



Isopogon & Petrophile *Study Group*

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Isopogon baxteri R. Br., detail, original botanical painting by Margaret Pieroni.
See our profile of this species in this issue.

Back issues of the *Isopogon & Petrophile Study Group Newsletter* are available at
<http://anpsa.org.au/iso-petSG/IPSG-news.html>

Exchanging cuttings & seed

This is a way to share propagation material between study group members. All States apart from Western Australia allow cuttings to be mailed from NSW. If you would like to be sent cuttings/seed, here are the steps (may vary for seed-only requests):

1. Email us to check that material is currently available. (isopetstudygroup@gmail.com).
2. Once availability is confirmed, purchase an **EXPRESS POST** satchel from Australia Post (Small \$11.95 or Medium \$15.70), self-address it, put in an envelope and send to:
**Isopogon & Petrophile Study Group
PO Box 291
ULLADULLA NSW 2539**
3. We will then package up your cuttings/seed and send it back to you **Express Post**.
4. An email will be sent to you on the day the package is mailed so that you can be ready to propagate as soon as the parcel arrives!

Species currently available are:

Isopogon – anethifolius, anemonifolius (1.5m shrub, 0.3m shrub), adenanthoides, axillaris, buxifolius var buxifolius, ‘Coaldale Cracker’, cuneatus (shrub and dwarf coastal form), dawsonii, divergens, dubius, fletcheri, formosus, gardneri*divergens, latifolius, latifolius (low), linearis, mnoraifolius, nutans, scabriusculus ssp. stenophyllus, spathulatus, trilobus, ‘Stuckeys Hybrid’

Petrophile – pedunculata, pulchella, recurva, serruriae, sessilis, shirleyae

We need to expand the available species list to include all species growing in members' gardens. If you can provide material from other species please let us know so we can add them to the list.

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Dear members

With the end of La Nina now declared, our I & Ps have come through this weather phenomenon with mixed results. Here on the NSW South Coast we have followed up our record 2020 rainfall (2009 mm) with a very wet summer/autumn. Already we have had 670mm for 2021 and not surprisingly some plants are very unhappy with the long-term waterlogging they have been subjected to. Our main isopogon casualties have been *I. anethifolius* plants and any remaining grafted plants on this rootstock. *I. anethifolius* appears much happier in drier, more free-draining soils than those we can provide at the moment. In contrast, grafts on *I. 'Coaldale Cracker'* are thriving, even when submerged for a couple of days as has happened a couple of times this year.

Our eastern petrophiles have handled the conditions ok with no losses so far. And our dozen or so (still young) grafted WA petrophiles have also survived intact, all putting on amazing growth through the warm, wet conditions. Most of these are grafted onto *P. pulchella* with a couple on *P. shirleyae*. Some of these have grown to a size where we can provide cutting material to members.



All the rain has been wonderful for species trying to re-establish after the big fires of summer 2019-20. We haven't received any reports on regeneration recently but our own observations continue to be encouraging, particularly for the reseeder species killed by fire. Last spring the seedling production of some of these species appeared to be rather patchy despite good rains but it's good to report we've seen more seedlings near killed parents of *I. anethifolius* in two locations in Morton National Park, and *P. pulchella* (near Nowra), and particularly prolific reseedling of *P. sessilis* at Boyds Lookout (Morton NP). We have not, however, spotted any of the resprouters producing any new seedlings, which is important for maintaining populations in the long-term. Existing plants have all recovered very quickly. Of these, *P. canescens* was relatively slow last spring but was putting on excellent growth in the Gibraltar Range National Park (between Grafton and Glen Innes, NSW) in December 2020 (see photo, left). We hope to observe good regeneration after the 2019 fires in WA when we visit the Stirling Ranges later this year.

It's an exciting time for growers of isopogons and petrophiles. With the good rain many species are really budded up ready to explode into flower over the next few months. We have already noticed our banksia species currently in full flower are providing their best display ever. Our *Isopogon cuneatus* plants are already starting to flower. All our *Isopogon latifolius* plants have masses of large prominent flower buds set to emerge in early spring. We have noted before that this species can be reluctant to flower so regular doses of sulphate of potash will be applied to ensure flowers appear.

Now is a great time to put down some isopogon and petrophile cuttings, so please let us know what you would like to try. Check out our expanding list of available species (see [Exchanging cuttings & seed](#)). Even if you struggle to grow some of these species in the ground, many are perfect candidates as container plants.

Yes, autumn is an interesting season for us isophiles. Did you know there's actually an isopogon called the Autumn Isopogon? It's one of the few to specialise in flowering in autumn. You are excused for not knowing as it's only just been given this name. See our article on the intriguing detective work which went into resolving one of the oldest mysteries in the *Isopogon* genus. As we go into winter, you'll want to know more about cold tolerance so check out what grows well in the chilly inland climes of Binnaway NSW (check out Anthony O'Halloran's photos, he's a talented photographer). And for more on the importance of accurate names, we look at what coneflowers, as we sometimes commonly call isopogons, really are.

In this issue we also look at recent research on ants as possible pollinators in proteaceae, a fascinating insight into what might affect the germination of pollen grains. It raises many interesting questions applicable to isopogons and petrophiles, and yet again highlights how little we know about pollination in these genera. On that subject, some of us have spotted insect visitors which may be pollinators, see the results in [Pollinator Patrol](#). It's important for us all to have cameras at the ready to record insect visitors so we can document their identity, the range of species, and other factors like timing and weather conditions.

If like us you've been pining for a dose of WA and its fabulous flora during Covid, you'll enjoy Don Williams' account of Corona in the wildflowers in this issue. Regional WA has been inundated with local WA tourists for the past year, so let's hope there's still plenty of space for easterners too. It should be a good season this year with Don & Joy reporting good rain north of Perth at Badgingarra. Hopefully the cyclone which recently cut a swathe through the middle of the state has not done too much damage to the local flora.

Our profiles this issue are both fairly well-known WA species first collected for science by William Baxter in the 1820s. *Isopogon baxteri* and *Petrophile ericifolia* are compact, ornamental species we should all try to grow. They're relatively easy to find in the wild too, so look out for them next time you're in WA.

We are planning to do some field research on isopogons and petrophiles in their heartland of Western Australia later this year, all things going well. A priority for this trip will be studying the differences between the various short-terete leaved petrophile species. *Petrophile ericifolia* is the best known of these to gardeners and we profile this delightful plant in this newsletter. But there are several other very similar species which even us so called experts struggle to tell one from the other. Hopefully this trip will clarify this group, so that we can provide a detailed explanation for the next issue.

Look out for the next issue of the APS national quarterly journal *Australian Plants* due to be published around July this year. It's devoted entirely to isopogons and petrophiles. We're working on it right now.

Catriona & Phil

From our members

Gerard Satherley, Central Coast, NSW

I retired early from a science/admin background for a major food manufacturer. Until recently my main leisure activity has been wildlife/nature photography ([website](#)). However recent events have refocused my attention on gardening. Though a passionate native gardener for 40 years it was a springtime trip to Western Australia that sold me on Isopogons and Petrophiles. I have tried to grow some of the Western species on their own roots with only *I. formosus* showing some resilience to the area's high humidity. Pot culture has improved their survival rate, however after some success with Grevillea and Eremophila grafting I am keen to try grafting Isopogons and Petrophiles.



