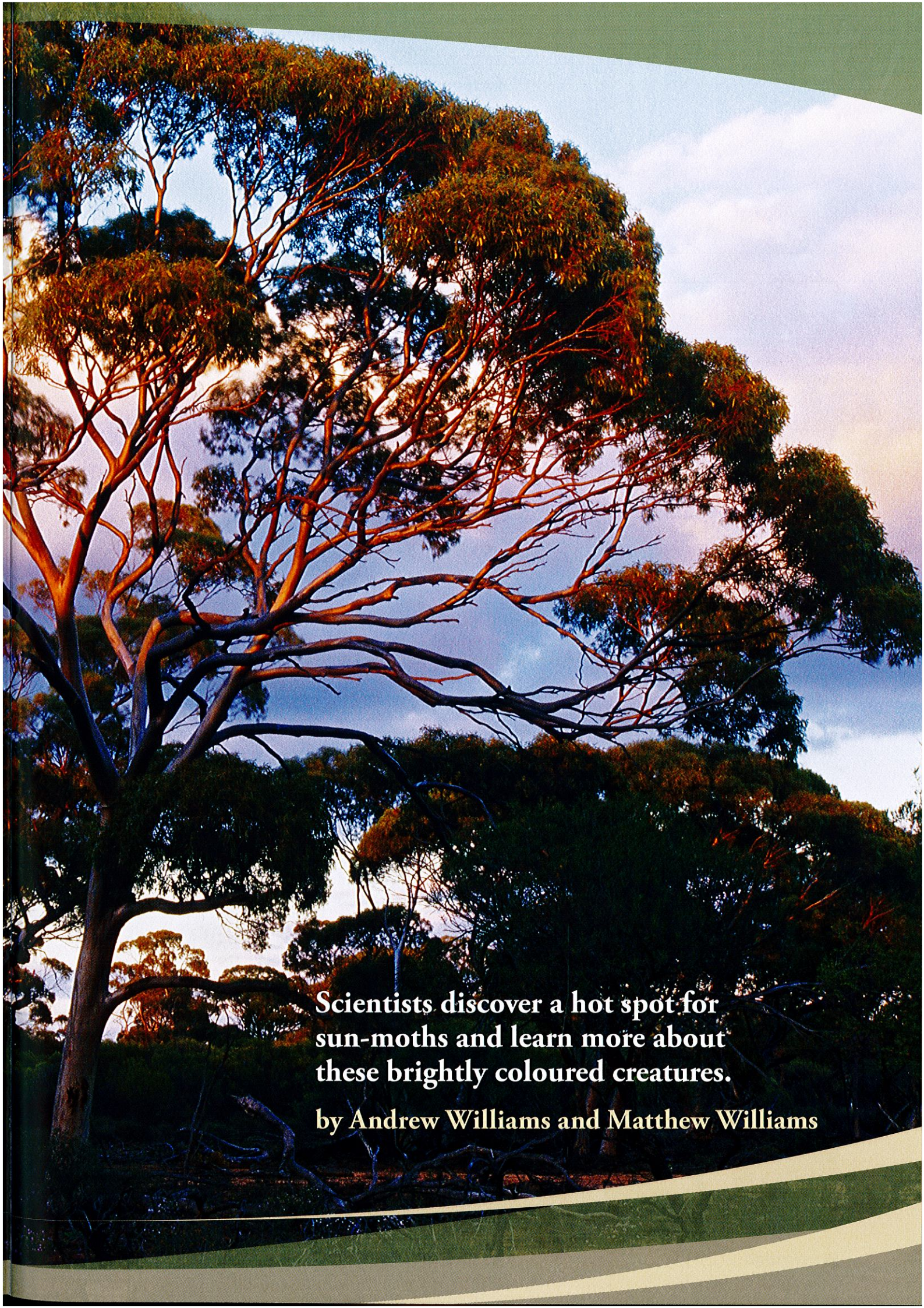




**Sun-moth haven
in the Wheatbelt:
Wyalkatchem Nature Reserve**



**Scientists discover a hot spot for
sun-moths and learn more about
these brightly coloured creatures.**

by Andrew Williams and Matthew Williams

Sun-moths belong to a moth family, the Castniidae, which occurred on the ancient supercontinent of Gondwana. Today the distribution of these brightly coloured day-flying moths mirrors that of the marsupials—they occur only in South and Central America and Australia. In South America they are called ‘giant butterfly moths’, whereas the Australian species are called ‘sun-moths’.

