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A Monograph of the Genus *Eleocharis* in Australia and
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BY

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UNIVERSITY OF QUEENSLAND
PHYSICS LABORATORY

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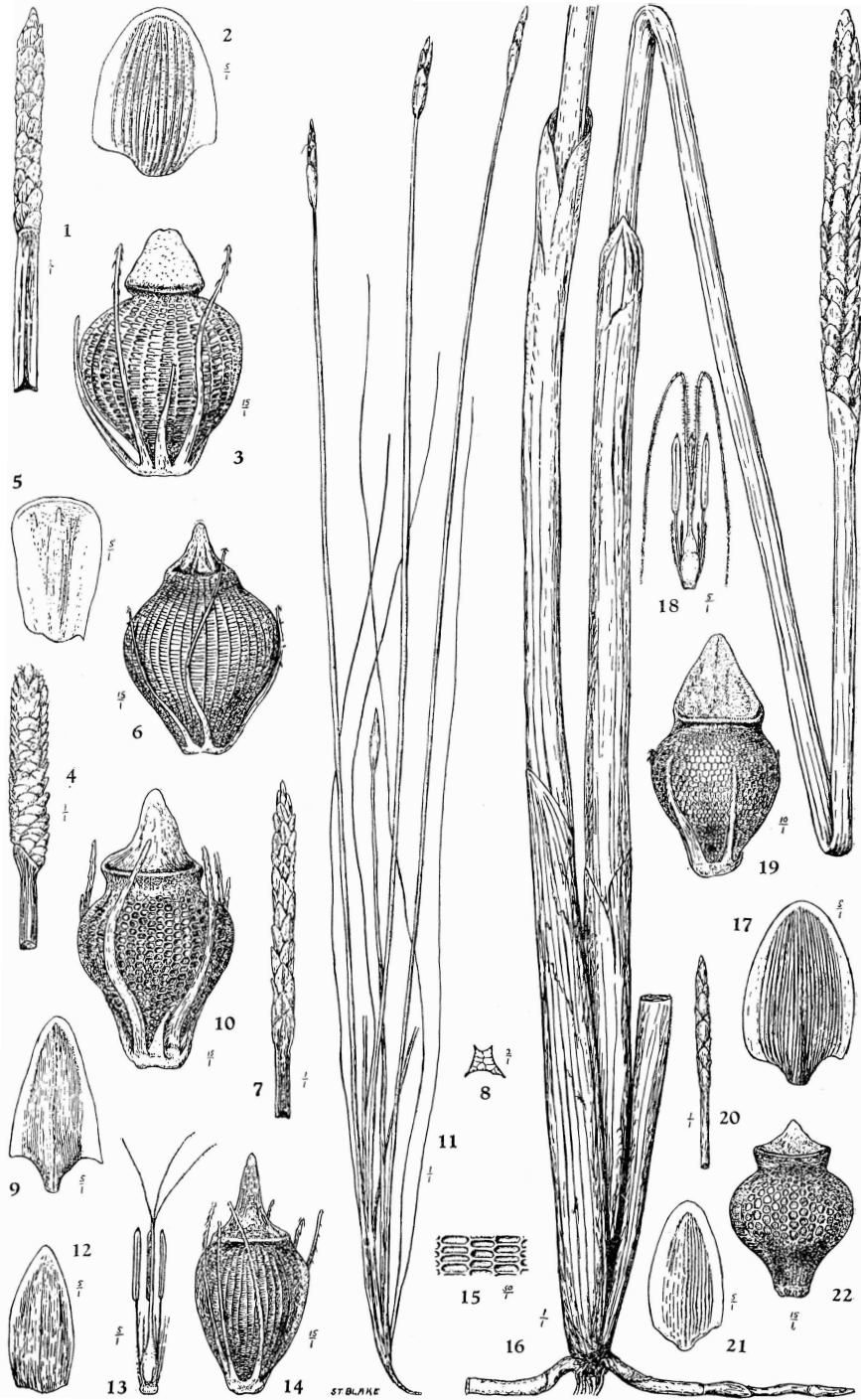
A MONOGRAPH OF THE GENUS *ELEOCHARIS* IN
AUSTRALIA AND NEW ZEALAND.

By

S. T. BLAKE, M.Sc., Walter and Eliza Hall Fellow in Economic Biology,
Department of Biology, University of Queensland.

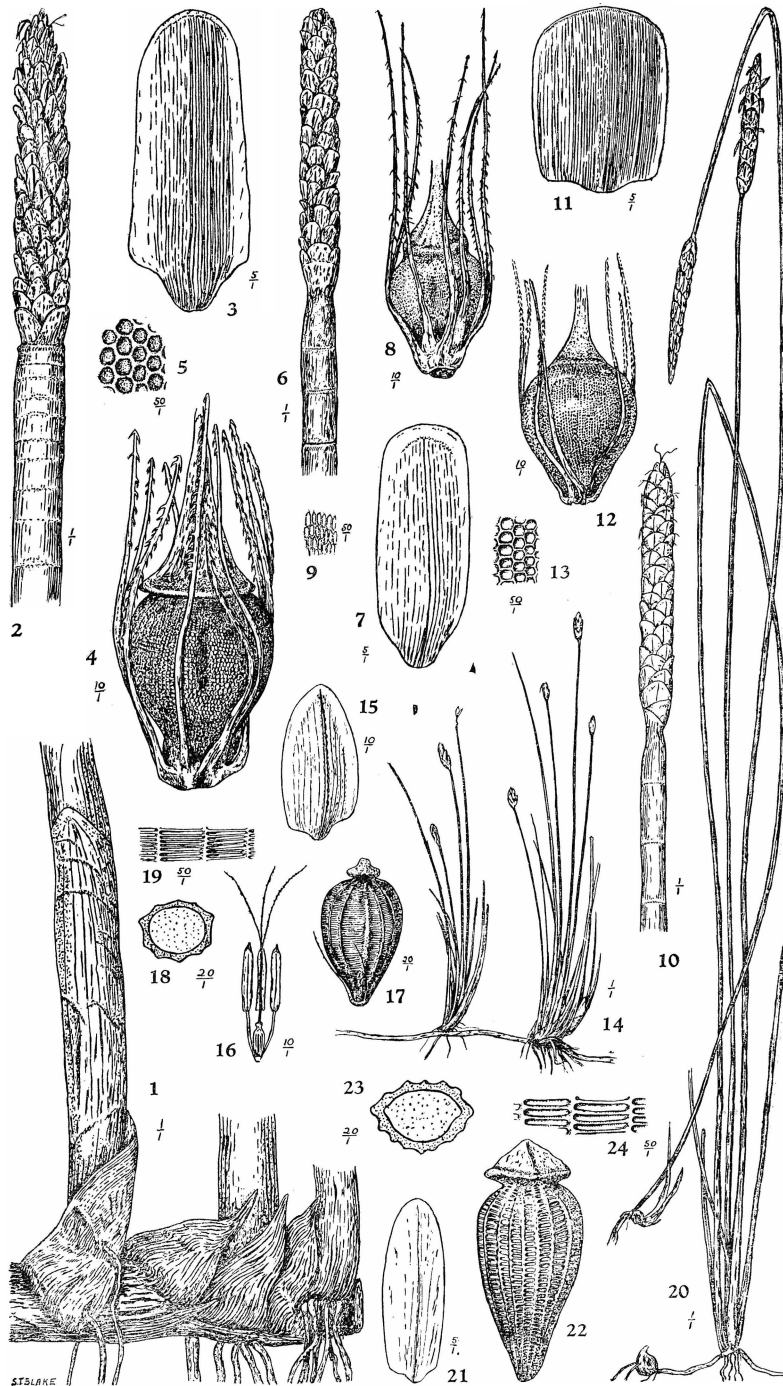
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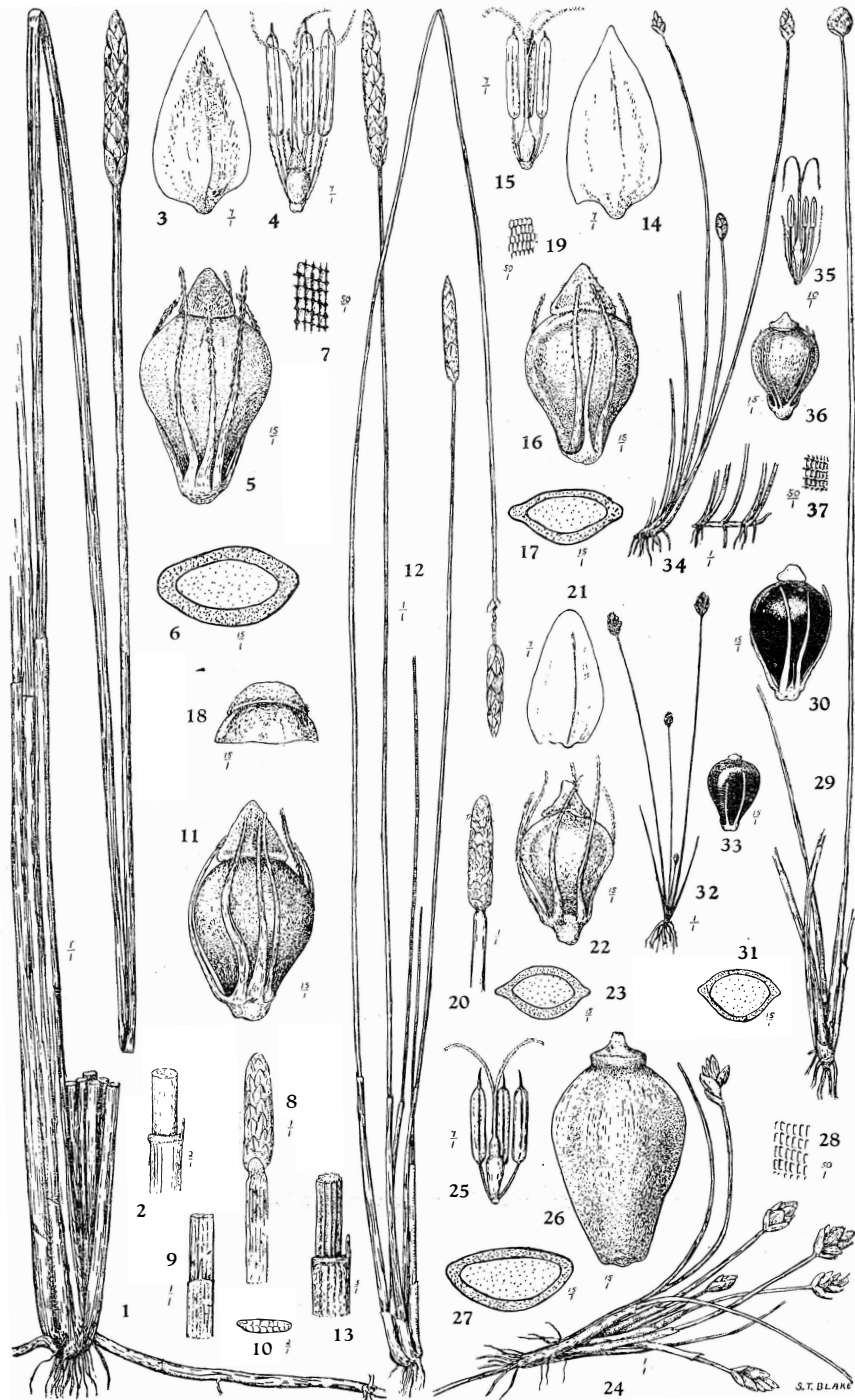


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A Monograph of the Genus Eleocharis in Australia and New Zealand.

By S. T. BLAKE, M.Sc., Walter and Eliza Hall Fellow in Economic Biology.

Department of Biology, University of Queensland.

[Read before the Royal Society of Queensland, 28th November, 1938.]

(Plates VII. to X.)

The Australasian, and more particularly the Australian, species of *Eleocharis*, in common with many other genera of *Cyperaceae*, seem never to have been properly understood, and for a long time the genus has been in a state of hopeless confusion. As the result of a prolonged examination of a very large series of specimens, both in the field and in the herbarium, a clarification of the situation has been possible, and the results are presented in this paper. Not only have I been fortunate in being able to study all but one of the Australian species in the field, but also in that nearly every collection in Australia has been made available to me, and for this I wish to express my sincere thanks to the following:—Mr. C. T. White (Queensland Herbarium, Brisbane), Mr. R. H. Anderson (National Herbarium of New South Wales, Sydney), Mr. F. J. Ræ (National Herbarium of Victoria, Melbourne), Mr. J. M. Black (Adelaide), Miss C. M. Eardley (Tate Herbarium, University of Adelaide), Professor J. B. Cleland (University of Adelaide), Mr. C. A. Gardner (National Herbarium of Western Australia, Perth), while Dr. H. H. Allan (Plant Research Bureau, Wellington) has donated a collection of New Zealand specimens. I am further indebted to Dr. J. Mattfeld, of the Botanischer Garten und Botanisches Museum, Berlin-Dahlem, for the donation of portions of type material, to Sir Arthur W. Hill, Director of the Royal Botanic Gardens, Kew, for copies of descriptions in works unavailable to me and for advice on nomenclature, and to Dr. A. B. Walkom, secretary of the Linnean Society of New South Wales, for a copy of a description.

Finally I wish to express my very deep gratitude to Dr. H. K. Svenson, of the Brooklyn Botanic Gardens, New York, who for some time past has been engaged in monographing the entire genus. His ready and kindly criticism, his assistance in determination and donation of specimens and in placing at my disposal copies of sketches and notes of specimens in the herbaria at Kew and the British Museum have very materially assisted in the preparation of this paper.

THE REVISION.

Eleocharis R. Br. Prodr. 224 (1810) (Cyperaceae-Scirpoideae-Scirpeae).—Spikelet solitary, terminal, erect, ebracteate, few- to many-flowered; glumes spirally imbricate, rarely more or less distichous; flowers hermaphrodite: perianth of 0–10 hypogynous bristles, style 3–2-fid, stamens 3–2–1, nut crowned by the persistent enlarged base of the style.

Annual or perennial leafless herbs frequently producing slender stolons sometimes bearing tubers, or descending or creeping rhizomes. Culms tufted or in a linear series, straight or arcuate or rarely flexuose,

commonly trigonous to terete, sometimes fluted or angular-striate, often acutely 3-4-5-angled, occasionally compressed or more rarely flattened (often spuriously so in the dried state), frequently pitted, sometimes prominently transversely septate; leaf-sheaths 1 or more, herbaceous, membranous, or scarious, the appressed or dilated orifice horizontally truncate to very oblique when viewed from the side, often thickened at or immediately below the margin and frequently bearing a short, erect mucro or more rarely a lanceolate point (rudimentary lamina), or scarious and then often marcescent; spikelet very variable in size and shape from globular to linear-cylindrical, from somewhat narrower to very much wider than the culm, sometimes flattened when laxly-flowered, sometimes appearing spirally angular when dry or over-mature; glumes appressed or spreading in fruit, sometimes relatively persistent, often readily deciduous with the spikelet continuing to grow out after the lower ones have fallen, usually membranous, often with hyaline more or less scarious margins, 1-nerved and more or less distinctly keeled or else the back broad, flattened, cartilaginous to coriaceous or herbaceous, and closely striate with fine nerves on each side of the mid-vein, 1-2 lowermost often sterile, more rigid in texture, often rather different in size and shape and usually more persistent than the others; style short or long, flattened to filiform in the upper part, usually quite glabrous below the filiform, usually fimbriate stigmatic branches, the lower part (style-base) thickened, and persistent on the fruit; anthers ovate or oblong to narrow-linear, the connective frequently produced beyond the cells into an oblong, triangular, or setaceous appendage; nut most frequently obovate to nearly orbicular in outline, less commonly pyriform or narrow, often contracted immediately below the apex into a distinct neck, lenticular (plano- or biconvex) to triquetrous in transverse section, the margins or angles often prominently costiform and then usually paler in colour than the sides, which may be smooth, pitted, wrinkled, reticulated, cancellate, or longitudinally striate or ribbed and transversely trabeculate, depending on the size, shape, arrangement, and prominence of the margins or corners, of the external cells, which themselves may be hexagonal, rounded, transversely oblong to linear or vertically oblong or almost square, and are usually arranged in more or less regular vertical series, often also in regular horizontal series, rarely without any definite arrangement: sometimes also longitudinal furrows may be present on one or more faces, chiefly the adaxial, often due to the pressure of the hypogynous bristles; style-base variable in size, shape, and colour, sometimes very small and continuous with apex of nut and not readily distinguishable from it, usually very distinct and often with a horizontally straight or variously curved thickened annulus at the line of junction often paler in colour than the remainder, which may be more or less spongy and is sometimes minutely hispid; hypogynous bristles stout or slender, more or less strongly flattened or filiform, free to the base or connate in the lower part, smooth or scabrous or barbellate or rarely subplumose with retrorsely or rarely antrorsely directed small teeth, sometimes caducous as the flowering advances, frequently absent from the first and in this respect sometimes variable in the same species.

The name has been very frequently spelt *Heleocharis*, and this is the spelling which has been most used in Australia. It is not proposed

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to discuss the subject here. It has been thoroughly treated by Sprague¹ and by Svenson², and besides Sir Arthur Hill has informed me in a recent letter that the legally correct spelling, *Eleocharis*, is to be conserved against the emended spelling of Lestiboudois. In the present paper the example of most authors has been followed in treating the two spellings as trivial variations of the same name.

Subdivisions of the genus have generally been based on the relative width of spikelet and culm and then on the number of style-branches (2 or 3) with an accompanying flattened or trigonous nut. Such an arrangement was employed in the *Flora Australiensis*, and by more recent Australasian authors, but it is very artificial. The width of culm relative to the spikelet is often an illusory character, and if strictly applied would at times separate closely related species. Then very many species with trifid styles have lenticular nuts. This occurs in nearly half of our species. Many other characters vary considerably within small groups of closely related species, and sometimes even within a species itself. While the following remarks apply chiefly to the Australasian species, they are in general applicable throughout the genus.

The culms often vary considerably in diameter, and this variation may have no correlation with the length. Very often a second growth following a burn, severe grazing, or other such catastrophe, produces unusually slender culms. Generally speaking the outline in cross section is fairly constant, though occasionally an extra, usually ill-defined angle may be produced on unusually robust culms. The degree of pitting or wrinkling may vary considerably, but is often due to irregularities in drying. During drying also the sharpness of angles is often accentuated, while pressure may tend to obliterate others. The presence or absence of transverse septae appears to be quite constant, at least within a species. The nature of the uppermost leaf-sheath is relatively constant, sometimes throughout entire groups, though at times closely similar species may be quite different in this character. In species where the sheath is commonly horizontally truncate at the orifice a slight obliquity may occur in some specimens, while the mucro present in all such Australasian species may vary in development. Where the orifice is constantly oblique it may be somewhat lanceolate when flattened, often with a short obtuse point or mucro. Variations may occur on the same plant. The spikelet within a species is often fairly constant in shape and size, but usually varies within more or less well-defined limits. When in fruit, irregularities in pressure, &c., during drying often produce quite different configurations in spikelets of the same species, due chiefly to the degree to which the glumes may spread. The glume may also tend to become somewhat incurved along its length, and to this is due the spirally angular spikelet mentioned above. In the living state such spikelets are terete or nearly so. The glumes may vary considerably in size and shape, even in the same spikelet. A common tendency is for the upper glumes to become narrower and more acute as the apex is approached, while concurrently the keel tends to disappear at a greater distance from the tip. The number of style-branches is in general constant for each species, though accidental states occur in which a reduced number is to be found, as in *E. pallens*. The number of stamens is usually constant in each species. The anthers often vary considerably in length, but the shape, nature, and size of the appendage

¹ Kew Bull. 1928, 352.

² *Rhodora* xxxi., 122-3 (1929).

is nearly constant. It should be pointed out, however, that the anthers are readily damaged, particularly the often delicate appendage, and in fruiting specimens are often difficult to find intact. In most specimens in the older collections they have disappeared. Where flowering material only is available, the anthers, and particularly the appendage, sometimes offer the readiest means of distinguishing certain species. The hypogynous bristles, upon which much emphasis has at times been placed, are often quite variable either in number or degree of development, or both. In many species they are regularly absent. In *E. nuda* they are present in flower, but fall away before the fruit matures. In *E. pusilla* and some extra-Australasian species they may be present or absent in the same species. When constantly present they are usually 6 in number, but due to branching of the one on the adaxial face of the ovary and nut the number may be as great as 10 (*E. sphacelata*). Likewise reduction may occur, and, in some species with normally well-developed perianth, specimens are occasionally seen in which the bristles are few, unusually slender, and then short and irregular in length. The mature nut is usually the most characteristic feature of a species. Variations in shape, colour, lustre, and degree of surface marking sometimes occur, but usually within very narrow limits. The presence or absence of costiform margins or angles is a well-defined and important feature in the Australasian species. Such slight variations in surface markings as occur are usually due to the extent of a slight thickening which sometimes takes place at the line of junction of the external cells, particularly at the corners. In a few species the shape of the actual cells varies somewhat, due to a tendency towards a slight lengthening or shortening of the prevailing form. The most pronounced variations are in the absolute dimensions, and in the degree of turgidity of lenticular nuts. The style-base in its general characteristics is relatively constant, often through whole groups, although in detail it may vary widely within a species. Variations in shape are connected with two quite independent features. In the first place, the length, whether relative to the nut or absolute, sometimes varies considerably; and in the second place the degree of rounding at the base may greatly affect the form of the style-base. When the latter is carried to extremes the style-base may appear more or less stipitate on the nut, whether the latter has an expanded apex or not. Generally speaking the style-base on a trigonous nut is distinctly pyramidal at the base, though it may be dorso-ventrally compressed in the upper part, while that on a lenticular nut is strongly compressed. Occasionally, however, in those species with a trifid style and a lenticular nut, the style-base shows a median line or a more or less distinct ridge on the abaxial side.

