Little Desert National Park Bush Blitz

Moths *(Lepidoptera)*

21 – 23 October, 2019

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Nomenclature and taxonomy used in this report is consistent with:

The Australian Faunal Directory (AFD)

http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/home

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List of contributors

List of contributors to this report.			
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Abstract

Surveys of moths (Lepidoptera) were conducted in the Little Desert National Park, Victoria, on 21-23 October 2019.

Three survey locations were chosen based on the various habitats available: Broughtons Waterhole (Central Block), a track 300m west of Lillimur Track (West Block) and a site north of One Tree Hill Track (East Block). Some moths were photographed at a survey demonstration in agricultural land at the Nhill Basecamp (Nhillbilly Farm) on 25 October 2019. These were included in the full species list.

A total list of 185 species was obtained, with 128 identified to species level. This was a relatively low total compared with a set of surveys conducted in 2015 (234 species). Sixteen species demonstrated range extensions, with five new for Victoria. An unidentified Erebidae species is not known to the contributors and may be new. The National Park was a hot-spot for diversity of the Geometridae genus *Dichromodes*.

The low species total may have resulted from the unusually dry conditions. However the surveys produced much new information on moths in the Little Desert and linked them with those observed in other reserves in western Victoria: Neds Corner Station, the Murray-Sunset NP, the Big Desert Wilderness Park and the Grampians NP. A study of the biogeographical gradation of species from the drier north to the wetter south would be worthwhile. Future monitoring is recommended to clarify the effects of drought and warming trends in climate.

1. Introduction

In Australia, current knowledge of moths (Lepidoptera) is largely based on notable collections in museums and the Australian National Insect Collection (ANIC), CSIRO, Canberra. However more widespread photographic recording, surveys, targeted collecting, DNA analysis techniques and new publications are improving the resources available to researchers and naturalists.

There is an ongoing commitment to collecting and collating information on Victorian moths in: the *Moths of Victoria* field guide series, now up to eight volumes (Hewish et al., 2014a, 2016; Kallies et al., 2015; Marriott, 2011, 2012a, 2012b, 2015; Marriott et al., 2017); Bush Blitz Surveys (Australian Biological Resources Study ABRS); Bioscan Surveys (Museums Victoria / Parks Victoria); on-line databases (e.g. Atlas of Living Australia ALA, iNaturalistAU); and contributions of specimens and photographs by many interested individuals.

However there is relatively little information on the moths of the Little Desert National Park. Label data associated with specimens in Museums Victoria give some localities and dates (main collector, K. Hately), as do photographs taken by local residents, Graham and Maree Goods. Surveys undertaken by P. Marriott, M. Hewish, and G. and M. Goods on 28-31 October 2015 produced a list of 234 moth species.

These lists were unlikely to be complete. Therefore a set of surveys was planned as part of the Little Desert Bush Blitz in October 2019, to extend the moth species list for the Park and identify species of particular interest.

2. Methods

2.1 Site selection

Rainfall, soil fertility and vegetation vary from east to west across the Park (Robin, 1998) and so three sites in the Park were chosen to sample different habitats: an eastern site, a central site and a western site. Two of the Little Desert sites were designated as Standard Survey Sites, SSS1 and SSS2, for consistent monitoring across disciplines and for possible future work. A public demonstration of moth surveying was held at the basecamp, Nhillbilly Farm near Nhill, and a few moth species were photographed.

Parks Victoria personnel gave advice on accessibility by four-wheel drive vehicles. Locations, dates, recorders and habitats are shown in Table 1 below.

Table 1. Survey sites in Little Desert National Park, 21 October to 23 October, 2019; public event site at Nhillbilly Farm Basecamp 25 October, 2019.

CE number	Location	Lat/long	Date	Start/finishTimes	Recorders	Habitat
BBLD 2019 001	SSS1, Central Block Broughtons Waterhole	36.56969°S 141.33701°E	21/22 Oct. 2019	Light on 7.45pm Light off 7.30am	Peter Marriott, Cathy Powers, Nish Nizar	Yellow Gum woodland, *Melaleuca uncinata*
BBLD 2019 002	Western Block – Track parallel to Lillimur Track	36.50053°S 141.11400°E	22/23 Oct. 2019	Light on 7.45pm Light off 7.15am	Peter Marriott, Cathy Powers, Nish Nizar	Slender Cypress-pine, *Leptospermum*, *Melaleuca uncinata*, eucalypt woodland, shrubby understorey
BBLD 2019 003	SSS2, Eastern Block – One Tree Hill Track	37.50417°S 149.82397°E	23/24 Oct. 2019	Light on 8.15pm Light off 7.15am	Peter Marriott, Cathy Powers, Nish Nizar	*Banksia ornata* groves, *Eucalyptus* spp., ephemerals
BBLD 2019 004	Nhillbilly Farm off Uthmeyers Road, Nhill	37.47185°S 149.83032°E	25 Oct. 2019	Light on 8.30pm Light off 10.15pm	Peter Marriott, Cathy Powers, Nish Nizar	Introduced plant species including grass, minimal native flora

2.2 Survey techniques

A light-trap (a 250W mercury vapour light shining on a vertical white sheet) was used to attract moths on three consecutive nights between 21 and 23 October 2019. The usual procedure was to set up the trap at early twilight to dusk, check through the night and early morning and then shut down at sunrise. Each species attracted to the light was photographed. Where appropriate, significant specimens were collected and secured in ice-coolers for transport back to basecamp. These specimens were lodged as voucher specimens in the Museums Victoria collection. The photographic records will be added to publicly accessible databases and photographs of every species listed in Appendix 1 will be supplied to and maintained in Museums Victoria Image Database.

