

Action Statement

Flora and Fauna Guarantee Act 1988

No. 146

Five threatened Victorian Sun-moths (*Synemon* species)

Description and distribution

The Sun-moths (family *Castniidae*) are considered to have a Gondwanan origin as they occur in the Neotropical, Australian and Oriental regions. The Australian species are all placed in the single genus *Synemon*, containing 20 described and 22 undescribed species (E. D. Edwards *pers. comm.*).

Sun-moths are broad-winged, colourful, day-flying moths with clubbed antennae and relatively slender bodies. Their diurnal habits are so strong that if passing clouds block out the sunshine they will immediately settle and not take flight again (unless disturbed) until sunlight returns. They usually fly rapidly, within a metre of the ground and keep their wings in motion continuously. When Sun-moths rest for short periods they often raise and lower their wings rhythmically, showing their brightly coloured hindwings. However, when resting for longer periods the hindwings are concealed by cryptically coloured forewings that harmonise perfectly with the surrounding debris and soil surface crust. Unlike most moth families, the Sun-moths are unable to fold away their antennae when at rest.

General life history and ecology of sun-moths

As adults, sun-moths have relatively brief lives of approximately four to ten days (depending on the species). The adults of some sun-moths have reduced mouthparts and do not feed. These species rely on nutrients that are stored in their bodies during the larval stage to sustain them through their short adult lives.

Female sun-moths mate and commence oviposition shortly after emergence from their pupae as all of their eggs are fully matured during the pupal stage. They have long, retractable ovipositors that are used to deposit their eggs beneath the soil, at or near the base of their larval food plants. After hatching, the larvae tunnel to the food plants roots or rhizomes and commence feeding. Prior to pupation each larva constructs a vertical, silk-lined tunnel to just below the soil surface from which the empty pupal casing protrudes after the adult moth has emerged.

It is not known how long any of the Victorian sun-moths take to complete their life cycles. However, Common and Edwards (1981) found that *Synemon magnifica*, a species that occurs in New South Wales, takes two to three years to complete a generation. The known larval host plants of the eight species of Victorian sun-moths are invariably monocotyledons and belong to the families *Cyperaceae*, *Xanthorrhoeaceae*, *Poaceae* and *Juncaceae*.

Conservation status

Synemon nais and *S. theresa* have been listed as threatened under the **Flora and Fauna Guarantee Act 1988**.

There is at present no authoritative list of threatened invertebrates in Victoria.

None of these species is listed as threatened under the **Environment Protection and Biodiversity Conservation Act 1999**.

Conservation objectives

Long term objective - all species

To ensure that the five species of sun-moth survive, flourish and retain their potential for evolutionary development in the wild by protecting and enhancing their habitat.

Objectives of this Action Statement - all species

1. Achieve long-term protection and sympathetic management of key Sun-moth sites.
2. Improve current understanding of distribution, abundance, biology and habitat requirements of Sun-moth.
3. Increase public awareness of Sun-moth and other grassland-dependent invertebrates.

Intended Management Action

The intended management actions listed below are further elaborated in DSE's Actions for Biodiversity & Conservation database. Detailed information about the actions and locations, including priorities, is held in this system and will be provided annually to land managers and other authorities.

Generic actions

1. Provide information and advice, including maps, regarding the location and management of sun-moth sites to landholders, land managers and other authorities, especially Catchment Management Authorities and local government authorities.

Responsibility: DSE (Biodiversity & Natural Resources Division, SW Region)

2. Incorporate actions to protect, enhance and restore sun-moth habitat into relevant Regional Catchment Strategies or their subordinate strategies via Biodiversity Action Plans. Implement these actions, according to priority, as resources become available, in conjunction with other agencies, community groups and landholders.

Responsibility: Catchment Management Authorities

3. Incorporate information regarding the location and management of sun-moth sites into local planning schemes, including environmental significance overlays, and apply the Victorian Planning Provisions so as to protect these sites.

Responsibility: Shires

Species-specific actions

For detailed information, including specific Intended Management Actions, refer to the following pages on each species.

