False Pretences: Wily Wildflowers

Greg Keighery looks at a number of Western Australian flowers that use convergence, deception and mimicry as a means of survival.

Flowers, most people imagine, are static beautiful objects, but they are far from this in reality. Flowers are the means by which plants produce seeds, these form the next generation and hence continue the species. Therefore, the successful transfer of pollen from one plant's flower to another to produce seed is the single most important event in any flowering plant's life.

Plants cannot move from one place to another, so they must rely on outside agents to transfer pollen from plant to plant. Although the agency may be non-living (such as wind or water), it is living agents with which we shall be concerned here.

Animals view and use flowers as a food source, and want to visit as few as possible to obtain their food, thus expending minimal energy. Plants want to maximise the number of flowers visited, and provide as little food (reward) as possible, since it takes energy to produce pollen or nectar. However, they must provide enough food for the pollinator to be attracted to visiting the flowers. This constant two-way warfare has led to the evolution of closely interdependent plant/animal relationships (co-evolution).

Imitation, so they say, is the sincerest form of flattery to humans. In the world of flowers, however, it serves more immediate purposes.

Because of this evolution, plants using the same sort of pollinators often have very similar flowers. The similarity is not surprising because it is easier to lure pollinators once they have learned to visit one flower type, and there are physical limits on the shape and size of flowers a pollinator can operate.

There are many, many examples, but for economy of space only two are illustrated.

Buzz Pollinated Bee Flowers

Solitary bees are common pollinators in W.A.. They feed their young on a pudding of pollen and nectar, and forage on flowers to obtain the large amounts of pollen required. Many flowers in W.A. provide only pollen as a food source, and no nectar. Water is, of course, very limiting in our dry climate.

These flowers are usually scentless, brightly coloured (often purple with bright yellow anthers), short-lived (open 8am to 4pm, bees forage in the early morning), and only a few are open per plant per day. The anthers open by a tubular pore at the end, and the bees collect pollen by grasping the anthers and buzzing their wings to vibrate the pollen out. This produces an audible buzz, hence the name.

An example of this flower form and pollinator is shown in the photographs of a tinsel flower (*Cyanostegia angustifolia*) and a bee vibrating the anthers.

Genera of plants with purple flowers and yellow anthers, offering only pollen, are scattered throughout our flora, some examples are *Arthorpodium*, blue tinsel lily (*Calectasia*), fringed lily (*Thysanotus*), rainbow plant (*Byblis*) and native tomatoes (*Solanum*).

However, just to make life interesting, not all buzz pollinated flowers are purple and yellow, some are purple with blackish anthers (*Thomasia* or *Tetratheca*). Others are all yellow flowers: *Cassia, Labichea, Hibbertia* or *Xyris*. These flowers are all short-lived, of similar size and shape, have tubular pored anthers, and no nectar.

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Cyanostegia angustifolia. (Above)

Native bee buzzing anthers of *Cyanostegia angustifolia.* (Above right)

Native bee buzzing anthers of *Arthropodium capillipes.* (Right)

Thomasia glutinosa on purple/black buzz pollinated flower. (Below)

Amagylla sp — solitary bees (males) on dry twig used as a night roost. Males will return to this twig for up to a week. (Bottom)

Pimelea physodes (Qualup Bell). (Left)

Blowfly on *Hakea rubriflora*. (Below)

Blowfly on *Hakea trifurcata*, another species with sickly-sweet smelling flowers. Note large numbers of pollen grains (yellow dots) on fly's back. (Below)

Flowers which have similar characteristics, despite being otherwise unrelated, often have similar pollinators: the flower structure has converged.

Bird Pollinated Flowers

Another spectacular convergence can be seen between the bird pollinated mountain bells (*Darwinia* species) of the Stirling Ranges and the Qualup bell (*Pimelea physodes*) from the adjacent Fitzgerald River National Park. Both look remarkably similar and the Qualup bell is frequently mistaken for a *Darwinia* by visitors to the Fitzgerald River. But, the similarity is due to attracting the same pollinators, not to a close relationship. Both plants use large colourful bracts to attract nectar feeding birds, who locate flowers by sight.

So the striking similarity we can see in many flowers is due to the way they are pollinated. This convergence means plant classification cannot be based on superficial resemblance, but often requires examination of less variable structures which are difficult to observe without a microscope.

There are also flowers which mimic aspects of an insect's life cycle (yet still offer the normal rewards). One example is *Hakea rubriflora*, which attracts blowflies by having flowers coloured like old meat and smelling like a very dead kangaroo. Known officially as the stinking *Hakea*, locally it is given the more colourful name sh-t plant. The scent attracts both male and female blowflies to the flowers (the females lay eggs on carcasses and the males visit carcasses to find females, then obtain sugar from nectar). *Hakea rubriflora* maximises the number of potential pollinators visiting the flowers, and utilizes species not normally attracted to flowers, by this mild deception.

More outright deception can be found in dry country species of *Phebalium*, where the flower has no functional nectaries but in their place has shiny nectar scales (which look like drops of nectar). Pollen is presented and gathered by visitors, but the added attraction of nectar (expensive to produce in a desert environment) is merely a deception.

Finally, a series of plants operate by total deception, offering no reward at all.