In Australia there are about 45 species of sun-moth. Of these, at least 20 occur in south-western Western Australia. Most are endemic to the region with a large proportion yet to be formally named. Over the past three years the Department of Environment and Conservation (DEC) has begun surveys to determine the

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Main Salmon gum occurs in some areas that sun-moths inhabit.

Photo - Marie Lochman

Inset A Perth sun-moth (*Synemon* sp. ‘Perth’).

Photo - Andrew Williams/DEC

Below Butterflies such as the Australian painted lady, below, can be distinguished from sun-moths by the way they hold their wings upright, as opposed to downturned like the claret sun-moth, pictured below right. *Photos - Jean Hort, Andrew Williams/DEC*



● Wyalkatchem Nature Reserve

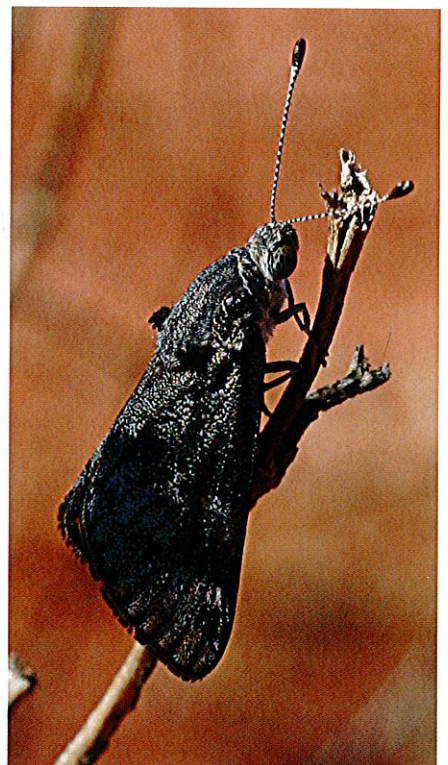
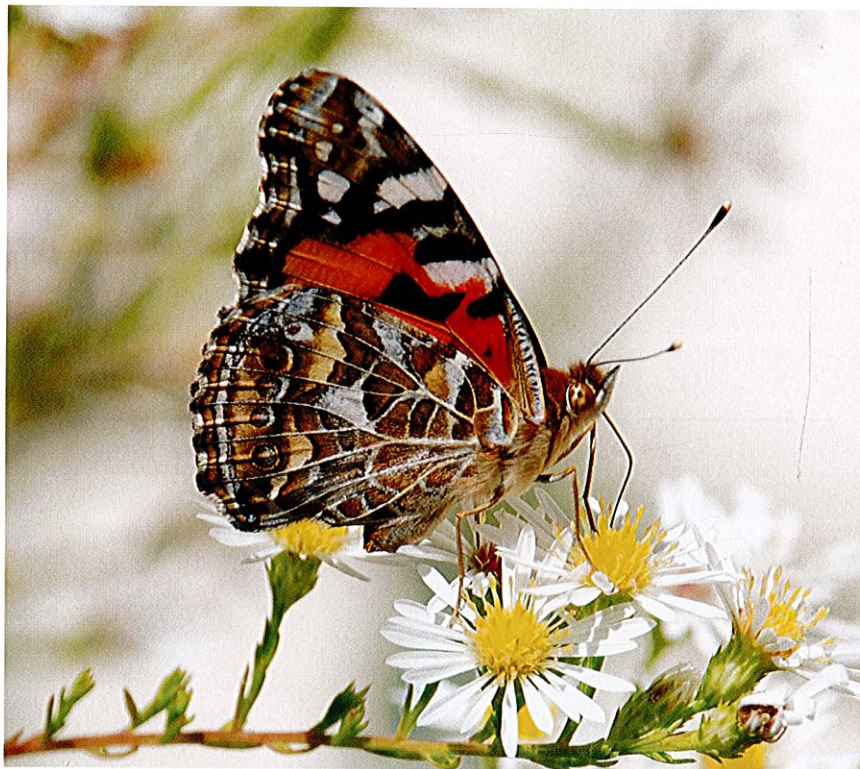
distribution, relative abundance and habitat preferences for some of the species which occur in the south-west. Nature reserves, national parks and flora conservation areas have been specifically targeted for inspection. In the central Western Australian Wheatbelt, Wyalkatchem Nature Reserve has been identified as a significant sun-moth hot spot.

