Threatened Species Recovery Hub

National Environmental Science Programme

Assessment of the impacts of the 2019-20 wildfires of southern and eastern Australia on invertebrate species Final Report

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Cover image: *Metaballus mesopterus*, the Kangaroo Island marauding katydid. This species is only known from Kangaroo Island and large portions of its known range were impacted by fire. Image:Richard Glatz

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Summary

The 2019-20 wildfires of eastern and southern Australia were exceptional in their severity and extent, resulting in catastrophic impacts on biodiversity. Those impacts have been well documented for vertebrate species and plants, but hitherto there has been far less assessment of the impacts of these wildfires on invertebrate fauna. However, some post-fire studies have indicated that the impacts of these fires have been very significant for some invertebrate species, including at least one case where the 2019-20 fires are likely to have caused the extinction of an already threatened invertebrate species, and many cases of species whose entire known distributions were burnt.

In this study, we attempted to assess the impacts of the 2019-20 fires on as comprehensive a set of invertebrate species as possible, and to identify those fire-affected species that are priorities for conservation response. There are many challenges involved in this assessment, mostly relating to a range of shortcomings in knowledge and available data for Australian invertebrates.

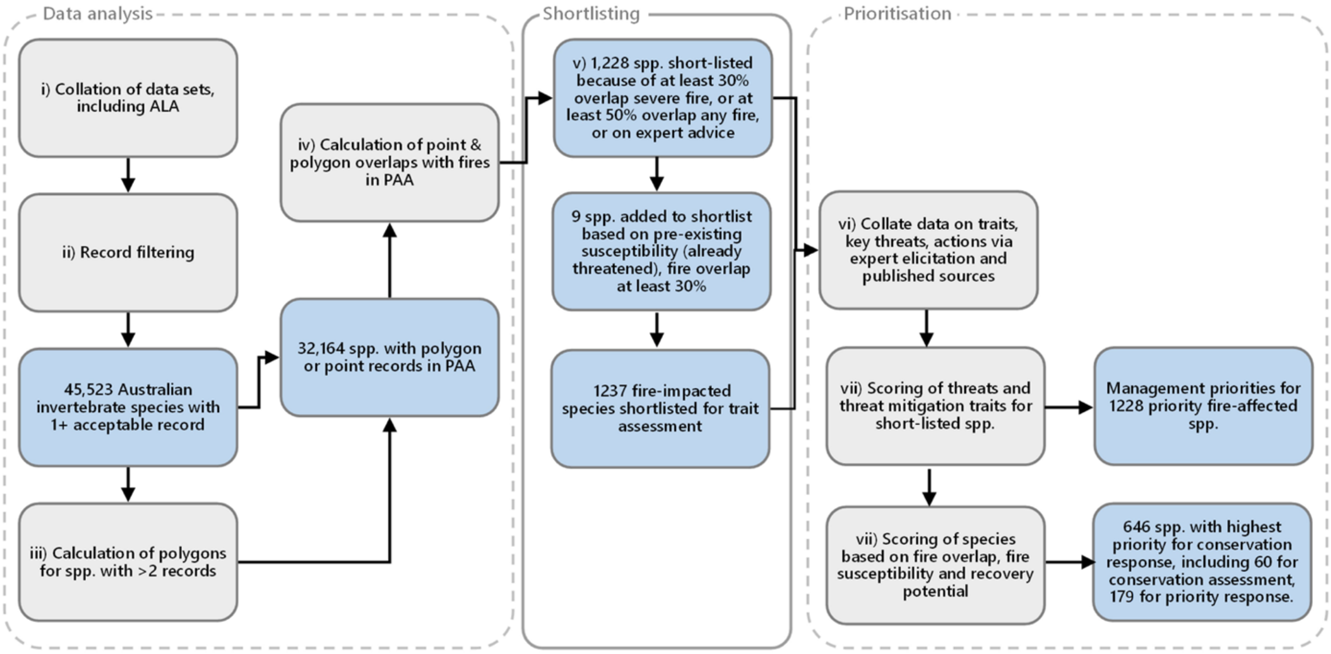
Our aims were to undertake a collaborative approach with experts and government representatives to:

a. assess, as comprehensively as possible, the proportional extent of the overlap of the 2019-20 wildfires on the ranges of invertebrate species. Using a combination of fire overlap and fire-susceptibility as assessed by life history and ecological traits, we then sought to develop a list of species that have been most affected by the 2019-20 wildfires and hence are priorities for conservation response, including assessment for listing as threatened under state, commonwealth or international legislation.
b. use mapping of species occurrences to determine centres of endemism for invertebrate species in Australia, in part to help identify areas that may be priorities for protection in future fire events.
c. compile a list of threats affecting priority fire-impacted species, and the management actions needed to aid post-fire recovery.

Approach

Broadly, our approach (see flowchart below) was to:

i. Collate invertebrate distributional data from many relevant datasets held by government agencies and experts.
ii. Filter those data to cross-match names, and exclude records that were old, duplicates, of imprecise location, or otherwise potentially unreliable.
iii. For all species with at least three acceptable locational records, calculate alpha hull polygons.
iv. For all species, superimpose the locational records and polygons upon the GEEBAM 2019-20 fire mapping in southern and eastern Australia (the 'Preliminary Analysis Area': PAA) to derive estimates of species' percentage overlap with high severity fires (GEEBAM classes 4 and 5) and with all fires (both including or excluding GEEBAM class 2). Because there are different biases and suboptimalities in use of points and of polygons, our 'best guess' overlap estimate for any species used the average of point and polygon overlaps, and we included upper and lower bounds to express uncertainty.
v. Short-list those species that we found to have overlap of (i) at least 30% with severe fire and/or at least 50% overlap with any fire, or (ii) for species currently listed as threatened, at least 30% overlap with any fire. These thresholds are loosely based on IUCN criteria for eligibility for listing as threatened. We also included species nominated by experts but for which we could not calculate fire overlap due to a lack of usable occurrence records.
vi. Collate data on ecological traits, key threats and key actions via expert elicitation (16 experts, 190 species), and also supplemented during a workshop (66 experts); traits for the remaining short-listed species were collected using reference to public sources and liaison with experts. These data were used to populate and apply a framework of ecological and other relevant traits for the set of short-listed species.
vii. Identify aquatic and semi-aquatic invertebrate species among this short-listed set, and apply a recently developed model to assess their risk of impact due to sedimentation of watercourses arising from fire.
viii. Complement the trait database with fire overlap values to estimate the proportions of population lost in the fires, to indicate recovery potential, to identify major threats and their expected impact on recovery (both nationally and at the regional level), and to help guide management responses.



Flowchart showing main steps used in analysis of fire impacts (grey boxes) and outcomes (blue boxes)

Key Findings

Relevant data for many Australian invertebrates are meagre and dispersed among many databases. We collaborated with many database holders to collate species' distributional information across separate databases to add to the data available from the single main national biodiversity distributional database, the Atlas of Living Australia (ALA). This collation added 67,927 occurrence records and helped to add records for species unrepresented, or with very few records, in the ALA, allowing for more confidence and comprehensiveness in our assessments of fire overlap. Adding in additional data resulted in substantial increases in estimates of distributional extent for some invertebrate species, but little change for most species in estimates of fire overlap.

Of the 111,233 described terrestrial and freshwater invertebrate species in Australia, we were able to compile data for 32,164 species (with a total of 238,649 records), which had acceptable records in the PAA. A high proportion of species were represented by only one (31%) or two (14%) records, and for these species in particular, we recognise that our assessments of fire overlap and impact have relatively low confidence. Many other invertebrate species are known to occur in the PAA, but we could obtain no acceptable records for them: hence, we are likely to have under-estimated the tally of fire-affected invertebrate species. Over two-thirds of invertebrate species are undescribed and whilst we could not include the majority of these in our analysis, we did include undescribed species which had been classified to morphospecies and linked to a physical museum specimen.

A total of 14,159 of the included invertebrate species (44% of the species for which we had records in the PAA) had some distributional overlap with the 2019-20 wildfires. The proportions of species with any fire overlap varied markedly among the PAA components of jurisdictions (from 40% for Western Australia to 84% for the Australian Capital Territory) and among fire recovery regions (from 62% for the rainforests of south-eastern Queensland to 88% for East Gippsland). Taxonomic groups with high tallies of species with some fire overlap included beetles (Coleoptera, 4195 spp.), butterflies and moths (Lepidoptera, 1523 spp.), wasps and ants (Hymenoptera, 1332 spp.), spiders (Araneae, 1313 spp.), and flies (Diptera 1285 spp.).

We found that 1051 (3.3%) of the included invertebrate species for which we had records in the PAA had at least 30% distributional overlap with severe fire and/or at least 50% overlap with some fire, with this tally rising to 1209 (3.8%) if the upper bound (i.e., including GEEBAM fire severity mapping class 2 as burnt) for overlap with total fire is used. Again, the proportions of species with such substantial fire overlap varied markedly among the PAA components of jurisdictions (from 0.6% for Tasmania to 13% for the Australian Capital Territory) and among fire recovery regions (from 1.7% for the rainforests of south-eastern Queensland to 8.8% for Kangaroo Island). Taxonomic groups with high tallies of species with such substantial fire overlap included beetles (Coleoptera, 236 spp.), flies (Diptera 198 spp.), butterflies and moths (Lepidoptera, 192 spp.), and spiders (Araneae, 117 spp.).

The tally of invertebrate species with high fire overlap vastly exceeds the number of vertebrate species reported to have such high fire overlap, with invertebrate species contributing 95% of the animal species with at least 50% distributional overlap with fire, and 94% of the animal species with at least 30% distributional overlap with severe fire. It remains a considerable but important conservation challenge to complement the substantial management response efforts directed to fire-affected vertebrate species with analogous conservation responses for the far larger number of fire-affected invertebrate species.

The conservation outlook for species already recognised as threatened may be especially jeopardised by the impacts of fire. Of 67 invertebrate species listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), 45 occur in the PAA. Of the 41 EPBCA-listed species for which we had acceptable records, we found that three species (Banksia brownii plant louse *Trioza barrettae*, Banksia montana mealybug *Pseudococcus markharveyi* and Eastern Stirling Range pygmy trapdoor spider *Bertmainius colonus* – all short-range endemic species restricted to the Stirling Range, Western Australia) had distributional overlaps of at least 30% with severe fire and/or at least 50% with any fire. A further 15 EPBCA-listed species had some, but less, distributional overlap with fire. Based on the assessment presented here, the EPBC Act status of *Trioza barrettae* and *Bertmainius colonus* should be considered for review for possible up-listing, and for *Pseudococcus markharveyi* for potential listing as Extinct. These species should also be considered to be priorities for conservation management response. Of species listed as threatened by the IUCN and/or by states/territories (but not currently listed under the EPBC Act), nine terrestrial species and 12 aquatic or semi-aquatic species had distributional overlaps of at least 30% with severe fire and/or at least 50% with any fire.

In addition to the 1209 species that our analyses showed had high fire overlap (30% distributional overlap with severe fire and/or at least 50% overlap with some fire), we included 19 expert nominated species for which we were not able to calculate overlap due to occurrence data not yet being on ALA, largely as a result of ALA taxonomy not yet being updated with newly described species, or for which our calculated overlap data had been superseded by more recent data; resulting in 1228 species with recognised or expected high fire overlap. Following inclusion of species currently listed as threatened which had at least 30% overlap with any fire, the total number of highly fire impacted species in our analyses was 1237 (note threat and management actions analysis was conducted on 1228 species).

In order to further prioritise these species for conservation assessment, response and research we developed a framework by which to analyse life history and ecological traits to assess: i) species' mortality risk from fire, and ii) their post-fire recovery potential. Of the 1237 highly fire impacted species, we identified 646 priority species that had traits that indicated high mortality risk in fire and a high risk of delayed, or incomplete, post-fire recovery. Of these 646 species, 239 were identified as being at elevated risk of further decline and were priorities for urgent response, 60 of which had sufficient data to be plausible candidates for assessment for listing as threatened, and 99 that were expected to be at high risk, but which urgently require further distributional data to confidently assess population decline. These 99 species are priorities for urgent surveys to determine their post-fire distribution, and elucidate aspects of their ecology and biology relating to fire susceptibility. A further 80 species were identified as moderately elevated risk of further decline and requiring further monitoring. These surveys are required to better define extinction risk, provide a more detailed assessment of fire overlap, map threats and inform management actions and should therefore be viewed as a core part of conservation management response, rather than tangentially as research priorities alone.

For those invertebrates with high levels of overlap and with traits that increase susceptibility to fire, or reduce recovery potential, there may be a high risk of extinction. Given their small size and often cryptic nature, demonstrating extinction (or not) of an invertebrate species will likely be difficult and require considerable targeted survey effort. However, this effort is important because: i) it will help to more explicitly quantify the extent of loss, particularly irretrievable loss (such as extinctions) due to these fires; and ii) where survivors are found for species at very high risk of extinction, urgent recovery actions may need to be implemented to safeguard the species and prevent extinction.

For the 1228 species with most substantial fire overlap, we collated information on traits, key threats and management responses to establish a database which we then analysed to prioritise management responses for individual species, across all fire-affected species nationally and regionally, and in the short (1-year post-fire) and longer-term (2-20 years post-fire). We found that further fire was the threat most likely to impede recovery for the set of species most affected by the 2019-20 fires, but that such risk could be at least partly ameliorated by the imposition of tailored fire management. However, the ordering of threats and management priorities varied among fire-affected regions and species. We identified those species for which further survey and research was the highest priority (to fill key knowledge gaps that are currently likely to impede management effectiveness), identified those species most likely to benefit from particular management investment, and those species whose recovery may be most challenging because current management options were unlikely to mitigate threats.

In addition to considering the impacts of fires on individual invertebrate species, we used the distributional information collated here across all Australian invertebrate species to identify centres of endemism for the Australian invertebrate fauna; and to assess the extent to which such significant areas were affected by the 2019-20 fires. Circumscription of such centres of endemism is important also to improve preparedness for future significant fire events, as it may help guide fire operational responses to protect those areas given that they may support especially rich concentrations of species whose small ranges render them particularly susceptible to disproportionately high losses in major fire events. The identification and subsequent protection of areas of endemism also provides an avenue to move beyond species level protection of Australian invertebrates, and allow inclusion of the many undescribed or data poor species, which are often excluded from species level conservation assessments.

During this project, we formed a collaboration with IUCN to deliver a substantial (5 day) workshop to assess 106 fire affected invertebrate species for inclusion in the IUCN Red List. The workshop was highly collaborative, and exceptionally well supported by a large number of experts from within Australia and internationally and with representatives from museums, NGOs and state and federal government. The workshop not only achieved a large number of species assessments in the time available, but was also valuable as an upskilling process, allowing a large number of individuals involved in invertebrate science or conservation in Australia to gain experience in the listing process.

The outcomes of the project are expected to increase inclusion of invertebrates in conservation assessments in Australia. During this project, we have shown that it is possible to overcome challenges such as few occurrence records and data deficiency to estimate the impact of fires on many Australian invertebrate species and to produce an informed and justified assessment of the species now most at risk.

Recommendations

Incorporating the findings of this project we have the following recommendations:

1. That the 60 fire-affected species we propose as priorities for further assessment of conservation status should be assessed urgently for state/territory and national threatened species listing or, where applicable, uplisting.
2. That the 99 fire-affected species identified as being at high priority for research and /or response should be the focus of targeted survey and research, in order to help further resolve their extent of loss and to guide recovery efforts. We further recommend the 80 species identified as moderate priority for research be the focus of surveys to resolve uncertainties in trait data.
3. The development and implementation of management planning at a regional scale to support the recovery of the species most impacted by the 2019-20 fires.
4. The development and implementation of a strategic monitoring program by which to chart the recovery of, and refine further management actions for, fire-affected species, including species currently listed as threatened and those species we have suggested for listing assessment.
5. The development and implementation of management plans for key sites of conservation significance (notably including centres of endemism) for Australian invertebrate fauna, with such planning including actions to mitigate and respond to future large scale threat events. This recommendation would help protect the large number of undescribed species and is a considered response to the paucity of data for described species.
6. The development and implementation of a program to better integrate databases held by individual states and museums to a centralised database of invertebrate records, accessible to the public. Such progress will require the implementation of enhanced mechanisms and/or more incentive for individual scientific researchers to upload collections data to a centralised database.
7. That the trait framework developed for this project be maintained by an appropriate research body or information storehouse, to enable it to be iteratively refined and updated as new research and monitoring data become available.

Figure 1.1. *Moggridgea rainbowi*, the Kangaroo Island micro trapdoor spider. This short-range endemic species is only known from Kangaroo Island, where it was highly impacted by fire. Along with the Kangaroo Island assassin spider (*Zephyrarchaea austini*), this species has an assessment pending for listing under the EPBC Act. Image: Jess Marsh

1. Introduction

The 2019-20 wildfires of eastern and southern Australia were exceptional in their severity and extent (Boer et al. 2020; Bowman et al. 2020; Lindenmayer and Taylor 2020; Wintle et al. 2020) (Fig. 1.2), with consequently severe impacts on many components of biodiversity (Ward et al. 2020; Collins et al. 2021; Godfree et al. 2021; Gallagher et al. in press; Legge et al. in review) (Figs 1.1, 1.3, 1.6). Many threatened species were much affected by these fires, such that they are now more imperilled, and many species not previously considered threatened have become threatened (Ward et al. 2020).

