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EFFECT OF FIRE ON BUTTERFLIES

Matt Williams

BUTTERFLIES are not a conspicuous part of our insect fauna. In the Western Australian Year Book of 1898/99, Arthur Lea wrote that "what strikes the visiting entomologist ... more than anything else is the great rarity of butterflies". So you might be surprised to learn that there are more than sixty species of butterfly in the south-west, as well as another dozen or so brightly coloured day-flying moths that are often mistaken for butterflies. (The butterflies are a relatively well documented group of insects and all of our south-west species are described and illustrated in Michael Braby's book *Butterflies of Australia: their identification, biology and distribution*, CSIRO publishing, 2000.)

Butterflies are an important part of ecosystems because they pollinate many native plants and their early stages form part of the food chain. However, their role as pollinators is being taken over by introduced butterflies such as the cabbage white, or by feral insects such as introduced honeybees.

Many butterflies and day-flying moths (collectively referred to as "butterflies" in this article) are becoming increasingly rare. This is because butterflies have three characteristics that make them particularly susceptible to local extinction in bushland remnants.

First, the caterpillar that will eventually become a butterfly is usually very selective about what it will eat. For example, the caterpillars of the blue iris-skipper eat only the leaves of purple flag, *Patersonia occidentalis*. The caterpillars of some butterflies are a little more tolerant. For example, in the Perth metropolitan area the caterpillars of the western jewel butterfly feed on green stinkwood, *Jacksonia sternbergiana*, and rattlepods, *Daviesia divaricata* — but they will survive on these plants only if a particular species of ant (*Crematogaster perthensis*) has a nest at the base. Western jewel caterpillars shelter inside the ant's nest during the day, emerging at night to feed. The ants tolerate the caterpillars because they produce honeydew that the ants feed on.

The western jewel butterfly seems to be able to recolonise burnt areas in the first year or two after a fire, so long as a nearby population exists to provide colonists (photo: Trevor Lundstrom)

Second, the early stages of butterflies (eggs, caterpillars and pupae) are highly vulnerable to fire. Most caterpillars live and feed on the above-ground parts of plants, and so are killed by fire. The western jewel's caterpillars find refuge from fire underground, but probably die from lack of food soon afterwards.

Finally, despite being able to fly, most species of butterfly will not disperse across unsuitable habitat. Although a few species — such as the yellow admiral, Australian painted lady and chequered swallowtail — are capable of flying exceptionally long distances, most

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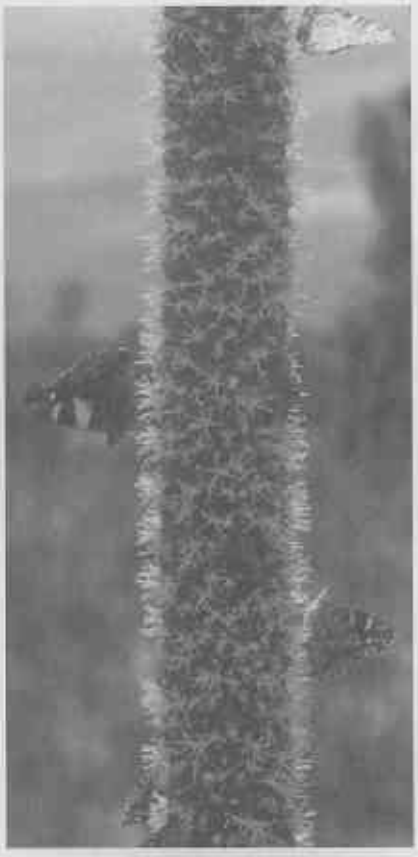
are extremely sedentary and do not disperse more than a few hundred metres (if that) during their lifetime. Barriers such as roads, urban areas and farmland are insurmountable for many species of butterfly.

Taken together, those characteristics mean that if the butterfly population in a reserve dies out, or its specific food plants are destroyed or defoliated, perhaps after a particularly severe fire, the chance that a new population will establish itself by immigration from elsewhere is extremely low. With the increasingly fragmented nature of our native bushland, and frequent occurrence of fires in the more heavily populated areas, butterflies are exposed to a high risk of local extinction within the remaining bushland reserves. This is particularly true if the reserves are small, or a long way from other butterfly populations.

For example, many of the native butterfly species that once occurred in King's Park are now locally extinct. The species that still regularly live and breed there are those that have adapted to feeding on introduced weeds, are strong dispersers that can easily re-establish themselves, or have both characteristics. Seven native butterfly species that were probably resident in pre-European times are now locally extinct in King's Park and have not been able to re-establish themselves, even though the Park contains suitable habitat.

