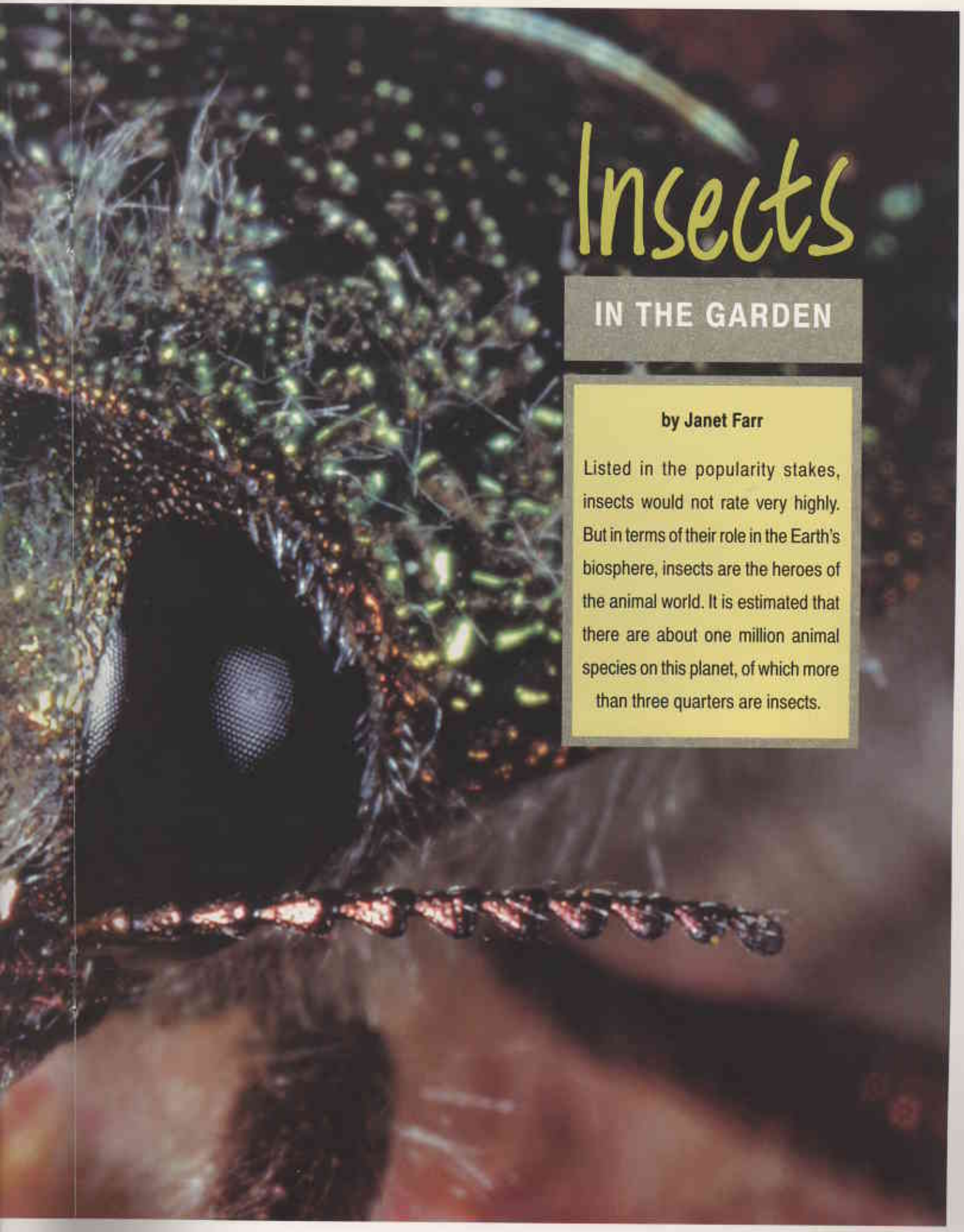

Insects

IN THE GARDEN

by Janet Farr

Listed in the popularity stakes, insects would not rate very highly. But in terms of their role in the Earth's biosphere, insects are the heroes of the animal world. It is estimated that there are about one million animal species on this planet, of which more than three quarters are insects.

