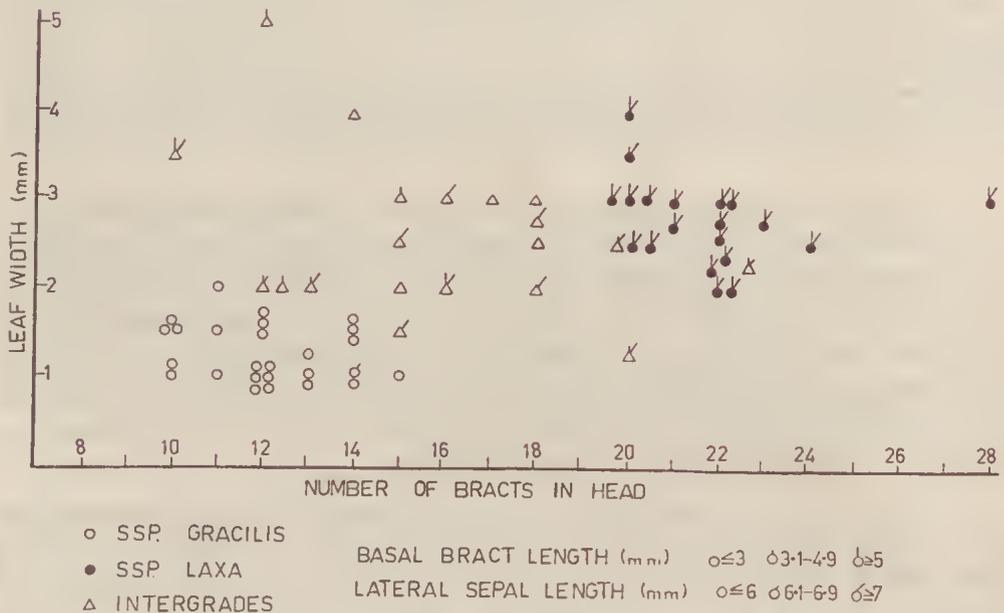


Fig. 1.—Variation in *X. gracilis*. For explanation see text.

Ecologically there is some difference in range of the subspecies but considerable overlap as mentioned below (p. 6). Furthermore there is little evident difference in the available conditions in the various parts of the geographic range.

Because of the complex variation and the confusion concerning the epithet "*bracteata*", the subspecies is described as new with a new Type, of which the exact locality and the chromosome number are known. *X. bracteata* is treated as a synonym but not the basionym of the new trinomial.



Fig. 2.—Distribution of *X. gracilis* in New South Wales. In addition to the localities shown, *ssp. gracilis* extends southward into Victoria.

Xyris gracilis R. Br., Prodr. Fl. Nov. Holl. (1810) 256; Kunth, Enum. Pl. IV (1843) 21; Hook. f., Fl. Tasman. II (1857) 69, excluding Tasmanian specimens; F. Muell., Fragm. Phytogr. Austral. VIII (1874) 204; Benth., Fl. Austral. VII (1878) 79, excl. var. *bracteata*; Nilss. in K. Svensk Vet.-Akad. Handl. n.s. XXIV, No. 14 (1891) 26, excl. var. *bracteata*†; Moore & Betche, Handb. Fl. N.S.W. (1893) 437; Rodway, Tas. Fl. (1903) 220, excl. Tasmanian material; Maiden & Betche, Census N.S.W. Pl. (1916) 38, excl. var. *bracteata*; Arber in Bot. Gaz. LXXIV (1922) 83, pl. II, fig. 17; Malme in Svensk Bot. Tidskr. XXI (1927) 381-399; Williamson in Vict. Nat. XLV (1928) 160, excl. fig.; Ewart, Fl. Vict. (1931) 262; J.H. Willis, Handb. Pl. Vict. (1962) 280; Beadle, Evans & Carolin, Handb. Vasc. Pl. Syd. Distr. (1963) 432. Further references will be found under the synonymy of ssp. *laxa*.

A complete specific description will be published in Contrib. N.S.W. Nat. Herb., Flora of New South Wales, No. 27.

1. Leaves narrow-linear, not exceeding 2 mm. wide. Flower-heads ovoid to ellipsoid; bracts 6-14, all closely appressed, the two at the base of the head not exceeding 3 mm. long. Flowers 1-4 in the head ssp. *gracilis* a.
- 1.* Leaves linear, 2-5 mm. wide. Flower heads subglobose; bracts 18-28, the two at the base 3-13 mm. long, lax. Flowers mostly 8-12 in the head ssp. *laxa* b.

The above key applies to typical representatives of the two subspecies; as pointed out above, intermediate plants will often be found showing different associations of characters.

a. ssp. *gracilis*.

TYPEFICTION: Brown's syntypes were from Victoria and Tasmania. They have not been examined but plants from Victoria correspond with the present application of the name whereas Tasmanian plants so far as is known do not (see below).

The type subspecies is characterised by the comparatively narrow flower heads with closely imbricate bracts and fewer flowers, together with uniformly very narrow leaves.

Leaves narrow-linear, 1-1.5 (-2) mm. wide, erect, rigid, often twisted. Peduncles terete, up to 60 cm. long, 0.5-1 mm. diam. Flower-heads ovoid to ellipsoid, 6-8 mm. long, 3-5 mm. wide; basal bracts closely appressed, the lowest pair 2-3 mm. long, the total number of bracts 6-14. Flowers 1-4 in the head. Lateral sepals not exceeding 6 mm. long, straight or slightly curved, the membranous wings each ca. 0.5 mm. wide. Anthers 1.5-2 mm. long. Seeds ca. 1 mm. long. Chromosome number $2n = 26$. Fl. summer.

DISTRIBUTION: Coast and Tablelands of New South Wales, eastern and southern Victoria, in sedge swamps on sandstone and similar rocks and in deep sandy soils near the margins of coastal swamps. The following specimens are considered typical of ssp. *gracilis*.

NEW SOUTH WALES: *Northern Tablelands*: Boonoo Boonoo, via Tenterfield, Knoetzsch 1.1885 (MEL); Timbarra, Stuart (?) (MEL). *North Coast*: Wardell, Constable 10.1961 (NSW 63267), 5.1964 (NSW 65116); S of Broadwater, Constable 5.1964 (NSW 64570); 1 mile W of Angouric, Green & Williams 11.1962 (NE); Coff's Harbour Airport, Green & Williams 10.1962 (NE); Coff's Harbour Airport, Constable 5.1964 (NSW 69451); Hastings R., Beckler (MEL); 2 miles SW of Lemon Tree Passage, Port Stephens, Johnson 4.1964 (NSW 69230); S of Nelson

† Nilsson cited a Port Jackson specimen under *X. gracilis* var. *bracteata* Benth. This presumably does not belong to that taxon, which is a Tasmanian plant (see p. 7), but I have not seen the specimen. The same applies to the specimen from Port Jackson cited by Rendle in Journ. Bot. XXXVII (1899) 501.

Bay on Stockton road, Evans 12.1961 (NSW 63140); Newcastle Racecourse, Cambage No. 608, 11.1901 (NSW 18334; SYD). *Central Coast*: Cowan, Evans 12.1963 (NSW 64314); Peat's road, Hornsby to Hawkesbury R., Deane 12.1884 (NSW 18327); Randwick, Betche 11.1881 (NSW 18335); near Long Bay Gaol, Evans 11.1932 (SYD); near La Perouse, Botany Bay, Evans 12.1925 (SYD), 12.1929 (SYD); S of Waterfall, on Prince's Highway, Evans & Constable 5.1964 (NSW 68719, 69453); junction of Prince's Highway and Darke's Forest road, Constable 2.1964 (NSW 64574); junction of Prince's Highway and Appin road, Constable 7.1963 (NSW 66918); near Bulli Lookout, Evans & Constable 5.1964 (NSW 68718); Thirlmere to Buxton, Evans 12.1962 (NSW 66926). *South Coast*: Bowen Is., Jervis Bay, Rodway 12.1925 (NSW 58324); Green Cape, Rodway 12.1920 (NSW 58326); Mt. Naghi, Naghi State Forest, Constable 8.1963 (NSW 64359). *Central Tablelands*: Clarence, Boorman 1.1901 (NSW 18331); Clarence, Constable 7.1963 (NSW 66134); Newnes Junction to Eskbank, Hamilton 11.1914 (NSW 18336); below Newnes Junction Station, Constable 6.1963 (NSW 66135); Bell, Constable 6.1964 (NSW 64604); near Mt. Irvine, Constable 4.1963 (NSW 63235); Mt. Victoria, Maiden 12.1896 (NSW 18333); near Mt. Boyce, Blackheath, Constable 12.1963 (NSW 63142); Blackheath, Evans 1.1928 (SYD); Blackheath, Constable 11.1963 (NSW 66546); Katoomba, Camfield 12.1908 (NSW 18328); Minnehaha Falls, Katoomba, Constable 8.1964 (NSW 65115); The Lake, Wentworth Falls, Constable 1.1964 (NSW 64016); Wentworth Falls, Burgess 1.1956 (NSW 35822); King's Tableland, Wentworth Falls, Hamilton 1.1915 (NSW 18339); Kanangra Walls, Sydney University Biological Soc. 4.1959 (SYD); Hill Top, Picton to Mittagong, Cheel 11.1911 (NSW 18337); Hill Top, Evans 1.1963 (NSW 63141); Mittagong, Dixon (NSW 18338); Upper Kangaroo R., SE of Robertson, Rodway 1.1943 (NSW 58323); Wingello, Boorman 12.1899 (NSW 18332). *Southern Tablelands*: Barber's Creek, Tallong, Rumsey 3.1899 (NSW 18340); Sassafras, Hadley, ex Herb. Rodway No. 3058, 1.1940 (NSW 58325); White Rock R., near Rockton, Constable 8.1963 (N.S.W. 64357); Genoa district, Bäuerlen 2.1885 (MEL).

VICTORIA: Herb. Mueller (MEL); Providence Ponds, Gippsland, Howitt 1882 (MEL); S. Gippsland, Lucas 1.1893 (MEL); Gippsland, Lucas 1.1884 (MEL); Emerald, McLennan 11.1904 (MEL); base of the Dandenong Ranges, Mueller 2.1875 (MEL); Port Phillip, Walter 12.1897 (NSW 18341); near Merton and Mordialloc, Reader (2 sheets) 1.1885, 3.1885 (MEL) (Note: the Merton locality, on the northern side of the Main Divide, seems doubtful).

Willis (1962) records the species also from near Portland and from the Glenelg River, but I have seen no material from western Victoria.

b. *ssp. laxa* O. Evans *ssp. nov.*

Folia linearia plana acuminata, 2–5 mm. lata, marginibus scabridulis. Pedunculi teretes vel angulati, 1–2 mm. diametro. Capitula subglobularia, circiter 1 cm. longa, 0.7–0.8 cm. crassa (corollis bracteisque longis exceptis); bractee 18–28, basilares laxae, scariosae, 2 infimae 4–13 mm. longae, oblongae vel lineares, saepe pallidae et conspicuae. Flores 8–12. Sepala lateralia 6–8 mm. longa, recta vel paulo curvata, ala unaquaque membranacea circiter 0.5 mm. lata. Antherae 2–2.5 mm. longae. Scmina 1–1.5 mm. longa. Chromosomata somatica $2n = 26$.

HOLOTYPE: 1 mile NW of Marley Beach, Royal National Park, N.S.W., B. G. Briggs 9.12.1961 (NSW 57708).

Leaves linear, flat, acuminate, 2–5 mm. wide, margins scabridulous. Peduncles terete to angular, 1–2 mm. diam. Flower-heads subglobose, ca. 1 cm. long, 0.7–0.8 cm. thick (omitting corollas and long bracts); bracts 18–28, the basal ones lax, scarios, the lowest two 4–13 mm. long, oblong to linear, often pale and conspicuous. Flowers 8–12 in the head. Lateral sepals 6–8 mm. long, straight or slightly curved, the membranous wings each ca. 0.5 mm. wide. Anthers 2–2.5 mm. long. Seeds 1–1.5 mm. long. Chromosome number $2n = 26$. Fl. summer. *X. bracteata* R. Br., Prodr. (1810) 256; Kunth, Enum. Pl. IV (1843) 21; Rendle in Journ. Bot. XXXVII (1899) 503; Malme in Svensk Bot. Tidskr. XXI (1927) 384; non *X. gracilis* R. Br. var. *bracteata* Benth., Fl. Austral. VII (1878) 79. Type of *X. bracteata* from Port Jackson in BM, not seen, but clearly this subspecies from the description; probable isotype in MEL which agrees with Brown's description and with the present subspecies (B. G. Briggs, pers. comm).

The subspecies is characterised by the larger flowerheads with more numerous bracts and flowers, the lax and often elongated sterile basal bracts and the wider leaves.

DISTRIBUTION: Central Coast and northern part of the South Coast of New South Wales, in damp soil, commonly in heathland. The following specimens are considered typical of ssp. *laxa*.

NEW SOUTH WALES: Sieber No. 427, Fl. Nov. Holl. (MEL); Brown, Iter Austral. 1802-5, 2 sheets (MEL). *Central Coast*: Mt. Colah, Salasoo No. 1512, 1.1957 (NSW 58322); Manly, Siegert 12.1884 (MEL); Mosman, Chapman 11.1906 (SYD); Kogarah, Camfield 11.1896 (NSW 18343); Kurnell, Constable 12.1962 (NSW 66058); Loftus, Camfield 1896 (NSW 18346); Loftus, Constable 7.1963 (NSW 66920); Loftus, Evans & Constable 5.1964 (NSW 68716); Port Hacking, Hamilton 1.1909 (NSW 18344); Bundeena, Green 11.1960 (NE); 1 mile NW of Marley Beach, Briggs 12.1961 (NSW 57708) HOLOTYPE; near Flat Rock, Royal National Park, Constable 2.1964 (NSW 64568); Waterfall, Camfield 1.1899 (NSW 18342); Prince's Highway, S of Waterfall, Evans & Constable 5.1964 (NSW 64569); Stanwell Park to Otford, Salasoo No. 1282, 12.1954 (NSW 30940); N of Sublime Pt., W of Austinmer, Constable 7.1963 (NSW 66919); Bulli, near junction of Prince's Highway and Appin road, Evans & Constable 5.1964 (NSW 68717). *South Coast*: Currarong, N of Jervis Bay, Briggs 12.1963 (NSW 64378); Long Beach, Jervis Bay, Briggs 12.1963 (NSW 64405).

INTERMEDIATE FORMS

The intermediate forms are mostly characterised by the wider leaves of ssp. *laxa* but the number of flowers and bracts in the head is both intermediate and variable, sometimes on the same plant. The lowest pair of sterile bracts are short, rarely exceeding 5 mm., and vary from relaxed to appressed. The lateral sepals vary in length from 6 to 8 mm. Examination of the anthers indicated variation in length and shape.

The following specimens are considered to represent intermediate forms.

NEW SOUTH WALES: *North Coast*: Red Rock to Corindi, Constable 5.1964 (NSW 64429). *Central Coast*: Putty road, 69 miles S of Singleton, Constable 7.1963 (NSW 64617); Bilpin to Bowen's Creek road, Constable 7.1964 (NSW 64684); Linden, Constable 4.1963 (NSW 63120), 11.1963 (NSW 67129); Linden, Evans 12.1963 (NSW 69269); Cowan to Jerusalem Bay, Evans 12.1963 (NSW 64313); Cowan, Kuring-gai Chase, Evans 12.1963 (NSW 64312), 5.1964 (NSW 68720, 68721, 68722); West Head road, Kuring-gai Chase, Evans 12.1956 (SYD), 12.1963 (NSW 66790, 66921); old Bobbin Head road, Kuring-gai Chase, Evans 5.1964 (NSW 64407); beside fire-trail, Mona Vale road to Cowan Creek, Evans 5.1964 (NSW 64410); Wahroonga, Cambage 12.1913 (SYD); Narrabeen, Fraser & Vickery 12.1933 (SYD); Cheltenham, Johnson 11.1946 (NSW 15591); Killara, Rainbow 12.1928 (NSW 18330); Oxford Falls road, Constable 4.1963 (NSW 63229); Castle Cove, McKee 5.1942 (SYD); Oatley, Camfield 12.1896 (NSW 18345). *Central Tablelands*: 2 miles S of Bodington Homes, King's Tableland, Wentworth Falls, Constable 1.1964 (NSW 64015), 2.1965 (NSW 73618).

Observations have so far indicated that ssp. *gracilis* extends deep into sedge swamps and grows elsewhere only in wet ground, while ssp. *laxa* appears to avoid the more crowded swamp conditions and extends from swampy places and ground liable to flooding into heath. However, plants of intermediate character with broad leaves have been collected in the heart of dense sedge swamp and also under comparatively dry conditions in heath on higher ground not very far away.

TASMANIAN SPECIES WHICH HAVE BEEN CONFUSED WITH

X. GRACILIS

X. gracilis has been reported from Tasmania by various authors (see references p. 4); however, from the collections in the Sydney and Melbourne herbaria, there is no record of its occurrence there; the true *X. gracilis* with its two subspecies

appears to be confined to the mainland of Australia. There appear to be three taxa in Tasmania which at one time or another have been confused with *X. gracilis*. These are as follows.

1. Species "A". This resembles the mainland *X. gracilis* ssp. *gracilis* in general appearance, but differs in the lateral sepals which have very much broader wings and, to a varying degree, in several other respects, e.g. the flower heads may be subglobular, the fertile bracts then short, broad and very convex. The outer (sterile) bracts may be lax. The chromosome number of $2n = 52$ (Briggs, 1965) differs from those known for both of the subspecies of *X. gracilis* in being at the tetraploid level. Consequently there seems to be a good case for treating it as a distinct species.

SPECIMENS EXAMINED: Tasmania: Heaths at Circular Head, Mueller 2.1875 (MEL); Detention Corner, Gunn No. 1389 p.p., 2.1845 (NSW 20462); ca. 4 miles S of Smithton on Edith Creek road, Johnson 1.1965 (NSW 77849); Hente Siding, near Strahan, Davis No. 9095, 1.1937 (NSW 58327); West Montagu, per Martin 7.1965 (NSW 76396, 76397, 76398).

2. *X. muelleri* Malme in Svensk Bot. Tidskr. XXI (1927) 381-383; *X. gracilis* var. *bracteata* Benth., Fl. Austral. VII (1878) 79 (non *X. bracteata* R. Br.).

TYPIFICATION: *X. muelleri* is based on *X. gracilis* var. *bracteata*, which was cited by Malme in synonymy at the head of his description. Bentham cited: South Port, Tasmania, C. Stuart; between Circular Head and Arthur River, F. Mueller. Malme cited: Heaths at Circular Head (F. von Mueller); South Port (Stuart sec. Bentham). Dr R. Melville has kindly examined Bentham's type material at Kew and reports that the Stuart specimen belongs to the species dealt with hereunder. Sheets labelled "Heaths at Circular Head, Contributor Baron von Mueller", and "Tasmania, F. Mueller, Herb. F. Mueller 1877" also belong to this species, but in view of the discrepancy in wording it is not certain that these are syntypes. Although Bentham's description is brief, Malme's description indicates that he had the present species in mind. Mueller's collections from "Circular Head" and "Circular Head to Arthur's River" in MEL and NSW include specimens not only of this species but also of species "A" and *X. marginata* (see specimens listed herein under the respective species). Since there is no confusion about the South Port specimen of Stuart this is, in accordance with Dr Melville's suggestion, here selected as LECTOTYPE.

This species is clearly distinguished from both *X. gracilis* and species "A" by the outer, sterile bracts which are lanceolate, acuminate, acute, lax, more than half as long as the subglobose flower-head, often with a distinct ridge or midvein on the outer surface towards the apex. It also differs from *X. gracilis* ssp. *gracilis* and species "A" in the leaves which may be 3 mm. wide or reduced to sheaths. Chromosome number $2n = 26$ (Briggs, 1965).

SPECIMENS EXAMINED: Tasmania: Heaths at Circular Head, Mueller (NSW 18382); Detention Corner, Gunn No. 1389 p.p., 2.1845 (NSW 69758); Murchison R. valley, near Tullah, Johnson 1.1965 (NSW 77848); 7 miles from Queenstown on road to Strahan, Phillips 1.1962 (NSW 63119); Strahan, Johnson 1.1949 (NSW 18381).

3. *X. marginata* Rendle in Journ. Bot. XXXVII (1899) 503. Although more closely related to *X. operculata* Labill., this has been confused with members of the *X. gracilis* group. On closer examination it is seen to differ markedly. The margins of the lateral sepals are broad and are fimbriate throughout, especially towards the apex. The outermost, sterile bracts are oblong, 4-5 mm. long by ca. 2 mm. broad, passing into the form of the fertile bracts. The ovary has an enlarged, rounded, hardened apex, somewhat resembling that of *X. operculata*. The species is also readily distinguished by the comparatively smooth margin of

the leaf; in transverse section the epidermis is undifferentiated at the margin whereas in the *X. gracilis* group there is a clearly marked marginal zone, with much more thickly cutinised epidermal cells often bearing projections. No chromosome count has been reported on this species.

SPECIMENS EXAMINED: *Tasmania*: Heaths between Circular Head and Arthur R., 2.1875 (MEL); Cradle Valley, Weindorfer 1.1914 (NSW 18380); Strahan, Rodway No. 2710, 12.1892 (NSW 18379); Hobartton, Le Grand (MEL); near Mt. King William, Rodway 12.1917 (NSW 58345); La Perouse, Rodway No. 9100, 12.1898 (NSW 58350); peat soil, Tasmania (MEL); Mt. Counsel, Port Davey area, Davis No. 1466, 3.1954 (MEL).

