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***Australian Plants* – Is it of Value? or Is it a Throw-away Magazine?**

How many readers read it cover to cover and discard it, probably very few.

Most readers will read items of interest and file it for future reference.

A reference! As a complete body of work, that is what *Australian Plants* is.

Filing issues into volumes? There are excellent binders to do this.

Referring to these past issues? Almost impossible, there is no adequate index.

Past issues? Long-term members are fortunate, they have back issues.

Past issues for newer readers? No longer produced for stock on request.

Bound volumes! Each volume as produced was beautifully bound and stocked for sale to new readers and especially for reference libraries. After binding volumes 1–11 the Society decided to cease this for commercial reasons.

New initiative! Because *Australian Plants* is a reference series of little lasting value, unless it is available over many back issues, adequately indexed the Editor has assumed the personal responsibility and expense of printing and binding issues since Volume 11, and preparing an adequate index.

Series-A – *Australian Plants* of the 80s comprises the 32 issues of Volumes 12, 13, 14, and 15 produced prior to 1990. Each volume is available separately, each with a complete index, each \$40.00.

Why Series-A? Previously bound volumes were available, Volumes 1–11 each at a significant cost at the time. For new members this represented a huge outlay and a decision was required as to how far back to purchase. In any case there was not an adequate index. Series-A comprises all issues of the 1980s, ten years of issues adequately indexed.

The Series Concept! The four volumes of Series-A have been presented as a significant reference to *Australian Plants*, complete in itself. For a fantastic reference library to our Australian flora purchase the volumes of Series-A, Vol. 12, 13, 14, and 15, each \$40.00.

Series-B will comprise the issues of *Australian Plants* of the 1990s, Volumes 16, 17, 18, 19, and 20.

Indexing, refer to page 306 for details. The last volume of each series carries a complete index for all volumes in a series. Hence, if you purchase Volume 15, it will have bound in it an index covering all issues of Series-A, *Australian Plants* of the 1980s.

Price – Because of my personal circumstances it is only possible to produce these volumes in limited quantities and this is reflected in the limited-edition price. Because of this, considerable trouble has been taken to produce them as an attractive prestige book at minimum cost. They are not cheap but are excellent value, each at \$40.00.

Available only from Editor, *Australian Plants*, post free.

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COVER PLATE — *Calectasia cyanea*. See page 307. Photography, R. G. Cooke.

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How to Recognise and Grow the

Tasmanian Irises and Lilies

and other close relatives

by Jim Carpenter

Most of the Tasmanian monocotyledons that are grown in gardens for their colourful flowers are grouped into closely related botanical families. These include Iridaceae, Liliaceae, Haemodoraceae (which includes the bloodroots, the kangaroo paws and *Conostylis* species of Western Australia) and Xanthorrhoeaceae (the grass trees) and mat rushes or sages. Not included here are the orchids, a family that stands apart from the irises, lilies and their kin. This article will help you to identify the Tasmanian species in the wild and to grow them at home. While most of these species have been grown in gardens by a few enthusiasts, few are more widely grown.

Most of the Tasmanian species are small tussocky or mat-forming herbs, so that they are useful as rockery plants or pot plants. The smaller and soft species will make decorative additions to native grasslands. By grassland, I mean a mixed sward of decorative grasses and other herbs, mown or burnt occasionally to remove accumulations of dead leaves. It is an alternative to the traditional lawns between beds of larger plants. Many of the lilies and irids of natural grasslands will seed freely but may be short-lived. The best way of keeping them going is to only mow grassland areas **after** the seed has matured and dropped, usually in late spring or early summer and **before** the plants start to regrow in autumn.

A few species, such as *Dianella*, *Lomandra* and *Xanthorrhoea* species, are too large for grassland or most rockeries, but are good for large tubs, as background plants in borders or beds or as feature plants.

Propagation

Grow Your Own Plants

Many of the irises and lilies have bulbs or corms, from which the plants regrow following a dormant period after seed formation, or from which new plants grow near the parent plant. These species can be propagated by separating the bulbs and replanting. Others, with grassy clumps of leaves, can be divided up at the crown — *Dianella* species, for example.

Seed of most species seems to germinate readily, though slowly in some; that is, there do not seem to be dormancy problems requiring seed treatment. The main difficulty lies in obtaining seed — you will have to collect it yourself in many cases. Most species have the seeds in capsules, which are fruits that split open to release the ripe seed. You have to be on hand to collect the seed as the capsules open, or put paper bags over the ripening capsules and tie the lower opening securely.

A few species have succulent berries. The flesh around the seed can be removed by steeping the berries in water after bruising them, allowing them to ferment for a few days. Then the berries are mashed up and the flesh decanted off. The seeds are spread on newspaper to dry.



Milligania densiflora △

Photography by John Simmons

▽ *Milligania johnstonii*



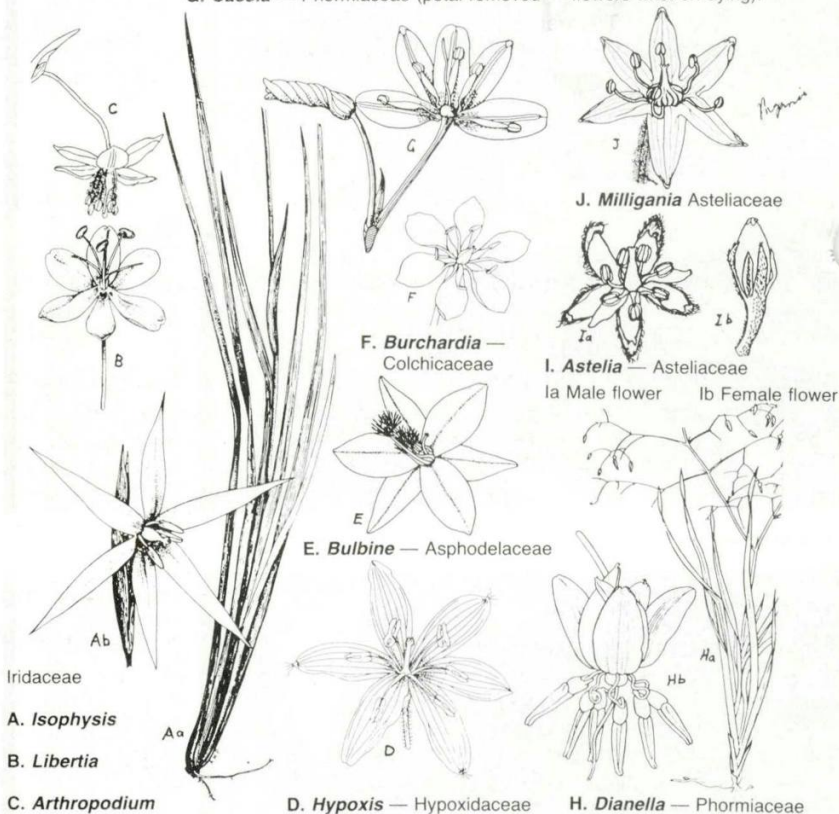


Astelia alpina, in flower $\triangle$, in fruit ∇ . Photography by John Simmons



Many readers will first see them in the bush and wish to identify them, so that they can obtain seeds and hence plants for their gardens. The following simple sketches will assist you to identify the plants you see.

G. *Caesia* — Phormiaceae (petal removed — flowers twist on dying).



Iridaceae

Leaves will be long and thin usually arising from the base of the plant with veins parallel to the sides as for *Isophysis* (A above). The descriptions opposite give their length and width and other notable features such as saw-tooth edges, hard or soft, fleshy, etc.

Flowers/Petals have components, usually in multiples of three, 6 **tepals** comprising 3 **petals** and 3 similar **sepals** with 3–6 **stamens**. Flower colour is the first guide given in the descriptions.

Flowers/Stamens. Inside the 6 tepals is a ring of **stamens**, each comprising the pollen bearing **anthers** on top of a stalk known as the **filament**. If there are only 3 stamens, the plant will belong to the Iris family, Iridaceae, Fig. A, B, C above, with the inevitable exception, *Sowerbaea* (see page 302). You will find all the other "lilies" have 6 stamens. The **stamens face out** away from the centre of the flower in the Iridaceae, A, B and C and in the family Colchicaceae, *Burchardia*, F. For all other lilies the stamens face to the centre.

Flower/Style and Ovary. The centre of the flower comprises the **style**, usually a simple column with the **stigma** on top of it except for the Iridaceae and Colchicaceae where the style is often branched or divided. The style sits on top of the **ovary** which, on fertilisation by pollen entering the style column, matures to become **seeds**. Where this ovary swelling is below the point of attachment of the petals (as with Iridaceae), it is said to be **inferior**. All the other "lilies" have this ovary swelling visible above the petals **superior** with the inevitable exception of *Hypoxis*, D.

Arthropodium milleflorum — a Vanilla Lily White to pale blue flowers

Small tubers give rise to one to 17 leaves, each 1-17 mm wide and 3-60 cm long. Branched stems, over 1 m tall, branched up to four times, carrying pairs of white to pale blue flowers at each node. Flowers fragrant, with three wide petals and three narrow sepals, in spring and summer. It grows in south-eastern Australia; in Tasmania, in the northern midlands and the south. It grows best in moist, well-drained soils, in partial shade. Frost hardy. Propagate by seed or by division of tubers. Use in rockeries, as potted plants or in grassland. It flowers well from the first year, seeding freely. See page 323. Iridaceae

Arthropodium minus — a Vanilla Lily Flowers mainly white

Leaves 0.5-5 mm wide and up to 30 cm long. Flowering stalks with one to four branches, a scale-like bract under each flower and one flower per node. White flowers in spring, with elliptical sepals and petals of similar size. The stamens have hairy filaments (stalks). It grows in south-eastern Australia; in Tasmania, in the far north-west and Central districts. It needs partial shade; tolerates moist and dry soils, and frosts. Propagate by seed or by division of tubers. Use as pot plants, in rockeries or in grassland. Iridaceae

Astelia alpina — Pineapple grass Greenish-brown flowers

Grows as tufts and mats of stiff, channelled leaves, 10-28 mm wide and up to 20 cm long, silvery underneath. The greenish-brown flowers develop in summer; they are in spike-like clusters up to 6 cm long, with male and female flowers forming separate clusters. The red berries that follow are more attractive than the flowers. It is from wet areas on mountains of south-eastern Australia. Grow it in very moist conditions, in full sun or partial shade. Frost tolerant. Propagate by dividing clumps or by seed. The leaves are attractive, in pots or rockeries. See page 289. Asteliaceae

Blandfordia punicea — Christmas Bells* Red/yellow flowers

Tufted plants with a tuberous corm and fleshy roots. The leaves are hard, saw-edged, 4-12 mm wide and up to 35 cm long. The flowers develop in summer on single unbranched stems, up to 1 m tall, in a narrow cluster of 15-50 orange and red or yellow bells. The stamens adhere to the tubes of the flowers. It grows in acid heaths and moors of Tasmania, mainly in the western half. In cultivation it grows best in full sun in moist acid soils; peat or loam is better than clay. Tolerates frost and some shade. Propagate by division or by seed. Sow fresh seed on the surface or very shallowly; keep damp and cool. Germination takes from three weeks to three months and the seedlings are slow to develop. This species has been propagated by tissue culture, experimentally. A good tub or rockery plant, and the flowers are long-lived as a vase flower. Anthericaceae

Bulbine bulbosa — A Leek Lily Yellow, green flowers

A tuft of fleshy leaves, 1.5 mm wide and 2-30 cm long, over a bulb-shaped tuber and fleshy roots. Fragrant yellow flowers in spring to summer in a small cluster, on a single stalk 8-60 cm long. All six segments of the flower are similar, forming yellow stars 1.5-2 cm across. The anthers are yellow and are all bearded with hairs at the top of the filaments (stalks). It grows in damp grasslands and open forest in south-eastern Australia as far south as northern Tasmania. It is best grown in moist, well-drained soil, in full sun or partial

*Refer to page 320 for a study of cultivation.