Svenson's distribution of the species in *Rhodora* xxxi., pp. 127-129 (1929), is without doubt the most natural arrangement yet proposed. The old genus or subgenus *Eleogenus* (*Heleogenus*) becomes his first series *Mutatae*, while he has distributed the remainder among ten series relying on combinations of characters drawn from the number of styles, the colour, surface markings (and therefore the shape of the external cells), and shape in transverse section of the nut, the style-base, and the nature of the orifice of the leaf-sheath.

Since this paper was published, however, it has been found necessary to modify this arrangement somewhat, and an increase in the number of series is to be expected. One such new series is proposed in the

present paper to receive *E. acuta* and its allies. Otherwise, except for a slight rearrangement in the order of the series, that arrangement is followed here.*

Throughout the work a binocular dissecting microscope was employed. For general examination and for drawing up the greater part of the descriptions a magnification of 20x–25x was used. This was supplemented by a study under a magnification of 40x–45x of the small species, details of the anthers in all species, of the external cells of the nuts, or to verify any other character which may be obscure under the lower magnification. The shape of the glumes given is that shown when the glume is flattened as much as possible without splitting it. The dimensions in the descriptions apply to the great majority of specimens, exceptional cases being noted in the discussion following these. I have differed from Svenson's method of giving the length of the nut together with style-base, by giving each separately, as the latter seems to give greater accuracy.

The Australasian species are mostly fairly well defined, and specimens should be readily determinable if good material is to hand. Fruiting material is preferable, and if such is available a magnification of 15x–20x should suffice when using the key. In most cases flowering material should be determinable, particularly if the base of the plant is present. Great care is required in measuring anther-tips. A magnification of about 40x is usually necessary, and care must be taken that the tips are not damaged.†

All the specimens cited have been actually examined unless expressly stated to the contrary. In the citation of specimens attention has been paid to geographical distribution. Generally speaking, the localities have been arranged in a general west-east and north-south direction.

The characteristic habitats of most species are wet, muddy places along stream banks or in swamps, often in water up to 2 ft. in depth. The annual species are frequently found on the edges or dried-out beds of lagoons, streams, &c. While the greatest concentration of species occurs in the regions of higher rainfall, one, *E. pallens*, is restricted to the more arid regions.

The perennial species have some fodder value, while pigs thrive on the tubers of *E. dulcis*. The latter are also edible to man, are collected by the Australian aborigines, and are largely cultivated in the Orient.

The bibliographical references are mostly confined to the original publications of the name-combinations (including synonyms) and references to be found in Australasian literature.

* When Dr. Svenson published this arrangement he had seen very little of the Australian species, and it was his suggestion that this account be published before he treated these parts of the genus.

While this paper was in press I received from Dr. Svenson papers embodying his final opinions on the genus. Through the courtesy of the editors and the printer I have been able to make some changes in nomenclature made necessary by these papers, but I cannot agree with Dr. Svenson's broadened circumscriptions of certain species. These involve the union of pairs of species which to me seem quite distinct.

† Anther-tips considerably less than 0.1 mm. long are described as minute.

The herbaria, in which the specimens cited are laid, are indicated as follows:—

Queensland Herbarium, Brisbane	(B)
National Herbarium of New South Wales, Sydney	(S)
National Herbarium of Victoria, Melbourne	(M)
Tate Herbarium, University of Adelaide	(T)
Herbarium of J. M. Black, Adelaide	(Bl)
Herbarium of J. B. Cleland, Adelaide	(Cl)
State Herbarium of Western Australia, Perth	(P)

When no letter is used the specimens are in the Queensland Herbarium. All my collections are represented here, and no special mention is made of them.

KEY TO THE SPECIES OF ELEOCHARIS IN AUSTRALIA AND NEW ZEALAND.

Glumes hardened on back, finely many-nerved with a distinct mid-vein, not at all or only obscurely keeled, the spikelet not much wider than the culm; style 2-fid or 3-fid; nut lenticular (Species 1–9).

Culms not transversely septate; external cells of nut hexagonal or transversely oblong to linear in 10-20 vertical rows on each face.

External cells of nut oblong or linear, or if somewhat hexagonal then the culm stout and acutely triquetrous.

Culms exceeding 2 mm. in width.

Nut constricted below apex into a distinct neck; glumes more than 4 mm. long, not cuneate (1)

E. fistulosa

Nut not constricted, the style-base almost confluent over shoulders; glumes less than 4 mm. long, cuneate (2)

E. spiralis

Culms less than 1 mm. wide (4)

E. difformis

External cells of nut more or less regularly hexagonal; culms never both stout and acutely triquetrous.

Culms usually less than 3 mm. wide; nut more or less attenuate below, with a distinct neck under the expanded apex and the annulus curved upwards.

Culms acutely, unequally, and re-entrantly 4-5-angled, soft and compressible; bristles always present . . (3)

E. philippinensis

Culms terete or indistinctly trigonous, bristles absent at maturity (6)

E. nuda

Culms 3 mm. or more wide, not prominently angled, nut not attenuate below and only very slightly expanded at apex, the annulus straight or nearly so (5) *E. Brassii*

Culms transversely septate; external cells of nut very small, very numerous, more or less rounded-hexagonal or elongated vertically.

Glumes about 8 mm. long, nut 2.2-2.5 mm. long; culms in a close linear series on a stout horizontal rhizome (7) *E. sphacelata*

Glumes 5-6.5 mm. long, nut 1.3-2.1 mm. long; culms tufted, rhizome short and oblique or stoloniform.

Glumes rounded at apex, flattened when dry, dull; hypogynous bristles strongly connate at base; plant often bearing tubers (8) *E. dulcis*

Glumes subtruncate, more or less shining, somewhat concave when dry; bristles free from each other at the base; stolons never tuberiferous (9) *E. equisetina*

Glumes membranous, with a distinct midvein, usually distinctly keeled, sides nerveless, the spikelet much wider than the culm unless the latter be flat. (Species 10-25.)

Style 3-fid, or if 2-fid then the upper leaf-sheath truncate and prominently mucronate at the summit. (Species 10-21.)

Nuts obscurely trigonous or terete, vertically ribbed and transversely trabeculate, the external cells transversely linear or oblong. (Species 10-11.)

Plants neither proliferous nor tuberiferous; spikelets ovate to linear, often setting fruit; glumes 2-2.2 mm. long (10) *E. pusilla*

Plants producing tubers, often proliferous; spikelets lanceolate to linear, rarely maturing; glumes 3 mm. long or more (11) *E. atricha*

Nuts triquetrous to lenticular, finely reticulate, alveolate, wrinkled, or smooth, the external cells very small and often very faint, mostly shortly vertically oblong, in very numerous series. (Species 12-21.)

Dwarf tufted plants with capillary culms and thin summits to the leaf-sheaths; nuts less than 1 mm. long, 3-ribbed. (Species 12-13.)

Glumes numerous, spirally imbricate; nut 0.45 mm. long, bristles absent .. (12) *E. nigrescens*

Glumes 4-5, subdistichous; nut 0.9 mm. long, bristles 6, comparatively stout .. (13) *E. caespitosissima*

Larger plants, the culms usually at least 0.5 mm. wide; orifice of leaf-sheath firm, often mucronate; nuts at least 1 mm. long. (Species 14-21.)

Nut trigonous, the dorsal angle prominently ribbed; style-base narrow-pyramidal, $\frac{1}{3}$ - $\frac{1}{2}$ as wide as nut.

Rhizome at length creeping; culms tufted or approximate compressedly \pm tetraquetrous, leaf-sheath oblique at orifice .. (16) *E. gracilis*

Rhizome short, culms densely tufted, soft, 6-9-fluted; leaf-sheath truncate and mucronate (17) *E. Dietrichiana*

Nut trigonous or lenticular, the dorsal angle if present not ribbed; style-base sometimes nearly as wide as nut.

Leaf-sheath oblique at orifice, not or only minutely mucronate; bristles filiform, not flattened at base; style-base pyramidal decurrent over the shoulders of the trigonous nut (14) *E. pachycarpa*

Leaf-sheath truncate and mucronate at orifice; bristles stout, flattened at base, or if slender then nut and style-base different from above.

Culms prominently 4-angled; nut trigonous (15) *E. tetraquetra*

Culms terete, angular-striate, or flattened; nut lenticular.

- Rhizome creeping, nuts not strongly costate on the margins, anthers with a setaceous appendage 0.2 mm. long; glumes tardily deciduous.
- Culms terete or nearly so; spikelet much wider than culm .. (18) *E. acuta*
- Culms strongly flattened; spikelet scarcely wider than culm (19) *E. plana*
- Rhizome very short; culms densely tufted; nuts with prominently costate margins; appendage to anther not exceeding 0.15 mm. in length; glumes readily deciduous.
- Glumes triangular-acute at apex; spikelet more or less acute; anther-tip 0.15 mm. long (20) *E. pallens*
- Glumes rounded at apex; spikelet \pm obtuse; anther-tip minute .. (21) *E. cylindrostachys*
- Style 2-fid, orifice of leaf-sheath never mucronate (Species 22-25).
- Nut more or less golden brown, 1.75 mm. long, bristles absent (22) *E. neozelandica*
- Nut black or reddish brown or greenish brown, not exceeding 1 mm. long; bristles usually present.
- Nut 0.9-1 mm. long.
- Leaf-sheath scarious or marcescent at apex; nut greenish when immature (25) *E. minuta*
- Leaf-sheath firm at apex; nut shining black at maturity, not greenish when immature (23) *E. geniculata*
- Nut 0.6-0.65 mm. long (24) *E. atropurpurea*

ENUMERATION OF THE SPECIES.

Series MUTATAE.—Mostly coarse plants with swollen culms as wide or nearly as wide as the spikelets. Glumes not at all or only obscurely keeled, the very broad back thickened and often hardened, closely striate, the margins hyaline; nut lenticular; style elongated, flat, 2-fid or 3-fid. (Species 1-9.)

1. *E. fistulosa* (Poir.) Link in Spreng. Jahrb. iii. 78 (1820); C. B. Clarke Ill. Cyp. t. xxxv. fig. 1-4 (1908); Svenson in Rhodora xxxi. 152 (1929), not of F. Muell., Benth., F. M. Bail., nor Domin. *Scirpus fistulosus* Poir. Encyc. vi. 749 (1804) not of Forsk. *S. acutangulus* and *S. medius* Roxb. Fl. Ind. i. 216 (1820). *E. acutangula* (Roxb.) Schult. Mant. ii. 91 (1824). *Limnochloa acutangula* (Roxb.) Nees and *L. media* (Roxb.) Nees in Wight, Contrib. Bot. Ind. 114 (1834). *L. fistulosa* (Poir.) Nees in Linnaea ix. 294 (1835). *E. planiculmis* Steud. Cyp. 80 (1855).

Stolons ca. 2 mm. diam. Culms tufted, erect, 3-6 dm. high, acutely triquetrous, somewhat spongy and finely reticulate, not septate, 3-4 mm. wide. Sheaths very thin, orifice oblique, marcescent. Spikelets cylindrical, acute, rather pallid, 20-35 mm. long, 3-4 mm. diam.; glumes dense, closely appressed, ovate or oblong-ovate, obtuse, 1-nerved and closely many-striate, rather densely glandular-spotted within, margins narrowly hyaline and \pm erose, 4.25-4.5 mm. long; style 2-3-fid; stamens 2-3, anthers linear, ca. 1.5 mm. long, shortly apiculate. Nut obovate, turgidly biconvex, the margins scarcely ribbed, 1.5-1.7 mm. long, 1.4 mm. broad, constricted below the apex into a neck $\frac{2}{3}$ as wide, the expanded apex $\frac{1}{2}$ as wide; sides glistening straw-coloured, the external cells transversely linear-oblong in ca. 15 vertical rows, the pitting very shallow; style-base triangular-ovate, flat, dark brown, ca. $\frac{1}{3}$ as long as nut; bristles 6-7, pale brown, rather stout, mostly smooth in the lower part, weakly barbellate above, one very short, the others subequal, usually as long as the nut together with style-base.—Plate VII., figs. 1-3.

Queensland.—Cook District: Cairns, in water in wet forest country ca. sea-level, June, 1935, Blake 9371.

And in Tropical Asia, Africa, South America, and the West Indies.

All previous references to the occurrence of this species in Australia belong to *E. philippinensis*.

2. *E. spiralis* (Rottb.) R & S. Syst. ii. 155 (1817); C. B. Clarke Ill. Cyp. t. xxxv. figs. 5-7 (1908); Svenson, Rhodora, xxxi. 135 (1929). *Scirpus spiralis* Rottb. Desc. & Ic. 45, t. xv. fig. 1 (1773). *Limnochloa spiralis* (Rottb.) Nees in Wight Contrib. Bot. Ind. 114 (1834). *E. compacta* R. Br. Prodr. 224 (1810); F. Muell. Fragm. viii. 239 (1874); Domin in Bibl. Bot. xx. Heft 85, 446 (1915) in part. *S. compactus* (R.Br.) Spreng. Syst. i. 202 (1825). *E. variegata* Benth. Fl. Austr. vii. 293 (1878) partly; F. M. Bail. Syn. Queensl. Fl. 594 (1883); Catal. Plants Queensl. 52 (1890); Queensl. Fl. vi. 1754 (1902) partly; Ewart & Davies Fl. North. Territ. 57 (1917) partly.

Stolons soft, 3-4 mm. diam. with rather distant short ovate membranous scales. Culms rather densely tufted, erect, 3-5 dm. high, 2-3.5 mm. wide, obtusely trigonous, or acutely triquetrous under the spikelet when dry and in that state somewhat rugose, not septate, rather shining. Sheaths firm, pallid or green or with purplish apices, orifice oblique, firm, with a fine setaceous point up to 4 mm. long. Spikelet cylindrical, subacute in flower, very obtuse in fruit, 1.5-3.5 cm. long, 4-6 mm. wide; glumes densely packed, shortly and broadly cuneate and scarcely narrowed at the subtruncate apex, pallid, somewhat coriaceous and faintly many-striate with a rather prominent mid-vein and usually a narrow brown zone within the broad hyaline margin, finally somewhat incurved, 3.3-3.8 mm. long; style 3-fid; stamens 3, anthers linear, yellow, and with the 0.2 mm. long triangular or ovate reddish appendage 2.2-2.3

mm. long. Nut broadly elliptic or somewhat obovate, margins not costate, sides glassy, pale straw-coloured, not pitted, external cells transversely linear in about 20 vertical rows, 1.5–1.7 mm. long, 1.2–1.4 mm. wide, the apical annulus indistinct; style base somewhat triangular, stout, almost confluent over shoulders of nut and about $\frac{1}{3}$ as long and $\frac{1}{2}$ as wide; bristles 5–6, very slender, usually about as long as nut, sometimes shorter or longer, white to pale brown with small weak antrorse and extrorse teeth, or some nearly smooth.—Plate VII., figs. 4–6.

North Australia.—Arnhem Bay, *Brown* 5934.*†

Queensland.—North Kennedy District: Rockingham Bay, edge of waterhole, March, 1868, *Dallachy* (M., S.). Port Curtis district: Gladstone, brackish marshy ground at sea-level, March, 1937, *Blake* 12790.

Also in Malaya, Ceylon, Southern India, Mauritius, and Madagascar (probably introduced into the latter island).

The description of *E. variegata* given by Bentham and Bailey refers partly to the present species, partly to the plants cited which are *E. plana* (No. 19 below).

3. ***E. philippinensis*** *Svenson* Rhodora xxxi. 155 (1929). *E. fistulosa* F. Muell. Fragm. vi. 93 (1867); First Census 125 (1882); Sec. Census 211 (1889); Boeck. in Linnaea, xxxvi. 472 (1869-70); Benth. Fl. Austr. vii. 293 (1878); F. M. Bail. Syn. Queensl. Fl. 594 (1883); Catal. Plants Queensl. 52 (1890); Queensl. Fl. vi. 1754 (1902); Compreh. Catal. 591 fig. 574 (1913); Domin Biblioth. Bot. xx. Heft 85, 445 (1915) not of (Poir.) Link. *E. variegata* W. V. Fitzgerald in Proc. Roy. Soc. West. Austr. iii. 118 (1918) not of Kunth. *E. variegata* var. *laxiflora* Merrill, Enum. Phil. Pl. 121 (1922) not of C. B. Clarke.

Stolons 1–1.5 mm. diam.; culms tufted, more or less erect but usually very lax, up to 10 dm. long (usually 3–5 dm.) and up to 3 mm. wide, acutely and unequally 4–5 angled, not septate; sheaths thin, rather lax, deep purple, marcescent. Spikelet linear acute, up to 6 cm. long and 3 mm. wide; glumes usually green, rather remote, ovate-elliptic or obovate-elliptic, obtuse but when dry convolute upwards and subsquarrose, herbaceous, rather prominently keeled and strongly striate, more or less distinctly brown-zonate within the narrowly hyaline margins, 4.1–4.8 mm. long; style 2–3-fid; stamens 3, anthers linear obtuse, 1.4–1.6 mm. long. Nut obovate, somewhat clavate, slightly narrowed into a distinct neck below the apex, strongly biconvex, the margins indistinctly ribbed, the sides dark brown, deeply pitted with the hexagonal external cells in 15–20 regular vertical series, 1.5–1.7 mm. long, 1.5–1.6 mm. wide; style-base flattened, deltoid, about $\frac{1}{2}$ as long and $\frac{3}{4}$ – $\frac{3}{4}$ as wide as nut, the annulus prominent outwardly curved upwards; bristles 6–7, the inner series somewhat the longer from less than $\frac{1}{2}$ the nut to as long as nut together with style base, usually firmly toothed. Plate VII., figs. 7–10.

Western Australia.—Kimberley Division: Isdell River near Mount Barnett Homestead, June, 1905, *Fitzgerald* 1038 (ex P.).

Queensland.—Cook District: Mareeba, edge of lagoon ca. 1,400 ft., March, 1938, *Blake* 13410; Cairns, in *Melaleuca* swamp ca. sea-level, June, 1935, *Blake* 9361. Port Curtis District: Rockhampton, common in wet places, November, 1867, *O'Shanesy* 46 (M.); wet places in railway

* I have not seen these specimens, the type of *E. compacta* R. Br., but Dr. Svenson has sent me sketches and notes on the specimens at Kew and at the British Museum.

enclosure ca. 25 ft., March, 1935, *Blake* 7820; Gracemere, in wet places, April, 1874, *O'Shanesy* 1821 (M.); Herbert Creek, *Bowman* in 1870 (M.). Wide Bay District: Near Bundaberg, near water, April, 1936, *Blake* 11271. Moreton District: Near Buderim Mt. on marshy ground in water, Feb., 1934, *Blake* 5226, 5227; Durundur, round lagoon, Nov., 1843, *Leichhardt* (M.); Petrie, near Brisbane, on muddy edge of water-hole in open forest, April, 1932, *Blake* 1220; Lawnton, near Brisbane, in dried-out swamp, March, 1932, *Blake* 1146; near The Blunder, near Brisbane, in ditch by the roadside, May, 1932, *Blake and Greenham in Herb. Blake* 1270; near Brisbane in swamp, Feb., 1875, *Bailey*; Brisbane, *Dietrich* 564 (M.); *Bailey* 21, 95 (M.); on mud near Bulimba Creek, June, 1933, *Blake* 4863; damp places at bottom of railway embankment, May, 1932, *Blake* 1296, and in Nov., 1932, *Blake* 1421; on dry mud in railway drain, May, 1937, *Blake* 12968; Pimpama, alongside road in shallow waterhole and around margin, Jan., 1933, *Cribb*. Darling Downs District: Palardo, between Miles and Roma, in fresh-water swamp, ca. 1,100 ft., Feb., 1935, *Blake* 7616.

Also in the Philippine Islands, whence it was originally described.

This species is readily distinguished from all other Australasian species by its soft, acutely and unequally 4-angled culms, the broadest side of which sometimes bears an incipient fifth angle. The nut approaches that of *E. nuda* but is less attenuate below, is more deeply pitted, the annulus is much less curved, and the hypogynous bristles are invariably present. The latter are usually well-developed, but when short they are often nearly smooth. A complete gradation is to be seen within some of the collections cited above. Occasionally the external cells show a tendency to lengthen transversely; but not to such an extent as to alter the typical character of the nut. *Blake* 9361 consists of small, exceptionally slender plants resembling at first sight those of *E. nuda*, among which they were growing.

It differs from *E. fistulosa*, with which it has been freely confused, by the more slender differently shaped culms, the spreading, upwardly inrolled glumes, and the hexagonal external cells.

4. ***E. difformis*** S. T. *Blake* sp. nov. aff. *E. laxiflorae* (Thw.) H. Pfeiff, sed culmis tenuissimis haud rigidis, nucis minoris cellulis extimis oblongis differt.

