

The Species of *Xeronema* (Liliaceae)

LUCY B. MOORE¹

BRONGNIART AND GRIS (1864a) proposed the genus *Scleronema* to accommodate a species which they named *S. moorii* in honour of Mr. C. Moore, Director of the Botanic Gardens in Sydney, who had collected specimens from the mountains of New Caledonia. The name *Scleronema* was preoccupied (Bentham, 1862: 109) and within a few months Brongniart and Gris (1864b) substituted the name *Xeronema* and the New Caledonian plant became *X. moorii* (spelled *moorei* by later authors). A full and illustrated description of this species appeared four years later (Brongniart and Gris, 1868: 2-5, table 1), together with a discussion of its affinities. The genus *Xeronema* was considered monotypic until the discovery of *X. callistemon* on cliffs of the Poor Knights Islands off the east coast of North Auckland, New Zealand (Oliver, 1925: 383, 1926: 1-3). In 1933 Mr. A. T. Pycroft found the new species on Taranga or Hen Island, some 30 miles farther south (Cranwell, 1933: 234-36). Figure 1 shows the geography of these locations.

In drawing up his description of *X. callistemon* Oliver had at his disposal Brongniart and Gris's 1868 account and figures of *X. moorei* but no direct comparison of specimens of the two species seems to have been made until recently. In August 1953 Mr. L. J. Dumbleton, then of the South Pacific Commission in New Caledonia, kindly sent early and mature flowering stems collected from an altitude of 600 to 750 metres on Mont Mou, followed in June 1954 by a rooted fan and a head of mature capsules still containing a few seeds, collected from an altitude of 1,000 metres on Montagne des Sources on the main

mountain chain near Noumea. These specimens confirm that the two species are amply distinct though undoubtedly congeneric, but there are good distinguishing characters other than those emphasized by Oliver. It seems worth while to review the differences and at the same time to record some further details about the New Zealand species.

ACKNOWLEDGEMENTS

The writer gladly expresses thanks to Mr. L. J. Dumbleton for the New Caledonian material on which comparisons were based; to Dr. W. R. B. Oliver for a copy of Brongniart and Gris's 1868 paper and figure and for other help; to Miss E. K. Pickmere (Mrs. W. Reynolds) for careful notes on garden plants; to Miss N. M. Adams for the drawings for Figure 4.

COMPARISON OF THE TWO SPECIES

The two species resemble each other in habit, with stiff iris-like bright green leaves borne in many short-stemmed fans (Figs. 2, 3). Leaf bases are very fleshy, making the plants drought-resistant, and in both species there is a distinct sinus just above the junction of sheath and blade; this sinus is not shown in Brongniart and Gris's figure and Oliver erroneously listed it amongst distinguishing characters of *X. callistemon*. The stout scape with its sheathing bracts carries the horizontal raceme well above the leaves. Flowers arise in the axils of bracts all round the raceme axis, but the pedicels of those on the under side elongate and bend upwards so that they are "toutes dirigées vers le ciel." The inflorescences seen show the same colour range in both species, being predominantly and persistently red (the pollen almost tangerine), with gradual change from bright to duller

¹ Botany Division, Department of Scientific and Industrial Research, Wellington, New Zealand. Manuscript received August 10, 1956.

