



50th Anniversary

Australian Plants

December 2009
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Front and back covers: *Telopea speciosissima* Simone Cottrell © Botanic Gardens

This issue is dated December 2009 to maintain sequence. It was, however, compiled in July 2010 and may mention occurrences that occurred between these dates.

Australian Plants articles

Australian Plants is published quarterly to promote knowledge of Australian native plants.

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Introduction – 50th Anniversary of *Australian Plants*

John Aitken, Joint Editor, *Australian Plants*.

The December 2009 issue of *Australian Plants* celebrates the 50th Anniversary of its first publication in December 1959. It also celebrates the memory of the journal's founding editor William (Bill) Payne and his determination and commitment to produce a quality journal over a 40 year period, which became the flag bearer for all those Regions throughout Australia that have been affiliated with the Australian Native Plants Society (Australia) (ANPSA, formerly ASGAP). In addition, this issue is a tribute to all those who have served on the editorial committees and have contributed articles and photos to *Australian Plants* over the past 50 years. The standard of articles has always been impressive and is a reflection of the enthusiasm and commitment of these people to promote the growing, conserving and appreciating of the Australian flora. To all these people we owe a great deal of gratitude.

It is the commitment of *Australian Plants* to maintain the high standard set by Bill Payne and his successor, Manfred Wagner, and to continue to produce a national journal that reflects the wide diversity of Australian flora in all States and appeals to its readers, by striking a balance between articles of practical interest to the average grower and scientific research papers.

As the first issue of *Australian Plants* was devoted to waratahs, it is appropriate that this 50th anniversary issue is also devoted to waratahs. Whilst the waratah is the floral emblem of New South Wales, it is, like many other State floral emblems, identified internationally as a unique Australian symbol.

Over the past 50 years, the propagation and development of different varieties and cultivars of waratahs have come a long way. This has been driven by the need for more reliable plants for garden use and for selected forms of flowers for the economically important cut flower industry, for both the domestic and the international markets. In fact, some New Zealand nurseries value the waratah so highly they are propagating and selling it under the name *Kiwi Rose*. Is nothing sacred? First, our trans-Tasman cousins rebranded the Chinese gooseberry as the Kiwi fruit and now they are coveting our waratah.

A copy of the first issue of *Australian Plants* can be found on the ANPSA website at <http://anpsa.org.au/download.html>.

I hope that you enjoy this very special issue of *Australian Plants*.

A remarkable achievement – a tribute to William Payne

Merle Thompson, Joint Editor, *Australian Plants*

With this issue of *Australian Plants* we are recognising the 50th anniversary of the first issue of the journal in December 1959. The journal has been produced continuously, but not completely regularly, throughout the intervening years.

While recognising the history of the journal itself, we must pay tribute to William H Payne. It is an astounding achievement that Bill Payne was the sole editor and the manager of production of *Australian Plants* for in excess of 40 of its 50 years.



Bill Payne, 1926–2005

Bill's role included all aspects of the preparation and production of the journal, from the concept to the liaison with the printer on the layout and quality control of picture colour. It involved the endless and arduous task of sourcing articles and photographs, of communicating with authors regarding proofs and determining the content and layout of each issue. The more those of us who have attempted to fulfil this role in recent years undertake this task (and we work as a committee, not as an individual), the more our admiration for his perseverance and resourcefulness grows.

It was not always an easy journey. The position of Editor *Australian Plants* was, for all the time Bill was in the position, an elected officer of the Council of the New South Wales Region of the Society for Growing Australian Plants, now known as the Australian Plants Society NSW Ltd. When the Society became a company each elected officer became a director of the Company. Bill was a strong-minded man and did not always agree with other strong-minded men on Council, with differences occurring, particularly over financial matters and, often, the timing of the production of journals. Again, the more we are involved in its production, the more we understand why Bill did not always find it easy to have an issue ready regularly every three months.

Until his retirement, Bill's role with *Australian Plants* had to be fitted around his work as a professional engineer and his private life as a husband and father, as well as his involvement in other like-minded

organisations such as the Australian Flora Foundation, of which he was a co-founder and a councillor for many years.

In paying tribute to Bill, we must also recognise his wife, Beryl, without whose support and forbearance he would not have been able to undertake such a time-consuming and demanding endeavour.

We should also acknowledge those who assisted with typing and proof reading and the printing company, Surrey Beatty and Sons, who produced the journal for much of its history, especially Surrey Beatty and his son, Ivor.

While it is not appropriate within the journal to record its history and others have, and will, write of these matters, it is most appropriate that we acknowledge the contribution to the journal of its foundation and long-term editor and record the gratitude of the many thousands of readers who have benefited from and enjoyed its issues during the last fifty years.

Bill held the position of Editor until 2001 and died on 5 November 2005.



Front covers of Issue No. 1 (December 1959) and Issue No. 169 (December 2001); the first and last issues of *Australian Plants* produced by Bill Payne.

Waratahs – an introduction

Peter Olde

Peter Olde is a former President of APS NSW Region and the Sutherland Group of APS NSW and was made life member of the APS NSW for his dedication and commitment to achieving the objects of the Society. He is also an honorary research scientist at the Herbarium of NSW, specialising in Grevilleas, and is the senior author of The Grevillea Book, Volumes 1-3 and a book, soon to be published, on Grevillea cultivars.

According to Robert Sweet (1826: 349) the waratah, *Telopea speciosissima*, was first introduced to England in 1789, well before it was described in 1793 by James Smith. Smith included it in the genus *Embothrium* and gave it the name *Embothrium speciosissimum*. At the time of its description he stated seeds imported from Sydney Cove had not germinated but that imported living plants were then growing in the garden of the Dowager Lady de Clifford, Nyn Hall near Barnet, but had not flowered.

The first flowers were recorded in 1807 by Sims (1808) who indicated that Mr Loddiges and four other collections contain this valuable and rare shrub, but we have not heard that it has as yet flowered in any but in that of Emp. J.A. Woodford, Esq., at Springwell, in Hertfordshire, where our drawing was taken in May last. Propagated by layers, or by seeds imported from New Holland. In 1809, Richard Salisbury recognised the genus as distinct from *Embothrium* and anonymously published the name *Hylogyne* (Knight 1809). It is claimed by his detractors that Salisbury altered his manuscript after first listening to a talk given by Robert Brown and rushed into print ahead of him. Salisbury however already had his own manuscript which was entirely different to Brown's, the alterations he made were minor and there is no evidence that he rushed to print, but rather that Brown was delayed. Salisbury nonetheless was unjustly pilloried at the time by his peers and his whole work unfairly ignored. Ultimately Brown's name, *Telopea*, published in 1810, was conserved notwithstanding the nomenclatural rule of priority.