Rhizoma tenuissimum repens; culmi caespitiosi, virides, haud septati, saepe filiformes (steriles), sed fertiles usque ad 0.7 mm. diam., subteretes, levissime 4-goni, nunc patentes vel erecti usque ad 30 cm. longi, nunc laxi in aqua submersi partim natantes, usque ad 100 cm. longi; vaginae tenuissime membranaceae, arctae, superior apice obliqua vel lanceolata haud ampliata, scariosa vel marcescens. Spicula viridis, erecta, linearis vel linearo-lanceolata, acuta, 5–12 mm. longa, 1.3–1.5 mm. lata, pauciflora; glumae appressae, obovato-oblongae, obtusae, 4.5 mm. longae, 2–2.2 mm. latae, ecarinatae, dorso virides, 1-nerves sed tenuiter pluristriatae, marginibus late hyalinae; stylus trifidus; stamina 3, antherae lineares minute apiculatae, 1.5 mm. longae. Nux pallida, obovata, turgide sed inaequaliter biconvexa, bicostata, 1.3–1.5 mm. longa, 0.8–1.0 mm. lata, apice $\frac{1}{4}$ – $\frac{2}{5}$ angustior sub annulo toroso recto vel fere recto vix constricta, verticaliter striata, cellulis extimis transversim oblongis 15–20-seriatim verticaliter vix recte dispositis; stylobasis triangularis appanata sessilis (i.e. $\frac{3}{8}$ – $\frac{3}{4}$ nucis lata), $\frac{1}{4}$ – $\frac{1}{3}$ nucis longa; setae

hypogynae 5–6 basibus vix vel haud connatae, firmae, pallidae vel brunescens, retrorsim firmule dentatae, inaequales sed plurimae nucem cum stylobasi adaequantur vel superantes. Plate VII., figs. 11–15.

Queensland.—Moreton District: Stradbroke Island, in Lake Karboorah, submerged to 2 ft., or on marshy ground at the brink, alt. 120 ft., Jan., 1938, *Blake* 13203. (TYPE in B.)

Readily distinguished by its habit, its exceedingly slender culms, the very tumid bicostate nut not constricted below the apex, and the transversely oblong prominent external cells in slightly irregular vertical rows. A large number of the culms are sterile, and these are even more slender than the fertile. There is a greater diversity in the terrestrial individuals than in the aquatic ones in this respect.

5. **E. Brassii** *S. T. Blake* Proc. Roy. Soc. Queensl. xlix. 154 (1938).

Tufted, stoloniferous, the stolons ca. 1.5 mm. diam. Culms erect or suberect, 40–50 cm. high, rigid, subterete, scarcely trigonous under the spikelet, 3.5–4 mm. diam., dried specimens often flattened and up to 5 mm. wide, striate and more or less rugulose but not at all septate. Upper leaf sheath membranous, purplish below, rather firm and oblique at the orifice, shortly mucronate or acuminate. Spikelet 3–5 cm. long, 4–5 mm. wide, linear, acute, dense-flowered, spirally angular when dry; glumes ovate, obtuse, concave, rigid, many-striate, straw-coloured or greenish but with a narrow brown zone within the narrowly hyaline margins and the entire upper part brown-dotted, at least within, 4.8–5.2 mm. long; style 2-fid; stamens 3, anthers linear, minutely apiculate, 1.5–2.5 mm. long. Nut tawny to brown, shining, broadly obovate or suborbicular, 1.8–2.3 mm. long, 1.6–2.1 mm. broad, equally and turgidly biconvex, faintly ribbed on the margins, not at all or only slightly constricted immediately below the apex, the sides striate or reticulate, rather deeply pitted, the hexagonal external cells in about 20 vertical rows on each face; style-base pallid to brownish, spongy, flattened, triangular-ovate, $\frac{2}{3}$ – $\frac{4}{5}$ nut in length and $\frac{3}{5}$ – $\frac{3}{4}$ nut in width, the annulus nearly straight; hypogynous bristles 6–4, of which 4 are about as long as the nut with firm retrorse teeth and 2 very slender, very small, or absent.—Plate VII., figs. 16–19.

North Australia.—Baines Creek, in swamps, March, 1856, *Mueller* (M.); Darwin, *Holtze* 412 (M.); *Giles* 62; without definite locality, *Tenison-Woods* and *Holtze* in 1886 (M.); *Tenison-Woods*.

Queensland.—Cook District: On Wrotham Park, ca. 50 miles northwest of Mungana, in swamps, April, 1938, *Blake* 13693; Forest Home Station, Gilbert River, in swamps, April, 1931, *Brass* 1864 (Type). North Kennedy District: Rockingham Bay, *Dallachy* (M.).

Mueller's and *Dallachy's* specimens were referred by *Bentham* and the latter by *Bailey* to *E. variegata* *Kunth*. These, as are the other North Australian specimens, are in young flower only. The original description was based on *Brass* 1864, and it is only since then that I have seen the plant growing. My specimens differ in minor points, and the above description has been slightly modified accordingly. In these specimens the nut is somewhat larger, rather darker in colour, the style-base is also darker, relatively smaller, and less regular in outline. The over-maturity of some of the material is responsible for most of these differences.

The species bears a superficial resemblance to *E. spiralis* due largely to the spirally angular appearance of the spikelet, but in the shape of the glumes and structure of the nut it is much closer to *E. nuda* and *E. philippinensis*. From these it differs in the complete or almost complete absence of any constriction below the apex of the nut, the straight annulus, and in the details of the style-base and the bristles. Of the latter 4 are regularly present and well developed; the remaining 2, when present, are very fine and small. The culms are very much stouter than those of either species, and differ also from the latter in their shape.

6. *E. nuda* C. B. Clarke in Kew Bull. Add. Ser. viii. 21 (1908); Ill. Cyp. t. xxxv. figs. 9–11 (1909); Domin in Biblioth. Bot. xx. Heft 85, 446 (1915); Maiden & Betche Cens. N. S. Wales Pl. 28 (1916); Svenson in Rhodora xxxi. 162 (1929). *H. atricha* F. Muell. Fragm. viii. 252 (1874); Benth. Fl. Austr. vii. 295 (1878) excluding the citation of Brown's plants; F. M. Bail. Syn. Queensl. Fl. 594 (1883); Catal. Pl. Queensl. 52 (1890); Queensl. Fl. vi. 1756 (1902) chiefly, Compreh. Catal. 594 (1913) chiefly, not of R. Br.

Stoloniferous, stolons very slender. Culms tufted, erect or nearly so, up to 3 dm. long, terete or trigonous, longitudinally striate, not septate, not exceeding 2 mm. diam.; sheaths very thin, purplish, striate, orifice of uppermost firm, very oblique. Spikelet greenish, linear-cylindric, acute, 15–30 mm. long, slightly wider than the culm; glumes rather remote, appressed, ovate-elliptic, rounded at apex, 3–3.5 mm. long, herbaceous and finely striate on the back with one prominent nerve but not keeled and sometimes finely glandular dotted inside, margins broadly hyaline usually with an intramarginal brown zone; style 2-fid; stamens 2, anthers linear, acute, 0.7–0.9 mm. long. Nut broadly obovate-pyriform constricted into a distinct neck below the apex, biconvex, prominently ribbed on the margins, sides glistening brown, shallowly pitted, the external cells rounded-hexagonal in about 12–15 vertical rows, 1.2–1.3 mm. long, 1–1.1 mm. wide; style-base shortly ovate-triangular to nearly truncate, $\frac{1}{3}$ – $\frac{1}{2}$ as long and about $\frac{2}{3}$ as wide as nut, the prominent annulus strongly concave upwards; bristles usually deciduous from the maturing nut, but apparently always present in the flower, and then usually 3–4, irregular, very slender, weakly barbellate, usually small.—Plate VII., figs. 20–22.

Queensland.—Cook District: Mareeba, in somewhat open swampy places in dwarf *Melaleuca* forest ca. 1,400 ft., March, 1938, Blake 13431; Cairns, in *Melaleuca* swamp about sea-level, June, 1935, Blake 9360. Burke District: Carron Creek between Gilbert and Norman Rivers *Gulliver* 10 and 17 (M. Co-type).

New South Wales.—Northern Tablelands: Timbarra, *Stuart* (M., S.).

Allied to *E. philippinensis*, differing in the more rigid differently shaped culms, the relatively broader appressed glumes, the distinctly pyriform nut with shallower pitting, the strongly upcurved annulus, and the caducous bristles. The New South Wales locality, if genuine and not due to a mixture of labels, presents a peculiar problem in geographical and climatic distribution. The material in Herb. Sydney consists of the basal parts of two culms and a packet of mature nuts bearing the words “*H. atricha* N. Eng.” in Mueller's writing. The label carries the note “One unripe spike on original.”

7. **E. sphacelata** R. Br. Prodr. 224 (1810); Hook. f. Fl. Tas. ii. 85 (1860), Fl. Nov. Zel. 300 (1864); F. Muell. First Census 125 (1882) and Sec. Census 211 (1889) partly; Boeck. in Flora lviii. 108 (1875); Benth. Fl. Austr. vii. 292 (1878) partly; F. M. Bail. Syn. Queensl. Fl. 593 (1883) partly, Catal. Plants Queensl. 52 (1890) partly, Queensl. Fl. vi. 1754 (1902) partly, Weeds & Pois. Pl. Queensl. 214 (1906) partly, Compreh. Catal. 591 (1913) partly; J. H. Maiden Useful Pl. Austr. 35 (1889) partly; Maiden & Betche Census N. S. Wales Pl. 28 (1916); Tate Handb. Fl. Extratr. S. Austr. 183, 264 (1890); Moore Handb. Fl. N. S. Wales 450 (1893); Turner in Proc. Linn. Soc. N. S. Wales xxviii. 306 (1903), xxx. 84 (1904); Cheesem. Man. N. Zeal. Fl. 767 (1906); Domin Biblioth. Bot. xx. Heft 85, 445 (1915); Ewart & Davies Fl. North. Territ. 57 (1917); Cleland & Black, Trans. Roy. Soc. S. Austr. li. 29 (1927); Ewart Fl. Vict. 223 (1930); Black Fl. S. Austr. 91 (1922); Svenson in *Rhodora* xxxi. 160 (1929). *Scirpus sphacelatus* (R. Br.) Poir. Encycl. Suppl. 102 (1817).

Rhizome stout, woody, 5–6 mm. diam.; culms in a close linear series, erect, up to 2 m. high, terete, 4–12 mm. diam., transversely septate and with a tumid ring close under the spikelet; sheaths very thin, oblique at the orifice. Spikelet cylindric acute, 3–5 cm. long, 8–9 mm. wide; glumes numerous, densely packed, elliptic or oblong-ovate, obtuse, mostly 8–8.5 mm. long (rarely up to 9 mm.), firm, streaked, dotted, or stained with brown, finely striate with a fairly prominent midrib, margins narrowly hyaline with an internal brown zone; style 3-fid, fimbriate in the upper part below the trifurcation; stamens 3, anthers linear apiculate, 3.5–4 mm. long including the acute 0.1–0.15 mm. long appendage. Nut light yellowish to tawny or pale brown, broadly obovate to orbicular, very turgidly biconvex with a definite furrow on the anticeous face, margins somewhat costulate, 2.2–2.5 mm. long, 1.8–2.2 mm. wide, sides finely reticulate, the external cells irregularly hexagonal, often elongated vertically, without any definite vertical or horizontal arrangement; style-base flat, the base thickened, about $\frac{2}{3}$ as wide as nut and sometimes slightly wider than its apex, triangular, more or less acuminate, from $\frac{1}{2}$ to as long as nut, the long style usually persistent; bristles 8–10, not quite regular, at least as long as the top of style-base, sparsely toothed, strongly united at the base above the prominent receptacle.—Plate VIII., figs. 1–5.

North Australia.—Daly River Settlement, *Mair* 70.

Queensland.—Port Curtis District: Rockhampton, *Dietrich* 561 (M.): common in every lagoon, Nov., 1867, *O'Shauesy* 52 ser. 7 (M.). Wide Bay District: Eundaberg, *Keys* 350. Moreton District: Wilson's Lagoon, March, 1844, *Leichhardt* (M.); Nudgee Waterhole, near Brisbane, on mud or in water, March, 1933, *Blake* 4618; Pimpama, in creek, Jan., 1933, *Cribb*. Darling Downs District: Chinchilla, in water a foot deep in lagoon periodically flooded, April, 1934, *Beasley* 237; Wyberba, near Wallangarra, on creek bank in mud, 2,500–3,000 ft., Jan., 1933, *Blake* 4618.

New South Wales.—Northern Tablelands: Timbarra, *Stuart* (M.). North Coast: Clarence River District, in 1875, *Wilcox* (M.); Gloucester Buckets, Sept., 1897, *Maiden* (S.). Central Tablelands: Blackheath, Jan., 1905, *Maiden* (S.); Mittagong, *Travers* (M.); Mossvale, Dec., 1920, *comm. Town Clerk* (S.); Jenolan Caves, April, 1900, *Blakely* (S.). Central Coast: The Clyde, Nov., 1884, *Bäuerlen* 80 (S.M.); Kangaroo

River, National Park, Sept., 1893, *Betche* (S.); Camden, *Atkinson* (M.), *Jephcott* in 1883, (M.). South Coast: Near Milton, *Bäuerlen* in 1883 (S.M.).

Victoria.—Wimmera: Wimmera River, Shire of Dimboola, Nov., 1893, *Reader* (M.). Western District: River Wannon, Dec., 1873, *Sullivan* 28 (M.); Hawkesdale, Dec., 1901, *Williamson* (B., S., M.); Mount Emu Creek, *Whan* (M.); Australia felix, *Mueller* (M.). Central District: Ballarat, *Spence* in 1882 (M.). North-east District; Beriambra Creek, morass on alluvium overlying porphyry, *Fl. Australian Alps* 97A, (M.).

South Australia.—Flinders Range: Wilpena (T.); Wilpena Creek, Nov., 1928, *Cleland* (Cl.). Southern Districts: Barossa, in water, Jan., 1849, *Mueller* (M.); Reedbeds, Nov., 1879, (T.); Upper Willow Creek, Waitpinga, Jan., 1933, *Cleland* (Cl.); Myponga, Jan., 1909, *Griffith* (Bl.); Kangaroo Island—Cygnet River, (T.), Feb., 1926, *Cleland* (Cl.). Rocky River and between Vivonne Bay and Rocky River, Nov., 1924, *Cleland* (Cl.).

Tasmania.—South Esk River, *Stuart* 556 (M.); *Oakden* in 1887 (M.); Swanport, *Story* (M.); Elizabeth River, Dec., 1892, (S., no collector's name); (locality illegible) *Archer* 56 (S.); without definite locality, *Rodway* (S.).

New Zealand.—North Island, Auckland Province: Tauroa, in swamp, Jan., 1913, *Carse*.

Apparently restricted to Australia and New Zealand, and readily distinguished by its stout horizontal rhizome and its large size. The strongly fimbriate margins of the upper part of the style, reminiscent of so many species of *Fimbristylis*, is also noteworthy. So far as my observations go, it never produces tubers, and all the Australian references to tuber-producing plants belong to the next species. Svenson refers to *E. sphacelata* *E. esculenta* Vieillard from New Caledonia, but as it bears tubers it is probably *E. dulcis* also.

8. *E. dulcis* (*Burm. f.*) *Trin.* ex Henschel, *Vita Rumph.* 186 (1883); Svenson in *Rhodora* xxxi. 158 (1929). *Andropogon dulce* *Burm. f.* Fl. Ind. 219 (1768). *Hippuris indica* *Lour.* Fl. Cochinch. 16 (1790). *Scirpus plantaginoides* *Rottb.* Desc. et Ic. 45, t. xv. fig. 2 (1773). *E. plantaginoides* (*Rottb.*) *W. F. Wight*, *Contrib. U.S. Nat. Herb.* ix. 267 (1905) not *E. plantaginoides* (*Rottb.*) *Domin.* *S. plantagineus* *Retz.* Obs. 14 (1789). *E. plantaginea* (*Retz.*) *R. & S. Syst.* ii. 150 (1817); *C. B. Clarke* Ill. Cyp. t. xxxiii. figs. 1–5 (1908). *S. tuberosus* *Roxb.* Fl. Ind. i. 213 and *S. tumidus* *Roxb.* loc. cit. 215 (1820). *E. tuberosa* (*Roxb.*) *R. & S. Mant.* ii. 86 (1824); *Domin Biblioth. Bot.* xx. Heft 85, 445 (1915). *E. tumida* (*Roxb.*) *R. & S.* loc. cit. *E. esculenta* *Vieillard*, *Ann. Sci. Nat. sér.* 4 xvi. 37 (1862). *E. sphacelata* *F. Muell.* *Fragm.* viii. 238 (1874) partly, xii. 25 (1882); *Benth.* Fl. Austr. vii. 292 (1878) partly; *F. M. Bail. Syn. Queensl. Fl.* 593 (1883) partly, *Catal. Pl. Queensl.* 52 (1890) partly, *Queensl. Fl.* vi. 1754 (1902) partly, *Weeds and Pois. Pl. Queensl.* 214 (1906) partly, *Compreh. Catal.* 591 (1913) partly, not of *R. Br.*

Stolons rather slender, sometimes bearing zonate tubers about 7 mm. diam. or more. Culms tufted, erect, up to ca. 1 m. high, cylindrical in the living state, usually quite flat when dry and in that state mostly 3–8 mm. wide, transversely septate, finally longitudinally striate; leaf-sheaths very thin, oblique at orifice. Spikelet cylindrical, rather obtuse,

25–50 mm. long, usually somewhat wider than the culm, or occasionally narrower if the latter be very wide, pallid; glumes numerous, rather dense, oblong to oblong-obovate, finely closely striate on the broad back with a more distinct midvein, sometimes spotted with brown, with a narrow hyaline margin and a faint brown zone within it in the upper part, mostly 6–6.5 mm. long and about $\frac{1}{3}$ as wide; style 3-fid, glabrous and smooth or nearly so in the upper part; stamens 3, anthers linear, 2.5–3 mm. long, the 0.2 mm. long apex acute. Nut tawny to greyish brown, shining, obovate-orbicular, truncate at the apex, biconvex, the margins not costate, 1.5–2 mm. long, 1.2–1.8 mm. wide, the sides smooth or minutely reticulate, the antecostate usually with a shallow longitudinal furrow, the external cells very small, vertically irregularly hexagonal or oblong-hexagonal though nearly quadrate at the base, in no regular series; style-base sessile, flat, triangular, about $\frac{2}{3}$ as wide and $\frac{1}{2}$ as long as nut, the remainder of style often persistent; bristles 6–8, about twice as long as nut, rather stout, retrorsely barbellate, flattened towards the base and there strongly united, the external series a little lower down than the others, the receptacle stout and prominent.—Plate VIII., figs. 6–9.

North Australia.—Darwin, in swamps, *Faelsche* in 1882 (M.).

Queensland.—Cook District: Cape York Peninsula, *Thomson* 20; Embley, May, 1901, *Roth* 397; Cairns, in swamp about sea-level, July, 1935, *Blake* 9663. Burke District: Burketown, edge of lagoons, June, 1935, *Blake* 9232. North Kennedy District: Cromarty, near Townsville, dominant in wettest places in open swamps, alt. 7 ft., March, 1935, *Blake* 8296. Port Curtis District: 80 miles north of Rockhampton, April, 1917, *Berney*; Rockhampton, lagoon, *Thozet* 6, 457, 811 (M.). Wide Bay District: Near Bundaberg in brackish swamp, April, 1936, *Blake* 11315. Moreton District: Petrie, near Brisbane, in small quiet stream, May, 1933, *Blake* 4781. Without precise locality: North Queensland, *Roth* 213, *Pollock*.

Extends through Malaya and south-eastern Asia to Madagascar, to Fiji, and is apparently in New Caledonia.

Very variable in stature and width of culms; occasionally specimens are to be found with culms up to 10 mm. diam., while several of the plants from Petrie bear barren culms not exceeding 1 mm. in width. The external cells of the nut also vary somewhat in shape and arrangement. Most Australian authors have confused the species with *E. sphacelata*, to which it is certainly very closely allied, but it never produces the characteristic stout horizontal rhizome of that species, the culms are usually more slender, the glumes and nuts are smaller, while the upper part of the style is never so prominently fimbriate and is nearly always quite smooth or entire at the margins. The tubers are not always present, though it seems probable that all plants would produce them under suitable conditions. As noted above these tubers are edible, and Roxburgh describes their cultivation by the Chinese. In Queensland it is stated that pigs thrive on them. The species is also an important member of the unusual but rich swampy pastures in the neighbourhood of Rockhampton.

9. *E. equisetina* Presl. Rel. Haenk i. 195 (1828); Svenson in *Rhodora* xxxi. 161 (1929); *E. plantaginea* F. Muell. Fragm. viii. 238 (1874) not of R. & S.; *E. sphacelata* Benth. Fl. Austr. vii. 292 (1878) and F. M. Bail. Queensl. Fl. vi. 1754 (1902) as to Bailey's specimens

only; not to R. Br. *E. plantaginoides* (Rottb.) Domin Biblioth. Bot. xx. Heft 85, 445 (1915), not *Scirpus plantaginoides* Rottb. (*E. plantaginoides* W. F. Wight).