My small number of Isopogons in the garden and pots all survived the recent big wet. Above, *I. cuneatus*, and left, *I. dawsonii*.

I have only ventured into the edge of the Gospers Mountain fire at Bucketty on one occasion and there was abundant regrowth of *I. anemonifolius*.

Lisa Godden, southern Sydney NSW

Since moving next door to the Royal National Park, Sydney, a couple of years ago I've been inspired to overhaul our gardens to native plants. You could say it's been a steep learning curve with a few casualties. At some stage *I. anemonifolius* flowering in the RNP caught my eye, so I decided to try growing similar at home and now have not just *I. anemonifolius* (dwarf & regular) but a few other west coast Isopogons in pots;

formosus (grey), Candy Cones, cuneatus and latifolius is the latest addition. Aside from the odd short back and sides from our garden vandals (aka sulphur crested cockatoos) they seem to be doing well so far and have plenty of buds forming. So far my favourite, just for the foliage, is the grey leaf formosus. I started 2 of these from tube stock and they've gone gangbusters. Candy Cones didn't enjoy some of the scorching days and got a little crisp but is coming good now. So far I haven't ventured into propagation, but maybe I'll try at some stage. Hope to have some good photos of the plants flowering for the next newsletter. As an aside, I noticed a few *I. anemonifolius* flowering in the RNP back in Feb, which seems extremely early? (see photo, below left) *They do tend to flower in autumn as well as spring.*



...[I'm] looking forward to learning more. My plants also seem to have lots of buds forming. Out of interest, is brown buds on *I. cuneatus* normal? (see photo, above right) They've been forming for a while but they just look a bit.. lifeless. I can't imagine how they'll turn into gorgeous pink flowers but I'm hoping to be surprised! *The brown buds are perfectly normal. Expect them to burst into flower shortly!*

Rhonda Daniels, Sydney NSW

I don't have anything to contribute other than to note that *I. formosus* growing in my mother's Sutherland garden on thin sandy soil has put on a LOT of foliage growth recently with all our rain. I almost didn't recognise the plant it was so lush.

Paul Kennedy, Elliminyt, VIC

Nothing great to report over the past four months. We have had a remarkable cool and wet summer which has been great for plant growth. The rainfall in January was 125mm but very little rain in February and March. *Isopogon dawsonii* and *trilobus* have had some flowers on them in February/March which may have been triggered by the January rains. There are three *Isopogons/Petrophiles* that I have grown from old seed and are only 500mm high at present, but I am hopeful they may flower later in the year and help me identify the species. I have pruned the *Isopogon formosus* bush again but it now spread out to be a metre square and 1.2m high.

Mike Beamish, Boolarra, VIC

Still no droughts here! 1093mm in the gauge for 2020, fairly evenly spread over the whole year. To March 31 this year 218.5mm has fallen, though for a 5 week period in late February and early March, virtually none. It didn't get overly warm during this period though, so I have not needed additional water in the native garden this summer, only in the veges and the pots. Still only one iso-pet in the garden now; the *I. anethifolius* in the

bottomless tub is looking good, though its companions are looking poorly (The Yam Daisies are senescing at this time of year, but have produced heaps of seeds for the next generation, and the Golden Grevillea has lost most of its leaves, probably a caterpillar that I haven't been able to track down yet). All the Petrophile seedlings I had did not survive. Recently I found a thriving *P. pulchella* in a friend's garden in Churchill, so acquired some fresh seed that I have just sown. Hopefully some of the 90-odd seeds will germinate for me, last time I tried I had about a 10% germination rate. I still have a few batches of 5 year old seed from a trip to WA in 2016, I'll sow these as well but don't hold much hope that they are still viable.

Kevin Collins, Mount Barker WA

Only had one loss, that of a *P. brevifolia*. Others are budding up. *I. scabriusculus* went backwards after flowering but is recovering. Not been out to the Stirling's recently but will monitor regrowth after the fire next visit.

Re: *I. baxteri*.

1. The small population of 3 plants in Mondurup Reserve did not regenerate at all after the prescribed burn 2 years back.
2. Found some nice plants on a laterite ridge within view of the coast at a friend's wildflower farm coastal side of Wellstead. See pic of plant (right). At this site there were several *I* & *P*s but we were touring on dark and didn't have time to check them out. Certainly a location to take you to. There is an outlier of *I. latifolius* at this location which appears to be slightly different to the Stirling's form and plenty of *P. diversifolia* & *P. divaricata*? & I'm sure others.



I popped in a couple of cuttings of *I. baxteri*, a week back, but they have very hairy stems which usually means "Impossible" or very difficult. We also mulched some old cone collections and seeded up in nursery trays. Not a single one has come up after 6 weeks. I am now going to try others mulched and direct seeded in the paddock. Part of my shed and old collections cleanup. May apply smoke water treatment on these.? Do you have any data on old *I* & *P* seed germination. The only ones I've grown from seed were very fresh collected. *Confirms many member reports that fresh seed is vital for good germination, but see Paul Kennedy's comment above.*



Marjorie Apthorpe, Currowan NSW

Several of my *Isopogons* died immediately after the fire, and I don't have much progress to report at Currowan (south coast NSW). My *Isopogon formosus* planted under a *Pittosporum* tree has enjoyed the cooler wetter summer, and has put on a lot of branches reaching sideways towards the sun. See picture (left). I have struck several cuttings which are growing vigorously. My *Isopogon anethifolius*, grown from seed, has put on lots of new branches and is about 1.5 m high.

Liesbeth Uijtewaal, The Netherlands

Nov 2020: I or P ID please... It was taken back in 2005, Oct 9th to be precise, near Tenterden. It would be lovely to put the right name to it! Thanks a lot in advance. *Looks the same as one of our plants which is currently flowering [as at 8 November]. We think it is a prostrate form of I. longifolius.*



Dec 2020: lovely surprises in the nursery to keep me happy! One root on *P. fastigiata* last week, on one of two pieces I propagated in September. They both still look very happy. One cutting graft (of 5) *I. cuneatus* on *I. formosus* has taken for sure. It may have been the wrong time of year since the *formosus* stocks are very reluctant to strike roots. Two did, after a fair while. The other combi's are still sitting quietly in the propagator.

Jan 2021: A couple of weeks ago one of the two *P. teretifolia* cuttings, propagated Sep 19th, struck that many roots that I already potted it up. So, things are going well here. ...By the way, just the one *P. fastigiata* struck roots, the other one, looking exactly the same as the first one, only produced a bit of callus and I put it back into the propagator. I just don't understand why the one should produce roots whereas the other one doesn't???? At least I've got a back-up plant now.