Five species of *Telopea* are now recognised; *T. aspera*, *T. mongaensis*, *T. oreades*, *T. speciosissima* and *T. truncata*. The Gibraltar Range Waratah, *T. aspera*, was only recognised in 1995 (Crisp & Weston). The most widespread and horticulturally significant species is *Telopea speciosissima*, which occurs over a wide geographic area in coastal and subcoastal New South Wales, in a range of altitudes and climatic zones, from Ulladulla and Berringer, near Conjola, south of Sydney, to Menai and other areas of the Sydney Basin, extending to the central coast over a wide area.



Embothrium speciosissimum James Sowerby (1757–1822)



T. aspera D. Greig © Australian National Botanic Gardens



T. oreades Brian Walters



T. mongaensis © M. Fagg, Australian National Botanic Gardens



T. truncata Dick Burns



T. speciosissima Peter Olde



Telopea speciosissima is found in deep soils mostly derived from sandstone, sometimes over clay-loam or with a percentage of clay content. A commonly associated species is Turpentine, *Syncarpia glomulifera*, an indicator of deep soils. In these situations, the species rarely if ever gets frosted in winter. Between the Watagans, west of Newcastle, the upper Blue Mountains and southern highlands of NSW it occurs at elevations up to 1000m above sea level where recorded minimum mid-winter temperatures can be as low as -12°C. Cold snaps in spring often visit snow and ice on flowering plants.

Increased cold tolerance can be inferred in plants from these regions as well as adaptation to lower summer humidity. Waratahs generally proliferate in cold climates along Australia's east coast in preference to warmer, coastal climates where they may have migrated during previous colder ice ages and remain as relics. Although there are apparently no taxonomic implications, acknowledging the possibility of genetically imprinted differences in seed grown from these provenances might be an important first step in successfully cultivating plants in a wider context.

Waratahs are said to be pyrogenic resprouters. Their life-cycle is firedependent. Fire destroys all seed and above ground tissue of the plant along with any pests present but established plants are rarely killed outright by it. In fact, fire stimulates post-fire growth which resprouts from the lignotuber at the base of the plant, just below or at soil level. Waratahs flourish in this period, flower prolifically, set abundant seed and uptake nutrients from the ash-bed. This takes place when other plants are recovering and when there is less competition for moisture and nutrients in the wider environment. In the two or three seasons after fire, flowering is usually prolific and results largely from the mobilisation of potassium, phosphorus and calcium, coincident with a rise in soil pH which synergistically act just like an annual fertiliser dressing. To maintain population-size, some of the seed produced at this time must germinate and establish before the bushland returns to its pre-fire status. Even though seed viability is high, survival rates are low because of high predation. For long-lived species that can survive fire this is not of immediate concern though persistence will ultimately lead to extinction. The few seedlings that do germinate may take many years to establish naturally but it is sufficient. Low seedling recruitment when combined with low mortality and longevity of established plants enables the population to slowly increase over time. As soon as the forest grows back, waratah vigour declines again into a kind of hibernation, with increasingly retarded flowering and with poor growth rates.



Regrowth of *T. speciosissima* from underground lignotubers, two months after the area had been completely burned out by a bushfire. Photo: Lloyd Hedges



A stand of *T. speciosissima*, two years after a bushfire had devastated the area. Photo: Lloyd Hedges



In thick stands, waratah blooms can be critically compared and selected. During one post-fire period at a selected site numerous cultivars were selected by Paul Nixon and are still grown commercially today. Commercial plantings generally consist of cultivar clones with consistent morphological features. These must be propagated asexually. Each cultivar has a different personality and temperament, varying particularly in degrees of hardiness, flower size and colour, and foliage. The home gardener should select from among the cultivars that have proved to be hardy and easier to grow. *Telopea* 'Braidwood Brilliant', T. 'Corroboree', T. 'Shady Lady' and T. 'Wirrimbirra White' are all worth a try. Some of these have hybrid vigour. *Telopea mungaensis* is anecdotally said to be easier to grow in climates low in summer humidity whereas quite the reverse can be said of T. *aspera*. Vigorous seedlings are another alternative for the home gardener as they produce a deep tap root and establish more easily than cutting-grown plants. However, floral characteristics cannot be guaranteed by this method

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Australian Native Plants Society

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The NSW waratah, *Telopea speciosissima*

Paul Nixon, all photos, unless indicated otherwise, by Leslie Meiklejohn

Paul is a leading authority on the cultivation of waratahs. The substantial progress that has been made in developing the waratah as a flower crop owes much to his initiative and hard work. Paul is the author of 'The Waratah', Kangaroo Press 1997 which is the authoritative book on the species, its history and cultivation.

Several growers have shown it is not only possible to grow waratahs but to grow them particularly well in cultivation. On the other hand, many people have tried several times to establish a few plants and have failed, so there is clearly something difficult or unusual in their culture.

Commercially the end product is a cut flower, a pot plant or a flowering plant in a pot.

Included in this article are descriptions of some commercially grown varieties, with colours ranging from white through pinks to reds, some flowering marginally early or late at one location. Other factors which influence the time of flowering include latitude, altitude, northern or southern slope and temperature. For example, a hot early spring will cause an early flowering.

Waratah propagation by cuttings is similar to other plants: cuttings taken in spring or autumn respond to the plant hormone Indol Butyric Acid at 2000ppm applied in liquid, powder or gel form. The cuttings should be kept in a moist environment for 7 to 10 weeks, when roots will develop.

Propagation is by seed collected in May/June. If seed is kept moist and preferably at 25°C, it will germinate quickly. I use Fongarid as a dust to prevent fungus troubles.

Before one ventures into commercial cultivation, some research should be undertaken to evaluate the potential of the enterprise, as the waratah is a plant that is slow to mature and much time and effort may be wasted.

Below is a list of named clones of waratah that may be of interest to the reader. They are available at some nurseries.

Red and Pink Cultivars

T. speciosissima 'Fire and Brimstone' is large and erect. The flowers are very large and globe shaped, dark red with stigmas white-tipped, the flower is surrounded by several whorls of short broad bracts cupped



close around the flower. Leaves are mid-green and very large with marked serrations. Flowering time is mid-season. Tests have shown this flower to have the longest vase life for waratahs.