Stolons slender, sometimes hardening into rhizomes. Culms tufted, erect, rather rigid and somewhat shining, terete, usually not much compressed when dry, transversely septate and longitudinally striate, up to 10 dm. high, 1-3 mm. diam.; sheaths brownish or purplish, the uppermost firm and oblique at the orifice, rather lax. Spikelet cylindrical, rather acute, 2-4 cm. long, slightly wider than culm, pallid; glumes rather dense, appressed but somewhat incurved from the mid-vein when dry, broadly elliptic or somewhat obovate, very obtuse, 4.2-5 mm. long and about $\frac{3}{4}$ as wide, very rigid, pallid, very finely striate with a green mid-vein, margin very narrowly hyaline with a very narrow internal brown zone; style 3-fid, glabrous; stamens 3, anthers linear with a 0.3-0.4 mm. long setaceous appendage, and including it ca. 2.5 mm. long. Nut golden brown to light chestnut, rather turgidly biconvex with rather prominent acutely costate margins, 1.8-2.1 mm. long, 1.3-1.4 mm. wide, rounded or subtruncate at the apex, the annulus not prominent, the sides vertically finely and closely striate and pitted between the striations from the small hexagonal to squarish external cells arranged in numerous vertical series, the anticous side sometimes furrowed; style-base triangular, flattened, brown, closely sessile, about $\frac{1}{2}$ as long and $\frac{1}{2}$ - $\frac{2}{3}$ as wide as nut, remainder of style usually persistent; hypogynous bristles 6-7, quite free at the base, rather slender, closely but shortly retrorsely barbellate, from about as long to twice as long as the nut, receptacle not prominent.—Plate VIII., figs. 10-13.

Queensland.—Cook District: Cairns, in water in wet forest country about sea-level, June, 1935, *Blake* 9372; Yarrabah, near Cairns, in swamp forest about sea-level, June, 1935, *Blake* 9647; Lake Barrine, near Yungaburra, ca. 2,500 ft., June, 1935, *Blake* 9581. Moreton District: Coolum, in swampy creek, April, 1938, *Blake* 13762; Palmwoods, in *Rhynchospora* swamp in cleared Eucalyptus forest country, soil a reddish brown loam, ca. 150 ft., May, 1930, *Hubbard* 2815; Brisbane River, *Bailey* 15, 50 (M.); New Farm road (Brisbane), in swamp, Feb., 1875, *Bailey*; Ekibin Creek (Brisbane), Feb., 1913, *White*; edge of Rocklea Creek (Brisbane), on mud or in water, forming fairly large stands, May, 1932, *Blake and Greenham in Herb. Blake* 1303; Indooroopilly, Brisbane, in waterhole, March 1932, *Blake and Everist in Herb. Blake* 1167; Kalinga Park, Brisbane, in swamp, March, 1932, *Blake* 1101, and at edge of waterhole, Dec., 1932, *Blake* 1440; between Nudgee and Virginia (Brisbane), on muddy creek bank or more frequently in water, Nov., 1932, *Blake* 1419; Gold Creek Reservoir, near Brisbane, in wet boggy places, 300 ft., April, 1937, *Blake* 12930.

New South Wales.—North Coast: Byron Bay, April, 1896, *Betche* (S.); Wyong River, in brackish water, Dec., 1893, *Betche* (S.); Wyong, April, 1899, *Hamilton* (S.).

The species also occurs in New Caledonia, Malaya, Ceylon, and Madagascar.

Bailey's specimens were referred by Bentham and later by Bailey to *E. sphacelata*, and by Mueller and Domin to *E. plantaginea* (*E. plantaginoides*). The specimens in Herb. Sydney have been referred by Kükenthal to *E. sphacelata*.

Though closely allied to both *E. sphacelata* and *E. dulcis*, *E. equisetina* is readily enough distinguished from both by the harder, often shining culms usually less flattened in herbarium specimens, the broader, shorter, more or less shining glumes somewhat incurved when dry, the long-apiculate anthers, the golden brown to light chestnut nut with acutely costulate margins and the sides finely vertically striate and seriate-pitted from the more evenly arranged, more regular external cells, and by the weaker usually much shorter bristles which are quite free from one another at the base. The only definite rhizomes I have seen are in my 9647; these are about 3 mm. diam., descending or curved, on which are borne tufts of culms, quite different from the closely linear series characteristic of *E. sphacelata*. In my 9372 the external cells of the nut show a tendency to become shortly vertically oblong, but they are otherwise very regular.

Series ACICULARES.—Nuts obscurely trigonous or terete, elongated, longitudinally ribbed and transversely closely trabeculate; style 3-fid; lowest glume fertile. Species 10–11.

10. *E. pusilla* R. Br. Prodr. 225 (1810); Benth. Fl. Austr. vii. 297 (1878); Tate Handb. Fl. Extratr. S. Austr. 264 (1890); Domin Biblioth. Bot. xx. Heft 85, 447 (1915); Maiden & Betche Census Pl. N. S. Wales 29 (1916). *Scirpus pusillus* (R. Br.) Poir. Encycl. Suppl. v. 103 (1817). *S. pumilio* Spreng. Syst. i. 204 (1825). *E. acicularis* F. Muell. Fragm. viii. 240 (1874); First Census 125 (1882), Sec. Census 211 (1888); Benth. Fl. Austr. vii. 297 (1878); Moore Handb. Fl. N. S. Wales 451 (1893); Cheeseman Man. Fl. N. Zeal. 768 (1906); Black Fl. S. Austr. 92 (1922); Ewart Fl. Vict. 223 (1930); not of R. & S. *E. acicularis* var. *elongata* Benth. Fl. Austr. vii. 297 (1878). *E. striatula* C. B. Clarke ex Domin loc. cit. not of Desv.

Rhizome slender or capillary, more or less hardened; culms tufted, more or less erect or somewhat arcuate, up to 25 cm. but usually 2–15 cm. long, capillary or rarely up to 0.5 mm. wide, somewhat thickened at base; sheaths loose, scarious, and often rigidly so, more or less inflated below the oblique orifice. Spikelet ovate to lanceolate, acute, 2–7 mm. long, 1.5–1.7 mm. wide; glumes ovate to obovate, obtuse or subobtuse, membranous, narrowly keeled, sides pallid or stained deep brown, 1.7–2.2 mm. long; style 3-fid; stamens 3, anthers linear obtuse, minutely apiculate, mostly 1–1.2 mm. long. Nut pale straw-coloured, rather glistening, narrowly obovoid, 0.7–1.1 mm. long, 0.45–0.55 mm. wide, obscurely trigonous, each face with 3–4 vertical ribs and finely trabeculate between them, the external cells transversely narrow-linear; style base very small, depressed ovoid, constricted at base to sometimes as much as $\frac{1}{2}$ its breadth, $\frac{1}{3}$ – $\frac{1}{2}$ as wide as nut, and mostly $\frac{1}{5}$ – $\frac{1}{4}$ as long; bristles few, very slender, small or absent.—Plate VIII., figs. 14–19.

Queensland.—Warrego District: Charleville, on wet mud in Eucalyptus parkland at 950 ft., April, 1936, *Blake* 11041. Maranoa District: Roma, depressions in Eucalyptus forest on mud, ca. 1,000 ft., March, 1936, *Blake* 10892. Darling Downs District: Jondaryan, damp depressions in grassland on dark grey clay, 1,250 ft., Feb., 1935, *Blake* 7756. Moreton District: Gatton Agricultural College (Lawes, near Gatton), dried-out depressions in grassland, deep black soil, forming small mats, September, 1933, *Blake* 4943.

New South Wales.—Northern Tablelands: Glen Innes, Jan., 1914, *Rupp* (S.). Rosehill, Guyra, Jan., 1932, *McKie* 223 (S.); Armidale, October, 1875, *Perrott* (M.). Western Plains: Euabalong, May, 1906,

Boorman (S.); Lachlan River, Sept., 1878, *Mueller* (M.); Edwards River, October, 1875, *Mueller* (M.). Central Coast: Hawkesbury Agricultural College, Nov., 1906, coll. ? (S.). Southern Tablelands: Near Tharwa, Federal Capital Territory, in open swampy ground ca. 2,000 ft., Feb., 1935, *Blake* 7358.

Victoria.—Wimmera: Near Dimboola, in swamps, Dec., 1893, *Reader* 9 (M.); Lowan, in swamps, Dec., 1892, *Reader* (M., B.); and without definite locality, *Reader* in 1895, (M.). Western District: Hawkesdale, Feb., 1904, *Williamson* (M.); Mount Emu Creek, Nov., 1853, *Mueller* (M.). Central District: Bacchus Marsh, around ponds, Jan., 1853, *Mueller* (M.).

South Australia.—Murray River, Jan., 1884, (T.); *Griffith* (Bl.).

Tasmania.—Perth, South Esk River, *Stuart* 234 (M.); and without definite locality, *Mueller* (M.).

New Zealand.—North Island: Auckland Province: Lake Taupo, water's edge, April, 1924, *Allison*. Wellington Province: Himatangi, near Foxton, damp hollow in sand-dunes, March, 1930, *Zotov*. South Island: Canterbury Province: Lake Tekapo, water's edge, Jan., 1936, *Allan*.

Apparently confined to extra-tropical eastern Australia and New Zealand.

The species is very variable in stature, and different collections are often very unlike one another in general aspect. Perrott's specimens (*E. acicularis* var. *elongata* Benth., and identified with the South American *E. striatula* Desv. i.e. *E. bonariensis* Nees, by Clarke), the Richmond specimens, and *Blake* 7358, 7756, and 10892, possess tall soft culms, but seem rather to be ecological states than distinct varieties. The species was first identified by Svenson (*Rhodora* xxxi. 186) with *E. acicularis* from the Northern Hemisphere, but he has latterly come to the conclusion that it is quite distinct and is more closely related to the South American species. The combined result of our observations on the two species is that *E. pusilla* produces stouter rhizomes than does *E. acicularis*, the culms are more or less distinctly thickened at the base, often more rigid (though in this approaching *E. acicularis* var. *occidentalis* Svenson of the Western United States), the glumes are more obtuse, the nut is somewhat broader, and much more prominently ribbed. Svenson considers the Australasian plant to be closest to *E. costulata* Nees & Meyen from the South American Andes (Chile and Bolivia). I have seen no specimens of this species, but from Svenson's description and figure, the Australasian plant differs in that the anthers are much larger and less prominently apiculate, the nut not at all greenish and perhaps less distinctly trigonous, in the depressed style-base, and in the glumes being of a rather different shape. The whole group is, however, a very difficult one.

11. *E. atricha* R. Br. Prodr. 295 (1810); F. Muell. Fragm. ix. 100 (1875); First Census 125 (1882) and Sec. Census 211 (1889) partly; Benth. Fl. Austr. vii. 295 (1878) excl. descr. and as to the citation of Brown's specimens only; Moore Handb. Fl. N. S. Wales 450 (1893); F. M. Bail. Queensl Fl. vi. 1756 (1902) as to the citation of the Wallangarra specimens only; Domin Biblioth. Bot. xx. Heft 85, 447 (1915); Maiden & Betehe Census N. S. Wales Pl. 29 (1916).

Stoloniferous; stolons 0.7 mm. diam. bearing ovoid tunicated tubers about 4 mm. long and 2.5 mm. diam. Culms tufted, oblique to erect or recurved, angular-sulcate, 3–40 cm. long, 0.5–0.7 mm. wide; leaf-sheaths

membranous, oblique and somewhat scarious at apex. Spikelet lanceolate to linear, acute, chestnut brown, often proliferous, 10–20 mm. long, 2–3 mm. wide; glumes oblong or ovate-oblong, obtuse, membranous, narrowly keeled, sides stained reddish-brown and streaked with numerous linear red-brown glands, 3.5–5 mm. long; style 3-fid, very slender; stamens 3, anthers linear, very shortly apiculate, 1.7–2.1 mm. long. Nut white to pallid straw-coloured, shining, narrowly obovate or oblong-obovate, 1.3–1.5 mm. long, 0.65–0.7 mm. wide, constricted immediately below apex to a short neck about $\frac{2}{3}$ as wide, trigonous, sides convex, prominently vertically ribbed and transversely trabeculate, the external cells transversely linear-oblong in 4–5 vertical rows on each face; style-base with a rather prominent annulus, pyramidal-deltoid or somewhat depressed, the base as wide as $\frac{3}{4}$ – $\frac{4}{5}$ nut and $\frac{1}{3}$ – $\frac{1}{2}$ as long as wide; bristles constantly absent.—Plate VIII., figs. 20–24.

Queensland.—Darling Downs District: Stanthorpe, Feb., 1913, *Sankey*; March, 1935, *Hale*; Bald Mountain, near Wallangarra, near water, Jan., 1933, *Blake* 4536. Moreton District: Brisbane River, *Bailey* 55 (M.); Kedron Brook, Nov., 1875, *Bailey*; Northgate, Brisbane, in marshy ground, March, 1933, *Blake* 4714.

New South Wales.—Western Plains: Narrabri, October, 1914, *Boorman* (S.). Northern Tablelands: Wallangarra, “a fresh-water plant growing . . . intermingled with other plants of a swampy proclivity,” Jan., 1918, *Boorman* (S.). Southern Tablelands: Near Tharwa, Federal Capital Territory, in open swampy ground ca. 2,000 ft., Feb., 1935, *Blake* 7537.

The type is *R. Brown* 5929 from Port Jackson (Herb. British Museum), of which Dr. Svenson has sent me a sketch and notes. Like most of the above-cited specimens it is immature. Indeed, *Boorman*'s specimens from Wallangarra are the only ones in full fruit, though a very few nuts are present on *Blake* 7537. The affinities of the species are doubtful and may not truly lie with the *Aciculares*, although the nature and structure of the nut is very similar to that of typical members of that series, except for the very prominent neck and annulus. These recall certain members of the *Mutatae*. The lowermost glume is usually barren, or at most bears a vegetative shoot in its axil. Sometimes the entire spikelet is replaced by a vegetative shoot. These shoots along with the characteristic tubers appear to be the normal means of reproduction, and mature nuts are seldom formed.

Series TENUISSIMAE. Usually dwarf plants with tufted capillary culms and often with distichous spikelets. Nuts small (0.4–1 mm.), more or less distinctly 3-angled and in some species present at the culm-bases. Style 3-fid. The Australian species (Nos. 12–13) belong to the sub-series *Leiocarpeae* with the nuts smooth or very finely reticulate.

12. **E. nigrescens** (*Nees*) *Steud.* Syn. Cyp. 77 (1855). *Scirpidium nigrescens* *Nees* in *Mart. Fl. Bras. ii*¹. 97 (1842).

Annual; culms tufted, oblique to erect, angular-sulcate, up to 10 cm. high and up to 0.7 mm. wide (mostly 0.3–0.5); sheaths thinly herbaceous, appressed but slightly dilated at the oblique hyaline orifice, often marcescent. Spikelet ovoid or oblong-ovoid, obtuse or subobtuse, 2.2–5 mm. long, 1.5–1.7 mm. wide, many-flowered; glumes closely spirally imbricate, somewhat spreading in fruit, oblong-elliptic, obtuse or retuse, strongly keeled, keel rather stout, green, curved in profile, disappearing below

apex, the sides hyaline or stained with brown, 0.9–1.1 mm. long; style 3-fid; stamen 1, anther linear obtuse, 0.4–0.5 mm. long. Nut tawny to pale brown, shining, obovoid, truncate at the slightly narrowed apex, triquetrous, prominently but narrowly 3-ribbed, 0.45–0.55 mm. long and 0.3 mm. wide, the sides convex, very finely reticulate or striate, the external cells vertically oblong; style base very short, depressed, $\frac{2}{3}$ – $\frac{3}{4}$ as wide as nut and sometimes slightly wider than its apex, but only 0.04–0.06 mm. high; bristles 0.—Plate IX., figs. 1–4.

North Australia.—Without definite locality, *Mueller* (M.).

Queensland.—Cook District: Near Mareeba, in wet places in Eucalyptus forest on sandy soil, ca. 1,400 ft., March, 1938, *Blake* 13398.

South Australia.—Southern Districts: Cataracts on Mount Lofty, Dec., 1850, *Mueller* (M.).

Chiefly found in Tropical Africa and Tropical America.

Dr. Svenson has identified this species for me and has sent me specimens from Cuba (coll. *Ekman*) and from Madagascar (*de la Bathie* 17947) for comparison. There is no difference between the Australian plants and those from these widely separated localities. The North Australian specimens were found mixed with *Fimbristylis sphaerocephala* Benth. under the latter genus, while the South Australian specimens had been placed by *Mueller* under *Scirpus* (*Isolepis*). The only other Australian species of *Eleocharis* which approaches it in appearance and its minute nut is *E. atropurpurea*, which, however, is readily distinguished by the colour of the glumes and of the lenticular nut, the 2-fid style, &c.

13. *E. caespitosissima* *Baker* Journ. Linn. Soc. xxi. 450 (1855).
Scirpus isdellensis W. V. Fitzgerald Proc. Roy. Soc. W. Austr. iii. 123 (1918).

Culms tufted, flaccid, filiform, mostly 3–5 but up to 10 cm. long, angular-striate, not exceeding 0.2 mm. wide; sheaths membranous, purplish at base, oblique and not dilated at orifice. Spikelet ovate, subacute to obtuse, 1.5–2.5 mm. long, at length 1.3–1.5 mm. wide, 2–3-fld.; glumes 4–5, lax, distichous or nearly so, 1.6–1.9 mm. long, ovate, apex rounded or slightly emarginate, membranous, keeled, sides stained deep brown particularly in the upper part; style 3-fid; stamens 2–3, anthers linear obtuse, minutely apiculate, 1.8–1.9 mm. long. Nut pale straw-coloured to brownish, narrowly obovoid-elliptic, apex rounded, 0.9 mm. long, 0.5 mm. wide, trigonous and 3-ribbed with convex faintly striate sides, the external cells minute, quadrate or shortly vertically oblong, in regular vertical series; style-base pyramidal, brown, ca. 0.25 mm. high and 0.3 mm. wide with a slightly prominent annulus; bristles 6, flat but thin, retrorsely hispid, 3 about reaching the top of the style-base, the others somewhat shorter.—Plate IX., figs. 5–7.

Western Australia.—Kimberley Division: Isdell River, near Mount Barnett Homestead, June, 1905, W. V. Fitzgerald 1043 (S., ex P).

And in Madagascar.

Dr. Svenson suggested the affinity of the Australian plant with this Madagascar species, and judging from the specimen of *de la Bathie* 17953 given me by him I can see nothing to separate the plants specifically. The nuts are paler in colour in the Australian plants, but they may not be *quite* mature, and some of the nuts in the Madagascar plants

exactly match them. According to Chermezon (*Bull. Soc. Bot. France* lxxv. 286 (1928)), *E. caespitosissima* develops stolons and possesses 3 stamens. There are no stolons present in any of the plants I have seen, and I am unable to determine the number of stamens in the Madagascar plants. In Fitzgerald's specimens (of which I have examined 9 tufts) there appear to be never more than 2, and at times perhaps 1 only. Fitzgerald describes his *Scirpus isdellensis* as possessing a creeping rhizome, paired spikelets, and brown nuts, none of which characters is shown by his type specimens.

The discovery of this species in North-Western Australia forms another link between the flora of that region and of Eastern Africa, a connection previously indicated by the mutual sharing of that peculiar genus *Adansonia*.

Series, SULCATAE (sp. 14). Coarser plants than the *Tenuissimae* with 3-fid styles and whitish or pale coloured trigonous nuts. South American species, one of them apparently introduced into New South Wales.

14. **E. pachycarpa** Desv. in C. Gay, Fl. Chile vi. 174 (1853).

A tufted perennial with a rather stout descending rhizome; culms rigid, slender, tetraquetrous, mostly up to 20 cm. high, about 0.3–0.4 mm. wide; upper leaf-sheath herbaceous-membranous, closely appressed, oblique and slightly dilated at orifice, sometimes minutely mucronate, extreme margin somewhat scarious, dotted with brown. Spikelet lanceolate to ellipsoid or ovoid, acute to subobtuse, 4–7 mm. long, 2–3 mm. wide, dark brown; glumes (lowermost more rigid, bracteiform, excepted) rather lax, ovate, obtuse, thinly membranous, keeled, the keel strongly curved in profile, the sides stained and streaked with red-brown, the margins hyaline-scarious, 3–2.6 mm. long; style 3-fid; stamens 3. Nut broadly obovate, slightly attenuate towards base, scarcely at all narrowed towards the apex, trigonous, the angles rounded and not at all ribbed, sides convex, tawny, minutely reticulate, the external cells minute, shortly vertically oblong and not at all prominent, 1.1 mm. long, 0.95 mm. wide, the annulus prominent but narrow, slightly undulate; style-base broadly pyramidal, closely sessile and slightly decurrent over the shoulders of the nut, discoloured and somewhat spongy, 0.6–0.7 mm. high; bristles 4, filiform, becoming pale brown, very unequal, the longest reaching to the top of the nut, slightly scabrous in the upper part only, or the smallest quite smooth.—Plate IX., figs. 8–11.