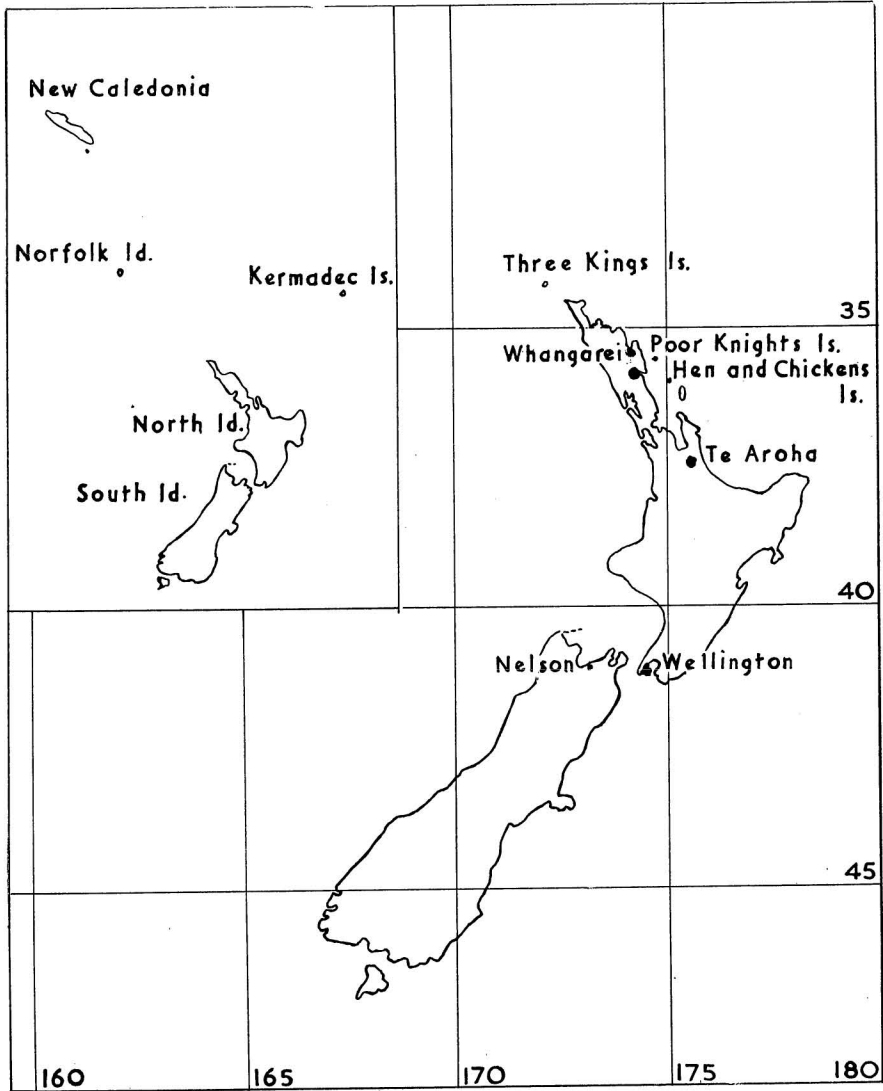


FIG. 1. Map of New Zealand showing places mentioned in text. Inset indicates position of New Caledonia in relation to New Zealand.

tones as the capsules ripen. *X. callistemon* shows a wide diversity in size, leaves reaching more than a metre and racemes up to 30 cm. in length; on the other hand plants 30 cm. tall can bear racemes only 1.0 cm. long both on exposed ridges on the islands and under comparable garden conditions. Dimensions given for *X. moorei* are nearer this minimum but it is uncertain whether the difference in size is at all significant; as a matter of con-

venience smallish plants and inflorescences might have been chosen for sending to herbaria. Thus vegetatively the two species would be difficult to distinguish from each other, and the flowering heads are much alike in general appearance.

Floral structures show good diagnostic characters. As Oliver pointed out, the tepals of the inner whorl in *X. callistemon* are narrower than the outer ones, whereas in *X.*

moorei they are all similar (Fig. 4A, D). Differences in capsule shape were emphasized by Oliver and are shown in Figure 4B, E; New Zealand capsules are more strongly stipitate than those seen from New Caledonia. A striking difference not recorded by Oliver, since it was not suggested by Brongniart and Gris, either in description or figure, is seen in the old capsules. In *X. moorei* the style remains slender and becomes twisted like the long staminal filaments which, together with the shrivelled persistent tepals, form a thready tangle about the opened capsule.² In *X. callistemon* the style thickens and dries firm and straight and stiffly erect so that the raceme permanently retains its brush-like appearance (Fig. 4B, E, Fig. 5). In both species the spreading of the capsule valves at dehiscence tends to split the style base into its three constituent parts, with frequent breakage in *X. moorei*.