A major effort has been made by national and state/territory agencies, conservation NGOs and the community to help recover many fire-affected species (e.g., https://www.environment.gov.au/biodiversity/bushfire-recovery). For such effort to be most beneficial and effective, it is important to identify and prioritise those species (and ecological communities) that have experienced the most loss and whose persistence is now most tenuous, to implement the most appropriate post-fire management actions for those species, and to provide where possible formal recognition of their imperilment.

Figure 1.2. Example of the severity and scale of the 2019-20 wildfires, in this example on Kangaroo Island. Image: John Woinarski

Given the vast number of invertebrate species and the proportion with very limited range (Harvey 2002; Harvey et al. 2011), it is likely that fires burnt much of the distributional extent of many species, severely reducing their populations and conservation outlook (Hyman et al. 2020; Moir 2021), and at least one invertebrate species has been recognised as 'likely' to have become extinct because of these fires (Moir 2021). However, for Australia's invertebrate fauna, it is especially challenging to progress the objectives of identifying the most fire-affected species, directing management, and listing as threatened. There are many components of this challenge, including the sheer number (ca. 300,000) of species, most of which are undescribed (Chapman 2009); limited knowledge of the biology (including responses to fire) and management needs of most species; limited distributional information for most species dispersed across many disparate and uncollated distributional databases; limited knowledge of population trajectories and status; and relative neglect of invertebrates in Australian conservation management (Walsh et al. 2013; Braby 2018; Taylor et al. 2018; Braby 2019). Furthermore, the complex life histories of many invertebrate species mean that the impacts of fire will vary depending upon what life stages are present in the population at the time of fire.

This project sought to address these challenges, in order to provide an evaluation of the magnitude of the impacts of these fires on the Australian invertebrate fauna; to deliver a justified assessment of these invertebrate species most likely to have been severely affected by the 2019-20 fires; to collate information to help guide post-fire management of (and priority research on) these species; and to provide evidence to help the responsible agencies to assess the conservation status, and list as threatened, the most fire-affected invertebrates. Where possible, we worked in collaboration with other related projects (such as NESP TSR project 8.3.2 'Effect of fire severity on the response of populations of priority wildlife species'), and with the IUCN to undertake a collaborative assessment of the conservation status of an initial subset (106 species) of fire-affected species, and we sought and received invaluable help from many conservation agencies, expert groups and individuals.

Figure 1.3. *Ogyris halmaturia*, the large brown azure butterfly. This species is believed to be extinct in Victoria and now is known to exist only in three separated subpopulations in South Australia (Geyle et al. 2021). The subpopulation on Kangaroo Island was heavily impacted by the 2019-20 fires. Image: Richard Glatz

1.1. Context

Several studies have been conducted on the impact of the 2019-20 fires on some faunal groups in Australia. Legge et al. (2020) [https://www.environment.gov.au/biodiversity/bushfire-recovery/bushfire-impacts/priority-animals] and Ward et al. (2020) showed there was significant overlap of fire on the habitat and ranges for many species of vertebrate and spiny crayfish (of the genus *Euastacus*), with this analysis recently updated in a companion NESP project by Legge et al. (2021).

An initial priority list of fire-affected invertebrates was developed rapidly following the 2019-20 wildfires to help guide immediate conservation investment (https://www.environment.gov.au/biodiversity/bushfire-recovery/bushfire-impacts/priority-invertebrates). However, as acknowledged in that report, this initial assessment was explicitly provisional as it: (i) did not attempt to undertake a comprehensive assessment across all invertebrate species; (ii) used only two national distributional databases; and (iii) did not include any consideration of fire severity. The current project builds from that initial preliminary assessment.

A subsequent study reported on more detailed analyses of fire overlap values for some invertebrate groups in New South Wales (Hyman et al. 2020); with that study finding that 29 species of invertebrate had all known occurrences within the fire extent, and 46 species had more than half their known occurrences within the fire extent. Furthermore, some state agencies have reported on fire overlap and impacts for invertebrate species in their jurisdictions (e.g., https://www.wildlife.vic.gov.au/__data/assets/pdf_file/0030/484743/Victorias-bushfire-emergency-Biodiversity-response-and-recovery-Version-2-1.pdf).

Our study is the first to provide a comprehensive national scale assessment of the impacts of the 2019-20 fires on Australian invertebrates. The current study was developed to extend from the provisional assessment, being more comprehensive in scope, incorporating a more substantial distributional dataset, and including consideration of fire severity and species' susceptibility to fire.

This project was developed in collaboration with the Department of Agriculture, Water and the Environment (DAWE). It has the following principal aims:

a. Using a collaborative approach, drawing on input from experts and state and federal government representatives, to elucidate the impacts of the 2019-20 wildfires on Australia's invertebrate species. For this we sought to assess, as comprehensively as possible, the proportional extent of the overlap of the 2019-20 wildfires on the ranges of invertebrate species. Using a combination of fire overlap and fire-susceptibility as assessed by life history and ecological traits, we then sought to develop a list of species that have been most affected by the 2019-20 wildfires and hence were priorities for assessment for listing as threatened under state, commonwealth or international legislation.

b. To use mapping of species occurrences to determine centres of endemism for invertebrate species in Australia, in part to help identify areas that may be priorities for protection in future fire events.

c. To compile a list of threats affecting priority fire-impacted species, and the management actions needed to aid post-fire recovery.

Taxonomic and spatial scope of project

Taxonomy and nomenclature follow the Australian Faunal Directory and all described non-marine Australian invertebrate species were considered (Table 1.1), although some were subsequently excluded from analysis if we could not access any acceptable (see section 2.2.1) distributional records. Aquatic and semi-aquatic freshwater species are included in the assessment, although we note that the spiny crayfish (genus *Euastacus*) are considered in more detail in Legge et al. (2021).

Table 1.1: Number of records in cleaned dataset by taxonomic class

Class	Number of records
Insecta	213,015
Arachnida	62,333
Gastropoda	41,415
Diplopoda	10,090
Malacostraca	3,710
Chilopoda	2,666
Oligochaeta	2,322
Chromadorea	1,736
Bivalvia	1,485
Branchiopoda	1,227
Rhabditophora	677
Not specified	265
Dorylaimea	263
Demospongiae	210
Hirudinida	207
Cestoda	190
Trematoda	150
Ostracoda	149
Maxillopoda	144
Udeonychophora	53
Monogenea	42
Enoplea	34
Symphyla	25
Agaricomycetes	21
Monogononta	19
Bdelloidea	17
Collembola	15
Eutardigrada	14
Archiacanthocephala	8
Hexanauplia	6
Phylactolaemata	6
Paleacanthocephala	5
Gordioida	3
Heterotardigrada	3
Scaphopoda	2
Polychaeta	2
Turbellaria	2
Hydrozoa	1
Entognatha	1
Nemertinea	1

Assessment area

Consideration of fire overlap was restricted to fires in the Preliminary Analysis Area (PAA) (Fig. 1.4), in line with other DAWE projects and recommendations by the Wildlife and Threatened Species Bushfire Recovery Expert Panel (https://www.environment.gov.au/system/files/pages/a8d10ce5-6a49-4fc2-b94d-575d6d11c547/files/preliminary-analysis-area-19-jan-2020.pdf). Such focus is because the 2019-20 wildfires were exceptional in this area.

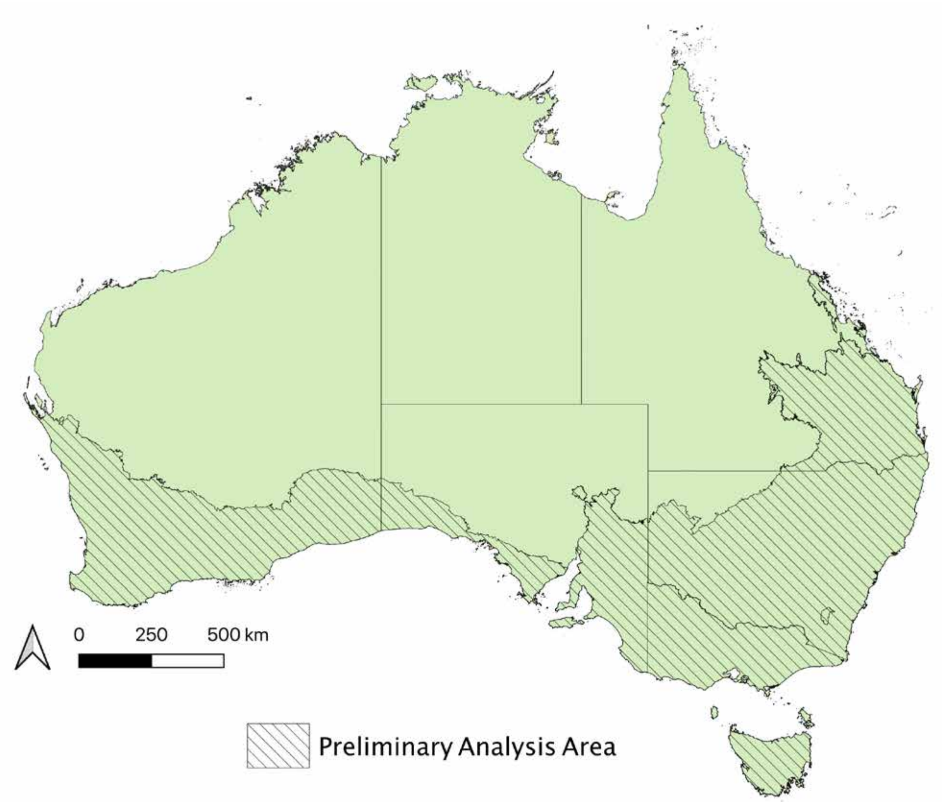


Figure 1.4. Preliminary Analysis Area (PAA) of southern and eastern Australia (hatched area), encompassing areas with exceptional fires in the 2019-20 fire season. Assessments of fire overlap for invertebrates in this study were confined to fires within the PAA.

Data sources

Species' occurrence records were sourced from the publicly-accessible Atlas of Living Australia, and through special agreements for this project from the Biological Databases of South Australia, Victorian Biodiversity Atlas, New South Wales BioNet, WildNet (Queensland), NatureMap (Western Australia), Environment Protection Authority (Victoria and South Australia), Western Australian Museum and Australian National Insect Collection (ANIC) (Table 1.2).

Table 1.2: Number of records in cleaned dataset by data source (including ALA, state and museum databases, private data holders)

Data source	Number of records
Atlas of Living Australia	274,607
WA Museum	36,331
Qld WildNet database	10,353
Victorian Biodiversity Atlas (VBA)	10,095
NSW BioNet Atlas	9,245
AUS National Insect Collection	1,218
Biological Database of SA (BDBSA)	588
WA Nature Map	60
Private data collection	37

A large number of experts and state and Commonwealth representatives provided additional occurrence data and information on traits, threats and management actions.

For many invertebrate species, there is no or limited information on pre-fire population size, as well as little documented evidence of species' population losses through fire (coupled with the unprecedented scale of the 2019-20 fires). Therefore, fire impact on species was estimated initially from our assessments of spatial overlap with fires (of varying severity), then complemented by information on species' susceptibility to fire, with this susceptibility assessment developed from expert elicitation and published sources.

1.2. Data challenges

1.2.1 Challenges and incorporating uncertainty and data deficiency

The challenges of meaningfully including invertebrates in conservation planning or assessment in Australia are significant. The sheer number of species and their taxonomic and ecological diversity, coupled with chronic underfunding for research, and public and political disinterest, has resulted in a shortfall in scientific knowledge on what invertebrate species occur in Australia, their ecological roles, diversity and distribution (Cardoso et al. 2011); this lack of knowledge remains a major barrier to the conservation of Australia's invertebrates (Taylor et al. 2018). A large proportion of Australian invertebrate species are yet to be described – and for these species we have no robust way of knowing how many may now be extinct, or on the verge of extinction. Even for described species, the challenges are formidable: publicly available distributional records are often sparse, biased by collecting effort, held in disparate locations and – in some cases – hampered by the inclusion of non-expert derived and potentially inaccurate observational data. Monitoring and pre-fire baseline data are patchy, restricted to a limited set of taxa which have experts working on them, or are based upon limited, often historical records. Many Australian invertebrate species have very few available distributional records (Figure 1.5), such that assessment of distributional overlap with fire can be estimated only with low confidence.

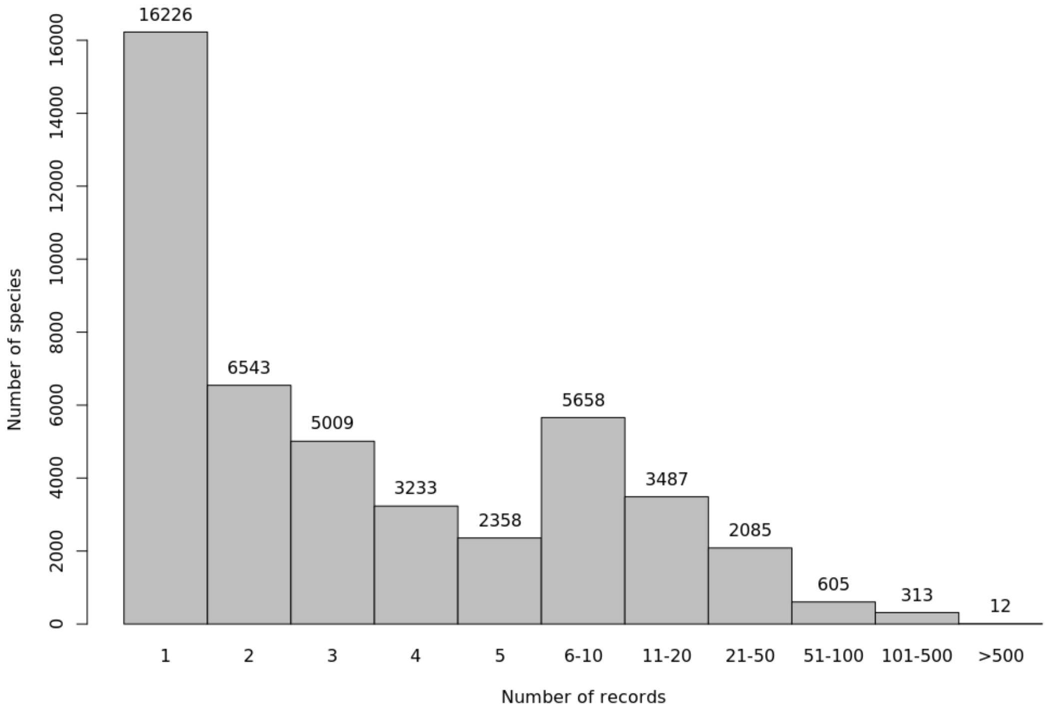


Figure 1.5. The numbers of acceptable locational records for Australian non-marine invertebrate species, using available data sources.

The challenges of assessing fire impact on Australian invertebrate species, especially on a large scale, are significant (Table 1.3). Faced with these challenges, we adopted a collaborative and coordinated approach with experts and government agencies to assess the extent of the impact of the 2019-20 fires on Australian invertebrate species, elucidate the species or groups that are now likely at most risk from this and future fire events and compile the best available information on management actions to aid recovery.

Table 1.3: Summary of challenges affecting the assessment of fire impacts on invertebrate species and how these were addressed.

Challenge	Description	Response and consequences
Taxonomy		
Taxonomic shortfall	Only around 30% of Australia's ca. 320,000 invertebrate species have been described (Chapman 2009).	Only described species or morphospecies with a museum reference code were used in analyses. This means that our tallies are an under-representation of the actual number of fire impacted species.
Taxonomic uncertainty	Invertebrates are complex to identify, some records in some databases might be unreliable.	Only vouchered records from distributional databases were included in analyses.
Nomenclature	Invertebrate taxonomy is not stable, so synonyms (outdated names) for a species can occur in different datasets.	All names were cross-checked to the standard of the Australian Fauna Directory (other than recognised but undescribed species with museum reference vouchers, which were included)
Ecology and life history		
Data deficiency	There is very limited information on the ecology (e.g., dispersal ability, habitat and resource requirements) of most Australian invertebrate species.	A substantial effort was made to collate relevant literature and expert opinion for ecological information; where no specific information was available, information from related species was used judiciously. Limitations of ecological knowledge of species mean that we have reduced confidence in estimating recovery potential.
Complex life history and ecology	Many invertebrates have multiple life stages, often with different life history and ecology traits and with varying susceptibilities to fire. and with overall impacts related to the timing of fire relative to the proportion of the population in particular life stages at the time.	Information from literature or experts was used to identify the life stages likely to have been exhibited by a species at the time of fire and their susceptibility. Limited knowledge about the relative proportion of a species' population in different life stages at the time of fire means that we have reduced confidence in estimating the proportion of the population likely to have been killed during a fire.
Aquatic and semi-aquatic species	Most databases do not explicitly include a field that signifies aquatic species. Furthermore, simple spatial overlaps of fire and distributional extent of invertebrate species do not well represent potential impacts on aquatic species, because these may be most affected by sedimentation downstream of burnt areas.	Species with at least some stage of their lifestyle in water were identified using published sources. For aquatic species, we calculated fire overlaps directly and also with an algorithm that estimated fire-related sedimentation (slug risk) potential, as used in analogous assessment for spiny crayfish (M. Ward, S. Legge *unpubl.*).