Blandfordia punicea △

Photography by R. Burns

▽ *Bulbine bulbosa*

Photography by J. O'Neill



shade; the best conditions vary with different gardens, perhaps due to the origin of the plants. Frost tolerant. Propagate by division of tubers, or by seed; it will self-seed naturally. Useful for pots, rockeries and grassland, including gardens in sheltered coastal situations. Photograph opposite. Asphodelaceae

***Bulbine glauca* — A Leek Lily**

Yellow, green flowers

Similar to *B. bulbosa*, but the rootstock is not bulbous, the leaves are 2-10 mm wide, usually covered with a bloom and often pinkish or pale green; there are often two or more flower stalks. It grows on the Great Dividing Range in New South Wales and Victoria; and in northern to south-eastern Tasmania, in inland and coastal areas. Asphodelaceae

***Bulbine semibarbata* A Leek Lily**

Yellow, green flowers

Similar to *B. bulbosa*, but an annual, smaller generally, with leaves 1-5 mm wide, and several flower stalks on each plant. Flowers only 8 mm across, with red to yellow-brown anthers that have beards under three of the six anthers (semi-barbata=half bearded). It is widespread in south-eastern Australia; in Tasmania, in the north and south-eastern areas. In cultivation, use and grow as *B. bulbosa*. It also self-seeds readily, so much so that it has been reported as becoming a garden weed! Asphodelaceae

***Burchardia umbellata* — Milkmaids**

Flowers mainly white

A few leaves grow from a corm in autumn and produce a rarely branched flower stem, 20 cm long, in early spring. The leaves are 2-5 mm wide and up to 70 cm long. The flower cluster has two to nine flowers in an umbel, the flowers being 1 cm across, white or slightly pink, with purple anthers. It is widespread across southern Australia, and in eastern Tasmania in woodlands. It is suited to moist, well-drained soils, dry in summer; and partial shade. Tolerant of frost. Useful for rockeries or grassland. See page 314. Colchicaceae

***Caesia alpina* — Alpine Grass Lily**

Yellow, green flowers

Similar to *Caesia parviflora* var. *minor*, but with greenish-white to yellow-green flowers in summer, in clusters of one to four flowers on a decumbent stem. The stamens have green filaments. It grows at medium altitudes in the Australian Alps and Tasmania. It is useful as a pot or rockery plant, growing in moist, well-drained soil. Frost tolerant. Propagate by seed. Anthericaceae

***Caesia calliantha* — Blue Grass Lily**

Blue, purple flowers

Similar to *C. parviflora* var. *vittata* but with leaves 3-15 mm wide and 8-50 cm long, and flowers on stalks 15-40 cm long with few or no branches. The flowers are blue-purple and the filaments of the anthers are white with a purple collar. It grows in damp soils of south-eastern Australia, as far south as north-eastern Tasmania. Cultivate as *Caesia parviflora*. Anthericaceae

***Caesia parviflora* — Grass Lily**

White to pale blue flowers

Tufts of hairless, limp leaves, with flower clusters on branched stalks, the flowers being 1 cm across with sepals and petals similar and twisting together as the flower withers. Flowers in spring to summer. All three botanical varieties are useful as pot plants, in rockeries and in grassland. They grow best in full sun, in moist, well-drained soils; frost tolerant. Propagate by seed. Anthericaceae

var. *minor* — Pale Grass Lily. Leaves under 2 mm wide. White to pale blue flowers on much-branched stalks up to 20 cm tall. Anthers with greenish-white filaments (stalks). From damp areas in south-eastern Australia, south to northern and eastern Tasmania.

var. *parviflora* — Grey Star. Grey, blue, lavender or rarely white or pink flowers. Leaves under 5 mm wide usually. Otherwise, similar to var. *minor* but larger, up to 75 cm tall. Cape York to northern Tas. on damp sandy soils.

var. *vittata* — Similar to *Caesia parviflora*, but with leaves up to 8 mm wide, flowers pale to dark blue, on stalks up to 50 cm tall and branched one to three times. Anthers with blue, white-banded filaments. It is found in eastern Australia, as far south as northern Tasmania.

Campynema lineare

Yellow, green flowers

Tufts of a few leaves, 10 mm wide and 10 cm long, with a cluster of a few flowers on a single stem 2-30 cm tall. All six segments of the flowers are pointed, 8 mm long and mustard-yellow, or green to brown-purple. The anthers are orange-red. It grows in the western mountains and button-grass plains of Tasmania.

Chamaescilla corymbosa — Blue Star

Blue, purple flowers

A rosette of a few leaves comes up in autumn from a small tuber; the leaves are 1.5-8 mm wide and 5-25 cm long. Flowers in clusters of 1-10, in spring, on a main stem 8-25 cm tall, blue (occasionally white or pink), starlike, 2.5 cm across. The six flower segments twist up together as the flower matures. It is widespread across southern Australia, including Tasmania, in damp sandy soils of open forests. It grows best in moist, well-drained soil, tolerates some wetness and dry soils, also frost, and full sun or partial shade. May be short-lived as a pot plant; useful in grassland. Propagate from seed or by division of tubers.

Anthericaceae

***Dianella* species** — Flax Lilies

Tasmania has four *Dianella* species. They are rhizomatous, with tufts of long, hard, handsome leaves; clusters of blue to purple flowers on stiff, branching stems in spring to summer, followed by attractive blue to purple berries in summer. The sepals and petals are similar. *Dianella* are decorative in large pots, as background plants in rockeries, in garden beds and as waterside species. Propagate by division of the crowns or separation of plants growing from rhizomes, or by sowing fresh seed. Photo, pages 301 and 332. Phormiaceae

Dianella caerulea, Paroo Lily is similar to *D. tasmanica* but even more robust, the flowers bright blue, the anthers yellow-brown, with yellow filaments, and the berries large and blue. It grows in open forests and heaths from Queensland to Tasmania. It is tolerant to most soil conditions including wet soils; also frost tolerant. Grow in full sun or shade. Spreads vigorously by long rhizomes.

Dianella longifolia, Flax or Blue Lily — The leaves are purplish at the base and usually have smooth edges; 4-12 mm wide and up to 80 cm long. The flowers are pale blue, occasionally white, carried in loose branched clusters. The anthers are yellow and the filaments orange and hairless. The berries are blue to purple. It grows in open forests of northern and eastern Australia, south to Tasmania. Tolerant of a wide range of soils, including clay soils, in cultivation; frost tolerant also. Grow in full sun to shade.

Dianella revoluta, Flax Lily is similar to *Dianella tasmanica* but not as robust, the leaves 4-12 mm wide and 15-85 cm long, with the edges rolled back (revolute) and nearly smooth. The leaf sheaths are distinct from the free leaf blades. The flowers are dark blue to violet, with brown to black anthers and yellow filaments. The berries are small and usually blue, although white-berried forms are available. Two varieties are found in Tasmania. The variety *revoluta* has the flowers held above the leaves in a loose panicle, and is widespread in forests and woodlands of temperate Australia. The variety *brevicaulis* has flowers on short stems, among the leaves, and grows in coastal and lakeside habitats in southern Australia, including eastern Tasmania.

Dianella tasmanica is similar to *D. longifolia*, but the edges and mid-ribs of the leaves are saw-edged, the leaves have no purplish tinge and are 14-32 mm wide and 20-95 cm long. The flowers are violet to lavender, the anthers pale yellow and the anther filaments golden orange. The berries are purple. It grows on the New England Plateau and the Australian Alps; in Tasmania, mainly at high altitudes. This is a robust, decorative, tufted plant that spreads quickly in good conditions. Use as an indoor plant, or as the other species. Tolerates wet soils and is best in moist, acid soils, in full sun or partial shade. Frost tolerant. There is considerable variation in the decorative value of the forms available.

Dichopogon strictus — Chocolate Lily

Blue, purple flowers

A small tuft of erect leaves, 1-10 mm wide and 10-60 cm long, that die down after flowering. The flowers in narrow clusters along a stem up to 1 m tall, with bracts under each flower. Flowering in spring to summer, the flowers being blue-violet, with three narrow sepals and three wide petals, each with marked central veins and frilled edges. Purple anthers with very hairy yellow appendages. It grows in heaths and woodlands of south-eastern Australia, south to the midlands and north of Tasmania. In cultivation, it is best in moist, well-drained soil, in full sun. Tolerant of frost and some wet soil conditions. Propagate by seed or by separation of tubers; will flower 18 months from germination, following sowing of seeds in autumn. Self-seeds in the garden. Suitable for pots, rockeries and grassland; in the sun the flowers are chocolate-perfumed. For cultivation refer also to page 323

Anthericaceae

Diplarrena moraea — Butterfly-flag

White flowers

Tufts of flat leaves, 5-10 mm wide and 30-60 cm long. The small flower clusters are on unbranched stalks, held well above the leaves. Closely resembling small *Iris* species, white with yellow and purple markings on three large and three small segments. One out of the three anthers is small and sterile (no pollen); summer flowering. It is widespread in dry woodlands and heaths of eastern New South Wales, southern Victoria and Tasmania. It flowers best in full sun; tolerant of most soils and frost but poor in heavy soils. Useful for pots, rockeries, grassland or at the edge of a pond. Propagate by division of crowns or seed.

Iridaceae

Diplarrena latifolia — Mountain-flag

White flowers

Similar to *Diplarrena moraea*, but larger all over with leaves 10-20 mm wide, it grows in heaths, in high rainfall areas of western Tasmania. It requires moist soils and full sun; may be short-lived in heavy soils. In cultivation, can flower in autumn and again in spring.

Iridaceae

***Drymophila cyanocarpa* — Turquoise Berry**

Liliaceae

Arching stems grow from wiry rhizomes, often growing on decaying logs in shady forests, from south-eastern New South Wales to Tasmania. The lance-shaped leaves grow in two rows, and the cream to pale mauve flowers grow on short stems in the axils of each leaf, and have similar sepals and petals, looking like nodding stars, 10-15 mm across in spring/summer. The berries are blue to purple, hanging for a long period and are very attractive. It grows best in moist, well-drained soil and in partial shade. Tolerant of frosts. Propagate by division, or by seed sown in cool conditions. Some success has been reported with potted plants, although berries have not formed in some garden situations.

Lozviagiaceae

***Haemodorum distichophyllum* — Bloodroot**

Dark purple/red flowers

The only Bloodroot in Tasmania, it grows in heaths and button-grass plains of the south-west. It has the same floral structure as Family Iridaceae, a bulb that is orange-red inside (bloodroot!) and unlike *Anigozanthos* and *Conostylis* species, is hairless. It grows as a small tuft of cylindrical leaves, 3 mm diameter and 3-10 cm long, sheathing a short flower stalk carrying a dense cluster of dark flowers, which have red and black sepals and green petals. The three anthers are red and prominent.

Haemodoraceae

***Herpolirion novae-zelandiae* — Sky Lily**

Blue, purple flowers

Found in wet, open areas in mountains of south-east Australia and New Zealand, as a grass-like turf of slightly fleshy, folded leaves, each 1.5-4 mm across and up to 5 cm long. The flowers are blue (occasionally white), without stalks, 2 cm across and having all six segments similar. The filaments (stalks) of the anthers are finely hairy. Grow as a low carpeting cover in pots, terrariums or rockeries in very moist conditions. It is a good miniature subject for pots, flowering well in a peaty mix. Transplants from the wild have been reported to be short-lived.

Phormiaceae

***Hypoxis* species**

Yellow, green flowers

They are small plants, growing from corms that are enclosed in papery leaf-bases. They have yellow sepals and petals that are joined at the base, the petals being slightly smaller. The ovary is inferior (under all flower parts). In gardens, *Hypoxis* species tolerate wet soils, and are suitable for pots, rockeries and grassland. *Hypoxis glabella* and *H. hygrometrica* do well in pots. They have an extended flowering season and produce many seeds.

Hypoxidaceae

***Hypoxis hygrometrica*, Golden Weathergrass** — Leaves narrow, up to 20 cm long, with a few hairs. The bright yellow flowers are on a main stem 2-20 cm long, growing in spring to summer. The petals and sepals are similar and the stamens have three short and three long filaments.

var. *hygrometrica* has leaves 0.5-1.5 mm wide, one flower per stem and with a small bracteole or scale (under 4 mm) beneath it. The ovary and sepals are hairless. It is widespread in south-eastern Australia.

var. *villosisepala* has leaves 1.5-2 mm wide, two flowers on each stem, larger bracteoles (up to 10 mm) and the ovary and sepals have some hairs. It grows mainly at higher altitudes in eastern temperate Australia; in Tasmania, in north-eastern and north-western areas.