Brongniart and Gris (1868: 3) describe fertile seeds of *X. moorei* as 1.5 mm. long, "uno latere convexa, aculeis brevibus apice inflatis truncatisque exasperata, altero nudo lateraliter raphe carinato." This description and their accompanying figures agree rather well with seeds of *X. callistemon*. Seeds from the capsules recently received from New Caledonia (Fig. 4F) are regularly longer than those of *X. callistemon* and almost oblong in outline; processes cover the surface except on rather vaguely defined furrows at the sides of the prominent keel which is itself echinate along its ridge. In *X. callistemon* (Fig. 4C) the seeds taper somewhat towards one end, the keel is smooth and the inner faces are plane and sharply distinct from the outer curved face which alone is echinate with semitransparent blunt cylindrical processes; processes in *X. moorei* are equally blunt but darker, more opaque and more inclined to be bent.

² "Les filets staminaux longs, secs et persistants du *Xeronema*, même à l'époque de la maturité du fruit, lui donnent un aspect tout particulier d'où nous avons tiré le nom générique" (Brongniart and Gris, 1868: 5). Compare the erroneous explanation in Cranwell and Moore, 1938: 25 and Moore, 1953: 26.



FIG. 2. *X. moorei*. Montagne des Sources, New Caledonia; on top of rocky ridge. 1955. Photograph by L. J. Dumbleton.

The pollen of *X. callistemon* has been described and figured (Cranwell, 1942: 293; 1953: 49, pl. 5, text fig. 38). That of *X. moorei* is slightly smaller but with similar exceedingly characteristic reticulation of the exine (Cranwell, 1953, from herbarium specimen, confirmed by N. T. Moar (personal communication) from fresh pollen).³

ECOLOGY AND DISTRIBUTION

The habitats of the two species are probably as nearly alike as their different latitudes can provide. *X. moorei* in New Caledonia (Lat. 22° S) "seems to do best on rather rocky narrow ridges more or less in the cloud belt" (Dumbleton, in litt.). Selling (in Guillaumin,

³Chromosome numbers of *Xeronema* have been counted by Dr. J. A. Rattenbury of Auckland University College. *X. moorei* from Montagne des Sources has a somatic number of $2n = 72$ (unpublished) and *X. callistemon* from Hen Island a somatic number of $2n = 36$ (*Roy. Soc. New Zeal. Trans.* (1957) 84 (4)). Specimens from which root tips preparations were made are growing at Auckland University College.