Challenge	Description	Response and consequences
Distribution		
Distribution, and locational biases	Survey effort for invertebrates is typically uneven and opportunistic, clustered round roads or towns, potentially distorting estimates of fire overlap.	Where the number of records permitted, alpha hull polygons were calculated from point records (thereby reducing survey effort bias), and fire overlap was calculated as the average proportion of points and polygon area that was burnt in the 2019-20 fires. Where there were fewer than three records, point data only were used to calculate % fire overlap. The massive number of invertebrate species considered in the project time frame constrained our capacity to develop more elaborate distributional models. Note polygon area may include habitat that is unsuitable for the species and therefore percentage fire overlap is likely under-estimated for many species.
Limited distributional data	Compared to vertebrate species, and plants, there are relatively few records for most invertebrate species (e.g., average number of observational and specimen-based records per species in ALA for birds is 66,159, for mammals is 605, and for invertebrates it is 42). This adds substantial uncertainty to modelled distribution and estimation of % fire overlap.	We sought to access all possible useful distributional datasets additional to ALA. Nonetheless, almost half of the species included in our assessment were represented by only 1 or 2 records (Fig. 1.5). For such species, we can have only low confidence that our assessment provides a true representation of the species' actual fire overlap. Furthermore, although we could calculate alpha hull polygons for all species with 3+ records, confidence that these polygons provide a good estimate of the actual distribution will be low for those species with few records. To help overcome the different biases inherent in estimating fire overlap from points and from polygons, we calculated overlaps for each (other than for species with only 1 or 2 records), and took the average of these two estimates.
Lack of consolidated database	Although ALA provides a nationally consolidated data-base, there are many other distributional databases for invertebrates, held by state agencies and researchers.	Custodians of all relevant databases were approached to contribute to this assessment. This resulted in a large increase in records beyond that available from ALA alone. In some cases, data were provided for this project only, so some outputs may display only a subset of records considered.
Introduced species	Our conservation focus should relate to native species only, but introduced species are present, without being reliably labelled as such, in some databases.	We sought to identify (and then remove from analysis) all introduced species.
Historical records	Older records may have poor geographic precision, or represent populations that no longer occur at the location (e.g., habitat at that site has been subsequently cleared).	Records pre-1990 were excluded from analysis unless this left fewer than 3 records for a species (with the threshold value of 3 chosen as the minimum required to establish alpha hull polygons).
Duplicate records	In some cases, the same record may occur in multiple databases.	Multiple records of the same species at the same location on the same date were consolidated to a single record.

Challenge	Description	Response and consequences
Fire mapping	Estimates of fire impact on individual species are informed mostly by the species' distribution and the mapping of fire (and its severity), so the precision and accuracy of fire (severity) mapping is critical for our assessment	We used the standardised fire mapping (GEEBAM) across the Preliminary Analysis Area (consistent with the companion NESP project reporting on fire impact of vertebrate species). We interpreted GEEBAM classes 4 and 5 as 'severe' fire. We treated GEEBAM class 3 as 'mild' fire. There is some uncertainty about whether GEEBAM class 2 includes areas in which the understorey may be burnt (but overstorey unaffected). We included three variants: a lower bound with GEEBAM2 considered unburnt; an upper bound including GEEBAM2 as mildly burnt; and the best guess as the average of these.
Conservation and fire response		
Data limitations – population size and trajectory	Most Australian invertebrates have no monitoring programs, and no information on population size.	Estimates of population losses in fire will be constrained (mostly to proportional area lost), and some conservation status assessment criteria will be difficult or invalid to apply.
Limited existing information on responses to fire	There has been little previous research or documentation of the responses of invertebrate species to fire (and especially so to fires of the severity of the 2019-20 wildfires), including mortality rates, recruitment post-fire, and associations with post-fire seral stages.	A substantial effort was made to collate relevant literature and expert opinion for ecological information relevant to potential fire impacts; where no specific information was available, information from related species was used judiciously. Further research is required to test the assumptions made about related species. Experts provided advice on the likely % survival/ mortality for each considered species for mild fires and for severe fires
Previous recent fires compounding impacts	Our assessment of fire impacts relates to the 2019-20 fires only, but in at least some cases (e.g., for many Stirling Range endemic invertebrate species) the combined impacts of recent fires may be a more important context for considering fire-related losses.	Where possible, experts provided some evidence of likely cumulative losses across recent fires, as context to our assessment of % impacts of the 2019-20 fires.
Existing conservation status	Species with pre-existing threatened status may be at increased risk as a result of the compounding effects of fire on existing threats, however, there is a significant bias in conservation status assessment of Australian biodiversity, with relatively few invertebrates assessed or listed (Walsh et al. 2013) and many imperilled (but not yet formally listed) species are likely to be as threatened as those formally listed.	Species with pre-existing threatened status were taken into account in analyses of fire impact. Furthermore, we produced a list of fire-impacted species likely eligible for formal conservation assessment, to bolster the number of invertebrates assessed.
Data limitations – threats and management requirements and options	There is very limited information on the threats affecting invertebrate species (and their relative impacts and interactions), and (hence) on the conservation management needs and the effectiveness of possible management actions.	A substantial effort was made to collate relevant literature and expert opinion for ecological information; where no specific information was available, information from related species was used judiciously. A substantial uncertainty analysis was developed (see section 3) to help derive conservation management priorities given the knowledge shortcomings.

Challenge	Description	Response and consequences
Additional considerations		
Community interest – taxonomic bias	Society cares more for charismatic vertebrates, and public interest in invertebrates – even species that have been highly imperilled by these fires – is limited. This may mean that there is relatively little support likely to be available for post-fire management required to recover many invertebrate species significantly affected by the 2019-20 fires.	Wherever possible, we have attempted to raise public awareness of fire-affected invertebrates and the conservation challenge they now face. (e.g., https://theconversation.com/im-searching-firegrounds-for-surviving-kangaroo-island-micro-trapdoor-spiders-6-months-on-im-yet-to-find-any-139556).
Cumulative uncertainties	Many of the challenges described above are cumulative, and may mean that there is considerable uncertainty about almost all relevant parameters relating to fire impact. With so much uncertainty (and so many invertebrate species to consider), and constrained resources, authorities may be reluctant to further assess and categorise some of these fire-affected species as threatened. If so, the required conservation management response for some fire-affected species may not be implemented.	A substantial uncertainty analysis was developed (see sections 2.2 and 3.2) to help derive conservation management priorities given the knowledge shortcomings. Uncertainty was explicitly recognised in all components of analysis, and where possible fire impacts were estimated for 'best guess', upper and lower bound scenarios.

Incorporating uncertainty and data deficiency

Given the knowledge shortcomings, a substantial uncertainty analysis was developed to elucidate susceptibility of fire-impacted species (see section 2.2.2) and to derive conservation management priorities (see section 3).

Figure 1.6. *Metaballus mesopterus*, the Kangaroo Island marauding katydid. This species is only known from Kangaroo Island and large portions of its known range were impacted by fire. Image:Richard Glatz

1.3. Data sources – the effects of consolidating databases on estimates of distributional extent and fire overlap

1.3.1. Introduction

In Australia, the primary publicly accessible and nationally consolidated source for distributional data is the Atlas of Living Australia (ALA). Compared to vertebrates and plants, the number of specimen-based records per species for invertebrates is far fewer (see Table 1.3), and in many cases, species are represented by only single occurrence records. These species with very few records present substantial challenges to interpreting distribution and any subsequent fire overlap analyses. In order to maximise the number of records available and to create the most comprehensive possible distribution polygons, we sought to access and consolidate as many relevant distributional datasets as possible additional to ALA, which resulted in a substantial increase in data (N=67,927 additional records). In this section of the project, we aim to elucidate how the addition of these extra records changes the apparent distribution of species and may change our interpretation of how species have been impacted by fire.

We hypothesise that considering ALA data alone may provide a problematically incomplete picture of species distributions and limit approaches to answering spatial questions. To test this hypothesis, we asked two questions. First, is there any difference (increase or decrease) in species' distributional area when using ALA data alone, compared to ALA data combined with additional data sourced from state government, museums and other institutions (henceforth referred to as 'corporate' data). Secondly, for species that show differences in distributional sizes when comparing ALA on its own to ALA plus corporate data, does this result in a difference (increase or decrease) to our estimates of percent fire overlap on species' range in the 2019-20 fires?

1.3.2. Methods

Species selection

Species included in this analysis were selected based on the following criteria: (1) a total of 50 or more records in our cleaned data set; and (2) records that originated from both ALA and corporate datasets. A total of 393 species met these criteria, but six were dropped from further analysis because despite having >50 datapoints in the total dataset (ALA plus corporate data), < three records were from the ALA only dataset, meaning a polygon could not be generated. A total of 387,366 species records were included in the final set.

Changes in distribution estimates

For all species, point and polygon (alpha hull) distributions were generated from both ALA data alone ("ALA" data) and for ALA data plus corporate data ("ALA+" data).

Changes in estimates of distributional size may be positive, or negative with additional data. The latter possibility arises because when creating alpha hulls there is scope to create many small polygons that might collectively have smaller combined area than a larger polygon created based on fewer datapoints.

Changes in percentage fire overlap

To align with methods in the rest of this report, we estimated averaged total fire overlap based on the average of four fire extent variables; a) we used an average of point and polygon overlap for all species with >2 records; and b) an average of mild fire = GEEBAM2 and 3 (GEEBAM2 treated as burnt) and mild fire = GEEBAM3 (GEEBAM2 treated as not burnt). This gave an estimate of the percentage of species' distributions burnt comparable to that used in the rest of this report. For each species, percentage fire overlap was calculated separately for ALA data and for ALA+ data.

Relationship between estimated distribution increase and fire overlap

We ran a Spearman's rank correlation (for non-parametric data) to test the hypothesis that increases in distribution area correspond with increases in percentage of species' distribution burnt. We used the 'cor.test' function in base R with method "spearman".

1.3.3. Results

Changes in distribution estimates

Of the 366 species that met our inclusion criteria, all species showed a difference in distributional area based on the two datasets. A total of 342 species' distributional areas increased when based on ALA+ data compared to ALA data alone and 24 species returned smaller distributions with ALA+ data than with ALA data alone (Figure 1.4). The differences in area ranged from -569 km^2 to +1,017,631 km^2 with a median distributional area change of + 21,835km^2 and varied among taxonomic orders (Table 1.4, Figure 1.7).

Table 1.4. Summary of the difference in estimated distribution extent between ALA and ALA+ datasets for the six orders with the most species represented in our dataset.

Order	Greatest reduction in area (km^2)	Greatest increase in area (km^2)
Araneae	-2	907,335
Coleoptera	-568	37,055
Hymenoptera	-474	109,583
Lepidoptera	-5	1,017,631
Odonata	-253	644,298
Stylommatophora	-126	22,430

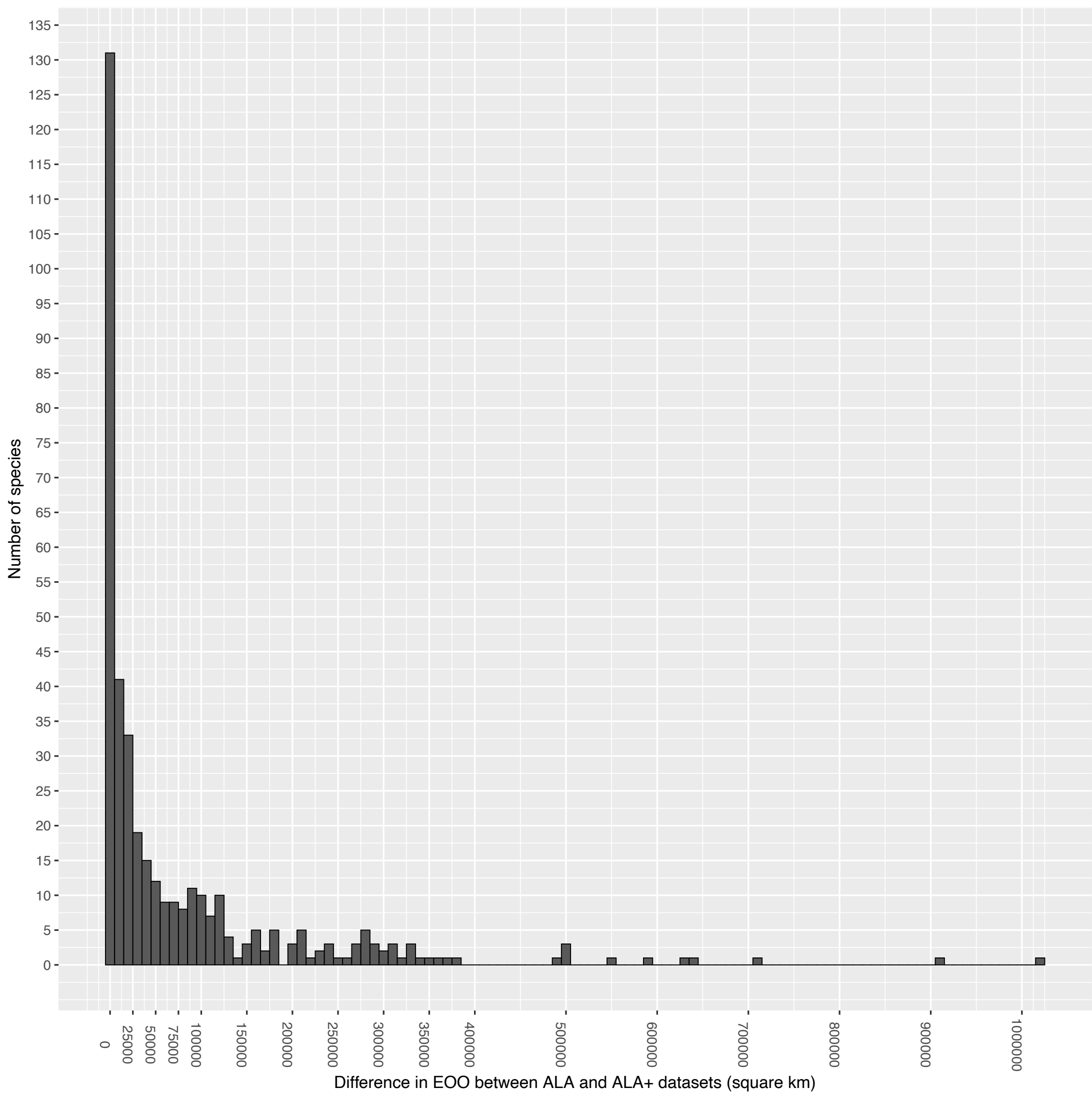


Figure 1.7. Frequency histogram of the difference in species' distribution areas (km^2) between ALA and ALA+ datasets.

Changes in percentage fire overlap

Of the 366 species in our dataset, 15 showed a reduction (for estimates derived from ALA+ data relative to those obtained from ALA data alone) in fire overlap greater than 2.5% and 13 showed an increase greater than 2.5% (Figure 1.5). Change in fire overlap varied among orders (Table 1.5), and overall ranged from -16% to +13% (Figure 1.8).

Table 1.5. Summary of the difference in fire overlap between ALA and ALA+ datasets for the six orders with the most species represented in our dataset.

Order	Greatest reduction in area (km^2)	Greatest increase in area (km^2)
Araneae	-4.2	8.5
Coleoptera	-0.5	2.0
Hymenoptera	-5.1	0.5
Lepidoptera	-8.0	9.7
Odonata	-16.1	13.4
Stylommatophora	-3.3	0.4

Relationship between distribution increase and fire overlap

The correlation test returned a weak positive relationship (S = 6108169, P < 0.01, rho = 0.25) indicating that as the difference in distribution size increases, the percentage of distribution burnt only marginally increases (Fig. 1.9).