In Australia, there are around 2 000 terrestrial and freshwater vertebrates, compared with about 85 000 known insect species, and it is estimated that only one-half to two-thirds have been named. Insects are the most diverse and abundant of all the animal groups—a success story in evolution. They are found wherever it is possible for living things to survive; the only habitat they have not successfully colonised is the ocean. Insects abound in the tropics and are found at the edge of the polar ice. They are found above the snowline on mountains and deep within caves. They live in the driest deserts and have invaded the fresh waters of streams, ponds, lakes and rivers. Their food is as diverse and varied as the habitats they occupy, from animal hair and blood to wood, plant leaves and nectar.

The role of insects within this planet's ecosystems are also extensive, from the transmission of disease to the transport of pollen between flowers, from predation and parasitism to being food themselves for a wide range of animals, including reptiles, fish, birds and mammals. Our gardens represent a microcosm of the natural world and, within them, insects representing most of the major classified groups can be found.

THE COMPOST HEAP

As leaf litter and organic matter are recycled in the natural environment, compost heaps and mulch offer habitats for the decomposers of the insect world. Uncovered compost heaps provide an excellent environment for fly maggots to live in and feed. But among the fly larvae will also be found rove beetles (family Staphylinidae), which can look more like earwigs than beetles due to their shortened wing covers. Rove beetles are mainly carrion feeders, and one species in particular, commonly called the devil's coach horse (*Creophilus erythrocephalus*), is very fond of maggots for its main course. This beetle can easily be recognised by its black shiny body and orange head, and when disturbed, can appear quite threatening as it curls its abdomen over its body. Another group of insects often found in association with rove beetles is the Histerid family. These insects are usually small (about five millimetres), varying from shiny black to metallic green. Histerids are commonly found in dung, and feeding on carrion and decaying matter.

If decaying fruit is a component of a compost heap, the common vinegar fly (*Drosophila* spp.) will be found among the myriad of small beetles and flies feeding on this fermenting smorgasbord. Looking much like fruit flies, vinegar flies not only play an important role in the decomposition of decaying fruit, they have also enabled us to understand the fundamental code of life—DNA. Through the study of *Drosophila,* scientists have been able to unlock this detailed mechanism of inheritance.

More commonly found insects appearing in humid micro-habitats of rotting organic matter or under stones or loose bark are the earwigs (order Dermaptera). Some of the world's largest species are native to Australia. Their most

Previous page
The jewel beetle *Costiarina* sp.
Photo – Babs & Bert Wells/CALM

Above right: The female earwig is one of the few insects to care for their young.
Photo – Jiri Lochman

Right: The jewel beetle *Sigmodera voei* enjoying a feed of nectar.
Photo – Babs & Bert Wells/CALM

characteristic and conspicuous feature is the large pair of pincer-like appendages at the rear of the body. Despite the size of these organs their function has still not been determined. Earwigs are generally vegetarian or omnivorous, and the native species are not usually considered significant economic pests.

However, the imported European earwig (*Forficula auricularia*), found in cooler regions, can be a serious garden and vegetable pest if present in large enough numbers. Unlike most insects, the female earwig exhibits maternal care. Eggs are laid in a short burrow and the female remains with the eggs and young nymphs up to the first or second moult. During the egg stage, the female actively cares for her progeny by licking the eggs to remove fungal spores and gathering the eggs should they become scattered.

With flies, cockroaches must be among the most maligned of the insect world. Some pest species are known to carry diseases such as poliomyelitis and salmonella. But of the 3 500 species known throughout the world, less than one per cent are pests. In Western Australia, the two pest species most likely to be encountered in gardens and houses are the American cockroach (*Periplaneta americana*) and the German cockroach (*Periplaneta germanica*). It is thought that these two species originated in Africa and were dispersed during the time of the slave trade.

Very few of the 450 or so Australian native cockroach species will be consistently found inside houses. One of the exceptions is the wingless white-margined cockroaches of Perth (*Drymaplaneta* sp.). Our native species are mainly found under stones, bark or logs and in rotting wood, and a few live in foliage.

