



# Isopogon & Petrophile *Study Group*

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**STUDY GROUP LEADERS/NEWSLETTER EDITORS**

Catriona Bate & Phil Trickett

Email: [isopetstudygroup@gmail.com](mailto:isopetstudygroup@gmail.com)

Ph: 0409 789 567



*Petrophile sessilis* after fire, November 2019, Jervis Bay NSW. Photo: Lois Sparkes

Back issues of the *Isopogon & Petrophile Study Group Newsletter* are available at

<http://anpsa.org.au/iso-petSG/IPSG-news.html>

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Financial report

Hi fellow Isophiles,

Our cover photo this edition marks the terrible bushfire summer of 2019-2020 which affected large swathes of isopogon and petrophile territory in New South Wales, Victoria, Western Australia and Kangaroo Island in South Australia.

Travel restrictions are making it difficult for all of us to get out and about to observe the impacts directly. National parks and reserves here on the NSW south coast suffered severe destruction from the Currowan fire and will not be reopened for some time. In our own garden, we lost several isopogons to fire and many plants near ember attacks were badly damaged due to radiant heat. However most of our living collection has survived. Luckily, drought did not unduly harm the isopogons and petrophiles, nor did the extreme high temperatures on fire days – unlike some banksias and various others which threw in the towel, much to our surprise. This is the first time in a decade we have had this issue. One of our enduring memories from the month we were under continual fire threat is the sight of the isopogons closest to the house as we sat on the deck waiting for flames to roar up to us and embers to fall – in the eerie bushfire light and intense heat their foliage glowed bright green, lush and serene. How incongruous!

Unlike those who, it is widely reported, are having trouble filling their time in isolation, we have never been busier! The chainsaw has been working overtime as we clear burned branches and do some long overdue major pruning work, followed by weeding and mulching over large expanses of garden. We are taking advantage of large piles of mulch left behind after contractors clearing burned vegetation have been through the district. Mulching is desperately needed to help tackle weeds springing up with renewed vigour after huge rains through February and March. In February we had more rain than in the entire year of 2019 – we had our highest daily total of the decade (292 mm) and our highest ever monthly tally (630 mm). Next will be the exciting part, planting out, and Phil has some interesting new grafts almost ready for us to trial in the garden. Who needs the gym? Day after day of hard labour in the garden is making us fitter than we've been for some time.

Our articles this issue cover what we know at this stage about the effects of the summer's unprecedented fires on Australia's isopogons and petrophiles. This is a topic we will be revisiting in future issues as more information becomes available. We also talk about how there's so much more to isopogons and petrophiles in the garden than just the flowers – we focus on cones and foliage, particularly how foliage can change colour in very attractive ways. It's not only autumnal deciduous plants that can put on a display. SG member Alex George discusses how some species change colour in response to a lack of moisture (see Diallagy). Alex has over 60 years' experience as a botanist and proteaceae expert. Our profiles are two Western Australian

species from north of Perth, *Isopogon adenanthoides* and *Petrophile semifurcata*. Although rarely cultivated, both species are relatively small in size and impressive in flower. In his grafting update, Phil shares the results of some interesting grafting experiments which are showing signs of promise.

Members have come up trumps with some encouraging propagation stories plus progress reports on their garden plants (including some beautiful photos). Plus, Mike Beamish gives us a glimpse of how isopogons and petrophiles are doing at Pangarinda Arboretum, Karlo Taliana catches an isopogon releasing its seed and Rhonda Daniels finds a record number of cones crowding at the end of a single stem. Some members also reported on the effects of the bushfires, but naturally no one can get out right now. We look forward to more reports in future. As we point out in our fire article, it's more important than ever for our study group to research and conserve these species.

Catriona and Phil

## From our members

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### Paul Kennedy, Elliminyt, VIC

A good day to be inside as it is showery and only 11 degrees C with very strong winds. Have had 80mm of rain this month. Below is my report on the progress of the Isopogons I have here at Elliminyt.

*Isopogon axillaris*. Has grown to 600mm in two years and flowered last spring. Grown in a raised bed of sandy loam. Watered during dry periods in summer. Looking very healthy.

*Isopogon formosus*. One of our success stories. Now 5 years old and a shrub 1 m high x 1.5m across. Puts on a metre of growth each year and is pruned back after profuse flowering. Growing up against a western brick wall in sandy loam.

*Isopogon cuneatus*. A large plant to 1m high in a raised bed of sandy loam. Flowers well each year since planted in 2015. Pruned after flowering to keep shape and reduce wind forces.

*Isopogon latifolius*. A new plant less than two years old growing in sandy loam. Growing slowly but looking very healthy.

*Isopogon* 'Stucky's Hybrid'. Have two plants which have grown well in a raised bed of sandy loam. The flowers are not particularly bright compared to other species.

*Isopogon trilobus*. Again I have two plants, one three years old and the other under two years. The older plant flowered this spring. More ornamental for its leaf shape than flower colour.

*Isopogon fletcheri*. As best I can key out because of its leaf shape of lanceolate leaves. Watered through dry parts of summer and flowered for the first time last spring. In an open sunny position which is probably not the best position but because our summers tend to be mild it is able to cope.

### Rhonda Daniels, Sydney NSW

Following up my email from a year ago re an unusual set of cones...On Easter Sunday in 2019, in a planted footpath garden bed near the coal loader at Waverton in Sydney I saw a local *Petrophile pulchella* with a rosette of 12-13 flower cones on one head. I don't think I have seen this many before - common or result of disease or disturbance to the growing tip? I went back in May 2019 to photograph it, but it was hard to capture all the cones in one photo! I have attached some photos for you to choose from. *This must be a record Rhonda! They do often have many terminal flower heads on the same stem, but a dozen or more is a really notable achievement. Wonder if this promotes pollination with so many flowers so close to each other? Eds.*



### Mark Noake, Moruya, NSW

We certainly live in interesting times here on the far south coast of NSW. Unlike many of our friends, we have escaped bushfire damage to our garden. Our challenge has been a severe drought during which we had no useful rain for twelve months. A small mountain due west of our property causes any rain from that direction to split around us so we rely upon east coast lows to provide our most significant moisture, and there was none of that. Of course climate change is intensifying all of these hazards to our existence. Fortunately we've seen significant rain, the fires are finally extinguished and intrepid gardeners are trying to rebuild.

In our garden, Carolyn's dogged triage watering saved many of our favourite plants but as the dam was drained quite a few fell at the last hurdle. Most of Phil "is it on its own roots?" Trickett's grafted specimens are still powering on, but we have learnt the value of propagating backups of interesting plants at the time of purchase.