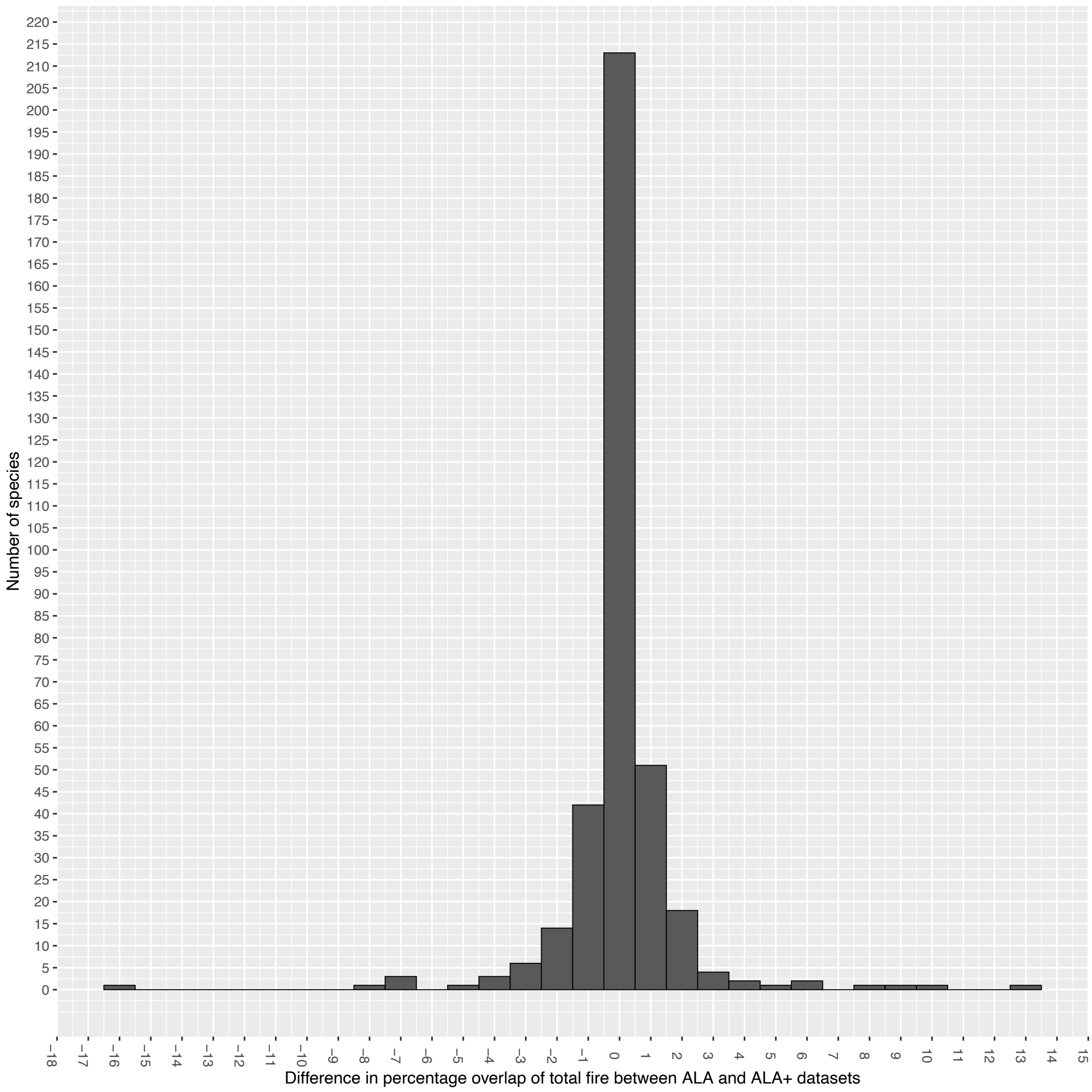


Figure 1.8. Frequency histogram of the difference in estimated fire overlap between ALA and ALA+ datasets.

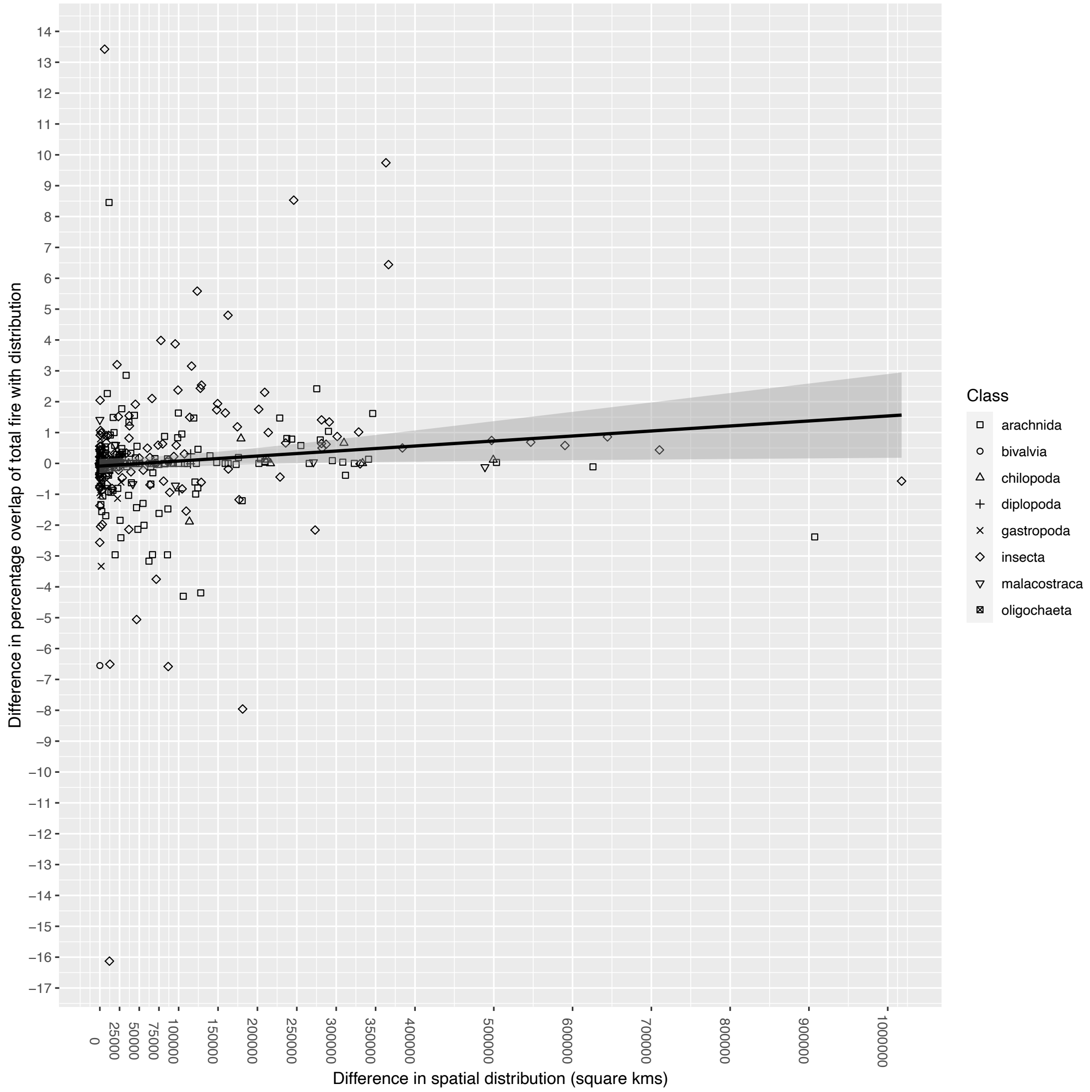


Figure 1.9. Scatterplot showing a very weak relationship between differences in estimates of species distribution and percentage of the distribution burnt (shading indicates 95% confidence intervals).

1.3.4. Discussion

Approximately one third of species in this case study showed no change in estimated distributional size, when using ALA on its own or ALA+. However, for some species, there was a very large increase in estimated distributional size when using additional corporate data sources, for example, 192 species showed an increase in estimated distributional area of between 1,000 km^2 and 100,000 km^2 and 92 species showed an increase of more than 100,000km^2. These large differences may have important ramifications for estimates of metrics by researchers that typically do not have access to government, or museum data and work on ALA data alone.

We have shown how the inclusion of additional data can greatly alter the apparent distribution of species and, in some cases, for our estimation of percentage fire overlap. With the threat of more frequent and larger fires as a result of climate change (Abatzoglou et al. 2019) and concerns of decreasing biodiversity and increasing extinction rates in Australia (Woinarski et al. 2019), it is crucial that Australian researchers have access to the best possible distributional data with which to elucidate decline, and interpret the impact of threats on populations. There is a significant digitisation backlog in various state bodies and museums and this means that large amounts of data are not currently available to researchers. Our results highlight the need for better support for the ALA as a centralised, accessible database. Secondly, we recommend the digitisation of museum and state data receive strong support and high priority (as currently being undertaken for the Australian National Insect Collection). Thirdly we recommend a better incentive scheme to encourage private researchers to upload their data to ALA and an earlier avenue to uploading it.

Do the differences in distributional area equate to differences in estimates of percentage of distribution burnt? This analysis showed differences of between -16% and +13% of species distribution burnt. However, a correlation analysis suggests that differences in species' estimated distributional size do not necessarily equate to differences in the calculation of percentage fire overlap. In the vast majority of cases (338 of 366 species), estimates of proportional fire overlap for individual species were similar (i.e., within 2.5%) when using estimated distributions derived from ALA records only and when using estimated distributions derived from the larger dataset of ALA+ records. However, although the proportional overlaps with fire varied little between analyses based on ALA data alone and analyses based on ALA data supplemented by other datasets, it is highly likely that the accuracy of the estimate of overlap increases with the number of records on which this estimate is based.

1.3.5. Species at the extremes

We generated maps for three of the four species at the extremes of the dataset comparison, those with the greatest decrease and increase in distribution area and those with the greatest decrease and increase in percentage of distribution burnt.

The greatest reduction in estimated distributional size (–568.7 km^2) was for the aquatic beetle *Allodessus bistrigatus*. This species has a substantial range of ~700,000 km^2 and the ~570 km^2 difference between the two data sets (ALA+ = 710,584 km^2, ALA = 710,015 km^2) was visually negligible and not mapped.

The greatest increase in estimated distributional extent (+1,017,631 km^2) from the estimate based on ALA data alone to that based on ALA+ data was for the Caper White butterfly, *Belenois java teutonia* (Fig. 1.10). The Caper White is a migratory species and is described as very common and widespread having a wide distribution across northern Australia, breeding in arid Australia and migrating south as far as southern Victoria and Tasmania in the warmer months (Braby, 2016); note the distribution as mapped using ALA and ALA+ data failed to show this southerly distribution. Our map suggests that the data from ALA alone were too sparse to form one large distribution and that several small polygons were generated which grossly underestimated distribution area. The ALA+ data set which is substantially richer for this species, shows a much more biologically sensible distribution range, but may still underestimate the true range (Braby 2016).

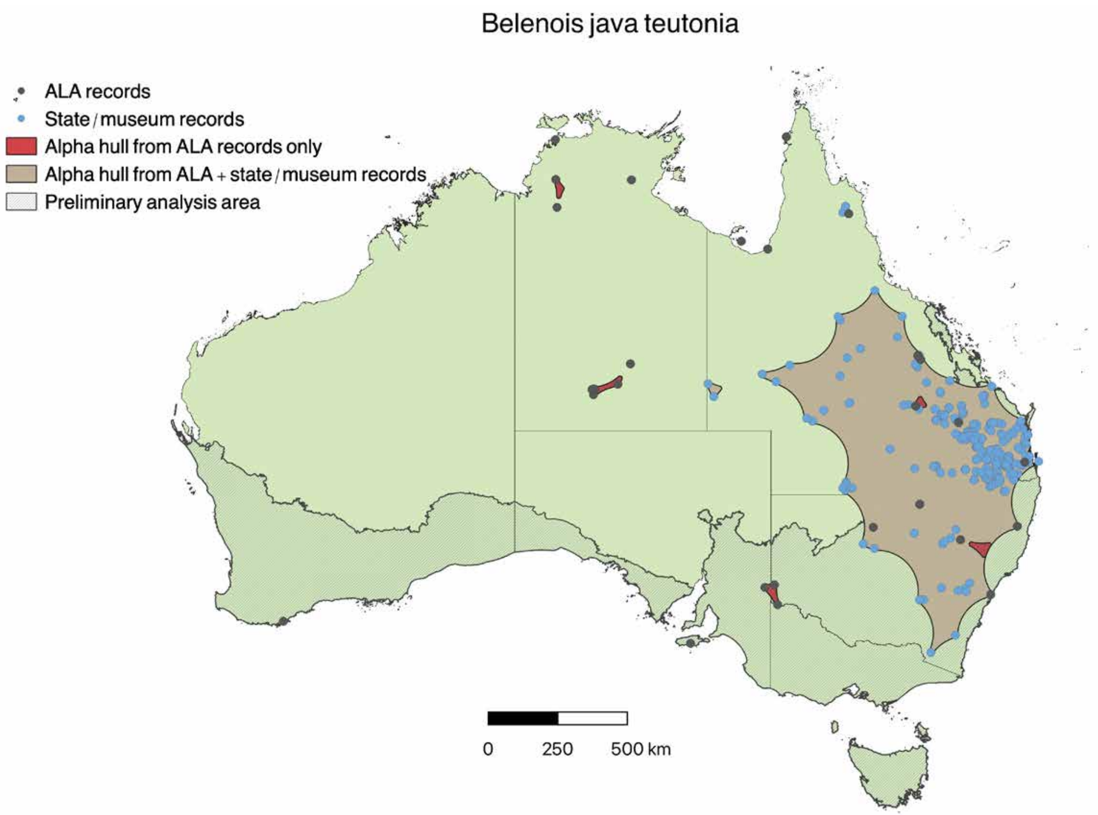


Figure 1.10. Map of estimated distribution of Caper White butterfly showing marked increase in estimated distributional extent using ALA+ data relative to ALA data alone.

With additional data in the ALA+ data set the greatest reduction in fire overlap was a damselfly, the Powdered Flatwing, *Austroargiolestes calcaris* (–16.2%) (Fig. 1.11). With ALA data alone the estimated distribution of *A. calcaris* was 27,899 km^2 with ~36% distribution burnt. The estimated distribution using ALA+ increased to 40,061 km^2, most of this additional area was not burnt, giving a revised area burnt of ~20%. The Powdered Flatwing inhabits streams and boggy seepages in south-eastern Australia (Watson et al. 1991).

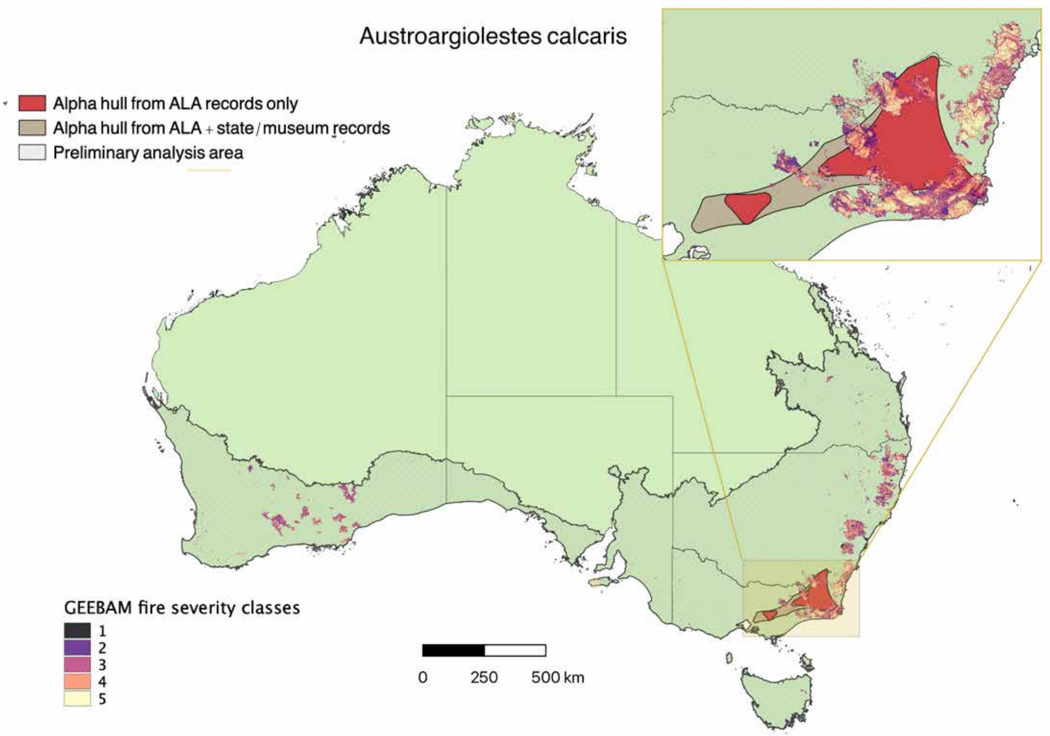


Figure 1.11. Map of estimated distribution of the Powdered Flatwing, *Austroargiolestes calcaris* showing marked reduction in estimated percent fire overlap when using ALA+ data relative to ALA data alone.

The greatest increase in fire overlap was in a dragonfly, the Coastal Petaltail *Petalura litorea* (+13.4%). The estimated distribution using ALA data alone was 1,387 km^2, of which only ~5% was affected by fire (Fig. 1.12). With the ALA+ dataset, the estimated distribution increased substantially to 7,455 km^2, a larger proportion (18%) of which was burnt. The Coastal Petaltail is listed as Endangered in NSW and is found in coastal regions of Northern NSW and southern Queensland. This example demonstrates that using the most data rich sources available can be critical for estimating the impact of fire on threatened species.