References

- Common, I. F. B. & Edwards, E. D. (1981) The life history and early stages of *Synemon magnifica* Strand (Lepidoptera: Castniidae). *J. Aust. Ent. Soc.* **20**: 295-302.
- Common, I. F. B. & Waterhouse, D. F. (1981) *Butterflies of Australia*. Angus & Robertson: Sydney.
- Common, I. F. B. (1990) *Moths of Australia*. Melbourne University Press: Carlton.
- DSE (2004) *Atlas of Victorian Wildlife* (electronic fauna database). Department of Sustainability & Environment. Biodiversity & Natural Resources Division: Melbourne.

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Further information can be obtained from Department of Sustainability and Environment Customer Service Centre on 136 186.

Flora and Fauna Guarantee Action Statements are available from the Department of Sustainability and Environment website: <http://www.dse.vic.gov.au>

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Small Orange-spotted Sun-moth

Synemon discalis Strand 1911

Description and distribution

A medium-sized sun-moth with a series of prominent bright orange spots on the black uppersides of the hindwing. Wingspan is about 3.1cm in males and 3.5 cm in females.

In the Big Desert, this species is on the wing concurrently with the superficially similar Orange-spotted Sun-moth (*Synemon parthenoides*) with which it can be easily confused. The Small Orange-spotted Sun-moth can be distinguished by its smaller size, narrower wings, paler wing undersides and bronzy-grey rather than blackish-grey upper forewings.

Note: E. D. Edwards has indicated that the *Synemon* species illustrated in Common (1990) as '*S. ?discalis*' is actually an undescribed species from Western Australia.

Within Victoria this species is only known to occur at two localities: in the south-eastern corner of the Big Desert, occupying an area of about 2 ha and 6 km north of Hattah on the Calder Highway. This record is based on a single female collected in October 1995.

Outside Victoria the Small Orange-spotted Sun-moth occurs in limited areas on the Yorke and Eyre Peninsulas in South Australia and at Mount Ragged and Norseman in Western Australia (E. D. Edwards *pers. comm.*). However, E. D. Edwards has indicated that the populations in Western Australia may belong to a closely allied but separate species. Common (1990) states that *Synemon discalis* is "...widely distributed in western Victoria and South Australia". However, this is an error as this species has a restricted distribution in South Australia and was not known to occur in western Victoria until 1995.

Habitat

Big Desert site: Low lying, open heathland on greyish-white sands. The dominant plant species at the one Victorian site are as follows: *Gahnia lanigera* (Desert Saw-sedge), *Lepidosperma carphoides* (Black Rapier-sedge), *Lepidosperma viscidum* (Sticky Sword-sedge), *Triodia scariosa* (Porcupine Grass), *Dampiera rosmarinifolia* (Rosemary Dampiera) and *Kunzea pomifera* (Muntries). Although trees and shrubs are scarce at the site there are a few specimens of *Eucalyptus leptophylla* (Narrow-leaf Mallee) and *Leptospermum coriaceum* (Green Tea-tree) near its margin.

Hattah site: An undulating mallee community on a reddish, sandy soil. The most abundant mallee species at the site are *Eucalyptus socialis* (Grey Mallee) and *Eucalyptus costata* (Yellow Mallee). Although the ground flora is dominated by *Triodia scariosa* (Porcupine Grass), the area also contains scattered occurrences of *Gahnia lanigera* (Desert Saw Sedge). Other plants that occur at the site include: *Lepidosperma viscidum* (Sticky Sword-sedge), *Westringia rigida* (Stiff Westringia), *Leptospermum coriaceum* (Green Tea-tree) and *Baeckea behrii* (Broom Baeckea).

Life history and ecology

At the Big Desert site this species is on the wing from late-October to mid-November, with the highest numbers being recorded in early November.

In most instances the females were recorded ovipositing at the base of *Gahnia lanigera* (Desert Saw-sedge) plants but on a few occasions they have been observed ovipositing at the base of *Lepidosperma carphoides* (Black Rapier-sedge) plants.

The rarity of large areas of *Gahnia lanigera* (Desert Saw-sedge) in the Wimmera-Mallee area may explain why the Small Orange-spotted Sun-moth appears to have such a restricted distribution in western Victoria. Although *Gahnia lanigera* is widespread in the Big Desert, it seems that the Small Orange-spotted Sun-moth requires fairly dense and extensive stands of this plant to maintain viable populations. At Port Lincoln in South Australia, E. D. Edwards found *S. discalis* probably utilising two other(?) species of small, unidentified sedges as larval food plants.