Hypoxis glabella, Tiny Star is similar to *H. hygrometrica* but hairless, with one or two flowers per stem and a pair of bracteoles, 2-18 mm, under the yellow-green flowers. Southern Australia, reaching to northern Tasmania. Photograph, page 305.

Hypoxis vaginata, Yellow Star is like *H. hygrometrica*, but with one bract or scale, 10-70 mm long, sheathing the flower stem; and leaves 1-3.5 mm wide. Mainly white flowers. The type variety *vaginata* has one or two flowers per stem and anthers over 2 mm; var. *brevistigmata* has one flower per stem, anthers under 2 mm long and grows in damp sites from New South Wales to northern Tasmania. They are tough herbs, the stems and/or leaves being tough and firm. It is widespread in southern Australia, reaching to northern Tasmania.

Isophysis tasmanica (syn. *Hewardia tasmanica*) Purple, red flowers

Stiff, erect leaves with brown margins; 3-5 mm wide and 15 cm long. In spring to summer, single flowers, 8 cm across, on a 15-30 cm stalk, with petals and sepals similar in size, narrow, very dark purple to red. It is found only in south-western Tasmania, on mountains and peaty moors. It is successful as a pot plant; in rockeries, but slow to grow and flower. Propagate by seed, sown in autumn.

Iridaceae

Laxmannia orientalis — Dwarf Wirelily Yellow, green flowers

Small plants, up to 15 cm tall, with wiry stems on stilt roots and tufts of narrow, cylindrical, short leaves. Flower heads, in spring, of three to seven flowers, nodding. Flowers less than 1 cm across, with three white petals and three red-brown, slightly larger sepals, lying within translucent, red-brown bracts. Three of the six stamens adhere to the petals. It grows in sandy soils of South Australia, Victoria and the Furneaux Islands and north-eastern Tasmania. It is suited to dry soils and full sun. Frost tolerant. Propagate by division of the rhizomes, or by cuttings.

Anthericaceae

Libertia pulchella — Grass-flag Creamy white flowers

The species has fan-shaped tufts of leaves, 2-7 mm wide and up to 15 cm long. The flower clusters are on an 8-20 cm stalk. The flowers are creamy white, with petals and sepals similar in size, fragrant, and appearing in spring to summer. It grows in mountain and wet areas from New South Wales to Tasmania; also in New Zealand and New Guinea. In cultivation it does best in moist, well drained soils, in partial to full shade. It is frost tolerant. Use in rockeries or pots.

Iridaceae

***Lomandra* spp.** — the Saggs or Mat-rushes Yellow flowers

These form tufts or tussocks of separate male and female plants (dioecious), with tough leaves in two rows. The flowers are in stiff, yellowish spike-like clusters.

Dasypogonaceae

Lomandra longifolia Yellow flowers

These form tussocks up to 75 cm across, with leaves 4.5-7.5 mm wide and 50-100 cm long. The flower clusters develop in spring, the flowers being whorled along single or branched stems, with spiny bracts. The sepals are shiny, yellowish and hard, and the petals are dull and yellow or cream. It is widespread in the east of Australia across to the lower south-east of South

Australia, and southwards to the eastern half of Tasmania, where it is one of the commonest species of the ground flora under open forests and woodlands and in grasslands. Some forms have scented and bright yellow flowers; others are dull. Selected forms make attractive rockery plants and pond-side plants. Tolerant of frosts and most soil types; most suited to dry situations and full sun to partial shade. Can be used as an indoor plant. Propagate by division of crowns.

Lomandra nana has tussocks 5-10 cm across, with blue-green leaves, 0.8-1.5 mm wide and 5-15 cm long. The flower clusters develop in spring to summer on stems that are shorter than the leaves; the male flowers being on a short single stem and the females having almost no stalk. It grows in sandy and rocky woodlands in south-eastern Australia, as far south as the Northern Midlands of Tasmania.

***Milligania* species**

Creamy white flowers

Tufted, rhizomatous herbs of the south-west and mountains of Tasmania. They have attractive keeled leaves that grow in three ranks. The creamy-white flower clusters develop in late spring and summer, and have large boat-shaped bracts under the flowers. These species are expected to need moist, cool conditions and full sun, such as can be provided in pots and rockeries. Some success has been achieved with plants potted in a gravelly mix, and in rockeries and raised beds kept moist and cool and having cool root runs under rocks or mulch. Propagate by transplanting small plants or offsets. *M. densiflora* flowers for a long period each year and spreads well under good conditions.

Asteleaceae

Milligania johnstonii. Dwarf, with stiff glossy leaves 3-6 mm wide and 1-4 cm long. Only two to six flowers in each head. Anther filaments (stalks) broadly triangular. A rare species, from the shores of south-western lakes and rivers of Tasmania. It has been grown as a pot plant in moist gravel. Photo page 288.

Milligania longifolia. Very long, pendulous leaves, 15-45 mm wide and 60-105 cm long. The flower clusters are also drooping, and open. The anther filaments are narrow, tapering and very short. A rare species, from Cradle Mountain, and the Gordon and Franklin Rivers, in rocky areas.

Milligania stylosa. Erect or spreading leaves, 20-35 mm wide and 15-50 cm long. The filaments of the anthers are cylindrical. The flower cluster has many flowers, is erect and narrow and has woolly branches. It grows in the mountains of south-western Tasmania.

Milligania densiflora. The leaves are hairy, 15-60 mm wide and 10-55 cm long. The flower clusters are plume-like, with many flowers and branches. The white flowers sometimes have a red throat. The anther filaments are narrow and tapering. It is widespread in south-western Tasmania and the Central Plateau in wet sedgeland and heaths. Photograph, page 288.

Milligania lindoniana. The leaves are green above and silvery below, 10-24 mm wide and 10-20 cm long. The flower cluster is erect, narrow, many flowered, with woolly branches. The flowers are white with dark red shades at the base and the anther filaments are broadly triangular. It grows in the mountains of south-western Tasmania in wet peaty areas.

***Patersonia fragilis* — Swamp Iris**

Violet flowers

Tufts of thick, rush-like leaves, often blue-green or with a whitish bloom, 1-6 mm wide and 20-60 cm long. The flower clusters have a few flowers on an unbranched main stem that is shorter than the leaves, in spring to summer. The flowers have three large and three small pale to blue-violet segments, on a tube that rises above sheathing brown bracts. The filaments of the stamens are mainly joined together. It is widespread in south-eastern Australia, including coasts and heaths of north and eastern Tasmania. It grows in moist, well-drained acid soils; but will tolerate wet and dry soils; best in full sun; tolerant of frosts. Propagate by seed or division of crowns. The Swamp Iris has been grown satisfactorily in pots and well-drained raised beds, but seems to be poor and short-lived in heavy garden soils. Use in rockeries, borders, terrariums or grassland. For cultivation, refer to page 317.

Iridaceae

***Patersonia occidentalis* (syn. *P. longiscapa*)**

Similar to *Patersonia fragilis* but with flat leaves, 2-10 mm wide and 30 cm long, and blue-violet flowers on a main stem up to 80 cm long. It is widespread across southern Australia, south to northern and eastern Tasmania. Grow as for *P. fragilis*, but it needs good drainage.

Iridaceae

***Sowerbaea juncea* — A Vanilla or Chocolate Lily**

Mauve/pink flowers

Tufts of solid, cylindrical, blue-green leaves, 1-2 mm across and 5-50 cm long. The flowers are in a dense cluster on a single stem 8-75 cm long. The flowers are scented, mauve, with pink bracts and develop in spring to summer. There are three fertile stamens and three small sterile ones. It grows in heaths in temperate eastern Australia, southwards to north-eastern Tasmania. Cultivate in moist, well-drained soils, in full or near-full sun. Tolerates some wetness, frost and partial shade. Propagate by division. Useful as a pot, terrarium, or rockery plant, especially at the edges of a pond. See page 302. Anthericaceae

***Thelionema caespitosum* (syn. *Stypandra caespitosa*)**

Blue flowers

Tufted and rhizomatous plants with soft but not limp leaves, 2-12 mm wide and 13-55 cm long. Tough aerial stems up to 3 cm long. Flower head very branched, rising above the leaves, in spring and summer. The dark blue (or occasionally white or pale yellow) flowers are starlike. The anthers are yellow with filaments that are bearded in the middle and coil up after the pollen is shed. It is widespread in damp sands and peats in south-eastern Australia, including south-eastern Queensland and Tasmania. Grow it in moist, well-drained soil, in full sun or near full sun. Will tolerate some wetness, also frost. Propagate by division of rhizomes.

Phormiaceae

***Thelionema umbellatum* (Syn. *Stypandra umbellata*)** Creamy white flowers

Tufted rhizomatous plants up to 40 cm tall, the leaves being 1-5 mm wide and 15-35 cm long. The flower heads are on short stems with one to three branches. The flowers have narrow white petals and sepals up to 8 mm long. The anther filaments are bearded in the middle and coil up after the pollen has been shed. It grows in shallow, peaty and sandy soils from eastern New South Wales to the Furneaux Islands.

Phormiaceae

Thysanotus patersonii — Twining Fringe-lily

Blue, purple flowers

Usually leafless, with green twining and branching stems up to one metre long arising each year from tubers, bearing single purple flowers in spring and summer. The flowers have three narrow sepals and three broad, fringed petals. It is widespread in all of temperate Australia. Grow in well-drained soil, in full sun or partial shade. Frost tolerant. Useful for rockeries.

Phormiaceae

Tricoryne elatior — Yellow Rush Lily

Yellow flowers

Wiry, sprawling stems with tufts of scale leaves (bracts) at the joints. The leaves are soft, few, grasslike, and 20-35 mm wide by 5-10 cm long. Flower clusters of about 10 flowers on tall, branched stems (up to 1 m) at most times of the year, but mostly in summer. The star-like flowers are bright yellow, under 2 cm across, and the petals and sepals twist up as the flowers mature. The anther filaments have a tuft of hairs. It grows in all states, south to northern Tasmania. Grow it in moist, well-drained soil, in full sun. Frost tolerant (at least, if from southern areas). Has been propagated by division. Useful in pots, rockeries and garden beds. Photograph, page 305.

Anthericaceae

***Wurmbea* Species** — Early Names

Flowers mainly white

Widespread in temperate Australia. These tiny plants are in forest and woodland. They grow in well-drained, moist soil in south-eastern Australia. They will tolerate some wetness; full sun or partial shade. In some gardens, it has been short-lived. Suited to rockeries and grasslands. They die down after seeding.

Colchicaceae

Wurmbea dioica is similar to *W. uniflora*, but with two to nine flowers on a stalk. The flowers are scented and white, with a dark purple band across each segment (nectaries); the anthers are red or purple in the male flowers. Male and female flowers are on separate plants (dioecious).

Wurmbea latifolia is similar to *W. dioica*, but its lower leaves are 4-8 mm wide and the bands on the flower segments are pale violet.

Wurmbea uniflora has three leaves each up to 2 mm wide arising from a corm. A single flower, 1 cm across, is carried on a stalk 4-17 cm tall in late winter to spring. White sepals and petals, lying in a single whorl, joined at the base. The anthers are yellow.

***Xanthorrhoea* spp.** — the Grass Trees or Yaccas

White/cream flowers

These have stems covered with closely-packed leaf bases, either subterranean or above ground trunks, and topped by heads of long, thin, hard leaves. The flower spikes are on tall, woody, cylindrical, unbranched stalks (scapes) and often only appear after fires. The flowers are white and star-like and are surrounded by masses of hard, dark bracts, called packing bracts, that form the bulk of the flowering pole. The sepals are papery and the petals softer. *Xanthorrhoea* species are suited to well-drained moist or dry soils, *X. bracteata* being somewhat tolerant of wet soils. Tolerant of frosts. Best in full sun or near full sun. Propagate by seed; after germinating in three weeks to 12 months, these species are slow to develop initially, taking three to four years to make presentable plants.

Xanthorrhoeaceae

Acknowledgement: My thanks to a number of members of the Tasmanian Region of S.G.A.P. who provided me with notes on their experiences with these species.