2.2.1 Methods used at standard survey sites

The methods for the standard survey sites, SSS1 and SSS2, and the third site were identical (see Survey techniques). The aspects of the sheets, plants in flower, moon phase and weather, especially wind and temperature, can affect the number and diversity of moth species attracted to the sheet.

SSS1 (Broughtons Waterhole):

- Aspect: One sheet drew from *Melaleuca uncinata* vegetation; one from eucalypt / stringybark vegetation.
- Floral diversity: Very few flowering plants.

- Weather: Calm, no cloud cover, half-moon rose at 3am; cold to very cold from 11pm onwards; damp air in early morning with some light ground-fog.

SSS2 (East Block off One Tree Hill Track)

- Aspect: One sheet drew from sand-dune and mallee / *Banksia ornata* vegetation; one sheet from direction of Wimmera River floodplains, Yellow and Red Gums, other *Eucalyptus* spp, ephemerals on sandy loam.
- Flora diversity: Very few flowering plants.
- Weather: Calm, no cloud cover, dry, half-moon rise at about 4.15am; warmer temperatures overnight.
- Other issues: The warmer night-time temperatures promoted ant activity on the sheet. This prevented some moths from settling, and one sheet had reduced moth numbers after approximately 11pm.

Widespread dry conditions in Victoria over recent years may have affected moth numbers.

2.3 Identifying the collections

Most identifications have so far been made from photographs. Once the setting of collected specimens is finalised, uncertain identifications will be checked.

If species had been previously encountered by the authors, they could be found among the more than 1200 species covered in the *Moths of Victoria* book series (Hewish et al. 2014a, 2016; Kallies et al. 2015; Marriott, 2011, 2012a, 2012b, 2015; Marriott et al., 2017) or among Victorian moth photographs in a personal computer database maintained by P. Marriott (more than 3000 species). For unrecognised species, searches were mounted in the Museums Victoria collection and the ANIC (through E.D. Edwards and reference photographs taken by the authors,) and the website BOLD: The Barcode of Life (www.barcodinglife.org). Other sources used were reference books (Common, 1990, 1994, 1997, 2000; Robinson and Nielsen, 1993; Matthews, 1999; Horak and Komai, 2006; Kaila and Sugisima, 2011).

Peter Marriott and Cathy Powers co-ordinated the identification process, assisted by Marilyn Hewish and E.D. Edwards (ANIC). Nomenclature follows the Australian Faunal Directory (AFD).

Where a genus name is presented within brackets, it indicates that the species was originally named under that genus but it is no longer considered to belong there. No alternative genus has been assigned (Nielsen et al., 1996).

3. Results and Discussion

Appendix 1 lists moth species recorded during the Bush Blitz, with a total of 185 species from 25 families. The highest number of species was recorded at the West Block, SSS2 (107), with 102 species at the East Block and 71 at the Central Block (SSS1).

This is lower than the species' tallies obtained in surveys by two of the authors (PM, MH) in October 2015: 234 at four sites, including 84 at the Central Block. One of the contributors (PM) was present at both surveys and noted that there were in general many fewer moths at the sheets during the Bush Blitz. It is possible that recent dry conditions have affected moth populations, but further work is needed to assess the effect of drought on moth populations.

Findings of interest include information on new species for the state, including an Erebidae species that is unknown to the contributors, range extensions, and the high diversity of the Geometridae genus *Dichromodes*.

Collecting efforts during the Bush Blitz will result in 27 specimens being set and lodged in the Museums Victoria collection.

3.1 Un-named or not formalised taxa

Out of 185 moth species, 128 were identified to species level (70%). Fifteen species (8%) have not been formally named, but they are well known to lepidopterists, have been lodged as distinct species in major collections (Museums Victoria, ANIC) and have been dealt with in the

Moths of Victoria field guides. These have been marked in Appendix 1 as "Genus" MoV sp. "(x)", with "x" being the designated species number in the MoV publication.

Another 39 species (21%) have not been identified to species level and are not known to the authors. They require further review. In Appendix 1, they are indicated by "Genus, subfamily or family" sp.

3.2 Putative new species (new to science)

In this report, 'putative new species' means an unnamed species that, as far as can be ascertained, was identified as a new species as a direct result of this Bush Blitz.

In the *Moths of Victoria* series, the authors have attempted to compile a complete Victorian Checklist for every family dealt with thus far. The book featuring the family Erebidae has recently been completed (Marriott et al., 2017) and yet a species not included there was discovered in the Little Desert. It is not known by any of the contributors. It is certainly new for Victoria. Further investigation in collections and websites is warranted to determine if it occurs interstate. If it cannot be found, it may be new to science.