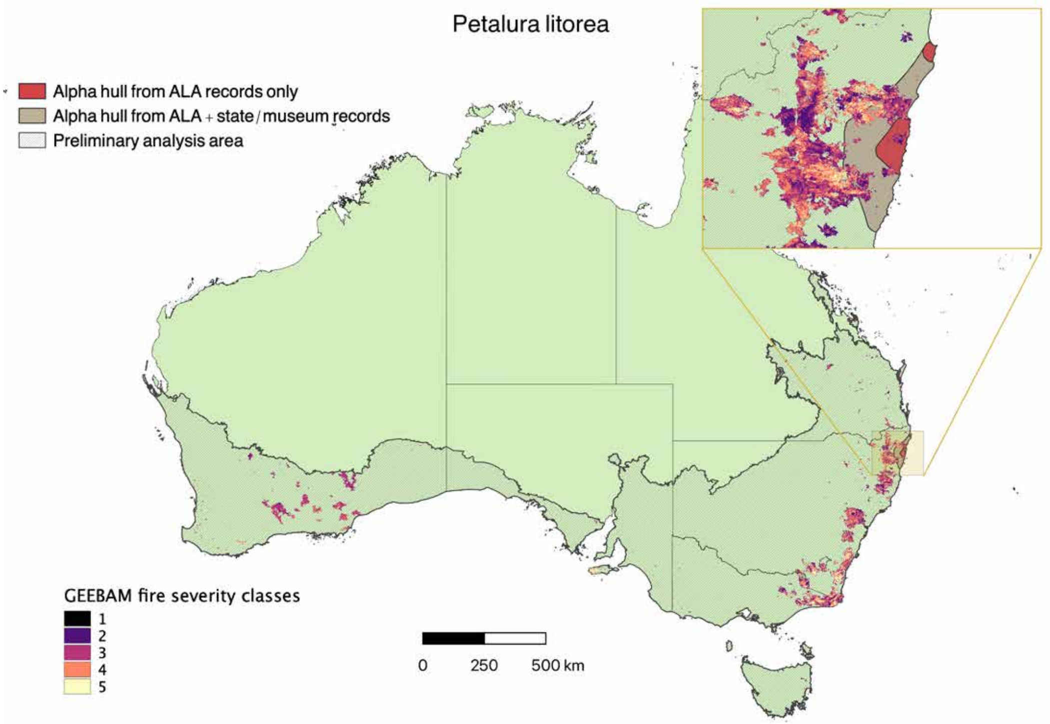


Figure 1.12. Map of estimated distribution of the Coastal Petaltail *Petalura litorea* showing marked increase in estimated percent fire overlap when using ALA+ data relative to ALA data alone.

2. Prioritising fire-impacted species for extinction risk and conservation response

2.1. Introduction

Given their high species richness and biomass coupled with the diversity of trophic niches, habitats, ecologies, functional roles, life histories and importance as ecosystems engineers, invertebrates are a hugely important group for ecosystem function and for the provision of ecosystem services (Waldbauer 2004; Pey et al. 2014; Bertelsmeier 2017). However, this diversity, coupled with their tendency towards range restriction, means many invertebrate species are likely to be at increased risk of extirpation or extinction from large-scale disturbance events, such as fire (Taylor et al. 2018). Consequently, there is an urgent need to understand how invertebrate species have been impacted by the 2019-20 wildfires; to assess which species are now at most risk; to identify the management and research actions most needed to improve the chances of recovery; and to identify species likely at most risk from future fires.

Comprehensive assessment of the fire impacts on Australian invertebrates is especially challenging. The impacts of fire on invertebrates are complex and dynamic and are not well documented for most species (Saunders et al. 2021). Fire affects invertebrate communities through multiple channels; these may be direct, for example mortality caused by exposure to lethal radiant heat or smoke, or emigration away from or immigration towards fire; or indirect, such as fire-induced changes to the habitat or ecosystem, causing loss of fitness, fatality or emigration (Whelan et al. 2002). The degree of exposure to the lethal effects of fire and a species' ability to recover in the post-fire ecosystem is influenced by its life history and ecological traits. Whilst many species are negatively affected by fire, this is not true of all and the post-fire ecosystem may favour recolonisation of dispersive and/or generalist species, which are able to tolerate the post-fire microclimate and exploit the resources made available in the post-fire ecosystem, or are specialist on features specific to burnt ground (Swengel 2001; Moretti et al. 2010; Schowalter 2012; Milberg et al. 2015; Heikkala et al. 2016). The type of fire is important too. Larger and more severe fires cause increased invertebrate mortality, and higher fire temperatures remove more organic material, habitat and shelter sites, and penetrate more deeply into soil and wood, killing eggs and individuals sheltering within them and reducing the availability of resources in the post fire ecosystem (Wikars and Schimmel 2001; Wikars 2002; Branson and Vermeire 2007; Ulyshen et al. 2010; Schowalter 2012; Branson and Vermeire 2013; Arnold et al. 2017; Buckingham et al. 2019; Simanonok and Burkle 2019).

The challenges of assessing fire impact on invertebrate species, especially on a large scale, are significant. Uncertainty of data and data deficiency are major barriers to the consideration of Australian invertebrates in conservation planning, yet the need for a greater inclusion of invertebrates in conservation planning and policy is high (Taylor et al. 2018).

Using a collaborative and multidisciplinary approach, we aim to assess, as comprehensively as possible and for all the species possible, the proportional extent of the overlap of the 2019-20 wildfires on the ranges of Australian invertebrate species. We then use a combination of fire overlap and fire-susceptibility, as assessed by life history and ecological traits, to develop a list of species that have been most affected by the 2019-20 wildfires and hence are priorities for further assessment for listing as threatened under state, commonwealth or international processes.

2.2. Methodology

2.2.1 Fire Overlap Analysis

We gathered invertebrate occurrence records for 17 phyla (Table 1.1) for Australia and its offshore islands and territories from the Atlas of Living Australia (ALA: www.ala.org.au), five state databases (New South Wales BioNet Atlas; Victorian Biodiversity Atlas; Queensland WildNet database; Biodiversity Databases of South Australia; and Western Australia's Nature Map), two museums databases (Australian National Insect Collection and Western Australian Museum), and some private data holders.

ALA data were downloaded using the ala4R package in R (Newman et al. 2020). We only included specimen-based records from ALA (i.e., basis of record: environmental DNA, genomic DNA, preserved specimen, living specimen, or material sample) due to the potential for high level of inaccuracies in observational records for invertebrates in the ALA database (Table 1.3).

For exclusion, we screened for marine and exotic species manually as well as using publicly available databases such as the Interim Register of Marine and Nonmarine Genera (IRMNG: https://www.irmng.org/) and the Global Register of Introduced and Invasive Species – Australia (GRIIS: https://lists.ala.org.au/speciesListItem/list/dr9884#list), respectively. Taxonomic errors such as improper species (e.g., morphospecies), misspelling, synonyms, and incorrect taxonomic information (class, order, family) were corrected where possible. Invalid and misclassified species names that we identified were corrected by comparing the species list against 112, 210 valid species names in the Australian Faunal Directory (AFD) taxonomy as of 27 October 2020 (AFD: https://biodiversity.org.au/afd/home). Subspecies were included, where these were recognised as valid units by AFD. Undescribed taxa, where classified to morphospecies and linked to a specimen in a museum collection, were also included.

All occurrence records were screened for duplicates and coordinate errors including missing or invalid coordinates and coordinates falling in the ocean. Records that pre-dated 1990 were removed if a species had at least three post-1990 records and retained otherwise: the rationale for this exclusion of pre-1990 records was to try to consider only those records that were most likely to match current distributions (e.g., to avoid sites of former occurrence that have since been cleared). We also recoded whether an occurrence record was sensitive, and these data points were not mapped in the outputs.

This compilation and filtering process provided us with a clean dataset with 342,534 occurrence records across 45,529 unique species (Table 1.1, 1.2, Fig. 1.5). Of these, we mapped the range of 22,754 species with three or more records by fitting an alpha polygon around records, $\alpha = 2$ (Burgman and Fox 2003; IUCN Standards and Petitions Committee 2019) using the ConR package in R (Dauby et al. 2017).

For all 45,529 species (32,164 of which had one or more records in the PAA) with at least one accepted record, we tallied the number of occurrence records for each species within each state, within bushfire recovery regions (comprising Australian Alps, East Gippsland, Greater Blue Mountains, Kangaroo Island, North Coast and Tablelands, NSW South Coast and South East Queensland: Fig. 2.2; https://www.environment.gov.au/biodiversity/bushfire-recovery/consultation/workshops-and-roundtables) and state area as clipped by the Preliminary Analysis Area (Fig. 1.4; https://www.environment.gov.au/system/files/pages/a8d10ce5-6a49-4fc2-b94d-575d6d11c547/files/preliminary-analysis-area-19-jan-2020.pdf).

We obtained a spatial layer of fire severity for the 2019-20 wildfires: the Australian Google Earth Engine Burnt Area Map (AUS GEEBAM) at 40 m resolution (DAWE 2020). The spatial layer categorised fire severity into 5 classes: 1 (no data), 2 (unburnt), 3 (low and moderate severity), 4 (high severity) and 5 (very high severity). We resampled this layer to 250m resolution and reprojected it in Albers equal Area 137 (https://spatialreference.org/ref/sr-org/australia-albers-equal-area-conic-134/) and clipped fire severity to the Preliminary Analysis Area (https://www.environment.gov.au/system/files/pages/a8d10ce5-6a49-4fc2-b94d-575d6d11c547/files/preliminary-analysis-area-19-jan-2020.pdf). We used the National Vegetation Information System (NVIS) dataset on the extent and distribution of vegetation types in Australian landscapes (https://www.environment.gov.au/land/native-vegetation/national-vegetation-information-system) to create a map of native vegetation (Table 2.1) and used this to mask the fire severity layer so that our fire overlap analyses only considered fire impacts on native vegetation.

Table 2.1. NVIS Major Vegetation Groups and their reclassification for the invertebrate analyses

NVIS value	NVIS Major Vegetation Group	native' and 'no data' reclassification
1	Rainforests and Vine Thickets	native
2	Eucalypt Tall Open Forests	native
3	Eucalypt Open Forests	native
4	Eucalypt Low Open Forests	native
5	Eucalypt Woodlands	native
6	Acacia Forests and Woodlands	native
7	Callitris Forests and Woodlands	native
8	Casuarina Forests and Woodlands	native
9	Melaleuca Forests and Woodlands	native
10	Other Forests and Woodlands	native
11	Eucalypt Open Woodlands	native
12	Tropical Eucalypt Woodlands/Grasslands	native
13	Acacia Open Woodlands	native
14	Mallee Woodlands and Shrublands	native
15	Low Closed Forests and Tall Closed Shrublands	native
16	Acacia Shrublands	native
17	Other Shrublands	native
18	Heathlands	native
19	Tussock Grasslands	native
20	Hummock Grasslands	native
21	Other Grasslands, Herblands, Sedgelands and Rushlands	native
22	Chenopod Shrublands, Samphire Shrublands and Forblands	native
23	Mangroves	native
24	Inland aquatic - freshwater, salt lakes, lagoons	native
26	Unclassified native vegetation	native
27	Naturally bare - sand, rock, claypan, mudflat	native
29	Regrowth, modified native vegetation	native
30	Unclassified Forest	native
31	Other Open Woodlands	native
32	Mallee Open Woodlands and Sparse Mallee Shrublands	native
25	Cleared, non-native vegetation, buildings	no data
28	Sea and estuaries	no data
99	Unknown/no data	no data

Note that the GEEBAM layer spans the period 1 July 2019 to 25 February 2020, during which 10.42 million ha was burnt in the PAA. Additional fires occurred in the PAA over the period 26 February 2020 to 30 June 2020, mostly in south-eastern Queensland, but these were small (total area 8,279 ha, or <0.1% of the total area burnt in the PAA in 2019-20: S. Legge pers. comm.). These post-February 2020 fires were not included in our analysis. As a consequence, we may have marginally under-estimated, for species mostly restricted to south-eastern Queensland, the tally of fire-affected species and the extent of their fire overlap.

To estimate fire overlap, we overlaid point occurrence data for all 45,529 species, and polygons for the 22,754 species with at least three records, on the fire severity layer. We estimated the percentage overlaps by first considering GEEBAM fire category 2 as unburnt (equation 1) and then as burnt (equation 2), reflecting some uncertainty about whether this class included some areas where fire may have burnt the understorey but left the canopy unburnt, or entirely unburnt (Legge et al. 2021). We also estimated the percentage overlap with severe fires, i.e., fire categories 4 and 5 (equation 3). Because many invertebrate species are likely to be differentially susceptible to mild and severe fires, we also calculated the percentage overlap with best guess extent of mild fires (mean of GEEBAM3 and GEEBAM2+3), lower bound (considering GEEBAM2 as unburnt) and upper bound (considering GEEBAM2 as burnt). For point data, we estimated the total number of occurrence points within each category in the PAA and the total number of occurrence points (nationally) for a species. Similarly for polygon overlaps, we considered the area of the species polygon within each fire category and the total area of the species polygon. For species occurring at least in part on off-land islands and territories (Table 2.2), the analysis excluded the part of their range polygons on off-land islands and territories due to computational constraints, resulting in some underestimation of their area of occurrence and slight overestimate of the percentage fire overlaps for such species.

Table 2.2. Offshore islands and territories included in the study.

Christmas Island
Cartier Island
Ashmore Islands
Norfolk and its nearby islets
Heard Island and McDonald islands
Islands of the Coral Sea
Lord Howe Island and its surrounding islets (part of NSW)
Macquarie Island (part of Tasmania)
Cocos (Keeling) islands

$$\text{Percentage overlap with GEEBAM2 as unburnt} = \left(\frac{\text{class 3} + \text{class 4} + \text{class 5}}{\text{Total occurrence} - \text{class 1}}\right) \times 100$$

Eq. 1

$$\text{Percentage overlap with GEEBAM2 as burnt} = \left(\frac{\text{class 2} + \text{class 3} + \text{class 4} + \text{class 5}}{\text{Total occurrence} - \text{class 1}}\right) \times 100$$

Eq. 2

$$\text{Percentage overlap with severe fires} = \left(\frac{\text{class 4} + \text{class 5}}{\text{Total occurrence} - \text{class 1}}\right) \times 100$$

Eq. 3

2.2.2 Fire Risk Matrix

The Fire Risk Matrix is a trait framework we developed to determine and prioritise fire-impacted species (n=1228) at most risk of extinction following fire. It complements an approach used to evaluate the vertebrate (and spiny crayfish) species most affected by the 2019-20 wildfires (Legge et al. submitted).

Species characteristics are considered under three categories;

1. Pre-existing factors (section 2.2.2.2) – (i) pre-existing threatened status, indicating other threats acting on the species and (ii) range restriction, with short range endemics potentially more vulnerable than species with extensive ranges.
2. Fire-susceptibility (sections 2.2.2.3 to 2.2.2.5) – the susceptibility of a species to mortality such as through exposure to radiant heat or smoke on impact from the fire, as determined by a species' microhabitat.
3. Post-fire recovery constraints (section 2.2.2.6) – the ability, and timeframe, for a species to recover or recolonise following fire and to survive and reproduce in the altered post-fire ecosystem.

Species are assessed separately for each of these categories.

2.2.2.1. Data collection

Ecological and life history trait definitions relating to recovery potential following disturbance were based upon Fath (2019), IUCN Categories and Criteria Guidelines (2019), Thurman, Stein et al. (2020) and the Kangaroo Island invertebrates trait work conducted by the Wildlife and Threatened Species Bushfire Recovery Expert Panel, 2020 (Provisional list of invertebrates requiring urgent management intervention | Department of Agriculture, Water and the Environment).

Data on life history and ecological traits were collected via an online questionnaire for all species for which spatial analysis indicated a high distributional overlap with fire. Data on ecological traits, key threats and key actions were collated via expert elicitation using the google form (16 experts, 190 species), and also supplemented during the workshop (66 experts), the remainder were collected using reference to public sources and liaison with experts. These data were used to populate and apply a framework of ecological and other relevant traits for the set of short-listed species.

Where possible trait data were compiled for individual species or, if this was not possible, inferred using congeners or confamilials. A scoring system was used to record confidence in trait data by inputting *confident* if the trait data was from a published source or expert and relating to that species; *inferred* if using confamilials or congeners AND where the trait was not variable in that taxonomic group; or *suspected* if using confamilials or congeners data AND there is variability within that taxonomic group in the trait. Scores were allocated to each confidence rating; Confident = 0.6, Inferred = 0.4, Suspected = 0.2 (Supplementary material, Trait_assessment_framework_2021-06-24, https://doi.org/10.5281/zenodo.5091296).