Mar 2021: Lovely surprise this morning: the first *P. serruriae* (yellow) germinated. ... ordered two lots (pink and yellow, 10 and 6 grams respectively) from Nindethana in November last year, keeping our fingers crossed the seeds wouldn't be too old. I planted them 4 weeks ago and was so pleased to find the first rootlet today! Hoping there'll be more to come. *Note the pink form of P. serruriae has been renamed P. axillaris.*

Isopogon scabriusculus ssp. *stenophyllus* from your garden is an absolutely wonderful plant. It is such a neat shape and it produces loads of flower heads, I absolutely love it. I've got some cuttings in the propagator at the moment, I do need back-ups of this one! (see photo, left)...There's a second cutting graft of *I. cuneatus* on *formosus* showing some growth.

I'm enjoying lovely spring weather and the plants in the glasshouses are enjoying it as well. *Petrophile fastigiata* was budding up heavily but like two years ago, when all promising buds turned into new foliage, it happens a lot too this year even though there still are buds that will turn into flowers. Last year all buds developed flowers. So strange, I wonder why this is???

Apr 2021: Found a lovely surprise in the propagator some days ago: at least one of the four *Isopogon scabriusculus* var *stenophyllus* I propagated on March 12th struck roots after 1 day in the fridge and 17 days in the propagator! All cuttings seem promising. Spring must be a good time for propagating even though it was hard to find stems without buds at the end.



Here's the promised pic of my *P. ericifolia* (left). I wish it had come out nicer but it hasn't. The flower buds haven't developed much since I took the pic a couple of weeks ago. Just for fun I added a pic of my *I. scabriusculus*, the same age. It's one of my favourites! (see photo previous page)

[You ask, does *P. ericifolia*] strike quite easily? There are plants that are easier to propagate but it's doable. I described my method before, e.g. for the previous newsletter. In 2019 I propagated 5 pieces end of September (=late summer), 3 struck roots in two months. Previously, in 2017, I took cuttings in Australia in October, propagated 13 pieces, 1 struck - in two months' time as well. That's the one in the pic. From this one might conclude that cuttings taken end of summer might be more successful but then again, cuttings taken from a plant grown under lower light conditions (Netherlands) might give better results too, keeping in mind that cuttings taken from the shaded side of a bush also give better strike rates.

The role of ants as pollinators

Catriona Bate

We have observed ants visiting isopogon and petrophile plants. So little is known about pollination in both genera that we take special interest in any animal visitors. Plant pollinator interaction is one of the first things to understand if we want to save our flowering plant species.

We know that isopogons and petrophiles are insect pollinated (for example, by native bees or hoverflies) rather than by birds or mammals. Their flowers do not produce any obvious scent and they offer no nectar reward although their pollen is an important source of protein for insect visitors. By holding pollen outside the flower on a relatively large presenter these genera make their pollen highly accessible, able to be easily picked up by even accidental visitors.



Ants visiting Petrophile rigida, Bremer Bay WA, October 2017

In Australia, ants are not among the top five native pollinating superheroes (native bees, flying foxes, flies and butterflies, moths, and birds). Ants are considered to be poor plant pollinators although they can play an important role in seed dispersal. Being wingless, they must crawl to each flower to reach their reward. They are also commonly smaller than the reproductive structures of flowers. Ant behaviour could also be a factor as their aggressive behaviour may deter other flower visitors and self-grooming may remove any pollen they collect. Self-cleaning keeps the sensitive hairs on their antennae free of contaminants; antennae are vital for smelling food, finding mates and communicating with each other. To do this, ants have a special cleaning structure on their front legs with brushes and combs through which they draw their antennae. A notch and spur covered in different types of hairs form a cleaning device, similar in shape to a tiny lobster claw. (This mechanism might be the key to designing future biomechanical cleaning devices for nanotechnology.)

Ants also produce secretions through their body that actually kill pollen. The primary function of this secretion is likely antiseptic, with ants spreading antibiotic secretions through the nest to prevent fungal growth and infections. Possibly, this is why ant pollination appears to be mainly limited to dry, or sometimes cold, environments.

Nicola Delnevo, an Edith Cowan University PhD student, also noticed ants visiting certain plants. He was investigating plant-pollinator interaction on threatened plant species of the Swan Coastal Plain in Western Australia and recognised this behaviour as unusual. The species he observed was a smokebush, *Conospermum undulatum*, and not only are ants abundant and diverse in this region, but ants were also this species' second-most active floral visitors. He used *C. undulatum* in a 2020 study which evaluated the effect of ant secretions on pollen germination.

The plant species included in this experiment were three smokebushes (*Conospermum undulatum*, *Conospermum stoechadis*, and *Conospermum canaliculatum*), two grevilleas (*Grevillea eriostachya* and *Grevillea leucopteris*) and *Dryandra nivea*. These species were selected as they are co-flowering shrub species that co-occur in the Swan Coastal Plain, and the same three species of ant were recorded visiting flowers of these plants.

In contrast to expectations according to the antibiotic hypothesis that ant secretions would mostly prevent the transfer of viable pollen, the study found that the germination of pollen grains was not inhibited in *C. undulatum*, or in the other species of this genus studied. The germination of pollen grains in *D. nivea*, *G. eriostachya* and *G. leucopteris*, on the other hand, was drastically reduced after contact with the ant treatment. This is consistent with the antibiotic hypothesis and with observations in other temperate and tropical plant species where the pollen germination rate decreased after contact with several different species of ants. Contact with ants severely reduced pollen germination to around 10% in *D. nivea*, *G. eriostachya* and *G. leucopteris*, but not in *Conospermum* species.

This evaluation of the role of ants as pollinators in *Proteaceae* shows that ants can be important pollinators for some *Proteaceae* members, and that generalizations downplaying the importance of ants as pollinators are wrong. Ants are important secondary pollinators for *C. undulatum*, a threatened species in the Australian kwongan. According to this study, *Conospermum undulatum* has evolved pollen with resistance to the negative effect of ant secretions on pollen grains. It's not the ants that are adapted to the climate of the south-west, it's the plant that has evolved to use ants as effective pollinators.

The study authors conclude that this finding adds to the ecological roles that ants play in the region. Antimicrobial secretions by ants in the dry Mediterranean climate of the Western Australian kwongan – so unlike warm, humid tropical rainforests where bacteria and fungi are likely to impose stronger selection on ants for such defences – does not necessarily inhibit ant pollination. The study shows that such mutualistic associations can occur in unexpected ways. Importantly, this opens the way for future studies to investigate flower-ant interactions in this global biodiversity hotspot. Further studies on *Conospermum* and phylogenetically related taxa will be an opportunity for understanding where and when this trait evolved and how common it is amongst the flora of south-western Australia.

All six *Proteaceae* species included in the study had nectar. Given that isopogons and petrophiles do not, and ants (known to love nectar) still visit, the possible impact of this absence on flower-ant interactions in the kwongan could be a reason to include these genera in future studies. Some *Isopogon* and *Petrophile* species may make use of ant pollination where ant frequency is high, particularly where plants are low growing, flowers are small and inconspicuous and/or close to the stem, or flowers have low amounts of pollen. Other species, however, may be subject to drastically reduced germination of pollen grains due to ant secretions like the grevillea and dryandra species in the recent study.