Most of the specimens cited from MEL were examined by Dr B. G. Briggs, using the criteria adopted in this paper.

ACKNOWLEDGEMENTS

My thanks are due to Mr. John Lewis of the British Museum (Natural History) for valuable criticism of and suggestions upon an early draft of this paper, although he does not agree with all my conclusions. I also wish to thank Mr. L. A. S. Johnson of the National Herbarium of New South Wales for readily giving advice and help on many occasions, to Dr. Barbara Briggs and Miss S. Close for preparing the accompanying figures, and to Dr. Briggs further for examining and reporting on specimens in Melbourne. Mr. D. McGillivray kindly assisted by preparing anatomical sections of leaves and stems. Thanks are also due to the Director of the National Herbarium, Melbourne, for the opportunity to examine specimens and for assistance in other ways, and to Mr. J. B. Williams of the Botany Department, University of New England, for supplying information; to Dr. R. C. Carolin, Curator of the Herbarium, School of Biological Sciences, University of Sydney for consultations and loan of specimens and to Mr. E. F. Constable, Botanical Collector, National Herbarium, New South Wales for diligent collecting of much living and herbarium material.

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Bleeser Specimens in the National Herbarium of Victoria, with some Notes on their Collector

J. H. WILLIS*

As a complement to Dr H. S. McKee's paper "The Bleeser Botanical Collection from Northern Australia" (Contrib. N.S.W. Nat. Herb. III, No. 4 (1963) 233-234), it is appropriate to record also in this journal the few type numbers among F. A. K. Bleeser's collections that are housed at the National Herbarium, Royal Botanic Gardens, Melbourne.

At the end of 1928 or early in 1929, the then Government Botanist of Victoria (Mr. F. J. Rac) received as a donation 102 numbers of North Australian specimens from Bleeser. These embraced 99 species, including 9 of *Acacia* 4 of *Eucalyptus* and 4 of *Calophyllum*. The date given on all of the herbarium labels (Nov. 1929) is the date of incorporation, not of collection which is unknown in most cases.

Eight of these numbers represent duplicate types of species described by O. Schwarz in 1927, half of which were not cited among the holdings at Sydney; a ninth number is the duplicate type of a grass described by R. Pilger (also in 1927):

- Bleeser 244. Duplicate of a syntype number of *Cynanchum dichasiale* Schwarz (also in Herb. NSW). Referable to *Secamone elliptica* R. Br.—teste S. T. Blake.
- Bleeser 297. Duplicate of type number of *Sideroxylon portus-darwinii* Schwarz (also in Herb. NSW). Referable to *Planchonella arnhemica* (F. Muell.) Royen—teste P. van Royen.
- Bleeser 332. Duplicate of type number of *Alectryon bleeseri* Schwarz (also in Herb. NSW). Referable to *Cupaniopsis anacardioides* (A. Rich.) Radlk.—teste S. T. Blake.
- Bleeser 421. Duplicate of a syntype number of *Osbeckia koolpinyahensis* Schwarz (also in Herb. NSW). Referable to *Osbeckia australiana* Naudin—teste Sydney Herb.
- Bleeser 456. Duplicate of type number of *Acacia lamprocarpa* Schwarz.
- Bleeser 479. Duplicate of type number of *Acacia pellita* Schwarz.
- Bleeser 502. Duplicate of a syntype number of *Calophyllum ramiflorum* Schwarz.
- Bleeser 536. Duplicate of type number of *Eriachne bleeseri* Pilger.
- Bleeser 544. Duplicate of a syntype number of *Capparis citrifera* Schwarz.

Of the 102 Bleeser numbers received at Melbourne Herbarium in 1929, two are now missing—viz 312 *Bacopa floribunda* (R. Br.) Wettst., and 548 *Litsea tersa* (L.) Merrill. In addition, however, there is a donation from Sydney Herbarium of *Eucalyptus bleeseri* Blakely, collected by Bleeser near Darwin in Feb. 1927, but it is without a number and is not the type, also a Darwin specimen determined in Berlin by Professor Engler (July 1925) as "*Typhonium oblongifolium*"—a name that appears never to have been published.

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Dr McKee (l.c.) concluded his paper with the remark "Little appears to be known of Bleeser who must have been a keen and competent collector". In 1956 Bleeser's widow (Mrs. A. M. Bleeser of Malvern, South Australia) kindly supplied the present writer with a number of personal details which fill many gaps in our imperfect knowledge of this worthy naturalist. The following biographical notes aim to set on record something of the background of F. A. K. Bleeser and of his later activities in the Northern Territory.

Florenz August Karl Bleeser was born at Woodside, South Australia, on 5th July, 1871. His father was of Polish descent, and at the early age of 15 or 16 Bleeser senior is believed to have accompanied Dr Richard M. Schomburgk during that botanist's exploratory journeys in British Guiana (1840-44), the boy's especial duty being to assist with the pressing and storing of the plant specimens collected. But it is singular that Dr Schomburgk should make no mention of this fact, nor even of Bleeser's name, in his "*Botanical Reminiscences of British Guiana*" (a 90-page brochure published at Adelaide in 1876). The mother was a native of Alsace-Lorraine where, as an early orphan, she had been brought up and educated in the Prime Minister's home.

When quite young, F. A. K. Bleeser was placed in the South Australian Postmaster-General's Department. Finding the prospects for a junior employee rather unpromising, he sent in his resignation when still only 18; but the Department countered by offering him promotion if he would transfer to Darwin, and Bleeser gladly accepted the proposition. So, in 1889, began a career in the Darwin Post Office that was to last for 52 years—long after his statutory retirement as Postmaster in 1936. During that half century he put his spare time to good account by collecting and studying the specimens of natural history over much of the Northern Territory. As the late Charles L. Barrett observed, in "*Koonwarra*" (1939) 229-32:

"He had been everywhere in the North, from the west coast to Arnhem Land; and to the Aru Islands in a lugger. He was familiar with the plants and animals . . . He knew the haunts and habits of aboriginal tribes, having, in his younger days, made boat voyages around the coast, and trips overland through unexplored country."

C. P. Mountford also paid this tribute in the *Adelaide Advertiser* of 18th May 1956:

"Although Bleeser was forced, by circumstance, to live the humdrum life of a civil servant, when he would have made his greatest contribution in a science laboratory, he added, more than any man, to the store of knowledge of the natural history around Darwin.

"Perhaps one of the greatest contributions was the hospitality and help which both he and his wife gave to visiting scientists."

Many scientists indeed benefited from the knowledge and companionship of Mr Bleeser, not the least being Dr Hubert Lyman Clark of the Museum of Comparative Zoology at Cambridge, Mass., U.S.A., during his two lengthy visits to Darwin for the purpose of studying sea-urchins (Echinoidea).

Bleeser sent some of his first plant collections for identification to Kew, also to Melbourne, but received no response from either herbarium. Finally, in the mid-1920's, he submitted samples to Berlin, where Dr L. Diels expressed immediate interest and wrote personally to encourage further collection. The duplicate specimens and records held at Darwin were carefully housed in zinc-lined cupboards in a small cottage, built as a private museum in Bleeser's garden.

On 19th February, 1942, following the first Japanese air raid on Darwin, Bleeser and his wife were compulsorily and hastily evacuated with other civilian inhabitants, while military personnel took over the town. They were obliged to move off within a few hours and to take only 35 lbs of luggage. Bleeser's valuable natural history collections and bush-house of growing orchids were left to the mercy of looters who soon destroyed everything of no immediate use to them; none of his botanical material survived. He was never well after leaving Darwin, and no doubt his crushing losses served to hasten his demise in Adelaide later that year (1st November, 1942).

All photographs having been left behind and lost in Darwin, the only existing portrait of Mr Bleeser would seem to be an informal snapshot by Charles Barrett. This was published in the *Victorian Naturalist* L (1933) 184, t. 25, in connection with Bleeser's discovery of a rare tropical orchid that is now considered referable to *Chiloschista phyllorhizus* (F. Muell.) Schlechter. Very probably other references to his natural history interests and achievements lie buried among files of the two Darwin newspapers, *Northern Standard* and *Northern Territory Times*, but the writer has not been able to make the necessary search.

Besides *Eucalyptus bleeseri* Blakely, the discoverer's name is also perpetuated in those of two grasses, *Eragrostis bleeseri* Pilger and *Eriachne bleeseri* Pilger.

A New Species of *Agrostis* from the Australian Alps

JOYCE W. VICKERY

Agrostis meioneetes J. Vickery, n. sp.

Gramen annuum (?), parvum, caespitosum, glabrum, ca. 10–30 cm. altum, situs alpinos vel subalpinos humidos mucosos incolens, ad vel prope basin ramosum innovationibus plerumque intravaginalibus, aliquando extravaginalibus. Culmi graciles, teretes, tenuiter denseque scabri, nodis glabris, internodis inferioribus quam vaginas brevioribus. Vaginae deorsum strictae sursum paullo laxae, tenues, striatae, laeves vel minute scabridae. Ligula membranacea, usque ad 5 mm. longa, acuta vel acuminata vel ultimo laciniata. Laminae planae vel plicatae, tenues, 1–7 cm. longae, 0.75–2.5 mm. latae explanatae, ad apices acuminatae diminutae, tenuiter striatae, 3–7-nervatae, laeves vel praesertim prope vaginas et ad carinas prope apices sparsim et tenuiter scabrae. Panicula in pedunculo scabrido breviter exserta, patens, pyramidalis, usque ad 10 cm. longa lateque, ramis subcapillaribus plus minusve rigide divergenterque patentibus 2–4-nodis, inferioribus 2–5-natis, superioribus 1–2-natis; rami supra basin divisi; rami, ramulique pedicellique tenuiter scabri. Spiculae ad ramulos terminales, plus minusve divergentes, in pedicellis tenuibus clavatis 0.5–3 mm. longis, purpurascentes vel stramineae. Glumae persistentes, divergentes, subaequales vel inferior quam superiorem longior, 3–3.5 mm. longae, acutae vel acuminatae, tenues marginibus hyalinis, lemma excedentes, sursum carinatae, ad carinas tenuiter scabrae, ad latera laeves vel tenuiter scabrae, 1-nervata vel superior 1–3-nervata. Lemma 2–2.5 mm. longum, oblongo-lanceolatum, anguste truncatum dentibus 4 minutis, tenue, hyalinum, obscure 5-nervatum, pilis plus minusve appressis 0.4 mm. longis tenuiter laxaeque vestitum, in dorso ex media arista lemma aequanti vel longitudine lmmatis lemma excedenti recta vel vix geniculata. Palea quam lemma paullo brevior, tenuis, hyalina, 2-carinata, marginibus quam interstitium laterioribus. Lodivuli hyalini. Anthrae 3, ca. 0.75–1 mm. longae, flavascentes. Ovarium stigmatibus duobus plumosis ad margines apicis anguste truncate. Caryopsis oblonga, utrimque ad latera, paullo sulcata, quam embryonem quadruplo longior. Rhachilla supra lemmata producta, praesertim sursum pilosa.

HOLOTYPE: *New South Wales*: Lake Cootapatamba, Kosciusko, 6800 feet, in moist places, amongst *Plantago*, L.A.S. Johnson & E. F. Constable 24.1.1951 (NSW 15995).

Small, densely tufted, glabrous annual (?) ca. 10–30 cm. high, inhabiting alpine and subalpine, moist, mossy sites, branching at or near the base, the shoots mostly intravaginal, occasionally extravaginal. Culms slender, terete, finely and closely scabrous, about 3-noded above the base, the lower internodes shorter than the sheaths, the nodes glabrous. Sheaths close around the culms below, becoming slightly loose upwards, thin, striate, smooth or minutely scabrid. Ligule membranous, up to 5 mm. long, acute or acuminate or at length laciniate. Blades flat or folded, thin, 1–7 cm. long, 0.75–2.5 mm. wide when flattened, tapering to an acuminate apex, finely striate with 3–7 nerves, smooth or lightly and finely scabrous especially on the margins near the sheath and on the keel towards the apex. Panicle shortly exserted on the scabrid peduncle, open, pyramidal at maturity, up to about 10 cm. in length and width with delicate, sub-capillary, but more or less rigidly divergently spreading branches in about 2–4 tiers, the lower 2- to 5-nate, the upper

solitary or 2-nate on the main axis; each branch divaricately dividing again about 0.5–3 cm. from its base to the first to third degree, the branches and pedicels finely scabrous. Spikelets borne at the ends of the branches on more or less divergent, slender, clavate pedicels 0.53 mm. long, purplish to straw-coloured. Glumes persistent, divergent, subequal or the lower slightly exceeding the upper, 3–3.5 mm. long, acute to acuminate, thin, with hyaline margins, exceeding the lemma, keeled upwards, lightly scabrous on the keel, smooth or lightly scabrous on the sides, 1-nerved or the upper 3-nerved. Lemma 2–2.5 mm. long, oblong-lanceolate, narrowly truncate and erose with 4 minute teeth, thin and hyaline, rather thinly and loosely clothed with more or less appressed hairs about 0.4 mm. long, obscurely 5-nerved, with a dorsal awn from barely exceeding the lemma to exceeding it by as much as the length of the lemma and straight to slightly geniculate. Palea about four-fifths as long as the lemma, thin and hyaline, 2-keeled with the margins broader than the intercarinal space. Lodicules hyaline. Stamens 3 the anthers about 0.75 mm. long, yellow. Ovary with 2 feathery stigmas at the edges of the narrowly truncate apex. Grain oblong, slightly furrowed on both sides, the embryo barely one-quarter of its length. Rhachilla produced beyond the floret, hairy, especially upwards.

NEW SOUTH WALES: Carruther's Peak (Kosciusko Plateau), 6350 feet, M. Mueller No. 2938, 5.2.1955 (NSW 71142); Cooma district (but probably from the adjacent mountains), A. C. Taylor 20.3.1953 (NSW 71143); Mt. Kosciusko, near Siemens Hut, alpine herbfield, D. Wimbush 2.1959 (CANB 63715); near Rennix Gap, Mt. Kosciusko, N.T. Burbidge 23.2.1955 (CANB 36033).

VICTORIA: Mt. Buffalo National Park (at \pm 4500 feet), on damp mossy ground beside Crystal Brook, in vicinity of "Tucker-Box" corner, J. H. Willis 21.2.1963 (MEL; NSW 71141).

A. meionectes has the general appearance of an annual but some specimens, especially the Holotype, have some vertical stems at the base with occasional extravaginal buds at the same time as the older culms are bearing inflorescences; this is not entirely inconsistent, however, with an annual growing up through peat or moss. More information regarding its biology is needed.

When first seen I was inclined to regard *A. meionectes* as merely a depauperate plant of *A. aemula* but with the accumulation of collections all manifestly alike from various parts of the Australian Alps there seems no reason to doubt that it should be regarded as a distinct taxon.

From *A. aemula* R. Br. and *A. avenacea* Gmel. it differs in its small stature, the fine short leaves, small panicle, and shorter and not or only slightly geniculate awn.

From *A. preissii* (Nees) J. Vickery of Western Australia it differs in the short and more stiffly divergent panicle branches, scabrous peduncle and internodes, shorter and not or only slightly geniculate awn, and longer anthers.

Algae of the Gilbert Islands

VALERIE MAY

The following algae were collected by Mrs. R. Catala during a trip to the Gilbert Islands in March to July, 1951. The Myxophyceae were kindly identified (in 1951) by Dr Francis Drouet of the Academy of Natural Sciences, Philadelphia, U.S.A., to whom I am greatly indebted. Mrs. Catala reports that some of these Myxophyceae are used by local inhabitants of the Islands in the preparation of the drink Toddy.

The collections are numbered in two series. The collection which consists mainly of Myxophyceae is numbered 1-24, and locations are given in the paper for this group. The Marine Collection is numbered 1-64. The locations for this series are as follows: Nos. 1-30 and 56-64 came from Tarawa Atoll, while Nos. 31-55 came from Abemanna. A few species of Chlorophyceae were collected among the Myxophycean numbers and are here recorded among other Chlorophyceae, while Nos. 47, 48 and 51 of the Marine Collection are here recorded under the Myxophyceae.

The species are recorded alphabetically under the headings Myxophyceae, Chlorophyceae, Phaeophyceae and Rhodophyceae respectively.

The specimens cited form part of my herbarium, located at the National Herbarium of New South Wales, Sydney.

MYXOPHYCEAE

Nos. 3-8 are from Bonriki Atoll, 21.3.1951; Nos. 9-16 are from Butaritari Atoll, 7.4.1951.

COLLECTED FROM WELL WATER:

Phormidium tenue (Menegh.) Gom.; un-numbered.

COLLECTED IN MARINE COLLECTION:

Calothrix pilosa Born. & Flah.; Nos. 48, 51.

Symploca hydrinoides Gom.; No. 47.

COLLECTED FROM TIDAL FISH PONDS:

Agmenellum quadruplicatum (Menegh.) Breb.; Nos. 4, 5, 11.

Anacystis dimidiata (Kuetz.) Dr. & Daily; Nos. 4, 5, 18.

Anacystis montana (Lightf.) Dr. & Daily; Nos. 5, 10.

Anacystis thermalis (Menegh.) Dr. & Daily; Nos. 4, 5, 10.

Coccochloris elabens (Breb.) Dr. & Daily; No. 23.

Lyngbya semiplena (Ag.) J. Ag.; Nos. 4, 5, 12, 17.

Lyngbya versicolor (Wartm.) Gom.; Nos. 4, 5.

Oscillatoria nigro-viridis Thw.; Nos. 4, 5.

Plectonema nostocorum Born.; Nos. 3, 4, 5, 6, 11, 17, 23.

Schizothrix lacustris A. Br.; Nos. 23, 24.

Spirulina subsalsa Oerst.; Nos. 4, 5.

COLLECTED ON ROCKS INLAND:

Anacystis montana (Lightf.) Dr. & Daily; No. 16.

Anacystis thermalis (Menegh.) Dr. & Daily; No. 16

Lyngbya semiplena (Ag.) J. Ag.; No. 16.

Oscillatoria nigro-viridis Thw.; No. 16.

CHLOROPHYCEAE

Bryopsis harveyana J. Ag.; No. 45.

Bryopsis plumosa (Huds.) Ag.; No. 62.

Caulerpa peltata Lamour. emend. W. v. B. var. *nummularia* (Harv.) W. v. B.; Nos. 17, 21.

Caulerpa serrulata (Forsk.) J. Ag. emend. Borgs.; No. 64.

Caulerpa serrulata var. *boryana* (J. Ag.) Gilbert; Nos. 2, 34.

Cladophora sp.; No. 37.

Codium sp.; No. 35.

Dictyosphaeria favulosa (Mert.) Decne.; Nos. 4, 12, 27, 28.

Enteromorpha sp., probably *E. intestinalis* (L.) Link; Nos. 13, 22, 39.

Gloeocystis grevillei (Berk.) Dr. & Daily; un-numbered, in Myxophycean collection; from freshwater pond. Kindly determined by Dr F. Drouet.

Halimeda macroloba (Decne.) Bart.; No. 33.

Halimeda sp.; No. 32.

Microdictyon umbilicatum (Velley) Zan.; No. 36.

Neomeris van-bosseae Howe; No. 58.

Palmogloea protuberans (Sm. & Sow.) Kuetz.; in Myxophycean Collection, Nos. 8, 13, 21, 22, 23. Kindly determined by Dr F. Drouet.

Protococcus grevillei (Ag.) Crouan; in Myxophycean Collection, No. 13. Kindly determined by Dr F. Drouet.

Rhizoclonium hieroglyphicum (Ag.) Kuetz.; in Myxophycean Collection, Nos. 18, 19, 20. Kindly determined by Dr F. Drouet.

Struvea delicatula Kuetz.; No. 8.

Udotea orientalis A. & E.S. Gepp; No. 7, 38.

Ulva lactuca L.; No. 31.

Valonia aegagropila Ag.; No. 26.

PHAEOPHYCEAE

Ectocarpus sp.; No. 43.

Notheia anomala Bail. & Harv.; on *Turbinaria* sp., No. 1.

Turbinaria conoides Kuetz.; No. 63.

RHODOPHYCEAE

- Centroceras clavulatum* Mont.; No. 18.
Ceramium gracillimum Griff. & Harv.; No. 30.
Chondria sp.; Nos. 11, 29.
Endosiphonia spinuligera Zan.; Nos. 10, 15.
Hypnea pannosa J. Ag.; Nos. 23, 59.
Jania sp., probably *J. rubens* (L.) Lamour.; Nos. 6, 24.
Laurencia obtusa (Huds.) Lamour.; No. 14.
Peyssonnelia gunniana J. Ag.; Nos. 42, 52.
Pterocladia pinnata (Huds.) Pap. (formerly known as *P. capillacea* (Gmel.)
Born. & Thur.); No. 25.

Further Records of Algae from New Caledonia Collected by Mrs. R. Catala

VALERIE MAY

In 1953 I presented a list of Algae from New Caledonia, collected by Mrs. R. Catala (Contrib. N.S.W. Nat. Herb. II (1953) 38-66). The present paper records some twenty-three additional species that have now been recognised amongst nearly 150 further collections.

My earlier paper recorded collections numbered from 1 to 346. The present paper records collections numbered 337 and from 348 to 478. The dates of collection and detailed locations are as follows:—

<i>Number</i>	<i>Collection Data</i>
337	Ilot du Grand Mato, 18.5.1950.
348-409	Ile Pott, 6.1950:
348-362	East coast.
363-376	West coast.
377-399 and 443	South coast.
400-409	North coast.
410-442	200 Km. south of Ilot Tilguit:
410-418	Poindimie, 19.8.1950.
419-442	Ponerihouen, 20.8.1950.
444-478	New Caledonia, Oct.-Nov. 1950.