*I. anethifolius* has been particularly susceptible to extremely dry conditions and our *P. teretifolia* bit the dust just before it rained. An attempt to move some *I. formosus* (which had gone completely Bolshie in an inconvenient spot) was not successful but we had plenty of others thriving in another bed. Phil's grafted Stucky's Hybrid is coming back after a very dodgy couple of months but the specimen on its own roots died early in the piece.

It seems that some of our more established plants, with deep roots, did not benefit from watering whereas younger plants had most of their roots close enough to the surface to find some water. Who knows? In the long run we've lost quite a lot of plants but not many species from our small collection. *P. teretifolia* is a notable casualty.

At this point in time we have high hopes for *I. "Coaldale Cracker"*, *I. anemonifolius*, *I. prostratus*, *I. formosus*, *I. anethifolius*, *I. dawsonii* and *I. "Stucky's Hybrid"* with a successfully tubed cutting of *I. sphaerocephalus* ready to go in. *I. latifolius* and *I. gardneri* x *divergens* (both Phil Trickett grafts) are thriving. Also still growing are *P. pulchella* (very hardy in our conditions), *P. biloba*, *P. sessilis*, *P. ericifolia* and an apparently misnamed *P. longifolia*. We have several plants of *P. pedunculata* propagated from seed and cuttings surviving but growing extremely slowly.

We wish all the very best to those who have suffered so badly in the devastating fires and hope that next year is not another *annus horribilis*.

### Mike Beamish, Boolarra, VIC

December 2019: The representation of *Isopogons* and *Petrophiles* in my garden is still rather poor, with only one species of each surviving in pots, none in the ground. *Isopogon buxifolius* is still slowly growing in its 200mm waterwell pot and it has flowered again in the 2019 spring, although I wasn't here to see it. Its branches and leaves seem to redden up over the colder months so that it looks unwell, but it regains its normal appearance with warmer weather and more sunlight. The *Petrophile pulchella* seedlings are still in



their seed tray, there are 20 healthy plants left from the 35 that germinated from more than 200 seeds sown. Normally I wouldn't have left them so long before potting up, but 3 months overseas and 6 weeks in South Australia have taken up my time; I promise to get it sorted before the hot summer weather arrives. Nevertheless, I'm pleased that 20 plants have survived the winter, out in the open, with absolutely no attention whatsoever. Fingers crossed they will survive the potting up.

Not surprisingly, travelling through Alaska, western Canada and 3 Hawaiian islands, we didn't stumble across any I's and P's, even though we did have a look at several gardens that contained other Australian plants. Banksias were the closest we could get! We thought we might find some in the wilds of South Australia, but we spent most of our time on the Eyre Peninsula and it seems there aren't any growing there naturally for us to find. According to the Electronic Flora of SA website, the only indigenous species are *Petrophile multisecta* on Kangaroo Island and *Isopogon ceratophyllus*, also on Kangaroo Island, but extending onto the Fleurieu Peninsula and into the south-east corner of the State and across into Victoria. So we were limited to what we could find in cultivation!

**Pangarinda Arboretum** at Wellington, where the Murray River enters Lake Alexandrina, came to the rescue. This is a lovely, well-cared-for botanic garden which features lots of South and Western Australian plants, some of which are labelled. The photos below are of the yellow-flowered *Petrophile drummondii* and a cream-flowered *Petrophile*, maybe *P. brevifolia*, and an *Isopogon*, maybe *I. polycephalus*.



April 2020: No fires around here! We've had the wettest summer in our roughly 30 years of records from Boolarra, Victoria, in the foothills of the Strzelecki Ranges. Last year we finished up with slightly more than a metre of rain (1002mm), most of it in the second half of the year, followed up with 93mm in January, 126mm in February, a measly 40mm in March, but so far at least 90mm in April, up to the 11th. In contrast, my sister lives about 80km north-east of Boolarra and received less than 400mm of rain last year! The areas of East Gippsland which were in drought and suffered through their own fires are only 200km east of here!

So, we are fortunate to have avoided the burns, but instead struggle to stop our plants from drowning or succumbing to the humidity. My 20 *Petrophile pulchella* seedlings have been potted up (11/1/20), with 4 additional losses in the process and I have just (10/4/20) planted one back into the garden. The others remain in their tubes pending decisions on their prospective new homes. My *Isopogon buxifolius* is still surviving quite happily in its small waterwell pot and I am considering whether to pot it up into a bigger tub and/or take some cuttings off it. In early December 2019 I sowed seeds of 4 species, 3 unknowns and *Petrophile*

*drummondii*. The latter and 2 of the unknowns were fresh, while the third unknown was an old cone that had been lying around for some time and its origins are lost in the fog of time. Strangely enough, this old cone has been the best performer, with 4 seedlings from 2 dozen seeds, while one of the other unknowns sent up 1 seedling from 2 dozen seeds and nothing has appeared from the remainder. The single seedling is struggling with the weather however and seems to be in the process of damping off, not helped by all our wet weather. I have recently sown more old seed, which originated from our WA trip in 2016, but I suspect I have left it too long and am not expecting any success with these.

### Karlo Taliana, Georges Hall, south-western Sydney

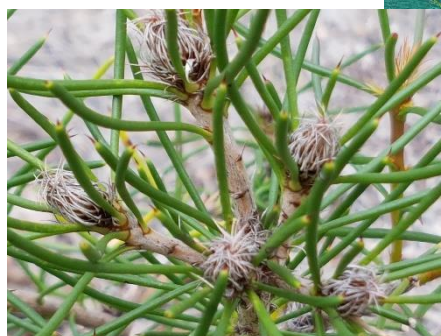
As suggested, not much happening in the garden or local bush, although I did catch one *Isopogon anemonifolius* in the act...releasing its seed (something I can't say I've seen before). Photo, right.



### Kevin Collins, Mount Barker WA

Propagation progress, clockwise from top left:

1. *I. buxifolius* dwarf foreground and left, *I. spathulatus* flowering on RHS.
2. *P. squamata*.
3. *I. dubius* seed grown. New bud (18 months old) from Wandering area.
4. *I. formosus* (coarse leaved with first buds in pot plant). This is the cutting grown one from clay roadside cutting on Chester Pass Rd. The coarse leaf form strike but the normal fine leaved ones refuse to?
5. *P. brevifolia* ? buds. (X Stirlings cutting grown.)
6. *P. rigida* bud



## Fiona Johnson, Blayney, NSW

I'm really sorry you had a tough time with the fires. It was a horrible summer and, while the weather's improved, 2020 isn't shaping up as a great year as yet. My central tablelands garden really suffered through summer, with decimation of many young plants by wingless grasshoppers and desiccation of established plants by the heat and the dry, particularly leptospermums.