On the 17th October 1998, just prior to the adult flight period, the site where this species occurs in the Big Desert was completely burnt. During the next three weeks several adults that had obviously emerged after the fire were observed flying around the area as if nothing had happened; it was noted however, that fewer individuals appeared throughout that flight period than during 1997. Throughout the 1999 flight period the adult population density at the site was similar to that observed in 1997. These observations seem to indicate

that the subterranean early stages of this species and a life cycle that possibly takes 2 to 3 years to complete are both excellent adaptations to survive wildfire.

The date on the single Hattah specimen would seem to indicate the adult flight period is earlier near Hattah than in the southern Big Desert. It seems likely that the adults would be on the wing from early to late October.

Decline and threats

Historically, it appears that the Small Orange-spotted Sun-moth would have had a more extensive distribution along the southern edge of the Big Desert. The wholesale clearing of natural vegetation that took place after Europeans settled the area seems to have brought this species to the brink of extinction in Victoria, as a result of habitat loss. Despite surveys carried out during the past three years at other (more northerly) sites where Desert Saw-sedge occurs in the Big Desert, no more populations have been found. The unusually large area of (particularly) healthy Desert Saw-sedge inhabited around Chinaman's Well Track seems to distinguish this site from other potential sites.

A possible threat to the Big Desert population of the Small Orange-spotted Sun-moth is from firebreak construction along the Chinaman's Well Track. Disturbance of this type (ie. soil movement) would kill a high percentage of the Desert Saw-sedge plants, resulting in serious damage to the population of Small Orange-spotted Sun-moths.

Although the Hattah site does not appear to be under threat (it is within the Hattah-Kulkyne National Park), the population of the Small Orange-spotted Sun-moth in the area cannot be regarded as secure, until the population's survival can be confirmed and its size assessed.

Existing conservation measures

There are no existing conservation measures for this species in the Big Desert, while the Hattah site is within a National Park.

Intended management actions

4. Ensure that no soil disturbance or other damage to the Chinaman's Well Track site occurs. It is imperative that the relevant regional DSE and Parks Victoria staff know the whereabouts of this area so that it is not accidentally damaged.

Responsibility: Parks Victoria, DSE NW Region

5. Conduct surveys for other Victorian populations of this species. In the Big Desert these surveys should be carried out from late October to mid-November and concentrate on areas of the southern Big Desert where Desert Saw-sedge occurs. Suitable habitat in the Hattah-Kulkyne area should also be surveyed for this species during October (as it is likely that the adult flight period is some two weeks earlier in this area).

Responsibility: DSE NW Region

6. Investigate the possibility of extending the boundary of the Birdcage Flora and Fauna Reserve to 1 km west of its present western boundary along the Chinaman's Well Track. This would officially upgrade the conservation status of the Chinaman's Well Track site and possibly improve the chances of the Small Orange-spotted Sun-moth surviving in perpetuity.

Responsibility: DSE NW Region

Reddish-orange Sun-moth

Synemon jcaria R. Felder 1874

Description and distribution

A medium-sized species with a thicker body form and narrower forewings than other Victorian sun-moths. Wingspan: about 3.5 cm in males and 3.8 cm in females. This species has bright reddish-orange uppersides to the hindwings with two small, black central markings and black borders.



In Victoria the Reddish-orange Sun-moth has been recorded at the Kiata Native Plants and Wildlife Reserve in the Wimmera and at several localities in the Big Desert. The Big Desert localities are as follows: (a) Nhill-Murrayville Road, 33 km and 43 km north of Yanac, near the western boundary of Wyperfeld National Park and the Big Desert State Forest respectively; and, (b) Milmed Track, 9.5 km, 14.6 km

and 18.1 km west of its junction with Bullygall Road, Wyperfeld National Park. Recent survey work has determined that the populations in the Kiata Native Plants and Wildlife Reserve, and on the Milmed Track (9.5 km west of its junction with Bullygall Road) in the eastern Big Desert are extant. Beyond Victoria, this species is known to occur near Mount Hope in central New South Wales, at the southern end of the Yorke Peninsula and in the Barossa Valley in South Australia, and in Western Australia at Mount Ragged and the Darling Range (E. D. Edwards *pers. comm.*).