New South Wales.—Central Coast: Port Jackson District, Nov., 1900, *Camfield*; Centennial Park, Sydney, October, 1900, Nov., 1900, *Cheel* (S.), and in Dec., 1908, *Hamilton* (B., S.); and without definite locality, Nov., 1908, *Hamilton* (S.).

Apparently introduced from South America, where it occurs in Chile.

Among Hamilton's specimens from Centennial Park some have culms up to 30 cm. long with proliferous spikelets. *Camfield*'s collection is not represented in Herb. Sydney, though accompanied by the label of that institution. Dr. Svenson tells me it is represented also in the Herbarium of the New York Botanic Garden and in the Gray Herbarium of the Harvard University, and in sending me a drawing of the latter specimen he suggested its identity with the Chilean species. It differs from *E. gracilis* in the more rigid habit, in the glumes strongly curved in profile, in the shape of the nut, in the style-base extending over the shoulders of the latter, in the more prominently ridged annulus, and in the fewer, weaker, not flattened bristles.

Series MULTICAULES (spp. 15-17). Old-world species with usually coarse culms, 3-fid styles, and trigonous, brown or olivaceous nuts.

15. **E. tetraquetra** Nees in Wight Contrib. 113 (1834); F. Muell. Fragm. viii. 239 (1874), First Census 125 (1882), Sec. Census 211 (1889); Benth. Fl. Austr. vii. 294 (1878); F. M. Bail. Syn. Queensl. Fl. 594 (1883), Catal. Pl. Queensl. 52 (1890), Queensl. Fl. vi. 1755 (1902), Compreh. Catal. 594 (1913); Simmonds in Proc. Roy. Soc. Queensl. vi. 225 (1889); Moore Handb. Fl. N. S. Wales 450 (1893); Domin Biblioth. Bot. xx. Heft 85, 448 (1915); Maiden & Betehe Census N. S. Wales Pl. 29 (1916). *Scirpus tetraquetra* (Nees) Thwaites Enum. Pl. Zeyl. 454 (1864).

Rhizome short, descending; stolons long and slender, covered with long narrow scales. Culms tufted, erect, 3 dm. to above 10 dm. long, 0.9-1.5 mm. wide, prominently and regularly tetraquetrous, angles ribbed, sides finely striate or with a rather prominent rib; sheaths membranous or herbaceous, purplish below, the orifice of the uppermost slightly thickened and brownish, truncate or somewhat oblique with a short erect obtuse mucro. Spikelet ellipsoid to lanceolate, acute, brown, 10-20 mm. long, 3.5-5 mm. wide, many-flowered; glumes ovate, acute to obtuse, 3.7-4.2 mm. long, faintly keeled on the more or less greenish back, sides membranous, stained with brown particularly in the upper part, margins rather narrowly hyaline, sometimes brown-zonate; style 3-fid; stamens 3, anthers oblong-linear, acute or very minutely apiculate, 0.7-0.8 mm. long. Nut yellowish to brown, shining, obovate, trigonous compressed, the lateral angles not or only faintly costate, the dorsal one not prominent, 1.5-1.6 mm. long, 1-1.1 mm. wide, not constricted below the 0.6-0.7 mm. wide apex, sides most finely and lightly reticulate, the external cells vertically oblong; style-base triangular-ovate, somewhat pyramidal below, compressed above, greenish to brown, coarsely cellular, $\frac{3}{4}$ - $\frac{3}{4}$ as long as nut and slightly wider than its apex; bristles 6-8, brown, flat, longer than nut and some at least overtopping the style-base, very closely retrorsely barbed with hyaline teeth much longer than the width of the bristle.—Plate IX., figs. 12-15.

Queensland.—Moreton District: Coolum, in swampy creek, April, 1938, *Blake* 13761; Sunnybank, March, 1889, *Bailey*.

New South Wales.—North Coast: Richmond River, *Hodgkinson* (M.).

There is also a sheet in Herb. S. without locality or collector's name.

The species extends through Malaya to Eastern Asia and India. I have seen specimens from the Philippines and from Japan. It is readily recognised by the regular prominently 4-angular culm (sometimes 3-angular according to C. B. Clarke), the very large style-base, and the sub-plumose bristles. Its exact systematic position is uncertain. Its truncate mucronate leaf-sheath and the nature of the surface of the nut suggest an affinity with the *Acutae*, but the shape of the latter, the massive style-base, the very small anthers, and the characteristic stolons are quite different. Svenson at first placed it in the *Tuberculosae* (*Rhodora* xxxi. 129), but later (in letter) suggested its affinity with *E. gracilis* and the *Sulcatae*, with which it agrees in the angular culms, the 3-angled nut, and to a lesser extent in the style-base. The unusually long and closely set teeth of the hypogynous bristles seem quite unique, though to some extent approached by some members of the *Acutae*.

16. *E. gracilis* R. Br. Prodr. 224 (1810); Domin Biblioth. Bot. xx. Heft. 85, 448 (1915). *E. gracilis* var. *gracillima* and var. *radicans* Hook. f. Fl. Nov. Zel. i. 270 (1864), Handb. N. Zeal. Fl. 301 (1867). *E. gracillima* (Hook f.) Hook f. Handb. N. Zeal. Fl. 745 (1867). *E. Cunninghamhamii* Boeck. in Flora xli. 412 (1858), in Linnaea xxxvi. 427 (1869-70); Cheeseman Man. N. Zeal. Fl. 769 (1906). *E. Hookeri* Boeck. in Linnaea xxxvi. 430 (1869-70). *E. palustris* F. Muell. Fragm. viii. 239 (1874) partly, not of R. Br. *E. multicaulis* Benth. Fl. Austr. vii. 295 (1878); F. Muell. First Census 125 (1882), Sec. Census 211 (1889); Tate Handb. Fl. Extratrop. S. Austr. 183, 264 (1890); Moore Handb. Fl. N. S. Wales 451 (1893); Tepper in Botan. Centralbl. lxiii. 38 (1895); Maiden & Betche Census N. S. Wales Pl. 29 (1916); Black Fl. S. Austr. 91 (1922); Cleland & Black Trans. Roy. Soc. S. Austr. li. 29 (1927); Ewart Fl. Viet. 224 (1930) (though scarcely figs. 128, 129), not of Sm. *Isolepis acicularis* A. Rich. Fl. Nouv. Zel. 103 (1832) not of Schlecht.

Rhizome creeping, 2-3 mm. diam., at first densely clothed with pale brown to purplish ovate striate scales. Culms tufted or approximate along the rhizome, erect or curved, slender, deeply striate but mostly flattened, at least when dry, up to ca. 20 cm. high, not exceeding 0.8 (usually 0.5-0.6 mm. wide); sheaths membranous or thinly herbaceous, striate, the uppermost dilated, thickened, and brown at the oblique orifice which is sometimes mucronate. Spikelet ovoid to oblong or lanceolate, subacute, mostly 5-9 mm. long and 2-2.5 mm. wide, but up to 12 mm. long and 4 mm. wide, brown; glumes rather dense, appressed, deciduous, ovate-oblong, rounded and not triangular at the apex, the lower ones obtuse, the upper subacute, 3.3-3.6 mm. long, obtusely keeled and somewhat concave, sides membranous, stained with reddish brown, margins hyaline; style 3-fid; stamens 3, anthers linear, minutely apiculate, 1.8-2 mm. long. Nut tawny or brown, somewhat shining, obovoid, rounded at apex, trigonous and 3-ribbed, 1.2-1.3 mm. long, 0.8-0.9 mm. wide, the sides convex, minutely reticulate punctulate to somewhat granular or transversely wavy-lined, external cells minute, shortly vertically oblong or subhexagonal; style-base usually rather stout, narrowly pyramidal, $\frac{1}{3}$ - $\frac{1}{2}$ as long as nut and $\frac{1}{2}$ - $\frac{2}{3}$ as wide as it, closely sessile, the annulus slightly prominent; bristles 5-6, flattened, pale brown, slender but rigid, firmly and finely retrorsely hispid, usually much overtopping style-base but sometimes scarcely so long as nut.—Plate IX., figs. 16-22.

Queensland.—Darling Downs District: Bald Mountain, near Wallangarra, near water, ca. 2,700 ft., Jan., 1933, *Blake* 4537; Wallangarra, in damp place at bottom of railway embankment, ca. 2,900 ft., Jan., 1933, *Blake* 4466.

New South Wales.—Central Tablelands: Katoomba, March, 1910, *Hamilton* (S.); Wattle Ridge, via Hilltop, Feb., 1912, *Cheel* (S.); Burratorang to Wentworth Falls, Nov., 1893, *Maiden* (S., M.). Central Coast: Parramatta *Woolfs* in 1871 (M.); Narrabeen, near Sydney, in marshy ground near sea-level, Jan., 1935, *Blake* 7429, 7431. Hunter's Hill (Sydney), *A. G. Hamilton* (S.); Kogarah, Nov., 1893, *Camfield* (S.); Kogarah Bay, Dec., 1899, *Cheel* (S.); Port Jackson District, Nov., 1897, *Betche* (S.); Lilipili Gully, Hurstville, Jan., 1900, *Cheel* (S.).

Victoria.—Western District: Hawkesdale, Nov., 1900, *Williamson*.

South Australia.—Southern Districts: Lofty Range, by stream, Dec., 1847, *Mueller* (M., S.); Mount Lofty, August, 1924, *Ising* (Bl.), in swamps, Nov., 1882, *Tate* (T.); Waterfall Gully, Dec., 1880, *Tate*

(T.); Clarendon, Blewitt's Spring, April, 1882, *Tepper* 614 (M.); Myponga, Jan., 1929, *Cleland* (Bl., Cl.); Encounter Bay: Hall's Creek, *Cleland* (Cl.), Back Valley, in swamp, Jan., 1926, *Cleland* (Cl.), and in creek, Jan., 1925, *Cleland* (Bl., Cl.); Upper Tunkalilla Creek, west of Encounter Bay, June, 1930, *Cleland* (Bl., Cl.); Kangaroo Island: Squashy Creek, 27 miles E. of C. Borda, March, 1926, *Cleland* (Cl.); Stun-sail Boom River, Jan., 1883, *Tate* (M., T.). South-east: Lake George (T.).

New Zealand.—North Island: Auckland Province: Tauroa, Jan., 1913, *Carse*; Paeroa, Thames Valley, Dec., 1909, *Petrie*. New Zealand, without definite locality, *Hooker* (M.).

Also in Norfolk Island (*Maiden and Boorman* in 1902 in Herb. Kew *vide* Svenson).

The species differs from the European *E. multicaulis* Sm. in the development of a creeping rhizome, the more slender, harder culms, the more rigid orifice to the leaf-sheath, the nut more abruptly rounded in the upper part, not olivaceous, not finely vertically striate but more or less distinctly transversely wavy-lined, and in the better developed bristles. The actual degree of slenderness of habit varies considerably, both in Australian and New Zealand specimens. The style-base in the latter is at least usually smaller than in the Australian specimens and the bristles rather weaker than the average. The Queensland specimens are the most outstanding by reason of their rigid, flattened culms up to 0.8 mm. wide, the finely granular rather than reticulate nut, and the rather weak bristles. However, these features occur in various combinations in other plants, and the extremes are no greater than which occur in most other species of the genus.

Besides the specimens cited above, I have sketches communicated by Dr. Svenson of the types of *E. gracilis* (Port Jackson, *R. Brown* 5932) and *E. Cunninghamii* (Bay of Islands, *Cunningham*). The above-cited specimens of Hooker's appear to be co-type material of *E. Hookeri* and *E. gracilis* var. *gracillima*.

17. *E. Dietrichiana* Boeck. in Flora lviii. 107 (1875); Domin Biblioth. Bot. xx. Heft 85, 447 (1915) in small part only.

Rhizome short, horizontal; culms densely tufted, more or less erect, subterete (or flattened when dry) but prominently 6–9-ribbed, up to 3 dm. long, 0.7–1 mm. wide; sheath purplish, membranous, orifice truncate and thickened, dark-coloured, prominently mucronate. Spikelet ovate or oblong, acute to subobtuse, 6–9 mm. long, 2–3 mm. wide, more or less dark brown; glumes not very numerous, appressed in flower, rather spreading in fruit, oblong-ovate with a rather acute triangular apex, thinly membranous, keeled, sides stained brown, margins hyaline, 3.3–3.6 long; style 3-fid; stamens 3, anthers linear, prominently apiculate, 1.8–2 mm. long, including the 0.2–0.25 long setaceous appendage. Nut tawny to dark brown, obovate, somewhat attenuate below the middle, gradually narrowed above and slightly expanded and thickened at apex, subequally trigonous, 3-ribbed, 1.2–1.4 mm. long, 0.7–0.8 mm. wide, sides convex, rather shining, minutely and finely reticulate or longitudinally striate, external cells very small, shortly vertically oblong; style-base short, pyramidal, about $\frac{1}{2}$ as wide as nut and about as long as wide, finely cellular, whitish or brownish; bristles 6, brown, firm, closely and shortly retrorsely scabrous, as long as $\frac{1}{2}$ – $\frac{3}{4}$ nut.—Plate IX., figs. 23–29.

Queensland.—Port Curtis District: Rockhampton, *Thozet* 112 (M.), wet places in railway enclosure, ca. 25 ft., March, 1935, *Blake* 7821; near Rockhampton, *Dietrich* 714 (type ex Berlin, M.), edge of fresh-water swamps ca. 15 ft., March, 1937, *Blake* 12738. Moreton District: Lawes, near Gatton, October, 1938, *Roe*; bottom of railway embankment, Sept., 1933, *Blake* 4946.

An interesting plant of uncertain range. Bentham (Fl. Austr. vii. 295) suggested that this species *may* be the same as his *E. acuta* var. *pallens* (*E. pallens* S. T. Blake), but did not state that it is. In the original description Boeckeler describes the style as bifid, while of the nut he states, *inter alia*, it is “biconvex, the dorsal side higher with a prominent angle.” Clarke [Kew Bull. Add. Ser. viii. 105 (1908)] arranged the species among those with bifid styles and determined also as belonging to it some specimens of *E. pallens* (see discussion under that species). There is an excellent series of specimens of *Dietrich* 714 (the type collection) in Herb. Melbourne and Dr. J. Mattfeld has very kindly presented me with two spikelets (one in flower and one in fruit) from the type-sheet in Herb. Berlin. In all the style is trifid, and Dr. Svenson tells me that such is also the case in specimens of the same collection in the United States National Herbarium at Washington. So it appears certain that Boeckeler’s description of the style is incorrect and also that his description of the nut is somewhat misleading.

Actually the species is very close in its floral characteristics to *E. gracilis*, differing chiefly in the somewhat narrower nut more gradually rounded in its upper part with a small but distinct neck immediately below the apex, the prominently apiculate anthers, and in the glumes with a less rounded rather acute triangular apex. The prominently ribbed culms with very thin tissue between the ribs, the mucronate truncate apex of the leaf-sheath, and the lack of a creeping rhizome further serve to distinguish it.

Series ACUTAE. Rather rigid tufted perennials with or without a creeping rhizome, the orifice of the leaf-sheath rigid and truncate with a prominent erect mucro; nuts lenticular, tawny to brown, the external cells vertically oblong, small, and not very prominent; style 3-fid. (Species 18–21.) Australasian species.

18. *E. acuta* R. Br. Prodr. 224 (1810); Benth. Fl. Austr. vii. 294 (1878) excl. var.; F. Muell. First Census 125 (1882) and Sec. Census 211 (1889); F. M. Bail. Syn. Queensl. Fl. 594 (1883), Catal. Plants Queensl. 52 (1890), Queensl. Fl. vi. 1755 (1902) excl. var., Compreh. Catal. 594 (1913), excl. var.; Tate Handb. Fl. Extratr. S. Austr. 183, 264 (1890); Moore, Handb. Fl. N. S. Wales 450 (1893) partly; Tepper in Botan. Centralbl. lxiii. 38 (1895); Turner in Proc. Linn. Soc. N. S. Wales xxviii. 306 (not 439) (1903), xxx. 84 (1905) chiefly; Maiden *ibidem* xxix. 724 (1904); Cheeseman Man. N. Zeal. Fl. 768 (1906); Maiden & Betehe Census N. S. Wales Pl. 29 (1916); Black Fl. S. Austr. 91 (1922); Cleland & Black Trans. Roy. Soc. S. Austr. li. 29 (1927); Ewart Fl. Viet. 283 (1930); Gardner, Enum. Plant. Austr. Occid. 12 (1930). *E. macronulata* Nees in Ann. Nat. Hist. sér. i. vi. 46 (1841); Steud. Syn. Pl. Glum. ii. 82 (1855); Boeck. in Linnaea xxxvi. 466 (1869-70); Palla in Kneucker: Cyperaceae (exclus. Carices) Restionaceae, Centrolepidaceae & Juncaceae exsiccatae, Lief vii. nr. 192 (1909) partly; *E. gracilis* var. β Hook. f. Fl. Tasm. ii. 85 (1860). *E. gracilis* (excl. var. β and γ) Hook. f. Fl. Nov. Zel. i. 270 (1864), Handb. N. Zeal. Fl. 301 (1867) not of R. Br. *E. palustris* Fragm. viii. 240 (1874) partly,

not of R. Br. *Scirpus acutus* (R. Br.) Spreng. Syst. i. 203 (1825). *S. tener* Spreng. loc. cit. 204. *E. ambigua* Kirk ex Buch. in Trans. N. Zeal. Inst. vi. 225 (1874).

Rhizome slender, woody, stoloniform; culms in distant tufts, more or less erect, up to 90 cm. high and up to 3 (mostly 1–2) mm. wide, terete or (when dry) more or less flattened, but always trigonous under the spikelet, usually longitudinally striate, rarely also irregularly pitted; sheaths herbaceous or rigidly membranous, appressed, striate, more or less purplish at base, the orifice of the uppermost dark brown, somewhat thickened, truncate or nearly so, prominently mucronate. Spikelet linear, more or less acute, usually dark brown or variegated with brown, 15–30 mm. long, 3–7 mm. wide; glumes rather dense, the two lowermost broad, rounded, shorter than the others, overlapping each other, herbaceous with hyaline margins and an internal brown zone: the remainder ovate-lanceolate, subobtuse to very acute at the triangular apex, 3.5–4.3 mm. long, membranous, faintly keeled (1-nerved on the greenish back), sides very thin, stained deep brown or reddish brown, margins and apex hyaline; style 3-fid; stamens 3, anthers linear, prominently apiculate, 1.6–2.5 mm. long including the 0.2 mm. long subulate uncrested appendage. Nut yellowish to brown, shining, broadly obovate, plano-convex to biconvex, often turgid, sometimes when young, showing traces of a third angle, sometimes with 1–2 faint longitudinal furrows, margins not costate, 1.4–1.8 (usually 1.5–1.7) mm. long, 1.0–1.4 (usually 1.1–1.2) mm. wide, sides smooth or somewhat roughened, external cells minute, shortly vertically oblong; style-base ovate to triangular, compressed, often showing traces of a third angle, whitish or discoloured, cellular, 0.4–0.8 (usually 0.4–0.6) mm. high, 0.5–0.8 (usually 0.5–0.6) mm. wide, the annulus prominent; bristles mostly 7, rarely 6, more rarely 8–9, rather slender, flattened below, strongly retrorsely toothed, rather unequal, reaching or somewhat overtopping the style-base, occasionally short and ill-developed.—Plate X., figs. 1–7.

Queensland.—Port Curtis District: Gracemere, common in wet places, August, 1867, *O'Shane* 107 (M.). Darling Downs District: Jimba, Plains of the Condamine, *Hartmann* (M.); Dalby, April, 1916, *White*; between Bald Mountain and Wyberba, in mud on creek bank, Jan., 1933, *Blake* 4510; between Bald Mountain and Wallangarra, in marshy ground, Jan., 1933, *Blake* 4482.

New South Wales.—Western Plains: Bengalla, *Leichhardt* (M.). North-west Slopes: Liverpool Plains, coll. ? (M.). Northern Tablelands: Tenterfield, *Stuart* 1028 (M.); Glen Innes, Dec., 1913, *Boorman* (S.); Elderbury Creek, 6 miles S.W. of Guyra, Dec., 1931, *McKie* 224 (S.); Walcha, "common . . . in shallow water . . .," Jan., 1913, *Boorman* (S.); Walcha District, Dec., 1898, *Betche* (S.). Central Tablelands: Orange, Jan., 1908, *Boorman* (S.). Central Coast: Duck Creek, Clyde, March, 1909, *Hamilton* (S.); Oatley, Jan., 1908, *Boorman* (S.); Centennial Park, Sydney, March, 1899, *Cheel* (S.), in damp peaty soil, Jan., 1908, *Boorman in Kneucker* 192 (Herb. Blake). Southern Tablelands: Queanbeyan, Dec., 1911, *Cabbage* 3347 (S.); near Tharwa, Federal Capital Territory, in open swampy ground, ca. 2,000 ft., Feb., 1935, *Blake* 7539; Rock Flat, near Cooma, in stream, Dec., 1896, *Maiden* (S., M.).