The species are recorded alphabetically under the four headings: Chlorophyceae, Phaeophyceae, Myxophyceae and Rhodophyceae.

In my earlier paper I pointed out certain similarities in the algal flora of New Caledonia and that of Brampton Island, Queensland. It is of interest to note now that three of the species recorded in the present paper have also been recorded from Brampton Island, viz. *Hormiothamnion solutum*, *Dictyosphaeria cavernosa* (Synonym: *D. favulosa*), and *Peyssonnelia gunniana*.

I am most grateful to Dr Francis Drouot of the Academy of Natural Sciences, Philadelphia, U.S.A., who has identified (in 1951-2) the Myxophyceae in this collection. I am also indebted to Dr George Papenfuss, University of California, U.S.A., Dr P. C. Silva, University of Illinois, U.S.A., Dr Yukio Yamada, Hokkaido University, Japan, and Miss C. I. Dickenson, Royal Botanic Gardens, Kew, England, who have been kind enough to examine certain specimens and whose opinions are recorded here regarding Nos. 337, 386, 440 and 442.

The specimens cited form part of my herbarium, located at the National Herbarium of New South Wales, Sydney.

CHLOROPHYCEAE

Acetabularia dentata Solms-Laubach; No. 402.

Bryopsis harveyana J. Ag.; Nos. 361, 368, 374.

Caulerpa fastigiata Mont.; No. 358.

Codium arabicum Kuetz.; No. 386. Kindly identified by Dr P. C. Silva in a letter dated Feb., 1952.

Dictyosphaeria cavernosa (Forsk.) Borgs. (Synonym: *D. favulosa* Decne); No. 387.

Microdictyon umbilicatum (Vellay) Zan.; Nos. 353, 454.

Ulva fasciata Delile; No. 477.

PHAEOPHYCEAE

Sargassum sp. near *S. corrifolium* J. Ag., but perhaps not quite referable to this species in the opinion of Dr Y. Yamada in a letter dated Nov. 1951; No. 442.

Spacilaria furcigera Kuetz.; No. 463.

MYXOPHYCEAE

Hormothamnion enteromorphoides Born. & Flah.; No. 464.

Hormothamnion solutum Born. & Flah.; No. 404.

Hydrocoleum cantharidosmum Gom.; Nos. 364, 406.

Lyngbya confervoides Gom.; No. 362.

Lyngbya sordida Gom.; No. 395.

RHODOPHYCEAE

Actinotrichia fragilis (Forsk.) Borgs. (Synonym: *A. rigida* (Lamour.) Decne.); No. 423.

Amphiroa anceps (Lamour.) Decne.; No. 421.

Carpopeltis multicornis (Kuetz.) D.T.; No. 411.

Champia parvula (Ag.) Harv.; No. 373.

Melanthalia obtusata (Labill.) J. Ag.; No. 467.

Martensia flabelliformis Harv.; Nos. 365, 457.

Peysonnelia gunniana J. Ag.; Nos. 367, 413.

Thysanocladia serrata Harv. Identification checked by Miss C. Dickenson in a letter dated Feb. 1952. No. 440.

Vanvoorstia sp. In a letter dated Sept. 1950, Dr G. F. Papenfuss discussed this species and suggested that it is possibly allied to a South African species of *Vanvoorstia*. No. 337.

New Taxa of *Acacia* from Eastern Australia. No. 1

MARY D. TINDALE

SUMMARY

Three new species of *Acacia* (Family Mimosaceae) from New South Wales are described. *A. fulva* and *A. chrysotricha* are bipinnate wattles of the *A. decurrens* (Wendl.) Willd. group. *A. saliciformis* is a phyllodinous species closely related to *A. mabellae* Maiden.

Acacia fulva Tindale, sp. nov.

Acaciae mollifoliae affinis, sed differt: foliolis acutissimis, anguste lanceolatis, ovatis vel anguste lanceolato-oblongis, ramulis breviter et dense lanatis, rhachide prope basin omnium pinnarum parium glandulis 1-2 approximatis, etiam in media rhachide inter pinnarum paria glandulis 1-2 approximatis, minimis, interjugalibus, depresso-sphaericis ornata, corolla et calyce pilis longis albis sinuatis vestito, leguminibus inter semina saepe minus constrictis.

Allied to *Acacia mollifolia* but differing in the following ways: pinnules very acute, narrowly lanceolate, ovate or narrowly lanceolate-oblong, the branchlets shortly and densely lanate, the rhachis with 1 or 2 closely spaced glands near the base of all the pairs of pinnae, also bearing 1 or 2 closely spaced, very small, interjugal, depressed-spherical glands midway between the pairs of pinnae, the corolla and calyx clothed with long, white, sinuate hairs, the pods often less constricted between the seeds.

Shrub or tree 1.5 to 10 m. high, the bark smooth and greyish green on young trees but rough and corrugated on older trees. *Branchlets* slightly ridged, the surface and ridges very densely and shortly lanate with velvety, silvery-grey or rusty-coloured hairs about 0.8 to 1 mm. long. *Young tips* chestnut-coloured. *Leaves*: petiole 0.3 to 1.5 cm. long, terete, with 2 black, depressed-spherical glands towards the apex, shortly lanate with silvery-grey or rusty-coloured hairs; rhachis 2.2 to 7 cm. long, terete, clothed as on branchlets, mostly bearing 1 or 2 closely spaced, very small, interjugal, depressed-spherical glands (each with a yellow rim) midway between each pair of pinnae, as well as 1 or 2 closely spaced glands at the base of each pair of pinnae. *Pinnae* 4 to 10 pairs, 3 to 7.5 cm. long, 0.7 to 1.5 cm. broad, silvery-greyish. *Pinnules* 11 to 26 pairs, 3 to 9 mm. long, 1.2 to 2 mm. broad, narrowly lanceolate (6:1) to ovate (2:1) or narrowly lanceolate-oblong (6:1), the apex sharply acute with an apical tuft of white hairs, the lower surface lanate with long, weak, silvery hairs which also occur along the margins in addition to a few on the upper surface. *Heads* bright yellow, globose, in racemes or panicles, each head composed of about 26 to 28 flowers, the peduncles stout, 0.5 to 0.8 mm. in diam., tomentose with fawn or chestnut-coloured hairs; buds densely clothed with castaneous hairs. *Bracteoles* with a broad, ciliolate or glabrous pedicel which is expanded into a pear-shaped, dilated, curved, apical portion densely clothed with long, white or fawn hairs, the apical tuft of hairs often as long as the pedicel. *Calyx* 1 to 1.2 mm. long, obconical, very shortly 5-lobed, fawn, scarcely angled, clothed with long, white, weak, sinuate hairs on the lobes and a few on the angles of the tube. *Corolla* about 2 mm. long, fawn, deeply dissected, with 5 acute, narrowly lanceolate lobes, clothed with a few, long, white, weak, sinuate hairs especially towards the apex. *Stamens* numerous, the filaments about 1.5 to 2.2 mm. long. *Anthers* bilocular.

Ovary sessile, dark brown, broadly oblong (3: 2), the apex rounded and bearing a tuft of long, white hairs. *Style* laterally attached. *Legumes* stalked, thickly coriaceous, dark brown, almost straight-sided, 6 to 11 cm. long, 5 to 6 mm. broad, densely lanate, with soft, castaneous and silvery hairs, 1 to 1.2 mm. long. *Seeds* black, dull, longitudinal in the legumes, oblong-elliptical; funicle filiform at first with a loop, then thickened into a fleshy pileiform aril over the top of the seed, the areole prominent.

HOLOTYPE: Northern slope of Mt. Wareng, Howes Valley, New South Wales, small shrubs 6 to 8 ft. high to trees 25 to 30 ft. high, bark on younger trees smooth and greyish green, older trees rough and corrugated, flowers bright yellow, foliage silvery grey, basalt, 700 ft. alt., Constable No. 4220, 4.1963 (NSW 63249), located in the National Herbarium of New South Wales, Sydney. **ISOTYPES:** K; A.

DISTRIBUTION: This species has a limited distribution, being recorded only from Gloucester Buckets, on the lower North Coast, and from Mt. Wareng, near Howes Valley, New South Wales.

FLOWERING PERIOD: April to June.

LENGTH OF LEGUME FORMATION: Mature fruit occur on the trees or shrubs from April until November.

SPECIMENS EXAMINED: *New South Wales: North Coast:* Gloucester Buckets, near Gloucester, Maiden 9.1897 (NSW 8141); Gloucester, Betehe 1.1882 (NSW 8140). *Central Coast:* Fire Trail to Mt. Wareng, ca. 2 miles E of Howes Valley, shrubs to small trees up to 20 ft. high, alt. 800 ft., in association with *Senecio* sp., *Jacksonia*, *Exocarpus*, *Clematis* and *Clerodendrum*, basalt, Constable 8.1959 (NSW 48118); Howes Valley Post Office to Mt. Wareng, ca. 1 mile E of Post Office, small shrub 5 to 10 ft. high, bark rough and dark brown, alt. 800 ft., Constable 8.1957 (NSW 44440); Mt. Wareng, 5 miles E of Howes Valley (ca. 25 miles SSW of Singleton), trees 6 to 9 m. high, confined to one area on middle slopes of mountain, basalt, Constable No. 4289, 7.1963 (NSW 70802; K; US; A; L; UC; U; MO; BR; NY); Mt. Wareng, ca. 2 miles E of Howes Valley Post Office, trees 25 to 30 ft. high, flowers pale yellow, pods light to dark brown, bark smooth on smaller trees, corrugated on older and taller trees, localized to stony basalt ridge at foot of mountain, 800 ft. alt., Constable No. 4785, 5.1964 (NSW 70826; BR; NY; UC; US; L).

This species is very closely allied to *Acacia mollifolia* Maiden et Blakely in Proc. Roy. Soc. N.S.W. LX (1926) 1927, 192. In fact Maiden & Blakely included this species in their description, having cited NSW 8140 and 8141 from Gloucester and Gloucester Buckets respectively. *A. mollifolia* has been recorded from the Central Western Slopes of New South Wales as well as from one locality in the Central Tablelands of this state.

In *A. mollifolia* the pinnules are more cultrate or linear with rounded or truncate instead of very acute apices, also the branchlets are shortly tomentose and the legumes often more constricted between the seeds. Interjugal glands occur on the rachises between the pairs of pinnae in *A. fulva* but are absent in *A. mollifolia*. Both species are characterized by very similar bracteoles but the flowers are different. The petals and the lobes of the calyx in *A. fulva* have a number of long, fine, weak, white hairs on their outer surfaces. The ovary in *A. mollifolia* is mid-brown and glabrous instead of dark brown with a tuft of long, white hairs as in *A. fulva*.

Acacia chrysotricha Tindale, sp. nov.

Arbor 6.6–23.3 m. alta, trunco usque ad 0.3 m. diam., cortice truncorum in arboribus junioribus leviter longitudinaliter sulcato, griseo, sed in arboribus vetustioribus rufo-atrobrunneo, profunde sulcato. Ramuli vix costati, ubique pilis patentibus, longis, atrogriseis, aureis vel fulvis, 0.8–1.2 mm. longis dense ornati. Ramuli novelli atro-aurei. Folia: petiolus vix costatus, 0.3–1 cm. longus, eglandulosus, ut ramuli vestitus; rhachis vix costata, 7–12.5 cm. longa, ut ramuli vestita, eglandulosa vel glandulis 1–3 sphaericis, atrobrunneis, glabris tantum ornata,

glandula una basi pinnarum parium vel inter pinnarum paria 1-3 infima et/vel glandula una basi pinnarum parium 1-2 suprema praedita. Pinae 12-17-jugae, 1.5-5 cm. longae, 0.4-0.8 cm. latae, supra atrovirides, subtus pallidiores. Foliola 12-23-juga, oblonga vel oblongo-elliptica, 3-4.5 mm. longa, 1-1.5 mm. lata, pilis paucis, longis, albis vel aureis supra et subtus vestita, apice acuta vel subacuta. Capitula laete aurea, globosa, in racemis vel paniculis disposita, floribus 21-23; pedunculis pilis aureis breviter pilosis. Bracteolae ea. 0.3 mm. longae, brunneae, spathulatae, sursum dilatatae, curvatae, dense ciliolatae, petiolo lato, dense ciliolato. Calyx ea. 0.1 mm. longus, parvus, brunneus, breviter quinquelobatus, angulatus, costis tubi ciliolatis; lobis obtusis, apicem versus ciliolatis. Corolla 0.5 mm. longa, quinquelobata, tubo glabro, lobis acutis, loborum apicem versus pilis paucis longissimis albis ornata. Stamina numerosa, filamentis circiter 2-3 mm. longis. Antherae biloculares. Ovarium sessile, glabrum, ovale. Stylus glaber. Legumina stipitata, coriacea, atrobrunnea vel nigra, submoniliformia, 6.5-8.5 cm. longa, 4-6 mm. lata, pilis longis deciduis atrobrunneis vestita.

Tree 6.6 to 23.3 m. high, trunk up to 0.3 m. in diam., the bark of younger trees grey and lightly fissured vertically but on the older trees dark red-brown with deep fissures. *Branchlets* inconspicuously ridged, the surface and ridges densely clothed with spreading, dark grey, golden or fawn hairs 0.8 to 1.2 mm. long. *Young tips* deep golden-yellow. *Leaves*: petiole slightly ridged, 0.3 to 1 cm. long, eglandulose, clothed as on the branchlets; rhachis scarcely ridged, 7 to 12.5 cm. long, clothed as on the branchlets, eglandulose or bearing only 1 to 3 spherical, dark brown, glabrous glands, 1 gland at the base of or between the 1 to 3 lowest pairs of pinnae and/or 1 gland at the base of the 1 or 2 uppermost pairs of pinnae. *Pinnae* 12 to 17 pairs, 1.5 to 5 cm. long, 0.4 to 0.8 cm. broad, dark green above, paler beneath. *Leaflets* 12 to 23 pairs, oblong to oblong-elliptical, 3 to 4.5 mm. long, 1 to 1.5 mm. broad, clothed on both surfaces with a few, long, white or golden hairs, the apex acute or subacute. *Heads* bright golden, globose, in racemes or panicles, with 21 to 23 flowers; the peduncles clothed with golden, shortly pilose hairs. *Bracteoles* about 0.3 mm. long, brown, spathulate, dilated above, curved and densely ciliolate. *Calyx* ea. 0.1 mm. long, small, brown, shortly 5-lobed, angled, the ribs of the tube ciliolate, the lobes obtuse, ciliolate towards the apex. *Corolla* 0.5 mm. long, 5-lobed, the tube glabrous, the lobes acute, towards the apex of the lobes clothed with a few, very long, white hairs. *Stamens* numerous, the filaments ea. 2 to 3 mm. long. *Anthers* bilocular. *Legumes* stipitate, coriaceous, dark brown or black, submoniliform, 6.5 to 8.5 cm. long, 4 to 6 mm. broad, clothed with long, deciduous, dark brown hairs.

HOLOTYPE: Connell's Creek, on Compt. 24 of Newry State Forest, just south of Urunga, on a side gully 40 to 50 ft. high, 8 inches in diam. at the base, one tree 70 ft. high, 12 inches in diam., A. Floyd 7.1961 (NSW 34451), located in the National Herbarium of New South Wales, Sydney. **ISOTYPES**: K; US; A; BRI; AD; MEL; NY; L; UC.

DISTRIBUTION: This species appears to have a very restricted range, as it has only been found in the Brierfield-Newry State Forest region of the North Coast, N.S.W.

FLOWERING PERIOD: Early and mid-August.

LENGTH OF LEGUME FORMATION: The month in which mature legumes are formed is November. The old fruit associated with NSW 55364 were found on the ground under the trees of *A. chrysostricha* on the 18th August 1961.

SPECIMENS EXAMINED: *New South Wales*: Brierfield, Bellinger River, a beautiful tree in thicket growth, flowering, height 30 ft., Swain No. 206, 8.1910 (NSW 8153); Newry State Forest, tree 20 ft. high, in gully, in poor rainforest, bark grey and brown, smooth on young trees, Floyd and Tindale, 8.1961 (NSW 55364); ditto, Lowery 8.1957 (Forestry Comm. Herb., Coffs Harbour).

A. chrysotricha has a very restricted distribution but, if it were originally much wider, this is certainly not indicated by herbarium specimens. Swain's collection of this species at Brierfield, N.S.W., in 1910, is the earliest record of *A. chrysotricha* which I have examined. It does not spread rapidly after a fire, as do other bipinnate wattles native to the North Coast. This species is very ornamental and should make a showy tree in parks. It often grows to 40 or 50 ft. in height and 8 inches in diameter at the base, although it occasionally reaches 70 ft. in height and a foot in diameter. The bark of the smaller trees is grey and lightly fissured vertically but on larger trees it is dark red-brown with deep fissures resembling that of *Eucalyptus fibrosa*.

This wattle occurs as an understory in rather steep, narrow gullies where *Eucalyptus pilularis* dominates the higher slopes together with *Syncarpia glomulifera* and *Tristania conferta*. The soil contains much free quartz up to 1½ inches in diameter, being derived from the somewhat metamorphosed Nambucca Series of shales which contain quartz veins. I am indebted to Mr. A. G. Floyd of the Research Section, Forestry Office, Coffs Harbour Jetty, for his helpful observations on this species and his assistance with my field work.

Acacia saliciformis Tindale, sp. nov.

Frutex vel arbor 2.5–7 m. alta, ramis pendulis, trunco erecto, cortice trunci laevi, argenteo vel caeruleo-griseo. Ramuli angulati, glauci, glabri. Surculi juniores rubidi. Phyllodia angustissime elliptica, subcoriacea vel coriacea, recta vel falcata, 6.3–12 cm. longa, 0.7–1.5 cm. lata, basi abrupte contracta, apice acuminato, acriter pungente, mucrone recto vel adunco, marginibus nervosis, glandula unica reniformi a basi phyllodii circiter 1.3–4 cm. remota, vena mediana utrinque prominente, lateralibus reticulato-ramosis, praeter venam e glandula decurrentem, aliquanto obscuris. Capitula pallide flava, globosa, in racemis disposita, floribus 20–32, pedunculis glabris, 5–9 mm. longis, circiter 0.2–0.3 mm. latis. Bracteolae peltatae, sursum dilatatae, dense ciliolatae, petiolo longo, ciliolato. Calyx circiter 1 mm. longus, obconicus, profunde quinquelobatus, sepalis spathulatis, late rotundatis, dense ciliolatis, tubo flavo, apicem versus sparse ciliolato. Corolla 2 mm. longa, glabra, petalis 5 liberis acutis, basin versus attenuatis, marginibus granulosis. Stamina numerosa, filamentis circiter 3–4 mm. longis. Antherae biloculares. Ovarium sessile, atrobrunneum, oblongo-ellipticum vel anguste lanceolato-oblongum, glabrum, circiter 0.5 mm. longum. Stylus glaber. Legumina longe stipitata, coriacea, atrobrunnea vel pruinosa, glabra, 7–12 cm. longa, 1.3–1.8 cm. lata, inter semina non contracta. Semina nigra, nitida, oblongo-elliptica, 6.8–8 mm. longa, 3–4 mm. lata, in legumine longitudinaliter disposita, funiculo primum filiformi deinde in arillum pileiformem super seminis apicem incrassato, areolo prominente.

Shrub or tree 2.5 to 7 m. high, with pendulous branches, the trunk erect, the bark of the trunk smooth, silvery and blue-grey. *Branchlets* ridged, glaucous, glabrous. *Young shoots* red. *Phyllodes* very narrowly elliptical, subcoriaceous or coriaceous, straight or falcate, 6.3 to 12 cm. long, 0.7 to 1.5 cm. broad, the base abruptly contracted, the apex acuminate, sharply pungent, the mucro erect or hooked, with the margins thickened, bearing a single reniform gland 1.3 to 4 cm. from the base, the median vein prominent on both sides, the lateral veins reticulately branched, somewhat obscure, except the vein decurrent from the gland. *Heads* pale yellow, globose, borne in racemes, with 20 to 32 flowers, the peduncles glabrous, 5 to 9 mm. long, 0.2 to 0.3 mm. broad. *Bracteoles* peltate, dilated above, densely ciliate, the

petiole long and ciliolate. *Calyx* about 1 mm. long, obconical, deeply 5-lobed, the sepals spatulate, broadly rounded, densely ciliolate towards the apex of its yellow, sparsely ciliolate tube. *Corolla* 2 mm. long, glabrous, the 5 petals free, acute, attenuated towards the base, the margins granulose. *Stamens* numerous, the filaments about 3 to 4 mm. long. *Antlers* bilocular. *Ovary* subsessile, dark brown, oblong-elliptical or narrowly lanceolate-oblong, glabrous, about 0.5 mm. long. *Style* glabrous. *Legumes* long-stalked, coriaceous, dark brown or pruinose, glabrous, 7 to 12 cm. long, 1.3 to 1.8 cm. broad, not contracted between the seeds. *Seeds* black, glossy, oblong-elliptical, 6.8 to 8 mm. long, 3 to 4 mm. broad, placed longitudinally in the legume, the funicle at first filiform, later thickening into a pileiform aril over the apex of the seed, the areole prominent.