However, the I & Ps appeared mostly unaffected (not that I have a great number). I did lose the *Petrophile linearis* I acquired at Horsham when there for the FJC Rogers seminar, which was not surprising. The small but very root-bound *Petrophile biloba* I bought from Neil Marriot at the same time is doing well. It's growing very slowly, as do many plants in my conditions, and was partly broken by a passing kangaroo but it's battling on and has its first flowering (see photo). The *Isopogon dawsonii* has been in the ground for about 18 months and has its first flower buds developing at present (see photo), but I can't see any buds on anything else yet. My 'yellow patch' of various yellow isopogons and other plants is looking good but no buds yet. But the *Isopogon mnoraifolius* hybrid you gave me at Horsham gave up the ghost during the summer and I don't really understand why, as all the plants around it stayed looking very healthy.

Garden progress, clockwise from top left:

1. *Isopogon anemonifolius* new growth
2. *Isopogon dawsonii* plant
3. *Petrophile biloba* plant
4. *Isopogon fletcheri* plant
5. *Petrophile pulchella* new growth



## Liesbeth Uijtewaal, The Netherlands

Spring brought so many I and P flowers and buds, some of them flowering for the first time which is extra exciting... Most plants were grown from cuttings in 2017, some plants are a few years older, grown either from seed or cuttings.

Isopogon: 'Candy Cones', 'Stuckey's Hybrid', anemonifolius, cuneatus, dawsonii, divergens, dubius, fletcheri, formosus, mnoraifolius, petiolaris, scabriusculus ssp. stenophyllus and trilobus. One that's cutting grown, more than two years old and still not budding up is I. anethifolius but I'm sure it will surprise me with flowers next year. It has been sulking in its pot for a while but it's back to life again.

Petrophile: ericifolia, fastigiata, linearis, pedunculata and teretifolia. P. pulchella/sessilis (not sure which species it is) was sown in November 2017 and hasn't flowered yet; in general seed grown plants take at least one more year to flower than cutting grown ones from mature plants. Fingers crossed I'll see the flowers next year and find out which species it is exactly.

I check the fastigiata each day to see the progress...not much to be honest. Many more exciting first buds in e.g. scabriusculus ssp. stenophyllus, dubius and fletcheri. Those I's and P's definitely are the gems in my collection: smallish growing, attractive shape and foliage and flowering at an early age from cuttings. Fairly easy to propagate too... P. fastigiata is getting close..... I. fletcheri has two 'flowers' that started to open with more to come. As said before, fabulous plants.



P. fastigiata bud, left, and flowers about to come out, right.

By the way as mentioned in the previous newsletter I've grown some back-up plants recently from cuttings of my P. ericifolia plant. Unlike the first cuttings, collected in Australia, these cuttings had a much better strike rate, 4 out of 6. Living in the Netherlands my plant was grown under much lower light conditions than the original that lived in a very sunny spot: this fits with the observations of Hazel Dempster that cuttings taken from the shady side of a bush have a better strike rate. So, if you intend to propagate a plant try the shaded bits, it might work!

## Exchanging cuttings and seed

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The following four step process is a way to share cuttings and seed between study group members. We need to expand the species list available by including 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.

All States apart from Western Australia allow cuttings to be mailed from NSW. If you would like us to send cuttings or seed to you, here are the steps (may vary for seed-only requests):

1. Email us to check that material is currently available ([isopetstudygroup@gmail.com](mailto: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 and 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!

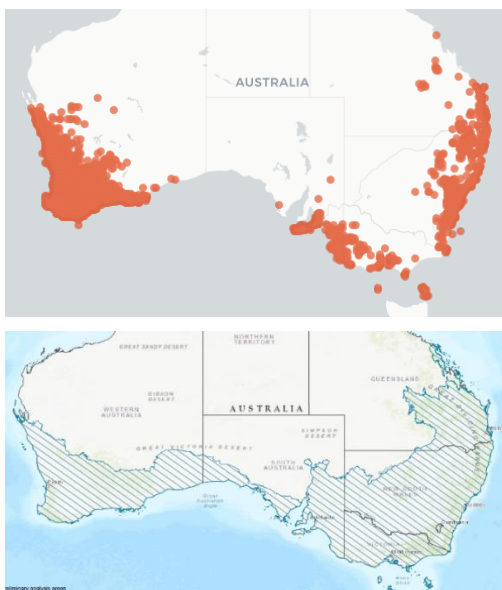
**Isopogon** – anethifolius, anemonifolius (1.5m shrub, 0.3m shrub), buxifolius var buxifolius, ‘Coaldale Cracker’, cuneatus (shrub, dwarf coastal form), dawsonii, divergens, dubius, formosus, gardneri, gardneri\*divergens, latifolius, mnoraifolius, petiolaris, spathulatus, sphaerocephalus, trilobus, ‘Stuckeys Hybrid’  
**Petrophile** – pedunculata, pulchella, sessilis, shirleyae

## Severe fires hit isopogon & petrophile hotspots

### Catriona Bate

By all accounts and measures the summer of 2019-20 was an extraordinary fire season across southern Australia, affecting much of the geographic range of isopogon and petrophile species and burning a total of over eleven million hectares of land. New South Wales took the brunt with its season being the worst on record in terms of the intensity and scale of the fires and the amount of area burned, but the fires also affected Victoria, Queensland, South Australia, and Western Australia. Experts say these catastrophic fires were fuelled by climate change. Extremely hot, dry conditions, underpinned by years of reduced rainfall and a severe drought, set the scene for this summer’s unprecedented fires.

The plight of wildlife has grabbed headlines but the impact on Australia’s flora has also been severe. The general area of the fires across Australia coincides broadly with the distribution of isopogons and petrophiles. Their distribution area is similar to that selected by the Commonwealth Department of Agriculture, Water & Environment for preliminary analysis of threatened and migratory species with more than 10% of their known or predicted distribution in areas affected by bushfires in southern and eastern Australia between 1 August 2019 and 13 January 2020.



Left, distribution of *Isopogon* and *Petrophile*. Below left, preliminary analysis area, bushfire affected threatened species. Below, areas burned by bushfire, summer 2019-20. Note that comprehensive maps are as yet difficult to find. This map gives an indication but is not complete.