T. speciosissima 'Brimstone Blush' is an open upright shrub with medium-sized dark red, cone-shaped flowers with similar coloured bracts; the styles are pink with white-tipped stigmas giving the flower an overall pink appearance. Flowers open mid to late season. Leaves are an unusual glossy green with the stems and leaf veins covered with rusty red hairs. This is a very vigorous clone, which has frequently been awarded Champion of the Waratah Festival, held annually at the Mount Tomah Botanic Garden.



T. speciosissima 'Fire and Brimstone'



T. speciosissima 'Brimstone Blush'

T. speciosissima 'Brimstone Early'. This clone was discovered at Peats Ridge near Gosford in the late 1980s. It is a medium-sized shrub with an open character; inflorescences are medium in size and dome-shaped, bracts are medium in size; the flower is red with lighter coloured stigma. This is the earliest of the Brimstone collection to flower. Leaves are medium in size with a moderate degree of serration. Whilst its vase life is average, Brimstone Early's main feature is that it is early flowering.

T. speciosissima 'Mirragon'. This clone was selected from a group of seedlings in 1990. Its main attraction is its dark red colour; the shrub remains small 2m x 2m and compact. Flower size is small with an

exaggerated cone shape. Its bracts are relatively long and dark red, as is the flower, including the style and stigma. Flowering time is early in the season.



T. speciosissima 'Mirragon'

Telopea speciosissima 'Green Bracts'.

This clone was discovered by Bob Harris as a seedling in the early 1980s. The shrub is large, compact and vigorous. It has a conical shaped inflorescence, two whorls of green tinged bracts that are short and stand out from the red flower, which has many florets with pink-tipped styles. Flowering time is late in the season. Leaves are large and dark green with a moderate degree of serrated margin. As a cut flower, 'Green Bracts' has a reputation for recovering well after being left out of water for some time, as occurs when freighting overseas.



T. speciosissima 'Green Bracts'



T. speciosissima 'Cardinal' is a very attractive clone. It is a compact shrub with distinct large red dome-shaped flowers. The style and stigmas are a similar colour, giving the flower an overall even colour; the broad and flaring bracts are a similar colour. Flowering time is mid season. Leaves are green and moderate in size and serration. The original plant lived over 45 years with over 120 blooms each year.

T. speciosissima 'Stringers Late'. This clone was found by Mr Stringer who made it available to growers. It is a compact shrub 3m x 3m; the inflorescence is large and dome-shaped. Bracts are fairly large and as red in colour as the flower. The late time of flowering is the main attractive characteristic of the clone.

Telopea speciosissima 'Red Centre'. A small shrub, deep red flower similar to a small 'Fire and Brimstone' with prominent white-tipped stigmas and close-cupped bracts. Flowers and leaves are relatively small.

T. speciosissima 'Ballerina'. This shrub is compact and supports an attractive globe form of flower. Its light shade of red is sought after by commercial flower growers. The flowers are medium size, as are the bracts, which are cupped around the flower. Flowering time is mid-season.



T. speciosissima 'Ballerina'



T. speciosissima 'Cardinal'



T. speciosissima 'Stringers Late'.



White Cultivars

T. speciosissima 'Wirrimbirra White', originally found in the Kangaloon area, was brought to prominence by Thistle Stead (Harris) and cultivated in The Wirrimbirra Sanctuary, Bargo, NSW. It has a large creamy-white flower with long bracts and is in demand for floral arrangements, etc. Unfortunately the tendency to burn and turn brown contrasts with the white flower, producing blooms which are unsightly for commercial use. Leaves are long and narrow and coloured light green.

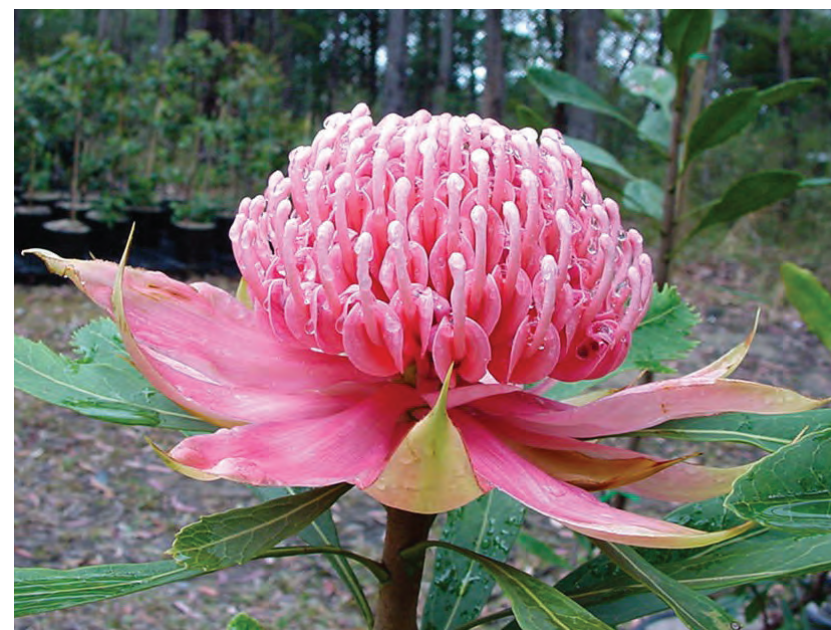


T. speciosissima 'Wirrimbirra White' Photo: Brian Walters

Pink cultivars

T. speciosissima 'Brimstone Pink'. This pink form, which originated in the Protea Australis collection, is vigorous and open, with the flowers being carried on long stems. The two or three rows of bracts are medium in size and cup around the crown of the flowers. Leaves are light in colour and medium in size. Flowering time is mid to late season.

T. speciosissima 'Pink Passion'. This clone is the progeny of pollen from 'Cardinal' onto 'Wirrimbirra White'. The shrub has an open upright form, with an attractive true-pink conical flower. Long bracts extending out gives the flower a large appearance. Leaves are a light green, although not as light as 'Wirrimbirra White'. 'Passion' has been in cultivation for over 20 years and has stood the test of time.



T. speciosissima 'Brimstone Pink'



T. speciosissima 'Pink Passion'



T. speciosissima 'Shade of Pale'. This attractive light pink flower was found in the same area as 'Wirrimbirra White' by bushland rangers. The shrub is compact and was introduced on to the market in 2006. The medium-sized cone-shaped flower has a light pink centre with short, almost white, bracts; its flowering time is mid-season. It has small, dark green leaves, which are moderately serrated. Florets and styles are pale pink and the stigma becomes covered by brown pollen as it matures. Numerous styles are "twin tubed". The light coloured bracts may suffer from burning, similar to 'Wirrimbirra White'.