Habitat

Kiata Native Plants and Wildlife Reserve: Mixed woodland on grey loamy soil. Dominant plant species at the main site where the Reddish-orange Sun-moth occurs are as follows: *Eucalyptus largiflorens* (Black Box), *Eucalyptus leucoxylon* (Yellow Gum), *Bursaria spinosa* (Sweet Bursaria) and *Lomandra effusa* (Scented Mat-rush).

Big Desert Sites: Mallee-heath on pale, sandy soils and mallee in swales variously on loamy, grey soil and/or pale orange, gritty, clay. The single Big Desert breeding site that has been found to date is in the latter habitat; this site is dominated by the following plants: *Eucalyptus dumosa* (Dumosa Mallee), *Eucalyptus costata* (Yellow Mallee), *Baeckea behrii* (Broom Baeckea), *Melaleuca lanceolata* (Moonah), *Melaleuca uncinata* (Broom-Honey-myrtle), *Acacia calamifolia* (Wallowa) and *Lomandra effusa* (Scented Mat-rush).

Life history and ecology

It has been confirmed that the larval food plant of the Reddish-orange Sun-moth is *Lomandra effusa* (Scented Mat-rush).

Unusually, instead of feeding on the roots of their larval food plant (like the larvae of most other Australian sun-moths) the larvae of this species feed internally on its rhizomes. The presence of larvae inside a plant is indicated by rhizomes with dead foliage amongst others that are healthy. This characteristic foliage dieback is caused by the feeding activities of the larvae, which eventually hollow out entire rhizomes.

Although the adults of this species have a very rapid flight the males are reasonably easy to observe as they often return to a favourite resting place. Females behave very differently and are usually difficult to locate. This species has a relatively long adult flight period that commences in late January and concludes in mid-March.

Decline and threats

This species has probably suffered a significant decline in distribution as a result of habitat loss, since Europeans settled the Wimmera and Mallee. It seems likely that it would have inhabited many sites on the Wimmera Plain between the Big and Little Deserts.

Unlike other Victorian sun-moths, this species is probably vulnerable to local extinctions as a result of fire. Larvae feed and finally pupate inside the rhizomes of *Lomandra* and are not protected by being underground (it is likely that hollowed out rhizomes that contain larvae or pupae would be highly combustible). It appears that this species relies on a cyclic recolonisation of burnt areas for its survival.

As the known breeding sites of this species are limited, it seems that wildfire or inappropriate prescribed burning has the potential to seriously reduce its numbers. It is also possible that the only known Big Desert breeding site could be threatened by any firebreak construction along the southern side of the Milmed Track.

The breeding population at the Kiata Native Plants and Wildlife Reserve is subject to the following threats: soil disturbance and grazing of larval food plants by rabbits, invasion of the site by *Ehrharta calycina* (Perennial Veldt-grass), and/or damage to the larval food plants caused by the continued use of a vehicular track that runs through the site.

Existing conservation measures

The population of this species at Kiata is protected to some extent by being within the Kiata Native Plants and Wildlife Reserve.

As the Big Desert breeding site (on the Milmed Track) is included in Wyperfeld National Park it is reasonably secure.

Intended management actions

7. Close the vehicular track that presently runs from the north-east corner to the south-west corner of the western section of the Kiata Flora and Fauna Reserve (on the western side of the L. D. Argall Memorial Oval). The area that was formerly occupied by the track should then be planted out with *Lomandra effusa* (Scented Mat-rush) to extend the potential breeding area of the Reddish-orange Sun-moth in the Reserve. It is most important that the seeds and/or divisions that are used for this purpose are gathered from local (Kiata) populations of the plant.

Responsibility: Parks Victoria

8. Increase the level of routine vermin and weed control at the Kiata Flora and Fauna Reserve. The main pest species to be controlled immediately are rabbits throughout the reserve, and *Ehrharta calycina* (Perennial Veldt-grass), around the perimeter of the main Sun-moth breeding site, on the western side of the Oval.