HOLOTYPE: 1 mile north of Colo Heights, ca. 1000 ft. alt., flower-heads pale yellow pendulous shrub or small tree 9 to 15 ft. high, in dry sclerophyll forest, associated with *Acacia parvipinnula*, M. Tindale 18.6.1960 (NSW 54041), located in the National Herbarium of New South Wales, Sydney. **ISOTYPES:** US; K; L; A.

DISTRIBUTION: Central Coast of New South Wales from the Mt. Kindarun district southwards to Bilpin and westwards to Glen Davis district.

FLOWERING PERIOD: March to September.

LENGTH OF LEGUME FORMATION: Probably 6 to 7 months. Mature legumes occur on the trees and shrubs from October to December, also March and early April.

SPECIMENS EXAMINED: *New South Wales:* Near "Three Ways" on the Kindarun-Coricudgy Fire Trail, towards Mt. Monundilla, 2000 ft. alt., shrubs 3 m. high, abundant in this rugged, sandstone country, flowers pale creamish-yellow, Johnson 5.1962 (NSW 61044); SSE of Mt. Kindarun, at about 10 miles NNW of Putty, shrubs up to 10 ft. high, common on sandstone ridges throughout the area, Johnson 9.1959 (NSW 54061; KANU; AD; MEL; PERTH; NY; CANB; U); Mt. Wareng-Wollombi road (ca. 25 miles S of Singleton), shrubs up to 10 and 12 ft. high, flowers pale yellow, smooth bark, pendulous habit, frequent in all areas, sandstone, alt. 600 ft., Constable No. 4225, 4.1963 (NSW 63256; US; A; UC; BR); Howes Valley to Putty, 12 ft. high, Johnson 9.1951 (NSW 65748); Macdonald River, Howes Valley, about 40 miles from Singleton, about 6 to 8 ft. high, somewhat pendulous, Cambage No. 1539, 7.1906 (NSW 65749); Grassy Hill, Colo Heights-Putty Road, slender shrub 5 to 6 ft. high, flowers pale yellow, young tips of branches reddish, rather pendulous habit, occasional, sandstone, alt. 1600 ft., Constable 8.1959 (NSW 54060; L; US); N of Colo Heights, slender shrubs up to 8 ft. high, flowers pale yellow, young shoots reddish, local in small clumps on sandstone ridge, disturbed area after fire and road building, Johnson & Constable 9.1959 (NSW 54062; BRI; L; BR; MEL; U; K; A; NY; UC); ditto, shrub sometimes 8 ft. high, in sandy soil, in sclerophyll forest, Evans & Blaxell 12.1960 (NSW 54059; RIO); 1 mile N of Colo Heights, tree 12 ft. high, with drooping branches, in dry sclerophyll forest, in sandy soil, associated with *Pultenaea scabra*, *Acacia parvipinnula* and *A. ulicifolia*, Tindale 11.1959 (NSW 48874; K; US; MEL; BRI; AD; L; NY; A; UC; CANB; KANU; PERTH); Upper Colo, tree 15 to 20 ft. high (with slender weeping habit, flowers cream, Ingram 8.1963 (NSW 63853); 3 miles NE of Bilpin, alt. 1800 ft., frequent in wet sclerophyll forest on sandy soil, flowers pale yellow, stems very glaucous, Briggs 3.1961 (NSW 53742).

This species is very prevalent on the sandstone ridges in dry sclerophyll forest along the Windsor-Singleton Road, especially between Howes Valley and Colo Heights, although more rarely it occurs in wet sclerophyll forest. The weeping, willow-like habit of the plant is perpetuated in the specific epithet. This species commonly grows in association with *Acacia parvipinnula*.

A. saliciformis is closely allied to *A. mabellae* Maiden which occurs on the South Coast and Southern Tablelands of New South Wales. The latter species may be readily distinguished from *A. saliciformis* by the golden pubescence on the peduncles of the inflorescences and the attenuated bases of the phyllodes.

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Chromosome Numbers of Some Australian Monocotyledons

BARBARA G. BRIGGS

SUMMARY

Chromosome number determinations are presented for 53 species, mostly native in Australia. These include the first counts on certain species of *Triglochin*, *Damasonium*, *Anarthria*, *Lepyrodia*, *Lyginia*, *Leptocarpus*, *Hypolaena*, *Calorophus*, *Coleocarya*, *Lepidobolus*, *Loxocarya*, *Centrolepis*, *Xyris*, *Eriocaulon*, *Murdannia*, *Aneilema*, *Pollia*, *Commelina*, *Philydrum*, *Helmholtzia*, *Schelhanmera* and *Xanthorrhoea*. Illustrations and brief comments on the taxonomy of many of the species are included.

The chromosome numbers reported in this paper are largely in groups under taxonomic investigation in the preparation of the Flora of New South Wales. Descriptions of the species occurring in this State, with details of most of the voucher specimens, will be included in the Flora treatments by Alma T. Lee (*Xanthorrhoeaceae*), L. A. S. Johnson and O. D. Evans (*Restionaceae*, *Centrolepidaceae*, *Commelinaceae*, and *Philydraceae*), and O. D. Evans (*Flagellariaceae*, *Xyridaceae*, *Eriocaulaceae*, and *Pontederiaceae*).

Most of the chromosome number determinations were made on root-tips, vegetative shoots or pre-meiotic floral buds, pre-treated with saturated aqueous *p*-dichlorobenzene for 2½ hours. Staining by alcoholic-carmin (Snow 1963) or aceto-orcein was used.

The species listed in Table I are, for the greater part, native in Australia; there are also three naturalised species and two counted on cultivated material (one of the last group, *Zebrina pendula*, also being naturalised in some areas). The non-native species are marked by asterisks.

The counts are given as somatic numbers, the few determined at meiosis being marked (‡). Somatic numbers are also given in citing previous determinations. The State from which the sample was obtained is indicated under "locality" as follows: New South Wales (N), Queensland (Q), Victoria (V), Tasmania (T) and Western Australia (W). Voucher specimens, listed by their registration numbers, have been placed in the National Herbarium of New South Wales. If there have been several previous counts on a species, no attempt is made to cite all such records; where possible reference is made to an author who gives discussion and mentions earlier findings.

The counts listed are by the author, except for that made on material of *Pollia crispata* from Mount Glorious, Queensland. I am indebted to Dr. B. A. Barlow of the University of Queensland for permission to cite this finding.

NOTES

(a) TRIGLOCHIN. Previously recorded counts are on members of Subgenus *Triglochin*, whereas *T. procera* has been placed in Subgenus *Cycnogeton* (Buchenau 1903). Although $2n = 32$ is also recorded in *T. bulbosum* L. most of the counts suggest a base number of $x = 6$. In *T. procera* one pair is distinctly longer than the other chromosomes (Fig. 6). This feature is not visible in the species illustrated by Skalirfska et al. (1961).

TABLE I. CHROMOSOME NUMBER DETERMINATIONS

See text for explanatory notes and details of listing procedure.

Name	2n	Locality	Voucher	Fig.	Notes	Previous count
JUNCAGINACEAE						
<i>Triglochin procera</i> R. Br.	32	N Albion Park	65826	6	a	
ALISMATACEAE						
<i>Sagittaria</i> * <i>graminea</i> Michx. var. <i>weatherbiana</i> (Fernald) Bogin	22	N Casula	68299	1	b	22 Baldwin and Speese 1955 (as <i>S. weatherbiana</i>).
<i>Allisma plantago-aquatica</i> L.	14	N Albion Park	65825	2		14 Björkqvist 1961, Löve & Löve 1961.
<i>Damasonium minus</i> (R. Br.) Buchen.	42	N Glenfield	71634	3, 4		
FLAGELLARIACEAE						
<i>Flagellaria indica</i> L.	38	N Seal Rocks	64995	7		38 Chuang et al. 1962
RESTIACEAE						
<i>Anarthria proliifera</i> R. Br.	♂ 22	W Busselton	57058	8		
<i>laevis</i> R. Br.	♀ 44	W Busselton	57049	..		
<i>scabra</i> R. Br.	♂ 44 ♀ ca. 44	W Esperance W Esperance	65792 65791	.. ..	
Lepydrola						
<i>flexuosa</i> (Benth.) L. Johnson & O. Evans	♀ 14	V Grampians	73021	10	d	
<i>tasmanica</i> Hook. f.	♀ 18	T Navarre R. to King William Ra.	72717	..		
	♀ 18	T West Montagu	76394	..		
Lyginia						
<i>barbata</i> R. Br.	♂ 14	W Bunbury	57053	9	e	
Restio						
<i>tetraphyllus</i> Labill. ssp. <i>tetraphyllus</i>	♂ 22	T Strahan	72720	..		22 Briggs 1963, ssp. <i>meiostachyus</i>
<i>complanatus</i> R. Br.	♀ 24	N Budderoo, S. of Robertson.	64831	..		24 Briggs 1963
	♀ 24	T West Montagu	76393	..		
Leptocarpus						
<i>tenax</i> (Labill.) R. Br.	♂ 22	N Hat Head	60652	11		22 Sands in Briggs 1963.
	♂ 22	N Manly	56880	..		
	♀ 22	W Busselton	57056	..		
<i>aristatus</i> R. Br.	♀ 22	W Cannington	57051	..		
<i>coangustatus</i> Nees	— 22	W Bunbury	57050	..		
Hypolaena						
<i>fastigiata</i> R. Br.	♂ 66 ♂ ca. 66 ♂ 66	N North Head N Anna Bay V Lemon Springs, S of Kaniva.	60686 60650 72887	.. .. ..	f	
<i>exsulca</i> R. Br.	♀ 26	W Cannington	57453	12		
Calorophus						
<i>minor</i> Hook. f.	♂ 24 ♂ 24 ♂ 24	N Anna Bay N Northbridge N Happy Jack's Creek.	60655 64620 64419	.. .. ..		14

Table 1—continued

Name	2n	Locality	Voucher	Fig.	Notes	Previous count
<i>Coleocarya</i>						
<i>gracilis</i> S. T. Blake	22	N Hat Head ..	60647	..		
	22	N Hat Head ..	60648	..		
<i>Lepidobolus</i>						
<i>drapetocoleus</i> F. Muell.	24	V Lemon Springs, S. of Kaniva ..	72886	17		
<i>Loxocarya</i>						
<i>pubescens</i> (R. Br.) Benth.	24	W Busselton ..	57052	..	g	
sp.	24-26	W Bunbury ..	57057	..		
<i>fasciculata</i> (R. Br.) Benth.	102- 104	W Bunbury ..	57059	13		
CENTROLEPIDACEAE						
<i>Centrolepis</i>						
<i>jascicularis</i> Labill.	26†	N Blackheath ..	77850	5	h	
	26	N Wentworth Falls	64363	..		
	26	T near Smithton ..	72729	..		
XYRIDACEAE						
<i>Xyris</i>						
<i>operculata</i> Labill.	26†	N Dee Why ..	59892	..	i	
	26	T West Montagu ..	76395	..		
<i>ustulata</i> Nilss.	26†	N Blackheath ..	66547	..		
<i>gracilis</i> R. Br.						
<i>ssp. gracilis</i>	26	N Blackheath ..	66546	..		
<i>ssp. laxa</i> O. Evans	26	N Marley Beach ..	57708	..		
<i>gracilis-laxa</i> intergrade	26	N Linden ..	67129	..		
	26	N Red Rock to Corindi.	64429	..		
sp. A	52-54	T near Smithton ..	77849	..		
	52	T West Montagu ..	76396	..		
<i>muelleri</i>	26	T Tullah ..	77848	..		
<i>complanata</i> R. Br.	52	N Howes Valley ..	64571	16		
	52	N Kurnell ..	64406	..		
	50-52	N Agnes Banks ..	69636	..		
<i>junceae</i> R. Br.	26	N Corindi ..	64614	15		
	26	N Darke's Forest Rd.	66914	..		
	26	N Currarong ..	67511	..		
ERIOCAULACEAE						
<i>Eriocaulon</i>						
<i>scariosum</i> Sm.	64	N Agnes Banks ..	64027	..		
COMMELINACEAE						
<i>Murdannia</i>						
<i>graminea</i> (R. Br.) Brückn.	40	N Richmond ..	64353	22	j	
<i>Anellma</i>						
<i>acuminatum</i> R. Br.	32	N Whian Whian S.F.	64617	..	k	
	32	N Allyn R. ..	64587	23		
<i>Pollia</i>						
<i>crispata</i> (R. Br.) Benth.	32†	Q Mt. Glorious ..	..	..	l	
	32	N SW of Bellingen	64623	..	m	
	32	N Allyn R. ..	64586	25		
<i>macrophylla</i> (R. Br.) Benth.	32	Q near Beatrice R.	71632	..		
<i>Commelina</i>						
<i>cyanea</i> R. Br.	44	N Euroka, near Glenbrook.	64618	..	n	
	44	N S of Glenbrook	64383	..	o	
	88	N Coffs Harbour ..	64624	..		
	88	N Alum Mountain ..	..	..
	88	N Vacluse ..	64588	28		
	88	N Lilyvale ..	..	..
	88	N Lord Howe Is. ..	78667	..		
aff. <i>cyanea</i>	44	Q Townsville ..	71633	..		

Table 1—continued

Name	2n	Locality	Voucher	Fig.	Notes	Previous count
<i>Commelina</i> (continued)						
*"sellowiana" = <i>C. diffusa</i> Burm. f.? ..	60	N Roseville, cult. ..	64415	..		30 Lewis 1964, 28 Morton 1956 (both as <i>C. diffusa</i>).
<i>Tradescantia</i>					p	
* <i>albiflora</i> Kunth.	60	N Bowen's Creek ..	65786	..		72 see Darlington & Wylie 1955
	60	N Roseville ..	64734	21		
	60	N Milperra ..	71577	..		
	60	N Narrabarba ..	72111	..		
<i>Zebrina</i>					p	
* <i>pendula</i> Schnizl.	24	N Coffs Harbour, cult. ..	64613	..		24, 48 see Darlington & Wylie 1955.
	24	N Sydney, cult ..	64585	..		
PONTEDERIACEAE						
<i>Eichhornia</i>						
* <i>crassipes</i> (Mart.) Solms	32	N Parramatta ..	74101	..		32 see Darlington & Wylie 1955
PHILYDRACEAE						
<i>Philydrum</i>						
<i>lanuginosum</i> Banks & Soland. ex Gaertn. ..	16	N Valley Heights ..	68295	26		
	16	N Glenfield ..	71682	..		
<i>Helmholtzia</i>					q	
<i>acortifolia</i> F. Muell.	34	Q Walsh R., Ather-ton ..	64360	..		
	34	Q cult. ex Binna-burra. ..	68296	19		
	34	N Whian Whian S. F. ..	64861	..		
LILIACEAE						
<i>Schelhammera</i>						
<i>undulata</i> R. Br.	36	N Cobargo ..	65844	24		
	36	N Popran Creek ..	78665	..		
XANTHORRHOACEAE						
<i>Xanthorrhoea</i>					r	
<i>australis</i> R. Br. ssp. <i>australis</i>	22	N Mt. Spirabo ..	56738	..		
	22	N Cobark ..	65650	..		
	22	N St. Helena, near Woodford. ..	56901	..		
<i>arborea</i> R. Br.	22	N Doyalson ..	34429	..		22 Waterhouse in Darlington & Wylie 1955, ssp. <i>media</i>
<i>media</i> R. Br. ssp. <i>latifolia</i> A. Lee	22	N Doyalson ..	34429	..		
<i>resinosa</i> Pers. ssp. <i>resinosa</i>	22	N Heathcote ..	68995	18		22 Waterhouse (l.c.) as <i>X. hastile</i>
<i>minor</i> R. Br.	22	V Orbost ..	72114	..		
<i>minor—australis</i> intergrade	22	T Tam O'Shanter Bay. ..	72129	..		
<i>macronema</i> F. Muell. ex. Benth.	22	N Kendall S.F., Kew ..	64591	20		
AGAVACEAE						
<i>Doryanthes</i>					s	
<i>excelsa</i> Corr.	48	N Calga ..	65793	27		48 Satô 1938

(b) ALISMATACEAE. In *Alisma plantago-aquatica* various authors have reported numbers within the range $2n = 10$ to $2n = 16$; however, extensive sampling by Björkqvist (1961) showed only $2n = 14$. The karyotype of the Australian material examined agrees with that illustrated by Björkqvist from Europe. The species is generally regarded as native in Australia; the lack of morphological and chromosomal divergence, over so extensive a range, is notable.



Figs. 1—4 Mitotic chromosomes; Fig. 5 meiosis, late prophase. $\times 850$.

1. *Sagittaria graminea* var. *weatherbiana* $2n = 22$.
2. *Alisma plantago-aquatica* $2n = 14$.
- 3 and 4. *Damasonium minus* $2n = 42$, metaphase and idiogram of haploid complement.
5. *Centrolepis fascicularis* $n = 13$.

Much attention has been directed to certain members of the Alismataceae, but the present count of *Damasonium* is apparently the first on this genus. It is presumably hexaploid, resembling *Alisma* in base number ($x = 7$), the large proportion of chromosomes with sub-median centromeres, and in the presence of telocentric and metacentric pairs. The number $2n = 42$ has been reported in *Alisma canaliculatum* A. Br. et Bouché, in which a karyotype similar to that in *A. plantago-aquatica* is replicated without obvious change. In *Damasonium minus*, however, several distinctive chromosome types are represented by only a single pair. If this has arisen from diploids resembling *A. plantago-aquatica* in karyotype, the polyploidy would appear to be long-established, and considerable further changes in chromosome form must have occurred.

The genus *Sagittaria* shows considerable constancy of karyotype and Fig. 1 agrees with the generalised idiogram for the genus given by Brown (1946) and with the observations of Baldwin and Speese (1955).

(c) RESTIONACEAE. Other counts on this family, particularly in *Lepyrodia* ($2n = 14, 18$) and *Restio* ($2n = 14, 22, 24, 32, \text{ca. } 44$) are given by Briggs (1963) who discusses possible basic chromosome numbers for the family, and draws attention to the repeated occurrences of the numbers $x = 7$ and $x = 11$ in diverse genera. The new counts add to the representation of the number $x = 12$; the four genera, *Restio*, *Calorophus*, *Lepidobolus*, and *Loxocarya*, in which this occurs, not being closely allied to one another. There is marked variation in chromosome size in the family, although, as far as known, there is reasonable uniformity of size within each genus. Species of different genera may have the same chromosome number but very different chromosome size (compare *Anarthria* and *Leptocarpus*, Figs. 8 and 11), and suggestions as to the course of chromosomal evolution cannot

be based on the numbers alone. The largest chromosomes observed are in *Anarthria* and *Lyginia*, each of which shows a number of apparently primitive morphological features. However, phylogenetic interpretations clearly require much more extensive data and cytotaxonomic studies on the family are being continued.

(d) LEPYRODIA. Johnson and Evans (1963) divided the Australian species of this genus into two groups on the basis of stem anatomy, these groups being correlated, as far as known, with chromosome number groupings. At that time the chromosome numbers of *L. flexuosa* and *L. tasmanica* were not known but, on anatomical features, the former was placed with species having $2n = 14$, while the latter resembled those with $2n = 18$. The present findings are in accord with the groups defined by these authors and confirm the correlation between chromosomal and anatomical conditions within the genus.

(e) LYGINIA BARBATA. Two, or perhaps three, rather distinctive forms are customarily included under *L. barbata* R. Br. One of these was originally described as *L. imberbis* R. Br. The count cited is of the *barbata* form; an approximate count on material of the *imberbis* form showed a similar level of chromosome number.

(f) HYPOLAENA. Despite the cytological difference, the two species counted appear very close in morphological and anatomical features. In addition to the counts cited, an approximate count shows a lower number, $2n = \text{ca. } 54$ in *H. fastigiata* from West Montagu, Tasmania. The species shows some morphological variation, but, on present information, this cannot be correlated with the cytological findings.