2.2.2.2 Pre-existing risk factors

2.2.2.2.1 Threatened invertebrates

Threatened species may be disproportionately susceptible to the impacts of such catastrophic events as the 2019-20 wildfires, given that they typically already have small and declining populations, have small and diminishing ranges and/or are affected by threatening factors whose impacts may be magnified or compounded by fire. Furthermore, wildfire may set back or compromise conservation efforts already established for such species.

Within our broader objective of assessing the impact of the 2019-20 fires on the Australian invertebrate fauna generally, we focused also on the potential impact of the 2019-20 fires on every Australian invertebrate taxon listed as threatened. There are several challenges and interpretative constraints in such an exercise, including:

i. there are major biases in most threatened species lists in favour of more charismatic and better-known taxonomic groups, rendering the size and composition of most lists of threatened invertebrates inadequate and unrepresentative (Walsh et al. 2013; Braby 2018; Taylor et al. 2018; James et al. 2019);
ii. for many listed threatened invertebrate species (particularly those that are localised, rare and/or poorly known), there is very little distributional data, rendering it difficult to reliably assess the extent of fire overlap;
iii. for many listed threatened invertebrates, there is little ecological information available, rendering it difficult to assess susceptibility to fire;
iv. listing processes (and the composition and conservation status of species on the various lists) have been notably inconsistent among Australian states and territories, and some jurisdictions do not list threatened invertebrates; and
v. all threatened species lists are dynamic.

We compiled a list of all Australian invertebrate species listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (list as at June 2021), by the IUCN or by Australian states and territories (lists as at the time of fire, taken as March 2020). For all species with at least one acceptable record (see section 2.2), we analysed the extent of distributional overlap with fires in the Preliminary Analysis Area, using point data and alpha hull polygons (for species with more than two records). For aquatic species (including species with at least one aquatic life stage), we also calculated the sedimentation slug risk (see section 2.3).

Our compilation comprised 681 Australian threatened invertebrate species (here taken to also include subspecies), including all 67 species listed under the EPBC Act (see Appendix 1). Most of these species (451, including 45 species listed under the EPBC Act) occur at least in part and are extant in the PAA (or were extant immediately preceding the fires); 248 of these species (including 16 EPBC Act listed species) are aquatic or semi-aquatic.

Assessments of the extent of distributional overlap with fire for species, including threatened species, are described in section 2.2.1.

2.2.2.2.2. Range restricted species

Species with restricted ranges may be at increased risk of extinction from large-scale fire events as it is more likely a large proportion of their range may be impacted; short-range endemic (SRE) invertebrates with highly restricted ranges are particularly at risk. Given there are data deficiencies for distributions in most species, it is not possible to reliably estimate likely extent of distribution from available occurrence data alone. This was especially important for estimating the likely impact on fire-impacted species with only one or two distributional records.

Published literature sources and expert elicitation were used to assign species to likely range restriction categories (Table 2.3). An SRE species is one that meets a range of criteria, including highly restricted range (Harvey, 2002); therefore, a species was only labelled SRE if published sources, or an expert identified that species as being SRE.

Table 2.3. Estimated range restriction categories for priority species, as derived from published sources or expert elicitation. Priority species were identified as those with at least 30% distributional overlap with severe fire, or at least 50% overlap with total fires.

Estimated range	Criteria	Score	Number of species
SRE	Species defined as SRE in published sources	1	49
Likely short-range endemic	Higher level taxonomy indicates likelihood of SRE (based on Harvey 2002) and species range <10,000 km^2	1	45
highly restricted range	>4 occurrence records, species range <10,000 km^2	0.8	105
range restricted	Published sources indicate species has restricted range or >4 occurrence records, species range 10,000-20,000 km^2	0.6	349
range not restricted	Published sources indicate species does not have restricted range or >4 records, species range >20,000 km^2	0.4	93
extensive range – also found outside of Australia	Published sources indicate extensive range (occurs outside of Australia).	0.2	12
Very low confidence in range	No published information on range, occurrence records <5	N/a	620

2.2.2.3 Fire Susceptibility Index (FSI)

A fire susceptibility index (FSI) was developed to score and rank species based on estimated proportional population decline following the 2019-20 fires using analysis largely of microhabitat traits, and incorporating fire severity and varying fire-susceptibility according to life stage.

We collated information on traits that relate to the likely susceptibility (mortality) of species in mild and in severe fires, based largely on the microhabitat of species, and we then related these to susceptibility to impact by fire (Table 2.4). For analysis of life history and ecological traits post-fire recovery see section 4.1.

Traits were scored separately for adult and juvenile (non-adult) life stages.

Table 2.4. Scoring susceptibility to fire by microhabitat / shelter site, 1: low mortality risk to 4: high mortality risk.

Microhabitat / shelter site	Fires of mild/ moderate severity	Fire of high severity
Deep burrow in ground (>30cm)	1	1
Shallow burrow in ground (<10cm)	1	3
In soil	1	1
In leaf litter (on ground)	3	4
On vegetation	2	4
Under rock	1	2
In/under bark	1	3
No shelter	2	4
In/under logs	1	3
In elevated leaf litter	3	4
In standing wood	1	2
Ground living	2	3
Creekline/water	1	2
No shelter	2	3
Arboreal – large trees/shrubs	1	3
Troglofauna / stygofauna	1	1

Assuming that a score of 4 indicates maximum mortality (100%), these scores were then re-configured to indicate the proportion of the population likely to have been lost at a site exposed to mild or to severe fire (Table 2.5).

Table 2.5. Scoring susceptibility to fire by microhabitat / shelter site: re-scaled as estimates of site-level proportion of the population killed in fires, the lower and upper bounds in parentheses.

Microhabitat / shelter site	Fires of mild/ moderate severity	Fire of high severity
Deep burrow in ground (>30cm)	0.25 (0.125-0.375)	0.25 (0.125-0.375)
Shallow burrow in ground (<10cm)	0.25 (0.125-0.375)	0.75 (0.625-0.875)
In soil	0.25 (0.125-0.375)	0.25 (0.125-0.375)
In leaf litter (on ground)	0.75 (0.625-0.875)	1 (0.875-1)
On vegetation	0.5 (0.375-0.625)	1 (0.875-1)
Under rock	0.25 (0.125-0.375)	0.5 (0.375-0.625)
In/under bark	0.25 (0.125-0.375)	0.75 (0.625-0.875)
No shelter	0.5 (0.375-0.625)	1 (0.875-1)
In/under logs	0.25 (0.125-0.375)	0.5 (0.375-0.625)
In elevated leaf litter	0.75 (0.625-0.875)	1 (0.875-1)
In standing wood	0.25 (0.125-0.375)	0.5 (0.375-0.625)
Ground living	0.5 (0.375-0.625)	0.75 (0.625-0.875)
Creekline or water	0.25 (0.375-0.625)	0.5 (0.125-0.375)
No shelter	0.5 (0.375-0.625)	0.75 (0.625-0.875)
Arboreal on trees / large shrubs	0.25 (0.125-0.375)	0.5 (0.375-0.625)
Troglofauna / stygofauna	0.25 (0.125-0.375)	0.25 (0.125-0.375)

For species with adult life stages occurring in more than one microhabitat, scores were averaged across microhabitats, and a comparable procedure was followed for juveniles. For each species, this produced an average (best guess) estimate (and lower and upper bound) of microhabitat-based susceptibility, for all combinations of each of adult and juvenile life stages, and mild and severe fires.

2.2.2.4. Incorporating fire overlap with trait data to determine susceptibility

i. For every species, for each of mild and severe fires, trait population loss estimates were averaged across microhabitat traits for each species ($adultMEANSUSC_{mild}$ and $adultMEANSUSC_{severe}$). Lower bounds ($adultMINSUSC_{mild}$ and $adultMINSUSC_{severe}$) and upper bounds ($adultMAXSUSC_{mild}$ and $adultMAXSUSC_{severe}$), were calculated by adding +/- 0.125 to $adultMEANSUSC_{mild}$ and $adultMEANSUSC_{severe}$, apart from when traits had a best guess susceptibility score of 1, in which case this was used as the maximum. Adult and juvenile traits were treated separately.

ii. Estimate of population loss across mild fire:
$adultLOWER_{mild}$ = (%fireOverlap_Mild_GEEBAM3) x ($adultMINSUSC_{mild}$)
$adultMEAN_{mild}$ = average (%fireOverlapMild_GEEBAM3, GEEBAM2_3) x ($adultMEANSUSC_{mild}$)
$adultUPPER_{mild}$ = (%fireOverlapMild_GEEBAM2_3) x ($adultMAXSUSC_{mild}$)

iii. Estimate of population loss across severe fire:
$adultLOWER_{severe}$ = (%fire overlapSevere_GEEBAM4_5) x ($adultMINSUSC_{severe}$)
$adultMEAN_{severe}$ = (%fire overlapSevere_ GEEBAM4_5) x ($adultMEANSUSC_{severe}$)
$adultUPPER_{Severe}$ = (%fire overlapSevere_GEEBAM4_5) x ($adultMAXSUSC_{severe}$)

iv. Total overlap by fire:
$adultMINSUSC_{fire} = adultLOWER_{mild} + adultLOWER_{severe}$
$adultMEANSUSC_{fire} = adultMEAN_{mild} + adultMEAN_{severe}$
$adultMAXSUSC_{fire} = adultUPPER_{mild} + adultUPPER_{severe}$

Steps i–iv were repeated for juvenile traits.

2.2.2.5. Life stage variation in traits

For many species, traits and thus fire susceptibility, vary with life stage. For example, dragonflies (Odonata) have subadult stages resident under water; cicadas have subadult stages buried deep underground. We attempted to estimate the proportion of the species' population that was represented by different life stages at the time of the fires. For holometabolous species (i.e., those species that metamorphose across highly contrasting life stages), which are likely to show the greatest variation, we used published sources and species' collection records, to record the months in which adults were most frequently collected. $MINSUSC_{total}$ was calculated by taking the lowest of $adultMINSUSC_{fire}$ or $juvMINSUSC_{fire}$ for each species; $MAXSUSC_{total}$ was calculated by taking the highest of either $adultMAXSUSC_{fire}$ or $juvMAXSUSC_{fire}$ for each species. $MEANSUSC_{total}$ was calculated by summing $adultMEANSUSC_{fire}$ and $juvMEANSUSC_{fire}$, weighted by the proportion of individuals in a species population likely to be adult or juvenile at the time of the fire, as follows:

Adults not present December – February:
$MEANSUSC_{total} = 0.25(adultMEANSUSC_{fire}) + 0.75(juvMEANSUSC_{fire})$

Adults only present December – February:
$MEANSUSC_{total} = 0.75(adultMEANSUSC_{fire}) + 0.25(adultMEANSUSC_{fire})$

Adults present in multiple months, including December – January, or not known
$MEANSUSC_{total} = 0.5(adultMEANSUSC_{fire}) + 0.5(adultMEANSUSC_{fire})$

2.2.2.6 Post-fire recovery constraints

The ability of a species to recover following a fire and to adapt to the altered post-fire ecosystem, as determined by life history and ecological traits, was assessed using a Recovery Risk Index (RRI).

We identified 11 trait categories and 49 ecological and life history traits that could be used to assess post-fire recovery risk using the RRI. Traits were selected based on their influence on post-fire recovery, recolonisation potential and the ability of a species to persist in the altered post-fire ecosystem and based on Fath (2019); IUCN Standards and Petitions Committee (2019); Thurman et al. (2020) and the Kangaroo Island invertebrates trait work conducted by the Wildlife and Threatened Species Bushfire Recovery Expert Panel, 2020 (Provisional list of invertebrates requiring urgent management intervention | Department of Agriculture, Water and the Environment).

Using the methods described in section 2.2.2.1. we compiled data on species' recovery-relevant traits using expert elicitation and a wide range of published sources. Each trait was allocated a score, from 0.2 indicating low risk and 1 indicating high risk of incomplete recovery to pre-fire population levels (Table 2.6): i.e., highest scores indicate that recovery will be least likely and/or least rapid.

For many species, traits information was not available at the species level, for these species, traits were allocated based on assumptions taken from data available for congeners or confamilials and scored for confidence using the *Confident, Inferred, Suspected* index.

Table 2.6. Scoring the Recovery Risk Index (RRI) for species based on life history and ecological traits, with trait category (TC) being a group of related traits and trait score (TS) being the score allocated to each trait, with high scores indicating increased risk of incomplete recovery to pre-fire population levels.

Trait category (TC)	Trait	Trait Score (TS)
Habitat specialisation reliance of a taxon on specific biotic or abiotic habitat features, with well-defined or narrow biotic or abiotic characteristics for breeding, foraging, nesting, or living. Includes reliance on a habitat through which a species is moving.	Habitat generalist, or associated with a habitat that is widespread and dominant in the species range.	0.25
	Associated with an uncommon or not dominant habitat type, but not dependent on it.	0.5
	Habitat specialist; highly dependent on specific habitat.	0.75
Ecological dependency the number of obligate organisms a taxon is dependent on for some part of its life stage, that a species relies on to complete some aspect of its lifecycle.	No obligate mutualism, generalist.	0.25
	Dependent on more than one species, which are part of a larger taxonomic group or guild,	0.5
	Specialist; dependent on one or very few species, for all or part of lifecycle.	1
Physiological tolerance the degree to which a species is restricted to a narrow range of abiotic conditions (eg, temperature, hydrology, or snow pack conditions).	Taxon shows broad physiological tolerance to condition in the post-fire ecosystem.	0.25
	Changes in abiotic conditions because of fire likely to impact taxon across part of range, but effects not likely to be lethal.	0.5
	Changes in abiotic conditions likely to cause some mortality, but not widespread.	0.75
	Taxon highly sensitive to abiotic conditions, abiotic changes likely to occur across a significant proportion of the taxon's known range and are likely to cause lethal effects on taxon.	1
Connectivity in the landscape. Fragmentation can be caused by taxon specific features, such as habitat specialisation or dispersal ability, or from landscape features, such as vegetation clearance, or changes to land use.	Taxon in a region is widely distributed, interconnected and dispersive.	0.25
	Taxon exists in sub-populations, but is dispersive with significant genetic crossover between sub-populations.	0.5
	Taxon has narrow range, existing in sub-populations, but some genetic exchange can occur between isolated sub-populations, or sub-populations are large enough to be viable.	0.75
	Severely fragmented. Most of the population found in small, isolated sub-populations. Individuals from sub-populations cannot disperse or exchange genetic material between other sub-populations.	1
Dispersal potential in a species' lifetime.	<10m	1
	10-100m	0.8
	100-1000m	0.6
	1km-10km	0.4
	10km+	0.2
Dispersal syndrome the degree of flexibility in either the timing or mechanism of dispersal. For mobile organisms, dispersal can either be obligate, meaning dispersal events are fixed within a specific life stage, or facultative, meaning individuals can "choose" if and when to disperse.	Active flight	0.25
	Obligate dispersal (fixed timing, dependence on a specific cue, or on another organism for dispersal).	0.5
	Low to no dispersal.	1

Trait category (TC)	Trait	Trait Score (TS)
Growth rate time to maturity, taking in to account time spent as dormant larval forms, aestivation and holometabolous taxa.	Days	0.25
	Weeks	0.25
	Months	0.5
	1-5 years	0.75
	>5 yrs	1
Life span taking in to account time spent as dormant larval forms, aestivation and holometabolous taxa.	Days	0.25
	Weeks	0.25
	Months	0.5
	1-5 years	0.75
	5-10 years	1
	10-50 years	1
Parity the timing of reproductive events, between Iteroparity, where offspring are produced repeatedly, to semelparity, where offspring are produced just once in an individual's lifetime.	Iteroparity; offspring produced repeatedly.	0.25
	Multiple reproductive events in a year, but only occurring in one season.	0.5
	One reproductive event a year.	0.75
	Semelparity; one reproductive event in a lifetime.	1
Clutch size the number of offspring produced by reproductive individuals in a single reproduction event.	1000+	0.25
	500 to 750	0.25
	250 to 500	0.5
	100 to 250	0.5
	50 to 100	0.75
	10 to 50	0.75
	<10	1
Fecundity Reproductive output across a female's lifetime, counted as the number of offspring or eggs produced on average by reproductive individuals of the species.	500 to >1000	0.25
	250 to 500	0.25
	100-250	0.5
	50 to 100	0.75
	1 to 50	1
Aquatic invertebrates only Downstream sedimentation risk (Slug risk).	'High risk'	1

Mean$_{RRI}$ was calculated by dividing TS by the number of scored TCs. The upper bound, Max$_{RRI}$ was calculated as the maximum of any TS a species was scored for; the lower bound Min$_{RRI}$ was the minimum of any TS a species was scored for.

2.2.3 Aquatic Invertebrates

Species were classed as aquatic if at least one of their life stages occurred in water. Because fire impacts on aquatic species may manifest mostly through downstream sedimentation events, we also calculated a sedimentation slug risk for 139 aquatic and semi-aquatic species (Table 8), using point data for all species, and polygons for 102 species with three or more records. Species which fell in to 'high risk' slug categories as per the Revised Universal Soil Loss Equation with Fire and Rainfall dataset (as described in (Legge et al. 2021) were allocated a score of 1 in the RRI.