Factors which inhibit germination of pollen grains are important to understand for conserving species. It is a longstanding Study Group observation that petrophiles are easier to propagate from seed than isopogons. There is agreement that petrophiles produce a majority of fertile mature fruit, whereas *Isopogon* fruit is often infertile. It appears to matter little whether the plants are growing in their wild state, or in gardens. Further, both western and eastern isopogon species are similar in this regard. This low fertility is a mystery. SG member John Knight has previously reported that *Isopogon* has a high pollen:ovule ratio of >25,000:1 so we would expect high fertility. Taking three large cones of *I. anethifolius* as a case study, John calculated that together they had almost 10 million pollen grains from 396 flowers. On checking the fruit for apparent fertility, he found only 63 of the 214 appeared to be fertile (29%). In this instance, there was only 1 fertile seed for around every 160,000 pollen grains. It is a highly inefficient process.

Reasons for this low fertility might include naturally poor pollination efficiency or a lack of the necessary pollinators. Another possible explanation is that perhaps this species has no evolutionary need for high fertility given the large size of each plant's seed banks which increase every year (in the event of a bushfire this seed bank allows it to quickly reproduce despite being killed).

We should also consider the possibility that at least in some *Isopogon* species, ants might inhibit the germination of pollen grains even in dry climates. And could it be possible that some *Petrophile* species have developed resistance to antibiotic ant secretions in the same way as *Conospermum undulatum*? An intriguing area of future investigation.

Delnevo N, van Etten EJ, Clemente N, Fogu L, Pavarani E, Byrne M, Stock WD. 2020. Pollen adaptation to ant pollination: a case study from the *Proteaceae*. *Annals of Botany* 126: Issue 3, 377– 386. <https://doi.org/10.1093/aob/mcaa058>
Native smokebush plant adapts to allow for ant pollination, researchers find. ABC Radio Perth, posted Friday 19 June 2020. <https://www.abc.net.au/news/2020-06-19/unique-wa-plants-adapt-to-allow-for-ant-pollination/12350088>

The Grooming Methods Of Ants Might Teach Us More About Nanogadgets

<https://www.techtimes.com/articles/72490/20150728/grooming-methods-ants-teach-more-nanogadgets.htm>

Pollinator patrol

Native bees, beetles, weevils, hoverflies and other flies, ladybirds, feral honeybees and cockroaches have been observed visiting isopogons and petrophiles. However, this is mostly not formally documented. It's devilishly hard to get a good photo of the little critters, let alone identify them. And sometimes it's hard to establish even the type of insect! Let us know if you can help. Here are some shots taken by Study Group members.



Above, beetle on *P. squamata*, Katanning WA. Photo: Mike Beamish
Right, Ladybird (*Coccinella transversalis*) on *I. anemonifolius*. Photo: Roger Farrow

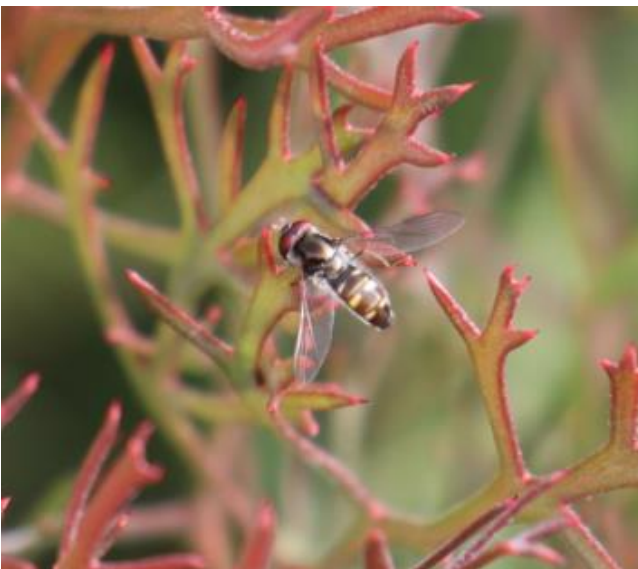
Please keep an eye out for insects visiting isopogons and petrophiles, and if you can, photograph them and send the photos in. It all helps in our efforts to establish and document pollinators and pollination in these genera.





Above left, reed bee on *I. fletcheri* 'Mountain Mist', Blayney NSW. Photo: Fiona Johnson

Above right, bee on *P. imbricata*, Dryandra Woodland WA. Note the pollen it is carrying on its legs. Photo: Lyn Alcock



Left, hoverfly on *Isopogon* Coaldale Cracker, Little Forest NSW. Photo: Catriona Bate

Isopogon baxteri R. Br., *Suppl. Prodr. Fl. Nov. Holl.* 9 (1830)

Isopogon baxteri was first formally described by Robert Brown in 1830. This species was named for William Baxter, a British gardener and plant collector who collected in WA between 1823 and 1830. It is a spectacular plant for both its distinctive holly-like foliage and numerous beautiful pink flowers. Flower heads are terminal, often in clusters, and hang slightly. As flowers open up, the perianth peels back slightly to reveal a frothy, intricate confection of pink and white frills, each flower's dense white outer hairs contrasting against the soft pink inner perianth. However, while the flowers might be soft and fluffy, the leaves are anything but, with sharp (but sparse) points.



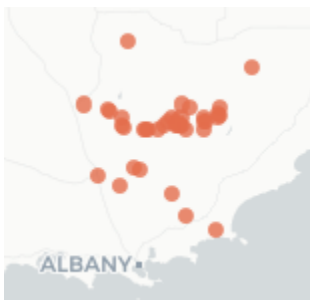
Isopogon baxteri near Bluff Creek, September 2016. Photo: Neil Marriott



Description – *Isopogon baxteri* is an upright shrub to 1m in height. It is a very hairy species in almost all respects, its leaves being the only part mainly hairless. Flowers are pale to deep pink and relatively long (up to 3.5 cm), generally appearing from August to January. The spindle-shaped pollen



presenters have a distinct constriction towards the end. Leaves are wedge-shaped with wavy margins and obvious veins, with several lobes, but generally three main ones. Each of the lobes have pungent red tips which deepen with age to dark burgundy/black. Stems are red and very hairy.



Distribution – reported to be endemic to the Stirling Ranges north of Albany in WA but also found in small numbers at nearby locations like Mt Barker.

It can readily be propagated from cuttings but like most WA species, grafted plants are required for east coast summer-wet gardens. It can be grafted onto eastern species *I. anethifolius*, *I. anemonifolius* and *I. 'Coaldale Cracker'* but requires an interstock of *I. cuneatus* or *I. 'Stuckey's Hybrid'*.

Cultivation – described as one of the most beautiful isopogon species, *I. baxteri* has proven difficult in cultivation and is rarely seen. However its compact habit, distinctive foliage and showy pink flowers make it well worth a go in pots and well-drained gardens. Regular pruning of long canes after flowering is recommended to improve shape and flower display.

Isopogon baxteri was propagated in the UK very early, with seed sent to the Edinburgh Botanic Gardens in 1830 and germinated in 1831. Plants flowered in the greenhouse in 1835.



