CONSERVING OUR REMARKABLE TRIGGERPLANTS

Juliet Wege

The triggerplant genus *Stylidium* is rather extraordinary. Famed for its incredible pollination system in which a touch-sensitive column or 'trigger' transfers pollen to and from insects, this large and charismatic genus also packs a punch in the beauty stakes. Triggerplant flowers come in a dazzling assortment of colours, shapes and sizes, are variously arranged and orientated, and are often adorned with hairs and small, intricate appendages. Furthermore, their growth forms are often highly ornamental and are remarkably diverse, encompassing rosetted or stoloniferous (running) perennials, dwarf shrubs, climbers, stilt plants, cushion plants, geophytes (which die back over summer to grow again next year), and tiny annual herbs.

But for all this wonderful variation, triggerplants have a dark side — a well-founded reputation as being taxonomically problematic and difficult to identify; however, this is gradually beginning to change. Over the past 20 years, a range of scientists have made extraordinary advances in the discovery, collection and description of new species, resulting in a much better understanding of triggerplant diversity in Australia. The genus is now known to comprise at least 300 species, most of which are endemic to Australia, with Western

A bee fly pollinates the threatened species *Stylidium applanatum*. Photo: Juliet Wege

Triggerplants know how to pack a punch – a native bee carrying a greenish pollen load gets thumped again by *Stylidium squamosotuberosum*. Photo: Juliet Wege

Australia's remarkable south-west region home to the greatest diversity. In this region, triggerplants grow in most habitats, and it is common for several different species to grow and flower together. Unfortunately, the south-west region is also where many triggerplants are either poorly known or under severe threat in the wild.

Underpinning conservation efforts in the south-west and beyond is a broad-ranging research program being conducted at the Western Australian Herbarium at the Department of Biodiversity, Conservation and Attractions (DBCA). This program not only includes the documentation of new species, but also the revision of known species and resolution of nitty-gritty nomenclatural issues, the sorting and classification of herbarium specimens, rare flora survey and conservation assessments, the study of evolutionary relationships and, perhaps unsurprisingly, a little pollination research.

Ingenious pollination

Triggerplant flowers are highly specialised. The male and female organs of the flower are fused together into a column that is usually bent at the throat of the flower so that it rests against the labellum (the tiny, modified fifth petal). At the tip of the column are the reproductive structures — male anthers and the female stigma, the latter usually developing after the pollen is released from the anthers. When a visiting insect probes for nectar, the column rapidly rotates so the tip hits the insect, either dusting it with pollen or, if the stigma has developed, retrieving pollen that the insect may already be carrying.

Triggerplant pollination has been clocked at 15–30 milliseconds, making it one of the fastest plant movements known. The rapid firing motion is followed by a much slower resetting, which returns the column to its original position so that it can be retriggered (within minutes in hot conditions). The rapid movement and slow resetting are brought about by changes in the distribution of potassium and chloride ions in the column bend, and associated changes in the shape of specialised motor cells.

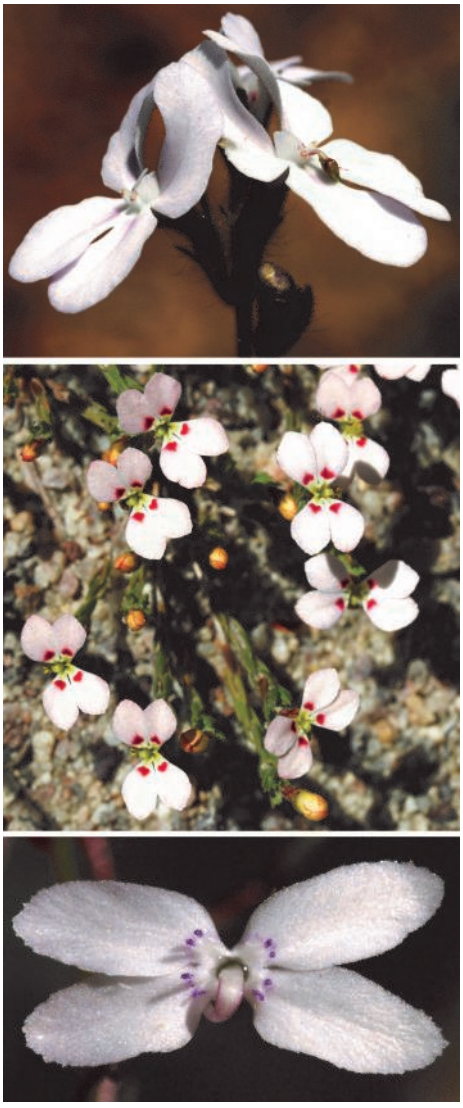
Ongoing research at sites across the South West region is revealing that a wide variety of nectar-gathering insects pollinate triggerplants, including an especially large range of large and small bee-flies and solitary native bees. All are undeterred by the unique form of punishment dished out to them; they seem to be long-resigned to their role as pollen couriers, repeatedly visiting different flowers in search of sweet nectar, and thus the triggerplant succeeds in moving pollen from one plant to the next.