As we know, native plants can flourish after bushfire. Isopogons and petrophiles come from fire-prone ecosystems and have evolved to cope with fire, recovering by re-sprouting or releasing a seed bank into the soil. But there's only so much hardship they can take. When fires are too frequent or too intense, plants are



Isopogons resprouting after fire, Stirling Range National Park, 2020. Probably *I. attenuatus*, which has a lignotuber. Photo: Genevieve Milnes

sensitive to fire i.e. killed. This particularly applies to reseeders which require enough time between fires to grow new seedlings to reproduction stage. Although resprouters can readily resprout, too frequent fires prevent them reproducing, while too intense fires could destroy their underground lignotuber. For a discussion of the way in which these genera respond to fire, [see our article in Newsletter 20](#), p20.

Looking at what happened in each state where isopogons and petrophiles occur, there are many areas of concern. This not only applies to species with a restricted distribution which could be wiped out altogether, but also to more common species where large tracts of their habitat have been destroyed and local populations annihilated. While national parks are one of the main ways we conserve biodiversity, these fires particularly occurred in national parks and surrounds. In time we may be able to discover exactly how different species fared. We all hope they recover and that their distribution will not be reduced even further than as at 2019. Damage, however, extends beyond individual species to whole ecosystems across considerable expanses. And the impacts of climate change on recovery is yet to be determined.

In New South Wales, the fires were concentrated along the Great Dividing Range and adjacent tablelands and in coastal environments. Over 150 national parks had more than 50% of their area affected, with over 50 having more than 99% burned. In terms of the major vegetation types, reportedly around 50% of all heathlands in the state were burned, over 25% of dry sclerophyll forests and over 50% of wet sclerophyll forests. Vast swathes of bush were lost where common species such as *I. dawsonii*, *I. anethifolius*, *I. anemonifolius*, *P. canescens*, *P. sessilis*, *P. pulchella* and *P. pedunculata* occur, particularly in the bushfire area ringing Greater Sydney which included the megafire called the Gospers Mountain fire. This also occurred in the southernmost reaches of their range in the Morton National Park and surrounds, decimated by the Currowan fire. Some 80% of the vast Greater Blue Mountains World Heritage Area, which incorporates five national parks, was burnt. Fire reached Govetts Leap near Blackheath where the rare species *Isopogon fletcheri* grows in moist sheltered cliffs within the spray zone of a waterfall. Previously considered fire tolerant because it resprouts after fire, this description may have to be revised.

*Isopogon prostratus*, a prostrate species with a lignotuber, is generally not common and has a fairly scattered range which falls in



*Isopogon anemonifolius*. Drawing by Lesley Page

the area of the widespread fires in the far southeast of NSW and far northeast of Victoria. In Victoria it is very rare with only two small, disjunct occurrences – at least one of these very likely to have been destroyed.

In South Australia, Kangaroo Island had almost half the island devastated, including about 96% of Flinders Chase National Park on the island’s western end. Kangaroo Island is home to the endemic species *Petrophile multisecta*. Previously not considered vulnerable due to healthy local populations, the situation may now be radically different.

In relative terms the fires in south west Western Australia were less extensive. But this state’s dominance of *Isopogon* and *Petrophile* species (80-90% of all taxa) means any fire is a concern. In addition, many species there have extremely limited distributions indeed.

A fire at Yanchep north of Perth tore through Yanchep National Park where *P. axillaris*, *P. brevifolia*, *P. macrostachya*, *P. serruriae* and everyone’s favourite *P. linearis* (Pixie Mops) are usually found. Of these, *P. axillaris* is least common and restricted to limestone areas between Perth and Geraldton. There was also a major fire in the WA Goldfields area near Norseman potentially near where the rare *Isopogon robustus* has a small population.

Another fire in the east of the state along the Great Australian Bight claimed large areas of Nuytsland Nature Reserve and spread to the adjoining Cape Arid National Park. Unfortunately, this area also had bushfires as recently as the summer of 2017-18. One positive is the fact the area is also a known western ground parrot habitat so will attract intensive post-fire conservation efforts. Among the seven isopogon species possibly affected are *I. alcicornis*, *I. attenuatus*, *I. trilobus* and the popular *I. formosus*. Of around six petrophile species, there is *P. teretifolia*, *P. fastigiata*, and *P. phyllicoides*.

But the most catastrophic consequences for isopogons and petrophiles likely occurred in the Stirling Range National Park, home to an amazing 13 isopogon species and about 21 petrophile species, where about a third of the park was destroyed. SG member Erica Shedley reports: ‘The fires in the Stirling Range were extensive and very hot so where it burnt, there was not much left, only black sticks. I was there in early March and was quite shocked by the severity of the fire. It burnt all up Bluff Knoll and north-west to Mt Trio and to the northern boundary of the park.’ Several of our members have sent in photos showing the bare soil and black sticks post-fire. As they note, it’s hard to tell which species is which, post-fire.



Burned petrophile in the Stirlings (probably *P. heterophylla*). Photo: Lyn Alcock

Species found in Stirling Range National Park	
ISOPOGON	PETROPHILE
<i>attenuatus</i>	<i>anceps</i>
<i>baxteri</i>	<i>carduacea</i>
<i>buxifolius</i> var. <i>obovatus</i>	<i>crispata</i>
<i>cuneatus</i>	<i>divaricata</i>
<i>formosus</i>	<i>diversifolia</i>
<i>latifolius</i>	<i>drummondii</i>
<i>longifolius</i>	<i>ericifolia</i> ssp. <i>ericifolia</i>
<i>polycephalus</i>	<i>filifolia</i> ssp. <i>filifolia</i>
<i>spathulatus</i>	<i>heterophylla</i>
<i>teretifolius</i>	<i>longifolia</i>
<i>trilobus</i>	<i>media</i>
<i>villosus</i>	<i>phyllicoides</i>
	<i>prostrata</i>
	<i>rigida</i>
	<i>seminuda</i>
	<i>serruriae</i>
	<i>squamata</i>
	<i>striata</i>
	<i>teretifolia</i>

There are too many species usually found here to mention (see list, left). Many are particularly associated with the Stirlings although they do occur elsewhere (usually in the same general region). For example, the woolly *I. baxteri* (common name the Stirling Range Coneflower) and *I. latifolius*, the spectacular species with the

largest flower head. Distinctive petrophiles of the area include *P. filifolia*, (one of this study group’s top species), *P. heterophylla*, *P. anceps* and *P. carduacea*.

In terms of known conservation issues, four of the species in Stirling Range National Park have conservation priority status indicating a possibly threatened species. First in order of priority is *Petrophile carduacea* (Level 2) which has distinctive serrated long leaves and can usually be seen on the side of Red Gum Pass Road. Next is *I. buxifolius var. obovatus* with Level 3 priority. Finally, *I. latifolius* is Level 4 reflecting limited distribution requiring ongoing conservation monitoring. There are currently no gazetted rare species in the Stirlings – however the recent fires may well result in revisions to current priority listings.