What is a sun-moth?

As their name implies, sun-moths tend to fly only in bright sunny conditions. In flight they resemble butterflies, particularly as their hind wings are usually brightly coloured in yellow, orange or red. Like butterflies, sun-moths also have distinctly clubbed antennae. But when at rest sun-moths

can always be distinguished from butterflies because they settle with their forewings folded back beside and over the body. This is a very characteristic moth posture; butterflies, on the other hand, rest with their wings held in an upright position above the body.

The biology of most of the Australian species has not yet been documented, but their pattern of development is fundamentally the same. The larvae (caterpillars) feed on monocotyledons with deep rhizome root systems. Native grasses, sedges and mat-rushes belong to this group and are commonly used by the sun-moths. Female sun-moths mate soon after they emerge from the pupa, and then start laying their eggs. They do this by means of a long retractable ovipositor, depositing an egg at a time in the soil at or near the base of their larval host plant. After hatching, the larva chews its way into the lower stem and then tunnels downwards into the leaf base or root rhizome. Here it remains underground, feeding on the plant’s developing leaf shoots before they reach the surface. Plants which harbour sun-moth larvae will often exhibit patchy stem and leaf die-off, a telltale indication of larval presence.





Above A ruby sun-moth showing its characteristic dark red hind-wing which is broadly bordered in black.

Photo - Andrew Williams/DEC

Seeking sun-moths

Each sun-moth species has very specific food-plants on which its larvae can feed. Knowing the identity and being able to recognise these plants in the field is particularly helpful when planning surveys to look for sun-moths. Details of food-plant distributions can be accessed on DEC's *FloraBase* website, and using these data enables researchers to focus on areas of potential sun-moth habitat.

Other crucial information to know is what time of year different sun-moths are likely to fly. Each sun-moth species has its own distinct flight period. Most species fly in spring or early summer, but there are some which only come out in mid to late summer, or early autumn. For this reason, repeat surveys of the same reserves have to be carried out at regular intervals during the year to ensure that these specialised species are not overlooked.

Sun-moths which appear in the hot dry summer months fly at times when flowering plants are few and far between. Nectar is generally not available, so over time the mouthparts of these specialised species have become greatly reduced. They do not feed but rely on nutrients accumulated during

the larval stage for energy. The life span of individual adults may be very short, in some cases only three or four days. Their sole imperative is to mate, and for the females to then locate suitable plants alongside which to lay their eggs. Frequently these rare summer sun-moths are only observable for about 10 to 14 days. Living in seasonally arid and hostile environments means that they must be adaptable. There is evidence that the juvenile stages may regulate their rate of development, enabling adults to emerge in greater numbers in years when weather conditions are most favourable.

Survey techniques

When surveying for sun-moths in the south-west, several factors must always be considered. Daily weather conditions often dictate when surveys can be carried out, as sun-moths always prefer to fly in warm to hot sunny conditions. The optimal time to see them is between 10am and 3pm. Experience has shown that surveying on overcast days is unprofitable. Male sun-moths are also territorial and, like some butterflies, they will seek out and occupy prominent ridges, hilltops or even areas of bare ground. Such places are always examined during surveys.

Sun-moths are also known to spend time in the vicinity of their larval food-plants, so areas in which these plants grow are specifically examined. It is not uncommon to see male sun-moths searching these food-plants for freshly emerged un-mated females. In addition to walking transects in nature reserves to find adult sun-moths, a surveyor may also locate juvenile sun-moths by scrutinising the food-plants for signs of larval activity.

Wyalkatchem—a sun-moth haven

Initial DEC surveys to document sun-moth distribution in south-western WA were undertaken in an area south-west of a line running from Geraldton to Esperance, an area mostly covered by the Wheatbelt. Although mostly cleared for agriculture, scattered remnants of the original vegetation remain. Many of these patches of remnant bushland are now preserved



Left Salmon gum and wandoo woodland in Wyalkatchem Nature Reserve. The claret sun-moth's food-plant *Lomandra effusa* grows in this patch of woodland. Claret sun-moths can readily be seen here in February.