T. speciosissima 'Shade of Pale'.

Each year Mount Tomah Botanic Gardens has a Waratah Festival for two weeks during the school holidays in late September. This involves displays of waratahs and related activities; well worth seeing. The Garden is increasing its collection of named varieties that can be seen growing there.

The New South Wales Department of Primary Industry is about to publish *A Guide for Commercial Growers of Waratah* by Dr. Ross Warrall and Bettina Gollnow. This publication is highly recommended, and will be a help to anyone proposing to grow waratahs.

There is an organisation that may be of help to waratah growers: The Wildflower Industry Network, 'WIN', contact Frank Allatt 02 45672093.

Editor's comment:

The Waratah by Paul Nixon is available from bookshops at Mount Tomah Botanic Garden and Mount Annan Botanic Garden.

The NSW Waratah: significant horticultural advances – still a long way to go

Dr Cathy Offord

Dr Cathy Offord is the Manager of Horticultural Research for the Botanic Gardens Trust, Sydney. She is based at Mount Annan Botanic Garden where she works on the horticulture and conservation of Australian plants. She has more than twenty years experience working with waratahs for cut-flower production and has also developed horticultural techniques for Flannel flowers. Cathy also works on conserving rare and threatened plant species such as Wollemi pine through seedbanking, tissue culture and living plant cultivation.

The New South Wales Waratah, *Telopea speciosissima*, is a large, long-lived shrub or tree that generally grows to about 3 m tall. It may reach 5 m in the absence of fires – however, fires are common in its natural habitat. After a fire waratahs usually regenerate from a 'lignotuber' – a woody swelling of its stem that lies partly or wholly under the ground. Regeneration of waratahs from seeds, which are short-lived in the wild, is a rare event and therefore is considered a secondary reproduction strategy.

The NSW Waratah grows naturally in patches of sandy loam on ridges and plateaus in the Sydney geological basin, the Central and South Coast districts and the Blue Mountains of New South Wales. Waratahs generally flower earlier in warmer areas; therefore coastal populations may flower in August, while mountain populations flower as late as November, the season depending on the spring temperature variations.

Further descriptions of the uses, propagation and cultivation of waratahs can be found in Offord 1996, Nixon 1997 and the Botanic Gardens Trust Website at: www.rbgsyd.nsw.gov.au/plant_info/Plants_for_gardens/Growing_waratahs

Advances in understanding the waratah

In the past twenty years there have been significant advances in our understanding of the biology of this species. Some of these discoveries have resulted in greater productivity in production of waratah cut-flowers. The following sections outline a few examples of breakthroughs in understanding and managing this complex species.

Bract browning – a problem understood, a problem solved

The first of these advances is the understanding of the phenomenon known as 'bract browning'. Work by Amelia Martyn for her PhD at



the University of Sydney has revealed that waratahs are adapted to growing best in around 50% of natural sunlight (Martyn et al., 2007, 2008). In full sun, where traditionally many waratahs are cultivated, the bracts that enfold the waratah flower can become sunburnt, particularly as they expand prior to full opening of the inflorescence. This results in loss of the bracts, or if they are retained, they are unsightly. Many waratah blooms are marred by this problem. Commercially this is a problem as many such blooms are unmarketable, or are considered second-rate and are dumped or sold cheaply, which detracts from the general confidence that consumers have in the product. In recent years, beautiful, unblemished blooms can be purchased, partly as a result of the new range of excellent varieties that are being cultivated, and because some growers are now shading their waratahs at critical times, or in some cases, growing the plants under shade all year.

Propagation – options abound

Waratahs are best propagated vegetatively to reproduce the genotype of the original plant. Semi-hardwood material is often the best material for cuttings and we find that a gel formulation containing IBA at around 3000ppm is optimal for most varieties.

Waratahs can be tissue cultured and we have maintained lines in our lab in culture for many years. One of the tricky things about tissue culture of this species is getting the waratahs from the culture environment back to the glasshouse as a fully functioning plant. This is a common problem, particularly with woody plants. Therefore, the hardening-off of waratahs from tissue culture needs to be very carefully managed, by slowly introducing plantlets to the ex-vitro environment (Offord and Campbell, 1992). The same technology can be applied to other related waratah species such as *Alloxylon flammeum* (Donovan et al., 1999).

Breeding better waratahs

Seedling-grown plants will be quite variable, even if collected from the same plant. Paternity of seeds can be mixed and the inheritance of different genes varies from seed to seed. This can be an advantage when looking for variability that may result in new varieties. With a good understanding of the breeding system of waratahs, we are able to efficiently select parents with desirable characteristics (Offord, 2006, 2007) and produce offspring that may have the improvements that are required. For example, the genetics of breeding for colour is now known (Offord 2006). A red flowering plant, crossed with a white flowering plant, will produce a plant with a pink flower, meaning that the genes for red and white are co-dominant. However, if two pink flowering plants



'Wirrimbirra White' waratah bloom blemished by bract browning
Photo: Cathy Offord © Botanic Gardens Trust



An unblemished 'Wirrimbirra White' waratah bloom grown under shade at Mount Annan Botanic Garden.
Photo: Cathy Offord © Botanic Gardens Trust

are crossed, the resulting plants will have red, pink and white flowering plants in a ratio of 1:2:1, showing that the gene for white is recessive, and a white flowering plant must have two white genes.

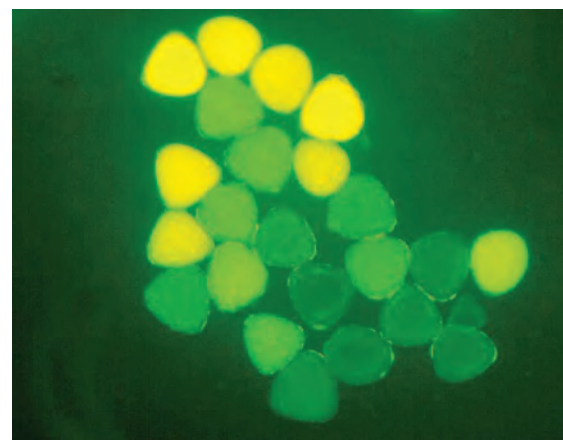
The genetics of inheritance of the flower size, plant vigour and other characteristics may be determined and manipulated in order to target the breeding of a waratah with the desirable characteristics for a particular purpose such as, small long-lasting pink, red or white flowering plants for cut-flower export, or a hardy classic-red waratah for a domestic garden.