Isopogon baxteri from Curtis' Botanical magazine 3539, 1836



I. baxteri in cultivation, new growth, Grampians Vic.

Confusing species – being so distinctive *I. baxteri* is not often confused with other species. The closest in appearance may be the more northern species *I. crithmifolius* and *I. dubius*, but *I. baxteri* can be easily distinguished by its paler pink flower colour and densely hairy flowers.

Petrophile ericifolia R. Br., *Suppl. Prodr. Fl. Nov. Holl.* 9 (1830)



Petrophile ericifolia was first formally described by Robert Brown in 1830. The type collection was made by noted early plant collector William Baxter in 1828. The species name refers to its heath-like (*ericia*) foliage (*folium*). There are several other very similar species but this one will be familiar to many gardeners as it is a popularly cultivated plant due to its compact habit and showy terminal yellow flowers each spring.

Description –*Petrophile ericifolia* is a compact, bushy shrub to 1.5m in height, but more commonly less than 1.5m. Inflorescences are terminal and bright yellow, with individual flowers up to 20mm long, which generally appear from August to



October. The short leaves are terete (round in cross-section) to 12mm in length, slightly scabrous and can be appressed (lying flat against the stem) or spreading. Leaves have few hairs, but tend to glabrous (hairless). The fusiform (spindle-like) pollen presenters are around 4mm in length and sparsely hairy.



There are two subspecies, often known as the southern form and the northern form, which are very similar. In summary, the southern form has larger flowers, inflorescences and leaves plus sticky bracts and flowers, and is more widespread.

1. *subsp. ericifolia* – found in the south and inland from Fitzgerald River National Park to Stirling Range and Lake Wagin, near Lake Grace, and in the Southern Cross-Coolgardie area. This subspecies is characterised by sticky involucral bracts and flowers, and branchlets with occasional hairs (or glabrous). Flowers are slightly larger than *subspecies subpubescens* – up to 20mm in length – and are villous (hairy). Leaves are twice the length of *subspecies pubescens* at 12mm and can be appressed or spreading. The inflorescence is 15-20mm in diameter. This subspecies commonly has bright green, sticky bracts and short, rather blunt leaves sometimes held out almost at right angles from the stem. These bracts are particularly striking before flowers emerge. Spent flowerheads are rather large compared to the small dainty leaves, and often reveal the white whiskers surrounding the seeds



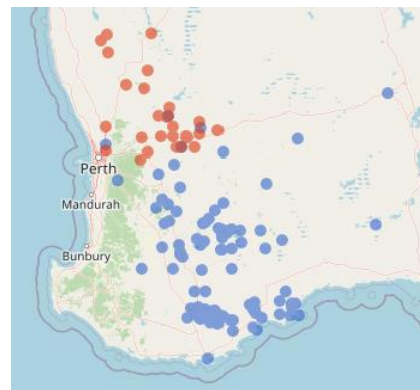
poking out from within.

2. *subsp. subpubescens* – grows mostly between Northam and Kellerberrin north-west of Perth, and also near Watheroo and Piawaning north of Perth. Flowers up to 16mm are hairy (villous) but not sticky, nor are the involucral bracts sticky. The leaves are appressed and much shorter than *subspecies ericifolia* at only 6mm and the inflorescence is also smaller at 10mm in diameter. In contrast to *subspecies ericifolia* this subspecies has branchlets with a medium to sparse covering of short, curly hairs.



Distribution – widespread and common, from just north of Perth south to the Stirling Range/Fitzgerald River National Parks. *Subspecies ericifolia* is particularly common in its southern range (shown in blue, right). *Subspecies pubescens* is shown in orange.

Cultivation – *subspecies ericifolia* is one of the most common western petrophiles in cultivation. It is spectacular in flower when masses of bright yellow, terminal flowers are displayed. Flower heads on long stems of this species have been successfully used to great effect in floral arrangements. It is quite reliable in the winter-wet southern states but is better suited as a container plant in coastal NSW and Qld. Members have successfully propagated this from cuttings and fresh seed. Grafting trials are underway with this species.



Petrophile ericifolia ssp. *ericifolia* in cultivation, Grampians, Vic.(left) and Brogo, NSW (right – photo, Denise Krake).

Confusing species – There are several species of a similar size which look like both subspecies of *P. ericifolia* (short terete leaves crowded along stems and terminal yellow inflorescences) which are often mistakenly called *P. ericifolia*. These include *P. globifera*, *P. wonganensis*, *P. recurva*, *P. scabriuscula*, *P. phylloides*, *P. foremanii*, *P. cyathiforma*, *P. imbricata* and *P. arcuata*. These species have differences in leaf characteristics, involucral and floral bracts, flowers and pollen presenters which require careful observation to spot. In the next newsletter we plan to discuss the distinguishing characteristics of this most confusing group of petrophiles.

Corona in the wildflowers

Don Williams, Hi Vallee, Badgingarra WA

[Newspapers have] given a fair amount of space to the dreaded Corona or Covid 19. As we at “Hi Vallee” have been exposing our display of wildflowers to all and sundry for some 30 years I hope you can all suffer a little more as we reminisce by giving our point of view on the events that have played out over the year.

First, along with lots of other tour operators, as soon as the lockdown in March happened our supply of visitors dried up, just like some of our dams. At first this was great, not having to get dressed up in “smart bush wear”, which is equivalent to “smart casual” and includes Blundstones and a broad brimmed leather hat like Harry Butler, all part of the image. This meant the sheep got some extra attention and a few suitable small loads got delivered to the saleyards at Muchea. There was no trouble getting through the border located on our side of the saleyards.

Then in early July the people managing Corona opened the internal borders. The suburban folk had more than enough of fighting for toilet paper and only buying one of all the various commodities, that the doomsday merchants were hoarding. They needed to be out in the open spaces. One of our regular campers was quick off the mark with two Grandpas, one Grandma, their two children and two grandchildren. The 'single' Grandpa was in his element, as he was a sheep farmer from south of Perth, and thought our feed situation was not as tight as his. His problem during lockdown was that he was not getting the farm fresh hogget to his family in the city. The group had to stay for eight days to absorb enough freedom and fresh air before returning to their former Corona-ridden confines.

We felt that this was a good start but were worried that the Eastern Grey Nomad, a species that usually arrives in Western Australia from the North anytime from August to late October, would have their migration pattern disrupted. We were also worried about the Jet Lagged Pale European – this species migrates from the northern hemisphere, often being known to perform amazing driving feats on the Indian Ocean drive. The foreign language traffic signs are still quietly waiting for better times. Both these species seem to have suffered a complete interruption to their normal migration.