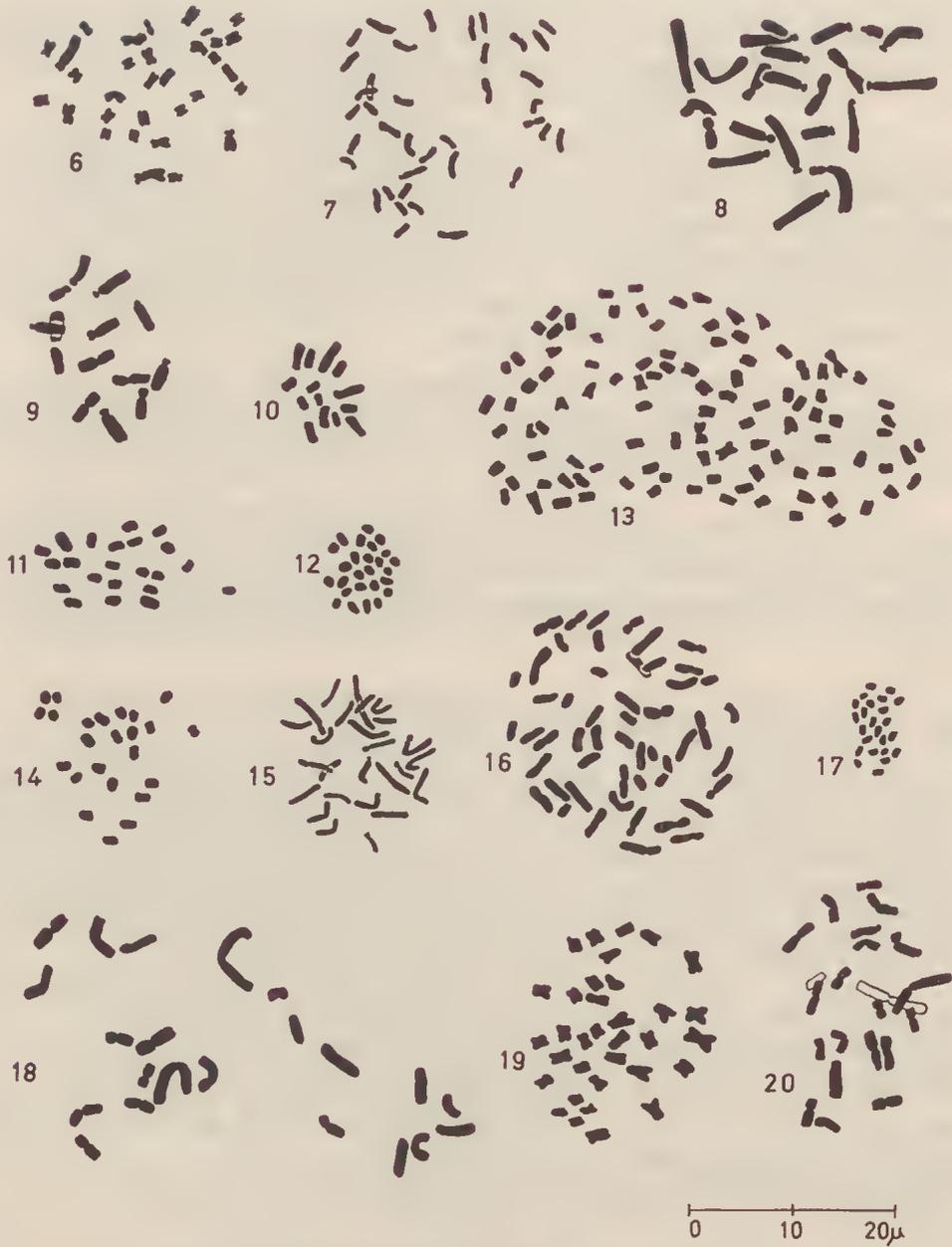
(g) LOXOCARYA. This genus is somewhat heterogeneous anatomically as well as cytologically and clearly needs further study.

(h) CENTROLEPIS. The number found in *C. fascicularis* differs from those reported in other species of *Centrolepis*: *C. strigosa* Roem. et Schult. $2n = 20$ and *C. aristata* (R. Br.) Roem. et Schult. $2n = \text{ca. } 46-48$ (Hamann 1960), *C. cambodiana* Hance $2n = 40-42$ (Larsen 1963). According to Hou (1957) *C. cambodiana* is close to *C. fascicularis* rather than to *C. strigosa*. Larsen suggests "that the original basic number is $x = 10$ or even 5"; however, the available cytological information is too scanty and too diverse to provide an adequate basis for speculation.

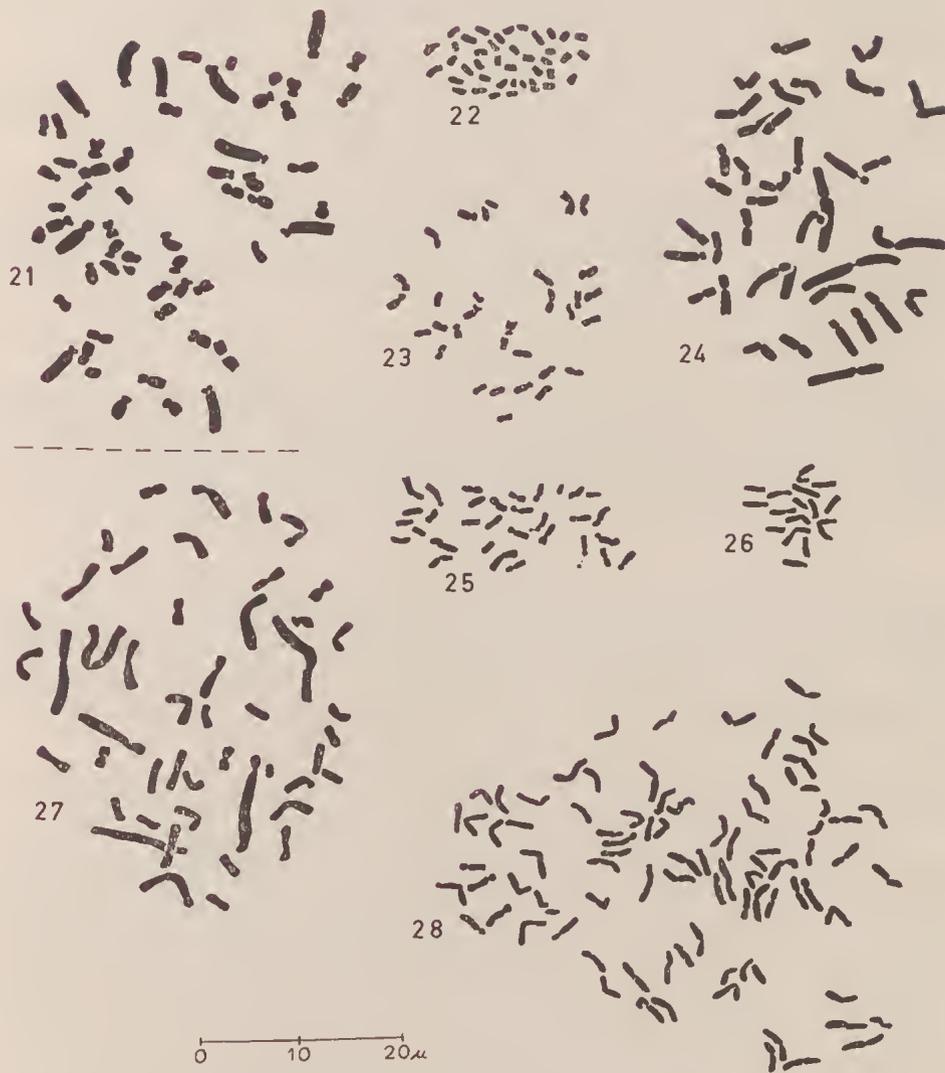
(i) XYRIS. The species counted include members of two of the sections of the genus (Malme 1930), *X. complanata* and *X. juncea* belonging to Section *Xyris*, the remaining species being members of Section *Pomatoxyris*. Previous counts all concern Section *Xyris* where there are reports of $n = 9$ in five North American species (Lewis 1961, Lewis et al. 1962), and of $2n = 34$ in *X. capensis* Thunb. var. *schoenoides* (Mart.) Nilss. from Thailand (Larsen 1963). Present findings render less probable the explanation put forward by Larsen, i.e. that $x = 17$ may have arisen as a secondary base number from ancestors with basic numbers of 8 and 9, the occurrence of species with the former number being unproven.

The occurrence of $x = 13$ in two of the sections (which appear to be well defined) suggests that it may be the basic number of the family. Other possibilities would imply the parallel development of this number in two evolutionary lines. Section *Nematopus*, of South America, remains cytologically unknown.

Xyris sp. A and *X. muelleri* are discussed by Evans (1965). The former shows close relationship to *X. gracilis*, while *X. muelleri* is easily recognised by the acuminate bracts at the base of the inflorescence.

Figs. 6-20 Mitotic chromosomes, $\times 1250$.

- | | |
|---|--|
| 6. <i>Triglochin procera</i> $2n = 32$ | 14. <i>Calorophus minor</i> $2n = 24$ |
| 7. <i>Flagellaria indica</i> $2n = 38$ | 15. <i>Xyris juncea</i> $2n = 26$ |
| 8. <i>Anarthria prolifera</i> $2n = 22$ | 16. <i>Xyris complanata</i> $2n = 52$ |
| 9. <i>Lyginia barbata</i> $2n = 14$ | 17. <i>Lepidobolus drapetocoleus</i> $2n = 24$ |
| 10. <i>Lepyrodia flexuosa</i> $2n = 14$ | 18. <i>Xanthorrhoea resinosa</i> $2n = 22$ |
| 11. <i>Leptocarpus tenax</i> $2n = 22$ | 19. <i>Helmholtzia glaberrima</i> $2n = 34$ |
| 12. <i>Hypolaena exsulca</i> $2n = 26$ | 20. <i>Xanthorrhoea macronema</i> $2n = 22$ |
| 13. <i>Loxocarya fasciculata</i> $2n = 102-104$ | |



Figs. 21—28 Mitotic chromosomes, $\times 1250$.

21. *Tradescantia albiflora* $2n = 60$
 22. *Murdannia graminea* $2n = 40$
 23. *Aneilema acuminatum* $2n = 32$
 24. *Schelhammera undulata* $2n = 36^*$
 25. *Pollia crispata* $2n = 32$

26. *Philydrum lanuginosum* $2n = 16$
 27. *Doryanthes excelsa* $2n = 48$
 (late prophase)
 28. *Commelina eyanea* $2n = 88$

* Further study, since this paper went to press, indicated that the cell illustrated in Fig. 24 is incorrectly interpreted at two places, largely due to the presence of secondary constrictions. The chromosome number is $2n = 36$, as given in Table I, rather than as drawn.

(j) MURDANNIA. The present observation is in agreement with a basic complement of $x = 5$ or $x = 10$. Lewis (1964) indicates that numbers based on such values are predominant in the genus.

(k) ANEILEMA. In the restricted sense used by recent authors, *Aneilema* seems to be morphologically coherent, but there is evidence of considerable cytological diversity; the six species cited by Lewis (1964) having $2n = 18, 26, 28, 32$ and 60 .

(l) POLLIA. The genus is little known cytologically, although counts of $2n = 10$ and $2n = 38$ are recorded (Darlington and Wylie 1955). Johnson and Evans (in preparation) outline the reasons for retaining in *Pollia* those species, including *P. crispata* and *P. macrophylla*, which Brückner (1930) treated as a separate genus, *Aclisia* E. Mey.

(m) Count by B. A. Barlow, University of Queensland.

(n) COMMELINA. Great cytological diversity has been recorded in the genus with all numbers from $n = 11$ to $n = 16$ being represented, together with numerous polyploid derivatives. *C. benghalensis* L. is the only species reported with $n = 11$, or multiples of this number (Lewis 1964). However, *C. cyanea* appears to be closely allied to *C. diffusa* and shows no close relationship to *C. benghalensis*.

(o) COMMELINA CYANEA. The specimens showing the lower level of ploidy are a pubescent form, found much less frequently than glabrous forms. The two localities cited for the former are only three miles apart, while the counts on the latter have been obtained from localities up to three hundred miles apart and from Lord Howe Island. The specimen from Townsville is also a hairy form, but does not fully match any other material in Herb. NSW. Delimitation of taxa in this group is difficult (see Johnson and Evans, in preparation).

(p) TRADESCANTIA. The genus includes a considerable range of polyploid levels, apparently based on $x = 6$, and a wide range of chromosome sizes.

Anderson and Sax (1936) cite a count of $n = 36$ in *T. albiflora*, but these authors also refer to an earlier count by Darlington of $n = 30$ in material named as *T. fluminensis* Vell. These names are not synonymous (Brückner 1927) but the species have been frequently confused, and the identity of the previously counted material is open to doubt. Johnson and Evans (in preparation) point out that the material naturalised and commonly cultivated in Australia has the features which Brückner indicated as characteristic of *T. albiflora*.

Zebrina is closely allied to *Tradescantia* and shares the base number $x = 6$. The chromosomes are many times larger than those of *T. albiflora*, but are comparable in size with those of some of the diploid and tetraploid species of *Tradescantia*.

(q) HELMHOLTZIA. *H. glaberrima* has been referred to a separate genus, *Orthothylax* Skotts. Discussion of its status will be given by Evans and Johnson (in press), who favour its retention in *Helmholtzia*.

(r) XANTHORRHOEA. The stability of chromosome number in *Xanthorrhoea* contrasts with the variety observed in *Lomandra*, on which studies are proceeding. *X. macronema* is morphologically distinctive and shows no intergradation with other species (Lee 1965). It is, however, similar in karyotype to other species investigated, a single large metacentric chromosome pair being conspicuous in all cases.

(s) DORYANTHES. Cave (1964) summarised the various chromosome number reports on the genus and found $n = 24$ in *D. palmeri* W. Hill. *Doryanthes* differs in morphology, anatomy, and cytology from other genera referred to the Agavaceae (Wunderlich 1950, Stebbins and Khush 1961; Cave l.c.) and its inclusion in this family is open to serious doubt.

ACKNOWLEDGMENTS

I wish to thank Mr. L. A. S. Johnson, Mrs. Alma T. Lce, and Mr. O. D. Evans for much valuable advice and discussion concerning taxonomic aspects of the groups studied, and for help given by the collection of materials.

I was greatly assisted by many who collected live plants for study, thus making possible a much greater coverage of species than would otherwise have been achieved. For such help I am indebted to Mr R. D. Royce and Mr A. George (State Herbarium of Western Australia), Dr J. S. Beard (King's Park and Botanic Garden, Perth), Mr J. T. Waterhouse (University of New South Wales), Mr E. Volek (Queensland Forestry Department, Atherton), Dr D. Martin and Mr M. Bennett (C.S.I.R.O. Tasmanian Regional Laboratory), Mr E. J. McBarron (Glenfield Veterinary Research Station), Mr H. Brownlee (Department of Agriculture, Sydney), Dr M. D. Tindale, Mr E. F. Constable and Mr A. N. Rodd (National Herbarium of New South Wales), and Mrs P. Messmer.

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Notes on *Xanthorrhoea* in Eastern Australia

ALMA T. LEE

When a preliminary survey of the collections of *Xanthorrhoea* in the National Herbarium of New South Wales was made some years ago, a number of variants from the described species were recognised, but at that time some of them were represented by only a few specimens often deficient in data about many characters. It is a pleasure to acknowledge that this preliminary work by L. A. S. Johnson of this Herbarium, comprising the recognition, sorting and keying out of these variants, has been a valuable aid in the present study. It seemed that increased collections and more detailed information about them would reveal a satisfactory basis for classification as the range of characters of these variants became known. This has to some extent proved true but, on the other hand, the material resulting from an intensive collecting programme has gradually enlarged the known variation within the recognised groups until the previously accepted boundaries disappeared. One by one the "species" were seen to lose their discreteness until only *X. macronema* maintained its distinctness to the degree usually acceptable in a species. This intergradation between species so commonly met with in the genus appears to be due partly to inherent variation correlated with distribution, and partly to hybridism, which breaks down specific distinctions in areas of contact.

In this connection it is of interest that representatives of most of the species have been examined cytologically, and have the same chromosome number, $2n = 22$, including *X. macronema* which is not known to show hybridism.

It is also of interest for future workers that certain phenotypes often show a strong correlation with soil or other habitat characters, and whether the plants have distinct habitat preferences which cause their location or whether the phenotype is a reflection of, i.e. caused by, its habitat is still a question worthy of further investigation.

In population studies of the kind necessitated in this work, reliable conclusions can only be reached with the help of large collections over wide areas, and while it has been possible to acquire greatly increased representation from New South Wales, even here the nature of the plants has in itself been a hindrance. Their flowering period is short and not necessarily an annual occurrence; a young community may give no indication for many years of the potential arborescence of its members; a herbarium specimen, unless annotated carefully, may give no idea of the size of parts nor of the habit of the plant; finally their sheer bulk discourages collectors and herbaria from amassing numerous specimens.

From other States collections available for study were usually quite meagre, and only a few recent sheets bear useful information about the plants from which the specimens were collected. Great value attaches therefore to the help received in obtaining information about Tasmanian and Queensland populations, and I am greatly indebted to Dr D. Martin, Officer in Charge, Tasmanian Regional Laboratory, C.S.I.R.O., who, with several of his colleagues, sent valuable information and many specimens from appropriate parts of Tasmania, and to Mr Lindsay Smith, of the Brisbane Herbarium, who imparted his considerable knowledge of the Queensland populations to me in conversation, thereby clarifying several problems in nomenclature concerning collections from the north of New South Wales.

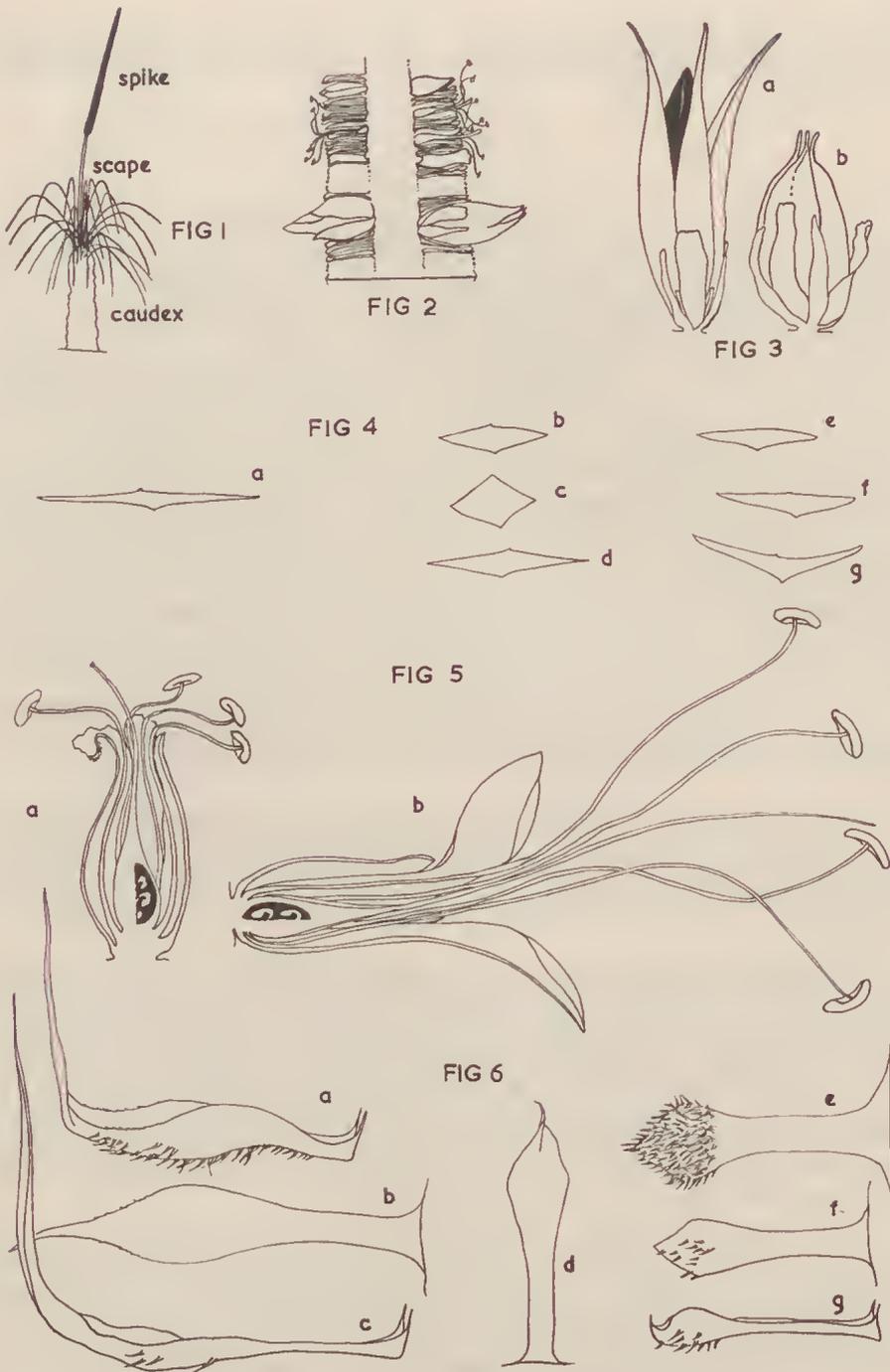


Fig. 1.—Habit (arborescent). Fig. 2.—L. S. Spike, diagrammatic; diameter indicated. Fig. 3.—Fruit: *a*. acute; *b*. obtuse.—Fig. 4.—Leaf shape in section: *a*. flat; *b*, *c*, *d*. quadrangular; *e*, *f*, *g*. triangular. Fig. 5.—Half flower ($\times 6$): *a*. *X. media*; *b*. *X. macronema*. Fig. 6.—Bract form: *a*, *c*. Prominent cluster bracts and *b*. long-acute bract (*X. australis*); *d*. intermediate; *e*. short-acute, tomentose bract (*X. resinosa*); *f*. short-acute, subglabrous bract and *g*. obscure cluster bract (*X. media*).

Added to the difficulties of much intergradation and initial lack of material was the problem of discovering any positive diagnostic characters, a difficulty which arose from the fundamental uniformity of the flowering and vegetative parts and led to eventual reliance on indicative rather than absolute differences.

From the complex of uniform or closely intergraded features presented by the specimens examined, the following characters have proved the most useful for diagnosis:—

- (i) Habit of the plant (Fig. 1): acauline, or weakly or strongly arborescent. The potential habit of individual plants of arborescent form must sometimes be deduced from that of other plants in the community, because of the slow growth-rates. Plants with caudex up to 75 cm. high are regarded as acauline.
- (ii) Shape of the broadest floral bracts and degree of prominence of the cluster bracts, though many intermediate conditions are found. In the following descriptions, bracts are said to be long-acute when the broadest ones are more or less narrow-elliptical and taper gradually into a narrow point, or short-acute when the broadest are oblanceolate to spatulate and narrow abruptly at the apex (see Fig. 6).
- (iii) Relative lengths of fully grown spike and scape (Fig. 1): the scape grows first, then the spike shows continued growth over a considerable period.
- (iv) Shape of the leaf in section, taken at about the middle (Fig. 4): there appears to be some fundamental difference between the triangular leaf and the quadrangular, though they approach through convexity of the upper surface of the triangular type; both, by decreased thickness, can approach a nearly flat condition. The terms, printed in italics, describing leaf shape in section, are those proposed by the Systematic Association Committee for descriptive Biological Terminology in Taxon XI (1962) 145.