The handy thing about breeding *Telopea speciosissima* is that they are self-incompatible, meaning that the plants need to be crossed with another individual to produce fertile seed (Offord, 2004). Therefore it is relatively easy to cross plants and be sure that the offspring is the result of hybridisation of the two parents. The trick in this is to exclude the possibility of cross pollination before the deliberate cross is made. To do this, we bag the flower just before the flowers open.

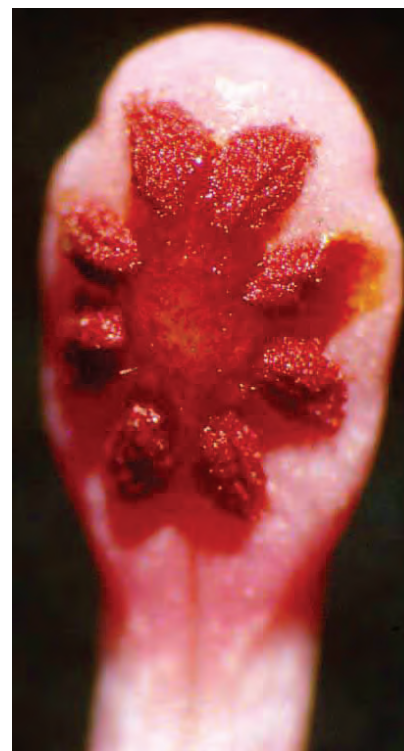
The waratah is a protandrous species, meaning that the pollen sacs shed on to the pollen presenter (the stigma). When the flower is open, the pollen is 'presented' to the pollinator – in nature generally birds searching for nectar, which then transfer the pollen to other plants, depositing cross-pollen on to the stigma in the process. The waratah is, therefore, a relatively easy plant to deliberately hybridise, as one only



Red, white and pink waratahs resulting from a breeding program. Photo: Cathy Offord
© Botanic Gardens Trust



Viability of waratah pollen seen with fluorescent microscopy; viable pollen is brightly fluorescing.
Photo: Amelia Martyn
© Botanic Gardens Trust



A close up of the stigma of *Telopea speciosissima* showing pollen deposited by the anthers.
Photo: Cathy Offord © Botanic Gardens Trust



An individual waratah flower; the anthers have deposited pollen and the corolla is reflexed; the stigma is 'presenting' the pollen for crosspollination by birds.
Photo: Cathy Offord © Botanic Gardens Trust



Making deliberate crosses of the waratah. Note the paper bag which will be replaced over the bloom to avoid bird pollination and removed when pods are evident. Photo: Cathy Offord © Botanic Gardens Trust

has to gently wipe off pollen from the pollen presenter (which has been bagged) and wipe on the donor pollen.

Pollen lasts for some days on the plant, depending on the air temperature, but the stigma is only receptive for a few days, peaking at around two days after the individual flower has opened. Self-pollen that germinates on the stigma is generally arrested before it reaches the ovary, but seeds that have been fertilised with self pollen abort (Offord 2004).

Even better waratahs to come

The following are a few of the areas that need to be explored to further realise the potential of the waratah. The challenge will be to see how quickly and effectively these issues can be resolved.

- Disease control – particularly *Phytophthora cinnamomi* – by a combination of breeding for resistance and better cultural practices
- Grafting to impart vigour and disease resistance.
- Extension of flowering times – breeding and growing plants in different climates
- Plants bred for different environments – further hybridisation with other waratah species
- Pruning for maximum flower production.

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Editor's comments:

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Monga or Braidwood waratah, *Telopea mongaensis*, in the Australian National Botanic Gardens (ANBG)

Paul Carmen

Paul has over 30 years' experience in horticulture, principally in production nurseries and landscape management. He has been employed at the Australian National Botanic Gardens (ANBG) in Canberra since 1989, working for 17 years in the nursery. He is currently employed as the manager of the Collections, Planning and Development Unit and has worked for the Australian Cultivar Registration Authority (ACRA) for 8 years, first as Secretary and as the Registrar since 2008.

Monga or Braidwood waratah (*Telopea mongaensis*) has proven to be the most reliable waratah in the Australian National Botanic Gardens. Most of the plants in the Gardens are now between 20-30 years old and its longevity has been enhanced by the ability to sucker.

This species can produce a spectacular flowering display over an extended period.

Telopea mongaensis is a lignotuberous, multi-branched medium-tolarge shrub with many erect stems. Adult leaves are dark green, 50-160mm long by 5-20mm wide. Flower heads are red to dark red, terminal, 60-110mm in diameter, open and loosely arranged with pink and/or green involucral bracts. Flowering begins in October and may extend to December depending on the district, aspect and seasonal climatic conditions.

T. mongaensis grows in the margins of temperate rainforests and extends to dry sclerophyll forest often along the edge of streams and sometimes occurs further up the slopes between 540-760 metres altitude on the escarpment from Monga (near Braidwood) to the Southern Highlands (Barren Grounds and Moss Vale).

The ANBG collection includes a good representation of taxa from across the geographical range of this species from Monga in the south to Moss Vale in the Southern Highlands. Individual plants are generally 2-3 metres in diameter, and usually moderately open multibranched shrubs. Most of the plants are very long-lived and are in the range of 20-30 years and a few are 40! The majority of plants in the Gardens have been grown from seed, although some collections have been successfully reproduced from cuttings using a hardwood rooting hormone.



The flowers and plant of *Telopea mongaensis*.
Photos: © M. Fagg, ANBG



Examples of *T. mongaensis* can be found in the family *Proteaceae* taxonomic thematic sections in the Gardens.

The other advantage that *Telopea mongaensis* has is that it is far more adaptable to cultivation conditions than *T. speciosissima* and will grow well in both sandy and clay soils, in shade or moderately sunny locations. It is also hardy to frost up to -6°C and more (in Canberra). The combination of the hardiness character and its multi-stemmed form has made this species a good candidate for hybridisation, with the best known cultivar being *T.* 'Braidwood Brilliant'.



Telopea 'Braidwood Brilliant' Photo: © M. D. Crisp, ANBG

Telopea 'Braidwood Brilliant' has become one of the iconic cultivars of the Australian National Botanic Gardens. The first plantings of *Telopea* 'Braidwood Brilliant' were made in the early 1970s. With masses of bright cherry-red flowers in mid-October, this popular cultivar continues to be a key feature of the ANBG's spring floral display.

It is one of the first truly Australian bred cultivars, having been a selection from the hybridisation of *Telopea mongaensis* R. Br. and *T. speciosissima* Cheel. Dr Robert W Boden (Director of the ANBG from 1979-1989) carried out the work at the Research Section of the Canberra Botanic Gardens in 1962.