To our surprise there was a surge of freedom-hunting West Australians that had planned to travel to the Barrier Reef, Sydney, Tasmania, New Zealand, Holland, Spain, Bali and numerous other exotic destinations. Due to the Corona restrictions they all found themselves having to take their holidays here in West Australia or as the ad says 'wander out yonder'. Some young families raced off to Boating Camping and Fishing to grab their rapidly disappearing stock of tents. One very astute family had two practice runs in the back yard at Hamilton Hill before they came on up to Hi Vallee, which meant they had no problems with the tent erection or food and cooking. Unfortunately, it was a whole lot colder than was expected and the first night saw the rug rats in bed with Mum and Dad. We are up to this and happily loaned the kids some decent sleeping bags. The younger studious boy made a great collection of rocks and assorted sheep bones, 'natural resources' that we take for granted in the country. The rewarding thing is that we received a really great letter of appreciation, a generous tip and a promise to return. One young D.I.N.K. couple (double income no kids) had to travel all the way to Geraldton to purchase an "Oz Tent two man stand up tent" the last one in the state.

As we know most older caravaners tend to travel in pairs. We had this one group made up of a Kiwi born couple and a West Australian couple who chose to stay three nights at Hi Vallee. Whilst they were here they took in many highlights including a visit to the Eneabba General Store where you can buy gas fittings, food and most importantly cleanskin red wine. These same folk also took in the Green Head general store, and yes, they have cleanskin red wine there too and very realistic priced fuel. There were many things about the country that these folk really appreciated. On one of the nights they were here, they should actually have been holidaying in Spain. Sadly, they do not look like they will be getting their money back from the Spanish hotel where they were supposed to stay. The result of this being they are never going to Spain again (neat rhyme) Spain's loss our gain. Another interesting thing about this group is that one of the blokes, Ken, has had a small business for some five years importing face masks and hand sanitizer. Guess where from? Wuhan in Northern China!

Most people do not think of our area as a foodie's patch. Perhaps Rob Broadfield, a Perth food critic, needs do a lap around our patch instead of Perth CBD and Margaret River. The eateries that impress the visitors for a hearty midday meal, in no particular order, are: Badgingarra Roadhouse for pies, peacocks and realistic fuel, Warradarge Roadhouse serving extremely good meals and great bird collection to entertain the young folk, Centre Break boutique hotel at Greenhead with a nice setting and serving good meals, Blue Fish and Chip shop just around the corner for a dine-in meal or take-out, which you can take over to the Dynamite Bay shelters to eat, and the old world Coorow Hotel serving good meals and has a great bar if you need an alcohol top up.

So, what do folk come to see and enjoy? This is an important question to ask as lots of folks, after visiting, will bring their friends up the following year and are then the 'experts'. Firstly of course is our wonderful year-round wildflower display. Other attractions for the adventurous are: Banovich Road, quiet with lots of

wildflowers and great for testing out the suburban road chariot; Lesueur National Park which mostly meets with everyone's approval, but with mixed feelings about the toilets. High on the approval rating especially with children is the Stockyard Gully Caves, the supreme test for the car and driver. Department of Biodiversity, Conservation and Attractions (D.B.C.A). get top marks there. One of this year's repeat visitors managed to bog his Kia Stinger on this road, which was highly amusing for all his friends. *My theory is the Kia Stinger is the modern version of the Holden Monaro.* The shearing and sheep dog display is always popular, and if there are children involved, they are always fascinated. When the fleece is shorn we usually have one clever child who will ask "Hey what are you going to do with the fur?". The antique four-wheel drive museum (our own farm graveyard and spare Hi Lux parts depot) always entertains the men folk for an hour or two. If we are around to fire up the 1954 Ford Power Major this just adds to the experience. Peter who has been coming for 25 years is now a qualified tour guide of this facility.

So, what are the onerous bits that one has to put up with? Hmm! Most evenings we visit the campers for drinks, mostly red wine, but can be beer, champagne or even white wine and then we watch the sun go down while having a fireside chat. This year most of the discussion has been about how great West Australia is. It would appear that we have some of the most photographed sunsets with everyone sending us their spectacular versions. One needs to be able to consume some or all of the drinks on offer, which occasionally includes tea or coffee. This must surely all be good for the body and the soul!!

This article first appeared in the Badgingarra local newspaper *The Sandpaper*.

A mystery solved: introducing the Autumn Isopogon

Catriona Bate

A long known Western Australian species has been given a brand-new name, *Isopogon autumnalis*. The name reflects this species' unusual flowering period. Unlike most other isopogons which mainly flower in spring, *I. autumnalis* flowers through the first half of the year, peaking in autumn. It has undivided, needle-like leaves and pale-yellow flowers.

With this new name, botanical detectives Barbara Rye and Terry Macfarlane have solved a longstanding mystery – the true identity of species 'A'. Although it was noted as a species in the 1995 revision of *Isopogon* published in *Flora of Australia* (still our only comprehensive authoritative reference), it was merely given a placeholder name (sp. A). To now determine the correct application of its name, Rye and Macfarlane had to go back 150 years.



Photo: K. Thiele

Specimens of this species collected in Western Australia in the late 1830s by rival professional collectors Drummond and Preiss floated around England and Europe, ending up in different collections to be dealt with by different botanists. Meisner's 1845 and 1856 identification as a form of *I. petrophiloides*¹ was later considered to be incorrect or misapplied and in 1870 Bentham described it as a new species, *Isopogon*

¹ The type specimen described by Robert Brown later became *I. teretifolius* ssp. *petrophiloides*, and is now considered a rare variant of *I. teretifolius* not taxonomically distinct from *I. teretifolius*.

drummondii. This naming was accepted for over a century and was included in reference books until around 1990.²

However, the legitimacy of Bentham's species name began to be questioned when another *Isopogon* of the same name was unearthed with an earlier date of 1843 published by Frenchman Jacques. In taxonomy the rule of priority is followed whereby the earliest description applies. Assuming the two species described in 1843 and 1870 were the same, the name *I. drummondii* Benth. began to be replaced with *I. drummondii* Jacques or Hügel ex Jacques.³ However Foreman, when revising the entire *Isopogon* genus in the 1980s, was unsure whether the two species were identical. Jacques published in a horticultural context, giving very little information and no illustration according to Rye and Macfarlane. Foreman left the matter unresolved but flagged that if the Jacques and Bentham species were actually different, the later species from Bentham could not retain the specific name *drummondii*. In the meantime he dubbed it species 'A'.

With that, species 'A' was left in limbo for over twenty years. There was no question that it is a distinct species. Indeed, Rye and Macfarlane conclude that it has no close affinities among other *Isopogon* species. The Australian Plant Census and FloraBase included it as *I. drummondii* Jacques. But what was its correct name?

When Rye and Macfarlane studied Jacques' species description, they found he had based it not on a specimen but hothouse plants so they could not check the original material he used. The plant material came from Hügel's garden and nursery near Vienna⁴ grown from seed originally collected by Drummond in Australia. Jacques' description was obviously intended for keen horticulturalists collecting new and unusual plants for the garden. Rye and Macfarlane established that there is no known herbarium specimen that can be connected with Jacques' species. However, comparing Jacques' description with Bentham's they discovered a key difference which is enough to show they are distinct entities. Jacques' species had linear leaves 60-150 mm long whereas Bentham's species had terete leaves 20-65 mm long. Rye and Macfarlane found that Jacques' species is most likely *Isopogon sphaerocephalus*, named by Lindley in 1840 from another Drummond collection. Thus *I. drummondii* becomes a recognised synonym of *I. sphaerocephalus*.