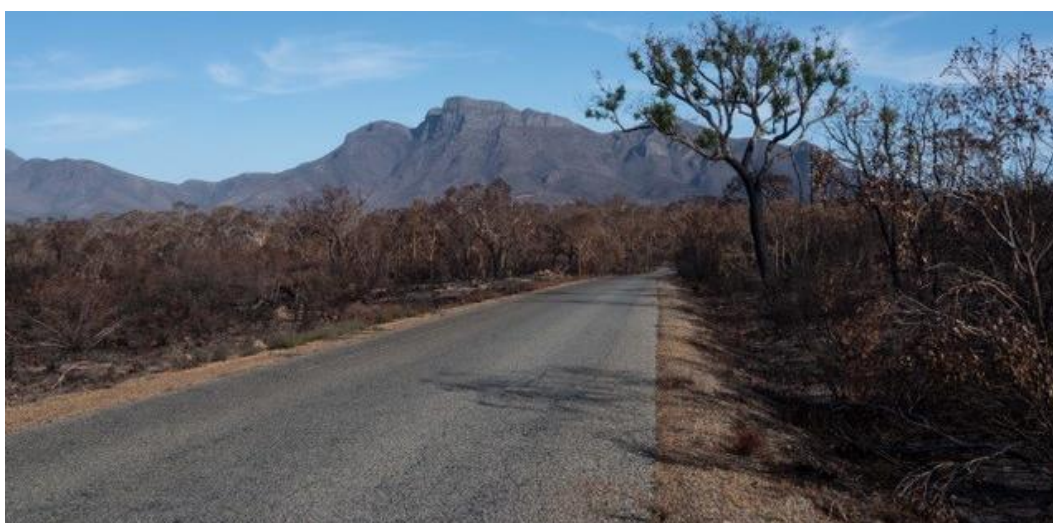
Governments have already announced plans for on-ground surveys and rapid assessment of threatened species and protecting regenerating habitat. In the Stirling Range National Park, a special program of seed collection and establishment of seed production areas for threatened plants is planned.

### Role of the Study Group

As a study group, we have an important role in helping to conserve these genera. The expectation that climate change will continue to facilitate fires in the future highlights the importance of ensuring we preserve species in our gardens, plus botanic gardens and seedbanks. We also need to understand species responses to a changing climate. The Royal Botanic Gardens Sydney has pointed to the need to make a substantial inroad to collecting as many plant species, and their genetic diversity, as possible, to be sure of preserving them into the future, and combine this with programs to recover threatened species and restore species in the wild.

We all need to redouble our efforts to collect as many species as possible, and to study their cultivation and propagation requirements. We have already raised the need for us, when restrictions permit, to get out into the bush to observe the response of isopogon and petrophile species to fire. This is not well documented in the existing literature. For example, which species have a lignotuber and therefore will resprout after fire? Observing recovery after fire is the easiest way to establish this. By this means we can also identify those which are reseederers. The list on the right summarises current knowledge.

Species known to have a lignotuber	
ISOPOGON	PETROPHILE
<i>petiolaris</i>	<i>shirleyae</i>
<i>mnoraifolius</i>	<i>canescens</i>
<i>ceratophyllus</i>	<i>multisecta</i>
<i>asper</i>	<i>linearis</i>
<i>attenuatus</i>	<i>brevifolia</i>
<i>anemonifolius</i>	<i>pedunculata</i>
<i>alcicornis</i>	<i>helicophylla</i>
<i>prostratus</i>	<i>seminuda</i>
<i>divergens</i>	
<i>drummondii</i>	
<i>linearis</i>	
<i>prostratus</i>	
<i>sphaerocephalus</i>	
<i>uncinatus</i>	
<i>fletcheri</i>	
<i>polycephalus</i>	
<i>rigida</i>	



View of Stirling Range National Park after the fire. Photo: Lyn Alcock

## Member observations on effects of fire

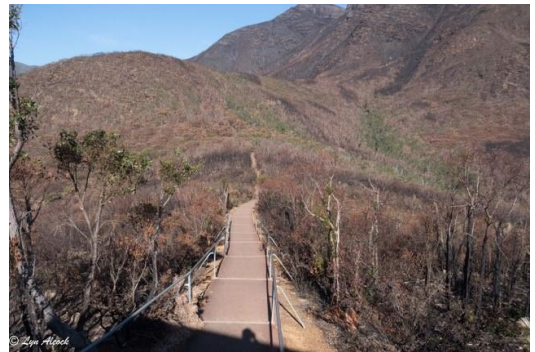
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Naturally, members are finding it difficult to get out to observe bushfire damage right now. In any case it seems it's mostly too early. However, some of our members have already provided observations about lignotubers. Hopefully we will all be able to do some field research later in the year when new growth should still be apparent and/or seedlings might be appearing. However, the issue of how to identify burned or recovering I&P species is an issue, any suggestions are appreciated. We may have to either prepare beforehand so we know what should be in the area and what it looks like, or do some identification work afterwards. If members forward their photos to us, we will also do our best to assist.

**Roger Farrow, NSW:** I would like to be able to continue checking the method of recovery of the vegetation along the Nerriga Road, including Isopogons and Petrophiles. According to the NPWS Web Site most parks and trails are open except those with high visitation rates. I notice that the Barren Grounds is closed. The main issue in the current Government CV guidelines is how far is one able to travel to an open National Park or Nature Reserve, or indeed not at all and walk for exercise from home, which is what most people in towns probably do. In which case most National Parks might as well be closed. We are 130 km from Nerriga and 50 km from Canberra which is allowable for shopping. Bunnings in Tuggeranong is actually packed... It would be far more risky going there than visiting Nerriga Road where I would encounter no one. Any of the Canberra Nature parks are also full of walkers especially places like Mt Taylor. Anyway I don't think I would have anything ready by your deadline as the seedlings coming up need to be more advanced to identify.

**Paddy Lightfoot, NSW:** Caryl and I are in isolation at present. We do a bush walk through the local reserve but no I & P that I have seen. The area missed being burnt.

**Lyn Alcock, WA:** Before our regional shutdown I did spend some time in the Stirlings and took a lot of photos, some of I&Ps. Will have a hunt through and see what I can find...I found it hard to ID I&Ps tho after the fire...but might have to even send some for you to check. [See one of Lyn's photos, right.]