On the basis of these characters, the genus falls into three subdivisions in the eastern States.

- (i) The "australis" group: *X. australis* and *X. johnsonii*.
- (ii) The "arborea" group: *X. arborea*, *X. media*, *X. minor*, *X. pumilio* and *X. resinosa*.
- (iii) *X. macronema*.

The essential differences between these groups are the long-acute bracts, prominent cluster bracts and distinctly quadrangular leaves of *X. australis* contrasted with the short-acute bracts, obscure cluster bracts and flat to triangular or only obscurely quadrangular leaves of the "arborea" group and of *X. macronema* (Figs. 4, 6). *X. johnsonii* has features of both groups but is closer to *X. australis*. These characters are not entirely satisfactory criteria for subdivision of the genus, but after years spent in gaining some familiarity with collected material I have failed to find any which are more reliable for diagnosis.

The many putative hybrid derivatives posed a problem in nomenclatural treatment; rather than overburden common usage with unwieldy formulae, and since they do in fact often represent considerable established populations, they have been here classified with the parent species which they resemble more in habit, their apparent derivation being mentioned in the text, and the particular specimens indicated in the citations.

flower (Fig. 5, b) and fruit. It occurs from the Central Coast of New South Wales to the coast of southern Queensland where it is known from as far north as Fraser Island (Map 5). *X. pumilio*, which has not been studied, appears to be a miniature species known only from the Port Curtis district of Queensland.

Of the other species only *X. johnsonii* and *X. australis* occur on the inland side of the Great Dividing Range or of the coastal ranges of Queensland (Maps 1, 2). *X. johnsonii* is most closely related to the isolated *X. thorntonii* of Central Australia and to *X. quadrangulata* of South Australia, and indeed a few of its representatives could not be separated morphologically from those species, though the vast distances between and the variation shown justify their recognition as allopatric species. *X. australis* is also related to the group through *X. johnsonii*, and if a Central Australian origin were hypothesised, *X. thorntonii* and *X. johnsonii* would be the northern derivatives and *X. australis* the southern from this stock.

X. johnsonii occurs only in Queensland and northern New South Wales, *X. australis* in New South Wales, Victoria, South Australia and Tasmania and, in hybrid form only, in Queensland. Both reach the eastern coast of the continent but this is exceptional (apparently by way of river valleys) in *X. australis*. It is improbable that *X. australis* and *X. johnsonii* fail to hybridise in their common territory in northern New South Wales, but it is also possible that the two occupy fairly rigidly distinct habitats so that opportunity is restricted, though both are found on igneous or metamorphic soils. As circumscribed here their distinction rests ultimately on only the bract and cluster bract form, but this tends to divide the specimens into groups with supporting features and may prove to be a good diagnostic character. Perhaps in response to soil or climatic effects, *X. australis* shows a variant in the west of its range in New South Wales (ssp. *acaulis*); *X. johnsonii* may require subdivision when better known.

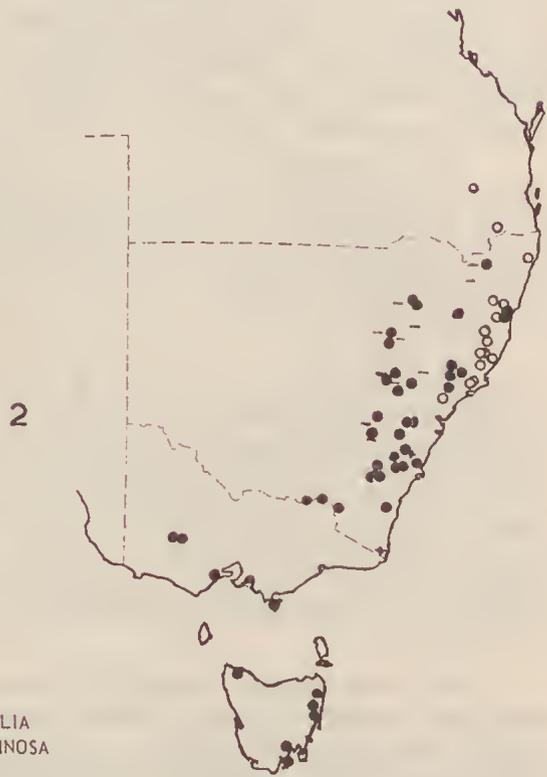
Hybrid derivatives presumably from *X. johnsonii* and *X. resinosa* ssp. *fulva* occur on the North Coast of New South Wales and on Stradbroke Island, Queensland (see *X. johnsonii*), and such derivatives from *X. johnsonii* and *X. media* ssp. *latifolia* occur and are probably quite common in coastal Queensland and north coastal New South Wales, though the two species seem to occur in pure communities related to different habitat conditions (see *X. media*).

X. australis (q. v.), with *X. media* ssp. *latifolia*, is almost certainly the source of extensive populations presumably of hybrid derivation in ranges of the North Coast of New South Wales and of southern Queensland, and also, with *X. media* ssp. *media*, of a slightly different population where *X. australis* and *X. media* ssp. *media* (and also *X. johnsonii*) approximate south of the Hunter and Goulburn Rivers in New South Wales (see *X. media* ssp. *media*). Two recent collections have revealed evidence of further hybridism in *X. australis*, this time with *X. resinosa* ssp. *resinosa*, in the South Coast of New South Wales (see *X. australis* ssp. *australis*), while there are a number of specimens from Tasmania which suggest that hybridism has occurred there between *X. australis* and the now much diminished population of *X. minor* (q. v.).

The species of the "arborea" group are, in fact, only the foci of a widely distributed coastal population, distinct enough at the extremes of variation but closely integrated in many places, in which morphology (see representative flower, Fig. 5, a) and habitat are often closely correlated, either as cause or effect. The four species are related as follows:—*X. minor*: acauline, the smallest in inflorescence, and most southerly in range occurring from Tasmania and South Australia to

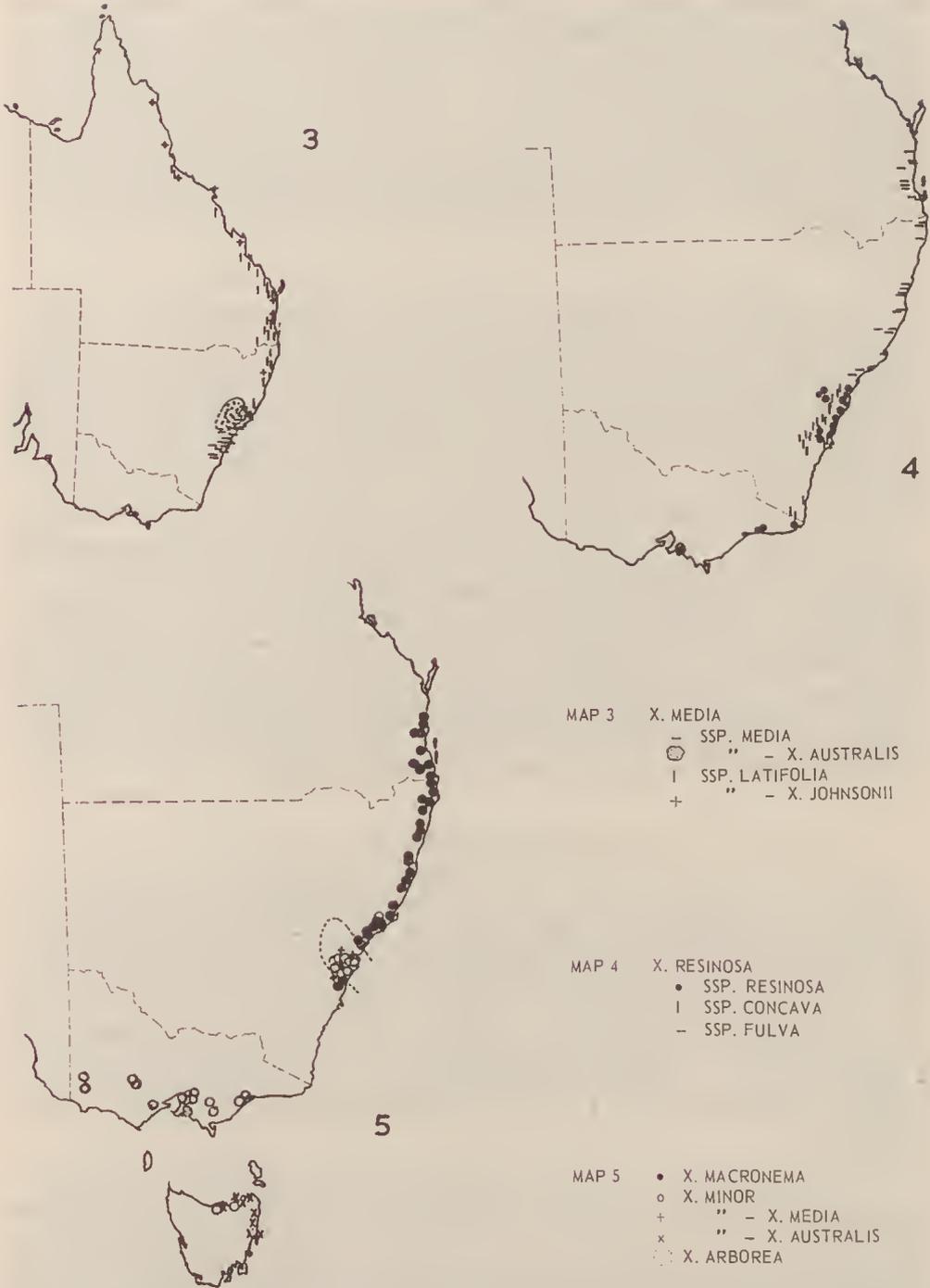


MAP 1 ○ *X. JOHNSONII*
 ● " - *X. AUSTRALIS*
 + " - *X. RESINOSA*



MAP 2 *X. AUSTRALIS*
 ● SSP. *AUSTRALIS*
 ○ " - *X. MEDIA* SSP. *LATIFOLIA*
 + " - *X. RESINOSA* SSP. *RESINOSA*
 - SSP. *ACAULIS*

Maps 1-2.—Distribution Maps for Eastern Species of *Xanthorrhoea*. Formulae in keys to the maps, such as *X. johnsonii*-*X. australis*, indicate hybrid derivatives from these taxa.



Maps 3-5.—Distribution Maps for Eastern Species of *Xanthorrhoea*. Formulae in keys to the maps, such as *X. minor*-*X. media*, indicate hybrid derivatives from these taxa.

about Port Stephens in New South Wales; *X. resinosa*: acauline, as small to much larger in inflorescence, with tomentose bracts, and extending from eastern Victoria northwards into southern Queensland; *X. media* ssp. *media*: acauline, similar in size to the larger *X. resinosa* but with near-glabrous bracts, occurring only in the Central Coast of New South Wales; *X. arborea*: arborescent, the largest in inflorescence, with a limited distribution near *X. media* ssp. *media*, and these two apparently merging (perhaps also with *X. minor*) in a northern population, *X. media* ssp. *latifolia*: acauline to weakly arborescent, varying in inflorescence size, and extending from about Wyong, N.S.W., to the northern coast of Queensland (Maps 3, 4, 5).

In Tasmania, early botanists recorded large areas occupied by *X. minor* in the north of the island (J. D. Hooker, Fl. Tas. II (1857) 59) but today it seems to be scarce, probably due to the clearing and cultivation of much of this country. *X. australis*, on the other hand, is widespread along the north and east of Tasmania. A number of recently collected specimens, representative of present day populations, strongly suggest hybridism, even allowing for the considerable inherent variation in *X. australis*, but as *X. minor* becomes more and more depleted it would not be surprising if populations of hybrid derivation by backcrossing came to show more and more of the "australis" character (see description under *X. minor*). In Victoria, *X. minor* extends from the South Australian to the New South Wales border, chiefly in the coastal fringe, and though it is not yet known from the South Coast of New South Wales it appears again in the Sydney Basin, chiefly on the heavier clay or lateritic soils. Its distinction from *X. media* rests mainly on size of inflorescence but a community at Monkeyjacket, near Port Stephens, contains examples of all sizes between the two, and there are a number of other instances of plants with intermediate characters (see *X. minor*). Possible "phantom" hybridism with *X. australis* apparently occurred earlier in the Parramatta district (see *X. bracteata*, under *X. minor*) producing plants like the Tasmanian putative hybrids, but no *X. australis* has ever been recorded from near Parramatta.

X. resinosa is at once distinguished from the other species by its tomentose bract tips; it is usually to be found on soils with fairly abundant ground water, and is more tolerant than other species of swampy conditions. This distinction, however, tends to obscure its close relationship with *X. media*, though Brown, in his original description (as *X. hostile*) remarked "perhaps too close to *X. media*". The two species may be found in the one area, but usually in different habitats of that area, *X. resinosa* in the wetter, *X. media* in the drier parts. Nevertheless I have seen *X. media* ssp. *media* growing in a typical *X. resinosa* habitat (at Bateau Bay near The Entrance, NSW 61297) and here, except for the tomentose bract tips, it was very close to *X. resinosa* morphologically. I do not know of them growing mixed in a community, but differences in flowering time could obscure such an occurrence.

X. resinosa reaches its most southerly point in north-eastern Victoria and extends, chiefly along the coastal strip, into southern Queensland as far as the Noosa River and also into the eastern part of the South and Central Tablelands of New South Wales, three subspecific populations being recognisable (Map 4). Apart from its relationship with *X. media*, *X. resinosa* shows apparent hybridism with *X. johnsonii* and *X. australis* as mentioned under these species above.

X. media is not known from as far south as *X. resinosa*, appearing first in the Central Coast of New South Wales bordering on the Tablelands near Picton. Here and in the Sydney area (the Type locality) it is often found on the dry rocky ridges of the Hawkesbury Sandstone and in these conditions flowering may be very infrequent. These communities are usually clearly distinguished from the freer flowering *X. arborea*, which grows in the same areas but in more sheltered habitats, and there appear to be few individuals which present any difficulties in identification. North of the Hawkesbury River, however, these populations are replaced by one (*X. media* ssp. *latifolia*) which combines their characters and lacks the correlation of leaf width, inflorescence size and habit which distinguish the two species further south. Indeed, the three characters which are diagnostic in the south become more or less intermediate in the northern population in which still other characters may have been derived from *X. arborea* (e.g. its free-flowering nature) or from *X. media* (e.g. its bright green glossy leaves and high scape to spike ratio, often 2:1 or 3:1). It is interesting too that *X. minor* reaches its most northerly point in the area where this replacement population (for *X. media* ssp. *media* and *X. arborea*) appears, and that hybridism occurs here between *X. media* and *X. minor*, so that *X. minor* too may be involved in a stock from which the three species are separated in the south (Maps 3, 5).

Apart from this integration with other species of the "arborea" group, presumed hybridism of certain *X. media* populations with *X. australis* and with *X. johnsonii* are mentioned under those species above.

From these observations on the populations as presently represented in our collections, a classification proposed at present cannot profess to be conclusive, and some of the taxa described below are given their rank more to accord with existing practice than from any conviction that it reflects their true biological status. Unfortunately these plants do not conveniently lend themselves to experimental investigation owing to their slow rate of growth and sometimes infrequent flowering. Nevertheless collecting must obviously be continued, and must be supported by descriptive notes on the size and habit of the specimen and its parts and of others in its community of origin.

Xanthorrhoea Smith

TYPE SPECIES: *Xanthorrhoea resinosa* Pers.

The genus *Xanthorrhoea* was originally described by J. E. Smith (Trans. Linn. Soc. Lond. IV (1798) 219) who cited its source only as "Locus Australasia". Later Persoon (Syn. Pl. I (1805) 370) gave Smith's description almost verbatim when describing *X. resinosa*, and it is apparent that both descriptions are based on the same specimen and that Persoon's species is the Type species of the genus.†

In 1810 Robert Brown (Prodr. (1810) 288) described *X. hostile* from Port Jackson and distinguished six other species in the previously monotypic genus. Brown did not refer to Persoon's publication of *X. resinosa*, and because of the full

† Earlier, Smith had published an account in English of the "Yellow Resin Tree" collected by Dr White at Port Jackson or Botany Bay which, though invalid, has caused some confusion in the nomenclature (Appendix to White, Journal of a Voyage to New South Wales pp. 235-6 and 249, Plate A; plates printed 29.12.1789 but volume published 1790); the specimens on which this account was based comprised only pieces of caudex with some leaf bases of *Xanthorrhoea* but the description mentioned a trunk of 14 or 16 ft., and this phrase must apply to *X. arborea* R. Br., since it was the only species in the area then explored with a caudex approaching these dimensions though never seen at this height today. Because of this, Moore & Betche (Hand. Fl. N.S.W. (1893) 425) and Maiden & Betche (Census N.S.W. Pl. (1916) 42) cited *X. arborea* as a synonym for *X. resinosa*.

and satisfactory treatment of the genus in the Prodrômus, Brown's names were taken up in subsequent works and Persoon's neglected or relegated to synonymy.

Thus in 1819 Smith wrote an account of the species of *Xanthorrhoea* in Rees's Cyclopaedia, using Brown's names and translations of Brown's descriptions. Under *X. hastile* he added that this species was his "Yellow Resin Tree" of 1790, attributing the mention there of a tall caudex to confusion of two species (*X. arborea* and *X. hastile*) by his informant, Dr White. He also implied in his original description of *Xanthorrhoea* that the Yellow Resin Tree was the basis of his genus (i.e. *X. resinosa*) by the words "caudex . . . resina flava scatens", other species exuding reddish coloured resin. Thus he indicated that *X. hastile* R. Br. was synonymous with *X. resinosa* Pers., and this implication has been accepted and reiterated by Kunth (Enum. Pl. IV (1843) 649), W. J. Hooker (Bot. Mag. LXXIX (1853) 4722) and recently by Bullock (Kew Bull. XIV (1960) 45), though only the last has taken up *X. resinosa* and reduced *X. hastile* to synonymy. Because of the possibility of error in determination of plants then so little known and so similar, and the prevalence of *X. media* rather than *X. resinosa* in the immediate vicinity of Sydney Cove, Port Jackson, in 1790, an effort was recently made to locate Smith's original specimen both at the Linnean Society of London, and at the Rijksherbarium, Leiden. No appropriate specimen could be found, however, and Smith's testimony must be accepted. It has also been suggested by Dr F. A. Stafleu (p.c.) that Smith's publication in Rees's Cyclopaedia might be regarded as a first designation of Lectotype.

1. *Xanthorrhoea resinosa* Pers., Syn. Pl. I (1805) 370.

HOLOTYPE: Port Jackson, or Botany Bay, J. White, 1788 apparently lost; see notes above.

NEOTYPE, here designated: *New South Wales*: Centennial Park, E. F. Constable 6.7.1962 (NSW 57853).

X. resinosa is an acauline species, the caudex attaining a height of only a few inches, with spikes which are nearly always shorter than the often tall scapes, short-acute, densely tomentose bracts (Fig 6, e) and obscure cluster bracts, and obtuse fruits (Fig. 3, b). Presumed hybridism occurs in two subspecies.

DISTRIBUTION (Map 4): *X. resinosa* occurs in eastern States from Victoria to Queensland; there are two coastal variants, ssp. *resinosa* in the south and ssp. *fulva* in the north, and a third, ssp. *concava*, which occurs on the Southern and Central Tablelands of New South Wales and in coastal highlands near Sydney.

The species has usually been known by its synonym *X. hastile*, but both this name and *X. resinosa* have been misapplied (see ssp. *resinosa* below).

a. *X. resinosa* ssp. *resinosa*.

EQUIVALENT SYNONYM: *X. hastile* R. Br., Prodr. (1810) 288; Holotype lost from BM due to war damage: Port Jackson, R. Brown, Iter Austral. 1802-5; NEOTYPE, here designated: as for *X. resinosa*.

The Type subspecies is characterised by rather thick leaves, triangular or quadrangular in section, mostly about 3-3.5 mm. broad, and by its dark brown, often stout spikes, shorter than or equal to their scape (except in a few specimens from the Blue Mountains where spikes exceed scapes). Presumed hybrids derived from this subspecies and *X. australis* ssp. *australis* are described under the latter, below.

DISTRIBUTION (Map 4): Coastal localities from Gippsland, Victoria, to Central New South Wales and the Blue Mountains, with hybrid derivatives from *X. australis* ssp. *australis* in the South Coast of New South Wales.

VICTORIA: Mallacoota, Williamson 1.1920 (MEL); Ti Tree Creek to Orbost, Sayer 1887 (MEL); Coast E of Marlo, Snowy R., per James & Co. 11.1915 and 1.1916 (MEL).

The species described or listed as *X. resinosa* by Moore & Betche in Handb. Fl. N.S.W. (1893) 425 and Maiden & Betche in Census N.S.W. Pl. (1916) 42 is in fact *X. arborea*, which is a quite distinct species.

The species described under *X. hostile* by J. D. Hooker in Fl. Tas. II (1860) 59, quoting a manuscript of Gunn, is *X. australis* ssp. *australis*.

b. *Xanthorrhoea resinosa* ssp. *fulva* Lee, ssp. nov.

HOLOTYPE: *New South Wales*: Coff's Harbour, E. F. Constable 17.10.1961 (NSW 61664).