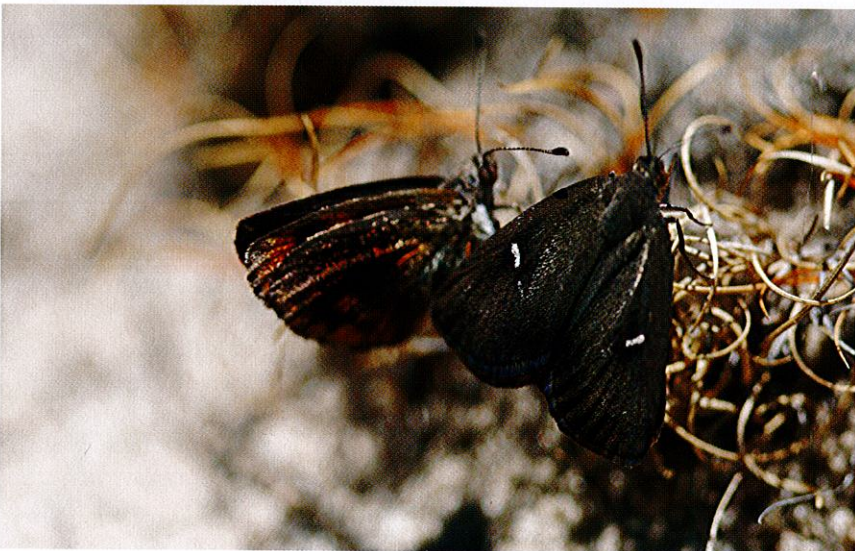
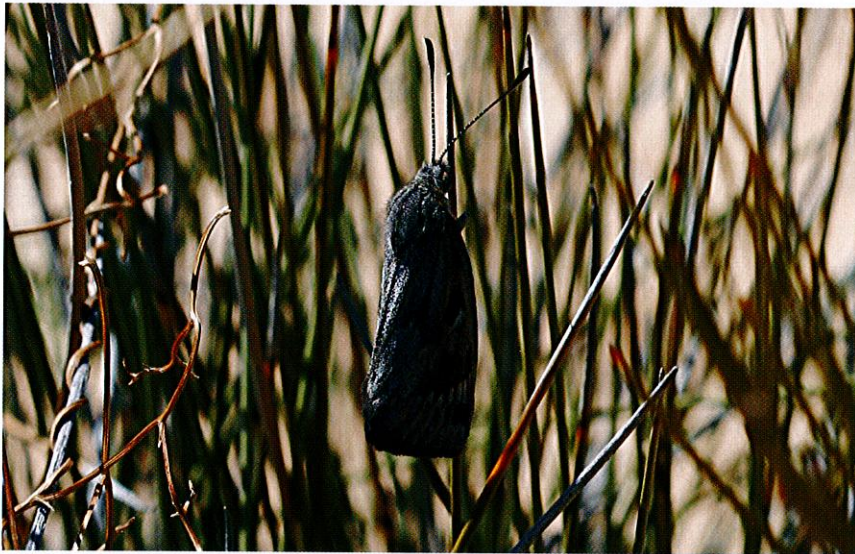
Photo – Andrew Williams/DEC

Below left A western red sun-moth resting on its food-plant.

Photo – Eleanor Williams

Bottom left Sunny sun-moths showing the distinctive white spot on the forewing.

Photo – Andrew Williams/DEC



for nature conservation in the form of nature reserves, national parks or local wildflower conservation areas. Even reserves vested for other purposes, such as timber or water supply, may have nature conservation value if their native vegetation is well preserved. Although often relatively small, nature reserves in the Wheatbelt frequently had great sun-moth diversity. As a general rule, sites with a combination of woodland, species-rich heathland and sedgeland featured the most sun-moths. One such area in the central Wheatbelt is Wyalkatchem Nature Reserve. This area has the right habitat attributes and supports an astonishing six different sun-moth species. In eastern Australia, localities seldom support more than a single species of sun-moth.