There are probably a number of species new to science among the 40 unidentified taxa listed in Appendix 1, but none has been identified as yet.

3.3 Exotic and pest species

The main families of Victorian moths that cause agricultural damage in the larval form are the Noctuidae, Pyralidae and Crambidae, though not all members of these families are economically significant. Most of these are native species that feed on crops, pastures or plantations, generally related to their native hosts (Common, 1990). There are no current official lists of native moths that are pests at the federal or state level (Dr M. Malipatil, pers. comm.; Dr Sabine Perron, pers. comm.). The species in the table below have been listed in Common (1990) as harmful moths and caterpillars of economic significance.

The noctuids, plutellids and pyralids listed in Table 2 generally frequent open country. All but one of the listed species were observed in the 'Basecamp' location. Noctuids are strong fliers and some species are mobile e.g. migratory Bogong Moths *Agrotis infusa* (review in Zborowski and Edwards, 2007). The adults may visit or invade nearby woodlands for nectar or in migration events. The geometrid listed inhabits woodlands and forests.

Table 3. Exotic and pest species recorded

Exotic/pest species	Location sighted/observed	Indication of abundance	Comments
Noctuidae *Mythimna (Pseudaletia) convecta*	Eastern Block SSS2 (BBLD 2019 003), Nhillbilly Farm (BBLD 2019 004)	Moderately common	Of major economic importance
Noctuidae *Helicoverpa punctigera*	Western Block (BBLD 2019 002), Eastern Block SSS2 (BBLD 2019 003), Nhillbilly Farm (BBLD 2019 004)	Common	Of major economic importance
Noctuidae *Agrotis infusa*	Eastern Block SSS2 (BBLD 2019 003), Nhillbilly Farm (BBLD 2019 004)	Moderately common	Of major economic importance
Plutellidae *Plutella xylostella*	Eastern Block SSS2 (BBLD 2019 003)	Uncommon	Of major economic importance
Noctuidae *Agrotis munda*	Central Block SSS1 (BBLD 2019 001),	Moderately common	Minor pest

	Eastern Block SSS2 (BBLD 2019 003)		
Noctuidae *Agrotis porphyricollis*	Western Block (BBLD 2019 002), Eastern Block SSS2 (BBLD 2019 003), Nhillbilly Farm (BBLD 2019 004)	Common	Minor pest
Noctuidae *Chrysodeixis argentifera*	Western Block (BBLD 2019 002), Nhillbilly Farm (BBLD 2019 004)	Moderately Common	Minor pest
Pyralidae *Etiella behrii*	Western Block (BBLD 2019 002), Eastern Block SSS2 (BBLD 2019 003), Nhillbilly Farm (BBLD 2019 004)	Common	Minor pest
Geometridae *Phrissogonus laticostata*	Western Block (BBLD 2019 002), Eastern Block SSS2 (BBLD 2019 003), Nhillbilly Farm (BBLD 2019 004)	Common	Minor pest

3.4 Threatened species

For Victoria, the EPBC Act list of Threatened Fauna includes only *Synemon plana*, the Golden Sun Moth. This moth has not been recorded in the Little Desert.

No other Victorian moths are found in national and state lists of threatened and vulnerable species. There is limited information on status and distribution of moths in Victoria, factors on which such listing could be based.

3.5 Range extensions

Sixteen species in the Bush Blitz moth list have not, to our knowledge, been previously recorded in the Little Desert National Park or its surrounds. Most represent extensions of known ranges within Victoria but five species appear to be new for Victoria.

Of the species new for the state, *Pedois amaurophanes* and *Machaeritis aegrella* were recorded at all three sites in the Park. They are therefore probably in widespread, established populations in the Little Desert. *Euphiltra angustior* was found only in agricultural land at Nhillbilly Farm. It was not detected in the denser, indigenous vegetation within the Park.

The Erebidae species is not included in the relevant Moths of Victoria book (Marriott et al., 2017) and is not known to the contributors. It warrants further investigation.

Table 5. Range extensions or significant infill in distribution records for species

Species	Location sighted/observed	Distance from nearest known record (km)	Comments
Pedois amaurophanes	West Block, Central Block SSS1, East Block SSS2	820 km	New for Victoria. Known from NSW; closest record SW of Sydney (BOLD)
Cryptophasa tetrazona	East Block SSS2	250 km	New for Victoria. Known from Qld, NSW, ACT, SA, WA; closest record