A Typo conspectu pallidiore spicarum saepe gracilliorum, a pilis pallidis in bracteis, et foliis gracillioribus saepe supra planis concavise differt. Folia 1.5–3.5, often 2–3, mm. lata; scapus gracilis plerumque 6–9 mm. (–19 mm.) diametro, 20–60 (–160) cm. longus; spica 12–20 (–29) mm. diametro, 5–60 (–90) cm. longa.

Differs from the Type in its often more slender, pale brown, greyish or fawn coloured spikes (from the pale or colourless hairs on light-brown coloured bracts), becoming darker only in fruit and then chiefly from the decay of stamens and perianth, and in its more slender and less rigid leaves, often flat or concave on the upper surface. Leaves *very depressed-obtriangular* in section or sometimes concave above 1.5–3.5, often 2–3, mm. broad; scape slender, 6–19, usually 7–9, mm. in diameter, 20–160, usually 20–60, cm. long, often finely wrinkled; spikes 12–29, usually 12–20, mm. in diameter and 5–90, usually 10–60, cm. long. Presumed hybrids derived from this subspecies and *X. johnsonii* are described under the latter.

DISTRIBUTION (Map 4): North Coast of New South Wales, and South Coast of Queensland, with hybrid derivatives from *X. johnsonii* (q. v.) in the North Coast, New South Wales, and on Stradbroke Island, Queensland.

QUEENSLAND: Coondoo Creek, NW of Mt. Coondoo, Francis 12.1919 (BRI 029103); Noosa R., White 3.1923 (BRI 029104); Coolum Beach (BRI 029095); Burun, Leichhardt 12.1843 (MEL); Beerwah, Francis 11.1919 (BRI 029101); Beerburrum Creek, Constable 5.1962 (NSW 61663); Rose Creek between Elimbah and Beerburrum, Johnson 5. 1961 (NSW 56782); Moreton Bay, Stuart (MEL); Stradbroke Island, Bick 4.1915 (BRI 029105); Russell Island, White 9.1913 (BRI 029097); without locality (BRI 029098).

c. *Xanthorrhoea resinosa* ssp. *concava* Lee, ssp. nov.

HOLOTYPE: *New South Wales*: 1 mile W of Buxton, A. Lee 5.12.1960 (NSW 61300).

A Typo foliis latoribus planioribusque in sectione *concavo-perdepressa obtriangularibus*, et saepe spicis primo pallidis differt. A ssp. *fulva* foliis rigidis latisque, et spicis scapisque longioribus differt. Folia 3–6.5, saepe 3.5, mm. lata, dura; spica 15–150, plerumque 50–90, cm. longa, ca. 20 mm. diametro; scapus levis, 50–250, plerumque 100–200, cm. longa, ca. 10 mm. diametro.

Differs from the Type in its broader, flattish to concave, bluish-green leaves, and often in the pale greyish aspect of the young spikes. The more rigid leaf character and usually stouter spikes and scapes distinguish it from ssp. *fulva*. Leaves slightly concave above, *very depressed obtriangular* in section, 3.5–6.5, usually 3.5, mm. broad, very firm in texture; spikes shorter than their scapes, 15–150, usually 50–90, cm. long and 12–30 mm. in diameter; scapes smooth or nearly so, 50–250, mostly 100–200, cm. long, about 10 mm. in diameter.

DISTRIBUTION (Map 4): Chiefly on the Central and Southern Tablelands of New South Wales, also in the highlands of the Central and South Coast divisions.

2. *Xanthorrhoea minor* R. Br., Prodr. (1810) 288.

HOLOTYPE: Port Jackson, R. Brown, Iter Austral. No. 5773, 1803 (BM); photograph only seen, specimen examined and reported on by Hj. Eichler, Australian Liaison Officer at Kew, 1962.

EQUIVALENT SYNONYM: *X. bracteata* R. Brown., loc. cit. HOLOTYPE: Port Jackson, R. Brown, Iter Austral. No. 5772, 1803 (BM); photograph of specimen and enlargement of bracts seen, the specimen examined and reported on as for *X. minor*. This sheet bears a field label "Port Jackson or Fort Dalrymple", localities in New South Wales and Tasmania respectively, though cited in the Prodr. as from Port Jackson. The specimen, now very imperfect, resembles *X. minor* in the size of scape and spike, the leaf section and the (described) acauline habit, and though according to the description its cluster bracts, now mostly missing, were of the prominent "australis" type, the bracts shown by the specimen are intermediate in shape and of a form not uncommon in *X. minor*. The affinities of *X. bracteata* thus seem to be with that species which is recorded from both the possible localities rather than with *X. australis* which is not known from Brown's "Port Jackson".

An interesting collection of several spikes and detached leaves (Parramatta, Woolls (MEL)) includes one spike with well-developed prominent cluster bracts together with others of normal *X. minor* and of young, scarcely determinate character. Possibly Brown's specimen was from a similar plant from this locality, but such occurrences are rare and have not been collected since, though we have a slightly larger spike which is comparable from Wyong (NSW 59851), but relevant details of its habit and exact locality are not known. Alternatively it might have been one of the putative hybrid derivatives from *X. minor* and *X. australis* still to be found in Tasmania. In the absence of supporting collections, it is considered that *X. bracteata* is best treated as conspecific with *X. minor*.

X. minor is an acauline species with a usually much-branched subterranean caudex which at flowering produces a number of spikes from the branches. It has triangular leaves, often concave above, about 2–2.5 mm. broad and 1 mm. thick, very small spikes, often 5–12 cm. long and about 5–10 mm. in diameter, on slender scapes 25–50 cm. long and only 2–5 mm. in diameter and smooth to quite strongly wrinkled, short-acute to intermediate bracts and obscure or sometimes slightly prominent cluster bracts. The flowers are larger than those usually seen in other species (except *X. macronema*) but this is not a satisfactory diagnostic character. Presumed hybrid derivatives from *X. minor* and *X. australis* ssp. *australis* show various combinations of the features of the two species, and some of these may come within the range of variation in *X. australis*, but others with relatively broad (ca. 3 mm.) near-triangular leaves, or short, slender spikes (ca. 2 cm. diam.) not longer than their scapes, and/or little prominence of the cluster bracts, are strongly suggestive of hybridism between these species. Intergradants in size of inflorescence between *X. minor* and *X. media* are presumably of hybrid derivation from those species.

DISTRIBUTION (Map 5): New South Wales, usually on clay soils of the Central Coast from near Sydney to Port Stephens, and in Victoria, †South Australia and northern Tasmania, with hybrid derivatives from *X. australis* ssp. *australis* in Tasmania, marked * in the citations below, and others intergradant towards *X. media* ssp. *media* in the Central Coast of New South Wales, mostly between the Hawkesbury–Nepean and George's Rivers.

VICTORIA: Hanson S, Black 11.1936 (MEL); between Mt. Nevis & Mt. Cole, Green (MEL); Creswick, Willis 1.1958 (MEL); Linton, Williamson (MEL); Warburton, White 11.1927 (BR1 029167); Woori Tallock, 12.1905 (MEL); Ringwood, Muir Nos. 2003 and 2004, 12.1960 (MEL); Bayswater, 11.1900 (MEL); Dandenong Ra., 1.1883 (MEL); Fumina R., Williamson No. 214, 2.1925 (MEL); Sandringham, 11.1898 (MEL); Glenelg R., Mueller 2.1878 (MEL);

† No specimens have been seen, but J. B. Cleland (p.c. 7.1965) has described typical *X. minor* from the eastern side of the Murray River in South Australia.

Port Phillip (MEL); Mitchell's R., Lake Tyers, Lake Wellington, 4.1878 (MEL); Thomson R., Tisdall 1882 (MEL); Cheltenham, Cowle (MEL); 8 miles W of Mumbannar, Tindale 3.1963 (NSW 63207); 1 mile W of Dartmoor, Tindale 3.1963 (NSW 63206); Upper Yarra, Staer 4.1911 (NSW 59881); Brighton, Morrison No. 330, 1892 (NSW 59880); Mornington, Weindorfer 11.1902 (MEL); Frankston, 12.1905 (MEL).

TASMANIA: Cape Portland, Rodway 1.1951 (NSW 61296 "B")*; S. Croppies Pt., 3 miles inland, Honeysett 12.1964 (NSW 77854)* and Honeysett 12.1964 (NSW 77853)*; Waterhouse, Bennett 11.1964 (NSW 77824); Bridwood Gate, Bennett 12.1964 (NSW 72395*, 72397*); $\frac{1}{2}$ mile W of Bridport, 12.1964 (NSW 72396); Tam o' Shanter Bay, W of Weymouth, Bennett 11.1964 (NSW 72129, chromosome count voucher)*; York Town, Gunn No. 764, 1.1843 (NSW 59883); Seamander, Rodway 10.1933 (NSW 61348)*; Elephant Pass near St. Mary's, Olsen 8.1963 (NSW 66319)*; near Coles Bay, Wolfe No. 6, 10.1962 (NSW 66043)*; road to Coles Bay, McDougall 1.1962 (NSW 61297)*.

The specimens from Queensland cited under *X. bracteata* by Bentham (Fl. Austral. VII (1878) 116) are not conspecific with *X. bracteata* nor with *X. minor*, but their affinities are doubtful. Those from Newcastle Ra., F. Mueller, and Whitsunday Is., Henne are at MEL but very imperfect; the former probably belongs to *X. johnsonii*, the latter to *X. media*. The Springsure specimen, if like "coll. Wuth" (MEL), may also belong to *X. johnsonii*. The description under *X. bracteata* by Bailey (Qld. Fl. V (1902) 1665) is mixed and appears to be partly derived from *X. johnsonii*, and Bailey's description under *X. minor* (ibid. p. 1664) may be derived from *X. media*, or partly at least from *X. johnsonii*.

3. *Xanthorrhoea media* R. Br., Prodr. (1810) 288.

HOLOTYPE: Port Jackson, R. Brown; lost from BM.

NEOTYPE, here designated: *New South Wales*: Parramatta, J. H. Camfield 11.1897 (NSW 59863).

X. media is characterised by an acauline or weakly arborescent habit, glabrous, near-glabrous or shortly ciliate, short-acute to intermediate bracts, and obscure eluster bracts scarcely exceeding or upturned beyond the spike surface (Fig. 6, f and g), glossy green leaves, and inflorescences (see half-flower, Fig. 5, a) very variable in size with the dark brown spike shorter than the scape. Presumed hybrid populations are formed by both subspecies (q.v.).

DISTRIBUTION (Map 3): *X. media* extends from the Central Coast of New South Wales and Blue Mountains, to coastal Queensland at least as far north as Townsville; two subspecies may be recognised: ssp. *media* in the southern and ssp. *latifolia* in the northern part of the specific range, the change occurring in the area between the Hawkesbury and Hunter Rivers.

Since its original description, *X. media* is rarely named in the literature though it is a common plant in the areas treated by Bentham, Mueller, Bailey and Moore & Betche. Its resemblance to *X. resinosa*, *X. johnsonii*, *X. arborea* and *X. minor* may have led to confusion with these species, but available cited specimens leave the interpretations of these botanists largely speculative.

a. *Xanthorrhoea media* ssp. *media*.

Acauline plants with narrow, glossy green leaves, usually 3 mm. or less in breadth, triangular to quadrangular in section, spikes 30–80 cm. long and 23–28 mm. in diameter, or 70–140 cm. long and 17–40 mm. in diameter in the most southern specimens which border on the Tablelands, and scapes distinctly longer, 90–200 cm. long and 8–12 mm. in diameter or up to 27 mm. in the thickest inflorescences. Presumed hybrid derivatives from this subspecies and *X. australis* ssp. *australis*

usually show a tendency to arborescence, a slight prominence of the cluster bracts all over the spike, and a quadrangular though sometimes thin leaf section, while other hybrid derivatives from *X. minor* (q.v.) are also known.

DISTRIBUTION (Map 3): From the border of the Central Tablelands near Picton, N.S.W., and the Blue Mountains to the coast as far north as Wyong, occasionally in coastal flats but more commonly on higher ground, with a population of hybrid derivatives from *X. minor* (q.v.) in the western and south-western outskirts of Sydney, and others from *X. australis* ssp. *australis* on the slopes and ridges above the Goulburn, middle Hunter and Macdonald Rivers. This latter population, which is close to *X. media* in habit, approaches very closely a few specimens which occur further north-west, outside the *X. media* boundaries, and chiefly for that reason supposed to be hybrid derivatives from *X. johnsonii* (q.v.) and *X. australis* ssp. *australis*.

b. *Xanthorrhoea media* ssp. *latifolia* Lee, ssp. nov.

HOLOTYPE: Queensland: Beerwah, Constable 5.1962 (NSW 61667).

A Type in caudice aliquando arborescente usque ad 1 m. alto, in foliis ca. 4–8 mm. vel usque ad 12 mm. latis, nitentibus, planis, differt. Caudex simplex vel nonnulli-ramosus, forsitan altior in locis altioribus, spicae 20–100 cm. longae, 11–35 mm. diametro, quam scapos multo (saepe 2 × –3 ×) breviores, scapi 7–20 mm. diametro.

Differs from the Type in its tendency to arborescence, and its broader, nearly flat leaves, and from *X. arborea* in its bright green, shining leaves and its often more slender spike which is much shorter than its scape. Caudex subterranean to about 1 m. high (sometimes higher but perhaps only in hybrid derivatives), with one or several shoots, the taller trunks often developed in places of higher altitude; scapes 0.3–2.5 m. long, usually 1.5–2 m., and 7–11 mm. in diameter, much longer than the spike of about 20–100 cm. in length and 11–30 mm. in diameter. Populations of presumed hybrid derivation from this subspecies and *X. australis* ssp. *australis* are described and cited under that taxon. Hybridism between *X. media* ssp. *latifolia* and *X. johnsonii* along the Queensland coast is probably not uncommon and though the two tend to form separate communities with some differences in habitat, they may interbreed where these are contiguous. Such plants are often arborescent to about 1 or 2 m., with spikes near the size of *X. johnsonii* and a narrower, more quadrangular leaf than in *X. media* ssp. *latifolia*.

DISTRIBUTION (Map 3): Central Coast of New South Wales from about Gosford to coastal Queensland about as far north as Townsville, in coastal flats or in the eastern slopes and highest parts of the coastal ranges; also forming large populations of presumed hybrid derivatives from *X. australis* ssp. *australis* (q.v.) in the coastal ranges from near Wyong, N.S.W., to at least as far north as southern Queensland, and others from *X. johnsonii* in the far North Coast of New South Wales and in Queensland, marked * below.

QUEENSLAND: Cooktown, Blake No. 15078, 7.1943 (BRI 029187)*; Murray Upper via Tully, Fisher 12.1954 (BRI 029168-9)*; Mt. Spec, Kennedy 6.1963 (NSW 67466); near top of Mt. Spec, Kennedy 6.1964 (NSW 72221); Moongabulla, Paluma Ra., Kennedy 6.1963 (NSW 68262)*; Hayman Is., White No. 10193, 6.1934 (BRI 029165)*; Sarina, Francis 4.1927 (BRI 029143); Byfield, White No. 8161, 9.1931 (BRI 029160)*; Lakes Creek, Rockhampton, Boorman 8.1912 (NSW 59825); Gladstone, White 7.1920 (BRI 029157); Boyne Valley Junction (BRI 029134-5, 029162); Baffle Creek, White 4.1920 (BRI 029144-5); Mt. Perry, Keys (BRI 029132); Goodwood (BRI 029161); Takura–Pialba line (BRI 029156); Howard dist., Poison Pl. Comm. 2.1938 (BRI 029159); Tin Can Bay, Smith No. 4454, 4.1950 (BRI 029158)*; Noosa Heads,

Aston No. 106, 10.1958 (MEL)*; Mt. Coolum, Smith No. 4453, 4.1950 (BRI 029138-9)*; Landsborough, White 9.1919 (BRI 029147); North of Beerwah, Smith No. 4452, 4.1950 (BRI 029136) and No. 4451, 4.1950 (BRI 029140); Beerwah, Constable 5.1962 (NSW 61667); Mt. Ngungun, Glass House Mts., Johnson 5.1961 (NSW 56680); Elimbah, Clemens 7.1943 (BRI 029137); 3 miles towards Ashgrove from Jolly's Lookout, Phillips 8.1963 (NSW 64326)*; North Pine, Bick 4.1915 (BRI 029150-1); Wellington Point, White 9.1919 (BRI 029152); Goodna, White 9.1915 (BRI 029146) and 6.1916 (BRI 029148); 10 miles N of Wyberba on Ukey road, Constable 3.1962 (NSW 57574)*.

4. *Xanthorrhoea arborea* R. Br., Prodr. (1810) 288.

HOLOTYPE: Port Jackson, R. Brown 17.5.1802; lost from BM.

NEOTYPE, here designated: *New South Wales*: Manly, E. Cheel 1.1900 (NSW 56675).

This species is characterised by its arborescent habit, long, stout spike nearly equal in length to the scape (about 1–2 m.), broad (5–8 mm.) flattish leaves often dull or slightly bluish-green in aspect and acute fruits (Fig. 3, a). It occurs on the Triassic Sandstones from Port Hacking to country east of Rylstone, N.S.W., and its usual habitat near Sydney is on the south-facing, cooler slopes or lower or more sheltered parts of the north-facing rocky hills. These plants were abundant in the small valleys around the first settlement at Sydney Cove and figure in many of the early illustrations of the Colony. Usually above them on the more exposed ridges of the Hawkesbury Sandstone arc to be found plants of the closely related *X. media* ssp. *media* but there is little evidence of intergradation between them. Further north these two species, in which characters of leaf breadth, arborescence and spike size are correlated, seem to give place to a population in which their characters, perhaps with those of *X. minor* also, are merged, namely *X. media* ssp. *latifolia*.

DISTRIBUTION (Map 5): Central Coast and Central Tablelands of New South Wales.

Under *X. arborea*, Bailey (Qld. Fl. V (1902) 1665) is describing not this species but some of the hybrids derived from *X. australis* ssp. *australis* and *X. media* ssp. *latifolia*, though his note that it is "the common large form in southern localities" suggests that he was including the widespread *X. media* ssp. *latifolia*, which is sometimes arborescent, under the same name.

5. *Xanthorrhoea johnsonii* Lee, sp. nov.

HOLOTYPE: *Queensland*: Between Dimbulah and Petford, Johnson 5.1962 (NSW 61293).

Species arborescens caudice alto usque ad 2 m.; folia viridia quadrangulata, 1–2, saepe 1.5, mm. lata, in sectione fere quadrato-rhombica; scapus 50–120 cm. longus, gracilis et 4–11 mm. diametro quam spicam ca. 15–30 mm. diametro 4–80 cm. per longitudinem saepe longior, vel crassior et 15–25 mm. diametro quam spicam ca. 30–60 cm. diametro 45–225, plerumque ca. 100, cm. per longitudinem saepe brevior; bractae ciliatae vel subglabrae brevi-acutae ad sublongi-acutae, fascicularis obscurae vel subprominentes spicae basi, pubescentes abaxiale.

An arborescent species with an often undivided caudex up to 2 m. high, with distinctly quadrangular narrow leaves almost square in section and 1–2, often 1.5, mm. broad, apparently green (or sometimes greyish green but perhaps only in hybrid derivatives from *X. australis*); the crown of leaves tends to be divided into a more or less erect part of young leaves and a narrow "skirt" of old leaves reflexed over the trunk; scape 50–120 cm. long, slender (4–11 mm. in diameter) and often longer than the spike of 15–30 mm. diameter and 4–80 cm. length, or stouter (15–25 mm. or more in diameter) and often equal to or shorter than the spike of about 30–40 or up to 60 mm. diameter and about 100 (45–225) cm. length; scape smooth or finely wrinkled (or rarely coarsely wrinkled as in *X. australis* and perhaps only in hybrid derivatives), the spike green at flowering and becoming straw-coloured,

light brown or pinkish from the bract colour soon afterwards, the tips finally darkening; bracts ciliate to almost glabrous, short-acute to intermediate in form, the cluster bracts obscure or often somewhat prominent only in the lower part of the spike, pubescent to tomentose on the abaxial surface.

This species is closely related to *X. australis* which it resembles in its capacity for arborescence, its quadrangular leaves, and its occasional development of prominent cluster bracts and of somewhat long-acute bracts, and it is very probable that hybridism between the two would occur, especially since they are both found on soils of igneous or metamorphic origin. Some of the less constant characters given for *X. johnsonii* above may indeed be the result of such hybridism, but at present a single specimen from southern Queensland and a few from the North West Slopes of New South Wales are the only evidence. In these some coarse wrinkling of the scape and longer bract-tips are features of *X. australis*, though the prominent cluster bracts of that species are lacking and little is known of these plants in the field. The Queensland specimen is a slender spiked form from an area where the stouter forms of *X. johnsonii* occur, and this suggests an origin from the ssp. *acaulis* of *X. australis*, though this subspecies is not known from Queensland. Indeed *X. australis* is known only from the south in Queensland (cf. NSW 56700 and BRI 029170-1 cited under *X. australis* ssp. *australis*) so that it is here that evidence of hybridism would be expected to appear, but it is also possible that there may be occurrences further north (see *X. australis* ssp. *australis*).

A few communities of presumed (from an observed hybrid swarm, *fide* L. A. S. Johnson) hybrid derivatives from *X. johnsonii* and *X. resinosa* ssp. *fulva* have the arborescent habit and stout inflorescence of southern *X. johnsonii* but the bracts are more or less tomentose at the apex; other apparent hybrid derivatives have been observed in coastal Queensland between *X. johnsonii* and *X. media* ssp. *latifolia* (q.v.) and may be quite common from the North Coast of New South Wales to the northern Queensland coast.