Telopea 'Braidwood Brilliant' was registered by the Australian Cultivar Registration Authority in November 1974 and in 1992 was released by the ANBG to the Proteaflora Nursery in Monbulk, Victoria which has marketed the cultivar to all parts of Australia.

Telopea 'Braidwood Brilliant' is a large upright and compact glabrous shrub which grows to about 2 metres in diameter. The leaves are 150-200mm in length, coriaceous, narrow and cuneate, tapering from a long petiole and the margin is slightly undulating but is distinctly toothed at the top.



Plant and flowers of *Telopea* 'Braidwood Brilliant' Photo: © M. D. Crisp, ANBG



The Gippsland waratah, *Telopea oreades*

James Turner; Photos: N. Hansen.

James has always had a keen interest in native plants, in particular the distribution and conservation of rare species. He has discovered several new records for Victoria and is a life member of the Bairnsdale Field Naturalist Club.

The Victorian member of the genus *Telopea*, although not as showy as the NSW species, is none the less spectacular in its own right.

It is a small to medium size tree, growing 10 to 12 metres in height, with dark dull green oblanceolate leaves up to 30cm long, with compact, flattish, brilliant red flower heads to about 10cm across that appear in late spring, continuing to early summer, at higher altitudes. A very rare white flowered form has also been recorded.

The timber is said to be close-grained and very hard and takes a beautiful polish. In the early days, it was used for making picture frames.

The species favours deep, moist loam soils in wet sclerophyll forest, to cool temperate rain forests and extending to warm temperate rainforest in a few places in the higher rainfall rangers and moist gullies, east of the Snowy River. It extends to similar sites in near-coastal Southern NSW.

To see a medium sized tree in full flower is a magnificent sight. The brilliant red flowers stand out against the dark green of the rain forest.

I was first introduced to the Gippsland waratah back in the 1970s when on a field excursion to the wet sclerophyll forests beyond Murrungowar. Here in the deep rich soils, it extends into the cool temperate rainforest of the Arte River, growing with Silver Wattle, *Acacia dealbata*, Black Oliveberry



Telopea oreades

Elaeocarpus holopetalus, Southern Sassafras *Atherosperma moschatum*, Musk Daisy-bush *Olearia argophylla*, Banyalla *Pittosporum bicolor*, plus a wide variety of ground ferns and tree ferns. All are growing as understorey to towering Messmate *Eucalyptus obliqua* and Mountain Grey-gum *Eucalyptus cypellocarpa*.

Its home could be said to be the Erinnundera Plateau where it is widespread. The overstorey in this area is mainly Shining Gum, *Eucalyptus denticulata* and Cut-tail, *Eucalyptus fastigata*.

Another easy place to see waratahs would be along the Bonang Road in the Martins creek area where there a number of fine specimens. Here they are mostly upstream of, and merging with, warm temperate rainforest.

At this site the dominate species are Lilly-pilly *Syzygium smithii* and Blackwood *Acacia melanoxylon*. Or, if they should be finished flowering here, you could continue on to along the road to Bendock at a higher altitude, where they are not hard to find.



Telopea oreades



The white-flowered form of *Telopea oreades* 'Errindundra White'
© Australian National Botanic Gardens

Unless you live in cool mountain area, or can emulate a cool moist site with deep loam, the growing of Gippsland Waratah in the home garden is likely to meet with limited success.

Often they can be established for a few years and then succumb during a hot summer.

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The Tasmanian Waratah, *Telopea truncata*

Article and photos by Dick Burns

Dick is a Life Member of the Australian Plants Society Tasmania Inc. He is also Curator for the Tasmanian Section of the Tasmanian Arboretum. Dick's enormous contribution to the objectives of the Australian Native Plants Society (Australia) (ANPSA) was recognised when he was a recipient of the Australian Plants Award at the 2007 Newcastle Conference.

Red is an uncommon flower colour in Tasmania, where white and yellow predominate, hence the startling effect of domed bushes or trees covered in the bright scarlet blooms of waratahs, from late spring into summer. Compared to the New South Wales species, the sheer mass of flowers covering plants of Tasmanian waratah more than compensates for the smaller flower size.



Telopea truncata, Tasmanian waratah

Description

Along with other species of *Telopea* known at the time, *T. truncata* was briefly described in *Australian Plants*, volume 1, number 1 by J. L. Willis, reprinted in volume 14, number 114. Alan Gray wrote an article for volume 5 number 39 – the front page of that issue was graced by a photo of the species taken by the great Frank Hurley. The same photo

had been used in volume 1 on p16 and it is worth noting that photo in one of the illustrations of the species recommended as representative of the species by *Flora of Australia* (volume 16, p389).

The Tasmanian waratah generally grows, with a lignotuber, as a tall multi-stemmed, multi-branched shrub to 3 m, but occasionally reaches single-stemmed tree stature, up to 8 m. I can recall such a tree hanging out over the King River (unfortunately now lost to a hydroelectric scheme). The timber is typically proteaceous, with the silky rippling highlighted in the furniture made from silky oak, *Grevillea robusta*.



The timber of the Tasmanian waratah

Young branches are stout and covered with rusty brown hairs that disappear with age. Leaves are smaller than those of other waratah species, 3-14 cm long and 5-22 cm wide. Adult leaves have a narrow obovate to spatulate shape and may have a slight lateral curve. Leaves on young plants sometimes have a few irregular lobes near the tip. Most leaves are entire with margins recurved. The tip ranges from being blunt to acute-angled. The upper surface of leaves is deep green and somewhat dull, where the underside is lighter coloured, often with rusty-coloured hairs.

Flower heads are generally a striking scarlet to deep crimson. They lack conspicuous bracts at their base and are generally smaller than other species, from 3.5 to 6 cm across. The individual flowers have the typical

Telopea structure, with a silky sheen rather than the glossy appearance of some mainland species. Flowers are nectar-rich but lack a perfume. The 15 to 20 flowers mature simultaneously.

Seeds are formed in follicles similar to other species but 3.5 to 6.5 cm long. Each fruit splits to release the winged seeds once it has ripened, turning woody and brown.



Flowers and fruits of *T. truncata*



Flower colour does vary occasionally. The most often-reported colour variation is the citron-yellow form, first mentioned in *Australian Plants* as coming from the garden of the late Essie Huxley. Isolated bushes have been found growing in a number of sites scattered through the State. One bush was once obvious along the Overland Track, but the last time I went past it had disappeared behind a standard red bush, a combination of vigorous growth by one and occasional pruning of the odd-coloured plant. There is one valley north of Queenstown that in flowering season seems to have nothing but waratahs growing and among the sea of red, the occasional yellow tree stands out. In the valley, other colours can be found, including pink or tending-into-peach. One plant at the Tasmanian Arboretum is, I have been told, pink and cream, but it has not flowered yet.