Responsibility: Parks Victoria

9. Inform regional Parks Victoria staff about the location of the Milmed Track breeding site in the eastern Big Desert.

Responsibility: DSE NW Region

10. Ensure that no damage occurs to the area around the Milmed Track breeding site in the eastern Big Desert from firebreak construction or other works along the southern side of the Milmed Track. The protected section of the Milmed Track should extend from about 5 to 20 km east of its junction with Bullygall Road.

Responsibility: Parks Victoria

11. Conduct surveys for additional populations of this species. These surveys would need to be carried out from late January to mid-March (during the adult flight period) and should concentrate on areas of native vegetation in the Wimmera and Mallee that have not been recently burnt.

Responsibility: DSE NW Region

Orange Sun-moth

Synemon nais Klug 1850

Description and distribution

This is the smallest Victorian sun-moth; its hindwings are orange with a blackish-brown inner section that surrounds an orange spot. Near their outer edges they have a row of small black spots that are surrounded by orange. Wingspan: about 2.7cm in males and 3cm in females.

The Orange Sun-moth has a restricted distribution in Victoria where it is known to occur at three sites near Walpeup. It formerly occurred at Sea Lake. The Walpeup sites are as follows: (a) Walpeup Recreation Reserve, on the northern side of the sports oval; (b) an area of remnant habitat on the western side of the main entrance to the Mallee Research Station; and, (c) in a small Bushland Reserve on both sides of the Ouyen Highway, 2 km east-north-east of Walpeup. This species also occurs at Ceduna in South Australia and near Mundrabilla in the far south-east of Western Australia (E. D. Edwards *pers. comm.*). Common (1990) mentions Madura as another Western Australian locality where this species occurs.

Habitat

The habitat of this species in the Walpeup district is a floristically diverse combination of open grassy areas interspersed with stands of trees and shrubs. The grassy areas are dominated by *Austrodanthonia setacea* (Bristly Wallaby-grass) and *Austrostipa* species (Spear-grasses). The more abundant tree and shrub species that occur are as follows: *Callitris gracilis* (Slender Cypress-pine), *Casuarina cristata* (Belah), *Alectryon oleifolius* (Cattle-bush), *Dodonaea viscosa* subsp. *angustissima* (Narrow-leaf Hop-bush), *Acacia hakeoides* (Hakea Wattle), *Pimelea microcephala* (Mallee Rice-flower), *Hakea leucoptera* (Silver Needlewood) and *Senna artemisioides* (Desert Cassia).

Life history and ecology

The adult flight period of the Orange Sun-moth is from mid-October to mid-November with the highest numbers appearing in early November. Although this species is very colourful its comparatively small size and rapid flight make it difficult to observe. It is not unusual for only two or three specimens to be seen during an entire day of searching at one of the known breeding sites, at the peak of the adult flight period. Although adult activity occurs throughout the day it is at its greatest from about 10 am to noon (Eastern Summer Time). The few observations that have been made of ovipositing females indicate that *Austrodanthonia setacea* (Bristly Wallaby-grass) and a small, unidentified species of *Austrostipa* (Spear-grass) may be the larval food plants of this species.

Decline and threats

Clearing for agriculture appears to have reduced the Victorian distribution of this species to a few small sites near Walpeup. The historic records from the Sea Lake area suggest that it may have occurred more widely throughout the central Mallee in the past.

Parts of the largest breeding site, 2 km east-north-east of Walpeup (on the Ouyen Highway) are threatened by weed invasion, particularly *Avena barbata* (Wild Oat). During years of good rainfall it seems that *Avena* has the



Sun moth spp.
Synemon nais sp. no. = 5143
(image Museum Victoria)



Distribution in Victoria (DSE 2004)

ability to colonise any areas that have been disturbed, for example disturbance and compaction by vehicle movements away from the road, including trail bikes. Such disturbance has degraded some of the restricted patches of perennial grasses required by the Orange Sun-moth. This disturbance has also broken the cryptogamic crust (of lichens and mosses) in places, further exacerbating the potential for weed invasion of the area generally.

Although the other two sites where this species occurs near Walpeup are in good (natural) condition they may be under the following threats in the future:

- inappropriate firebreak construction, leading to further habitat loss and/or weed invasion,
- change of land tenure and management practices at the Recreation Reserve site, causing alienation of habitat,
- weed establishment (especially Wild Oats) along the northern boundary of the Recreation Reserve site,
- clearing or modification of the Mallee Research Station site to use more land for agricultural research.