Xanthorrhoea bracteata (*X. minor* of Tasmania). The stems are subterranean, and often branched, producing clusters of crowns above ground, each with its tuft of green leaves; the leaves are triangular in cross-section. The flowering stalks are 5-8 mm diameter and 30-50 cm long, and the flower spikes are 14-22 mm diameter and 10-18 cm long, developing in January to February. The packing bracts are triangular, and the petals are usually reflexed.

Xanthorrhoea arenaria is similar, but the leaves tend to have a bloom, the scape is 5-9 mm diameter and 20-60 cm long and the flower spike 18-24 mm diameter and 7-30 cm long, developing in June to January. The packing bracts are awl-shaped and the petals are erect or slightly recurved.

Xanthorrhoea australis has a trunk up to 3 m tall and often branched. The leaves are blue-green, with a bloom, and are square to diamond-shaped in cross section. The scapes are 18-40 mm diameter and 30-50 cm long and the flower spike is 50-80 mm diameter and 1.1-1.8 m long, developing in July to December. The packing bracts are long and awl-shaped. The petals are erect or slightly recurved and the flowers are scented.



Dianella flower △, fruit on page 332, description, 294. Photo R. Hayward

Sowerbaea

The Genus by R. J. F. Henderson¹

*Sowerbaea*² was described by the English botanist Sir James Edward Smith in 1798/99 from plants collected in the Sydney area by Surgeon-General John White. The genus contains five species all of which are endemic in Australia. They occur predominantly in swampy heath associations on acid sands in coastal and subcoastal areas, from tropical to temperate regions in all mainland states, except South Australia, and Tasmania.

Sowerbaea are related to the genera *Laxmannia* and *Borya* but differ principally in the coloured bracts and perianth segments of the conspicuously stalked flowers, the three rather than six functional stamens, and the characteristic H-shaped (or U-shaped) anthers.

***Sowerbaea juncea* Andrews**

Rush lily, Vanilla plant,
Chocolate Flower, Chocolate Lily

A tufted and rather grass-like plant, the tufts are 1–5 cm across at ground level. The roots are fibrous-fleshy and lack any tubers. Leaves are long and narrow, erect or outwardly curving, 5.5–50 cm long, the blade semicircular (semi-circular in cross-section) to cylindrical, 0.8–1.75 mm wide and obtuse at the tip. The ligule formed by coalescence of lower blade margins is 2.5–12 mm long. Floral axes are robust, rarely branched, and 8–75 cm tall including the flower-clusters. Clusters are more than 20-flowered and are 1.5–3.5 cm across. Individual flower stalks are 1–14 mm long and are spreading to down-curving. The floral segments are lavender/pink, more or less equal in length (5–9 mm long), boat-shaped, elliptic to obovate and obtuse at the tip. The stamens are less than two-thirds the length of these segments, their filaments flap-like and 1.2–1.8 mm long while their anthers are smooth and 2.5–3.2 mm long. The non-functional stamens (staminodia) more or less equal the filaments of functional stamens. The three-locular globose ovary is 1–2 mm long and has 0–2 ovules in each locule. The 3.5–4.2 mm long style bears the stigma beyond the anther tips. The irregularly angular to hemi-ellipsoidal brown to black seed is 2–2.5 mm long, lacks any appendages and is dull and minutely warty over its surface. Chromosome numbers of $2n = 16$ and 32 have been recorded for this species. The wide variability in this species may be due, at least in part, to its varying chromosome numbers. Plants occur in coastal, sub-coastal and mountain heath communities in eastern Australia from just south of the Tropic of Capricorn to northern Tasmania. Photograph on page 304.

***Sowerbaea alliacea* F. Muell.**

Northern Territory *Sowerbaea*

Known from several localities in western Arnhem Land and nearby areas, it differs from other *Sowerbaea* species in its flowers which lack staminodia, and in the occurrence of fleshy spindle-shaped tubers on many of its roots. These tubers may be up to 3 cm long and 1 cm across. Unlike *S. juncea*, plants of this species have leaves with sharp-pointed tips, and slender floral axes that are few-branched from near base and up to 45 cm tall including flower-clusters, the branches spreading to ascending. Its clusters are 15–40 flowered and 0.5–2 cm across, the flower stalks 1–8 mm long.

¹The article is based on *Flora of Australia*, Volume 45, Pp. 264–268, 440, 494 (1987).

²Smith named the genus after James Sowerby, the skilled artist and engraver of plates of flowering plants and fungi for numerous late eighteenth and early nineteenth century British botanical publications including Smith's own 36 volumes on 'English Botany'. Smith and Sowerby were fellow members of the Linnean Society.

Floral segments are green-white to lavender and 3.5–5 mm long with petals broader than sepals. The stamens are more than two-thirds the length of the floral segments and their filaments are about 1 mm long, their anthers minutely roughened and 2–2.75 mm long. The obloid ovary has one ovule in each locule. The 1.25–1.8 mm long style bears the stigma below the tips of the anthers. Chromosome numbers of $2n = 8$ and 16 have been recorded for this species. This plant occurs in sandy soils usually in somewhat swampy situations in forest communities. The smaller forms seen in certain elevated sandstone habitats may only be due to variations in chromosome numbers.

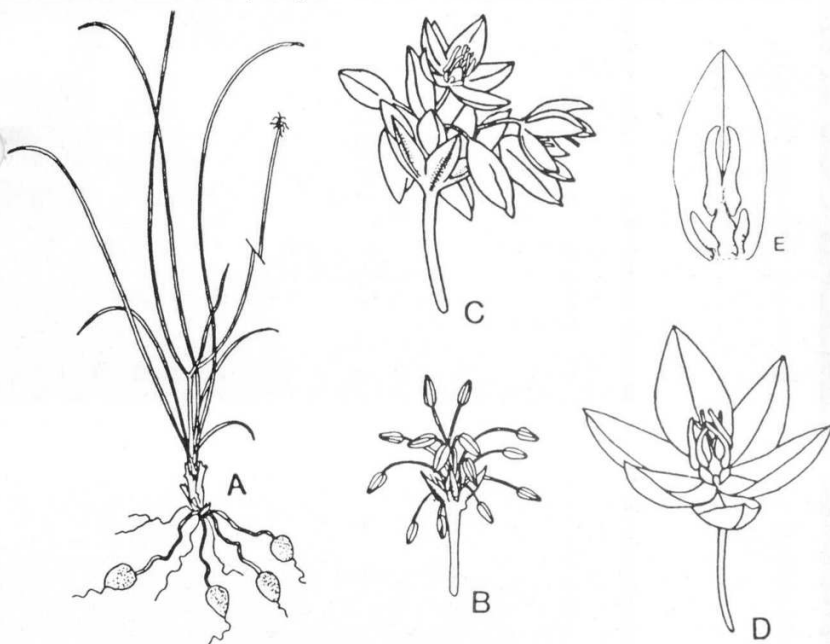


Figure 1. A–B *Sowerbaea alliacea* A, habit $\times 0.2$; B, flower cluster $\times 1.5$. C–E, *S. juncea* C, flower cluster $\times 1.5$; D, flower $\times 3$; E, petals and stamens with two staminodes $\times 8$.

***Sowerbaea laxiflora* Lindley**

Vanilla Lily, Purple Tassels

The more widespread Western Australian representative of the genus occurs in the south-west, in near-coastal heath communities on yellow to black sandy or clay soils. It differs from all other *Sowerbaea* species in its flowers which have anthers more than 3.5 mm long. It differs from *S. juncea* in its shorter (to 30 cm long) leaf-blades which are flat or triangular in cross-section, sharp pointed at the tip and lacking any ligule. Floral axes are slender to robust, bear a few shortened leaves, and are simple to few-branched. The floral segments are purple, pale pink to white, while the stamens are three-quarters to seven-eighths of their length and have minutely roughened anthers 3.8–4 mm long. The staminodia are about three-quarters the length of the staminal filaments. The smaller ovary (0.75–1 mm long) has three or four ovules in each locule developing into minutely prickly, irregular shaped, angular seed 1–2 mm across. A chromosome number of $2n = 8$ has been recorded from this plant.



Sowerbaea juncea, △
Photography by Peter Codd

▽ ***Sowerbaea laxiflora***
Photography by F. Lullfitz





Hypoxis glabella, △
Photography by C. Woolcock

▽ *Tricoryne elatior*
Photography by J. Glass



***Sowerbaea multicaulis* E. Pritzel**

Many-stemmed Lily

It occurs only in a few inland Eremaean localities in the south-west. It is distinguished from the other Western Australian species by its shorter leaves (5–10 cm long), its flowers with much shorter anthers (only 1.6–2 mm long) and its ovaries with two ovular locules. It differs from *S. juncea* in its generally shorter leaves with longer (to about 15 mm long) ciliate ligules. Floral axes are stout, simple, many per tuft and only up to 20 cm tall including the flower-clusters. The flower stalks reach 7 mm long and the purple segments only 5 mm long, the petals noticeably longer than the sepals. The stamens are about two-thirds the length of these segments, while their anthers are only 1.6–2 mm long and lack lobes below the connective. The ovary has a shorter style (1.5–2.5 mm long) which bears the stigma from below to exceeding the anther tips. Mature seed has not been seen.

***Sowerbaea subtilis* D. A. Stewart**

The tropical Queensland representative of the genus is known from coastal areas just north of the Tropic of Capricorn. It is most like *S. juncea* but can be distinguished from that by its narrower flower clusters (5–15 mm across) and its fertile stamen-filaments attenuate (not abruptly contracted) to the shorter (1.5–2 mm long) U-shaped (not H-shaped) anthers.

Flower clusters are less than 15-flowered and only up to 7 mm across. Individual flower stalks are no more than 5 mm long. The floral segments are pale pink but longitudinally purple striped and up to 6 mm long. The stamens are about half the length of these segments, their anthers 1.5–2 mm long. The staminodia are about three-quarters the length of the filaments of functional stamens, while the ovary has only one ovule in each locule. A chromosome number of $2n = 16$ has been recorded for this species. ■

Australian Plants, Series-A Indexing

Each volume has a complete index presented as described below. The last volume of each series, that is Volume 15 for Series-A, carries a complete index for all of the 32 issues of the series, and because of its detail, comprises 44 pages. It features:

1. A comprehensive index to articles and subjects in such a manner that a beginner does not need to know scientific plant names.
2. Plants for Particular Applications – A comprehensive index to plants for containers, for rockeries, etc.
3. Creating and Maintaining the Wildflower Garden – A reference to recorded experience of many competent wildflower growers from all parts of Australia, soil preparation, planting, watering, etc.
4. Propagation of Plants – Seed – Cuttings – Grafting – The recommended practices for readers without special skills or facilities, from propagators from all parts of Australia.
5. Gardening In Tropical Climates – Procedures and plants based upon established gardens.
6. Gardening for the Dry Inlands and Country Areas of Australia, a separate complete index.
7. Gardening in Cold Climates and Southern Areas of Australia, a separate complete index.
8. Gardening in the Temperate Areas of Australia, an extensive index, no scientific names.
9. Over 2,500 species are indexed by botanical name with pronunciation given for each generic name, plant family etc.
10. Against each page reference is a letter;
C – indicating that this reference relates to the cultivation of that particular plant;
D – indicating that the reference is confined to a description of the plant or its habitat;
P – means that the plant is shown in a large colour photograph and;
X – relates to propagation of the plant.
11. Principal Reference – There will be numerous references to each plant or practice you want to refer to (planting, watering, etc.). The principal reference, i.e. the reference that should be checked first, is in bold type. This feature alone makes the reference invaluable.

Tinsel Lilies

by I. R. Dixon, Horticultural Advisory Officer
Kings Park Botanic Garden, Perth, WA

Calectasia of Western Australia

Calectasia belong to the Dasypogonaceae family (formerly Liliaceae). In Western Australia there are at least three species, *Calectasia arnoldii* m.s., *C. cyanea* and *C. grandiflora* and a possible new species (photo page 308) with pale blue flowers, bushier growth and grey hairy leaves from the Badgingarra-Coorow area. All are perennial plants with slender woody, flexible sometimes branched stems and irregularly or spirally arranged linear-subulate slightly prickly leaves. Most have short underground rhizomes and fibrous roots.