Victoria.—Mallee: Lake Albacutya, near water's edge, Nov., 1899, *D'Alton* 2 (M.). Wimmera: Nhill, *D'Alton* 3 (M.); near Dimboola, *Reader* 32 (M.); Shire of Dimboola, in swamps, Sept., 1892, *Reader* (M.); Lake Hindmarsh, April, 1895, *Reader* 5 (M.); Wycheproof, Sept., 1917, *Watts* 401, (S.); and without locality, *Mueller* (M.). Western District: Mount William Creek, *Sullivan* 5 (M.); near entrance to Hopkins River, *Knight* (M.); Garvoc, Dec., 1911, *Tovey* (M.); Skipton, on plains, *Whan* 125 (M.). North Central District: Harcourt, April, 1919, *Semmens* 53 (M.). Central District: Near Dandenong Ranges, *Dixon* in 1891 (M.); Tooradin, in swamps, Jan., 1935, *Blake* 7283.

South Australia.—Southern District: St. Vincent Gulf, in coastal swamps, *Mueller* (M.); Bethany, coll. ? (M.); Angas River, *Mueller* in 1848, (M.); Mt. Gawler (T.); Reedbeds near Adelaide, Dec., 1879, (T.); Bridgewater, *Black* in 1904 (Bl.); Happy Valley, Nov., 1906, *Black* (Bl.); National Park, Belair, Jan., 1924, *Black* (Bl.); Myponga, Dec., 1910, *Griffith* (Bl.); Black Swamp, Jan., 1924, *Cleland* (Cl.); Port Elliot, *Hussey* 510, (M.); Inman Valley, *Cleland* (Cl.); Hindmarsh Valley, Encounter Bay, Jan., 1922, *Cleland* (Cl.); Kangaroo Island, without definite locality, *Tate* in 1882 (M.), Cygnet River, Jan., 1883, *Tate* (M., T.). Murray Lands: River Murray Lagoons, Jan., 1884, and Mannum, March, 1883, *Tate* (T.); near Swan Reach, Nov., 1913, *Cleland* (Cl.). South-east: Millicent Drain, Dec., 1917, *Black* (Bl.); Lake Bonney, Dec., 1922, *Cleland* (Cl.). Eyre's Peninsula: Port Lincoln (T.).

Western Australia.—South-western Division: Greenough River, *Walcott* (M.); Stirling Range, Jan., 1857, *Mueller* (M.); and without locality, *Drummond* 364 (M.).

Tasmania.—Diana's Basin, October, 1892, *Rodway* (S.); South Esk, wet places, *ex Herb. Archer* (S.), in water, *Stuart* 254 (M.); Swanport, edges of creeks, *Story* (M.); Claremont, *Lucas* (S.); New Norfolk, Dec., 1860, *Gunn* 573 (S.).

Norfolk Island.—October, 1905, *Drummond* 76 (S.).

New Zealand.—Without definite locality, *Hooker* (M.), and *Colenso* (ex herb. Hooker in M.). North Island: Wellington Province: Bunnythorpe, near Palmerston North, in swamp, Dec., 1928, and in damp places in pastures, Nov., 1928, *Zotov*. South Island: Westland Province: Greymouth, *Helms*; Pukekura, boggy places on forest margin, Jan., 1937, *Poole*. Canterbury Province: Ashburton, margin of water-race in tussock grassland, Dec., 1918, *Allan*; Wakanui Beach, in brackish water on margin of creek, Jan., 1918, *Allan*. Otago Province: Dart River, head of Lake Wakatipu, in boggy ground, Jan., 1936, *Zotov*.

Certainly the most variable of the Australasian species. The culms vary a great deal in stoutness and hardness, the leaf-sheath at times tends to become oblique, particularly in New Zealand specimens, the spikelet varies greatly in width (partly dependent on the width of the culm), the glumes in size and acuteness, the nut in turgidity, length, breadth, and smoothness, the style-base in form and size, and the bristles in degree of development. The variations occur in a multiplicity of combinations and seem to depend largely on local ecological factors. In view of this it is not at all surprising that a tremendous amount of confusion has existed in connection with this and related species. The following combination of characters serve to distinguish it:—Culms more or less terete in distant tufts on a creeping rhizome, the mucronate

orifice to the upper leaf-sheath, the usually acute spikelet with prominently triangular hyaline apices to the glumes which are not readily deciduous and frequently fall away in basipetal succession, the 3-fid style but lenticular nut without costate margins, and the long subulate unerested appendage to the anthers. From *E. palustris* it is sufficiently distinguished by the mucronate leaf-sheath and 3-fid style, and from *E. gracilis* by the lenticular unribbed nut, besides other characters. To judge from the specimens in Herb. Sydney, *Gunn* 573, the type of *E. mucronulata* Nees, does not differ from the general trend of *E. acuta* except that the style-base is rather larger than usual, and is also a stout, though not exceptionally stout plant. Palla in *Kneucker* 192 distinguishes the species by several characters, but the specimens I possess distributed under that number do not at all agree with his characters for *E. mucronulata* and are merely depauperate plants of *E. acuta* similar to some of the Victorian ones, with culms about 10 cm. high on very slender rhizomes and greatly reduced bristles. It appears that Palla based his diagnoses on other plants, and seems to have confused *E. acuta* with *E. pallens*.

E. acuta var. *platylepis* Hook. f. Handb. N. Zeal. Fl. 745 (1867) and *E. acuta* var. *tenuis* Carse Trans. N. Zeal. Inst. lvii. 89 (1926) are both typical *E. acuta*.

19. ***E. plana*** S. T. Blake Proc. Roy. Soc. Queensl. xlix. 155 (1938).

Rhizome long-creeping, ca. 2 mm. diam.; culms in distant tufts, erect or oblique, up to 80 cm. high, flat or slightly plano- or concavo-convex, 2-4 (usually 3) mm. wide, longitudinally striate, transverse irregularly rugulose; sheaths rigidly membranous or subherbaceous, striate, the upper one discoloured, thickened, and truncate or nearly truncate at the orifice with a rigid dorsal mucro 1.5-3 mm. long. Spikelet pallid or brownish, linear-cylindrical, subacute, mostly 10-15 mm. long, 2-2.5 mm. wide; glumes, excepting the two lowermost bracteiform, ovate, acute, faintly keeled, thinly membranous, straw-coloured, apex triangular and with the margins broadly hyaline, 3.4-3.7 mm. long; style 3-fid; stamens 3, anthers linear, prominently apiculate, and including the 0.2 mm. long linear appendage, 1.4 mm. long. Nut at length shining brown, obovate, biconvex, turgid, the margins scarcely costate, minutely punctulate or wrinkled, 1.2-1.8 (usually 1.4) mm. long, 1-1.1 mm. wide, the external cells shortly vertically oblong; style-base triangular or ovate, compressed, pallid, cellular, often somewhat hispidulous at the base, about $\frac{1}{2}$ as long and $\frac{1}{2}$ as wide as nut; bristles 6-8, slender, retrorsely scabrous, about as long as the nut together with style-base.—Plate X., figs. 8-11.

Queensland.—Port Curtis District: Herbert Creek, *Bowman* in 1870 (M.); Gracemere, common in wet places, August, 1867, *O'Shanesy* 109 (M.). Darling Downs District: Palardo, west of Miles, in swamps, 1,100 ft., Feb., 1935, *Blake* 7615 (TYPE in B.); Chinchilla, in water, Nov., 1933, *Beasley* 208; and in water or on wet mud in railway enclosure, ca. 985 ft., Feb., 1935, *Blake* 7674; Macalister, April, 1916, *Bick*; Jondaryan, damp depressions in grassland, 1,250 ft., Feb., 1935, *Blake* 7757; Milmeran, around pond in heavy black soil in paddock on cleared Eucalyptus forest land, 1,382 ft., March, 1931, *Hubbard* 5873. Moreton District: Tarampa Creek, *Bailey* (M.); Lawes, near Gatton, bottom of railway embankment, 294 ft., Sept., 1933, *Blake* 4944, 4945.

New South Wales.—Western Plains: Cobar, August, 1911, *Abraham* 145 (S.). North-west Slopes: Liverpool Plains, coll. ? (S.). Northern Tablelands: Tia to Walcha, Nov., 1897, *Maiden* (M.). North Coast: Without further indication of locality or collector (S.). Central Western Slopes: Narramine, Nov., 1892, *Helms* (S.).

A very critical species, often very difficult to distinguish from *E. acuta* and requiring further study. Only six of the above-cited collections are mature and some of these differ among each other somewhat in the size and colour of nut and style-base. In these and other spikelet characters the species is exceedingly like *E. acuta*, but the spikelet is sometimes more obtuse and the style-base often more distinctly hispidulous than ever observed in that species. Well-developed specimens are easily known by the strongly flattened culms as broad as or broader than the spikelet, more or less distinctly ribbed on the margin, and reticulate-wrinkled on the sides. The flattened culm is very prominent in the living plant, and has been remarked upon by more than one collector. In the herbarium they are distinguishable from artificially flattened specimens of *E. acuta* by the fact that they are flat even at the very apex and that the very prominent mucro to the leaf-sheath always occupies the middle of one side of the culm, whereas in *E. acuta* the culm is subtrigonus or subterete under the spikelet and the mucro may appear to occupy any position relative to the flattening of the culm. Slender specimens, such as *Blake* 4944, 4945, both regrowths after fire, are especially difficult to identify.

Bailey's specimens were referred by Bentham to *E. spiralis*, and his description of the latter species is based to some extent on this collection. The broad culm probably led Bentham into this mistake, for otherwise the two species have nothing in common. Clarke and Domin referred the same specimens to *E. cylindrostachys*, which differs sharply in the absence of a creeping rhizome, the more slender terete culms, the very deciduous obtuse glumes, the costate-margined nut, and the very shortly apiculate anthers, and in other characters.

20. ***E. pallens*** *S. T. Blake* Proc. Roy. Soc. Queensl. xlix. 154 (1938). *E. acuta* var. *pallens* Benth. Fl. Austr. vii. 295 (1878); F. M. Bail. Queensl. Fl. vi. 1755 (1902) and Compreh. Catal. 594 (1913). *E. acuta* Moore Handb. Fl. N. S. Wales 451 (1893) partly; Turner Proc. Linn. Soc. N. S. Wales xxviii. 439 (1903) not p. 306, and xxix. 177 (1904); Ewart & Davies Fl. North Territ. 57 (1917); Black Trans. Roy. Soc. S. Austr. xli. 635 (1917); Cleland, Black, and Reese *ibidem* xlix. 110 (1925) not of R. Br. *E. Dietrichiana* Baker Proc. Linn. Soc. N. S. Wales xxv. 671 (1900) at least in part; Diels & Pritzel in Engl. Bot. Jahrb. xxxv. 79 (1904); Domin Biblioth. Bot. xx. Heft 85, 447 (1915) excl. Dietrich 714; Maiden & Betche Census N. S. Wales Pl. 28 (1916); Gardner, Enum. Plant. Austr. Occid. 12 (1930); not of Boeck. *E. macronulata* Palla in Kneucker: Cyperaceae (excl. Carices), Restionaceae, Centrolepidaceae & Juncaceae exsiccatae, Lief vii. nr. 192 (1909) partly, not of Nees.

Rhizome very short; culms very densely tufted, erect or sub-erect, up to 5 dm. high, slender, slightly thickened at base, subterete, smooth but longitudinally prominently 9–10-sulcate, 0.6–1 mm. wide; sheaths firmly membranous, closely appressed, lightly striate, the orifice of the uppermost truncate, thickened and discoloured, with an erect mucro up to 2 mm. long. Spikelet linear-cylindrical, obtuse at the base, acute or subacute at the apex, brown or tawny, usually pallid, dense-flowered,

mostly 1-2 cm. long, 2 mm. wide; glumes numerous, closely appressed, rarely somewhat spreading, readily deciduous, ovate or oblong-ovate, acute with a triangular apex, scarious, faintly keeled and more or less stained with brown on the back, otherwise hyaline, 2.9-3.5 mm. long; style 3-fid, very rarely accidentally 2-fid; stamens 3, anthers linear, apiculate, and including the 0.15 mm. long appendage 1.5-2 mm. long. Nut broadly obovate or suborbicular, sometimes somewhat attenuate towards the base, biconvex to subplanoconvex, often turgid, 1.1-1.4 mm. long, 0.9-1.0 mm. wide, tawny, brown, or sometimes dark brown, the margins costiform, the sides smooth or rugulose, usually lightly reticulate, the external cells small, shortly vertically oblong, sometimes rather prominent; style-base very variable in the same spikelet, mostly more or less deltoid or ovate-triangular, most often compressed, pallid or tawny, in the lower part more or less spongy and fimbriolate, as long as up to $\frac{1}{3}$ nut and $\frac{1}{3}$ - $\frac{3}{4}$ as wide as it, often, however, strongly depressed and ovate or strongly constricted at base; bristles 7-10 flat, retrorsely scabrous, usually stout, pallid or brownish, usually subequal, shorter or longer than the nut, occasionally short or very long.—Plate X., figs. 12-19.

North Australia.—Upper Victoria River, *Mueller* (M.); Lake Woods, August, 1911, *Hill* 489 (B., S., M.); without definite locality, *Reid* in 1874 (M.).

Central Australia.—Deering Creek, *Horn Expedn.* (T., S.); Charlotte Waters, May, 1875, *Giles* 75 (M.).

Queensland.—Burke District: Hughenden, June, 1919, *Hawthorn*. Mitchell District: Prairie, in depressions in Eucalyptus forest on sand, 1,400 ft., May, 1936, *Blake* 11607; Muttaborra, April, 1919, *White*; Bowen Downs, *Birch* (M.); Darr River, *Birch*; Geera, east of Barcardine, edge of lagoons on sand, 900 ft., Dec., 1935, *Blake* 10361. Gregory South District: Near Windorah, on alluvial plain, July, 1936, *Blake* 12046; Earlstoun, between Quilpie and Windorah, edge of small stream on mud, April, 1934, *Blake* 5456. Warrego District: Thargomindah, on creek bank, ca. 400 ft., June, 1936, *Blake* 11773; Charleville, on wet mud in Eucalyptus parkland, 950 ft., April, 1936, *Blake* 11042; Offham, ca. 25 miles south of Wyandra, in depressions in grassland, 700 ft., April, 1936, *Blake* 11235 (TYPE in B.); Curragh Station, near Cunnamulla, alongside of bore-drain in brown loam, Jan., 1931, *Hubbard & Winders* 6230. Cunnamulla, wet depressions in grassland plain, 600 ft., April, 1936, *Blake* 11205. Maranoa District: Roma, May, 1914, *Soutter*; and in depressions in Eucalyptus forest, on mud, ca. 1,000 ft., March, 1936, *Blake* 10891; Miltonise Station, ca. 30 miles west of St. George, in gilgai in brigalow (*Acacia harpophylla*) scrub, ca. 600 ft., March, 1936, *Blake* 10814; St. George, May, 1894, *Wedd* 619; Ballandool River, *Looker* 143 (M.); Noondoo Station, near Dirranbandi, depressions in *Eucalyptus coolabah* parkland, ca. 600 ft., Feb., 1936, *Blake* 10583. Darling Downs District: Jondaryan, damp depressions in grassland, 1,250 ft., Feb., 1935, *Blake* 7758; without further indication of locality, *Ford* (M.). Leichhardt District: Comet, *O'Shanesy* 4099 (M.) Port Curtis District: Rosewood, wet places, Jan., 1876, *O'Shanesy* 1570 (M.).

New South Wales.—Far Western Plains: Mount Poole, Sept., 1887, *Bäuerlen* (S.); west of Paroo, *A. W. Mueller* 45 (S.); Mount Murchison, *Bonney* 49 (M.), *Dallachy & Goodwin* (M.); 45 miles east of Broken Hill, May, 1917, *Cleland* (S.); Wonnaminta, Dec., 1887, *Bäuerlen* (S.); beyond the Darling River, Feb., 1867 *Beckler* (M.). Western Plains:

Warrego River, Sept., 1885, *Boorman* 31 (M.); near Bourke, Sept., 1893, *Campbell* (S.); Brewarrina, Nov., 1903, *Boorman* (S.); Namoi River, March, 1887, *Carson & Carson* (M.); Narrabri, Nov., 1935, *Anderson* (S.); Cobar, July, 1911, *Abraham* 151 (S.); Euabalong, May, 1906, *Boorman* (S.); between the Darling and the Lachlan, *Burkitt* (M.); Moama, Feb., 1894, *Guilfoyle* (S.). North-west Slopes: Inverell, Jan., 1913, *Thomas* (S.). Central Western Slopes: Narramine, Nov., 1892, *Helms* (S.). Northern Tablelands: Glen Innes, Jan., 1914, *Rupp* 3 (S.); Armidale, *Perrott* 63, 97 (M.).

Victoria.—Wimmera: Avoca River, dried-out flooded places, Dec., 1853, *Mueller* (M.).

South Australia.—Far North: Cordillo Downs, in watercourse, May, 1924, *Cleland* (Bl., Cl.); Strzelecki Creek, Sept., 1916, *A. S. White* (Bl.); Cooper's Creek, coll. ? (S.). Flinders Range: Mount Lyndhurst, Feb., 1897, *Agric. Bureau of South Australia* 108 (S.). Lake Torrens: Arcoona, round edge of small lake, but on dry land, Sept., 1927, *Murray* (Bl.); by Termination Hill, June, 1883, (T.).

Western Australia.—I have seen no specimens from this State, but from Svenson's notes *Diels* 3726 from Shark Bay seems certainly to belong to the present species.

The species is confined to the Australian mainland and is almost restricted to the interior. It has been consistently confused with *E. acuta* and was regarded as a variety of that species by Bentham, and more recently with *E. Dietrichiana*. From the former it differs in general habit, the lack of a creeping rhizome, the costate margins of the usually smaller nut, the broader bristles, etc., and from the latter in the harder culms, the longer spikelets, the lenticular nut not constricted into a neck, the nature of the style-base and to a lesser extent of the bristles, and from both in the glumes readily deciduous in acropetal succession and usually pale in colour, and in the shorter cristulate appendage to the anthers as well as in details of the style-base. As a matter of fact *E. pallens* is very close to *E. cylindrostachys*, from which it differs chiefly in the more acute spikelets and glumes and the better-developed appendage to the anthers. The confusion surrounding the species has, however, been such that the unravelling of the bibliographical references has proved a very intricate task. Although fairly homogeneous in aspect, considerable variation in floral characters occur. For the most part this variation is restricted to the degree of roughening of the surface of the nut and to the shape and bulk of the style-base. The latter is usually more or less triangular in outline, or else ovate, due to constriction near the base, usually dorso-ventrally flattened, mostly rather less than $\frac{1}{3}$ as long and $\frac{1}{2}$ – $\frac{2}{3}$ as wide as nut. There is a tendency for the style-base to become depressed, usually with a coincident tendency towards an increase in breadth and rounding at the apex. Thus in the extreme state, the style-base becomes quite short and extends over the shoulders of the nut, attaining about $\frac{3}{4}$ the width of the latter. Occasionally the larger style-bases show a median line or even a somewhat prominent angle on the abaxial face, and in one such case (*Campbell's* specimens from Bourke in Herb. S.) a faint dorsal angle occurs on some of the nuts. Perhaps the most interesting sport—for one can call these aberrant cases nothing more—is the *very occasional* occurrence of 2-fid styles, usually in spikelets with normal styles as well. This aberration is to be found in some of the specimens cited by Bentham, and appears to be the basis on which Clarke and Domin united this species with *E. Dietrichiana*, which, as

pointed out above, was erroneously described by Boeckeler as possessing a 2-fid style. Another interesting aberration occurs in *Mueller* 45 and in *Cleland's* specimens from east of Broken Hill, both in Herb S., in which a short creeping rhizome is developed. The culms are, however, approximate and not in distant tufts, and it appears that some of the plants at least were growing on a steeply sloping bank. The collection constituting the type was selected as such because the large number of specimens in it would seem, from field considerations, to be descendants of possibly a single individual, while at the same time exhibiting nearly every variation yet observed. As no other species of the genus is known to occur within 80 miles (*E. pusilla* occurs at Charleville) and no near relative within 250 miles, there is good reason for believing that these plants are genetically homogeneous.

21. ***E. cylindrostachys* Boeck.** in Flora Iviii. 108 (1875); Benth. Fl. Austr. vii. 294 (1878); F. M. Bail. Syn. Queensl. Fl. 594 (1883); Proc. Roy. Soc. Queensl. 1. 75 (1884), Catal. Pl. Queensl. 52 (1890), Queensl. Fl. vi. 1755 (1902), Compreh. Catal. 594 (1913); F. Muell. First Census 125 (1882), Sec. Census 211 (1889); Moore Handb. Fl. N. S. Wales 450 (1893); Turner Proc. Linn. Soc. N. S. Wales xxviii. 306 (1903), xxx. 84 (1905); Hamilton ibidem xxxvi. 82 (1911) and Austr. Natur. v. 2 (1913); Demin Biblioth. Bot. xx. Heft 85, 448 (1915); Maiden & Betche Census N. S. Wales Pl. 29 (1916); Dovey, Queensl. Nat. ix. 91 (1935). *E. obtusa* F. Muell. Fragm. viii. 240 (1874), not of Schult.