2.2.4 Prioritising species

Fire-impacted species with at least 50% total fire overlap, or at least 30% high severity fire overlap were further prioritised using the FSI and RRI (Fig. 2.1). The FSI provides an estimation of proportional population decline and so following IUCN criteria for category A of a decline in population of 30% or greater, we treated all species with an FSI of at least 30 and an RRI of at least 0.35 priorities for response (Table 2.7).

Table 2.7. Prioritising fire-impacted species based upon the FSI and RRI. Species are assigned priority classes based on a combination of estimates of the proportion of the population killed in the fires (FSI) and their trait-inferred risks of recovery (RRI). Priority 1 species are those considered likely to have experienced the highest proportional population losses in the 2019-20 fires and also have an expected low likelihood of, or to take longest for, post-fire recovery.

	Fire susceptibility index (FSI)				
Recovery risk index (RRI)	<20	20-29	30-49	50-69	70-100
0.7-0.9			Priority 2	Priority 1	Priority 1
0.6-0.69			Priority 3	Priority 2	Priority 1
0.5-0.59			Priority 4	Priority 3	Priority 2
0.35-0.49			Priority 4	Priority 4	Priority 3
0.24-0.34					

2.2.4.1. Prioritising for Research

Priority species were further categorised into priorities for conservation assessment, response and research according to the following criteria:

a. Conservation assessment: Species with sufficient data to be appropriate candidates for conservation status assessment. Note these species are not necessarily more threatened than the species prioritised for research.

b. High priority research: Priority species likely at high risk of loss, extirpation, or extinction and either scoring low for *Confidence* or *Certainty*, or for which key ecological, biological or distributional data to allow confident assessment of fire impact is unknown

c. Moderate priority for research: Species in Priority 1 or Priority 2, for which FSI and RRI indicate high susceptibility to fire and reduced recovery capacity, but which have few occurrence points and for which no estimation of likely range was possible from published literature (ie the actual distribution of these species may in fact be larger than we estimated); or species in Priority 3 or 4, with moderate FSI and RRI scores and with estimated ranges of restricted or highly restricted. These species were classed as Moderate priority for research

d. Lower priority for research: Species for which there may be significant data deficiencies, but for which available data do not flag particular elevated risk.

Our recommendations for conservation assessment incorporate uncertainty but significant gaps in the data mean that it is likely that many more species might be priorities but not identified in our analyses and so resolving this uncertainty is critical. We quantified uncertainty using the following metrics:

Certainty – The total number of traits a species was scored for, across FSI and RRI. Species scoring low on *Certainty* are priorities for traits research.

Confidence – The average trait Confidence score (*Confident* 0.9, *Inferred* 0.6, *Suspected* 0.3) across all traits for each species. Species scoring low on *Confidence* are priorities for traits research.

Estimated Range – Species with few occurrence records and for which an estimation of range could not be made using published sources were classed as very low confidence in *Estimated Range*; these species require research focused on survey and monitoring to elucidate their distribution and thus, their key threats.

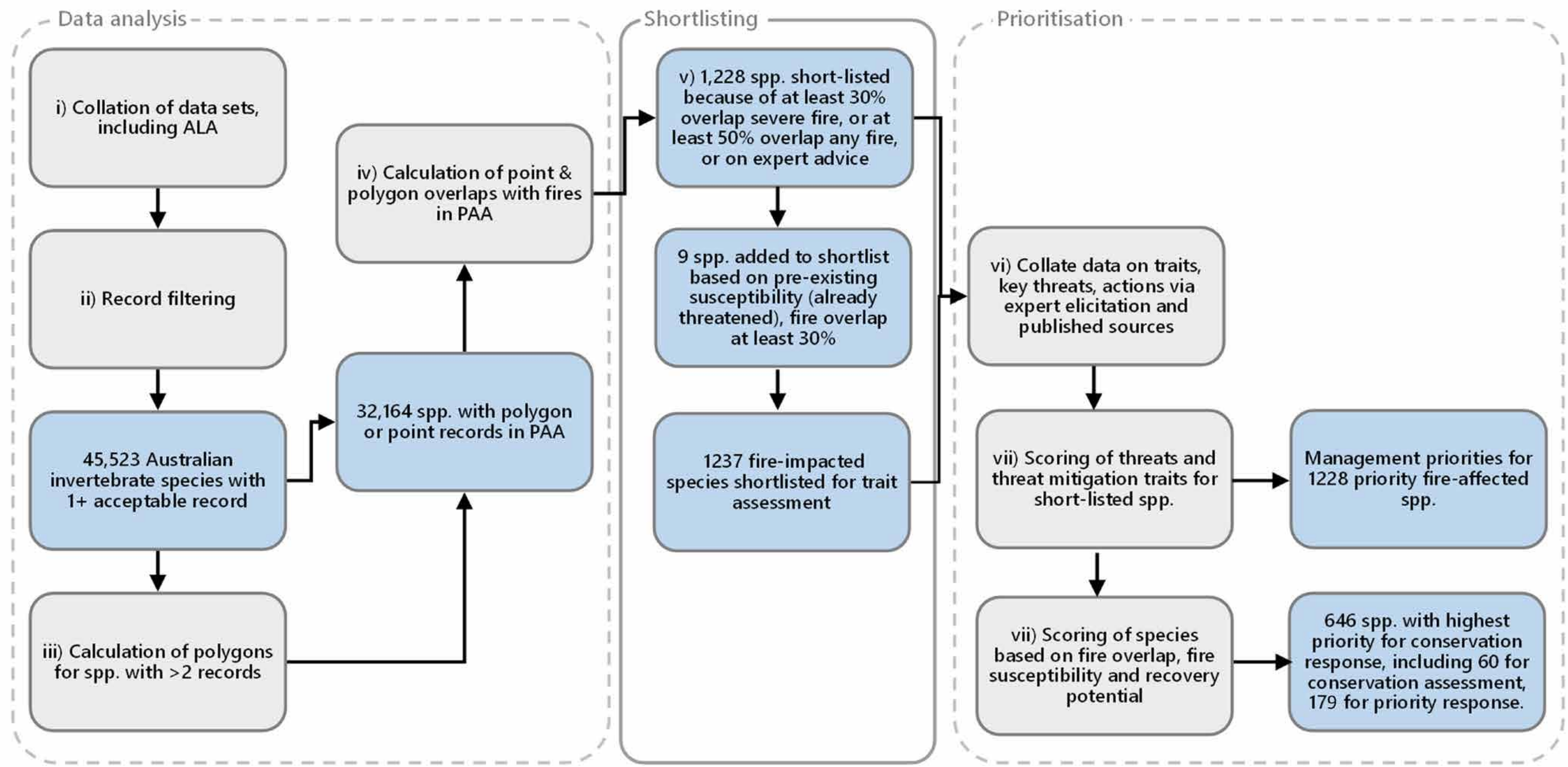


Figure 2.1. *Flowchart illustrating the stages for prioritising fire-impacted species.*

2.3. Findings

2.3.1. Data overview

Our assessment included 32,164 species with occurrence records in the Preliminary Analysis Area; of these, analysis indicated that 14,159 species (i.e., 44%) had at least some of their point records or polygons overlapping with at least some of the 2019-20 wildfires. Of these, 1228 invertebrate species, across 52 orders, had at least 50% of their known range impacted by any fire, or at least 30% by high severity fire. Included in this total were 15 species suggested following expert elicitation, for which fire overlap could not be calculated due to recent taxonomic changes, or where recent surveys had resulted in updated fire overlap, but for which there were reasonable grounds to infer higher fire overlap.

Of the 1228 species that had at least 30% overlap with severe fire, or 50% overlap with any fire, we found 382 species had complete distributional overlap with fire (considering overlap with mild fire taken as the mean of GEEBAM2 and GEEBAM3), but all of these species were represented in our database by only one or two records such that, although such high assessed fire overlap is clearly of concern, we have low confidence in this estimate of overlap value. The tally increases to an upper bound estimate of 541 species whose known distribution (of one or two records only) was entirely burnt, if GEEBAM2 is always considered burnt.

We also included an additional nine species, which had between 30-50% total fire overlap that were listed as threatened under state or federal legislation or by the IUCN. This resulted in a short-listed total of 1237 fire-impacted species (see section 2.3.4).

2.3.2. Geographic patterns in fire impacts

There was marked variation among jurisdictions in the proportion of species with fire overlaps (Table 2.8), largely reflecting the proportional extent of fire within the PAA component of those jurisdictions. New South Wales had the most species affected by the 2019-20 fires, and Tasmania the least. Relative to the number of species included in each jurisdiction, the Australian Capital Territory had the highest proportion of species with high, and with any, fire overlap.

Table 2.8. Summary table of numbers of invertebrate species, and of fire-affected invertebrate species, considered in this study by jurisdiction. Note: (1) none of the Northern Territory was included in the Preliminary Analysis Area; (2) these tallies do not represent the total number of invertebrate species in these jurisdictions (or parts thereof), but rather the number of species for which we could access acceptable records; (3) tallies do not add across jurisdictions, given that some species occur across multiple jurisdictions; (4) the entirety of Victoria, Australian Capital Territory and Tasmania occurs within the PAA.

Jurisdiction	No. of species with records	No. (%) species with at least 30% overlap with severe fire, or at least 50% overlap with any fire	No. (%) spp. with any fire overlap
Queensland (PAA component)	10,141	142 (1.4%)	5,437 (53.6%)
New South Wales (PAA component)	12,461	837 (6.7%)	8,162 (65.5%)
Australian Capital Territory	1,200	158 (13.2%)	1,009 (84,1%)
Victoria	7,521	153 (2.0%)	4,325 (57.5%)
Tasmania	4,925	30 (0.6%)	2,596 (52.7%)
South Australia (PAA component)	3,871	44 (1.1%)	2,176 (56.2%)
Western Australia (PAA component)	6,715	87 (1.3%)	2,711 (40.4%)

The Australian government identified a set of extensively-burnt regions (Figure 2.2) within some of these jurisdictions as foci for conservation management response (https://www.environment.gov.au/biodiversity/bushfire-recovery/consultation/workshops-and-roundtables). Tallies for the number of invertebrate species included in this analysis, and the number affected by fire are given in Table 2.9. The highest proportions of fire-affected invertebrates are, unsurprisingly, mostly in those regions with highest proportional area burnt (Kangaroo Island and East Gippsland), although notably the number of invertebrate species with high overlap was disproportionately large in the Australian Alps.

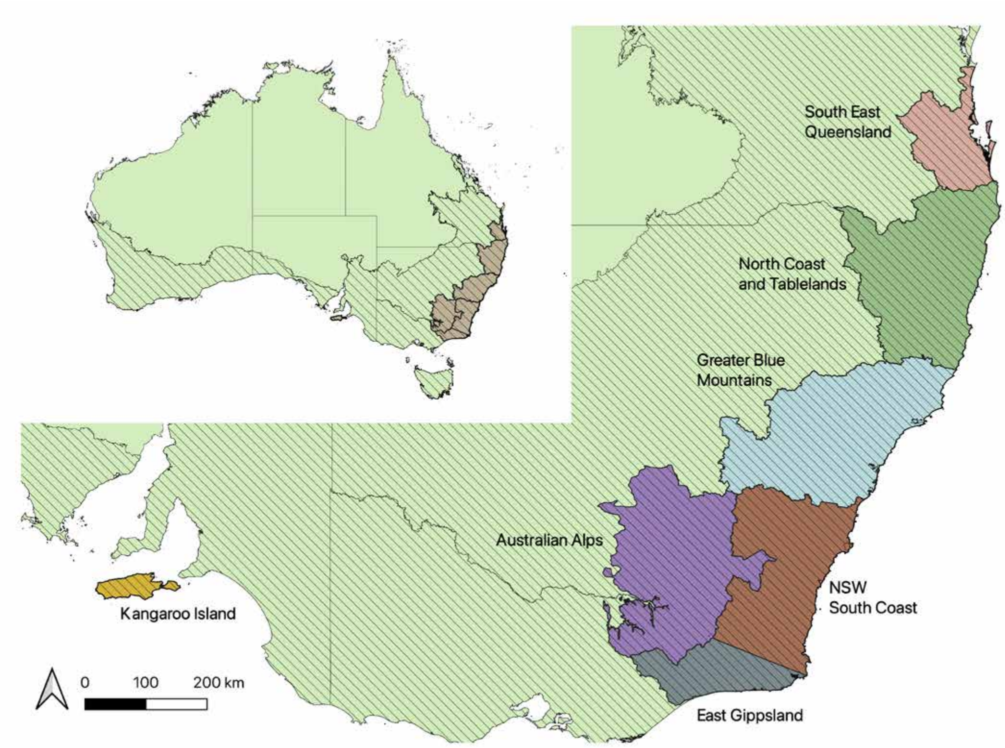


Figure 2.2. Priority regions identified or biodiversity recovery by the Department of Agriculture, Water and the Environment.

Table 2.9. Number and proportion of fire-affected invertebrate species in fire-affected regions, as shown in Figure 2.2. The regional extents of burnt area are taken from https://www.environment.gov.au/biodiversity/bushfire-recovery/consultation/workshops-and-roundtables

Region	Area [km^2] burnt (%)	No. of species with records	No. (%) species with at least 30% overlap with severe fire, or at least 50% overlap with any fire	No. (%) spp. with any fire overlap
Australian Alps	5,737 (4%)	2,885	230 (8.0%)	2,370 (82.2%)
East Gippsland	8,794 (42%)	1,229	89 (7.2%)	1,078 (87.7%)
Greater Blue Mountains	11,478 (15%)	6,710	361 (5.4%)	4,955 (73.9%)
Kangaroo Island	1,674 (38%)	388	34 (8.8%)	331 (85.3%)
rainforests of New South Wales north coast and tablelands	16,332 (23%)	4,390	312 (7.1%)	3,549 (80.8%)
south coast New South Wales	11,579 (21%)	3,366	259 (7.7%)	2,745 (81.6%)
rainforests of south-east Queensland	972 (4%)	5,908	98 (1.7%)	3,679 (62.3%)

The regional occurrence of species prioritised for conservation response (see Section 2.3.4) is summarised in Table 2.10.

Table 2.10. Number of species prioritised for assessment or response per region, see Table 2.19 and 2.20 for species per region

Region	No. species with prioritised for conservation assessment	No. spp. high priority for research	No. spp. moderate priority for research
Australian Alps	4	5	1
East Gippsland	2	9	7
Greater Blue Mountains	6	22	20
Kangaroo Island	6	9	2
rainforests of New South Wales north coast and tablelands	10	17	19
south coast New South Wales	9	27	16
rainforests of south-east Queensland	1	2	4

2.3.3. Fire overlap for threatened species

Of the 451 listed threatened species occurring in the PAA, we were unable to access any acceptable distributional data for 77 species (including four EPBC Act-listed species), and we could locate only one record for 44 species (including five EPBC Act-listed species), and only two records for a further 54 species (including three EPBC Act-listed species) – so, we could make no assessment, or assessments with only low confidence, for 39% of the threatened species occurring in the PAA. We recognise that it may be possible for expert opinion, or databases not included in our analysis, to fill some gaps in assessment for some of these data poor species.

Fire overlap estimates for every threatened species are given in Appendix 1, and summarised here. Of the 451 threatened species in the PAA, 152 (34%) had some distributional overlap with the 2019-20 fires (Table 2.11); this included 17 (38%) of the EPBC Act-listed species. Species listed as threatened in Tasmania had notably low fire overlaps (88 of the 99 Tasmanian threatened species for which we had records had zero fire overlap), reflecting the generally limited extent of the 2019-20 fires in Tasmania.

Note that lists of threatened species, and their conservation statuses, vary over time. This section reports on lists as at May 2021.

Table 2.11. Summary table of fire overlap classes for threatened species occurring in the PAA. Note that this assessment does not include sedimentation risks for aquatic and semi-aquatic species.

Fire overlap class	No. (%) of EPBC Act -listed species	No. (%) of other listed threatened species
At least 30% with severe fire, or at least 50% with total fire	3 (6.7%)	20 (4.9%)
Not above, but 10-30% with severe fire, or 30-50% with total fire	2 (4.4%)	19 (4.7%)
Not above, but 1-10% with severe fire, or 5-30% with total fire	3 (6.7%)	39 (9.6%)
Not above, but 0+ to 1% with severe fire, or 0+ to 5% with total fire	9 (20.0%)	57 (14.0%)
No overlap with fire	24 (53.3%)	199 (49.0%)
No data	4 (8.9%)	72 (17.7%)
Total	45	406

Fire overlap values for the non-aquatic EPBC Act listed vertebrate species are summarised in Table 2.12 (for species reported here to have some overlap); and for high overlap non-aquatic species listed as threatened on lists other than the EPBC Act in Table 2.13.

Table 2.12. Summary table of non-aquatic EPBC Act listed invertebrate species with at least 1% overlap with the 2019-20 fires. Species are ordered from highest overlap with severe fires.