Wyalkatchem Nature Reserve is located north-east of the Wyalkatchem townsite. With an area of about 256 hectares, it is bordered to the north, south and east by gently undulating cleared farmland typical of much of the central Wheatbelt. Wyalkatchem Golf Course abuts the south-western boundary. The nature reserve can be accessed along Goldfields Road which runs alongside most of the southern boundary, and the Koorda-Wyalkatchem Road which cuts through the northern edge of the reserve. The habitat on the nature reserve can be broadly separated into four units. To the west, salmon gum (*Eucalyptus salmonophloia*) and wandoo (*E. wandoo*) woodland predominates on the heavy clays, with mallee-dominated woodland at the northern end of the nature reserve. Much of the remainder of the nature reserve supports variable tamma (*Allocasuarina*

Right A mating pair of western red sun-moths showing the extensive red markings on the upper-side of the hind wings (female, left) and underside of the wings (male, right).

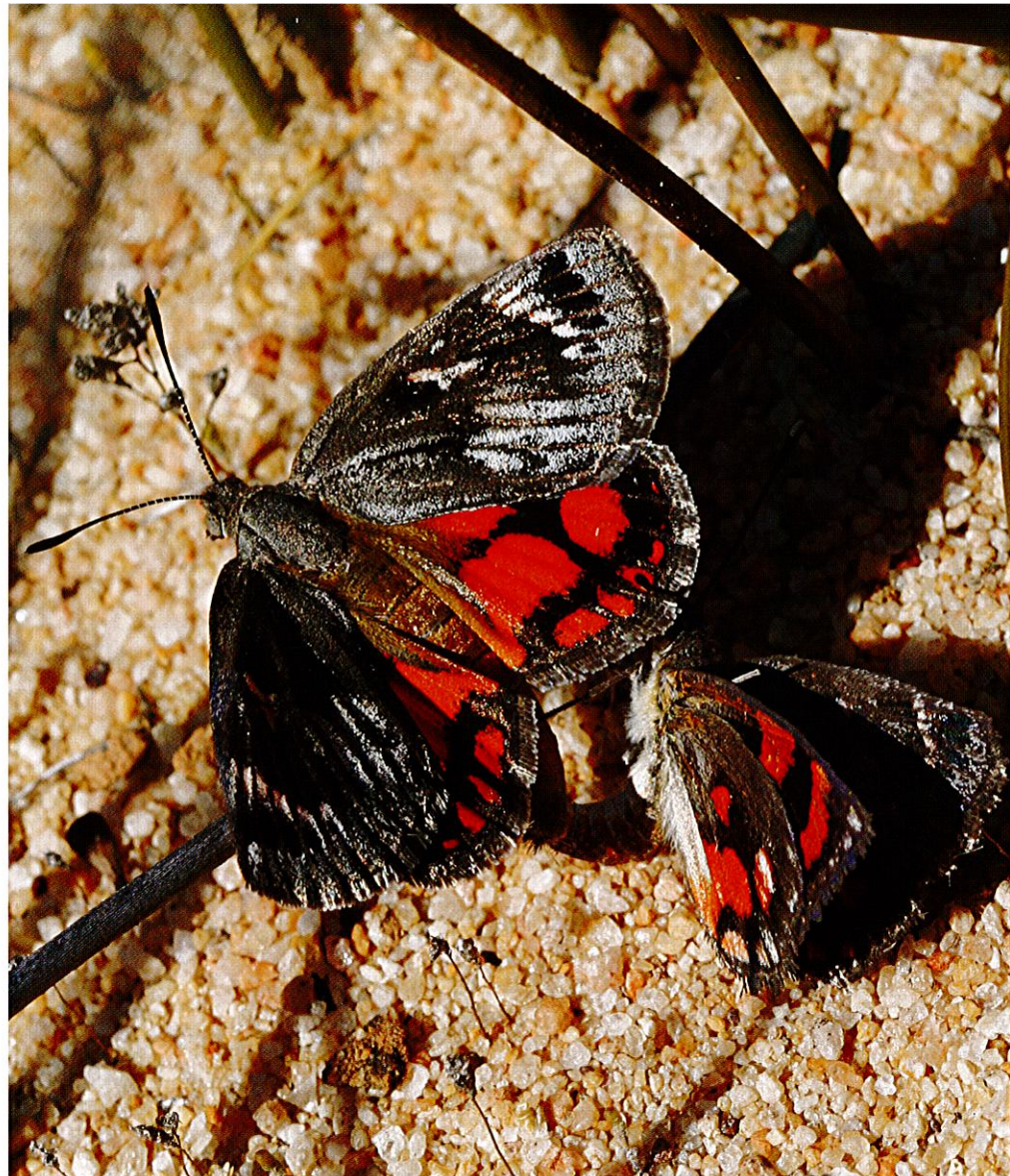
Photo – Andrew Williams/DEC

campestris) dominated shrubland over low mixed heath with tussocky cord-rush (*Ecdiocollea monostachya*) and other sedges. In some parts of the nature reserve, tussocky cord-rush sedgeland exists on its own.