**Erica Shedley, WA:** I was [in the Stirlings] in early March...I wasn't able to determine the full extent of the fire or what population of rare species were burnt as I only had an hour there, trying to find some birds for my tour guests. Fortunately they were able to save the Bluff Knoll Café and the Stirling Range Retreat, but both have lost most of their customers, particularly now with the virus. I am not able to travel over to the South Coast Region, or out of the South West region for that matter to look for wildflowers, due to regional road blocks for possibly 3 to 6 months. Hopefully Kathy and Kevin may be able to get over to the Stirling Range when the plants start to reshoot and germinate, but one would have to know the exact location of the various species, or have them tagged, as it would be difficult to tell which is what for some time.

**Kevin Collins, WA:** We like Erica saw the badly burnt areas of the Stirling's back 6 weeks ago. Xanthorrhoea, Eucs and others starting to shoot to give life to the blackened landscape. Primarily it was to see the new species of dryandra that Lyn Alcock had photographed and I observed as being prostrate instead of mounding. If I get the chance may drive out to a couple of locations where I know I & Ps grow.

From Mondurup reserve we know *I. polycephalus*, *I. attenuatus* & *P. rigida* resprout. *P. diversifolia* & *P. serruriae* are killed & seed up.

**Liesbeth Uijtewaal, The Netherlands:** Of course I have no experience with burnt I's and P's but I feel that my *Isopogon anemonifolius* definitely would have survived the bushfires since it grows many stems from the ground, away from the initial mesh propagating container. It may have developed a lignotuber or some other

underground structure from where it can reshoot after a bushfire? Interesting to see that these structures can be formed from cuttings, I seem to recall that in general lignotubers only develop in seedlings?? On the other hand I once had a lignotuberous *Calothamnus*, cutting grown offspring developed a lignotuber as well.



## It's not just about the flowers

There is no doubting the brilliance of so many of our stunning isopogons and petrophiles in flower. The range of colours, abundance of flower heads, intricate floral elements such as Fibonacci spirals and chequerboards, matchsticks, tassels, stripes and spots, and a wonderful range of textures make for stunning displays each spring. But there's so much more to these amazing plants.

The distinctive cones and drumsticks which give these species their common name are beautiful in their own way. Sometimes cones are used in floral arrangements. While not colourful, they retain many intricate elements. SG member Rhonda Daniels has been enjoying the autumn display of *P. pulchella* with an amazing number of flower heads arranged in neat rosettes at the end of long stems (see right).



The detail in these spent cones is often overlooked. Someone who really appreciates the patterns, textures and muted palette of such cones is Ita Goldberger who has been photographing them in the WA bush recently, prompting much admiration online. Here are her pictures of *Isopogon sphaerocephalus* (left), *Isopogon asper* (overleaf, left) and *Isopogon dubius* (overleaf, right). An interesting comment on the latter was that it looks like jewellery!



*Isopogon asper* (left) and *Isopogon dubius* (right). Photos: Ita Goldberger

But wait, there's more! We have often discussed the many attractive aspects of isopogon and petrophile foliage. The range of shapes is fascinating and includes many species with a three-dimensional leaf structure. Massed displays in gardens which feature these genera using the same species or repeated plantings of a certain range of species takes advantage of this to create an impressive year round display. There are good examples in public gardens such as The Australian Botanic Garden Mount Annan NSW, Royal Botanic Gardens Victoria Cranbourne, and in private gardens such as that belonging to our SG members Mark and Carolyn Noake. You can also find this occurring naturally in the bush.

Foliage colour is another important feature of isopogons and petrophiles. There is a wide range of greens from blue-grey through to deep green and bright green. Commonly bright green, these leaves are far from drab, as Australian plants are sometimes assumed to be. A strength is the ability to look good no matter what the conditions or season. Many members have commented on how many of their isopogons and/or petrophiles sailed through the recent drought with foliage virtually unaffected.

And there is another thing about isopogon and petrophile foliage that is special. It can change colour. When this happens, the effects can be striking. Alex George discusses how some species can turn red or pale to conserve moisture in his article on [diallagy in this issue](#). Another colour change process conserves phosphorus during leaf development. Leaves only develop their green colour later on, first putting out leaves in shades of red.

This delayed greening is an often-overlooked feature which is also shared with many other proteaceae species. Reds, yellows and bronzes are very common and they make an impressive contrast against the greens

of the mature foliage. Here are some examples in our garden now – from left, *I. formosus*, *I. 'Coaldale Cracker'*, and *I. baxteri*.



Hans Lambers, Professor of Cell Biology (UWA), co-authored a paper in 2014 examining this feature in proteaceae, titled 'Low levels of ribosomal RNA partly account for the very high photosynthetic phosphorus-use efficiency of Proteaceae species'. In this video, Hans discusses reasons for this 'delayed greening' in new growth of *I. dubius*. <https://www.facebook.com/kwonganfoundation/videos/1692163744138118/>

Two reasons are put forward for this 'delayed greening'. Firstly, it is considered a defence mechanism against marauding macropods feasting on the tender new growth. Apparently the red/yellow colours are not appealing to kangaroos and wallabies. Our experience last year with a couple of red-necked wallabies showed that not all wallabies are put off by 'delayed greening' foliage. They decimated our I & Ps, devouring all the new growth with relish! Hans explains that the second reason for 'delayed greening' is a response to the low levels of phosphorus in our commonly impoverished soils – "Phosphorus is the most important limiting nutrient in their environment, so it is essential they use it as economically as possible. It is needed, among others, to make proteins. First they make all the proteins to build the cell. Then they recycle the phosphorus that was needed to make those proteins, and start using that phosphorus to make the proteins in the chloroplasts; that is when they become green, the red pigments protect the leaves against high light intensities before the chlorophyll can absorb all the light for photosynthesis. Isn't that clever?"

So don't just look at the colourful flower heads on our I & Ps. Pay attention throughout the year. And please take some photos of I & Ps in your garden and in the bush, and send them through to share with members.

## Diallagy: dry weather colouration

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### *Alex George*

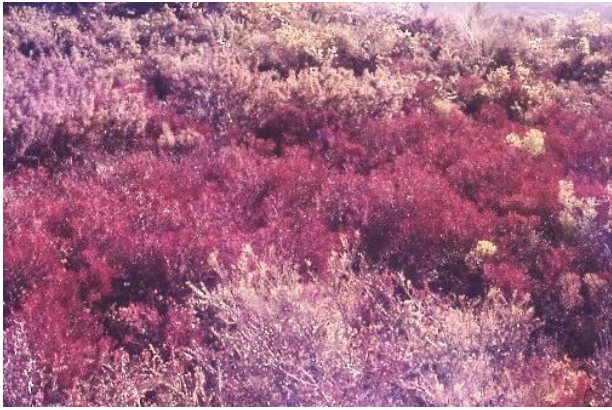
Diallagy is a term that I coined in 2002 to apply to the strategy of 'evergreen' plants in which the foliage changes from its normal green to a different colour during extremely dry weather and then reverts to its green state when moisture is restored. The word is derived from the Greek *diallage* meaning 'interchange'. Its adjectival form is 'diallagous'.