Calectasia arnoldii

Stilted Tinsel Lily

This species, as yet, has not been officially described (not formally published), therefore we use the manuscript name. It was only recently found (1989) in the Quairading area with an outlying population ca. 400 km away near Coorow. Plants are rare in their natural habitat and listed under Western Australia's Endangered Flora as Priority One — taxa with few poorly known populations of threatened plants. They tend to grow in low lying open Myrtaceae and Proteaceae scrub in sandy soil with a high loam content. Superficially their flowers, which are produced in winter and early spring, are similar to *Calectasia cyanea* but more intense blue. No other colour forms have been recorded. Their anthers change to red in colour as they age. Photo page 308.

The main distinguishing feature is their stilt roots which are 1–3 mm thick and 1–15 cm long. Branches or main stems are up to 60 cm long and are upright. They are killed by fire and regenerate from seed. This is the only species we know of without underground rhizomes, therefore they are unable to resprout from the base. It is being successfully propagated by tissue culture in Kings Park Laboratory.

Calectasia cyanea

This is the most widespread of all our species, growing from Eneabba south-eastwards possibly to the south coast. It also occurs in South Australia and Victoria. Plants vary considerably in size from a small plant with two or three upright stems to a bushy plant up to 60 cm wide and 60 cm tall. They can occur as isolated single plants or occasionally in small colonies close together. The soil types they grow in vary from very poor freely drained sands to loamy sands, and lateritic soils, in very dry areas to winter wet soils, e.g., edges of swamps which fully dry out in summer. Plants can be found in light shade, open woodland or low scrub. Photo on page 285.

Flowers can be produced any month of the year, although the main flowering period is from June to September. Colour varies from iridescent blue to bluish purple, occasionally bluish white or rarely pure white. Flowers can change colour from blue to red as they age, also the anthers change colour from yellow to red as they age. Plants are long lived, possibly 50–100 years; this is probably why few seedlings are found in their natural habitat as they have no need to produce many replacements, they just resprout from their underground rhizomes after fire.



Calectasia arnoldii △

Photography by K. Dixon

▽ *Calectasia* 'Coorow'?





Calectasia arnoldii △ plant and showing its 'stilt' roots ▽ Photo K. Dixon



Cultivation of *Calectasia*

These notes are for *Calectasia cyanea* as we have had the most experience with it. The other species should respond to similar treatment.

Grow in full sun or broken sunlight with some protection from surrounding vegetation, in a free draining preferably sandy soil. Plants respond well to a light dressing of general slow release fertiliser. Regular watering is required at least for the first year after planting, i.e., spring, summer and autumn until the onset of heavy winter rain. Pruning is not necessary apart from the removal of any dead branches. They also respond very well to container growing in broken sunlight.

Propagation — The majority of flowers do not produce viable seed and when they do most tend to be predated by insects. Although good seed may be produced at other times of the year the best time for seed collection in Perth is early December. Fresh seed gives germination rates of up to 71% with seed taking about four weeks to germinate. Seedlings are very susceptible to damping off disease, therefore the seed pots are best drenched with a suitable fungicide, e.g., Previcur. As a biological control seedlings should be transplanted (pricked out) when one or two days old, otherwise this fungus disease will spread through the whole seed pot in a few days killing all seedlings. The seedlings are slow growing and are best grown in light shade in pots for at least one year and then planted out in their final growing positions. Under these conditions eight-month-old seedlings are 4–5 cm high.

New plants have also been raised by semi-hardwood cuttings, however strike rates are usually very low; also heavy losses occur later after potting on and they tend to be slow growing. Plants have been successfully raised by tissue culture in the Kings Park laboratory. Old plants can also be divided in late autumn, however, heavy losses usually occur. This treatment appears to be best after the plants have been burnt and when new growth is shooting from the rhizomes.

Calectasia grandiflora

As the name suggests the flowers are (usually) much larger than other species. The other main difference between this and *Calectasia cyanea* is the anthers do not change colour as they age. Flowers are usually found from August to October. This species is fairly rare in its natural habitat between Serpentine and Cannington, however, further studies are required to find out how wide its distribution is. It occurs in Banksia woodland in sandy soil or sandy clay at the edge of winter-wet swamps. Only one location is known where this species and *C. cyanea* occur together. Like *C. cyanea* this species resprouts after fire and we assume it, too, has a long life span. It would be best to select the swamp forms for heavier soils. New plants have been raised by tissue culture. Again they are slow — after two years in containers they were about 15 cm high and flowering well. ■

Calectasia Study Group

A new study group; the leader, Ruth Brookes, 14 Tighe Street, Cloverdale, W.A. 6105. This group will concentrate on the unique three species described above. They are ideal rockery plants. There is a huge market potential for unique flowering potted plants. The key to success is the selection of the very best forms and developing from there. The major problem with these plants is the difficulty of propagation and their slow growth. With tissue culture we can now produce the plants and slow growth in a pot plant is ideal provided they are not too expensive to produce to a marketable size. An ideal study subject for those who garden in pots in a small space. — Editor. ■

***Burchardia* (Milkmaids)**

Their Propagation and Cultivation in Western Australia

by Bob Dixon,
Horticultural Advisor,
Kings Park and Botanic Garden, Perth, WA

Surprisingly, as they are so attractive, *Burchardia* are rarely grown in cultivation in Western Australia, this may be because they are so common in remnant bushland around Perth. Before describing a few of the more showy species, the following general notes may well be a guide to the propagation and cultivation of many of the small "lilies".

Using fresh seed some are easy to germinate, with guess estimate germination rates of 60–70% for *Burchardia multiflora* and *B. umbellata*. Very few of the newly described species have been grown from seed, therefore we have no data on the germination rates and cultural requirements. Seed in Western Australia is sown in autumn in a free draining preferably sandy mix. Seedlings can be pricked out when a few days old and grown on in small pots of multi-seedling pots, alternatively the seedlings are left in the seed pot until they become dormant and then transplanted into other pots or planted in the open ground. Plants respond well to light applications of slow release fertiliser.

A general recommendation for over summering pots when the foliage has died down is to plunge them up to the pot rim into soil or sand that is in a position with full sun and cover with a layer of litter, e.g., Eucalyptus leaves. Keep the pots dry. Alternatively, place the pots in shade and cover with a layer of litter and keep dry. When kept in extremely hot conditions with no protection from the sun the tuberous roots often dehydrate. In early April remove the pots and commence regular watering.

Burchardia have a natural dormancy period during summer when the leaves die down and their corms, with tuberous roots, store food and moisture ready for new growth in the following autumn. This new growth often appears above ground level when the soil is still bone dry. Plants are best transplanted from the open ground before the onset of this new growth. They will be difficult to find unless there is an old seed head still attached. Care should be taken when weeding in the open ground as plants are easily damaged by a hoe.

If planting out in the open ground try a clayey or loamy sand which is free draining and a full sun position amongst low shrubs to give some protection.

Burchardia bairdii

This plant is fairly widespread in winter wet or swampy areas which dry out in early summer. Generally the soils are sandy loams or peaty sands. The distribution is from Cataby 180 km north of Perth to south of Forrestdale near Perth, plants are fairly common near Muchea and Gingin. Flowers which are produced between August and November vary considerably in colour with pink buds opening out to very light pink or deep pink. Although this species looks similar to *B. umbellata* it is a more robust plant, often more branched with a larger number of flowers carried on a stem 40–120 cm high. Photo, page 312.

Although seed germinates readily, I have only sown one batch, and seedlings transplant easily, at this stage. I have been unable to over-summer the small plants, due to dehydration of the tuberous roots. Older plants are



Burchardia rosea △

Photography by R. Dixon

▽ *Burchardia bairdiae*





Burchardia multiflora
Photography by G. Keighery

easier to over-summer in plunged pots. I have also carried some through by giving the pots an occasional summer watering and others which were kept in a shade house under a bench, without summer water.

Burchardia multiflora

This is another species which occurs in winter wet areas generally in swamps or near streams on loamy sands, or around granite outcrops and in shallow soils in moss swards over rock. Flowers, which are produced between July and September, are very attractive with deep pink buds opening out to whitish pink with a deep pink mid stripe. The flowering stem which is 5–27 cm high, carries rigid leaves which are often almost as long as the stem itself.

Fresh seed is easy to germinate in 36–61 days and the young (1–3 day-old) seedlings take readily to pricking out (transplanting). I have found this species fairly easy to over summer in plunged pots. Seedlings normally take three years to flower in pots. When planting out in the open ground, they dehydrate in poor sandy soils, therefore I recommend growing conditions similar to those recommended for *B. bairdiae*. Photograph on page 313.

Burchardia rosea

This is a newly described species which has a fairly limited distribution from north of the Lower Murchison River to near Port Gregory (north of Geraldton). It grows in winter wet, low lying and seepage sites, also in shallow soils over rocks. In Kalbarri National Park it is fairly common often forming large colonies on the moist red sandy soils. Although in winter wet areas they are generally not as wet as the sites for the preceding species. Photograph, page 312.

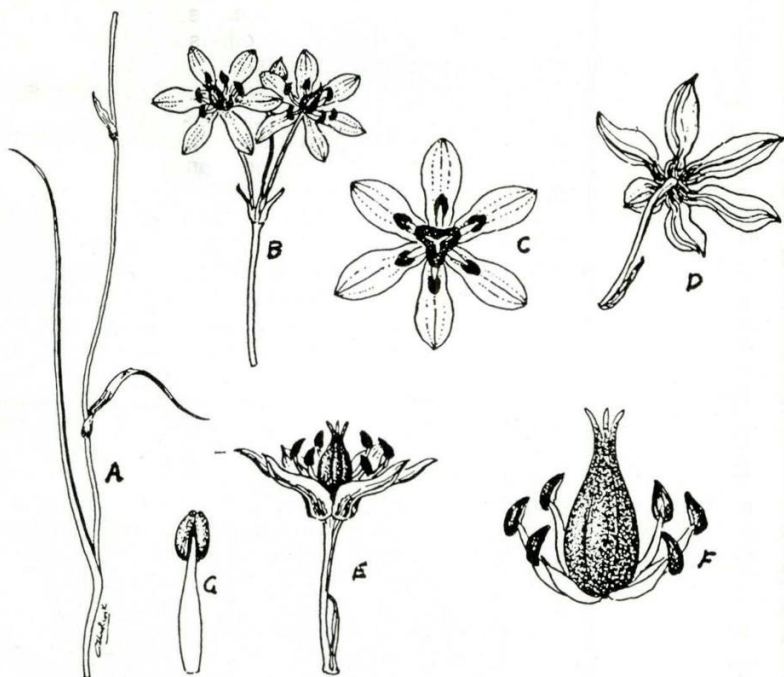
Unfortunately we have no data on seed germination. However, mature plants are easy to grow on in pots, and over summered in a shadehouse or plunged with a covering of leaf litter. I have no information on growing on the plants in the open ground. Again I would suggest a free draining sandy loam and a full sun position with some protection from surrounding vegetation.

As the name suggests the flowers are rosey pink; they are usually produced between August and October on long flowering stems 20–50 cm tall. This species I would suggest, is the most attractive of the *Burchardia* and well worth trying in cultivation. In its natural habitat it flowers prolifically most years, whereas the other species tend to be at their best after a bushfire when the competition has been removed.

Burchardia umbellata

A plant 10–65 cm tall with white or occasionally light pink flowers, produced between August and October. In Western Australia it grows on a variety of soils which are not normally winter wet, as for the preceding species. It may be found on very poor free draining sands as in Kings Park bushland or in sandy lateritic soils. This species also occurs in the eastern states of Australia from Queensland to New South Wales, Victoria and South Australia where it grows on a variety of soils and habitats from dry woodland to swamps. Photo 15: 56P.