The spring fliers

Of the six sun-moths known from Wyalkatchem Nature Reserve, three fly in spring, one in early summer, and two in mid-summer. The three spring-flying species are the western red sun-moth (*Synemon catocaloides*), the ruby sun-moth (*S. nupta*) and the Perth sun-moth (*S. 'Perth'*). The unofficial name *Synemon 'Perth'* is used here as a convenient tag for a complex group of closely allied sun-moths which are presently under taxonomic revision by Australia's sun-moth authority, Ted Edwards, curator of Lepidoptera at the Australian National Insect Collection in Canberra.

The western red sun-moth is a large species with a wingspan of up to 50 millimetres. The upper surface of the forewing is dull grey with indistinct dark markings and sometimes whitish markings as well. By contrast the upper surface of the hind wing is bright red or orange-red with some blackish markings. The underside of both the fore and hind wings have contrasting orange-red and grey markings, and in flight this orange and red colouration is very conspicuous. However, when at rest, the wings are folded so that only the dull grey upper forewing surface is visible. This provides the moth with excellent camouflage. It is a relatively common species in the Wheatbelt, where it flies from October to early November. It is almost invariably found



in habitat where its larval food-plant, the tussocky cord-rush, predominates.

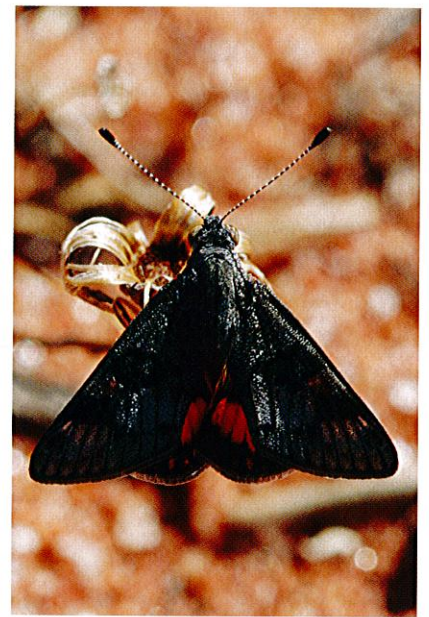
The ruby sun-moth is slightly smaller than the western red sun-moth and flies at the same time of year. However, the ruby sun-moth is generally found in the vicinity of its larval food-plant—a medium-sized broad-leaf sedge. This sun-moth is superficially similar to the western red sun-moth, but the upper side of its forewings is darker grey with blackish and whitish markings. The upper side of the hind wing is dark red, but very broadly bordered with black. The underside of the wings is mostly black with some restricted dark red markings on the forewing and whitish spotting on the hind wing. In flight this sun-moth always appears very dark. When settled, the dull dark grey forewing pattern also gives this sun-moth effective camouflage.

The Perth sun-moth is a medium-sized sun-moth with mottled grey, black and white rounded forewings, and hind wings heavily spotted yellow

or orange-yellow. At Wyalkatchem, this sun-moth flies in October and early November and is usually seen in open tamma-dominated shrubland.

The summer flyers

The three summer-flying species are the sunny sun-moth (*Synemon heliopsis*), the claret sun-moth (*S. jcaria*) and the darkling sun-moth (*S. 'BobHay'*). The unofficial name *Synemon 'BobHay'* is, like *S. 'Perth'*, simply an interim identification tag while the species is officially described. The sunny sun-moth is relatively small with a wingspan of 35 millimetres. The upper surface of its forewing is dull grey-brown with a small bright white central spot. The upper side of the hind wing is also dull grey-brown but with extensive paler orange-brown markings. In flight, this sun-moth is inconspicuous. However, when it settles on upright sedges or twigs, the white spot on the forewing is always prominently displayed. In Wyalkatchem Nature Reserve, sunny sun-moths may be seen in mid to late November and



early December, usually in tamma shrubland where tussocky cord-rush predominates.