			Lyrup, SA (ALA, BOLD)
Euphiltra angustior	Nhillbilly Farm	1000 km	New for Victoria. Known from NSW, Qld; closest record Tinonee, NSW (ALA, BOLD)
Machaeritis aegrella	West Block, Central Block SSS1, East Block SSS2	600 km	New for Victoria. Known from NSW, ACT; closest record Namadgi NP, ACT (ALA, BOLD)
Erebidae species	East Block SSS2	Not known	New for Victoria. Not known to the contributors; needs further investigation
Scoparia meyrickii	East Block, SSS2	350 km	Range extension from subalpine areas east of Melbourne (ALA, PM)
Arrade leucocosmalis	East Block SSS2	80 km	Range extension from Grampians and central Vic. (MoV, MV, ALA, BOLD, PM)
Halone servilis	East Block SSS2	80 km	Range extension, previously known from Melbourne area to Grampians (MoV, ALA, BOLD)
Ardozyga desmatra	East Block SSS2	130 km	Infill in range, Brisbane Ranges, Vic. (140 km) to Mt Gambier, SA (130 km) (ALA, BOLD, PM)
Eupselia axiepaena	East Block SSS2	230 km	Range extension from central Vic., closest record Eppalock (ALA, BOLD, PM)
Catadoceta xanthostephana	West Block	320 km	Range extension; previously known east of Otway Ranges (ALA, BOLD, PM)
Euchaetis incarnatella	East Block SSS2	600 km	Range extension from Mallacoota in far-eastern Vic. (ALA, BOLD, PM)
Tanyzancla marionella	West Block	350 km	Infill in range from Wilsons Promontory (510 km) to Vivonne

			Bay, SA (350 km) (ALA, BOLD, PM)
Wingia psittacodes	West Block, East Block SSS2	650 km	Range extension from Mallacoota in far-eastern Vic. (ALA, BOLD, PM)
Tipanaea patulella	West Block	200 km	Range extension from central Vic., closest record Scarsdale (ALA, BOLD)
Thrincophora lignigerana	East Block SSS2	250 km	Range extension; known from central and eastern Vic., closest record Campaspe (ALA, BOLD)

4. Information on species lists

A list from any moth survey in Australia will contain a large proportion of taxa that cannot be named to species level and this problem is intractable.

It has been estimated that there are 20000-30000 moth species in Australia (Zborowski and Edwards, 2007) and fewer than half of these have been formally named (Nielsen et al. 1996).

The numbers of taxonomic studies carried out to the standards needed for identification and scientific naming are limited because of the size of the task. Even large, common species long known to lepidopterists may lack names (see Appendix 1, MoV species). Most named species were described in the late 1800s and the early to mid 1900s. Recent revisions using DNA analysis and genitalia dissection have shown some species to be incorrectly placed (e.g. Hitchcock et al., 2017) and many families, subfamilies and genera are in need of thorough revision. Smaller species (micro-moths) are particularly poorly known.

The limited and confused state of some of the taxonomy makes simple identification difficult for many species. It is therefore also difficult to recognise new species. It seems logical to start the taxonomic task by naming the species that are well known but undescribed. Many can be found sorted into species groups in collections. Some are so familiar to lepidopterists that their identification features, life histories, distribution, habitat preferences and flight times are known (e.g. many unnamed species dealt with in the *Moths of Victoria* series). Many specimens are available for DNA analysis and genitalia dissection. Unfortunately there is more work to be done than there are specialists to do it.

The species list is unlikely to be complete as moth flight times are limited and different suites of species occur in different seasons. Surveys in different seasons would greatly extend the list. Some moth species are not attracted to light and they are under-represented in the list. Day-time work was limited to protect the survey participants from extreme tiredness. Therefore day-flying moths and larvae were not specifically sought.

For new species to be named, specimens need to be collected and stored in permanent and accessible collections. However collecting, sorting and setting every moth species in large-scale surveys such as Bush Blitzes has proven to be impractical as the numbers are so high. Therefore the Bush Blitz surveys were conducted mostly by photography and specimens were collected only for species recognised as significant and possibly new. These have been lodged in Museums Victoria where they are available for research and possibly, naming.

Photographs cannot be used for naming species. However they can rapidly provide large species lists for land managers and researchers and widespread photography can quickly clarify distribution, flight times and variability in appearance. Most named species and many

unnamed ones can be recognised by their general appearance shown in photographs. For instance, there are keys and identification guides in the *Moths of Victoria* book series.

5. Information for land managers

The Little Desert NP forms a large 'island' remnant of native vegetation in a largely cleared landscape. It thus offers a refuge for flora and fauna and a snapshot of the regional biodiversity before European settlement. Conservation of its natural values is important.

Fire regimens, weed and pest control, maintenance and extensions of parking areas and access tracks, construction and tourist development should all be managed as far as possible to protect the extensive biodiversity and National Park as a whole. Review and continued enhancement of the Wimmera Parks Landscape Conservation Action Plan should be supported.

The Wotjobaluk Peoples can work closely with partners and neighbours to re-create land management practices, including fire regimes, that heal Country and go beyond the standard pest, plant and animal control (as detailed in the Bush Blitz briefing document).

Owners of outlying private properties should be encouraged to plant indigenous species, especially, but not exclusively, food-plants for Lepidoptera. Corridors will assist in fauna movement and decreased insecticide spraying will reduce mass eradication of a major food source for birds and other predators.

With Neds Corner Station, Murray-Sunset NP, Big Desert Wilderness Park and Grampians NP, the Little Desert NP forms an important network protecting the wide biodiversity of western Victoria. It is important that all reserves and Parks are managed to protect their natural values.