DISTRIBUTION (Map 1): Coast, ranges and their slopes over most of eastern Queensland, at least as far north as Cairns, and in the North Coast, Northern Tablelands and North Western Slopes of New South Wales, usually on hillsides in the coastal localities, with some specimens suggesting hybridism with *X. australis* ?ssp. *acaulis* in the North West Slopes of New South Wales and in southern Queensland (marked * below), and others of presumed hybrid derivation from *X. resinosa* ssp. *fulva* in the North Coast of New South Wales and on Stradbroke Island, Queensland (marked † below).

QUEENSLAND: W of Mareeba, Mesmer 9.1962 (NSW 66041); 5 miles NW of Dimbula, McKee No. 9239, 4.1962 (NSW 57555; between Dimbula and Petford, Johnson 5.1962 (NSW 61293); Walsh's Pyramid (BRI 029188); 2 miles S of Stannary Hills, McKee No. 9433, 4.1962 (NSW 57558); Ravenshoe, Mesmer 8.1962 (NSW 59789); Wyoming, Mesmer 9.1962 (NSW 66042); 20 miles W of Greenvale Station, Speck No. 4661, 7.1954 (CANB); Townsville-Ingham-Blue R. crossing, Hall 6.1956 (BRI 000935); foot of Mt. Spec road, Paluma Ra., Kennedy 6.1964 (NSW 72220); Deep Creek 16 miles N of Townsville, Kennedy 6.1963 (NSW 64346); 31 miles SW of Ayr, N of Mt. Benjonney, Smith No. 4379, 6.1949 (BRI 029184); 14 miles NW of Emerald, Adams No. 1287, 9.1964 (NSW 72222); Springsure, Bick No. 7, 5.1915 (BRI 029177); Springsure, ? Wuth No. 177 (MEL); Mt. Perry, Keys No. 569 (BRI 029189); Mt. Ivory, Pedley No. 328, 10.1958 (BRI 012940) and No. 328A, 10.1958 (BRI 012939)*; Pelican, Ryan 10.1958 (BRI 012943); Highland Plains NNE of Oakey, Grove 10.1958 (BRI 012937-8); Gympie road near Brisbane, Bick No. 6, 4.1915 (BRI 029190-2); near Brisbane in Sunnybank cemetery reserve, Blake No. 14284, 8.1940 (BRI 029182-3); Stradbroke Is., McKee No. 8716, 9.1961 (NSW 56688); Stradbroke Is., McKee No. 8717, 9.1961 (NSW 56687); Stradbroke Is., McKee No. 8744, 9.1961 (NSW 56784)†; Wyaga, White 9.1919 (BRI 029176).

The record of *X. bracteata* from Queensland by Bentham (Fl. Austral. VII (1878) 116) is based on some unsatisfactory specimens at MEL; those from Newcastle Ra., F. Mueller, and Springsure, ? Wuth are probably *X. johnsonii*; Bailey (Qld.

Fl. V (1902) 1665) quotes Bentham, but his description appears to be mixed; he also (*ibid.* p. 1664) cites a specimen (not seen) from "hills about Cairns" under *X. minor* which might be *X. media* or one of the smaller forms of *X. johnsonii* which occur in that situation; Bailey's use of *X. quadrangulata* (*ibid.* p. 1666) also seems to apply to *X. johnsonii*, and Domin (*Bibl. Bot.* XX Heft 85¹ (1915) 527) described Queensland plants under *X. quadrangulata* which probably belong to *X. johnsonii*, though I have not seen the cited specimen. *X. quadrangulata* and *X. johnsonii* are undoubtedly very close morphologically but the following differences have been noted: *X. quadrangulata*: Flowers (? always) yellow; spike dark brown, rather stout, shorter than the scape; capsule with points 2-5 mm. long; leaves in a more or less spherical crown. *X. johnsonii*: Flowers white; spike light coloured, stout and exceeding the scape to slender and shorter than the scape; leaves, when old, hanging close around the caudex, thus forming a narrow "skirt"; capsule points 1-2 mm. long.

6. *X. australis* R. Br., Prodr. (1810) 288.

HOLOTYPE: *Tasmania*: Grass Tree Hill near Risdon Cove, R. Brown, Iter Austral. No. 5775, 2. 1804 (BM).

TOPOTYPE: *Tasmania*: Grass Tree Hill, D. Martin 13.12.1962 (NSW 63238).

The Holotype specimen of *X. australis* consists of leaf pieces only as does its duplicate at Kew, and since the spike characters are diagnostically important and since urban development is rapidly reducing the numbers of these plants in the Type locality, the Topotype specimen above is set up to guide interpretation of the original description and to establish this writer's concept of the species. Dr Martin, who examined the Grass Tree Hill community, expressed the opinion that specimens of *Xanthorrhoea* there were all conspecific.

Typically *X. australis* comprises an arborescent population with distinctly quadrangular leaves, a stout spike exceeding a relatively short scape, and light coloured, long-acute bracts and prominent cluster bracts (Fig. 6, a, b, c) throughout the spike, but these characters do not all obtain in an acauline, short-spiked subspecies, nor in many of the specimens believed to be derived from *X. australis* by hybridism (see ssp. *australis*).

DISTRIBUTION (Map 2): Queensland (as hybrid derivatives only), New South Wales and Victoria, chiefly in the Great Dividing Range and its inland slopes just into South Australia, and in the north and east of Tasmania.

The description under *X. australis* in J. D. Hooker (Fl. Tas. II (1858) 58) seems to apply to some of the smaller Tasmanian plants rather than the tall arborescent form in the original description, and may describe intergradant specimens believed to be hybrid derivatives from *X. australis* and *X. minor*. The description under *X. australis* in Black (Fl. S. Austral. ed. 2 (1943) 195) is derived from mixed material including both *X. australis* and *X. minor*, though the two species have recently been distinguished on the eastern side on the Murray River in South Australia (J. B. Cleland, p.c. 7.1965). Hooker, however, describes (*ibid.* p. 59) *X. australis* ssp. *australis* under the name *X. hastilis*.

The Type specimen from Tasmania is well matched in Victoria and New South Wales, but the species shows considerable inherent variation as well as much putative hybridism. In New South Wales collections are numerous enough to support division of the species into two subspecies described below; these may prove to be distinguishable in Victoria also, but material from that State is as yet very inadequate.

a. *Xanthorrhoea australis* ssp. *australis*.

Often massive, arborescent plants with caudex commonly branched and sometimes several times, especially in the northern part of the range, often 1–3 m. high, but sometimes more especially in higher altitudes. Leaves narrow, quadrangular, 1–2 mm. broad, thin to thick (*very depressed-obtrullate* or *rhombic* to *quadrate-rhombic* in section) with a greyish or silvery aspect sometimes scarcely noticeable, forming a roughly spherical crown of leaves rather than a narrow skirt of old hanging leaves distinct from more or less erect young ones. Spike stout and sometimes very large, often 3–6 cm. in diameter, 50–350, usually 90–200 cm. long, light or gingery brown at anthesis, longer than its scape. Scape stout, coarsely wrinkled, 1.1–4, usually 1.5–3, cm. in diameter, 35–150 cm. long. Bracts light brown, often yellowish inside, the tips darkening with age, long-acute, with very long-pointed cluster bracts upturned as much as 2 cm. over the bract surface or sometimes scarcely prominent among very long-acute bracts.

Specimens of hybrid derivation from this subspecies and *X. media* ssp. *latifolia*: caudex sometimes up to 7 m. high, several-branched. Leaves broader, to 4 mm. broad, and relatively thinner, usually without any greyish aspect and often with a very thick, dark purplish-red base. Spikes as in the subspecies in size but the scape often of nearly equal length, each about 1 m. long, the scape usually almost smooth, and the bracts darker in colour so that the spike has a dark brown aspect. Bracts often intermediate or even short-acute in form, cluster bracts less prominent or even obscure.

Two recently collected specimens are apparently of hybrid derivation from this subspecies and *X. resinosa*, probably ssp. *resinosa*: caudex about 1 m. high, flattish or quadrangular leaves 3.5 mm. broad, the long stout spike of *X. australis* ssp. *australis* shorter or longer than its scape, but with short-acute, tomentose bracts like those of *X. resinosa*.

Other populations of presumed hybrid derivation from this subspecies and *X. media* ssp. *media*, or *X. minor*, are described under those taxa, and possible hybridism with *X. johnsonii* is mentioned under that species.

DISTRIBUTION (Map 2): Chiefly in the Tablelands throughout New South Wales usually on soils of igneous or limestone origin, reaching the North Coast apparently by way of river valleys in a few places; in Victoria chiefly in the Great Dividing Range from the New South Wales border just into South Australia, and in the north and east of Tasmania, with hybrid derivatives from *X. media* ssp. *latifolia*, marked * in the citations below, in mountains of southern Queensland on soils of igneous derivation, and in ranges of coastal New South Wales from near Wyong to the Queensland border often on similar soils and in association with or even in rainforest; with other hybrid derivatives from *X. resinosa* ?ssp. *resinosa* in the South Coast of New South Wales, and others from *X. media* ssp. *media* (q.v.) in the Central Coast of New South Wales and from *X. minor* (q.v.) in Tasmania, and possibly from *X. johnsonii* (q.v.) in the North Western Slopes and Northern Tablelands of New South Wales.

QUEENSLAND: Bunya Mts., Cleland (NSW 56700)*; Mt. Cordeaux, White No. 13142, 11.1949 (BRI 029170-1)*.

VICTORIA: Upper Murray R., Findlay 1883 (MEL); Hume's R. (i.e. Murray R.), *scripsit* F. Mueller (MEL); Grampians, Walter 11.1900 (NSW 56698); Hall's Gap, Grampian Mts., Joshua 1963 (NSW 67462); Torquay, Williamson (MEL); Wilson's Promontory, *scripsit* F. Mueller (MEL).

TASMANIA: Sister's Creek, Martin 12.1963 (NSW 67463-4); S of The Gardens, NE Tasmania, Wolfe Nos. 1-2, 10.1962 (NSW 66053); 8 miles S of St. Helens, per Martin (NSW 67357); N of Coles Bay, Wolfe No. 4, 10.1962 (NSW 66051) and No. 5, 10.1962 (NSW 66052); Grass Tree Hill near Risdon Cove, Brown 2.1804 (BM, Iter Austral. No. 5775, photograph only seen); Grass Tree Hill, $\frac{1}{2}$ mile N of highest point on Risdon-Richmond road, Martin 12.1962 (NSW 63238); Grass Tree Hill, E dolerite spur, Martin 1.1963 (NSW 66545); Grass Tree Hill, Jackson 10.1961 (HO 3863); North Bruni Is., Rodway 1.1901 (NSW 61349); North Bruni Is. Martin 6.1964 (NSW 64590); Tasmania, Carpenter 1919 (NSW 56699).

This subspecies is described by J. D. Hooker (Fl. Tas. II (1860) 59) quoting a manuscript of Gunn) under the name *X. hastile*. Bailey (Qld. Fl. V (1902) 1665) described hybrid derivatives from this subspecies and *X. media* ssp. *latifolia* under the name *X. arborea*; these plants represent the only form in which *X. australis* is known in Queensland.

A recent collection comprising leaves, photograph and young spike from Magnetic Island, Queensland, is of considerable interest: Arcadia, Magnetic Island, Kennedy No. 4, 7.1963 (NSW 67465). Queensland botanists do not know of any occurrence of *X. australis* ssp. *australis* north of one near the Bunya Mountains, yet this specimen from Magnetic Island has potentially all the characters of the subspecies though it is too young to be sure of the ultimate bract and cluster bract form. Its caudex is about 1 m. tall, leaves are narrow-quadrangular, 2 mm. broad and the spike has distinctly prominent cluster bracts right to the tip, while the incompletely grown floral bracts suggest an intermediate or even long-acute form. All these characters could be ascribed to *X. johnsonii* except for the cluster bracts which are definitely those of *X. australis*, while another specimen of imperfect and old spike from Ingham: near Ingham, Narrea (BRI 029178), shows long-acute bracts seen only in the latter species and its hybrid derivatives. These two specimens, unsatisfactory as they are, suggest that *X. australis* ssp. *australis* may yet be found further north than at present known or, perhaps more likely, that its genes have persisted in hybrid populations and are now being manifest far from the site of its occurrence. On the other hand, the character of the cluster bracts of the Magnetic Island plant may prove to be temporary, though the Ingham plant, unless misleading because of its age, still suggests an element of *X. australis* ssp. *australis* in the area.

b. *Xanthorrhoea australis* ssp. *acaulis* Lee, ssp. nov.

HOLOTYPE: *New South Wales*: 6 $\frac{1}{2}$ miles W of Dubbo, Constable 9.12.1961 (NSW 61344).

A Typo habitu acaule vel subacaule, spica multo minore, et scapo gracilliore spicam excedente, differt. Spica 12-30 cm. longa, 1.7-3.0 cm. diametro; scapus saepe ca. 30 cm. longus, quam spicam longior, 7-12 mm. diametro.

Differs from the Type in its permanently acauline or near-acauline habit, and in its much smaller inflorescence, the spike 12-30 cm. long, 2.2-3.5 mm. in diameter, thus often shorter than the slender scape of about 30 cm. length and 1 cm. diameter. Intermediate forms between this and ssp. *australis* are apparently fairly common, but there seems to be a considerable correlation of small spikes with caespitose habit, and of stout spikes longer than the scape with arborescent habit.

Possible hybridism of this subspecies with *X. johnsonii* is mentioned under that species.

DISTRIBUTION (Map 2): Western Slopes and western parts of the Northern and Central Tablelands of New South Wales, perhaps with hybrid derivatives from *X. johnsonii* (q.v.) in the North West Slopes of New South Wales and in southern Queensland.

7. *Xanthorrhoea macronema* Benth., Fl. Austral. VII (1878) 113.

LECTOTYPE, here selected: *New South Wales*: Hastings R., Dr Beckler (K; ISOTYPE MEL).

PARATYPES: Moreton Is., McGillivray, 10.1847 (K); Tweed R., Chas. Moore, recd. 9.1874 (K).

Although Mueller's publication of this name (Fragm. IV (1864) 112) was of a Provisional Name only, Bentham is considered to have attributed the authorship intentionally to Mueller. Bentham cited three syntypes which are extant at Kew (not seen by me but examined by L. A. S. Johnson, Australian Liaison Officer, 3.1963) and of these the Lectotype above is designated to stabilise the nomenclature.

An acauline species characterised by its short spikes on long, very slender scapes, large flowers with perianth and long stamens spreading at anthesis not recurved as in other species, short-acute bracts and obscure cluster bracts, triangular leaves (in section) with several deep grooves between the ribs, and very scabrid margins.

DISTRIBUTION (Map 5): Central and North Coast of New South Wales and south eastern Queensland.

QUEENSLAND: Fraser Is., White No. 2530, 5.1925 (BRI 029114); Fraser Is., White 10.1921 (BRI 029109); Noosa Heads, White 1.1920 (BRI 029122); Coolum, Trapnell 11.1960 (BRI 025965); sandstone ridges going to Burun, Leichhardt 12.1843 (MEL); Buderim Mt., White 4.1912 (BRI 029112); Eudlo Creek, Bailey 11.1898 (BRI 029117); Mooloolah Swamp, Bailey 12.1890 (BRI 029118); Tallebudgera, White 3.1923 (BRI 029130); Landsborough, White No. 9636, 11.1933 (BRI 029124); Candle Mt., White 5.1918 (BRI 029120); Moreton Bay, Stuart (MEL); Mt. Gravatt, Bick 4.1915 (BRI 029121, 029129); Stradbroke Is., Scortechini & Bailey, Oct. (BRI 029116); Stradbroke Is., Bick 4.1915 (BRI 029119); Russell Is., White 9.1913 (BRI 029128); Tambourine Mt., Longman & White 2.1917 (BRI 029110, 029113); Coolangatta, Simmonds (BRI 029127); Macpherson Ra., White 12.1915 (BRI 029111).

ADDENDUM. Since this paper went to press, J. B. Cleland, in *S. Austral. Nat.* XL (1965) 27, has published his corrected interpretation of the species of *Xanthorrhoea* in South Australia, revealing that both *X. australis* and *X. minor* occur in the extreme south-east, on the Victorian side of the Murray River (see above, pp. 46 and 51). His description of a colony as consisting of a few plants of *X. australis* together with hundreds of *X. minor* may be a correct interpretation, but it is possible that the colony comprises a hybrid swarm containing the two species and intergradants, some of the last being perhaps young (trunkless) *X. australis*.

Notes on *Acacia deanei*

MARY D. TINDALE

SUMMARY

Two geographic subspecies are recognized in *Acacia deanei*, since *A. paucijuga* F. Muell. ex N.A. Wakef. is reduced to a subspecies of the former. A key to these taxa is provided, also a list of representative specimens and notes on their distribution. Chromosome counts on both subspecies have been supplied by Barbara G. Briggs (personal communication).

Acacia deanei (R.T. Bak.) Welch, Coombs et McGlynn occurs in drier country than do most species of the *A. decurrens* group. It is a bushy shrub or small tree up to 7 m. high, often occurring on red soil plains or stony hillsides. However it is found on a variety of soils including sandy loams, gravelly clays and clay loams. Two geographic subspecies can be recognised.

Acacia deanei (R.T. Bak.) Welch, Coombs et McGlynn in Journ. Roy. Soc. N.S.W. LXV (1931), 1932, 227.

ABSOLUTE SYNONYM: *Acacia decurrens* (Wendl.) Willd. var. *deanei* R.T. Bak. in Proc. Linn. Soc. N.S.W. XXI (1896) 348.

KEY TO THE SUBSPECIES

1. Pinnules mostly 1 to 4.5 mm. long. Corolla usually clothed with golden hairs towards the apices of the lobes. Ribs of the calyx glabrous to tomentose. Upper pinnules mostly obtuse ssp. *deanei* a.
- 1.* Pinnules mostly 5 to 11 mm. long. Corolla glabrous. Ribs of the calyx usually glabrous. Upper pinnules mostly truncate ssp. *paucijuga* b.

However a number of intermediates do occur especially on the Central Western Slopes of New South Wales where both subspecies are common wayside trees and shrubs. In some specimens of ssp. *deanei* the corollas are almost glabrous.

A. deanei ssp. *deanei* has a more northern distribution than ssp. *paucijuga*, being found in the drier parts of south-eastern Queensland, as well as on the Western Slopes, Western Plains and a few localities in the Northern Tablelands of New South Wales, whereas ssp. *paucijuga* occurs on the Central and South Western Slopes, the Central and Southern Tablelands of the latter State, as well as on the Western Plains. This subspecies extends into Victoria at Suggan Buggan, Deddiek and the Snowy River Valley.

a. ssp. *deanei*.

HOLOTYPE: Gilgandra, New South Wales, Henry Deane. No type material could be traced but R.T. Baker provided a critical description, so that there is no doubt concerning the identity of *A. deanei*.

REPRESENTATIVE SPECIMENS: *Queensland*: a few miles E of Kogan, in sandy wash at foot of ridge, L. S. Smith No. 10254, 10.1957 (BRI; NSW 60015); 2 miles S of Wyberba, erect shrub to small tree 15 ft. high, in gravelly clay, Constable No. 2038, 3.1962 (NSW 63189). *New South Wales*: Mt. Exmouth Slopes, 1800 ft. alt., erect bushy tree 12 to 15 ft. high, Johnson & Constable 4.1952 (NSW 20352); Lightning Ridge-Goodooga, 400 ft. alt., Constable 5.1951 (NSW 18446); 5 miles W of West Wyalong, tree 7 ft. high, often a shrub, on the red soil plains with *Acacia cardiophylla* and *Cassia nemophila*, Tindale 10.1963 (NSW 63795).

b. ssp. *paucijuga* (F. Muell. ex N.A. Wakef.) Tindale comb. et stat. nov.

BASIONYM: *Acacia paucijuga* F. Muell. ex N. A. Wakefield in Viet. Nat. LXXII (1955) 93.

LECTOTYPE: In virgultis planitierum steriliorum ad flumen Broken Bay, gregaria. Fruct. 7-10 ft. alt. Dr. M. (= von Mueller), (MEL), examined.

REPRESENTATIVE SPECIMENS: *New South Wales*: 6 miles S of Grenfell on the road to Young, small tree with smooth, green, ridged bark, on red soil plains, Tindale 10.1963 (NSW 63790); 9 miles S of Temora, along roadside, Boyd 12.1962 (NSW 68290); near Grong Grong, tree 12 ft. high, on red soil plains, Tindale 10.1963 (NSW 63858); Walbundrie, 700 ft. alt., tree 20 ft. high, on clay loam, McBarron & Tindale 10.1952 (NSW 39540). *Victoria*: Suggan Buggan River Valley, 1500 ft. alt., on dry stony hillslopes, Wakefield No. 2093, 1.1947 (NSW 78664).

CHROMOSOME COUNTS

A chromosome count of $2n = 26$ was made for *A. deanei* ssp. *deanci* by Barbara G. Briggs (personal communication) on material which she collected in *Eucalyptus-Callitris-Acacia* woodland, 4 miles north of Gilgandra, N.S.W., in August 1964 (NSW 78663). Dr. Briggs has also recorded previously unpublished counts on two of my collections of ssp. *paucijuga*. They are as follows: $2n = 26$ on material obtained 1 mile SW of Rankin Springs, N.S.W., on the 29th October 1963 (NSW 63857) and $3n = 39$ for a specimen collected at Derain, N.S.W., on the 30th October 1963 (NSW 63788). It is not known whether such triploid individuals are frequent in this subspecies but previously published counts for members of the *A. decurrens* group have been diploid.

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