A large number of parasitic insects help control cockroach populations. Tiny chalcid wasps parasitise egg cases and emerge through minute holes. Ground-dwelling cockroaches are parasitised by several species of a curious beetle belonging to the family Rhipiphoridae. These beetles breed in the cockroach body, eventually immobilising it. Cockroaches are preyed upon by frogs, reptiles and insectivorous birds and mammals. These insects therefore play an important role in the environment, by helping to break down organic matter,

Right: The head-raising and spitting of saw flies is a defence against bird predation.
Photo – Janet Farr

Below: The green leaf hopper bug looks like a leaf.
Photo – Wade Hughes/Lochman Transparencies

and also as an important food source for a wide range of animals which we might consider far more desirable species.

AMONG THE LEAVES

Leaf-dwelling insects often appear far more interesting and exciting than the ground-dwellers, which are usually seen when a rock or piece of debris is disturbed. Leaf dwellers are mostly active during daylight, while ground-dwellers are usually nocturnal. Also they are often more flamboyant in their colouring and even their behaviour patterns. Sitting quietly in your garden on a mild summer's day, preferably near a local native flowering plant, you may be surprised by the number of different insects that can be seen: green leaf hopper bugs, which look remarkably like leaves; stick insects trying to look like twigs; a lacewing munching on an aphid; the occasional wasp, butterfly or hover fly; or maybe even a beautiful jewel beetle visiting flowers for nectar.

Leaf-feeding insects are generally leaf chewers or sap suckers, or may be found within the plant as leaf miners or gall formers. Many will confine their munching or sucking to one particular species or a number of species in a particular genus or plant family. A few insects, however, will feed on a wide range of plant species. Many leaf chewers have different patterns of feeding, so the damage pattern on a leaf can help identify the insect responsible.

If you have a eucalypt in your garden, you may be familiar with the native caterpillars called spitfires, which are really in the immature sawfly stage of development, and are not true flies, but a form of wasp. Spitfires are usually found in tight clusters on the stems and trunks of young eucalypt trees. In the evening, they migrate to the leaves where they munch down to the midrib. If disturbed, these insects can appear quite formidable and will react in unison, raising and flicking their tails, rearing back the head

Above: The cutout of a leaf-cutter bee on a rose leaf.
Photo – Janet Farr

Below: The native bee *Neopasiphe mirabilis* sleeping on a hibbertia flower.
Photo – Bill Belson/Lochman Transparencies

and exuding a thick, strong-smelling liquid from the mouth. This liquid is not spat from the mouth, as the name implies, and is harmless if touched. This behaviour is thought to deter predatory birds with the message that they are distasteful. Spitfires can severely defoliate young trees, but since they have a gregarious habit it is easy to control them by removing the cluster of larvae and disposing of them without the use of chemical insecticides. Most plants can tolerate up to 25 per cent defoliation before their growth is affected, and up to 60 per cent defoliation over a continuous period before survival is threatened.

Above: A hemipteran shield bug with its eggs.
Photo – Babs & Bert Wells /CALM

Other common leaf feeders on eucalypts are the Chrysomelid leaf beetles (see 'Leaf Beetles—The Mysterious Australians', *LANDSCOPE*, Summer 1990-91). These charming insects look similar to ladybird beetles and have curious lobed feet, which look like tiny boots. The adults vary from red, golden yellow to creamy beige, and in many species, the patterns on their wing cases include bright iridescent metallic colours. Eggs look much like rice grains and are usually laid in groups forming bands around the shoots and stems of their host plants, or are aligned in rows on the leaves of food plants. After hatching, the larvae feed in groups, much like spitfires. Adults feed on the same plants they fed on during their juvenile stage.

The feeding pattern left by these beetles is a distinctive scalloping of the leaf edges, but to date in Western Australia, leaf beetles are not regarded as a serious problem.