6. Other significant findings

The reduction in species numbers recorded between the 2015 surveys (234) and the Bush Blitz (185) may be significant. The two surveys had one survey site in common: Broughtons Waterhole (Central Block, SSS1) and the reduction also showed at this site: 84 species in 2015, 71 in the Bush Blitz. Peter Marriott was present during both the 2015 surveys and the Bush Blitz. He noted that there were in general many fewer individual moths on the sheets during the Bush Blitz. Conditions have been exceptionally dry in the last few years. However more work is needed to clarify the response of moth populations to drought and the warming trends in climate. Now that the Central and Eastern Block sites have been designated as Standard Survey Sites, they can be used for future monitoring.

The Little Desert proved to be a hot-spot for the Geometridae genus *Dichromodes*: 17 species in total, including 11 at the West Block, 11 at the Central Block and 8 at the East Block. The high representation of these species also occurred in 2015, with 20 species in total and 14 at the Central Block. In both surveys, there was an association with stands of *Melaleuca uncinata*. *Dichromodes* species are known as Heath Moths and they occur predominantly in heathland and shrubby woodlands (coastal or inland). The Little Desert would be an appropriate place for a detailed study of the genus *Dichromodes* as there is in excess of 12 undescribed dry-country species recorded.

The numbers of Geometridae species were higher in eucalypt / stringybark vegetation. Many geometrid larvae, especially the Bark Moths, tribe Boarminii, feed on eucalypt foliage and are therefore associated with eucalypt woodlands (Hewish et al., 2016).

As expected, the range of species recorded from the Little Desert included several known from dry-country reserves in north-western Victoria, such as the Big Desert and Murray-Sunset NP e.g. *Euphronarcha leptosdesma*, *Gastrinodes* MoV sp. (1) and *Syneora* MoV sp. (1) (personal surveys, PM, MH). The overlap in species almost certainly derives from the dry climate, poor soils and the predominantly mallee vegetation they share.

Some also occur in the Grampians NP, in areas lacking mallee vegetation. A Bioscan Survey in the Grampians NP showed it to be an area of biogeographical overlap between moth species of dry country in north-western Victoria and those occurring across wetter areas in southern Victoria (Hewish et al., 2014b). Neds Corner Trust for Nature Reserve in far north Victoria supports mainly chenopod shrubland and the single moth list available showed little overlap with that of the Little Desert (Hewish et al., 2012). There are only a few surveys of each of these reserves. Further work could clarify the biogeographical gradation of moth populations from north to south in western Victoria.

7. Conclusions

The Bush Blitz results represent a snapshot over only a few days, and the moth species list was relatively short. However the surveys have extended the species list for the Park and provided information of scientific value in range extensions, some of them new records for Victoria. An Erebidae species needs further investigation to determine if it is new to science. The Park has proved to be a hot-spot for the Geometridae genus *Dichromodes*.

Further work is needed. The species list is not complete. Work at other seasons and sites would reveal many new species for the Park. The Standard Survey Sites are now available for monitoring changes in moth populations caused by wetter and drier seasons, drought and warming trends in climate.

As a single Park, the Little Desert offers valuable protection for the fauna of central western Victoria, including moths. Further surveys at Neds Corner Station, the Murray-Sunset National Park, the Big Desert NP and the Grampians NP would clarify their interconnecting roles in protecting the moth fauna of western Victoria as a whole and it would show in detail the gradation in populations from north to south.

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Appendix 1. List of Lepidoptera (Moths) recorded during the Little Desert National Park, Victoria Bush Blitz						
Family	**Species**	**Common name**	**Putative new species**	**Threatened (EPBC Act)**	**Threatened (State / Territory Act)**	**Exotic / pest**
ANTHELIDAE	*Munychryia senicula*		No	No	No	No
COSMOPTERIGIDAE	*Cosmopterigid* sp.		Insufficient data	No	No	No
COSMOPTERIGIDAE	*Leptozestis* sp.		Insufficient data	No	No	No
COSMOPTERIGIDAE	*Leptozestis* sp.		Insufficient data	No	No	No
COSMOPTERIGIDAE	*Limnaecia* sp.		Insufficient data	No	No	No
COSMOPTERIGIDAE	*Limnaecia* sp.		Insufficient data	No	No	No
COSMOPTERIGIDAE	*Macrobathra melanomitra*		No	No	No	No
COSMOPTERIGIDAE	*Macrobathra* sp.		Insufficient data	No	No	No
CRAMBIDAE	*Hygraula nitens*		No	No	No	No
CRAMBIDAE	*Nomophila corticalis*		No	No	No	No
CRAMBIDAE	*Scoparia meyrickii*		No	No	No	No
CRAMBIDAE	*Tipanaea patulella*		No	No	No	No
DEPRESSARIIDAE	*Pedois amaurophanes*		No	No	No	No
ELACHISTIDAE	*Elachista (Atachia) carcharota*		No	No	No	No
EPERMENDIIDAE	*Epermenia exilis*		No	No	No	No
EREBIDAE	*Acyphas pelodes*		No	No	No	No
EREBIDAE	*Acyphas* sp.		Insufficient data	No	No	No
EREBIDAE	*Anestia ombrophanes*	Clouded Footman	No	No	No	No
EREBIDAE	*Arrade leucocosmalis*	Garden Snout	No	No	No	No
EREBIDAE	*Erebidae* sp.		Yes - possibly	No	No	No
EREBIDAE	*Eublemma inconspicua*	Inconspicuous Eublemma	No	No	No	No
EREBIDAE	*Halone servilis*	Grey Halone	No	No	No	No
EREBIDAE	*Termessa nivosa*	Snowy Footman	No	No	No	No
EREBIDAE	*Termessa zonophanes*	Double Yellow-patched Footman	No	No	No	No
EREBIDAE	*Thallarcha rhaptophora*	Desert Footman	No	No	No	No
GELECHIIDAE	*Ardozyga desmatra*		No	No	No	No
GEOMETRIDAE	*(Boarmia) zaloschema*	Shaded Bark Moth	No	No	No	No