Cyperus pulchellus is a small perennial herb (it has a tiny corm) which is commonly found on saturated shallow soils over basalt in north W.A.. On the Mitchell Plateau, *Cyperus pulchellus* is invariably found in company with a small *Eriocaulon* species, both flowering together. Both species have small, bright, white pom-pom-like flower heads, however, the *Eriocaulon* produces abundant nectar whereas the *Cyperus* has none. Bees visiting the *Eriocaulon* may encounter the taller *Cyperus* as they enter or leave the population, and forage on the flowers but gain no reward except pollen. The *Cyperus* looks very similar (it has a white pom-pom head, unlike the normal green/brown for

Phebalium canniliculatum, which produces no nectar, being probed by beetle. (Right)

Eriostemon desertorum, which does produce nectar, being probed in same position by flower-visiting wasp. (Below)

Bees operating *Gompholobium*. Note position on flower, pressing wing petals down. (Above)

Diuris longifolia (Donkey Orchid) at Whicker Range near Busselton. Note similarity to flowers of pic. 13. (Below)

Pultenaea radiata, Whicker Range near Busselton.

Cyperus) and is less common than its model, hence the bees do not learn to avoid it.

Flowering during the wet, this small *Cyperus* would have considerable problems using wind to transfer pollen (it is easily washed out of humid air), so it mimics a food source to ensure an animal is available to transfer the pollen.

The award for masters of deception, however, must be given to the orchids, who often offer no reward, but have evolved very complex flowers to perfect the deception.

Buzz Mimics

Queen of Sheba orchid (*Thelymitra variegata*) has shiny, brightly coloured, purplish flowers with large yellow appendages, and is said to mimic the tinsel lily (*Calectasia cyanea*), a buzz pollinated species. Similar mimicry is probably present in enamel orchid species (*Elythranthera*) and curly locks (*Thelymitra spiralis*). Observations on the visitors to these orchids are needed, and this is a field where anyone with a little patience could, in the right area, make a significant contribution to the knowledge of our unique flora.

Pea Mimics

Pea flowers are ideal bee flowers; this is a truism. Bees are one of the few insects strong and smart enough to operate a pea flower (note photos of bee on *Gompholobium* or *Daviesia trigonophylla*). The basic pea flower has a contrasting eye, and this guides the bee to the nectar below. The bee pushes down the wing petals to expose the nectar, and in doing so releases the pollen/style held in the keel petals to be gathered by the bee or to pick up pollen from another flower.

The donkey orchid (*Diuris longifolia*) occurs in a number of colour forms and flower sizes which mimic a pea flower (photo shows Busselton form, which mimics the colourful *Pultenaea radiata* or *Chorizema* peas of this area). Thus bees visiting these peas will also visit the donkey orchid although this flower has no nectar or pollen.

Sexual Mimics

Perhaps the most amazing form of deception practised by orchids is sexual mimicry. Australia has a large group of wasps whose females are flightless, but who mate with the male on the wing. The male locates the female by a chemical attractant (pheromone) released by her into the air. A large number of orchids have evolved means of producing similar compounds, and attract male wasps to the flowers to transfer pollen.

Some orchids have structures which look remarkably similar to the female wasp (e.g. the hammer orchids, *Drakea species;* or *Caladenia barbarossa*). The male wasps attempt to pick up the female mimic and are catapulted onto the pollen placement or pickup regions of the flower.

Many orchids bear no resemblance to female wasps, and rely totally on pheromone to attract the male. These orchids are generally a dull green/brown and red. Examples of these orchids can be seen in the excellent field guide *Orchids of Western Australia* by Noel Hoffman and Andrew Brown (e.g. *Caladenia longiclavata, C. multiclavata, C. plicata, C. corynephora, C. cairnsiana, C. bryceana, C. roei*).

Currently the taxonomy of these fascinating orchids is under review by Dr Stephen Hopper of the Wildlife Research Centre, and his work will enable clarification of the relationships between the pollinators and their orchids. As the taxonomy of the wasps and orchids is revised, we are finding out more about the precision of flower/pollinator interdependence.

W.A. has a unique flora, but it also has a unique pollinator fauna to service this flora. Currently we know very little about flower/animal relationships, yet if we are to preserve our plants we also must preserve the fauna which pollinates them. Increasing study is revealing an amazing complexity of plant/pollinator relationships of which we have only listed a few. This is an area where any interested naturalist can make major contributions to our knowledge by simple observation, not needing complex or expensive equipment.

For More Information

Hoffman, N. and Brown, A. *Orchids of South Western Australia.* University of Western Australia Press, 1984.

SWANS 11(1), 1981; and 13(3), 1983.

Caladenia barbarrosa, sexual mimic. Note similarity of flower to a flightless female wasp.

Cover
Pink and Grey Galahs do well to peer cautiously from their perch. Although a familiar species, the picture of the fledgling (right) emphasises the value and vulnerability of even our common wildlife.
Cover Photo: Jiri Lochman

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Selling

by Liana Christensen

Thousands of kilometres of isolated coastline, numerous deserted airstrips, lack of radar surveillance: the same factors which make W.A.'s Northwest a drug importer's haven also facilitate the less sensationalised crimes of poaching and smuggling wildlife.

Trafficking in native fauna is an extremely attractive criminal proposition. It is as lucrative as drugs — some estimate an annual turnover in excess of $40 million — and it is far less risky. Large operations, including the Mafia, are believed to be involved in both activities. Having established a safe route, they set up a 'conveyor belt' moving drugs into the country and sending wildlife out. In a telephone interview reported in *The Bulletin*, ex-Mafia boss Vincent Teresa claimed that bird smuggling was 'a racket that is just getting bigger and bigger'.

Smuggling is one of the major problems facing our State's 32 wildlife officers. In the Northwest, some wildlife officers are responsible for districts covering hundreds of thousands of square kilometres. They work in close connection with the local police, as well as federal police and customs officers. Typically, a wildlife officer will make ten-day patrols — which often stretch into two weeks because of problems with terrain or weather — checking known or likely trouble spots.

A Dangerous Job

A wildlife officer's work is often difficult, and sometimes

Kevin Marshall