Existing conservation measures

Following the final recommendations of the Land Conservation Council, the area where this species occurs on the Ouyen Highway (2 km east-north-east of Walpeup) was designated as a Bushland Reserve.

To date, the breeding site within the grounds of the Mallee Research Station has been retained as part of the Station's shelterbelt system and has been fenced to exclude livestock.

Intended management actions

12. Liaise with the Mallee Research Station to make sure that no unnecessary soil disturbance occurs at the Mallee Research Station site. Also, to determine if the fence around the area needs to be upgraded to exclude rabbits and hares.

Responsibility: DSE NW Region

13. Contact the management committee of the Walpeup Recreation Reserve to inform them of the Reserve's conservation significance and the need to prevent soil disturbance throughout the Reserve.

Responsibility: DSE NW Region

14. Protect the Bushland Reserve 2km east-north-east of Walpeup from further unnecessary soil disturbance by:

- preventing trail bike riding. Consideration should be given to fencing and signage
- liaising Vic Roads and V/Line to ensure minimal impact from routine maintenance of the Ouyen Highway and the railway line, both of which traverse the area

Responsibility: DSE NW Region, Parks Victoria

15. Conduct surveys in areas of suitable habitat in the Walpeup, Sea Lake and Underbool areas for other populations of this species. These surveys would need to be carried out during the adult flight period from mid-October to mid-November.

Responsibility: DSE NW Region

16. Monitor the abundance of exotic weeds and grasses at all three of the sun-moth sites near Walpeup twice per year. It is imperative that measures are taken to control these plants if they appear to be invading the areas of native perennial grasses at any of these sites.

Responsibility: DSE NW Region, Parks Victoria

Cryptic Sun-moth

Synemon theresa Doubleday 1846

Description and distribution

A small indistinctly marked species. Males are generally brownish-black and females paler grey; both sexes have dull orange uppersides on the hindwings with a row of spots near their outer edges (brown in males, black in females). Wingspan is about 3.1 cm in males and 3.5 cm in females.

This species has not been recorded in Victoria for approximately one hundred years. It occurred formerly at Castlemaine, Ararat and Beechworth. It also occurred formerly in South Australia near Adelaide and at Slapes Gully in the Mount Lofty Ranges and in the Clare Valley. The most recent South Australian record is from the Clare Valley where a single specimen was collected by N. B. Tindale during the early 1960's (E. D. Edwards *pers. comm.*).

Habitat

As there are no extant populations of this species, its exact habitat requirements are unclear. The locality data on historic specimens indicate that it inhabited open, grassy woodland (probably dominated by eucalypts) on well-drained and possibly stony soils. The ground flora was probably dominated by *Austrodanthonia* species (Wallaby-grasses) and *Austrostipa* species (Spear-grasses).

Life history and ecology

Very little is known of the ecology of the Cryptic Sun-moth. On morphological grounds, E. D. Edwards (CSIRO Division of Entomology) has placed it in the temperate subgroup of the grass-feeding group of *Synemon* species. This affinity would suggest that the larval food plant/s of this species are probably *Austrodanthonia* (Wallaby-grass) species. The label data on historic specimens held at the Museum of Victoria and information provided by E. D. Edwards indicates that the adult flight period of this species commences in mid-December and finishes in early January.

Decline and threats

Although the reason why this species seems to have died out is unclear, it can probably be attributed to the widespread loss of habitat as a result of clearing for agriculture. It is possible that undiscovered population/s of this species persist. As one of the historic occurrences of this species was at Castlemaine, it is of interest that a small population of the Golden Sun-moth (*Synemon plana*) was recently discovered at Fryerstown (J. Landy *pers. comm.*). This is an indication that the Cryptic Sun-moth may have also survived past disturbance from gold mining activities in the Castlemaine-Fryerstown district. The hilly terrain and stony soils of the area limit cultivation and thus have increased the likelihood of this species surviving.

Existing conservation measures

There are no existing conservation measures for this species as it is presumed extinct.