New plants are easy to raise from seed and grow on well in pots. When planted in the open ground in Western Australia they prefer a full sun position in a free draining sandy soil with some protection from surrounding vegetation, when grown in light shade they tend not to flower. Seedlings normally flower when they are three years old. We find in our poor sandy soils, this is by far the easiest species to establish and plants can virtually be left to fend for themselves. As with the other species they should be dried off during summer. ■



Burchardia umbellata — A. The plant to 60 cm tall with 1 or 2 leaves near the base to 20 cm long, producing heads of 2–9 flowers, B. The 6 white to faintly pink flowers, C, D and E. D with faint pink striping, has 6 stamens, G, attached to the base of the superior ovary (petals removed in Fig. F). The anthers on the end of the stamens, G, are purple for flowers in the eastern Australian species, but yellow in W.A.

Buchardia multiflora is very similar to *B. umbellata*, with purple anthers and larger bracts.

Buchardia bairdii and *B. rosea* have yellow anthers, the latter having pink flowers as shown in the photograph on page 312.

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This is the first of three issues of Australian plants presenting the Liliiflorae of Australia. The No. 132 issue will describe in some detail why all the new strange family names here have replaced the large family Liliaceae. Some may find it rather technical but with the other two issues before and after it, the presentation will be a valuable reference. This issue includes some excellent articles on cultivation and the third issue will round off this important data.



Patersonia sericea △

Photography by S. Pearson

▽ *Patersonia umbrosa* forma *xanthina*

Photography by D. Hockings



Patersonia

Their Cultivation and Propagation

By Bob Dixon
Horticultural Advisor,
Kings Park and Botanical Garden, Perth

Patersonia is best represented in Western Australia with 13 of the 17 Australian species occurring in this state. They are usually evergreen perennial herbs or rarely under shrubs, the exception being *Patersonia babianoides* with foliage which dies down each year (annual foliage). Plants have basal leaves generally arranged in fan shape and a compact root stock or short segmented rhizomes. The terminal flowers, several of which are contained in a spathe of two rigid bracts, last for only a short period of time, however, they are quickly replaced by another flower.

Patersonia are of outstanding beauty with their iridescent, predominantly blue, purple or violet (also white and yellow) flowers, the true colour of which seems to be almost impossible to capture on film. They are ideal rock garden subjects or can be used as filler plants in garden beds. As pot plants they would have severe limitations as they require a sunny position.

Unfortunately, few species are generally grown with only *Patersonia occidentalis* in cultivation, at present, in Kings Park and Botanic Garden. Species in cultivation at the State Herbarium Garden, George Street, South Perth, include *P. occidentalis* and *P. umbrosa*. Local nurseries grow small quantities of *P. occidentalis* which are available every year, occasionally, if your lucky, *P. xanthina* and *P. umbrosa* can be purchased.

Most species of *Patersonia* excepting *P. occidentalis* have proved to be extremely difficult to establish in Kings Park and Botanic Garden. This may, in part, be due to our very poor, free draining sandy soil as several species often grow in heavier soils and in some cases winter wet areas or poorly drained soils. Therefore improved cultural practices such as adding loam to the soil, light mulching and occasional summer watering may be necessary to establish other species on our poor sandy soils.

Although all *Patersonia* are worthy of cultivation, the following notes refer only to those species on which we have some cultural details. Most germination times are extracted from Kings Park Nursery records, often old seed was used, therefore the use of fresh seed or sowing under better conditions may reduce the number of days to germination. Sowing the seed in autumn is recommended in Western Australia, in cooler districts sow in spring.

Patersonia inequalis

Unequal Bract *Patersonia*

This is a tufted plant or sometimes sub shrub with short erect stem. Flowers (sepals) are white, which is unusual for the genus and produced between August and October, on stems up to 23 cm long. Leaves are linear (long and narrow, parallel slides with a length/breadth ratio of at least 12 to 1) medium green, up to 32 cm long but usually much shorter. It occurs naturally on the south coast from Hopetoun to Mondrain Island (West of Esperance) in heath.

Propagation is best by seed which takes 49 to 61 days to germinate, percentage germination rates are very low. Unfortunately, to date, these plants have not established themselves in the botanic garden. They gradually decline in vigour, as though they are wasting away, then die.

Patersonia juncea

Rush Leaved Patersonia

This is a very variable species with narrow linear to terete (circular in cross section) leaves 6–22 cm long and flowering stems 5–24 cm long. Plants of small stature as well as large plants can have short or long leaves, therefore, selection of the better clones, those with flowers well above the foliage, is important for ornamental use. Flowers are pale violet and produced from August to October. Plants occur naturally, often in gravelly soils and creek beds, from Eneabba to the Stirling Range and east to Israelite Bay in Jarrah forest, woodland, mallee and heathland. Propagation is best by seed. Two seed lots sown in Kings Park Nursery took 106–120 days to germinate and gave a low germination rate.

Patersonia occidentalis

Purple Flags or Western Patersonia

Unfortunately the common name Western Patersonia (after *occidentalis* = western) can be confusing as this species has such a wide distribution from Western Australia, South Australia, Victoria and Tasmania. In Western Australia it is widespread from the Murchison River to Israelite Bay, growing on a variety of soils, e.g., loamy sands, calcareous sand, granitic and gravelly soils. Although it often grows in poorly drained situations it also grows in the well drained poorer soils, e.g., Kings Park bushland. Photograph 14: 200P.

This densely tufted plant is extremely variable both in the length of the flowering stem 8 to 75 cm and leaf, as well as the width of the leaf. Flowers are usually held just above the height of the leaves or can be much higher but may also be shorter, normally they are purple, however, pink and pure white forms have been recorded. The size of the flowers varies from 3.0 to 3.3 cm across and the flowering period is generally from September to December.

This is undoubtedly the easiest species to grow in cultivation. It is extremely easy to grow from seed germinating in 41–89 days with germination rates, in ideal conditions, 60–70%. Seedlings are very tough and the plants are easy to grow on in containers. Plants have also been successfully divided in late autumn, but why bother, unless you have a good form, as they are so easy from seed. Seedlings respond well to a light dressing of a general slow release fertiliser and flower about 15 months after germination.

In the open garden they prefer a full sun position or can be grown in very light broken shade and require a free draining preferable sandy soil. Practically no pests attack the plants apart from a small grub which eats the developing seed. Although each flower produces numerous seed it is often in short supply as it seems to be a favourite food of the Port Lincoln or Twenty Eight Parrot.

Patersonia pygmaea

Pygmy Patersonia

A small sub shrub up to 20 cm high with a short woody stem and linear leaves 4–17 cm long. The flowers are purple, produced from August to November and normally held on stems shorter than or equal to the length of the leaves, sometimes longer, therefore selection of the longer stemmed forms would be better for ornamental purposes. Plants normally grow on lateritic or sometimes sandy soils and are common in the Darling Range south of Lesmurdie, they also occur as far south as Albany and the Stirling Range. Unfortunately this is another difficult plant to establish, again gradually seeming to wither away. A heavier soil, light broken sunlight and or regular summer watering may help to establish this species. Propagation is by seed, with the seed germinating in 48–60 days with usually poor germination rates. Photograph 14: 204.

Patersonia rudis subsp. *rudis* grows naturally on lateritic or sandy soils in the northern Jarrah forest from New Norcia down to Dwellingup. It has leaves from 30–70 cm long and hairy flowering stems 20–50 cm long with the flowers being held just equal to the length of the leaves or slightly shorter. The flowers are violet and produced from October to December, sometimes into January. Again this is another difficult species in cultivation and similar treatment recommended for *P. pygmaea* should be tried.

Propagation is by seed with the seed germinating in 60–76 days, germination rates are usually very poor.

Patersonia rudis subsp. *velutina* which is believed to be uncommon, to my knowledge has not been cultivated in Kings Park. It has more velvety hairs and is usually shorter in stature than subsp. *rudis*. Distribution is inland in the Southern Cross/Coolgardie region, where it grows in semi-arid woodland and shrubland, flowering from November to December.

Patersonia umbrosa

A loosely tufted herb with linear leaves 30–90 cm long, flowering stems 30–80 cm long usually shorter than the leaves, rarely longer. This species now contains two varieties, *P. umbrosa* forma *umbrosa* and *P. umbrosa* forma *xanthina*.

Patersonia umbrosa forma *umbrosa* (the southern form) occurs from Deep River (West of Walpole) to the Stirling Range and Fitzgerald River in poorly drained soils in scrub heath, woodland and Jarrah forest. It has purple flowers produced from August to November.

P. umbrosa forma *xanthina* was previously known as a separate species *P. xanthina*. It is almost exactly the same as forma *umbrosa* except that the flowers which are produced between August and October are bright yellow and the colour of the foliage tends to be a little lighter green. It occurs usually on lateritic soils in Jarrah and Karri forest from near Perth to Deep River.

To our knowledge these two forms have not been cultivated in Kings Park, earlier determinations were incorrectly identified. I have germinated *P. umbrosa* forma *xanthina* myself in 50 days, guess estimate 2–3% germination rate, however, the seedlings only survived for a few months.

Plants can also be divided in autumn and early winter, this method has been successfully used by at least one commercial nursery in Perth. The seed of this species is most untypical of the genus being very large 5–8 mm long globular and pale yellowish-brown. I know of plants in cultivation. As well as being difficult to germinate (in the bush after fire the seedlings are often thick on the ground, other times few seedlings can be found) they tend to be hard to grow on especially forma *xanthina*.

Now I have told you what little we know about the propagation and cultivation of *Patersonia*, do not let it put you off trying to grow them as they are very rewarding plants when in full flower. Who knows they may well be far easier to grow in some areas in eastern Australia than they are in the West, anyway we certainly need to gain more knowledge on their culture. ■

Nutritional Studies of Christmas Bell

by G. P. Lamont,
G. C. Cresswell, G. J. Griffith,
NSW Agriculture and Fisheries,
Gosford, NSW 2250 Australia

Blandfordia is a small genus of the family Liliaceae endemic to the east coast of Australia. These tufted perennial herbs have a fibrous root system that forms a fleshy corm in mature plants. They are often widespread in well-drained acid heaths that are subject to periodic inundation. *Blandfordia* are slow-growing, and take three years from seed before the first inflorescence is produced. The inflorescence comprises 3–18 tubular flowers or bells borne on an erect stem. Most commonly the bells are red with yellow tips, but pure red and pure yellow forms also exist. This report follows a study of the response of *Blandfordia grandiflora* to both controlled-release and liquid fertiliser.

In August 1988, 18-month old root-washed seedlings of *Blandfordia grandiflora* were planted into a potting medium of 50% peat moss and 50% river sand in 75 mm pots of 800 ml volume. The potting mix was amended with 1 lime:1 dolomite (v/v) to adjust the pH to 5.0, which is within the optimum range (pH 4 to 6) for Christmas bells (unpublished data).*

Ten replicate plants were graded by weight and allocated to each of the following treatments:

- (1) Osmocote eight to nine-month controlled-release fertiliser 18N-2.6P-10K applied to the soil surface at 0, 0.625, 1.25, 2.5, 5.0 and 10 kg·m⁻³ (0, 0.5, 1.0, 2.0, 4.0, and 8.0 g/pot).
- (2) Liquid formula A with a ratio of 1 N:0.6 K (the same N:K ratio as the Osmocote).
- (3) Liquid formula B with a ratio of 1 N:1.5 K, the N:K ratio observed in leaf tissue of healthy wild growing plants of *B. grandiflora*.

The different N:K ratios were achieved by varying the concentration of K (55–150 mg·litre⁻¹) in a base nutrient solution containing (mg·litre⁻¹) 100 N (3% NH₄-N), 15 P, 161 Ca, 25 Mg, and 2 Fe (FEEDTA). Solutions A and B were applied once or twice weekly. All ten treatments received an application of Librel BMX micronutrient mix (Allied Colloids, Wyong, Australia) once a month.

Plants were arranged in a randomised complete-block design in an unheated greenhouse (temperature 8–30°C) at Gosford, New South Wales, with natural day-length and 20% shading. Plants were hand-watered when necessary and given 20% excess water once a week to minimise salt buildup in the mix.

After three months, leaf number, leaf length, and shoot width at the base of each plant, measured by calliper, were recorded. After six months, the pH and electrical conductivity (EC) of the mix in each pot was measured using the pour-through technique of Yeager *et al.* (1983). Shoot width was again measured before each plant was root-washed and weighed. Because these two-year-old plants were required for other experimental use, the root and shoot fractions could not be determined. Treatment effects on all measured variables were tested using analyses of variance. A regression model was used to describe the response of final weight to increasing rates of Osmocote.