Yellow form of *T. truncata*

Tasmanian waratah grows readily from seed, but to be sure of obtaining the desired flower colour, propagation from cuttings is essential. Plants grown from seed from yellow forms yield mostly red flowers.

In the valley near Queenstown, I found one bush with fasciated stems, so that about four flower heads were clustered together. Cuttings did strike, but failed to grow on.



T. truncata, pink form



View of trees of red and yellow blooms in the valley of waratahs, north of Queenstown, Tasmania.



Telopea truncata, fasciated growth

I have never met anyone who has seen a white coloured waratah, although Dr Curtis lists this colour. There is a proteaceous plant with the common name “white waratah”, *Agastachys odorata*. Within Proteaceae, *Agastachys* is only distantly related to *Telopea*. Its much smaller flowers are white to cream, perfumed and formed in spikes.

Fruits are small one-seeded nuts. Leaves are of similar shape to *Telopea* but smaller. These spikes are often crowded towards the tip of the branch forming a large head. This may be the reason for the common name.

The Naming

Jacques-Julien Houtou de Labillardière (1755–1834) collected specimens while in Van Diemen’s Land, probably from the expedition’s base in Recherche Bay in 1792-93. He described it as *Embothrium truncatum* in his major publication on the voyage, *Novae Hollandiae Plantarum* volume 1 (1804). In 1801, Robert Brown assigned it to this newly named genus *Telopea*. In Latin, ‘truncatus’ means cut off straight or ending abruptly and it is believed that Labillardiere was referring to the straight end of the wing on the seeds of the species.

The suggestion made in Paul Nixon’s *The Waratah* (page 30) that the species epithet comes from Tasmania’s being cut off from the mainland seems unlikely. Although the species name was published in 1804, Labillardière was in Van Diemen’s Land some seven years before Bass Strait was discovered by Bass and Flinders during their voyage of 1798-99. Another suggestion put forward by Nixon is that the flower head appears flattened. The genus *Embothrium* was described by Johann Forster, father and son, in 1775 and *Telopea speciosissima* was growing in England by 1789, with James Edward Smith describing it in 1793. Labillardière may have been able to compare the two species.

A northern tributary of the Leven River is Tulip Tree Creek, named probably for the waratahs found there. The first mining town established on the West Coast of Tasmania was Waratah.

Growing conditions

The Tasmanian waratah is more common on richer soils, particularly those derived from dolerite. However, I do know of a 25-year old specimen growing happily on river alluvium in Ulverstone and the ten or so specimens in the Tasmanian Arboretum collection are vigorous on old, impoverished clay. I was once told that when people used to take plants from the wild, they used to put a rock from near the source under the transplanted waratah; I assume this would have provided the young plant with the required mycorrhizal fungi.

Distribution

Populations of Tasmanian Waratah are scattered throughout the main island, generally in montane eucalypt forests, occasionally in montane heath or rainforest, preferring moister conditions. One location of note is above the 300 m sea cliffs of the far south east towards Tasman Island, where it grows in wetter forests and tangled with *Bauera* and Silver Banksia in the Cape Pillar Scrub. (See A Flora of Isolation in Australian Plants vol 22 pp 211-14, 227-30.)

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Proteafloa's Shady Lady Waratahs

David Mathews; Photos: Proteafloa, unless specified otherwise.

David Mathews is Managing Director of Proteafloa Nursery and is a specialist grower of Australian and South African Proteaceae in Australia. He has been involved with the nursery production of Protea for over 30 years and has been responsible for the introduction and commercialisation of many new varieties.

The Shady Lady® Series began in the mid 1980s with the launch of the hardy hybrid 'Red' Waratah. At the time there was little published information on nursery production of *Telopea* and there was a common belief that they were difficult to grow and not suited to most home gardens. The idea behind the series was to introduce a range of Waratahs that would be widely available to gardeners and that would give them success. The first in the series was 'Red', a *Telopea speciosissima* x *oreades* and the result of a chance find and then extensive trialling by Proteafloa. It proved to be really tough and a great flowerer.

The next milestone for the series was the release of Wirrimbirra White, a very rare white form of *Telopea speciosissima*, as Shady Lady® White. Proteafloa worked with the Australian National Botanic Gardens to source propagation material from their specimen plants and establish a core of stock plants needed for commercial propagation. Our program has ensured that this very rare plant is widely available and unlikely to be lost.

Proteafloa had also begun a breeding program looking to use the genetics of the 'Red' to create a superior flower and to develop a Pink by crossing the 'White' and 'Red'. The results were spectacular with Shady Lady® 'Crimson' and 'Pink' being released. These selections were also welcomed by the cut flower industry.

The final addition needed for the range was a 'Yellow'. We knew that a yellow *Telopea* had been seen in Tasmania but was very rare so we were really excited when we learnt that plant breeder Dr Graeme Downe was developing a 'Yellow' variety. The outcome was a hybridised waratah which we commercially released as Shady Lady® 'Yellow', the first yellow Waratah to be publicly available and the first release from Dr Downe's 20 year breeding program.

From the same program we selected a new 'White' which is much easier to grow, flowers more readily, is a clearer white and has a more robust flower head - marvellous for both gardeners and flower growers. So this new selection has now replaced the original Wirrimbirra White.



Shady Lady® Red
Photo: Eliza Arrowsmith



Shady Lady® Yellow



Shady Lady® Pink



Shady Lady® Crimson



Shady Lady® White

Although the first intention of the Shady Lady® program was to develop plants for gardeners, the range of colours now available has widened the commercial market, superior growing characteristics have improved returns for growers and the promotion around the series has raised public interest.

Cultivation

The Shady Lady® selections make growing Waratahs in gardens much easier. Here are some tips to further help:

Position – a cooler area is preferred and as the name suggests, shade for part of the day is an advantage, but not essential. Avoid direct exposure to coastal winds.

Soil – well-drained, acidic soil with a pH of 5.5 is ideal. Slightly heavier soils with some clay content are preferred. Sandy soils need to be improved with organic matter.

Mulch – protect the surface root system with an organic mulch such as straw, composted pine bark or leaves.

Watering – these plants do most of their growing in spring and early Summer. For strong growth it is important to keep the moisture up to them during this time. Once established they are well adapted to drought.