Another leaf feeder with a distinctive damage pattern is the leaf-cutter bee (*Megachile* species). A member of the Hymenoptera—the insect order containing bees, wasps and ants—this small native bee is quite common in suburban gardens and city parks around Perth. Leaf-cutter bees build cigar-shaped nests in any suitable hollow. A prime nest site could be a crack in a fence post or between two bricks where the mortar has fallen out. The nests are made of thin leaf pieces, which are cut to a circular or semi-circular shape. The adult female will hold the leaf with her legs and cut a disc with her jaws starting at the leaf's edge (leaving it looking as if someone has taken a disc punch to it). The completed leaf disc is folded between her legs as she flies to the nest site. These bees are not regarded as serious plant defoliators, but rather as important pollinators.

There are an estimated 2 000 species of native bee in Australia and many of these have yet to be named. Unlike the honey bee imports, most Australian bees are solitary, each female constructing her own nest and rearing her own offspring. Most female bees have a sting, but they are not aggressive like the honey bee and will only use their defence weapon if grasped or squashed. All bees use pollen and nectar as food for their larvae and are, therefore, important pollinators of our native plants (see 'The Real Bees of Western Australia', *LANDSCOPE*, Summer 1993–94).

Plant-sap-sucking insects belong to the order Hemiptera. This order includes the plant-feeding cicadas, leaf hoppers, psyllids (more commonly known as lerps), aphids, scale insects, mealy bugs, white flies, shield bugs, stink bugs and the blood and body fluid feeders such as bed bugs, water boatmen and water scorpions. These insects, instead of being equipped with mouthparts suitable for biting and chewing, have evolved mouth parts to pierce and suck up the juices of plant and animal tissue. Some of these plant-sucking bugs can be very specific in the food they prefer to eat. Many psyllids will feed from one species or group of closely-related species. A common psyllid in Western Australian gardens (*Creis* sp.) constructs a conical-shaped transparent shelter (called a lerp). This species will feed on a range of eucalypt trees, but can more often be found on flooded gums (*Eucalyptus rudis*).

Cottony cushion scale is often found on acacias. Its natural predator is the ladybird *Rodolia cardinalis*.
Photo – Jay Sarson/Lochman Transparencies

Like psyllids, many plant-sap-suckers have evolved elaborate protective coverings, which, in some cases, can look like outgrowths of the host plant. A common example of these are species within the family Coccoidea, often found in clusters of pink or white pearl-like scales on eucalypts and acacias. The cottony cushion scale (*Icerya purchasi*) produces a series of wax filaments, which give it a fluffy, fluted appearance. Many such bugs have become so specific that the adult females hardly resemble insects.

Since a large component of the food they ingest is water, most plant-sap feeding bugs produce relatively large quantities of a sugar-rich liquid excrement called honey dew. Consequently, these insects are attractive to other sugar-seeking insects such as ants. Ants will farm some species for the purpose of using the honey-dew, and during this process protect the honey-dew producers from predators. Nevertheless, most are consumed by a wide range of animals and birds, including ants.

Ladybirds are well known for controlling aphids. One ladybird in particular, *Rodolia cardinalis*, is an Australian super star, as it was exported to California to control the previously-mentioned cottony cushion scale. Ladybirds belong to the beetle family Coccinellidae, and some species within this group are among the most efficient predators of scale insects, aphids, mites and other small pest species. A few species do feed on vegetation and are pests themselves, attacking the leaves of potatoes and pumpkins. Ladybirds, however, are voracious feeders in both the larval and adult stages. The most common species you are likely to encounter in your garden is *Leis conformis*, which is bright orange-red with black spots. The bright colouring of most species is probably a warning against predators, since adult ladybirds secrete a poisonous liquid if disturbed.

Both larvae and adults of the delicate green lacewing (*Chrysopa* sp.) are very fond of sap-sucking insects. One larva may eat three to four hundred aphids before becoming an adult. They impale their victims on long pincer-like jaws then suck out the body fluids. Larvae also camouflage themselves by carrying around the remains of their prey on their backs. These insects belong to the insect order Neuroptera, which also includes ant-lions (see Urban Antics in this issue). All neuropterans are carnivorous, but the adults may also feed on honey-dew.

