# Blooming spectacular

Two hundred years since the first triggerplant was scientifically described, research into this unique and diverse plant group is continuing to unearth new species, especially in Western Australia's south-west.

by Juliet Wege

With more than 250 species, subspecies and varieties, the triggerplant genus *Stylidium* is among the largest flowering plant genera in Australia and the largest in the family *Stylidiaceae*. Members of this family—which also include the lesser-known genera *Levenhookia*, *Forstera* and *Phyllachne*—are easily distinguished by a unique floral column that bears the male and female reproductive parts at the tip. Unlike its relatives, the columns of *Stylidium* are touch-sensitive, giving rise to the genera's common name. Triggerplants form an important and vibrant component of a variety of ecosystems, especially in south-west WA, a region internationally recognised for its biodiversity.

## Trigger happy

Triggerplants are small herbs with delicate, highly-specialised flowers. Each flower possesses five corolla lobes, which are fused in the lower part to form a tube of variable length. One of the lobes—the labellum—is highly reduced in size to accommodate the movement of the column (or trigger). The column is a slender structure that arises from the centre of the flower. It is typically bent backward at the throat of the flower and often rests against the labellum. When an insect forages for nectar, the column springs from its poised position, flips rapidly through the air and strikes its body. The column then gradually resets and is ready to fire again in a short space of time. This catapult-like device is a cunning way to transfer pollen from one flower to the next.

Although the pollen sacs and stigma are placed together at the tip of the column, the stigma doesn't usually emerge until after the pollen has been released. Young flowers therefore function like a miniature powder puff, dusting visiting insects with pollen, while older flowers gather an insect's pollen cargo. Native and introduced bees, flies, butterflies, wasps and beetles have all been observed visiting triggerplant flowers. The trigger movement is so quick (15 to 20 milliseconds) that these unsuspecting pollen couriers don't know what has hit them! They fly away somewhat bemused, but soon return to another flower in search of a sweet nectar reward. The process is repeated and pollen is ultimately transferred from one flower to the next.

A triggerplant will strike with great precision, repeatedly hitting pollinators on the same part of their body. Yet different species of *Stylidium* can hit visiting insects in different places. This is achieved through variation in both flower orientation and column length (or reach). Column length varies from 1.5 millimetres in the tiny triggerplant (*S. perpusillum*) to more than two centimetres in the tattered triggerplant (*S. laciniatum*). One wonders which insect is brave enough to pollinate the latter species!

*Previous page*
**Main** The cow-kicks triggerplant (*Stylidium schoenoides*) growing on sandy soils near Wilson Inlet, Denmark.
*Photo – Alex Bond*
**Inset** Hairy triggerplant (*Stylidium hirsutum*).
*Photo – Jiri Lochman*

**Above (left)** The silky triggerplant (*Stylidium pilosum*) specimen collected by Labillardière in the 1700s, and **(right)** the same species growing in the wild.
*Photos – Terry Macfarlane and Juliet Wege/CALM*

**Left** A pollen-laden bee-fly feeding on a triggerplant flower.
*Photo – Jiri Lochman*

**Above** *Stylidium hygrophilum*. Triggerplant flowers possess a highly-specialised column used to dust pollen onto unsuspecting pollen couriers.

**Right** The flowers of south-west triggerplants come in an extraordinary range of shapes, sizes and colours. *Photos – Juliet Wege/CALM*

## Astonishing diversity

Triggerplants display a breathtaking diversity in growth form, leaf structure and arrangement and flower morphology. The genus comprises both annual and perennial herbs that grow between three centimetres and three metres high. The short-lived herbs are the smallest triggerplants. They typically grow in seasonally wet habitats and often in such large numbers that they form a carpet of colour in early spring. The tattered triggerplant is the tallest *Stylidium*. This remarkable climbing perennial twines around the surrounding dense vegetation, often with the aid of tendril-like branches.

The leaves of triggerplants come in an assortment of shapes and sizes, and are often ornately trimmed or decorated with hairs. It is common for the leaves to be attached to a condensed stem stock and arranged in a rosette at the base of the plant. Sometimes, the leaf rosette is elevated above the soil surface on stilt-like roots, giving the appearance of a plant lightly dancing across the ground. Alternatively, the leaves are arranged on an elongated stem, which is either held upright or creeps laterally across the soil surface. A handful of species lack leaves altogether, such as the fleshy-rhizomed triggerplant (*S. squamosotuberosum*).