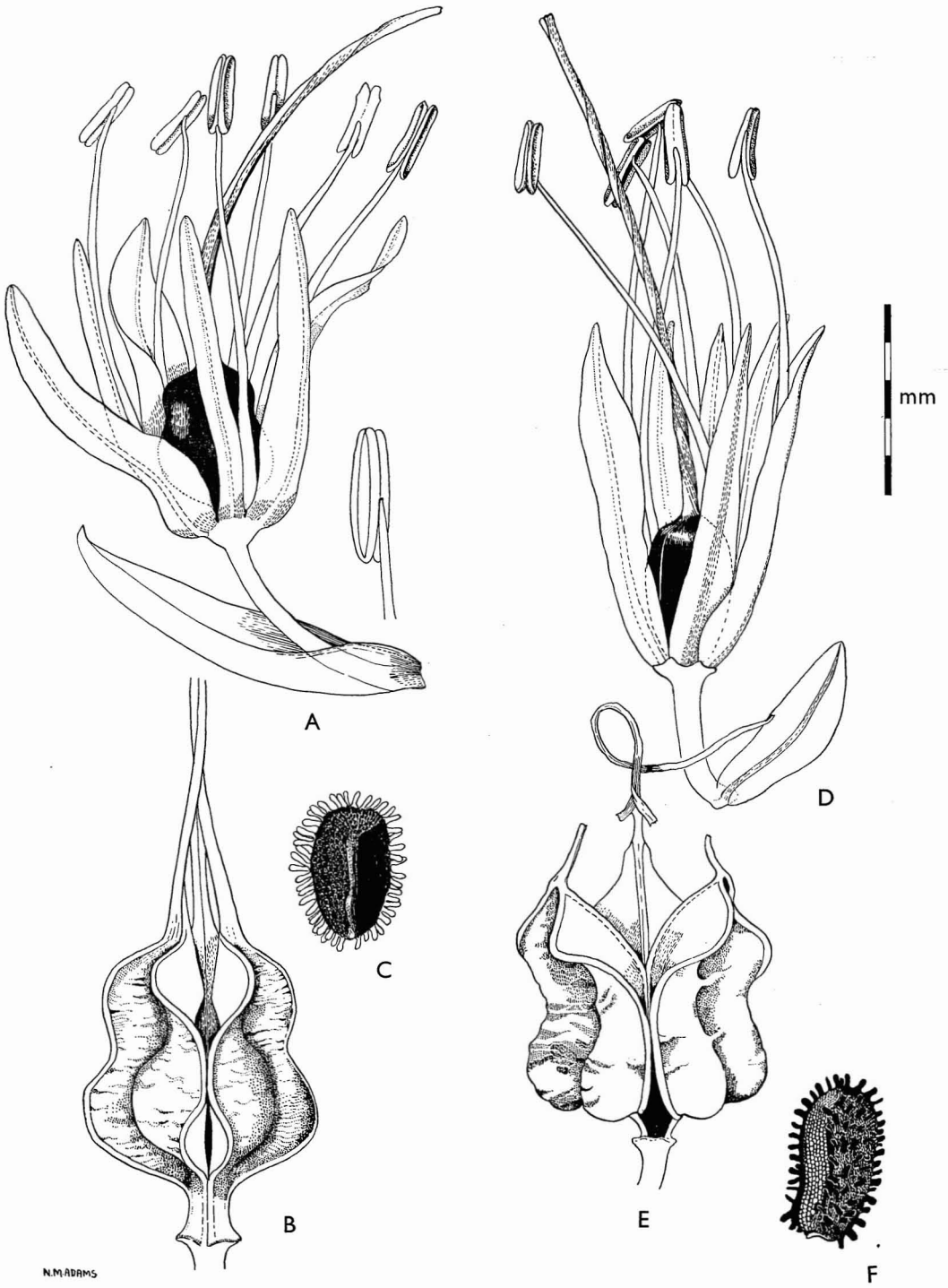
FIG. 3. *X. callistemon*. Hen Island, New Zealand; on cliff edge, sea in background. 1933. (*Arthropodium cirratum* in foreground.) Photograph by L. M. Cranwell.

1925: 13) records it from "Montagne des Sources, *Araucaria Muelleri*-forest, 800 m., not uncommon"; his photograph (*loc. cit.* Fig. 8) shows this as a rather open forest where much light reaches the rocky floor. K. H. Marshall (1954: 21) mentions, above the "clouds" forest, "a small natural clearing of about one square chain, at 5,000 feet, just crammed full of xeronema in full bloom."

On the New Zealand offshore islands good drainage and plenty of light seem essential for *X. callistemon*, as on ledges and tops of cliffs to an altitude of 300 metres, and, on the northern island of the Poor Knights, on flat

ground where rhyolitic soil is "very poor, dry and inhospitable" (Cranwell, 1937: 104, pl. 26). Seedlings are established only in well-lit places. On cliff faces plants that have accumulated great masses of leaf-debris not infrequently break off. Those that fall to the floor of rather dense forest do not long survive in the shade there. Some tumble into the sea and such a clump was found washed up on one of the Chickens Islands where the species is not known to grow (Cranwell and Moore, 1935: 309); it is quite unlikely that the sea could ever lift a whole plant to a place where it could establish afresh and so extend

FIG. 4. A-C: *X. callistemon*. A, flower from middle of raceme, garden-grown by Mrs. A. R. Pickmere (BD 50094A); B, capsule, garden-grown by Dr. W. R. B. Oliver; C, seed, Poor Knights Island, keel view: pale processes confined to outer rounded surface and seen only peripherally, keel and inner faces smooth. D-F: *X. moorei*. D, flower from middle of raceme, Mont Mou (BD 83585B); E, capsule, Montagne des Sources (BD 87634); F, seed, Montagne des Sources, lateral view showing dark processes on rounded outer surface to right and on keel to left. Scale applies to flowers and capsules; seeds drawn twice as large; enlarged anther shows filament inserted in pit between anther lobes. Drawings by Nancy M. Adams.