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State / Territory Act)	Exotic / pest
GEOMETRIDAE	*Anachloris tofocolorata*	Tofu Carpet	No	No	No	No
GEOMETRIDAE	*Arhodia* sp.		No	No	No	No
GEOMETRIDAE	*Boarmiini MoV* sp. (3)		No	No	No	No
GEOMETRIDAE	*Chlenomorpha sciogramma*	Bent-wing Geometrid	No	No	No	No
GEOMETRIDAE	*Chlorocoma cadmaria*	Spectacular Emerald	No	No	No	No
GEOMETRIDAE	*Chlorocoma vertumnaria*	Red-fringed Emerald	No	No	No	No
GEOMETRIDAE	*Corula geometroides*	Ash-grey Geometrid	No	No	No	No
GEOMETRIDAE	*Crypsiphona ocultaria*	Red-lined Geometrid	No	No	No	No
GEOMETRIDAE	*Cyneoterpna MoV* sp. (1)		No	No	No	No
GEOMETRIDAE	*Dichromodes aff. anelictis*		Insufficient data	No	No	No
GEOMETRIDAE	*Dichromodes atrosignata*	Black-signed Heath Moth	No	No	No	No
GEOMETRIDAE	*Dichromodes cirrhoplaca*	Orange-barred Heath Moth	No	No	No	No
GEOMETRIDAE	*Dichromodes consignata*	Singed Heath Moth	No	No	No	No
GEOMETRIDAE	*Dichromodes diffusaria*	Disbursed Heath Moth	No	No	No	No
GEOMETRIDAE	*Dichromodes explanata*	Fine-lined Moth	No	No	No	No
GEOMETRIDAE	*Dichromodes fulvida*	Fulvida Heath Moth	No	No	No	No
GEOMETRIDAE	*Dichromodes indicataria*	Variable Heath Moth	No	No	No	No
GEOMETRIDAE	*Dichromodes longidens*	Toothed Heath Moth	No	No	No	No
GEOMETRIDAE	*Dichromodes lygrodes*		No	No	No	No
GEOMETRIDAE	*Dichromodes MoV* sp. (4)		No	No	No	No
GEOMETRIDAE	*Dichromodes* sp.		Insufficient data	No	No	No
GEOMETRIDAE	*Dichromodes* sp.		No	No	No	No
GEOMETRIDAE	*Dichromodes* sp.		No	No	No	No
GEOMETRIDAE	*Dichromodes* sp.		No	No	No	No
GEOMETRIDAE	*Dichromodes* sp.		No	No	No	No
GEOMETRIDAE	*Dichromodes* sp.		No	No	No	No
GEOMETRIDAE	*Dinophalus MoV* sp. (1)		No	No	No	No
GEOMETRIDAE	*Dinophalus MoV* sp. (3)		No	No	No	No
GEOMETRIDAE	*Dithalama cosmospila*	Grey Spotted Wave	No	No	No	No

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State / Territory Act)	Exotic / pest
GEOMETRIDAE	*Dysbatus singularis*	Dry-country Line-Moth	No	No	No	No
GEOMETRIDAE	*Epyaxa subidaria*	Subidaria Moth	No	No	No	No
GEOMETRIDAE	*Euphronarcha leptodesma*	Pale Desert Bark Moth	No	No	No	No
GEOMETRIDAE	*Gastrinodes argoplaca*	Cryptic Bark Moth	No	No	No	No
GEOMETRIDAE	*Gastrinodes MoV* sp. (1)		No	No	No	No
GEOMETRIDAE	*Hypobapta diffundens*	Diffundens Grey	No	No	No	No
GEOMETRIDAE	*Idaea costaria*	White-edged Wave	No	No	No	No
GEOMETRIDAE	*Idaea inversata*	Purple Wave	No	No	No	No
GEOMETRIDAE	*Idaea philocosma*	Flecked Wave	No	No	No	No
GEOMETRIDAE	*Lipogya leucoprosopa*	Dash Bark Moth	No	No	No	No
GEOMETRIDAE	*Lipogya MoV* sp. (1)		No	No	No	No
GEOMETRIDAE	*Nacophorini MoV* sp. (3)		No	No	No	No
GEOMETRIDAE	*Oenochroma cycnoptera*	Dry-country Wine Moth	No	No	No	No
GEOMETRIDAE	*Oenochroma MoV* sp. (2)		No	No	No	No
GEOMETRIDAE	*Oenochroma vinaria*	Hakea Wine Moth	No	No	No	No
GEOMETRIDAE	*Pasiphilodes testulata*	Pome Looper	No	No	No	No
GEOMETRIDAE	*Phrissogonus laticostata*	Apple Looper	No	No	No	Yes
GEOMETRIDAE	*Phrixocomes hedrasticha*	Saw-tooth Heath Moth	No	No	No	No
GEOMETRIDAE	*Phrixocomes MoV* sp. (1)		No	No	No	No
GEOMETRIDAE	*Phrixocomes* sp.		Insufficient data	No	No	No
GEOMETRIDAE	*Phrixocomes* sp.		Insufficient data	No	No	No
GEOMETRIDAE	*Prasinocyma semicrocea*	Common Gum Emerald	No	No	No	No
GEOMETRIDAE	*Psilosticha absorpta*	Fine-waved Bark Moth	No	No	No	No
GEOMETRIDAE	*Psilosticha pristis*	Little Brown Bark Moth	No	No	No	No
GEOMETRIDAE	*Rhuma MoV* sp. (3)		No	No	No	No
GEOMETRIDAE	*Scopula rubraria*	Reddish Wave/Plantain Moth	No	No	No	No
GEOMETRIDAE	*Syneora MoV* sp. (1)		No	No	No	No
GEOMETRIDAE	*Taxeotis cf celidora*		No	No	No	No
GEOMETRIDAE	*Taxeotis didymosticha*	Twins' Taxeotis	No	No	No	No