The claret sun-moth is a very small sun-moth, most individuals having a wingspan of only 30 millimetres. The sharply pointed forewings have a diffuse pattern of grey, brown and whitish markings, while the hind wings are bright orange, usually with a narrow black band and border. The underside is mostly pale orange. These small, fast-flying sun-moths invariably fly close to the ground in the vicinity of the food-plant, scented mat-rush (*Lomandra effusa*). At Wyalkatchem the species flies in February and may be seen in salmon gum and wandoo woodland where the larval food-plant is particularly common.

The darkling sun-moth is unusual, in that it does not have brightly coloured hind wings like most other sun-moths. The upper side of the forewing is dull grey with variable diffuse markings, while the hind wing is greyish-black with a slightly iridescent sheen in some lights. The underside is dark brownish-grey variably patterned with whitish spots. At Wyalkatchem this cryptic species flies only in February, where it is found in tamma shrubland over tussocky cord-rush sedgeland.

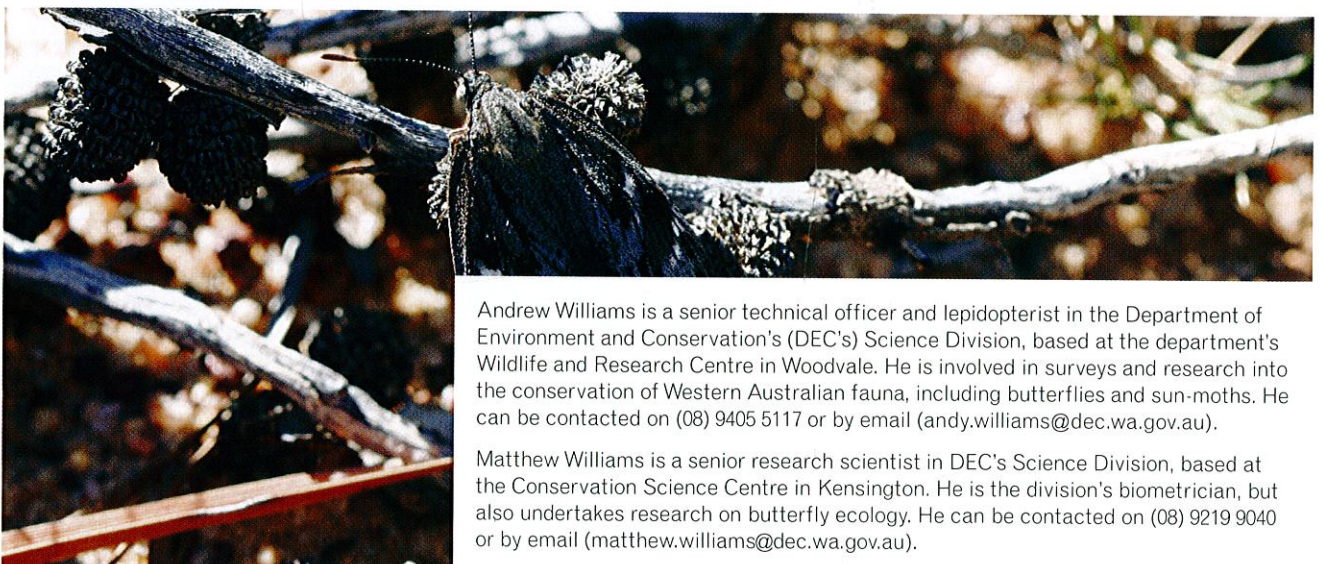
These preliminary sun-moth surveys have greatly increased our knowledge of the diversity, abundance and distribution of sun-moths in south-western Australia, and further highlighted the importance of remnant patches of bushland in the Wheatbelt

Above left Tamma-dominated shrubland over tussocky cord-rush sedgeland is widespread on Wyalkatchem Nature Reserve.

Above The claret sun-moth, which inhabits the salmon gum and wandoo woodland in Wyalkatchem Nature Reserve.

Below A ruby sun-moth at rest.
Photos - Andrew Williams/DEC

for the conservation of our invertebrate fauna. Much is still to be learnt about the habits and life histories of these ancient sun-moths, but it is reassuring to know that they have survived the impact of past large-scale clearing of native vegetation. Having an understanding of where the various sun-moths occur will enable DEC to better manage these priceless endemic Western Australian species.



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