N.M. ADAMS

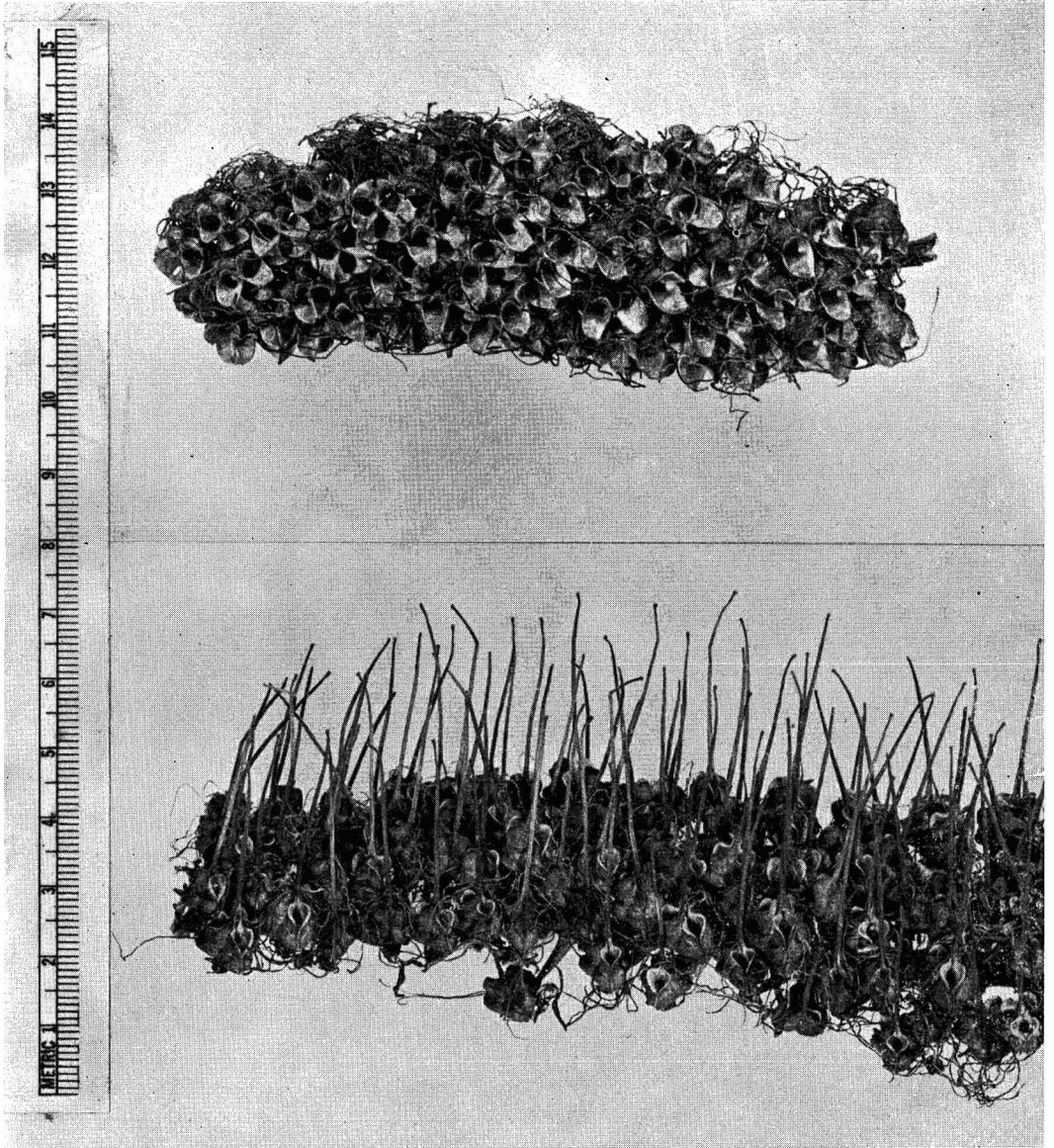


FIG. 5. Racemes with dehiscent capsules. Above, *X. moorei*, Montagne des Sources, whole raceme, styles twisted and tangled with dry threadlike tepals and stamens; below, *X. callistemon*, garden-grown by Dr. Oliver, portion of raceme only, styles stiff and erect. Photograph by S. N. Beatus.

the range of the species.