Having established two distinct entities, what should the 1870 Bentham species be named? As Bentham's later use of the specific name *drummondii* is considered illegitimate due to duplication with the synonym for *I. sphaerocephalus*, a completely new name was required. As part of this process, the detectives had further work to do to find an individual herbarium specimen to be the type specimen (lectotype) for any new name, a vital reference point for botanists. This involved checking the Drummond and Preiss specimens or syntypes used for the original description of this taxon by Bentham.

An 1839 Drummond specimen was selected because of its good condition and accompanying detail. This is surprising given what we know about the two rival collectors who were direct opposites. According to German botanist Diels, Drummond, the older British bushman, was always in the saddle out collecting rather than arranging his collections while young German Preiss was usually on foot and used a then novel scientific approach complete with prolific labelling (see Haebich article). So it is Preiss's collections which are considered to be better than Drummond's in terms of quality, annotation and overall presentation. The only Preiss

² For example, Blackall & Grieve 1954/56 and 1981, Marchant et. al. 1987, Sainsbury 1987, Wrigley & Fagg 1989, and Elliott & Jones 1990.

³ Including the Australian Plant Census <https://profiles.ala.org.au/opus/foa/profile/Isopogon%20drummondii>

⁴ Charles von Hügel (1795-1870) was an Austrian nobleman, army officer, diplomat, botanist, and explorer, celebrated for his botanical garden and his introduction of plants and flowers from New Holland (Australia) to Europe's public gardens.

syntype seen by Bentham able to be located (held at the National Herbarium of Victoria) was in poorer physical condition and lacking collection details. Rye and Macfarlane note it is possible that the un-numbered Preiss syntype in Melbourne is a duplicate of one of the numbered specimens cited by Meisner under *I. petrophiloides*.

Poor Ludwig Preiss seems to have always been somewhat overlooked. In a recent article historian Anna Haebich discusses biases which led to Preiss, at one time the colony's best qualified botanist, being largely forgotten. She notes Australian naturalist Rica Erikson's observation that although his collections were far superior to others being offered for sale in England, British botanists (of whom Bentham is one) were prejudiced in favour of collectors of their own nationality.

It is hardly surprising, then, that Bentham named his new species in honour of Drummond (obviously unaware of Jacques' previous naming of an isopogon in Drummond's honour) and not Preiss. Rye and Macfarlane have taken a different approach in choosing the descriptive name *autumnalis*. Perhaps (but unlikely) they took Foreman's placeholder 'A' as inspiration in transforming *Isopogon* sp. A into *Isopogon autumnalis*! With this renaming we no longer have a species in both *Isopogon* and *Petrophile* genera named for the same person. However, descriptive names are generally far more useful and the new name is a helpful clue to the highly distinctive feature of this species, that it flowers in autumn.

This distinctive flowering time makes identification straightforward. However, if you find it without flowers, it may initially be mistaken for other species with needle-like leaves such as *P. brevifolia*, *I. divergens* and *P. pilostyla* which occur in similar areas. *I. autumnalis* occurs near Perth at the foot of the Darling Scarp and northwards to Mogumber and in Lesueur National Park (e.g. Cockleshell Gully). Check for spent flowers or emerging buds to determine flowering time and thus identity.

Resolving the taxonomy of this species brings it within the scope of conservation efforts. This species is relatively uncommon and occurs in small pockets. It has been given priority conservation status indicating some degree of threat and a need for further work to properly investigate threat levels and directions for conservation strategies. A possible threat is dieback to which it is known to be susceptible. Its conservation status is listed as priority three.

Rye, B. L. & Macfarlane, T. D. (2019). A new name, clarification of synonymy, and a new subspecies for *Isopogon* (Proteaceae), in Western Australia. *Nuytsia* 30: 309-316. <https://florabase.dpaw.wa.gov.au/science/nuytsia/931.pdf>
Anna Haebich, Friday essay: the forgotten German botanist who took 200,000 Australian plants to Europe, *The Conversation* July 24, 2020. <https://theconversation.com/friday-essay-the-forgotten-german-botanist-who-took-200-000-australian-plants-to-europe-143099>

Coneflowers: when the common is uncommon

Catriona Bate

Coneflowers, conebrushes, conesticks and drumsticks. All of these words are used as common names for isopogons and petrophiles. That's because of their distinctive flowerheads, like balls on sticks, which usually remain on plants after their flowers are spent.

But if you put the term 'coneflower' into an internet search engine you'll most likely come up with echinacea (pictured right), a well-known genus native to North America. We might think a pink coneflower is one of our beautiful pink *Isopogon* species from Western Australia such as *I. cuneatus* or *I. latifolius*, but it's actually better known as a cultivar of echinacea.



According to botanist Kathy Keeler there are at least five different genera with species called coneflower (of which there are more than 30). Three genera, *Echinacea*, *Rudbeckia*, and *Ratibida*, are common and sold as garden flowers in North America.

All from the sunflower family, *Asteraceae*, these genera are also widely known and grown in Australia. And many Australians know echinacea for its homeopathic properties. Jane Edmanson from *Gardening Australia* highly recommends *Rudbeckia* as an absolute favourite perennial for Australian gardens, explaining the common name coneflower refers to lovely cones in the centre of reclining sort of petals. Easy to grow, vigorous and full of colour, it's no wonder they are so recommended. However they do require well drained



Ratibida pinnata. Photo: Kathy Keeler

soil. There are 23 species of *Rudbeckia*, all native to North America. Common names include orange coneflower (*Rudbeckia fulgida*), tall coneflower (*R. grandiflora*), western coneflower (*R. occidentalis*), etc. A fourth coneflower genus is *Dracopis* which contains just one species, *Dracopis amplexicaulis*, and has recently been separated from *Rudbeckia*.

Daisy or daisy-like might be a better description of the North American coneflowers. Only one genus has a strongly defined cone, the prairie coneflowers, genus *Ratibida*. South African leucadendrons also have well-defined cone-shaped heads but are commonly known as conebushes.

To North Americans (and possibly to many Aussies), the fifth coneflower genus, Australian *Isopogon*, is a complete mystery and when it appears in an internet search for coneflowers, can lead the unwary astray. For isopogon enthusiasts, it's the American coneflowers which are the mystery. In Australia, this common name for isopogons is mostly only used in less formal settings. When we want to increase the awareness of different plants it helps to have an easy to remember and simple terminology.

Not all of our isopogons have a common name but a review reveals a surprising number of species called coneflower. The term coneflower is generally only used for western species whereas eastern species are more likely to be commonly called drumsticks.