Intended management actions

17. Conduct surveys in areas where this species occurred historically, for surviving populations. These surveys would need to be carried out from mid-December to early January, during the adult flight period. Priority should be given to surveying the Castlemaine district for the reasons outlined under the heading 'Decline and Threats'.

Responsibility: DSE NW Region

18. Contact relevant wildlife departments/authorities in South Australia so that efforts to locate and conserve this species can be co-ordinated throughout its former range.

Responsibility: DSE NW Region

Striated Sun-moth

Synemon sp. aff. *collecta*

Description and distribution

A medium-sized sun-moth with whitish striations and markings on the dark brown uppersides of the forewings. Females are marked more prominently. Wingspan is about 3.9 cm in males and 4.1 cm in females. This taxon is very closely related to *Synemon collecta* and may prove to be conspecific with it. However, typical *Synemon collecta* is paler and occurs only in coastal and sub-coastal Queensland from Bowen to Inglewood and Warrick (E. D. Edwards *pers. comm.*).

There appears to be only one extant population of this species in Victoria. This population occurs near Shelley on the Murray Valley Highway approximately 35 km west of Corryong, occupying a small area (about 50 m wide by 300 m long) along the south-east side of the road. A few individuals have also been recorded at the airstrip to the south-west of Shelley. Historic Victorian records from Stawell, Hamilton and Beremboke (on the western side of the Brisbane Ranges) date from the early 1900s or earlier. The species has also been recorded from the Northern Tablelands of New South Wales, from Armidale to Barrington Tops (E. D. Edwards *pers. comm.*). It still occurs near Armidale (D. Britton *pers. comm.*), where a population has recently been located.

Habitat

The natural habitat of this species is uncertain as the only known Victorian population occurs in a mowed firebreak along the margin of a pine plantation. It seems likely that the Striated Sun-moth would have originally inhabited open, grassy woodland and grassland habitats that were dominated by *Austrodanthonia* species. The firebreak at Shelley is dominated by *Austrodanthonia laevis* (Smooth Wallaby-grass) (E. D. Edwards *pers. comm.*).

Life history and ecology

Observations of this species at Shelley in Victoria and Armidale in New South Wales have found that the males are more easily located than females (G. E. Wurtz and D. Britton *pers. comm.* respectively). This is probably due to males flying above the grass as they search for freshly emerged, unmated females. Adult Striated Sun-moths are on the wing from late December to mid-January.

At Shelley, the larvae of this species probably feed on *Austrodanthonia laevis* (Smooth Wallaby-grass) as it is the dominant *Austrodanthonia* species at the site. It is likely that the larval food plants at the other historic Victorian sites would also have been *Austrodanthonia* (Wallaby-grass) species.

Decline and threats

The Striated Sun-moth seems to prefer grassy habitats with a higher rainfall than most other Victorian sun-moths.

This preference has probably led to its loss in many parts of its former range, as it would have occupied areas that were preferentially cleared for agriculture by early European settlers. It is also possible that its grassy habitats were prone to colonisation by many species of exotic grasses and broad-leafed weeds.

The most serious potential threat to the Shelley site would be from a change of management practices for fire control. Ploughing or harrowing would be deleterious to the Striated Sun-moth population and may cause its disappearance. The site may also be vulnerable to weed invasion in the medium term.

Existing conservation measures

The site where the Striated Sun-moth occurs at Shelley is slashed at least annually. This form of management may help to maintain the ecological conditions that the species requires.

Intended management actions

19. Liaise with the land manager of the Shelley site, to ensure that the current management practices are maintained and that the site is not harrowed or ploughed.

Responsibility: DSE NE Region

20. Conduct surveys in the Shelley district and other areas where this species historically occurred for other populations. These surveys and other fieldwork on the species would need to be carried out from late December to mid-January, during the adult flight period.

Responsibility: DSE NE Region

21. Locate live females at the Shelley site and observe them for long enough to determine which species of larval food plants they seek for oviposition.

Responsibility: DSE NE Region

22. Investigate the possibility of reintroducing this species to suitable sites at the historic localities where it has died out.

Responsibility: DSE NE Region

23. Monitor the Shelley site for this species biannually, to obtain regular data on its population size and density.

Responsibility: DSE NE Region