Watching for pollinators takes a degree of patience (particularly in tick-prone habitats), but on a sunny morning it usually doesn't take long to observe some trigger action, particularly at sites where there are lots of plants in flower. Insects will happily move between flowers and, after a short while, a large and often colourful pollen load will become visible to the naked eye. In fact, if there is more than one *Stylidium* species growing in the vicinity, the insects are likely to move between them, and more than one pollen splodge may become visible. This is the really ingenious thing about triggerplant pollination: different species of *Stylidium* can place pollen in different places on different kinds of pollinators and can retrieve pollen from the correct spot on each. The direction of column movement (whether ventral, lateral or dorsal), and the length and shape of the column help to dictate the precise part of the insect's head, thorax or abdomen that will be hit. The same insect might visit three different triggerplants, only to be hit on the side of the thorax, the top of the head and the tip of the abdomen — they simply don't stand a chance!

A collection at the core of conservation efforts

The *Stylidium* collection at the Western Australia Herbarium, which consists of more than 12,250 preserved specimens, is at the centre of the *Stylidium* research program and associated conservation efforts. Sorting and accurately cataloguing this collection, which has more than tripled in size in the past 40 years, has been vital to understanding what species occur in Western Australia, where they grow and how rare they are. This baseline information is essential for conservation management, especially in view of the significant numbers of triggerplants that are known to be rare, threatened or otherwise of conservation concern.

There are 99 *Stylidium* taxa listed on the *Threatened and Priority Flora list for Western Australia*, more than half of which have been discovered and named in the last 20 years. Most need further survey to better document their distribution and abundance, as well as any threats to their survival. Triggerplants can be challenging to survey; they are often difficult to find when sterile, usually have narrow flowering windows, and different species can be easily confused with one another. Not only do you need to be in the right place at the right time, but you need to know exactly what you're looking for—a sound taxonomic framework is crucial.



Species discovered at the Western Australian Herbarium: *Stylidium diplotrichum* (top), *S. perula* (centre), *S. perplexum* (bottom). *Photos: Juliet Wege*

To produce this framework, each specimen at the Western Australian Herbarium is being assessed and validated. This process had led to the correction of many mis-identifications and a suite of new species discoveries including: *Stylidium diplotrichum*, a rare and stunning large-flowered species from the Lesueur sandplains; *S. perula*, a sprawling, stoloniferous species with a distribution centred on the Avon Wheatbelt; and *S. perplexum*, a lignotuberous shrub from near Dardanup. In

A new population of the conservation-listed species *Stylidium tylosum* was discovered by chance last year. *Photo: Juliet Wege*

each case, the taxonomic status of these species was confirmed by relocating and examining them in the wild. This is a plant group that demands field work, not only to obtain key data and resolve taxonomic issues, but to inform conservation.

Spring surveys

Every spring, I integrate field-based taxonomic research with surveys of poorly known triggerplants. This might involve a targeted search of a particular area to look for new populations of rare species, gathering information on pollinators or population numbers, or assessing habitat preferences or quality. Sometimes it simply means following my instincts and stopping the car to search a site I'm passing because my triggerplant radar has begun to quiver. Just last year those instincts turned up a new population of *Stylidium tylosum*, a pretty but little-known species from the southern Avon Wheatbelt.

Targeted surveys for the triggerplants most at risk are often done in collaboration with DBCA Conservation officers and volunteers, who have fantastic regional knowledge. Such a collaboration recently led to the conservation status of two taxa from the Avon Wheatbelt (*Stylidium applanatum* and *S. coroniforme* subsp. *amblyphyllum*) being upgraded to Threatened. Two more species will be targeted this year: *S. hygrophilum*, from east of Margaret River, and *S. asymmetricum*, from the Wandoo National Park.

Stylidium hygrophilum is one of a select number of leafless triggerplants: it is a geophyte, having a rhizomatous stem that lies undetected in the soil until late spring, at which time its attractive apricot-pink flowers come into bloom. There are less than 250 individuals known in the wild, a sobering statistic that spurred a seed-banking quest in 2014 during a private trip to Margaret River. I was able to convince my long-suffering partner to help me bag plants with developing fruit so that seed could subsequently be collected by a DBCA Conservation Officer and sent to Western Australia's Threatened Flora Seed Centre. This teamwork resulted in around 2,500 seeds being banked.

The second species to be targeted for surveys this year is *S. asymmetricum*, an ephemeral herb named for its unusual, asymmetric corolla lobes. This tiny triggerplant is currently known from just three sites and is being threatened by feral pig diggings and inappropriate off-road vehicle use. A team of people will be out and about this year, taking advantage of the good seasonal conditions to survey the known populations and search for more.

What the future brings

Stylidium remains in a state of taxonomic flux as our natural history collections continue to be sorted and classified, new species formally described, and the scientific names researched and validated. A taxonomic account of the genus is being prepared and will include web-delivered fact sheets and an interactive key, both of which will be full of photographs and information that will revolutionise identification and facilitate conservation efforts across the country. So watch this space. No, better still, go and watch some triggerplants. You'll be amazed at what you see.

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The hunt is on for more populations of the tiny triggerplant *Stylidium asymmetricum*. *Photo: Juliet Wege*