Also camouflaged among the green foliage ready to pounce on its dinner is the praying mantis (family Mantidae). The young mantis feeds on soft-bodied insects such as aphids; the mature mantis feeds on caterpillars, bugs, beetles and other insects. The mantis gets its name from the characteristic 'prayer' position

of its forelegs, which are used for catching prey.

The most efficient of all aphid and scale-insect feeders are hover-fly larvae (family Syrphidae). These larvae are known to consume 800–900 aphids during their life from egg to pupae, and have been seen to eat an aphid a minute. The acrobatic adults may be recognised by their mid-air hovering habit over flowering plants. Adults rely on nectar to enable them to mate and lay eggs so their offspring can continue their aphid feast.

Together with the hover fly darting among the foliage and flowers, a myriad of tiny wasps may be seen. These wasps mainly belong to the Hymenopteran families Braconidae and Trichcogrammatidae that are parasites of a wide range of insects including caterpillars, aphids, scale insects and insect eggs. These wasp families include many important species used for the biological control of pest insects. The adults rely on nectar while searching for mates and for hosts for the survival of their young. The larger Ichneumonid wasps are internal parasites of caterpillar larvae. In most species, the female lays an egg into the insect-host's body, using her long ovipositor, and the larva feeds within the insect.

PREDATORS IN AIR AND WATER

Other species of wasp often feed on caterpillars or spiders. Female mud daubers (family Sphecidae) build mud nests on house walls. These nests usually contain a solitary larva, which is fed on prey paralysed by the female. The female paralyses its victim with her sting then carries it to the nest. Social wasps within the family Vespidae include the paper nest wasp (*Polises humilis*), which, although an Australian native, was accidentaliy introduced to Perth from coastal eastern Australia. The nest looks much like an upside-down toadstool and may be found suspended from well-sheltered branches, trees or shrubs, or from the eaves of houses. They are beneficial in destroying a number of pest caterpillar species, which are captured as food for their young, but they can be a nuisance because of their painful sting. These wasps are most commonly seen flying persistently near shrubs, verandahs and eaves.

Left: The water beetle (*Eretes australis*) uses its fringed legs as oars and also carries an air tank.
Photo – Babs & Bert Wells/ CALM

Below: The praying mantis uses its camouflage to deceive its prey.
Photo – Babs & Bert Wells/ CALM

The paper nest wasp is often mistaken for the introduced European wasp (*Vespula germanica*). Unlike the paper nest wasp, the European wasp has jet black antennae and bright yellow legs. The paper nest wasp flies with its legs trailing behind, whereas the European wasp flies with its legs tucked up close to its body. The nests of European wasps are hidden in holes, rockeries, woodheaps, cavity walls or roof spaces and are therefore not as conspicuous as the nests of the paper nest wasp.

If your house is near a pond, lake or stream, common visitors to your garden will be dragonflies and damsel flies. Looking much like miniature helicopters, they can be seen darting about during spring in search of airborne, soft-bodied insects, which they catch with their powerful spiny forelegs. The juveniles (nymphs) are aquatic, living in fresh water and feeding on small fish, tadpoles, worms and insects. It is thought that dragonfly nymphs are significant in controlling mosquito larvae. The adults live on the wing, catching prey, eating and mating—all while in flight. Another common visitor to gardens with ponds, and even swimming pools, is the back-swimmer or notonectid. Notonectids are sucking bugs like the aphids and scale insects described earlier. However, unlike the land plant feeders, these curious insects feed on other water insects. Back-swimmers are highly adapted for living

in fresh water. Their hind legs are long, flattened and fringed with hairs. These modified legs are used as oars as the notonectid swims upside-down looking for prey. The wing cases of these insects are used to trap air, collected at the water's surface before diving. The water beetles (family Dytiscidae) use a similar method to trap air, as do the adult whirligig beetles (family Gyrinidae). Both beetles are common visitors to swimming pools. However, these insects can seldom breed and mature under normal swimming pool conditions.