The strategy differs from autumn colouration in deciduous plants which usually occurs as leaves change colour before falling. It can be quite colourful and so may be seen as our version of autumn colour.

In Western Australia several species show foliage colour change in a normal summer, best known being species of *Borya* that turn shades of orange and yellow. It is also common in *Allocasuarina campestris*. It was towards the end of an extremely dry summer (2000–01), however, that I noticed it showing up more widely and recorded my observations in a paper (2002) and in my book *The Long Dry* (2002). I recorded it in 99 species in 59 genera of 24 families (both dicots and monocots), and more have been added to the list since. The rate of regreening after the rains began varied from a few days to a few weeks, indicating that a number of strategies are involved. Apart from research on *Borya* by Don Gaff at LaTrobe University many years ago (Gaff, 1981), very little has been done towards unravelling these.

In the Proteaceae, pronounced diallagy is uncommon, though a number of species show subtle change, e.g. in their foliage simply turning dull or a little pale. One of the most spectacular diallagous plants, however, is *Petrophile seminuda* which turns red in most summers. It is also widespread and can form swathes of deep red in kwongan and Wandoo woodland. *Petrophile squamata* can turn deep red, while *Isopogon scabriusculus* can turn pale.





*Petrophile seminuda* in its 'coloured' state. Left, with other diallagous plants, N of Mt Lesueur, W.A., 27 March 1977.  
Right, Tootbardi Road, N of Badgingarra, W.A., 27 March 1977.

The message for those growing these species is: if your plants turn red or pale, don't worry that they are about to cark. Enjoy the colour and await the next good rain. About 10 mm or more will be enough to set them regreening.



*Petrophile seminuda* with the sedge *Ecdeiocolea monostachya* and other diallagous plants, S of Cadda Road, Brand Hwy, W.A., 20 March 2014.

Gaff, D. (1981), The biology of resurrection plants, pp 114–146 in J.S. Pate & A.J. McComb (eds), *The Biology of Australian Plants*, University of Western Australia Press, Nedlands.

George, A. (2002), *The Long Dry: Bush Colours of Summer and Autumn in South-western Australia*, Four Gables Press, Kardinya.

George, A.S. (2002), The south-western Australian flora in autumn: 2001 Presidential Address, *Journal of the Royal Society of Western Australia* 85: 1–15.

## *Isopogon adenanthoides* Meisn., *Hooker's J. Bot. Kew Gard. Misc.* 7: 69 (1855)



*Isopogon adenanthoides*, or the spider coneflower, was given the specific name *adenanthoides* for the similarity of its foliage to many *adenanthos* species – *oides* is a common suffix in botany, meaning similar to, or resembling.

**Description** – *Isopogon adenanthoides* is a striking, small, upright shrub to 1m in height, without a lignotuber. It is quite a hairy species, with velvety branchlets, cone scales and involucral bracts plus leaves with long, fine spreading hairs. The terete leaves are 10-18 mm long and occur all along the branches right up to and covering each terminal inflorescence.

They are mostly trifid off a short leaf stalk (see photo below). While the leaf segments end in a pungent point, the foliage overall is soft and furry. Flower heads are abundant and terminal, providing a stunning display. Flowering



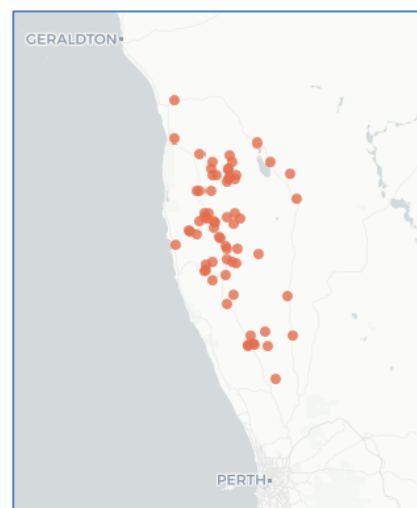
generally occurs from July to October, with glabrous pale pink flowers (hairless apart from a tuft of hairs at the apex) poking out from amongst the foliage. The long flowers (up to 25mm), which droop after opening, tend to emerge from a flattish area on top of the inflorescence, and wave in the air like spider's legs, hence the common name. The pollen presenter (pictured above) is spindle-shaped with a clear constriction before its point (stigmatic cup).



relatively common in a restricted area north of Perth from Three Springs to Badgingarra and Eneabba. Excellent places to find this species are Alexander Morrison National Park and Tathra National Park and the roadside verges around Badgingarra.

**Cultivation** – this is yet another beautiful isopogon rarely seen in cultivation. Its compact habit and terminal pale pink flowers make it a spectacular plant for pots and well-drained gardens. Like most WA isopogons, grafted forms are probably required for reliable results in east coast gardens. It grafts readily onto eastern species *I. anethifolius*, *I. anemonifolius* and *I. 'Coaldale Cracker'*.

**Distribution** – *Isopogon adenanthoides* is





**Confusing species** – *I. adenanthoides* can be confused with *Isopogon asper* which it often grows alongside. However, *I. asper* is usually smaller and differs in having inflorescences densely clustered along branchlets, with smooth and more-segmented leaves (up to seven segments). *I. asper* has a lignotuber. *Isopogon inconspicuus* can be found in similar areas but is also smaller, with white and very hairy flowers. Its similar-looking leaves are pinnate rather than trifid.

Left, *I. adenanthoides* habit, Hi Vallee Badgingarra. Photo: Lyn Alcock

## *Petrophile semifurcata* F.Muell. ex Benth., *Fl. Austral.* 5: 335–336 (1870)



*Petrophile semifurcata*, Zuytdorp Nature Reserve, 2019.

Photo: Roger Farrow

The specific name is from the Latin meaning half forked, referring to the leaves being shallowly forked or some leaves being forked and some entire.