- Nodding Coneflower – *Isopogon teretifolius*
- Simple-leaved Coneflower – *Isopogon nutans*
- Stirling Range Coneflower – *Isopogon baxteri* or *Isopogon latifolius*
- Spider Coneflower – *Isopogon adenanthoides*
- Rose Coneflower – *Isopogon formosus* or *Isopogon dubius*
- Pink Coneflower – *Isopogon crithmifolius* (right)
- Spreading Coneflower – *Isopogon divergens*
- Pincushion Coneflower – *Isopogon dubius*
- Barrel Coneflower – *Isopogon trilobus*
- Nepean Coneflower – *Isopogon dawsonii*
- Drummond's Coneflower – *Isopogon drummondii*
- Sickle-leaved Coneflower – *Isopogon linearis*
- Elkhorn Coneflower – *Isopogon alcornis*
- Clustered Coneflower – *Isopogon polycephalus*



In regard to petrophiles, the term coneflower is rarely used in common names. The only example I could find was by gardening writer Angus Stewart who simply uses 'Cone Flower' as the common name for *Petrophile*

biloba. Instead, eastern petrophile species are most likely to be called conesticks while western species are simply called petrophiles e.g. Granite petrophile (*Petrophile biloba*).

To further confuse matters, in the plant world cones are generally ovate (ovoid) or egg-shaped. So it makes more sense to refer to petrophiles, which have ovoid cones longer than they are wide which persist for a long time, with the term 'cone' than it does to use the term for isopogons which tend to have globular heads. Of the isopogons listed above, *I. trilobus* has conspicuously ovoid cones.

It all goes to show the truth of the oft-cited golden rule – for clarity, stick to botanical names.

Kathy Keeler, A wandering botanist blogspot <http://khkeeler.blogspot.com/2020/08/plant-confusions-more-than-three.html>

Jane Edmanson, Gardening Australia <https://www.abc.net.au/gardening/factsheets/plant-profile---coneflowers/9436548>

Frost and heat tolerance: what's growing at Binnaway

Catriona Bate

Study Group member Anthony O'Halloran and wife Annabelle Greenup run a native nursery and cut-flower farm, Bilby Blooms, outside Binnaway on the Central West slopes of NSW (just south of Coonabarabran). They selected the property for its deep sandy soils and good access to water, and grow a wide range of plants suitable for hot, dry summers and cold, frosty winters.

Anthony and Annabelle grow several isopogon and petrophile species in their home garden and some species are included in their extensive nursery stock list (*I. anemonifolius*, *Isopogon* Coaldale Cracker, *Isopogon dawsonii*). They specialise in some local flora from the Warrumbungle Ranges and Pilliga Forest.

In terms of cut flowers, WA species dominate but isopogon and petrophile species do not feature in the plantation, represented by the lone species of *Isopogon dawsonii*. Anthony explained that floriculture requires good stem length and very large flower heads. The flowers of their tough local, *I. petiolaris*, are not presented well and are too small so it is unsuitable. The *I. anethifolius* growing in the plantation has not done well and although stems are long the flower heads on this particular form are small. Disappointingly, they have found that florists confuse the blooms of *I. dubius* with the heads of the local weedy thistle. However, *I. dawsonii* is liked by florists for Ikebana. On the wet day we visited in October 2020, the plantation had a stunning array of spectacular WA eucalypts in flower, and there was a similar range of WA banksias just waiting their turn.

At Bilby Blooms they consider their frosts more severe than in Canberra. The overall minimum is lower, but time spent at these temperatures is less. Because of this the impact of the sun on frosty foliage and flowers is particularly noticeable. They find they can get frost-sensitive plants to survive by protecting them from morning sun, and because they are grown in soils similar to their natural requirements, are more forgiving of stresses like frosts due to having deep roots. Managing irrigation over the winter period is essential as 'sappy' plants will suffer in these months.



Isopogon Stuckey's Hybrid. Photo: Anthony O'Halloran

Experience with the spectacular WA pink isopogons over the years has shown that the frost was too much for *I. latifolius* but they can get *I. cuneatus* through ok. *Isopogon Stuckey's Hybrid* grows well and is very tough. This accidental hybrid is a likely cross between *I. cuneatus* and *I. buxifolius* so perhaps this performance is logical. Interestingly, member Tony Cavanagh has raised the possibility that one parent could have been *I. latifolius* rather than *I. cuneatus*, and in this case, either the *I. buxifolius* parentage could be providing toughness, or it's evidence favouring *I. cuneatus* parentage. A plant of *I. formosus* has survived well, thriving over many years without water. But it's *Isopogon dubius* which is the star in this department – it's very frost-hardy and thrives on neglect. Even better, it's easy to propagate from seed (see below for more information). A plant planted in autumn (March) flowered very early, in the next spring.

Another star performer in terms of hardiness at Binnaway is *I. dawsonii* which Anthony describes as 'super frost-hardy'. It can be pruned hard, is long-lived, and can reach over 4m in height! We would expect cold tolerance given this species comes from the chilly Blue Mountains/Lithgow/Mudgee area so it's great to see its performance proved in even more severe conditions. *Petrophile canescens* should have similar cold tolerance and also seems to be doing well at Bilby Blooms.

Of course the local species, *I. petiolaris*, is very hardy in the ground here. Anthony noted it's found on ridges and on shallow flats in deep sand at locations including the Pilliga, The Drip, Warrumbungles and Goonoo Forest. It grows with black pine, Dwyer's Red Gum (a mallee), hibbertia, dampiera, and homoranthus. The new hybrid *Isopogon Coaldale Cracker* is also doing well, as we would expect – one of its parents is *I. petiolaris*, and it has proved tough to drought and severe frost in Armidale NSW.



Isopogon dawsonii. Photo: Anthony O'Halloran

Other eastern species doing well in the garden are *I. anemonifolius* dwarf and *I. anethifolius*. Western species such as *I. buxifolius*, *I. trilobus*, *P. linearis* and *P. seminuda* all survive, protected from morning sun to minimise frost damage – most of these are over 15 years of age.

Propagation notes:

Isopogon petiolaris – a local species which grows readily from seed. However, seedlings grow fast and soon outgrow the pot. Because it is hard to keep looking good in pot culture (lasts a few months only whereas they need it to last at least 6 months) they don't tend to sell it in the nursery. This explains why it's difficult to buy this species in nurseries generally.

Isopogon dubius – propagates readily using fresh seed without any special treatment, just break open the flower head. Anthony is simply spreading old prunings over the garden to grow new plants in situ. In the nursery, seed material was spread over a perlite/cocopeat mix. However, the resulting seedlings hate having wet foliage and so brown or dampen off. Of about 130 seedlings germinated in a trial, only 37 survived.

Anthony and Annabelle's setting and learnings are important input for the Study Group with regard to propagation and plant choice plus tolerance and optimum conditions for different species.

We are finding great variations in the performance of plants of the same species with different provenance (from different places). All specimens of a species are not equal, some are definitely tougher than others. It's early days in this research but so far indications are that there are tougher forms of *I. anemonifolius* (low or dwarf). The same is probably true for *I. anethifolius* and *I. petiolaris*. So perhaps in time Anthony and Annabelle might be able to try better forms of *I. anemonifolius* and *I. anethifolius* which are tougher in their conditions.



Isopogon dubius at Bilby Blooms. Photo: Anthony O'Halloran

Financial Report

Total 26/10/2020	\$1,804.06
Bank balance	\$1,700.62
Cash on hand	\$103.44

Total 19/4/2021	\$1,804.06
Bank balance	\$1,700.62
Cash on hand	\$103.44