BUTTERFLIES

Of course an article on insects in your garden would not be complete without mentioning the ballerinas of the insect world, the butterflies. While butterflies rely on nectar for food, they are plant-eating caterpillars during the juvenile stage. Three of the more conspicuous species to be found in suburban gardens are the wanderer *(Danaus plexipus)*, which has been seen as far north as Kununurra, and the Australian admiral (*Vanessa itea*) and painted lady (*V. cardui*), which prefer the south-west corner of Western Australia. The wanderer lives up to its common name as it has gradually extended its distribution across the Pacific Ocean from North America, but well-defined migrations have not been seen in Australia. Host plants of the caterpillars include introduced cotton bushes in the family Asclepiadaceae. The adults are attracted to orange flowers, which are a similar colour to themselves.

Larvae of the Australian admiral feed on both native and introduced stinging nettles (*Urtica* sp.). Adults are known to frequently settle in the sunshine with wings outspread, and rest on tree trunks with closed wings, their head directed downwards. On tree trunks, the underside of their wings matches the grey bark. Adults will sometimes congregate at sap flows on eucalypt trunks and they have been seen to congregate at times on hilltops. The adults are also attracted to white flowers.

The beautiful painted lady is a common visitor to the sand dunes near Bunbury and has been recorded around Fremantle in early November. This butterfly is a well-known migrant and is thought to have originated in Africa. The larvae mainly prefer legumes and plants within the families Asteraceae and Malvaceae, and in Western Australia, adults are known to like *Pimelia* species.

The vine hawk moth dipping into a eucalypt flower for nectar. Nectar-producing plants are important, not only for birds, but also for insects. However, many plants that have evolved to induce bird pollination (e.g. grevilleas) are not visited by nectar-seeking insects. Photo – Babs & Bert Wells/CALM

The chequered swallowtail (*Papilio demoleus*) belongs to the butterfly family Papilionidae, which contains some of the world's most beautiful insects; for example, the brilliant blue Ulysses butterfly and the spectacular green Cape York birdwing, both of which are found in north-eastern Queensland. The chequered swallowtail is uncommon in the southern coastal areas of Western Australia, but has been observed on migratory flights in the South West. The food plants of its caterpillars include species of the genus *Psoralea*, namely *P. leuantha* at Carnarvon and Millstream, and *P. pustulata* south-east of Broome. Eggs of this species have also been found on citrus, but their life cycle is rarely completed on these plants. However, the canopus butterfly (*Papilio canopus*), which is found in the north-west of Western Australia, is known to feed and survive on cultivated citrus. Native food plants include species within the Rutaceae family, which includes citrus.

ATTRACTING INSECTS TO YOUR GARDEN

Actively designing your garden to attract insects may initially seem strange, but insects are an important component of our environment. Natural areas of bushland close to towns that can support many beneficial native insects are rapidly disappearing, so providing habitats for them will ensure their survival.

For a conservation strategy, it is also a good idea to retain a small part of your garden (away from the house and vegetable plot) in an unruly state, allowing weeds and grasses to grow and flower, and leaf litter and dead and dying branches to remain to provide food sources and habitats for a wide range of insects, as well as the animals that keep them from reaching pest proportions.

Generally speaking, variety in your garden is a most important consideration, because for our insect fauna, variety is the source of life.

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LANDSCOPE

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Noisy scrub-birds are rare in museum collections. This one, from a Dutch Museum, was probably collected by John Gilbert. See page 36.

This year, The Hills Forest celebrates its fifth birthday. Find out what's been happening there in our story on page 10.

The Kimberley region of Western Australia has some weird and wonderful landforms. Read all about them on page 16.

Mount Bakewell looms over the old town of York, but it is more than just a prominent landmark. Find out why on page 42.

The northern quoll is just one of WA's marsupials that have been part of a recent conservation status review. See page 22.

FEATURES

REGULARS

COVER

Get down on the ground, scramble through the leaf litter and compost in your garden, and discover the fascinating world of insects. 'Insects in the Garden', on page 28, shows how these seemingly insignificant creatures help keep the ecosystem running smoothly and how they are a vital part of nature's life-cycle.

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