Rhizome very short or descending; culms tufted, erect or nearly so, mostly 30–50 cm. high, subterete or (when dry) compressed, finely and lightly longitudinally striate, 1–1.7 mm. wide, somewhat thickened at base; sheaths membranous or thinly herbaceous, the uppermost closely striate, appressed, the orifice truncate or slightly oblique, with a prominent, rigid, erect dorsal mucro, brown and usually thickened at the margin. Spikelet pallid or very pale brown (rarely dark brown), linear cylindrical, obtuse, many-flowered, 10–15 mm. long or at length attaining 20 mm. after the fall of the lower glumes, 2.5–3 mm. wide; glumes numerous and very dense, the lowermost short bracteiform persistent, the remainder very deciduous, ovate, obtuse, thinly membranous, keeled, the keel disappearing some distance below the apex, margins broadly hyaline, 2.2–2.5 mm. long; style 3-fid; stamens 3, anthers linear, subacute or most minutely apiculate, 1.0–1.2 mm. long. Nut yellowish to golden brown or brown, obovate, cuneate or slightly attenuate towards base, equally and rather turgidly biconvex, margins prominently ribbed, even over apex, 1.1–1.25 mm. long, 0.7–0.9 mm. wide, sides smooth and shining, cells very minute, shortly vertically oblong but quite inconspicuous; style-base ovate or triangular-ovate, strongly flattened though usually with a median line on the abaxial face, somewhat spongy and roughened, $\frac{1}{3}$ to nearly $\frac{1}{2}$ as long and $\frac{1}{2}$ – $\frac{2}{3}$ as wide as nut; bristles 8–9, subequal, brown, rather stout, flattened and striate, closely and shortly retrorsely toothed, about as long as the nut together with style-base.—Plate X., figs. 20–23.

Queensland.—North Kennedy District: Ravenshoe, open swampy ground ca. 3,000 ft., June, 1935, *Blake* 9549. Port Curtis District: Rockhampton, damp places, *Thozet* 813 (M.); Boyne River, *Hartman* 89 (M.); Rosedale, clay-loam waterholes, not common, Nov., 1930, *Dovey* S. 18. Leichhardt District: Wandoan, abundant round lagoons and creeks in heavy soil, 890 ft., with *Juncus* sp., Nov., 1930, *Hubbard* 4991.

Burnett District: Mount Perry, *Keys* 367; Monto, open damp places ca. 750 ft., March, 1937, *Blake* 12825. Darling Downs District: Near Palardo, between Miles and Roma, on creek bank ca. 1,100 ft., May, 1934, *Blake* 5887; Baking Board, 5 miles west of Chinchilla, edge of lagoon, March, 1933, *Quinlan*; Brigalow, in melonhole in dead brigalow scrub ca. 1,000 ft., Feb., 1938, *Blake* 13309; Milmerran, around pond in heavy black soil in paddock from Eucalyptus forest land, 1,382 ft., March, 1931, *Hubbard* 5872; Bald Mountain, near Wallangarra, in railway gutter, 2,750–3,000 ft., Jan., 1933, *Blake* 4462. Moreton District: Buderim, May, 1933, *Middleton*; Durundur Lagoon and Archer's Lagoon, November, 1843, *Leichhardt* (M.); Moreton Bay, Nov., 1858, *Stuart* 111 (M.); various places near Petrie, in or at edge of water, *Blake* 1016, 1046, 1115, 1145, 1219, 1222, 1233; Geebung (Brisbane), in small creek in *Melaleuca nodosa* forest, Nov., 1932, *Blake* 1408; Rocklea (Brisbane), Nov., 1909, *White*; Enoggera Creek, April, 1908, *White*; Brisbane, in swamps, March, 1875, *Bailey*; Yatala, Sept., 1931, *Michael* 1848; Pimpama, Jan., 1933, *Cribb*; Marburg, October, 1930, *Kunze in Herb. Hubbard* 5480; Forest Hill, near Gatton, *Brimblecombe*; Mudgeeraba, in swamp with *Juncus* sp., 15 ft., cleared rain-forest country, Sept., 1930, *Hubbard* 4289; Tamborine Mountain, in stream with *Juncus* spp. and *Sparganium* sp., 1,800 ft., open situation, red soil, very common, May, 1930, *Hubbard* 2521; Lanefield, 38 miles S.W. of Brisbane, in shallow pool in grassland, 152 ft., April, 1930, *Hubbard* 2123.

New South Wales.—North-west Slopes: Nangara Cerek, Barraba, April, 1913, *Rupp* (S.). Northern Tablelands: Wallangarra, April, 1914, *Boorman*; Deepwater, Jan., 1911, *Boorman* (S.); New England, *Stuart* 6, 355 (M.). North Coast: Clarence River, *Wilcox* (M.); Ballina, Dec., 1892, *Bäuerlen* (S.); Coraki to Casino, June, 1906, *Maiden* (S.); Port Macquarie, Feb., 1891, *Boorman* (S.); Awaba, Oct., 1899, *Boorman* (S.). Central Coast: Parramatta, *Woolls* (M.); Richmond, *Woolls* (M.), October, 1910, *Greenwood* (S.); Douglas Park, Dec., 1910, *Hamilton* (S.); Duck Creek, Clyde, March, 1909, *Hamilton* (S.); Nepean River, Dec., 1910, *Hamilton* (S.).

Differs from the American *E. obtusa* (Willd.) Schult., to which it has been referred by Mueller, by the longer, narrower spikelets, the narrower glumes, the constantly 3-fid style, the perennial habit, etc. Among the Australian species it is fairly easily recognised by the long obtuse spikelets and the very deciduous obtuse glumes, though in most characters it is very close to *E. pallens*, as pointed out under that species. In a few specimens from New South Wales the glumes are dark brown.

Series PALUSTRIFORMES sub-series PALUSTRES. Rather rigid, usually stoloniferous perennials with the upper leaf-sheaths oblique at orifice; nuts biconvex, yellow or brown, smooth; style 2-fid; style-base spongy, rarely depressed. (Species 22.)

22. *E. neozelandica* C. B. Clarke ex T. Kirk in Trans. N. Zeal. Inst. xxvi., 260 (1894) and Ill. Cyp. t. xxxvi. figs 10–14 (1909); Cheeseman Man. N. Zeal. Fl. 768 (1906).

Rhizome creeping, branched, slender but rigid, 0.7–1 mm. diam., brown to purplish brown. Culms solitary or in distant small tufts, rigid, somewhat spongy, often curved, striate-angular, 0.4–0.5 mm. wide, up to 6 cm. long; sheaths deep purplish near base, firmly membranous, striate, the upper one sometimes red-streaked, somewhat inflated at the rigid oblique or very oblique orifice. Spikelet broadly ovoid, acute to

obtuse, 5-7 mm. long, 3-4 mm. wide, 4-10-flowered; glumes broadly ovate, obtuse, 3.3-3.4 mm. long, concave, back 1-nerved, pallid to greenish, sides membranous stained reddish- or purplish-brown, margins hyaline; style short, 2-fid, branches long; stamens 3-2, anthers linear, prominently apiculate, 1.6-1.8 mm. long, including the 0.3 mm. long appendage. Nut shining golden brown, slightly asymmetrically obovate, subequally biconvex with a faint furrow on the abaxial face, not turgid, margins obtuse not costate, 1.7-1.8 mm. long, 1.2-1.3 mm. wide, not constricted below the apex, which is only $\frac{1}{4}$ as wide, smooth, external cells vertically oblong, minute and inconspicuous; style-base deep brown, very small, sessile, depressed but thin, only 0.2-0.25 mm. high, as wide as apex of nut, the annulus prominent; bristles absent.—Plate X., figs. 24-28.

New Zealand.—North Island: Auckland Province: Tanau Tanau Beach, near Reef Point, sandy margin of tidal creek, Jan., 1915, *Carse*. Wellington Province: Himatangi, near Foxton, boggy places in sand-dunes, March, 1931, *Zotov*. South Island: Nelson Province: Farewell Spit, *Kirk* 1248 (TYPE in Herb. Kew; see below).

An interesting little New Zealand endemic; I have not seen the type, but Dr. Svenson has sent me sketches and notes of its salient characters. These agree with Clarke's figures, so far as the latter go, which were derived from *Kirk* 1005 from Cape Farewell, and indicate a hyaline orifice to the leaf-sheath. In most of the cases I have seen the orifice is more or less brownish, while the degree of obliquity varies considerably. Sometimes it is nearly truncate, sometimes almost lanceolate. Other interesting points are the obliquely obovate nut, one edge being concave inwards near the base, the other slightly convex outwards; the very small style-base; and the absence of bristles. The position of the species in the genus is by no means clear, for while in the characters of style, nut, and leaf-sheath it corresponds closely with the *Palustres*, the very small style-base and complete absence of bristles do not. There does, however, seem to be in New Zealand a distinct tendency for other species to produce unusually small style-bases, so that this species may not be so abnormal in this respect as might appear. It is of course possible that it has been derived from the *E. acuta* type, in which, as has been pointed out above, tendencies towards the reduction in style-branches, reduction in size and development of style-base and bristles, and increase in degree of obliquity of orifice of leaf-sheath have been observed.

Series MACULOSAE. Nut biconvex, black to reddish-brown or olive, the surface smooth or minutely wrinkled; style 2-fid; style base conical or depressed, not strongly flattened. There are two sub-series, differentiated as follows:—

Sub-series RIGIDAE. Non-stoloniferous annuals with sheaths firm at the apex. Nuts black or purplish, the pericarp not marcescent (Species 23-24).

Sub-series OCREATAE. Stoloniferous perennials, the sheaths scarious at the apex. Nuts black to reddish-brown or olivaceous, the pericarp marcescent, often slightly wrinkled. (Species 25.)

The species of this series are chiefly tropical, and especially numerous in America.

23. **E. geniculata** (L.) R. & S. Syst. Veg. ii. 150 (1817); Svenson, *Rhodora* xli. 50 (1939). *Scirpus geniculatus* L. Sp. Pl. i. 48 (1753) partly. *S. caribaeus* Rottb. Descrip. Pl. Rar. Progr. 24 (1772). *E. caribaea* (Rottb.) S. F. Blake in *Rhodora* xx. 24 (1918); Svenson *ibid.* xxxi. 225 (1929). *E. capitata* R. Br. Prodr. 225 (1810); F. Muell. Fragm. vi. 94 (1867), viii. 240 (1874), First Census 125 (1882), Sec. Census 211 (1889); Boeck. *Linnaea* xxxvi. 461 (1869-70); Benth. Fl. Austr. vii. 296 (1878); F. M. Bail. Syn. Queensl. Fl. 594 (1883), Catal. Pl. Queensl. 52 (1890), Queensl. Fl. vi. 1756 (1902), Compreh. Catal. 594 (1913); Tate in Rep. Horn Exp. iii. 181 (1896); Domin Biblioth. Bot. xx. Heft 85, 446 (1915); Ewart and Davies Fl. North. Territ. 57 (1917). *E. setacea* R. Br. Prodr. 225 (1810), not Prodr. 224. *S. Brownei* Spreng. Syst. i. 204 (1825); *Eleogenus capitata* Nees in Wight Contrib. Bot. Ind. 112 (1834); *Chlorocharis capitata* Rikli in Pringsh. Jahrb. xxvii. 564 (1895).

Annual; culms oblique to erect up to 4 dm. long and up to 0.7 mm. wide, rather rigid, angular-striate; sheaths rather rigid, appressed, purplish at base, uppermost with a rigid, oblique and more or less lanceolate orifice. Spikelets mostly rather reddish brown, globose to ovoid, 4-5 mm. long, 3.5-4 mm. wide; glumes dense, deciduous, broadly ovate to broadly obovate (suborbicular), very obtuse, membranous, more or less stained with brown, keeled, keel mostly greenish or pallid, 1.8-2 mm. long; style 2-fid; stamens 2 or 3; anthers linear-oblong, minutely apiculate, 0.5 mm. long. Nut shining black, obovate with rounded apex, biconvex with faintly ribbed margins, 0.9-1 mm. long, 0.7-0.8 mm. wide, the sides smooth with the minute subquadrate external cells quite inconspicuous; style-base white and spongy, conical to ovate but usually depressed, in height not exceeding $\frac{1}{3}$ the length of the nut and scarcely $\frac{1}{3}$ as wide as it; bristles 6-8, rather coarse, somewhat scabrous, brown to white, usually as long or somewhat longer than nut.—Plate X., figs. 29-31.

Western Australia.—South-west Division: Murchison River, wet places by the Brook Oolinyarra, *Oldfield* (M.).

North Australia.—Victoria River, *Mueller* in 1855 (M.); on creeks flowing into the Victoria River, Nov., 1855, *Mueller* (M.); Sea Range, *Mueller* in 1855, (M.).

Central Australia.—Palm Creek, Glen of Palms, July, 1894, *Tate* (T., M.).

Queensland.—Burke District: Carpentaria, *R. Brown* (B., S., M.); Riversleigh, on brink of Gregory River, 19° 0' S., 138° 45' E., April, 1935, *Blake* 8692; Normanton, on low sandpan, May, 1935, *Blake* 8985, and on open slightly saline swampy ground, August, 1936, *Blake* 12489. Cook District: Chillagoe, Dec., 1925, *Campbell* (S.), and in wet places among limestone boulders near creek, 1,150 ft., March, 1938, *Blake* 13539; Mareeba, on bank of Granite Creek on wet sand, 1,300 ft., June, 1935, *Blake* 9523; Newcastle Range, between Forsayth and Einasleigh, sandstone country, in gullies, Feb., 1928, *Brass* 1755; Einasleigh, in swamps, *Armit* 461 (B.M.); Barron River Gorge, near Cairns, below 100 ft., on wet sand, June, 1935, *Blake* 9441. Moreton District: Coolum, wet muddy places chiefly near the sea, April, 1938, *Blake* 13741; Caloundra, in a rock crevice facing the sea, August, 1932, *Blake* 1379;

Moreton Island, edge of *Juncus maritimus* swamp, May, 1937, *Blake* 13035; Stradbroke Island, at Point Lookout, in wet places near the sea, July, 1938, *Blake* 13824.

In most warm countries, both in the Old and in the New World. In Queensland its chief habitats appear to be of a calcareous or saline nature. The hypogynous bristles are usually described as brown in colour, but in Australian specimens they are usually white. Occasionally they are absent, but appear to be always present in Australian plants.

The nomenclature of this species has been the cause of extreme confusion as it has also involved the status of commonly used names of other species. It has now been shown that the name *E. capitata* R. Br. was *not* based on *Scirpus capitatus* L., and that Brown's species is identical with *S. geniculatus* L. Hence the correct name is *E. geniculata* (L.) R. & S. although the American species which has usually been so called is *E. elegans* (HBK) R. & S. A more thorough statement of the position is given by Svenson in *Rhodora* xli. pp. 50-51 (1939), which came to hand as this paper was in press.

24. ***E. atropurpurea*** (Retz.) Kunth Enum. ii. 151 (1837); Boeck. *Linnaea* xxxvi. 458 (1869-70) excl. vars.; F. Muell. *Fragm.* viii. 240 (1874), *First Census* 125 (1882), and *Sec. Census* 211 (1889); Benth. *Fl. Austr.* vii. 296 (1878) partly; C. B. Clarke *Ill. Cyp.* t. xxxvi. figs. 6-9 (1909); *Domin Biblioth. Bot.* xx. Heft 85, 446 (1915); Ewart and Davies *Fl. North. Territ.* 57 (1917); W. V. Fitzgerald *Proc. Roy. Soc. W. Austr.* iii. 118 (1918); Svenson *Rhodora* xxxi. 227 (1929); Gardner *Enum. Plant. Austr. Occid.* 12 (1930); not of F. M. Bail., Moore, or Maiden and Betehe. *E. atropurpurea* var. *setiformis* Benth. *Fl. Austr.* vii. 297 (1878); F. M. Bail. *Syn. Queensl. Fl.* 595 (1883), *Catal. Pl. Queensl.* 52 (1890), *Queensl. Fl.* vi. 1756 (1902), and *Compreh. Catal.* 594 (1913). *Scirpus atropurpureus* Retz. *Obs.* v. 14 (1789).

Annual, usually dwarf; culms tufted, up to 10 cm. long but mostly much smaller, filiform but more or less triquetrous, rarely exceeding 0.3 mm. wide; sheaths thin, purplish or brownish at base, apex of uppermost appressed, firm but thin, oblique or attenuate. Spikelet ovoid oblong, obtuse, mostly blackish, 2-4 mm. long, 1.5-2 mm. wide; glumes numerous, dense, at length more or less spreading, elliptic, obtuse, membranous, keeled, keel greenish, sides stained purplish brown, mostly 1-1.3 mm. long; style 2-fid; stamen 1, anther linear or oblong-linear, obtuse, most minutely apiculate, 0.3 mm. long. Nut 0.6-0.65 mm. long, 0.4-0.45 mm. wide, glistening black and almost quite smooth, obovate, rounded or rarely subtruncate at apex, biconvex, the margins very narrowly ribbed, the sides sometimes minutely striate, the external cells very minute and inconspicuous; style-base very small, strongly depressed, white, $\frac{1}{4}$ - $\frac{1}{3}$ as wide as nut, ca. 0.05 mm. high; bristles mostly 4-6, slender, glistening white, translucent, minutely scabrous or nearly smooth, shorter than nut, sometimes rudimentary or absent.—Plate X., figs. 32-33.

Western Australia.—Kimberley Division: Isdell River, 5 miles below Mount Bartlett, July, 1905, *Fitzgerald* 1274 (ex P.).

North Australia.—Victoria River, *Mueller* (M.).

Queensland.—Cook District: Koolatah, 15° 15' S., 142° 25' E., on edge of lagoon, ca. 200 ft., August, 1936, *Blake* 12596; North of Chillagoe, in channels of Walsh River on sand, ca. 1,000 ft., April, 1938, *Blake* 13622; Mount Molloy, banks of lagoons, April, 1932, *Brass* 2484; Cairns in *Melaleuca* swamp at about sea-level, June, 1935, *Blake* 9359. Burke

District: Near Normanton, 17° 10' S., 141° 15' E., edge of fresh-water lagoon, August, 1936, *Blake* 12627; Normanton, edge of lagoon, August, 1936, *Blake* 12521; Carron Creek, *Gulliver* 14 (M.). Mitchell District: Edge of Warrigal swamp near Torrens Creek, March, 1933, *White* 8777. Leichhardt District: Gainsford, *Bowman* (M.). Port Curtis District: Rockhampton, wet places, August, 1867, *O'Shanesy* 95 (M.), Nov., 1867, *O'Shanesy* 65, ser. 8 (M.); Gracemere, annual rills on sides of ranges, Nov., 1870, *O'Shanesy* 1272 (M.). Maranoa District: Miltonise Station, about 30 miles west of St. George, in gilgai in brigalow (*Acacia harpophylla*) scrub, ca. 600 ft., March, 1936, *Blake* 10819.

Scattered through the tropical regions of both the Old and the New World.

The species can be readily identified by the tiny glistening black nut and the translucent bristles. The preceding species is its closest relative in Australia, but besides the smaller size of all its parts, the glumes of *E. atropurpurea* are more prominently keeled, giving to the spikelet a distinctly angular appearance, and usually blacker in colour. In *Blake* 12521 the plants are unusually coarse (culms up to 0.6 mm. wide) and lax, and the glumes are up to 1.4 mm. long.

Bentham confused this species with the following one (*E. minuta*). The copious synonymy of the species is cited by Svenson *loc. cit.*

25. *E. minuta* Boeck. in Engler Bot. Jahrb. v. 503 (1884). *E. atropurpurea* Benth. Fl. Austr. vii. 296 (1878) partly and excl. var.; F. Muell. First Census 125 (1882) partly and Sec. Census 211 (1889) partly; F. M. Bailey Syn. Queensl. Fl. 595 (1883), Catal. Pl. Queensl. 52 (1890), Queensl. Fl. vi. 1756 (1902), Compreh. Catal. 594 (1913) all excl. var.; Moore, Handb. Fl. N. S. Wales 451 (1893); Maiden and Betche Census N. S. Wales Pl. 28 (1916). *E. Maidenii* Kükenthal in Fedde, Rep. Spec. Nov. xiii. 135 (1914) incl. var. *subaquatica*. *E. ocreata* Domin Biblioth. Bot. xx. Heft 85, 446 (1915) not of Nees.

Perennial, but flowering the first year, sometimes producing short stolons or rhizomes. Culms tufted, at times also some in rather loose linear series when rhizomes are present, erect, spreading or recurved, mostly 5–15 cm. long but frequently smaller, and sometimes up to 20 cm., angular-sulcate and usually rather soft and compressible, 0.4–0.6 mm. wide; sheaths purplish at base, thinly membranous, dilated, oblique, thinly scariosus, and often torn at the orifice. Spikelet ovoid or oblong-ovoid, obtuse or sub-acute, dark-coloured, 3–7 mm. long, 2 mm. wide, dense-flowered; glumes numerous, elliptic-ovate, obtuse, membranous, keeled, keel green rather prominent, sides stained with purplish-brown above, 1.7–1.8 mm. long; style 2-fid; stamens 2, anthers oblong-linear, minutely apiculate, 0.35–0.4 mm. long. Nut obovate, sometimes slightly attenuate near the base, rather turgidly biconvex, margins ribbed, 0.95–1 mm. long, 0.65–0.7 mm. wide, shining, minutely reticulate and roughened, olivaceous to dark greenish brown but the pericarp tending to blacken and wither at maturity, the external cells vertically oblong; style-base whitish, depressed, conical-acuminate, about $\frac{1}{3}$ as long and $\frac{1}{3}$ as wide as nut, the annulus prominent, somewhat wider than the rounded apex of the latter, upwardly curved from the middle; bristles 7–5, firm, unequal, shorter or somewhat longer than the nut, retrorsely scabrous, whitish, strongly united at base, somewhat translucent when young.—Plate X., figs. 34–37.