The flowers come in a glorious array of shapes, sizes and colours. The centre of the flower is often adorned with appendages and/or colourful markings that function both to entice insects toward the throat of the flower and to correctly orientate them for pollen transfer. The form and structure of these appendages and markings is highly variable, and can be unique to a given species. The flowers are usually borne on long stalks and are arranged in simple or complex inflorescences. The number of flowers per inflorescence varies from one to more than 500. Some species produce many inflorescence stalks per individual plant, thereby producing striking floral displays.

Triggerplants are well adapted to the hot, dry summers typical of southern WA. They either escape the harsh summer as soil-stored seed, or die back to an insulated stem stock or growth node, which lies dormant until the onset of autumn or winter rains. While most species are killed by fire and regenerate from seed, some are known to resprout from buried stem stocks.

## Horticulture

Triggerplants were successfully grown from seed in European glasshouses in the early nineteenth century, enabling European botanists to observe their unique pollination mechanism. At a time when there was a great deal of competition to be the first to flower strange plants from the other side of the world, *Stylidium* 'excited a considerable degree of curiosity and became the subject of much conversation' (according to Salisbury in *The Paradisus Londinensis*, 1808). Today, several species from *Stylidium* can be purchased from local plant nurseries, however, the full horticultural potential of the genus has yet to be realised.

## South-west hotspot

The south-west of WA—world renowned for its botanical diversity—is home to some 70 per cent of triggerplant species, most of which do not grow anywhere else. They occur in a range of habitats, including sandplain heaths and shrublands, eucalypt woodlands and forests, and coastal heaths and woodlands. Seasonally wet habitats such as swamps and stream gullies are a favourite haunt, as are the run-off areas at the edge of granite outcrops. The coastal high-rainfall zone is home to the greatest diversity of species, with fewer species present in drier, inland habitats. While some triggerplants are common and reasonably widespread, many are rare and/or geographically restricted as a result of highly specific habitat requirements or, in many cases, habitat loss. Sixty species found in the south-west are on the conservation priority list, and several of these are listed as declared rare flora.

Because of their small and often slender stature, triggerplants are readily overlooked when not in flower. Like many orchids, individual plants tend to have a fairly short flowering season, so close attention must be paid to the timing of any triggerplant foray. September to December is the optimal time to hunt for triggerplants, although peak flowering periods vary across the south-west. For example, the best time to see triggerplants endemic to the northern sandplains is in mid-September and October, whereas in wetter, more southern habitats, most species flower in November and December. A handful of southern species flower during summer, including the tattered triggerplant and the grey triggerplant (*S. glaucum*), and in autumn, like the tile-leaved triggerplant (*S. imbricatum*) and the Leeuwin triggerplant (*S. leeuwinense*). It isn't unusual to find several species occupying the same habitat. Species that grow in the same locality sometimes stagger their flowering times, so repeated visits to the same spot can be rewarded by the discovery of a different suite of triggerplants in flower.

**Above far left** Inverted-flower triggerplant (*Stylidium inversiflorum*) from Lesueur National Park.
*Photo – Jiri Lochman*

**Above left** Pale mountain triggerplant (*Stylidium albomontis*) is restricted to the south coast of WA.
*Photo – Bill Belson/Lochman Transparencies*

**Above** A triggerplant with a reed-like growth form (*Stylidium scariosum*).

**Left** Crab claws (*Stylidium macranthum*) grows in heathland near Esperance.
*Photos – Jiri Lochman*

## Triggering attention

*Stylidium* was described 200 years ago when the eastern Australian grass triggerplant (*S. graminifolium*) was named from a specimen collected in 1770 by Sir Joseph Banks and Daniel Solander, botanists aboard the *Endeavour*. The first known collection of a Western Australian *Stylidium* was made in December 1792 by Jacques-Julien Houtou de Labillardière, the botanist on a French expedition under the command of Admiral Bruny D'Entrecasteaux. He collected and named the magnificent silky triggerplant (*S. pilosum*) from the Esperance region. Robert Brown subsequently collected a range of triggerplants while circumnavigating Australia on the *Investigator* with Matthew Flinders. His description of 38 species in 1810—many from the south coast of WA—was a significant taxonomic contribution to the genus.