*A test for soil acidity (pH) is described on page 327. Do these figures surprise you?

Table 1. Effect of fertiliser treatment on plant fresh weight and shoot width after six months.

Fertiliser	Application (kg·m ⁻³ or frequency)	Fresh wt ^z (g)	Shoot width (mm)	pH	EC (dS·m ⁻²)
Osmocote	0	32.5	11.7	6.0	0.36
	0.625	34.6	14.1	6.0	0.40
	1.25	36.8	14.5	5.8	0.43
	2.5	35.9	18.4	5.6	0.76
	5.0	51.2	22.5	4.9	1.33
	10	36.5	19.6	3.7	2.23
Solution A 1 N:0.6 K	Once weekly	35.8	17.2	6.3	0.59
	Twice weekly	31.9	17.9	6.4	0.60
Solution B 1 N:1.5 K	Once weekly	45.3	19.5	6.3	0.69
	Twice weekly	34.2	21.5	6.1	0.74
LSD 5%		9.43	2.8	0.39	0.19

After three months, there was a significant treatment effect on shoot width but not on leaf number or leaf length. After six months, the linear relation between shoot width and final weight was poor ($r^2 = 0.38$). This was probably due to treatment effects on root:shoot ratios. These are described in detail below. Leaf number, leaf length, and shoot width are therefore of limited value as nondestructive measures of vegetative growth of *Blandfordia*.

Several weeks after the commencement of the trial, the oldest leaves of plants receiving 10 kg Osmocote/m³ developed necrotic tips. Some older leaves eventually became completely necrotic and one plant from this treatment died. The roots of plants receiving 10 kg Osmocote/m³ were brown and stunted, with many dead root tips. Similar leaf symptoms were seen in both twice-weekly liquid feed treatments after ≈ 4 months. Plants receiving Osmocote at 0 and 0.625 kg·m⁻³ were pale green or yellow and had some reddening around the margins of older leaves. In these treatments, plant roots were white, extensive, and predominantly fibrous. With increasing rates of Osmocote, plants were greener and had less-bulky root systems in which fleshy storage organs were predominant over fibrous roots. The roots of plants receiving liquid feed once a week were white with roughly equal amounts of fibrous and storage roots. Over the six-month experimental period, shoots in all treatments were drawn down an average 2 cm in the pot by the contractile roots.

The tendency of Christmas bells to produce fibrous roots instead of storage roots at low fertility may improve the plant's ability to obtain nutrients in short supply by increasing the surface area of roots available for nutrient uptake and for mycorrhizal infection.

The response in final fresh weight to Osmocote was not adequately described by a linear ($r^2 = 0.03$) or a quadratic model ($r^2 = 0.12$) because of the variation in root:shoot ratios. However, the 5 kg·m⁻³ rate gave a significantly higher fresh weight than other rates of Osmocote (Table 1). This is double the 2.5 kg·m⁻³ optimum rate of Osmocote recommended for Christmas bells by Dunston (1982). However, a re-analysis of his data shows the optimum rate to be 3.3 kg·m⁻³. Liquid fertiliser B applied once a week produced the heaviest plants of the liquid treatments, giving a comparable growth response to the best Osmocote rate.

The range in nutrient supply examined in the liquid feed treatments was too narrow to establish an optimum rate; consequently, the relative effectiveness of controlled-release and liquid feed programmes could not be properly assessed. However, at equivalent rates of N supply (Osmocote rates of 1.25 and 2.5 kg·m⁻³ about correspond to the once and twice-weekly liquid applications) no difference in growth was noted between Osmocote and liquid feeding. Increasing the frequency of liquid feeding from once to twice a week did not improve the growth of plants receiving solution A and caused root injury and reduced the growth of plants receiving solution B. This injury was possibly a response to excess salinity between each fertilisation and the next watering. Similar root injury and poor growth occurred in the 10 kg Osmocote/m³ treatment where the EC was 2.23 dS·m⁻¹. Our observations suggest that an EC of 2 dS·m⁻¹, the approximate conductivity of the two liquid feed formulations, is excessive for Christmas bells.

Of the liquid feed treatments, only formula B applied once a week gave a significant increase in fresh weight over the control (0 Osmocote). This formulation had a ratio of 1 N:1.5 K, which is the average ratio of N and K in tops of healthy plants collected in the wild. As N was supplied at 100 mg·litre⁻¹ in both liquid feed formulations, growth differences between the two treatments were due to the availability of K.

The pH of the media leachate determined after six months of growth decreased linearly with increasing rates of Osmocote. However, only at the highest rate of 10 kg·m⁻³ was the pH (3.7) considered too low for growing Christmas bells. This acidifying effect has been noted previously for Osmocote and is presumably caused by leaching of NO₃-N from the mix. Fertiliser uptake efficiencies of <5% have been recorded for similar controlled-release products. From plant analysis data, fertiliser application records, and final fresh weights, we estimate the N uptake efficiencies in this trial to range from 10% to 60%.

The highest fresh weights occurred at the Osmocote (9 month 18N-2.6P-10K) rate of 5 kg·m⁻³ and with the once weekly liquid feed of 1 N:1.5 K ratio. Plants fertilised with low rates of Osmocote were pale green but had extensive root systems that were white and predominantly fibrous. As the rate of Osmocote was increased, plants became greener and produced smaller root systems in which fleshy storage organs were predominant over fibrous roots. ■

Banksia Study Report No. 9

Banksia Study Group

This report is now available for \$5.00 plus \$1.50 postage from the leader of the Banksia Study Group, Trevor Blake, 22 Vista Avenue, Ringwood East, Victoria 3135. Still available are Reports 7 and 8, \$4.00 and \$5.50 respectively, plus \$1.50 postage for one or \$2.65 for two or three reports. The study groups operate in different ways, the *Banksia* being especially fortunate with the competence of its members, particularly their ability to carry out extensive, detailed, scientific experiments. They confine their studies to practical problems relating to propagation and cultivation of *Banksia*. The No. 9 is a 64-page booklet of exceptional value.

Very competent reports on extensive studies of *Banksia spinulosa* var. *cunninghamii*, cover growth and flowering habit, response to fertiliser and propagation by seed, cuttings and grafting. The grafting study could be of major importance, concerned not with *Banksia spinulosa*, which is "highly *Phytophthora* resistant", but its use as a stock upon which is grafted all other *Banksia* species including the spectacular western species. The well documented experiments include using *Banksia ericifolia*, *B. marginata* and *B. integrifolia* also as a stock for *B. occidentalis* and *B. brownii*. None approached the near 100% success with *Banksia spinulosa*. The report gives detailed advice on how a complete beginner can carry out their own grafts. How about people from all over Australia trying the method and reporting results?

There are numerous other reports from competent and new growers. The report is of major significance and value. — Editor. ■

Growing Some Lilies/Iris

by Peter McGee,
Leader, *Thysanotus* Study Group

Culture of *Arthropodium*, *Dichopogon* and *Murchisonia*, plants related to *Thysanotus*

It is thought that the genera *Arthropodium*, *Dichopogon*, *Murchisonia* and *Thysanotus* are closely related. For this reason, the study group is looking at the potential of all species in these genera in horticulture. In my opinion, *Thysanotus* has the best flowers and some species have considerable potential in pots because of their foliage. *Arthropodium* and *Dichopogon* also have some merit in the garden having attractive flowers, most of which are scented. They tend to look a little tatty in pots, though they are very hardy. *Murchisonia* is still a complete unknown for us, being distributed in areas of Western Australia and South Australia to which we have no access.

Growth of *Thysanotus* is mentioned on the next page. Here I concentrate on the little we know about growing *Arthropodium* and *Dichopogon*. Species of both genera are widely distributed across Australia, though locally abundant, they are often difficult to find unless they are flowering, because their leaves are camouflaged in the grasses they are commonly found with. Both genera have similar requirements for growth, so I will deal with them as one unit. Flowering is spread over several months and is influenced by the rainfall and temperature, slowing down in cold weather and dry times. I have had flowers in early spring and late autumn, but they occur most commonly in summer for most species. Cross pollination is required for seed set and most plants retain their seeds for days to weeks after seed maturation. Seed seems to be dispersed by ants locally and by birds over longer distances. Most seed drops to the ground though and germinate close to the mother plant.

Cool temperatures are needed for seed germination. In the laboratory, we germinate them at 16°C, and it takes about 14 to 20 days to get up to 100% germination. At 25°C no seeds germinate, and at lower temperatures it takes a little longer. Seedlings are robust and are easy to transfer to soil. They grow fairly slowly, but respond to fertiliser application. Seedlings transplant easily to the garden and only need cool, moist conditions at the time of transfer. All species form tuberous roots. Once a plant is established, the easiest way to increase your stock of plants is to divide the root system, leaving one tuber with some of the tissue of the central shoot bud per divided plant. I have divided one plant into 10 plantlets and then with use of considerable fertiliser, divided a clump one year later into a further 12 plants. Needless to say, only divide worthwhile plants if the excess is not going to flood your garden.

The plants are quite hardy, doing best in full sun, but coping in dappled shade. All species seem to cope quite well with dry conditions, but perform better in loamy or clay soils than sandy soils.

I have had problems with snails and slugs eating the leaves and flower shoots. Aphids are also a problem almost year round, black aphids in early spring to the green and yellow types later in the season. I usually only wash aphids off with a jet of fine water.

Both *Arthropodium* and *Dichopogon* form vesicular-arbuscular mycorrhizas, and are thus quite distinct from *Thysanotus*. They do not need to form the association where the soil is fertile, but most probably will in gardens anyway. If you grow them in pots it would be wise to ensure the soil does not dry out as they may not have formed mycorrhizas.

For those who want to start growing these species, I would suggest you start with *Dichopogon strictus*, the chocolate lily. It has long stems of pale blue or violet flowers that have a faint vanilla perfume. Also of interest is *D. fimbriatus*, the nodding chocolate lily. *Arthropodium minus* and *A. milleflorum* have smaller flowers and are often white or pale mauve. ■

The Fringed Violets, *Thysanotus*

Notes by
W. H. Payne*

There are problems with the reliable cultivation of the Fringed Violets in the garden. The plants rely on a friendly fungus widely found in Australian undisturbed natural soils and most reports of successful cultivation in the garden have been in situations where other natives are growing nearby, plants with larger and more vigorous root systems that can support this friendly fungus. On the other hand they are extremely sensitive to *Phytophthora* and to nematodes.

Thysanotus multiflorus would appear to be less dependant than other species, on this soil fungus and there are many records of it prospering in the garden displaying its magnificent flowers to 5 cm across. Just what has been growing nearby is not recorded. It will grow well in a pot as shown in the photograph opposite and as with all Fringed Violets, is happy with regular, though dilute, doses of Aquasol.

*These notes were prepared after consultation with Dr Peter McGee, leader of the *Thysanotus* Study Group and others. The 46 Australian species are described and pictured in many large photographs in Australian Plants, Vol. 12, No. 94 Issue. In the same issue Bob Dixon records years of study of their propagation and cultivation, and Gwen Elliott gives excellent, detailed advice on "Australian Plants In Containers". In Australian Plants, Vol. 15, No. 118, Peter McGee reports on current scientific research into the associated "friendly fungus", a study receiving funding from the Australian Flora Foundation. ■

Thysanotus multiflorus — Fringe Lily

Merricks Nursery, Victoria

This is a beautiful tufted plant growing to 50 cm high and 30 cm wide. The masses of bright mauve-purple flowers are held on many flower stems above the foliage. Flowering is normally spring and early summer. **Position:** Select a protected, preferably warm position in the garden in full or partial sun. Fringe Lilies will not grow in heavy shade. **Soil:** The Fringe Lily prefers a sandy well drained soil, although free draining medium to heavy soils are quite adequate. Raise the garden bed and incorporate sand in heavy soil areas. **Fertilising and Watering:** Plants benefit from a light dressing of general slow-release fertiliser or blood and bone in autumn and spring. Keep plants moist during dry conditions to encourage growth, but watering in other conditions is usually not necessary. **As a Container Plant:** Fringe Lilies make excellent container plant specimens. Select a container with generous drainage holes in the base and fill with a good quality open potting mix into which is incorporated slow-release fertiliser pellets of Nutricote or Osmocote. **Pests:** Slugs and snails are the only real pests. **Frosts:** Hardy to light frosts. ■

National Parks of Northern N.S.W

The NPA Guide by Peter Wright *et al.*

Australia is fortunate to have many magnificent national parks. Tourists are often not sure how to enter them or what they should look for. This large 340-page book, which contains detailed maps, describes the 24 national parks in northern New South Wales and on the western slopes. This book is a must for all tourists — keep it in the car. It may be obtained by mail for \$39.95, post free, from Surrey Beatty and Sons Pty Ltd, 43 Rickard Road, Chipping Norton, NSW 2170.