Except that seeds drop easily into rock crevices at lower levels, neither species has an efficient dispersal mechanism. Of the numerous seeds in each capsule many fail to mature, some are shaken out, and some escape only when the capsule finally disinte-

grates.

X. moorei is known only from New Caledonia. *X. callistemon* has been found on two of the many island groups off the North Auckland coast, but not on islands between these two. The same sort of "spotty" distribution is shown by *Meryta sinclairii* (also

with affinities with New Caledonia) growing on Hen and Chickens and Three Kings Islands but not on Poor Knights and other intermediate groups. The recent discoveries on Three Kings of *Plectomirtha baylisiana* (Anacardiaceae) and *Tecomantbe speciosa* (Bignoniaceae) (Oliver, 1948: 224, 233), representing families not otherwise known in the New Zealand flora, and of the new genus *Elingamita* (Myrsinaceae) (Baylis, 1951: 99–102), illustrate also how important these offshore islands are from the point of view of plant geography. The cliff habitat of *X. callistemon* should save it from fire which is the worst menace to these significant but vulnerable vegetation remnants.

ADDITIONAL NOTES ON *X. callistemon*

Cockayne (1928: 73) places *X. callistemon* in the highest class from a horticultural standpoint. Although it is not yet listed by nurserymen it is grown in many gardens and has flowered as far south as Nelson. At the Royal Botanic Gardens, Kew, plants had been established by 1938 and the species flowered there for the first time in 1953. Garden plants have provided useful supplementary information about this rare species.

In Hatea Street, Whangarei (30 miles south of the Poor Knights Islands), at the home of the late Mrs. A. R. Pickmere, *X. callistemon* has been grown in pots and in open ground since 1924, flowering first in 1932, and the original plants are still thriving in 1956. These plants set good seed and some details of germination and growth rate have been recorded from them (Cranwell and Moore, 1938: 27). A seedling from the first flowering has bloomed at Te Aroha at the age of 22 years. Dr. W. R. B. Oliver has a plant in a sandy coastal garden at Seatoun, Wellington, North Island, brought from Poor Knights in 1933 by Cranwell and Moore; this has produced flowers regularly since 1942, with a maximum number of 16 inflorescences in 1951 and a total in nine recorded years of 48 flower heads. Seeds from this plant have been

successfully germinated.

Miss E. K. Pickmere pointed out in 1942 (in litt.) that amongst plants from Poor Knights Islands two distinct forms can be recognized at flowering, and particularly at bud stage, though vegetatively all are alike. The difference lies in the floral bracts which in most of the plants under observation in the garden are definitely longer than the pedicel, exceeding the bud length, and are green at the time the flowers open (Fig. 4A, of BD 50094A⁴); in other plants, as in Dr. Oliver's (and in *X. moorei*), the bracts are barely as long as the pedicels and are red and scarious from the beginning (e.g., BD 50094B). In two plants, both from the southern island of Poor Knights and growing in one pot, bracts were measured in 1943; larger bracts on basal, middle and upper flowers were 4.5, 1.5, and 0.7 cm. long while smaller ones were 1.3, 1, and 0.5 cm. long respectively. The difference has been maintained in these garden plants over many years and in the one case where flowers of a seedling have been compared with those of its parent both are short-bracted. Two published colour pictures of this species suggest the difference though neither does the plant full justice. In a painting of a partly opened inflorescence (Laing and Blackwell, 1940, unnumbered) the longer green bracts are perhaps overemphasized; a colour photograph (N. Z. Gardener, 1954, Colour Supplement) shows a raceme at the stage where bracts begin to wither, but this appears to be of the short-bracted kind.

Garden plants have also provided material for an anatomical study (Mueller, 1928) of root, stem, and leaf. The cytological and embryological work required to make a detailed comparison between this genus and others in the subfamily Asphodeloideae (Cave, 1953: 142) awaits attention.