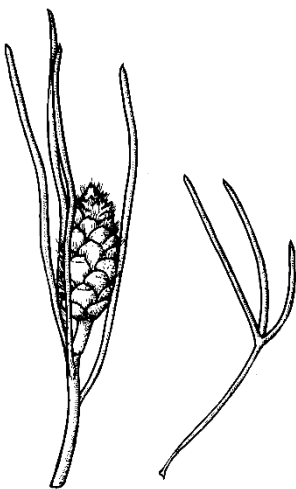
**Description** – one of the most northern of the petrophile species, it is an erect, bushy small shrub 0.3–1.5 m tall (but most often up to 1m high by 1m across). *Petrophile semifurcata* is conspicuously hairy, with velvety branchlets and cone scales, short, stiff hairs on the pollen presenter, and longer silky hairs on the flower tube or perianth. The leaves, however, are smooth. It is notable for its attractive and relatively large terminal creamy flower heads (2–4 cm



long) held up high on a pronounced stalk itself 10–20 mm long.

The needle-like leaves are long (7–14.5 cm), upright and rigid. Leaves can be simple, or with spreading lobes (2- or 3-lobed), sometimes dividing again towards the tip. Specimens with all of their leaves simple, or with a mixture of simple and divided leaves, are fairly common in the northern part of the geographic range but all southern specimens have divided leaves.

A long inflorescence rises on its stalk from tiny involucre bracts. Flowers have long silky hairs and emerge widely spaced and spreading. Around 14 mm long, they are whitish, lemon-yellow or cream in colour and appear between



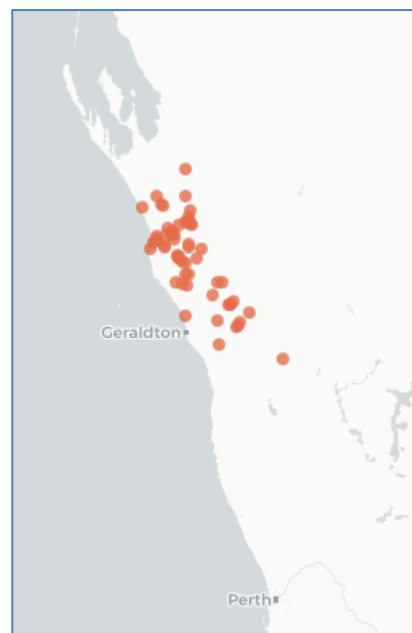
September and November. Cones appear much longer and narrower than the inflorescence. They hold nuts which are around 10 mm long.

**Distribution** – mostly found between Geraldton and Kalbarri in Western Australia, it grows in sand heaths, in open heath and in low heath with *Banksia* in deep yellow sand. It is easily found along the main Ajana-Kalbarri Road in Kalbarri National Park around October. Locally common, it is most common of the four petrophile species in Kalbarri National Park.

**Cultivation** – this species has been overlooked for cultivation. However its small size and prominent flowers make it very suitable for gardens. Plants with narrow leaves like this are now popular. At its peak it can look spectacular in the wild and should be even better in cultivation. It has not



*P. semifurcata* shrub, Kalbarri, 2019. Photo: Kevin Collins



been successfully propagated as yet but should be a candidate for the study group.

**Confusing species** – closely related to *P. incurvata* and *P. conifera* but readily distinguishable by the leaves and flowers. Specimens with simple leaves may be mistaken for calothamnus or smoke bush when not in flower but the persistent cones can easily confirm its identity.

## Grafting update

### *Phil Trickett*

I have had a number of new successes but as usual it has been a mixed bag. The following experiments used material collected on a whirlwind study trip to WA last year which concentrated on studying isopogons and petrophiles north of Perth up as far as Kalbarri. A collecting licence enabled us to take cuttings and seed of a large range of species and send them back home Express Post ready for processing as soon as we flew home.

Cutting grafts were undertaken for the following isopogons, all grafted onto I. 'Coaldale Cracker'. Here is a list of grafts attempted and results so far:

*I. adenanthoides* – no luck from only four attempts. Need to try again as Tony Henderson has grafted it successfully.

*I. asper* – no luck again. This seems to be a bogey species for me as it too has been grafted by Tony.

*I. linearis* – great success with plants from a number of localities. Thanks to Tony for his tip with this species as it needs an interstock of *I. cuneatus* or *I. 'Stuckey's Hybrid'*.

*I. inconspicuus* – a number of successes from a couple of localities. Very pleasing as this is known to be difficult to graft.

*I. sphaerocephalus* – success from one locality but failed with the striking large-leaved from Mt Lesueur.

*I. tridens* – often confused with *I. trilobus* but has cream flowers and only grows north of Perth. Plenty of successful grafts so should be a popular species to share with Study Group members.

*I. panduratus ssp. panduratus* - one of the easiest isopogons to graft so will have some replacements for the ones which perished in our January fire.

*I. teretifolius* – this is one of the two distinctive nodding isopogons (*I. nutans* is the other). I hadn't been able to graft this from previous trips but this time have a number of successful grafts growing well. This will be another beauty to share with members.



Successful grafts on *I. 'Coaldale Cracker'*: left, *I. teretifolius*; middle, *I. linearis* (with *I. cuneatus* interstock); right *I. inconspicuus*).

Petrophiles continue to present a major grafting challenge for me. Cutting grafts are proving unviable due to the rootstocks not striking roots readily enough. And growing stocks from seed is barely a viable option due to the 1-2 year period needed to establish seedlings to a size suitable for grafting. All the petrophile species collected from the WA trip were tried on a range of eastern petrophiles as cutting grafts but all failed due to the incredibly low strike rate of the rootstocks (close to zero!). Cuttings were also tried for the WA species but again no success. If anyone knows the secret to putting roots on petrophiles I would love to hear from you. As a third and potentially even more difficult way to produce plants, I have set seed of a range of these western petrophile species. After three months, the first two seedlings have just poked their heads up, so you do have to be patient!

But...there may be some light at the end of the horizon re: petrophile grafting. Previously I had trialed grafting western petrophiles onto isopogon rootstock with no success. However, I had never tried any isopogon interstocks, so I thought I would try grafting a couple of western petrophiles, *P. biloba* and *P. filifolia* onto *I. 'Coaldale Cracker'* with an interstock of *I. cuneatus*. And surprise surprise, the scions are starting to shoot. Time will tell whether these grafts are compatible but if they are it would be a great outcome. The interstock required is no big deal, as *I. cuneatus* grafts onto *I. 'Coaldale Cracker'* at close to 100% success rates. More on this trial next newsletter.

# Financial Report

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Total 23/11/2019 \$1,714.06

Bank balance \$1,610.62

Cash on hand \$103.44

Total 24/4/2020 \$1,714.06

Bank balance \$1,610.62

Cash on hand \$103.44