# FLORA

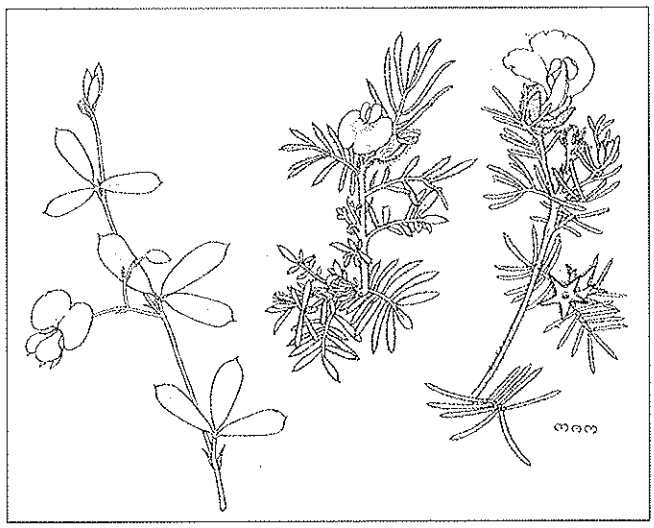
# THE GENUS GOMPHOLOBIUM - GLORIOUS BUT LITTLE-STUDIED LEGUMES

*Ann Smithson*

*Gompholobium* is a relatively little-studied endemic Australasian genus of native legumes (pea plants), having around 44 species, all bar one of which are endemic to Australia. They are sometimes more commonly known as glory peas or wedge peas, and are generally small to medium shrubs often forming a conspicuous component of the forest understorey and kwongan. *Gompholobium* species might be familiar to you through their characteristically large, inflated, globular pods that can be very conspicuous during fruiting, and their very colourful and often quite large flowers, which are typically-shaped for members of the pea family. They can also be distinguished from other similar genera by the calyx surrounding the corolla, which is very deeply divided into five lobes. While the well-known eastern states species *G. latifolium* is commonly called the golden glory pea due to its very bright yellow flowers, *Gompholobium* flowers can be yellow, orange, red, pink, blue or purple, depending on the species, and when flowering are often very showy. WA is the centre for *Gompholobium* diversity, with all but 14 of the 44 species predominantly or exclusively found here, and the combination of few studies together with the many species that have very restricted known distributions make this a particularly fascinating genus to study.

Native legumes in general are the most diverse plant family in Australia, comprising around 13% of known species. Legumes are such an important component of our vegetation, by species numbers and by biomass, because of their role as nitrogen fixers. Australia has old and highly leached soils depauperate in nutrients essential for plant growth, particularly nitrogen and phosphorous, compared with the rest of the world. Legumes have a symbiotic relationship with nitrogen-fixing *Rhizobium* bacteria, which are contained in nodules on plant roots and fix atmospheric nitrogen to nitrate. This nitrate is subsequently utilised by the plant for growth and can be taken up by other plants or animals after decomposition or through consumption, hence legumes increase the availability of nitrogen in ecosystems. Indeed, adaptation to nutrient limitation may well be one of the key factors driving high plant diversity in the south-west WA biodiversity hotspot, and adaptation to different *Rhizobium* species is one mechanism that could drive divergence and speciation in legumes. In WA, flowering legumes, such as the 'eggs-and-bacon' peas (genera *Daviesia*, *Bossiaea*, *Gastrolobium* and *Chorizema*) and *Gompholobium*, attract substantial numbers of native insects as pollinators through production of nectar and pollen, and thus have an important ecosystem services function in the landscape. Research has suggested that some co-flowering legumes may mimic each other to increase pollinator attraction, and many flowering legumes including *Gompholobium* may in turn be mimicked by rare co-flowering orchids such as species of *Diuris***, indicating pollination may be another important mechanism driving species divergence and adaptation.

*Roots of* G. marginatum *from cultivated speciments at Kings Park with a typical root nodule (nodule is approx. 4 mm long). (Ann Smithson)*



G. marginatum, G. preissii *and* G. tomentosum. *(Illustration by Margaret Wilson from 'Flora of the Perth Region')*

Unlike the closely-related genus *Gastrolobium*, whose species produce the toxic compound fluoro-acetate in their leaves giving rise to their popular name of poison-peas, the leaves of *Gompholobium* species are not toxic, and are often heavily grazed. In most *Gompholobium* species, female insects are also attracted to the developing seed pod while they are green and soft,

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**Gompholobiums**

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*Bright red* G. polymorphum. *It can be regognised by its twining habit and trifoliate leaves. The flowers are 30mm across. (Ann Smithson)*

and lay an egg inside. As the pod inflates, the seeds are consumed by the developing insect larva. The larva usually chews its way out of the now-empty seed pod, to pupate elsewhere. It is not uncommon to find up to 90% of *Gompholobium* seed pods in native bushland so attacked, with each pod bearing a characteristic hole on the outside - frustrating for seed-hunting botanists and plant alike! However, no-one yet knows which species of insects are involved, although they are likely to be specific, since *Gompholobium* seeds contain the aminoacid canavanine, which is both an insect-feeding deterrant and a food source for the developing seed.

G. polymorphum *showing the inflated pod and deeply five-lobed calyx typical of the genus. (Ann Smithson)*

Renewed interest in *Gompholobium* has been recently stimulated by a comprehensive taxonomic revision of the genus, describing a number of new species.* Our research at the University of Western Australia and Kings Park shows how much there is still to do to understand about these fascinating species. We are focusing on studying local adaptation, in particular in jarrah forest understorey species, as an aid to determining optimal seed sourcing zones for revegetation of native habitats and for conservation. *G. polymorphum* is for us a species of particular interest, and is a very characteristic species as it is the only member of the *Gompholobium* genus that can actively twine up surrounding understorey vegetation - most commonly *Xanthorrhoea* and *Acacia pulchella*. As the name suggests, *G. polymorphum* is also highly variable morphologically, particularly in having at least three distinctive flower colour forms - yellow, orange and crimson/pink - which usually do not co-occur in the same population. Our data so far suggest that these corolla colour forms are geographically restricted, with the yellow-flowered form being found in jarrah forest understorey from the Perth Hills south to Albany, the orange-flowered form from the Perth Hills to Serpentine often on more open sites, and the crimson/pink-flowered form on southern coastal sandplains and around the Stirling and Porongurup ranges. While genetic data generated so far show no consistent DNA sequence differences between forms, differences in physiological traits such as germination and growth rates are found. We therefore suspect that *G. polymorphum* is a mosaic of recently diverged forms locally adapted to specific environments within south-west WA. Additionally, the recently described *G. gairdnerianum*, which is restricted to very specific habitats in Mt Lesueur National Park, may well be a further northern form within the complex. Has local adaptation been driven by adaptation to soils and nutrient limitation, or to different pollinator types, or other factors? We hope to be able to answer these questions soon.

Has this article interested you in these glorious peas? If so, look out for *Gompholobium* at your local native plant nursery or at the Kings Park native plant sales - many species make a showy display when grown as a small group within a native plant garden and will germinate well from seeds that garden plants produce (lightly scarify the seeds with sandpaper, or pour boiling water over them and leave to soak, prior to germination on the surface of native plant potting mix). However, do check that the *Gompholobium* species you are buying suits your soil type. If you find the twining *G. polymorphum* in native bushland in the coming spring I'd be particularly interested to hear about the location from you, especially if you note the flower colour form that you find.

*[* for ref, contact Ed. ** see WW 12/1, Jan 2008]*

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