During the nineteenth and early twentieth centuries, more than 180 species, subspecies or varieties of *Stylidium* were named by botanists across Europe. These scientists largely based their research on pressed plant specimens, collected on major expeditions to Australia or sent to Europe by early colonists. Describing new species of *Stylidium* without the benefit of field observation must have been a source of immense frustration to botanists in Europe. Pressing and drying triggerplants distorts the delicate flowers, and many diagnostic features evident on living plants become difficult, if not impossible, to see. Consequently, many oversights and errors were made. As London-based

**Above** The common beaked triggerplant (*Stylidium adnatum*) can form spectacular floral displays.
*Photo – Andrew Davoll/Lochman Transparencies*

**Right** The posy triggerplant (*Stylidium crossocephalum*) is a common northern sandplain species.
*Photo – Jiri Lochman*

## A taxonomic tangle

The naming of the triggerplant genus by European botanists was not without some controversy. *Stylidium* was described in December 1805, when Carl Ludwig von Willdenow, citing an unpublished paper by the Swedish Professor Olov Peter Swartz, named the eastern Australian species *S. graminifolium*. He derived the generic name from the Greek word for pillar ('stylos'), in reference to the touch-sensitive floral trigger. However, Swartz wasn't the first scientist to name the triggerplants. Five months earlier, French botanist Jacques-Julien Houtton de Labillardière named six species under the generic name *Candollea*, chosen to honour Swiss botanist Augustin Pyramus de Candolle.

While Labillardière's publication pre-dates that of Swartz, his use of the name *Candollea* was illegitimate, since it had been previously used by French botanist Charles François Brisseau de Mirbel to name a genus of ferns. As a result, Labillardière subsequently accepted the name *Stylidium*, however, he was unaware that this name was also illegitimate! *Stylidium* had already been used by Portuguese naturalist João de Loureiro in 1790 to describe a genus in the Alangiaceae, a family of tropical trees and shrubs.

The correct name for the genus was subsequently a source of considerable debate. Ferdinand von Mueller, Australia's most eminent botanist at the time, was adamant that the correct name was *Candollea*, however, his European contemporaries did not agree with him. The decision to conserve the name *Stylidium* for the triggerplants was made at an international botanical congress in the early 1900s.

*Adapted from Raulings & Ladiges 2001* (Australian Systematic Botany *14: 901–935*).

**Above** The rare yellow mountain triggerplant (*Stylidium galioides*).
*Photo – Marie Lochman*

**Left** A boomerang triggerplant (*Stylidium stowardii*).
*Photo – Jiri Lochman*

botanist George Bentham noted in *Flora Australiensis*, published in 1869:

> 'the precise form of the corolla, the direction of its lobes in the expanded flower, and the small scales or glandular appendages in the throat or at the base of the labellum may be constant in many cases, and might serve for good specific characters but these parts are so delicate that there is great uncertainty in describing them from dried specimens'.

Despite being one of the largest genera in Australia, *Stylidium* has received significantly less taxonomic attention in recent years than iconic groups such as *Acacia*, *Eucalyptus* and *Grevillea*. In fact, no formal monograph of *Stylidium* has ever been undertaken by a botanist based in Australia. Nonetheless, during the past 50 years, knowledge of *Stylidium* has improved substantially, with a variety of botanists describing more than 100 new species. Of special note is Rica Erickson's delightful and informative book, *Triggerplants*, produced in 1958. While now outdated, it contains some beautiful illustrations and detailed field observations, and is a must-read for any botanical enthusiast.

## Progress and challenges

We have yet to describe and name all of our triggerplant species. This has enormous conservation implications, since many species are geographically restricted, and subject to threatening processes such as land clearing and weed invasion. Unnamed species are especially at risk of extinction because they are not being actively targeted in conservation programs.

Recent research conducted at the WA Herbarium is helping to protect our triggerplant flora by identifying and naming new species. This research, funded by the Australian Biological Resources Study, has involved the detailed study of thousands of pressed plant specimens housed at botanical institutions across Australia and Europe. Plants have also been examined in their natural environment. Field notes and digital photographs have been used to capture important taxonomic information, which is then linked to a pressed voucher specimen. Flowers have also been preserved in ethanol for later study. While material stored in this manner is completely drained of colour, the flowers retain their shape and can be accurately described with the aid of a dissecting microscope.

During the past three years, 25 new species have been unearthed in the south-west, many of which are rare or poorly known. For example, *S. hygrophilum*—a swamp-loving species with beautiful pale pink flowers—is currently only known from one small population in the Whicher Range, south of Busselton. *Stylidium validum*—another species new to science—is known only from greenstone habitats east of Hyden and may be threatened by mining activities. Identifying and naming these species will enable their conservation requirements to be addressed.

Large, complex genera such as *Stylidium* require detailed study over many years, if not decades. As it is estimated that there are more than 300 species in the genus, it is clear that much work remains before we can fully understand this extraordinary and beautiful group of plants.

For the past three years Juliet Wege has been funded by the Australian Biological Resources Study (ABRS) to review *Stylidium* for the Flora of Australia. She can be contacted through the WA Herbarium on 9334 0143 or by email (julietw@calm.wa.gov.au).

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# contents



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