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State / Territory Act)	Exotic / pest
GEOMETRIDAE	*Taxeotis exsectaria*	Ochre-headed Taxeotis	No	No	No	No
GEOMETRIDAE	*Taxeotis intermixtaria*	Dark-edged Taxeotis	No	No	No	No
GEOMETRIDAE	*Taxeotis* sp.		Insufficient data	No	No	No
GEOMETRIDAE	*Zermizinga sinuata*	Lucerne Looper Moth	No	No	No	No
HYPERTROPHIDAE	*Eupselia beatella*		No	No	No	No
HYPERTROPHIDAE	*Eupselia axiepaena*		No	No	No	No
HYPERTROPHIDAE	*Thudaca campylota*		No	No	No	No
HYPERTROPHIDAE	*Thudaca haplonota*		No	No	No	No
LASIOCAMPIDAE	*Porela MoV* sp. (1)		No	No	No	No
LASIOCAMPIDAE	*Porela MoV* sp. (2)		No	No	No	No
LIMACODIDAE	*Pseudanapaea* sp.		Insufficient data	No	No	No
NOCTUIDAE	*Agrotis emboloma*		No	No	No	No
NOCTUIDAE	*Agrotis infusa*	Bogong Moth	No	No	No	Yes
NOCTUIDAE	*Agrotis munda*	Brown Cutworm	No	No	No	Yes
NOCTUIDAE	*Agrotis porphyricollis*		No	No	No	Yes
NOCTUIDAE	*Chrysodeixis argentifera*	Tobacco Looper	No	No	No	Yes
NOCTUIDAE	*Dasygaster padockina*		No	No	No	No
NOCTUIDAE	*Earias chlorodes*	Pale Earias	No	No	No	No
NOCTUIDAE	*Hecatesia thyridion*	Southern Whistling Moth	No	No	No	No
NOCTUIDAE	*Helicoverpa punctigera*	Native Budworm	No	No	No	Yes
NOCTUIDAE	*Leucania diatrecta*		No	No	No	No
NOCTUIDAE	*Leucania stenographa*		No	No	No	No
NOCTUIDAE	*Mythimna (Pseudaletia) convecta*		No	No	No	Yes
NOCTUIDAE	*Persectania dyscrita*		No	No	No	No
NOCTUIDAE	*Persectania ewingii*	Southern Armyworm	No	No	No	No
NOCTUIDAE	*Spodoptera exigua*		No	No	No	No
NOCTUIDAE	*Thoracolopha verecunda Group*		No	No	No	No
NOLIDAE	*Aquita tactalis*	Tactile Tuft-moth	No	No	No	No
NOLIDAE	*Nola eurrhyncha*	Well-beaked Tuft-moth	No	No	No	No