Well managed national parks are the vital component in our concern to conserve the unique native flora of Australia. Over the next few issues we outline the Society's strategy for conservation but the overriding concern is the provision of adequate reserves to maintain the plant in the wild. ■



Thysanotus multiflorus

Photography by R. Anderson



Replanting of Rainforest²

Editor

The major devastation of our rainforests since the arrival of colonists has been due to land clearing for agriculture. Much of this, such as dairy farming in New South Wales, has become uneconomic and a scheme for replanting is desirable. Unfortunately, it is not as simple as that and a well planned strategy is required. Meanwhile the battle rages between the forester seeking to make a living and the "greenie" wishing to save the world¹.

The scheme involves the replanting of rainforests in such a way that they may be harvested in a managed way, existing, protected rainforest to be left untouched. A rather long-term project, you may well think, but it is surprising how time gets by while the forests keep growing. Meanwhile, forests and their creatures come back to life and flourish; not monoculture, but a full range of natural species of plants and animals.

There has been a lot of experience from small rainforest plantings and some research seeking species that would give an economic return in the shortest time. Undertaken on a well devised incentive plan, the support from the general public would be most enthusiastic. A positive 'greenie' plan?

There is only one factor stopping this scheme from prospering — the elected governments of this fine land of ours. The Society is taking the initiative in northern New South Wales and proposes a publicity campaign. It remains to be seen if the "greens" of the area, possibly the largest concentration of them in Australia, take up the challenge to take a positive stand on such an important environmental issue. What is needed is a competent, dedicated leader in the area to take up the crusade in a responsible way.

The various alternatives are: state reforestation, incentives for private participation, local government zoning, forest areas in development proposals, etc., all dependant on local conditions needing local study and planning. There are many other areas of Australia suitable for productive development of replanted rainforests; are there any people in them concerned enough to join the campaign? — **replant our rainforests.** ■

¹Hopefully both parties are beginning to realise that they both want the same thing. Experience has shown that if we do not allow logging in Australia, the forests of our not so well off neighbours will be stripped. Well may the people of Brazil and Malaysia be critical of us for requesting that they forgo economic improvement to save their forests and the world, while we do nothing to reforest our landscape.

The "greenies" are not living up to their public image of saying NO to everything! This is a chance for them to promote a positive proposal; let us plant forests with one objective being a sustainable harvest; let us manage our new forests for economic benefit to the nation's economy and work for country people; but let us also create a living forest with nature's full of complement of creatures in a sustainable life cycle.

²Replanting of Rainforest; one of the conservation strategies adopted at the 1991 Federal Conference of the Society for Growing Australian Plants. A number of specific objectives were adopted, in principle, to target the Australian Centenary Committee for the year 2001 celebrations appointed to commemorate 100 years of federal government. Taken together, the package of proposals would represent a major advance in the conservation of the Australian flora for generations to come.

As with most things, an elected government will rarely act unless it perceives a significant number of voters committed to an issue. What is needed is for individuals and groups of people living near forested areas or areas that can be regrown, to devise schemes for their area and present them to government, or let us do it for you. We do not mean only SGAP members or groups, but all the conservation and wilderness groups in Australia. Let us stop talking and do something positive.

Soil Acidity and Alkalinity

by Brett Robinson

Soil pH plays a major role in the health and nutrition of plants. If the soil pH is not appropriate for the plants we wish to grow, then malnourished or diseased plants will result. The pH scale measures acidity and alkalinity, just as degrees Celcius measures hot and cold. Pure water is neither acidic nor alkaline, and gives us our main reference point in the pH scale, which is **NEUTRAL**, where $\text{pH} = 7$. Strongly acid soils have a pH of around 4 and strongly alkaline soils have a pH of about 9. The lower the number, the more acid.

There are two main ways that soil pH affects plant growth. The first is that pH affects the supply of nutrients from the soil to the plant. For example, plants growing in acid soils sometimes become deficient in calcium, and plants in alkaline soils become deficient in iron. Both of these elements may be present in good quantities in the soil, but the supply to the plant is reduced by too low or high a pH value. The second, and often dramatic effect is that toxic elements in the soil may be released if the pH is too high or low. A common example of this is the release of aluminium from the minerals in acid soils. Once released from the minerals, the aluminium is highly toxic to many species of plants.

Many Australian soils are mildly to severely acid. This is the most common pH problem confronted by gardeners. A pH reading below 5 or above 7 indicates that many plants will experience problems growing in the soil. Potting mixes also need to be kept within this pH range. However, different plants have different requirements. It will be noted from page 320, the optimum range for the growing of Christmas Bells is 4 to 6, a very acidic condition.

Changing the pH

Acidity problems are easily overcome by incorporating lime or compost into the soil. Lime naturally mixes very slowly with the soil, so it is best to dig it in to at least 10 cm depth if this is at all possible. A good rate to apply in the first instance is 1 kg of agricultural lime per 4 square metres or 1 kg of slaked lime per 5 square metres or 2 kg of good compost per square metre. If the soil was very acid to start with, wait a few weeks and check the pH again. If necessary repeat the application until the pH is between 5.5 and 6.5.

Lowering the pH of alkaline soils is more difficult than raising the pH of acid soils. It may be best to choose plants suited to "limey" soils if confronted by this problem. Otherwise, the treatment involves adding large doses of ammonium sulphate fertilizer or aluminium sulphate ("hydrangea blueing compound").

Measuring the pH of Soils and Potting Mixes

There are several methods for measuring pH available on the market. Most of them are expensive and only suited to commercial nurseries and soil laboratories. It is also important to collect an appropriate sample for analysis. This is easy for potting mixes. Just dig some mix out of the middle of the pot. For soils, both topsoil (0 to 10 cm depth) and subsoil (10 to 30 cm) samples should be tested. Collect a larger sample than necessary (e.g. 500 g), mix it thoroughly and select a small amount from this. Unless investigating a specific problem, avoid sampling from excessively wet or dry areas.

Indicator solution method — This method works by creating a colour reaction between the soil and a solution. It is easy to use, reliable, and very cheap. A small sample of soil or potting mix is mixed into a paste with the indicator solution, which is then covered with a white powder. The white powder absorbs the coloured solution and gives a very reliable colour test result. A test kit costs around \$15 and lasts for about 50 tests, probably many years.

Electronic glass bulb pH meters — employ a meter with a digital display and glass electrode in a small plastic case. A mixture of one part soil with five parts pure water is required. Potting mix is prepared by mixing one part with two parts water. These meters are very reliable and accurate, but the glass bulb is fragile and expensive. Note that glass bulb meters are **NOT** the type that you push into the soil with metal electrodes and a dial read-out — they are **completely** useless. The cost of a glass bulb meter is \$70–\$80.

Soil pH Testing Kit

Inoculo Laboratories*

Plant starvation is not always caused by absolute lack of minerals but often because the soil is too alkaline or too acid. When plants do not respond to fertilisers, it suggests that the soil pH may be unbalanced. A favourable lime condition guarantees the full effect of Phosphate, Nitrogen and Potassium fertilisers. Different plants thrive best on different soil pH levels. In general, vegetables prefer a higher pH than many flowers. Wide differences in pH (more than one unit) from the commended level often reduce the amount of mineral nutrients available to the plant. Deficiency diseases can result from an incorrect pH. This applies especially to the trace elements so necessary for plant growth.

Soil pH has a strong effect on soil structure and therefore on ease of cultivation and water-holding capacity. Acid soils reduce the life and effectiveness of nitrogen-fixing bacteria. Legume nodules do not develop in strongly acid soils and bacteria, which normally take nitrogen from the air and convert it into nitrate fertiliser, do not function efficiently, or at all.

So What Is pH

Just as a thermometer registers temperature in degrees, so does a scale of 1–14 register the alkalinity or acidity of the soil. The half-way point of 7.0 pH is called "neutral". Soils below 7.0 pH are acid and above 7.0 pH are alkaline. This term does not altogether mean the soil is neither acid nor alkaline, but that the two conditions are exactly in balance. The scale is not linear, a soil of 5.0 pH being ten times more acid than one of 6.0 pH and 100 times more acid than one of 7.0 pH. The leaflet that comes with the kit gives a table of recommended pH ranges which mostly covers commercial crops, vegetables or exotic plants but for *Boronia* it is 5.5–6.5, Bottlebrush 6.0–7.5, Geraldton Wax 5.5–6.5, Tea Tree 5.5–7.0 and Wattles 5.5–7.0. You will note that all these are close to neutral and tends towards a slightly acid soil.

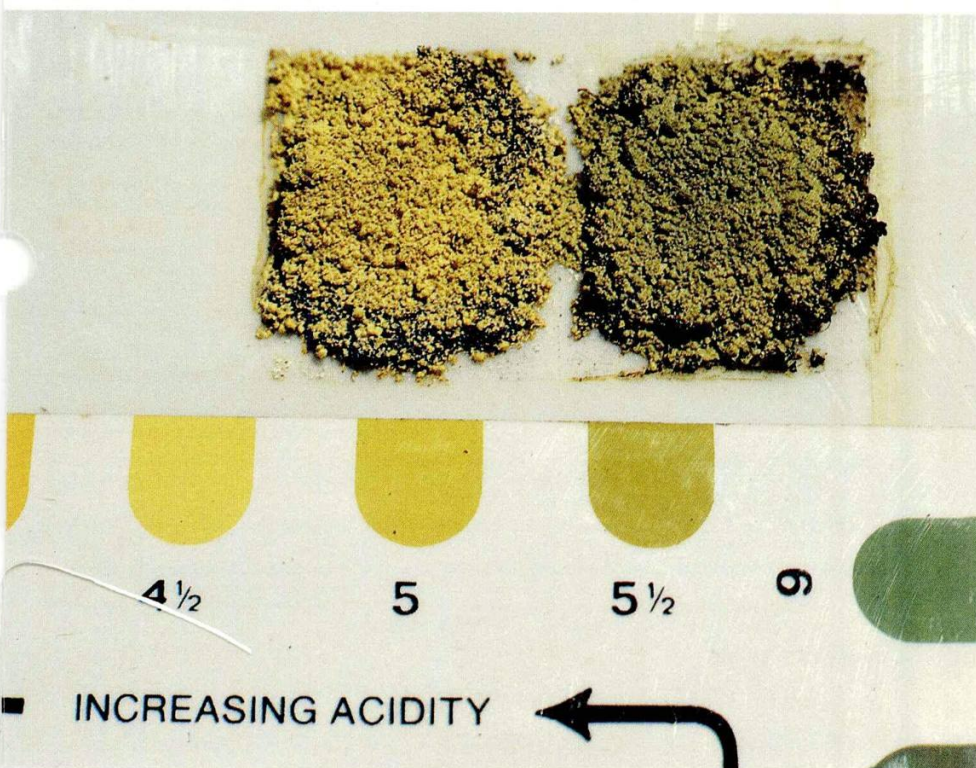
The instruction leaflet then describes how to use the kit, shown opposite.

*This kit was designed by Senior Soil Scientists with the Division of Soils, CSIRO, Australia. It is used in field work by the CSIRO and by commercial bodies who accept their advice on crop production. Available from Inoculo Laboratories, PO Box 39, Surrey Hills, Victoria, 3127 for \$15.00. The above article was taken from the instruction leaflet that accompanies a Soil pH Testing Kit by the Editor.



The pH Test Kit ▲

▽ Checking soils samples



Readers — Please Help?

I need your comments on the cultivation of species of *Pimelea* and good colour slides. Please assist me to compile your journal. —Editor

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Dianella tasmanica
See pages 294 and 301