SUMMARY

Fresh material of *X. moorei* Brong. et Gris

⁴ Number in the Herbarium of the Botany Division, D.S.I.R., New Zealand.

from New Caledonia has been compared with *X. callistemon* W. R. B. Oliver of New Zealand. Differences in perianth members and in form of fruit mentioned by Oliver are confirmed, but the sinus on the inner edge of the leaf is well-developed in both species and is not a distinguishing character. Hitherto-unmentioned differences are that the style at fruiting stage is thin and irregularly twisted in *X. moorei*, stout and stiffly erect in *X. callistemon*; in seeds of *X. moorei* the keel is echinate, in *X. callistemon* keel and well-defined inner faces are without processes. The montane habitat of *X. moorei* in New Caledonia is probably similar in some respects to the coastal cliffs of New Zealand offshore islands where *X. callistemon* grows. No morphological feature of either species suggests an explanation for the peculiar distribution of the genus, and of the New Zealand species. Garden plants provide supplementary information about *X. callistemon*, and in particular indicate that two forms may be differentiated on characters of the floral bracts.

REFERENCES

- ANON. 1952. Colour Supplement. *New Zealand Gardener* 11(1). Sept. 1.
- BAYLIS, G. T. S. 1951. *Elingamita* (Myrsinaceae). A new monotypic genus from West Island, Three Kings. *Rec. Auckland (N.Z.) Inst. and Mus.* 4(2): 99-102, 6 figs., 1 pl.
- BENTHAM, G. 1862. Notes on Malvaceae and Sterculiaceae. *Linn. Soc. London, Jour., Bot.* 6: 97-123.
- BRONGNIART, A., and A. GRIS. 1864a. Sur un nouveau genre de Liliacées *Scleronema*. *Ann. des Sci. Nat., Bot. Sér.* 5,2: 166-168.
- 1864b. Sur un nouveau genre de Liliacées. *Xeronema*. *Soc. Bot. de France, Bul.* 11: 316-318.
- 1868. Description de quelques Plantes remarquables de la Nouvelle-Calédonie. *Paris Mus. d'Hist. Nat., Nouvelle Arch.* 4: 1-48.
- CAVE, M. S. 1953. Cytology and embryology in the delimitation of genera. *Chron. Bot.* 14(3): 140-153.
- COCKAYNE, L. 1928. *Vegetation of New Zealand*. Ed. 2. xxiv + 456 pp., 87 pls., 3 maps. Engelmann, Leipzig.
- CRANWELL, L. M. 1933. A new locality for *Xeronema callistemon*. *New Zeal. Jour. Sci. and Technol.* 15(3): 234-236.
- 1937. New plant records from the Poor Knights Islands. *Rec. Auckland (N.Z.) Inst. and Mus.* 2(2): 101-110.
- 1942. New Zealand pollen studies I. *Rec. Auckland (N.Z.) Inst. and Mus.* 2(6): 280-308.
- 1953. New Zealand pollen studies. The monocotyledons. *Bul. Auckland (N.Z.) Inst. and Mus.* 3: 1-91, 8 pls.
- CRANWELL, L. M., and L. B. MOORE. 1935. Botanical notes on the Hen and Chickens Islands. *Rec. Auckland (N.Z.) Inst. and Mus.* 1(6): 301-318.
- 1938. *Xeronema*: an island lily. *New Zeal. Inst. Hort. Jour.* 8(1): 25-27.
- GUILLAUMIN, A. 1952. New Caledonian plants. *Acta Horti Gotoburgensis* 19(1): 1-29, 4 pls.
- LAING, R. M., and E. W. BLACKWELL. 1940. *Plants of New Zealand*. Ed. 4. xvii + 499 pp. Whitcombe and Tombs, Christchurch.
- MARSHALL, K. H. 1954. Plants and vegetation of New Caledonia. *Wellington Bot. Soc. Bul.* 27: 19-21.
- MOORE, L. B. 1953. Coastal plants. *Post-primary School Bul.* 7(7): 1-32.
- MUELLER, J. 1928. *Xeronema callistemon*. Thesis (unpub.) deposited at Auckland Univ. Coll.
- OLIVER, W. R. B. 1925. Vegetation of Poor Knights Islands. *New Zeal. Jour. Sci. and Technol.* 7: 376-384.
- 1926. New Zealand angiosperms. *New Zeal. Inst. Trans.* 56: 1-5.
- 1948. The flora of the Three Kings Islands. *Rec. Auckland (N.Z.) Inst. and Mus.* 3(4, 5): 211-238.