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State / Territory Act)	Exotic / pest
NOLIDAE	*Nola MoV* sp. (12)		No	No	No	No
NOLIDAE	*Nola niphostena*	Desert Tuft-moth	No	No	No	No
NOLIDAE	*Nola pleurosema*	Plain Tuft-moth	No	No	No	No
NOLIDAE	*Nol* a sp.		Insufficient data	No	No	No
NOLIDAE	*Nola* sp.		Insufficient data	No	No	No
NOLIDAE	*Nola* sp.		Insufficient data	No	No	No
NOLIDAE	*Nola* sp.		Insufficient data	No	No	No
NOTODONTIDAE	*Commonia hesychima*		No	No	No	No
NOTODONTIDAE	*Destolmia lineata*	Streaked Notodontid	No	No	No	No
NOTODONTIDAE	*Hobartina* sp.		Insufficient data	No	No	No
NOTODONTIDAE	*Ochrogaster lunifer*	Bag Shelter Moth	No	No	No	No
NOTODONTIDAE	*Psalidostetha banksiae*	Banksia Moth	No	No	No	No
OECOPHORIDAE	*Antipterna* sp.		Insufficient data	No	No	No
OECOPHORIDAE	*Catadoceta xanthostephana*		No	No	No	No
OECOPHORIDAE	*Catoryctis tricrena*		No	No	No	No
OECOPHORIDAE	*Cryptophasa tetrazona*		No	No	No	No
OECOPHORIDAE	*Deigmoesta* sp.		Insufficient data	No	No	No
OECOPHORIDAE	*Euchaetis incarnatella*		No	No	No	No
OECOPHORIDAE	*Euchaetis inceptella*		No	No	No	No
OECOPHORIDAE	*Euchaetis metallota*		No	No	No	No
OECOPHORIDAE	*Euphiltra angustior*		No	No	No	No
OECOPHORIDAE	*Gelechioid* sp.		Insufficient data	No	No	No
OECOPHORIDAE	*Heteroteucha* sp.		Insufficient data	No	No	No
OECOPHORIDAE	*Heterozyga coppatias*		No	No	No	No
OECOPHORIDAE	*Leucorhabda macrosticha*		No	No	No	No
OECOPHORIDAE	*Linosticha orthogramma*		No	No	No	No
OECOPHORIDAE	*Machaeritis aegrella*		No	No	No	No
OECOPHORIDAE	*Microbela epicona*		No	No	No	No
OECOPHORIDAE	*Microbela* sp.		Insufficient data	No	No	No

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State / Territory Act)	Exotic / pest
OECOPHORIDAE	*Mimobrachyoma hilaropa*		No	No	No	No
OECOPHORIDAE	*Myrascia* sp.		Insufficient data	No	No	No
OECOPHORIDAE	*Ocystola paulinella*		No	No	No	No
OECOPHORIDAE	*Philobota ancylotoxa*		No	No	No	No
OECOPHORIDAE	*Philobota eremosema*		No	No	No	No
OECOPHORIDAE	*Philobota* sp.		Insufficient data	No	No	No
OECOPHORIDAE	*Phytotrypa brochosema*		No	No	No	No
OECOPHORIDAE	*Phytotrypa pretiosella*		No	No	No	No
OECOPHORIDAE	*Plectobela zanclotoma*		No	No	No	No
OECOPHORIDAE	*Protomacha notia*		No	No	No	No
OECOPHORIDAE	*Stathmopoda* sp.		Insufficient data	No	No	No
OECOPHORIDAE	*Tanyzancla argutella*		No	No	No	No
OECOPHORIDAE	*Tanyzancla marionella*		No	No	No	No
OECOPHORIDAE	*Telecrates laetiorella*		No	No	No	No
OECOPHORIDAE	*Wingia psittacodes*		No	No	No	No
OECOPHORIDAE	*Zelotechna* sp.		Insufficient data	No	No	No
OPOSTEGIDAE	*Opostega* sp.		Insufficient data	No	No	No
PLUTELLIDAE	*Plutella xylostella*	Cabbage Moth	No	No	No	Yes
PTROPHORIDAE	*Trichoptilus ceramodes*		No	No	No	No
PTROPHORIDAE	*Wheeleria spilodactylus*		No	No	No	No
PYRALIDAE	*Assara subarcuella*		No	No	No	No
PYRALIDAE	*Austropaschia porrigens*		No	No	No	No
PYRALIDAE	*Callionyma sarcodes*		No	No	No	No
PYRALIDAE	*Etiella behrii*	Etiella Web Moth	No	No	No	Yes
PYRALIDAE	*Hednotodes callichroa*		No	No	No	No
PYRALIDAE	*Hellula hydralis*	Cabbage-centre Moth	No	No	No	No
PYRALIDAE	*Meyriccia latro*		No	No	No	No
PYRALIDAE	*Mimaglossa habitalis*		No	No	No	No
PYRALIDAE	*Persicoptera pulchrinalis*		No	No	No	No

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State / Territory Act)	Exotic / pest
SATURNIDAE	*Opodiphthera eucalypti*	Emperor Gum Moth	No	No	No	No
SATURNIDAE	*Opodiphthera helena*	Helena Gum Moth	No	No	No	No
TINEIDAE	*Moerarchis australasiella*		No	No	No	No
TINEIDAE	*Tineid* sp.		Insufficient data	No	No	No
TINEIDAE	*Tineid* sp.		Insufficient data	No	No	No
TINEIDAE	*Tineid* sp.		Insufficient data	No	No	No
TORTRICIDAE	*Ancylis* sp.		Insufficient data	No	No	No
TORTRICIDAE	*Ancylis* sp.		Insufficient data	No	No	No
TORTRICIDAE	*Arotrophora arcuatalis*		No	No	No	No
TORTRICIDAE	*Holocola* sp.		Insufficient data	No	No	No
TORTRICIDAE	*Thrincophora lignigerana*		No	No	No	No
YPONOMEUTIDAE	*Zelleria proterospila*		No	No	No	No
ZYGAENIDAE	*Pollanisus viridipulverulenta*	Satin-green Forester	No	No	No	No