Queensland.—Wide Bay District: Nikenbah, N.E. from Maryborough, June, 1927, *Tryon*. Moreton District: Coolumb, in wet places, April, 1938, *Blake* 13794; Buderim, May, 1933, *Middleton*; Caloundra, in swamp near coast, August, 1932, *Blake* 1372; Petrie and neighbour-

hood, in swampy places, *Blake* 1143, 1254, 1255, 1262; various places in the neighbourhood of Brisbane in wet places, *Blake* 1271, 1361, 1423, 1436, 4723, 4724, 5018, 12967, *Bailey* 56 (M.), 91 (B., M.), *White*; Tamborine Mountain, ca. 45 miles S. of Brisbane, in stream through pastures, red soil, 1,800 ft., May, 1930, *Hubbard* 2524; Stradbroke Island, edge of *Melaleuca* swamp, Dec., 1934, *Blake* 7100; and in wet places inland near Point Lookout, July, 1938, *Blake* 13825.

New South Wales.—North Coast: Byron Bay, *Forsyth* 37 (S.). Central Coast: Narrabeen, near Sydney, inundated in lagoon and in dry claypan, April, 1909, *Hamilton* (S.), on marshy ground, Jan., 1935, *Blake* 7430; Centennial Park, Sydney, Jan., 1909, *Hamilton* (S.), “growing under water,” Feb., 1909, *Hamilton* (S.), “whole plant (except the inflorescence) submerged in the ponds,” Jan., 1900, *Cheel* (S.).

Victoria.—Central District: Port Melbourne, near mouth of Yarra River, Dec., 1891, Feb., 1892, Dec., 1894, March, 1895, *Reader* (M.).

And in East Africa, Socotra, Madagascar, and Mauritius.

I am indebted to Dr. Svenson for the identification of this species.

There is a great deal of variation, particularly in habit, and this may be indicated as follows:—

(1.) The most common state is that in which the plants form often dense tufts with culms of medium height and rigidity; soft rhizomes or stolons are sometimes developed. This is typical *E. Maidenii*, and, according to Svenson, is indistinguishable from the type of *E. minuta*.

(2.) *Cheel*'s specimens and one collection of *Hamilton*'s from Centennial Park, both indicated as being taken from submerged plants, have elongated very flaccid culms up to 3 dm. long with greenish spikelets. They form the basis of *E. Maidenii* var. *subaquatica* *Kükenthal*, but are certainly merely an accidental state due to the habitat.

(3.) The Victorian specimens have well-developed hardened rhizomes, rigid culms with prominent scarious sheaths, nearly globular spikelets, browner nuts, and rather larger style-bases. *Hamilton*'s collection from a dry clay-pan at Narrabeen approaches them very closely.

(4.) *Blake* 12967 comprises mostly tiny plants with few tufted filiform culms, and are very similar in appearance to small plants of *E. atropurpurea*. They are flowering in their first year, and are clearly the result of the unusually rapid drying-up of the ground due to adverse weather conditions. Similar dwarf and depauperate plants of other species were associated, while normal plants occupied wet places nearby.

The Victorian plants are the least closely bound to the general trend on account of the browner nut. Generally the nut is yellowish when very young, later becomes greenish, and then greenish-brown. At extreme maturity the pericarp becomes wrinkled and blackish on the wrinkles.

EXCLUDED OR DOUBTFUL SPECIES.

Eleocharis geniculata *R. Br.* Prodr. 224 (1910). [i.e. *E. elegans* (HBK) *R. & S.*] According to *Domin* in *Biblioth. Bot.* xx. Heft 85, 449 (1915) this American species has been introduced to the neighbourhood of Sydney, where it was collected by *Hooker*. I have seen no specimen from thence.

E. halmaturina *J. M. Black* Trans. Roy. Soc. S. Austr. li. 378 (1927). This species was based on very immature specimens collected by *Cleland* on Kangaroo Island. It is certainly no *Eleocharis*, and the specimens appear to be small plants of a *Tetraria*.

RELATIONSHIPS.

The geographical relationships of the Australasian species of *Eleocharis* are summarised in the following table:—

AUSTRALASIAN ENDEMIC.		WIDES.				INTRODUCED.
AUSTRALIA.	NEW ZEALAND.	PANTROPICAL.	OLD WORLD TROPICS.			
			Australia-India.	Australia-India-Madagascar.	Australia-Africa.	
<i>difformis</i> ..	<i>neozelandica</i> ..	..	<i>philippinensis</i> ..	<i>spiralis</i> ..	<i>cespitosissima</i> ..	<i>pachycarpa</i>
<i>Brassii</i> ..	<i>sphacelata</i> ..	<i>fistulosa</i> ..	<i>tetraquetra</i> ..	<i>dulcis</i> ..	<i>minuta</i> ..	
<i>nuda</i> ..	<i>pusilla</i> ..	<i>geniculata</i> ..		<i>equisetina</i> ..		
<i>atrata</i> ..	<i>gracilis</i> ..	<i>atropurpurea</i> ..				
<i>Dietrichiana</i> ..	<i>acuta</i> ..	(also N. Temp.) ..				
<i>plana</i> ..		<i>nigrescens?</i> ..				
<i>pallens</i> ..						
<i>cylindrostachys</i> ..						
Total—			2 (8%)	3 (12%)	2 (8%)	1 (4%)
8 (32%)	4 (16%)	4 (16%)	5 (20%)			
	1 (4%)					
	13 (52%)					
			12 (48%)			

The chief phylogenetic interest centres round those groups in which endemic species occur. These are the *Mutatae*, the *Multicaules* and *Acutae* together with *E. neozelandica*, and the *Aciculares*. The *Mutatae* comprise in all 18 or 19 species, none of which occur in Europe. In Africa 5 or 6 species are known. One of these, *E. fistulosa*, is wide-spread, *E. variegata* is endemic to Madagascar and Mauritius but is closely related to the Indo-Malayan *E. laxiflora*. *E. spiralis*, *E. dulcis*, and *E. equisetina* are found in Madagascar. The remainder of the distribution is as follows:—

Asia (South-east and Malaya): *fistulosa*, *spiralis*, *dulcis*, *equisetina*, *philippinensis*, *laxiflora*.*

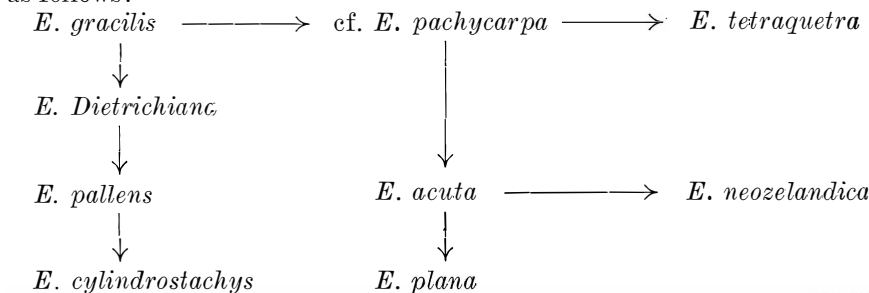
Australia: *fistulosa*, *spiralis*, *dulcis*, *equisetina*, *philippinensis*, *sphacelata*,* *nuda*,* *Brassii*,* *difformis*.*

Central America, West Indies, Northern South America: *fistulosa*, *cellulosa*, *mutata*,* *plicarhachis*,* *interstincta*.*

North America (Eastern): *cellulosa*, *equisetoides*,* *quadrangulata*,* *Robbinsii*,* *elongata*.*

There thus appears to be two major centres of concentration, one in the Old World and one in the New World. One species, *E. acutangula*, is common to both, though there is a tendency towards the development of distinct trends, and *E. spiralis* of the Old World is closely allied to *E. cellulosa* of the New World. The other American species need not concern us here except for the fact that *E. Robbinsii* and less frequently *E. elongata* exhibit the primitive character of a trigonous nut. Of the 10 species occurring in Asia and Australia, 9 occur on the latter continent (all to be found in Queensland), and four are restricted thereto (except that *E. sphacelata* also occurs in New Zealand). This is interesting, for it is scarcely in accordance with the generally accepted dictum that much of the flora of northern Australia is of Indo-Malayan origin. This theory has been greatly over-stressed, while far too little attention has been given to the possibility that northern Australia may have been a centre of distribution from which Malaya may have received part of its flora. There is quite a lot of evidence in favour of the latter, and a great deal against the former generally accepted view, though this is scarcely the place to discuss the subject.

The group of species *E. gracilis*, *E. pachycarpa*, *E. Dietrichiana*, *E. tetraquetra*, *E. acuta*, *E. plana*, *E. pallens*, *E. cylindrostachys*, and *E. neozelandica* is a most interesting one, and though distributed between four series, the species are undoubtedly closely allied. Whether *E. pachycarpa* be truly indigenous or only introduced as seems more likely, matters little. Chiefly by reason of its triquetrous nut and well-developed rhizome *E. gracilis* appears to be the most primitive member of the group, while the affinities of the other species may be indicated as follows:—



* The species endemic in the respective areas are indicated by an asterisk.

Recently admitted or described species brings the number up to 23. Of the extra species 2 are endemic in Africa, and 2 in Central America, etc.

There seems little doubt that the group is of southern origin. *E. tetraquetra*, however, extends into south-eastern Asia, having a somewhat similar range to some of the *Mutatae*.

The *Aciculares* find their greatest development in America (south-western United States, Mexico, and the Andes), where all the species of the series are found, except for the two Australian species. One of the latter, *E. pusilla*, is most closely allied to an Andean species, while *E. atricha* appears to hold an isolated position in the series.

INDEX.

In the following index only names based on Australasian specimens are mentioned:—

Eleocharis—

<i>acicularis</i> auctt. . . . .	.. ..	<i>E. pusilla</i>
var. <i>elongata</i> Benth. . . . .	.. ..	<i>E. pusilla</i>
var. <i>pusilla</i> . . . . .	.. ..	<i>E. pusilla</i>
<i>acuta</i> auctt. . . . .	.. ..	<i>E. acuta</i> + <i>E. pallens</i>
<i>acuta</i> R. Br. . . . .	.. ..	18
<i>acuta</i> var. <i>pallens</i> Benth. . . . .	.. ..	<i>E. pallens</i>
<i>acuta</i> var. <i>tenuis</i> Carse . . . . .	.. ..	<i>E. acuta</i>
<i>ambigua</i> Kirk . . . . .	.. ..	<i>E. acuta</i>
<i>atricha</i> R. Br. . . . .	.. ..	11
<i>atricha</i> F. Muell. . . . .	.. ..	<i>E. nuda</i>
<i>atropurpurea</i> Kunth. . . . .	.. ..	24
<i>atropurpurea</i> Benth. . . . .	.. ..	<i>E. minuta</i>
var. <i>setiformis</i> Benth. . . . .	.. ..	<i>E. atropurpurea</i>
<i>Brassii</i> S. T. Blake . . . . .	.. ..	5
<i>caespitosissima</i> Baker . . . . .	.. ..	13
<i>capitata</i> R. Br. . . . .	.. ..	<i>E. geniculata</i>
<i>compacta</i> R. Br. . . . .	.. ..	<i>E. spiralis</i>
<i>compacta</i> Domin . . . . .	.. ..	<i>E. spiralis</i> and <i>E. Brassii</i>
<i>Cunninghamii</i> Boeck. . . . .	.. ..	<i>E. gracilis</i>
<i>cylindrostachys</i> Boeck. . . . .	.. ..	21
<i>Dietrichiana</i> Boeck. . . . .	.. ..	17
<i>Dietrichiana</i> auctt. . . . .	.. ..	<i>E. pallens</i> chiefly
<i>diformis</i> S. T. Blake . . . . .	.. ..	4
<i>dulcis</i> Trin. . . . .	.. ..	8
<i>equisetina</i> Presl. . . . .	.. ..	9
<i>fistulosa</i> (Poir) Link . . . . .	.. ..	1
<i>fistulosa</i> auctt. . . . .	.. ..	<i>E. philippinensis</i>
<i>geniculata</i> (L.) R. & S. . . . .	.. ..	23
<i>gracilis</i> R. Br. . . . .	.. ..	16
<i>gracilis</i> Hook. f. . . . .	.. ..	<i>E. acuta</i>
var. β Hook. f. . . . .	.. ..	<i>E. acuta</i>
var. <i>gracillima</i> Hook. f. . . . .	.. ..	<i>E. gracilis</i>
var. <i>radicans</i> Hook. f. . . . .	.. ..	<i>E. gracilis</i>
<i>gracillima</i> Hook. f. . . . .	.. ..	<i>E. gracilis</i>
<i>halmaturina</i> J. M. Black . . . . .	.. ..	<i>Tetraria</i> sp. (?)
<i>Hookeri</i> Boeck. . . . .	.. ..	<i>E. gracilis</i>
<i>Maidenii</i> Kük. . . . .	.. ..	<i>E. minuta</i>
var. <i>subaquatica</i> Kük. . . . .	.. ..	<i>E. minuta</i>
<i>minuta</i> Boeck. . . . .	.. ..	25
<i>mucronulata</i> Nees . . . . .	.. ..	<i>E. acuta</i>
<i>mucronulata</i> Palla . . . . .	.. ..	<i>E. acuta</i> and <i>E. pallens</i>
<i>multicaulis</i> auctt. . . . .	.. ..	<i>E. gracilis</i>
<i>neozelandica</i> C. B. Clarke . . . . .	.. ..	22
<i>nigrescens</i> Steud. . . . .	.. ..	12
<i>nuda</i> C. B. Clarke . . . . .	.. ..	6
<i>obtusata</i> F. Muell. . . . .	.. ..	<i>E. cylindrostachys</i>
<i>ocreata</i> Domin . . . . .	.. ..	<i>E. minuta</i>
<i>pachycarpa</i> Desv. . . . .	.. ..	14
<i>pallens</i> S. T. Blake . . . . .	.. ..	20
<i>palustris</i> F. Muell. . . . .	.. ..	<i>E. acuta</i> and <i>E. gracilis</i>
<i>philippinensis</i> Svenson . . . . .	.. ..	3

<i>plana</i> S. T. Blake	19
<i>plantaginea</i> F. Muell.	<i>E. equisetina</i>
<i>plantaginoides</i> Domin	<i>E. equisetina</i>
<i>pusilla</i> R. Br.	10
<i>radicans</i> Hook f.	<i>E. gracilis</i>
<i>setacea</i> R. Br.	<i>E. caribaca</i>
<i>sphacelata</i> R. Br.	7
<i>sphacelata</i> auctt.	<i>E. sphacelata</i> + <i>E. dulcis</i> + <i>E. equisetina</i>
<i>spiralis</i> Benth.	<i>E. spiralis</i> and <i>E. plana</i>
<i>spiralis</i> R. & S.	2
<i>striatula</i> C. B. Clarke	<i>E. pusilla</i>
<i>tetraquetra</i> Nees	15
<i>tuberosa</i> R. & S.	<i>E. dulcis</i>
<i>variegata</i> Benth.	<i>E. spiralis</i> and <i>E. Brassii</i>
<i>variegata</i> Fitzg.	<i>E. philippinensis</i>
<i>Isotepis</i> —	
<i>acicularis</i> A. Rich.	<i>E. gracilis</i>
<i>Scirpus</i> —	
<i>acutus</i> Poir.	<i>E. acuta</i>
<i>compactus</i> Spreng.	<i>E. spiralis</i>
<i>isdellensis</i> Fitzg.	<i>E. caespitosissima</i>
<i>pumilio</i> Spreng.	<i>E. pusilla</i>
<i>pusillus</i> Poir.	<i>E. pusilla</i>
<i>sphacelatus</i> Poir.	<i>E. sphacelata</i>
<i>tener</i> Spreng.	<i>E. acuta</i>

EXPLANATION OF PLATES.

In all plates the nut is shown from the dorsal (abaxial) view with the filaments removed, the transverse section of the nut with the dorsal side or angle downwards, the flower from the adaxial view, and the glume from the abaxial view.

PLATE VII.: SERIES *MUTATAE*.

FIGS. 1-3, *Eleocharis fistulosa* (Blake 9371): 1, spikelet, natural size; 2, glume, x 5; 3, nut, x 15. FIGS. 4-6, *E. spiralis* (Blake 12790): 4, spikelet, natural size; 5, glume, x 5; 6, nut, x 15. FIGS. 7-10, *E. philippinensis* (Blake 12968): 7, spikelet, natural size; 8, transverse section of culm, x 2; 9, glume, x 5; 10, nut, x 15. FIGS. 11-15, *E. difformis* (Blake 13203): 11, terrestrial plant, natural size; 12, glume, x 5; 13, flower, x 5; 14, nut, x 15; 15, surface of nut, x 50. FIGS. 16-19, *E. Brassii* (Brass 1864): 16, portion of plant, natural size; 17, glume, x 5; 18, flower, x 5; 19, nut, x 10. FIGS. 20-22, *E. nuda* (Blake 9360): 20, spikelet, natural size; 21, glume, x 5; 22, nut, x 15.

PLATE VIII.: SERIES *MUTATAE* AND *ACICULARES*.

FIGS. 1-5, *Eleocharis sphacelata* (Blake 4618): 1, base of plant, natural size; 2, upper part of culm with spikelet, natural size; 3, glume, x 5; 4, nut, x 10; 5, surface of nut, x 50. FIGS. 6-9, *E. dulcis* (Blake 4781): 6, spikelet, natural size; 7, glume, x 5; 8, nut, x 10; 9, surface of nut, x 50. FIGS. 10-13, *E. equisetina* (Blake 1440): 10, spikelet, natural size; 11, glume, x 5; 12, nut, x 10; 13, surface of nut, x 50. FIGS. 14-19, *E. pusilla* (Blake 4943): 14, plant, natural size; 15, glume, x 10; 16, flower, x 10; 17, nut, x 20; 18, transverse section of same; 19, surface of nut, x 50. FIGS. 20-24, *E. atricha* (Blake 7537): 20, plant, natural size; 21, glume, x 5; 22, nut, x 20; 23, transverse section of same; 24, surface of nut, x 50.

PLATE IX.: SERIES *TENUISSIMAE*, *SULCATAE*, AND *MULTICAULES*.

FIGS. 1-4, *Eleocharis nigrescens* (Blake 13398): 1, plant, natural size; 2, flower, x 15; 3, nut, x 25; 4, transverse section of same. FIGS. 5-7, *E. caespitosissima* (Fitzgerald 1043): 5, plant, natural size; 6, nut, x 15; 7, surface of nut, x 50. FIGS. 8-11, *E. pachycarpa* (Camfield): 8, spikelet, natural size; 9, upper part of leaf-sheath, x 5; 10, nut, x 15; 11, transverse section of same. FIGS. 12-15, *E. tetraquetra* (Blake 13761): 12, spikelet, natural size; 13, upper part of leaf-sheath, x 5; 14, nut, x 15; 15, transverse section of same. FIGS. 16-22, *E. gracilis* (Blake 7431): 16, plant, natural size; 17, upper part of leaf-sheath, x 5; 18, glume, x 7; 19, flower, x 7; 20, nut, x 15; 21, transverse section of same; 22, surface of nut, x 50. FIGS. 23-29, *E. Dietrichiana* (Dietrich 714): 23, plant, natural size; 24, upper part of leaf-sheath, x 5; 25, glume, x 7; 26, flower, x 7; 27, nut, x 15; 28, transverse section of same; 29, surface of nut, x 50.

PLATE X.: SERIES *ACUTAE*, *PALUSTRIFORMES*, AND *MACULOSAE*.

FIGS. 1-7, *Eleocharis acuta* (Blake 7539): 1, plant, natural size; 2, upper part of leaf-sheath, x 2; 3, glume, x 7; 4, flower, x 7; 5, nut, x 15; 6, transverse section of same; 7, surface of nut, x 50. FIGS. 8-11, *E. plana* (Blake 7615): 8, spikelet, natural size; 9, upper part of leaf-sheath, natural size; 10, transverse section of culm, x 2; 11, nut x 15. FIGS. 12-19, *E. pallens* (Blake 11235) 12, portion of plant, natural size; 13, upper part of leaf-sheath, x 5; 14, glume, x 7; 15, flower, x 7; 16, nut, x 15; 17, transverse section of same; 18, upper part of another nut, x 15; 19, surface of nut, x 50. FIGS. 20-23, *E. cylindrostachys* (Blake 13309): 20, spikelet, natural size; 21, glume, x 7; 22, nut, x 15; 23, transverse section of same. FIGS. 24-28, *E. neozelandica* (Carse): 24, portion of plant, natural size; 25, flower, x 7; 26, nut, x 15; 27, transverse section of same; 28, surface of nut, x 50. FIGS. 29-31, *E. geniculata* (Blake 13539): 29, plant, natural size; 30, nut, x 15; 31, transverse section of same. FIGS. 32-33, *E. atropurpurea* (Blake 13622): 32, plant, natural size; 33, nut, x 15. FIGS. 34-37, *E. minuta* (Blake 4724): 34, portions of two plants, natural size; 35, flower, x 10; 36, nut, x 15; 37, surface of nut, x 50.