I am currently studying the effects of fire on native butterflies and do regular surveys to monitor changes in the abundance of butterflies after fire. Currently, I have four study sites in the Perth metropolitan area: Koondoola Regional Bushland Reserve, Warwick Conservation Area, Cottonwood Crescent Bushland and Kensington Bushland. So far, I have recorded thirty species of day-flying Lepidoptera (27 butterflies and 3 day-flying moths) in these surveys.



Many butterflies are attracted to flowering Xanthorrhoeas after a fire, such as the yellow admiral (centre left) and Australian painted ladies (photo: Matt Williams)

Koondoola Regional Bushland (Bush Forever Site 201, 13 km north of Perth city) is a 120 ha reserve of *Banksia attenuata* woodland on Spearwood and Bassendean dunes. Koondoola Bushland is predominantly in excellent condition and probably has an intact butterfly fauna. Of my four study sites, Koondoola has the most species of butterfly (28 recorded so far), and also the greatest numbers, with an average of about 150 individuals being recorded on a 4 km survey during spring. Species sensitive to disturbance, such as the spring-flying sun-moth *Synemon ?discalis*, forester moth, fringed heath-blue, western jewel, blue iris-skipper, large bronze azure, western and large brown skippers and the mallee ochre, still occur at Koondoola but are rare or absent at the other sites.

Warwick Conservation Area (Bush Forever Site 202, 58 ha in area) is about 4 km to the west of Koondoola and has similar vegetation. Divided into four fragments by a road, high school and playing fields, Warwick bushland has been subject to greater disturbance. Some parts have been burnt frequently, and weed invasion is more noticeable. Some butterfly species, however, are more abundant at Warwick, most notably the endangered graceful sun moth (*Synemon gratiosa*). Just why this rare moth, which flies during autumn and whose caterpillars feed on a mat-rush (*Lomandra* sp.), is more common at Warwick is not known. My study, which is also assessing the abundance of food plants at each site, may eventually be able to answer this question. Species that can utilise introduced weedy grasses as food plants, such as the marbled xenica, western brown and western grassdart, are also more abundant at Warwick.

Cottonwood Crescent Bushland in Dianella (Bush Forever Site 43), is only 11 ha in area but is in remarkably good condition. In vegetation type and condition it is very similar to Koondoola, which is 4 km to the north. Cottonwood has a very diverse butterfly fauna for such a small remnant, having 10 of the 20 resident species known from Koondoola. Its butterfly fauna is a subset of Koondoola's and future surveys may well expand the species list for this site.

Kensington Bushland (Bush Forever Site 48) is a 9 ha remnant only a couple of kilometres south of central Perth, and so has been isolated for the longest time. It has also been subject to repeated burning (most recently when over three quarters was burnt in February 2003) and is the most disturbed of the four sites, although the bushland is still in reasonably good condition. The vegetation type and soils are similar to those of the other sites. However,

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Virtually nothing is known about the effects of fire on some species, such as this day-flying forester moth (photo: Phyllis Robertson)

The fringed blue butterfly appears to be heavily impacted by fire and is most abundant in long-unburnt areas (photo: Trevor Lundstrom)

Kensington Bushland is depauperate in butterflies, having only about 5 resident species, with many species now locally extinct. I am currently planning to re-introduce blue iris-skippers to Kensington bushland in November 2003.

Over the past two years I have devised and tested a standard survey technique to assess the abundance of butterflies. I have found that using existing tracks and firebreaks to conduct the surveys is adequate, and is both faster and causes less disturbance than transects through the bushland. Warm, sunny weather is needed for the surveys. Days with maximum temperatures between 23 and 30 °C are ideal. Surveys vary from 1 to 4 km in length and are conducted between 10 am and 3 pm. The main flight period for butterflies is mid September to mid December, with peak activity in early November, but additional surveys around March are needed to detect some autumn-flying species such as the graceful sun-moth and wedge grass-skipper.

Now that I have finalised a standard survey technique, more reserves in the Perth metropolitan area will be added to my list of study sites in the coming year. The help of volunteers in conducting these surveys is always welcome, and if you would like to assist me with these surveys, and learn how to identify some butterflies along the way, please get in touch with me.

Matthew Williams is a Research Scientist in CALM's Science Division. He can be contacted on 9334 0399, or email: mattw@calm.wa.gov.au.