Humidity - high summer humidity is tolerated but not essential.

Temperature - they prefer a range between 0 and 35 degrees Celsius but will tolerate about 5 degrees variation either side of this. Severe frost may damage the flower buds or burn the open flowers.

Nutrition – unlike some other members of the Protea family, Shady Lady® Waratahs respond well to blood and bone fertiliser and general native formulations. Apply in mid-spring just after flowering.

Container Growing – although these are tall plants they do surprisingly well in large containers (half-wine barrel size). Containers are a great option where the ground conditions aren't right. The 'Red' does particularly well. Just a few things to remember: use a potting mix formulated for natives, apply a native fertiliser, ideally a controlled release product, water daily in the drier months and prune to the shape you want. In hotter regions, positioning your plant to get protection from the direct afternoon sun will improve growth.

The Waratah is one of Australia's most spectacular wild flower groups. It is a member of the Protea family, the genus is *Telopea* and there are 5 species – *speciosissima* (NSW waratah), *aspera* (Gibraltar waratah), *oreades* (Gippsland waratah), *mongaensis* (Braidwood waratah) and *truncata* (Tasmanian waratah). There are significant differences between the species but it would appear that they are compatible for breeding which means there is great scope to continue to improve and diversify the Shady Lady® range.



Pests and Diseases of Waratahs

Peter Olde and Gordon Meiklejohn

Gordon Meiklejohn is a member of the Macarthur Group and a commercial grower of waratahs at Oakdale, New South Wales.

There are three above-ground pests and diseases that need to be considered in any discussion about waratahs.

1. Scale. By far the worst and most difficult to control is scale and its close relative, the mealy bug. Mealy bug can also infest the soil and attack the roots. Scale mainly attacks unhealthy or stressed plants but when it gets a hold, can be extremely difficult to remove, even for its natural predator, lady bugs and their larvae. The species *Chilocorus circumdatus* is sold commercially in two forms, *Chilocorus* red and *Chilocorus* blue for this purpose. Lady bugs have a short life-cycle but can build quickly and are voracious. The parasitic wasps *Aphytis* spp., *Comperiella* spp. and Green lacewings *Mallada signata* are other natural enemies of scale insects.

The most common and devastating scales on waratahs are mussel scale, oyster scale and macadamia white scale. These can build up in prodigious numbers on the underside of the leaves. If untreated, they can infest a whole plantation. Because scale is a sucking insect that derives its food from the sap of the plant, it will gradually weaken and can eventually kill the host plant. It will also cause disfigured flowers and distorted foliage. Lady bug larvae cannot deal with large infestations quickly, so scale must be controlled and reduced first by low toxicity chemicals such as white oil which, when mixed with an insecticide such as Procide or Confidor, can be extremely effective, though the insecticide will also kill the beneficials. Insecticidal additives should be altered at each alternate application to prevent resistance. Eco oil, which is safe to beneficial insects, is an excellent alternative. It is a mixture of canola, tea-tree and eucalyptus oil and when diluted, is economical and relatively effective. You can also make your own quite cheaply using canola oil from the pantry. Add some garlic or pyrethrum concentrate to it and a little detergent to act as a surfactant and bleach to act as a steriliser. This concentrate should be diluted with water at a rate of 50:1 - 1 tablespoon to a litre of water. It would be wise to test it before you use it however on an area or lawn or weed lest you have unintentionally made an effective weedicide. White oil suffocates scale but can burn plants in summer and so should be applied in other seasons. Never apply in temperatures above 25°C. Late afternoon or

early evening is the best time. It is important to spray not only both sides of the leaf but also the stem and the mulch at the base of the plant. Repeat spray at first sign of reinfestation but at a minimum within 14–28 days for improved effectiveness or complete eradication. It can sometimes be difficult to determine the kill rate because dead scale will remain on the leaf. It can be rubbed off easily whereas living scale is more persistent and difficult to remove.

No discussion about scale is complete without a discussion about ants. Some species of ant have a symbiotic relationship with scale insects, especially coccid scales. They protect and farm them, replace them with eggs stored in their nests and spread them around the plants that they are known to like. They hide them in crevices when under attack from physical removal and attack natural predators. In return, they obtain a supply of nectar exuded by the scale and to which they are apparently addicted. They can be deterred on the ground by the use of products like Antex or other commercial deterrents. Another technique is to coat the base of the plant with a sticky substance such as a silica areogel mixed with pyrethrum, or wrap it with plastic and coat with grease. Do not apply grease direct. A sticky paper, like fly paper or some modification thereof, could perhaps be used but will need regular replacement. Remember too that the plant must be isolated from its surroundings because ants easily make bridges from other plants that touch leaves. The best method is to find and attack the ants at their nest, usually with boiling water in large quantities. Add chilli, lemon/vinegar and/or epsom salts to the water. Any treatment is likely to be temporary owing to the adaptive nature of ants.

Once ants are removed, an alternative management method of scale control is to hard-prune or stump each plant in autumn, remove all cut foliage and burn, and await the emergence of clean new growth which must then be managed carefully. Removing and replacing the mulch at the same time is also recommended. Cold winters are a natural form of insect control but are not available to all, nor always very effective against scale.

2. The Macadamia twig girdler. (Waratah bud and stem borer) *Xylorycta luteotactella* is a boring grub that penetrates the inflorescences and stems. It ruins the flower head and so weakens affected stems that they can break under low pressure. It can be controlled by the application of carbaryl, though this might also be harmful to parasitic wasps that prey on the grub-like larvae. The moth stage is the most dangerous phase of the insect's life-cycle. Rajakulendran (2009) has discovered that the moth lays its eggs when the ambient night temperature exceeds



10°C in mid-December and throughout February. The eggs are laid at the base of a developing bud or on a young stem and the emergent grub quickly bores in after hatching. Of the insecticides tested, *Bacillus thuringiensis* (commonly known as Bt) and Spinosad are considered to be the least harmful to the environment and have shown good efficacy. They must be sprayed prophylactically during the active phase of the moth to achieve success.



Top left: A fully matured larva
Above: A pre-pupa inside the stem
Left: A young larva feeding on the surface covered by webbing and frass.

Photos: Lowan Turton NSW Department of Industry and Investment

3. The Macadamia leaf miner. *Acocercops chionsema* is a small caterpillar that burrows into the leaf leaving tell-tale trails in the epidermis. It can be controlled with a systemic insecticide like rogor but mainly affects the resale value of cut flowers. It is not a serious pest of the home gardener.

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