Species	Common name	EPBC Act status	Status in other lists	No. records	% overlap SEVERE fire	% overlap TOTAL fire
Trioza barrettae	Banksia brownii plant louse	EN	IUCN (CR); WA (EN)	5	69.3	73.6
Pseudococcus markharveyi	Banksia montana mealybug	CR	IUCN (CR); WA (CR)	2	50	50
Bertmainius colonus	Eastern Stirling Range Pygmy Trapdoor Spider	VU	WA (VU)	26	34.8	43
Leioproctus (Andrenopsis) douglasiellus	a short-tongued bee	CR	WA (EN)	4	18.1	37.6
Paralucia spinifera	Bathurst Copper Butterfly	VU	IUCN (EN), NSW (EN)	138	5.5	7.5
Pommerhelix duralensis	Dural Land Snail	EN	NSW (EN)	220	2.6	7.5
Thersites mitchellae	Mitchell's Rainforest Snail	CR	IUCN (EN), NSW (EN)	177	0.1	1.1
Bertmainius tingle	Tingle Pygmy Trapdoor Spider	EN	WA (EN)	7	0.01	4.1

Most of the 29 EPBC Act listed non-aquatic invertebrates occurring in the PAA had no or little distributional overlap with the 2019-20 fires. However, six EPBC Act listed terrestrial invertebrates had at least 1% of their distributions overlap with severe fire, with the four species with highest overlap all being short-range endemic species from Western Australia. More detailed analysis by the relevant WA authority indicates that all of the (very small) known range of *Pseudococcus markharveyi* was burnt in severe fires in 2019-20, and consequently the species is 'now likely to be extinct' (Moir 2021). Based on the assessment presented here, the EPBC Act status of *Trioza barrettae, Pseudococcus markharveyi* and *Bertmainius colonus* should be considered for review for possible uplisting or, for *Pseudococcus markharveyi*, for potential listing as Extinct. These three species should also be considered to be priorities for conservation management response.

Table 2.13. Summary table of non-aquatic invertebrate species listed as threatened on lists other than under the EPBC Act, for species with at least 30% overlap with the 2019-20 fires. Species are ordered from highest overlap with severe fires.

Species	Common name	Status in other lists	No. records	% overlap SEVERE fire	% overlap TOTAL fire	States
Xylocopa aeratus	Green Carpenter Bee	Vic (Regionally EX)	32	75.4	81.2	NSW, Qld, SA, Vic
Atelomastix poustiei	a millipede	WA (VU)	7	73.0	79.1	WA
Glyptorhagada bordaensis	a land snail	IUCN (VU)	4	67.5	82.2	SA
Zephyrarchaea melindae	Toolbrunup Assassin Spider	WA (VU)	5	58.1	71.1	WA
Zephyrarchaea barrettae	Talyuberlup Assassin Spider	WA (VU)	2	50	50	WA
Zephyrarchaea robinsi	Eastern Massif Assassin Spider	WA (VU)	9	40.3	47.5	WA
Atelomastix danksi	a millipede	WA (VU)	6	40.3	64.6	WA
Bertmainius pandus	pygmy trapdoor spider	WA (CR)	9	32.0	69.9	WA
Bothriembryon (Bothriembryon) glauerti	a land snail	IUCN (VU)	3	28.8	48.8	WA
Pommerhelix depressa	Jenolan Caves Woodland Snail	IUCN (VU)	4	26.3	60.7	NSW
Bothriembryon brazieri	a land snail	IUCN (VU)	7	25.3	40.6	WA
Atelomastix tigrina	a millipede	WA (VU)	13	19.3	39.3	WA
Georissa laseroni	a land snail	IUCN (VU)	11	19.3	47.0	NSW
Oreixenica latialis theddora	Alpine Silver Xenica	Vic (EN)	4	16.6	35.0	Vic
Strumigenys xenos	an ant	IUCN (VU)	3	14.8	41.0	NSW, Qld
Maratus sarahae	peacock spider	WA (EN)	7	12.6	34.9	WA

Sixteen terrestrial invertebrates considered threatened on lists other than the EPBC Act had at least 30% of their distributions overlap with the 2019-20 wildfires, of which eight had >30% overlap with severe fires (Table 2.13). Ten of these species are short range endemics from Western Australia. Given that these species were considered threatened prior to the 2019-20 fires and had such extensive proportions of their range burnt, all should be considered for listing under the EPBC Act and as priorities for conservation management response.

For aquatic and semi-aquatic threatened invertebrate species, we evaluated not only direct overlap with fire (as done for terrestrial species above), but also the risk of sedimentation ('slug risk') arising from fires in the catchment upstream of records. We note that for one group of aquatic invertebrates, the spiny crayfish *Euastacus* spp., more detailed information and assessment of fire impact is presented in the complementary report of Legge et al. (2021).

Fire overlap values for the aquatic and semi-aquatic EPBC Act listed vertebrate species are summarised in Table 2.14; and for high overlap aquatic and semi-aquatic species listed as threatened on lists other than the EPBC Act in Table 2.15. Note that we had no acceptable data for the EPBC Act-listed *Engaewa pseudoreducta* (CR), *Engaewa reducta* (CR), *Engaewa walpolea* (EN) and *Westralunio carteri* (VU).

Table 2.14. Summary table of aquatic and semi-aquatic EPBC Act listed invertebrate species with some overlap with the 2019-20 fires. Species are ordered from highest overlap with severe fires. Note that information on slug risk from Legge et al. (2021) is available only for (some) *Euastacus* species: 'nd' indicates species for which this source provided no information.

Species	Common name	EPBC Act status	Status in other lists	No. records	% overlap SEVERE fire	% overlap TOTAL fire	% pts in high slug risk	Slug % overlap (Legge et al. 2021)
Euastacus dharawalus	Fitzroy Falls Crayfish	CR	IUCN (CR); NSW (CR)	5	20.7	35.8	0	nd
Cherax tenuimanus	Margaret River Hairy Marron	CR	IUCN (CR); WA (CR)	15	4.3	4.7	0	
Thaumatoperla alpina	Alpine Stonefly	EN	Vic (VU)	17	1.4	3.0	0	
Hyridella (Protohyridella) glenelgensis	Glenelg Freshwater Mussel	CR	IUCN (CR); Vic (CR)	7	0.2	0.4	0	
Euastacus bispinosus	Glenelg Spiny Freshwater Crayfish	EN	IUCN (VU); Vic (EN)	21	0.1	3.4	0	nd

Table 2.14 indicates that most of the EPBC Act listed aquatic and semi-aquatic invertebrate species had relatively low overlaps with the 2019-20 wildfires, and for the species for which we had acceptable records, no species urgently need consideration for up-listing due to the impacts of the 2019-20 fires. However, our assessment indicates that conservation management response should be a priority for the Critically Endangered *Euastacus dharawalus*, for which ca. 36% of its range was burnt (including 21% in severe wildfire).

Burnt burrows of the Kangaroo Island micro trapdoor spider (*Moggridgea rainbowi*) at Western River Wilderness Protected Area. This species is endemic to Kangaroo Island and the whole known western range of the species was impacted by high severity fires. Image by J. Marsh

Table 2.15. Summary table of aquatic and semi-aquatic EPBC Act listed invertebrate species with some overlap with the 2019-20 fires. Species are ordered from highest overlap with severe fires. Note that information on slug risk from Legge et al. (2021) is available only for (some) *Euastacus* species: 'nd' indicates species for which this source provided no information.

Species	Common name	Status in other lists	No. records	% overlap SEVERE fire	% overlap TOTAL fire	% pts in high slug risk	Slug % overlap (Legge et al. 2021)	States
Triaenodes resima	caddisfly	Vic (VU)	1	100	100	0		Vic, NSW
Euastacus guwinus	Tianjara Crayfish	IUCN (CR)	3	73.5	97.9	66.7	100	NSW
Euastacus bidawalis	Bidawal Crayfish, East Gippsland Spiny Crayfish	IUCN (EN); Vic (VU)	5	56.7	73.8	20.0	71.1	Vic, NSW
Euastacus diversus	Orbost Spiny Crayfish	IUCN (EN); Vic (EN)	19	55.7	77.4	84.2	52.7	Vic
Ramiheithrus virgatus	caddisfly	Vic (VU)	2	50.0	75.0	0.0		Vic, NSW
Euastacus yanga	Southern Lobster, Variable Spiny Crayfish	Vic (VU)	25	40.0	61.1	52.0	13.2	Vic, NSW
Euastacus clarkae	Ellen Clark's Crayfish	IUCN (EN)	19	32.7	67.5	26.3	94.3	NSW
Euastacus claytoni	Clayton's Crayfish	IUCN (EN); Vic (VU)	9	31.8	35.9	55.6	24.4	Vic, NSW
Euastacus gumar	Bloodclaw Crayfish	IUCN (EN)	3	27.4	32.1	0.0	26.4	NSW
Petalura gigantea	Giant Dragonfly	NSW (EN)	292	23.0	42.5	27.4		NSW
Euastacus pilosus	Hairy Cataract Crayfish	IUCN (EN)	11	21.1	51.7	54.6	22.7	NSW
Euastacus spinichelatus	Small Crayfish	IUCN (EN)	5	12.6	41.5	20.0	30.1	NSW

Table 2.15 indicates that many species listed as threatened, but not yet under the EPBC Act, were substantially affected by the 2019-20 wildfires. Of the 12 such species that we found to have highest fire overlap, nine are spiny crayfish (*Euastacus* spp.), supporting previous assessments that prioritised this group of species for post-fire conservation response (https://www.environment.gov.au/biodiversity/bushfire-recovery/bushfire-impacts/priority-animals) and assessment for listing under the EPBC Act. For the three other species listed in Table 2.15, our assessment for the two caddisflies is constrained by the few records (1 and 2), but our indicative results suggest that both merit some further attention. The giant dragonfly *Petalura gigantea*, already listed as Endangered in New South Wales, had 43% of its range burnt, including 23% in severe fires, and merits consideration for assessment for listing under the EPBC Act.

2.3.4. Priority fire-impacted species for research and conservation assessment

Following trait-based analysis of the 1237 short-listed fire-impacted species using the fire susceptibility framework, we identified 646 species, which had high overlap, high estimated proportional population loss and decreased ability to reach post-fire recovery (Appendix 2). Based on FSI and RRI scores, we categorised these species, from Priority One to Priority Four, with Priority One species having the highest estimated risk. Tables 2.16 and 2.17 show the breakdown of these species into Priority groups.

Table 2.16. Prioritisation summary for species for which fire overlap analysis was based upon >2 acceptable occurrence records. Species are assigned priority classes based on a combination of estimates of the proportion of the population killed in the fires (FSI) and their trait-inferred risks to recovery (RRI).

	Fire susceptibility index (FSI)				
Recovery risk index (RRI)	<20	20-29	30-49	50-69	70-100
0.7-0.9	(N=30 spp.)	(N=9 spp.)	Priority 2 for response (N=48 spp.)	Priority 1 for response (N=3 spp.)	Priority 1 for response (N=4 spp.)
0.6-0.69	(N=23 spp.)	(N=12 spp.)	Priority 3 for response (N=44 spp.)	Priority 2 for response (N=4 spp.)	Priority 1 for response (N=0 spp.)
0.5-0.59	(N=16 spp.)	(N=10 spp.)	Priority 4 for response (N=26 spp.)	Priority 3 for response (N=5 spp.)	Priority 2 for response (N=1 sp.)
0.35-0.49	(N=33 spp.)	(N=12 spp.)	Priority 4 for response (N=63 spp.)	Priority 4 for response (N=18 spp.)	Priority 3 for response (N=1 sp.)
0.24-0.34	(N=22 spp.)	(N=7 spp)	(N=19 spp.)	(N=2 spp.)	(N=0 spp.)

Table 2.17. Prioritisation summary for species for which fire overlap analysis was based on 1 or 2 acceptable records.

	Fire susceptibility index (FSI)				
Recovery risk index (RRI)	<20	20-29	30-49	50-69	70-100
0.7-0.9	(N=16 spp.)	(N=30 spp.)	Priority 2 for response (N=9 spp.)	Priority 1 for response (N=42 spp.)	Priority 1 for response (N=17 spp.)
0.6-0.69	(N=53 spp.)	(N=28 spp.)	Priority 3 for response (N=48 spp.)	Priority 2 for response (N=27 spp.)	Priority 1 for response (N=3 spp.)
0.5-0.59	(N=29 spp.)	(N=36 spp.)	Priority 4 for response (N=32 spp.)	Priority 3 for response (N=33 spp.)	Priority 2 for response (N=11 sp.)
0.35-0.49	(N=51 spp.)	(N=71 spp.)	Priority 4 for response (N=49 spp.)	Priority 4 for response (N=51 spp.)	Priority 3 for response (N=71 sp.)
0.24-0.34	(N=35 spp.)	(N=56 spp)	(N=21 spp.)	(N=26 spp.)	(N=13 spp.)

Prioritised species were split across 36 orders, 13 orders had only one representative species across all priority groups, and four orders; Lepidoptera, Coleoptera, Araneae and Diptera each had greater than 50 species (highlighted in Table 2.18).

Table 2.18. Breakdown of invertebrate orders into priority groups. Orders with >50 priority species are highlighted.

Order	Common name	No. of species (families)				
		Priority 1	Priority 2	Priority 3	Priority 4	Total
Amphipoda	Amphipods	2 (1)	2 (2)	0	0	4 (2)
Araneae	Spiders	21 (9)	23 (15)	39 (19)	14 (7)	97 (28)
Blattodea	Cockroaches	0	0	2 (1)	1 (1)	3 (2)
Chilopoda	Centipedes	0	0	1 (1)	0	1 (1)
Coleoptera	Beetles	7 (6)	14 (6)	38 (9)	57 (12)	116 (17)
Cyclophyllidea	Cestode parasite	0	0	0	1 (1)	1 (1)
Diplostomida	Trematode	0	1 (1)	1 (1)	1 (1)	3 (2)
Diptera	Flies	2 (1)	0	34 (16)	32 (12)	68 (23)
Ephemeroptera	Mayflies	0	0	2 (1)		2 (1)
Onychophora	Velvet worms	3 (1)	5 (1)	0	0	3 (1)
Harpacticoida	Copepod	0	0	0	1 (1)	1 (1)
Hemiptera	True bugs	4 (2)	8 (6)	5 (4)	5 (4)	22 (13)
Hymenoptera	Bees, ants wasps	2 (2)	0	10 (6)	17 (7)	29 (9)
Isopoda	Isopods	1 (1)	0	1 (1)	0	2 (2)
Lepidoptera	Butterflies and moths	1 (1)	2 (2)	41 (12)	88 (20)	132 (23)
Mecoptera	Scorpionflies	0	0	0	1 (1)	1 (1)
Mesostigmata	Mites	0	0	0	1 (1)	1 (1)
Neorhabdocoela	Parasitic flatworms	2 (1)	2 (1)	0	0	4 (1)
Opiliones	Harvestmen	1 (1)	3 (2)	6 (3)	0	10 (3)
Orthoptera	Grasshoppers, crickets, katydids	1 (1)	1 (1)	1 (1)	0	3 (1)
Plecoptera	Stoneflies	1 (1)	0	4 (2)	0	5 (2)
Polydesmida	Keeled millipedes	3 (1)	14 (2)	1 (1)	0	18 (4)
Polyzoniida	Millipedes	1 (1)	0	0	0	1 (1)
Pseudoscorpiones	Pseudoscorpions	4 (1)	3 (1)	6 (2)	1 (1)	14 (3)
Psocodea	Bark lice	0	0	0	1 (1)	1 (1)
Psocoptera	Book lice	0	0	1 (1)	0	1 (1)
Sarcoptiformes	Mites	2 (2)	1 (1)	0	0	3 (3)
Spirurida	Nematodes	0	0	0	1 (1)	1 (1)
Spirostreptida	Millipedes	0	2 (1)	0	0	2 (1)
Strongylida	Nematodes	1 (1)	0	1 (1)	0	1 (1)
Stylommatophora	Land Snails	6 (5)	14 (3)	0	0	20 (3)
Thysanoptera	Thrips	1 (1)	0	0	0	1 (1)
Trichoptera	Caddidflies	0	3 (2)	9 (5)	7 (4)	19 (6)
Trombidiformes	Mites	3 (3)	4 (3)	2 (2)	1 (1)	10 (8)

2.3.4.1. Priority species for further conservation assessment

Following prioritisation of species into the four priority groups, we used the fire susceptibility framework to further categorise species as candidates for further conservation assessment, high priorities for research or response and moderate priorities for research and response.

Of the 646 prioritised species, we identified 60 species with sufficient and robust data, which were priorities for conservation assessment under the EPBC Act (in collaboration with state/territory assessment), or which were already assessed and were candidates for up-listing (Figure 2.3, Table 2.19).

Whilst these species are of conservation significance, it should be noted that they are not necessarily the most imperilled species, but represent the species with sufficient life history, ecological or distributional data to allow a robust and straightforward assessment of conservation status.

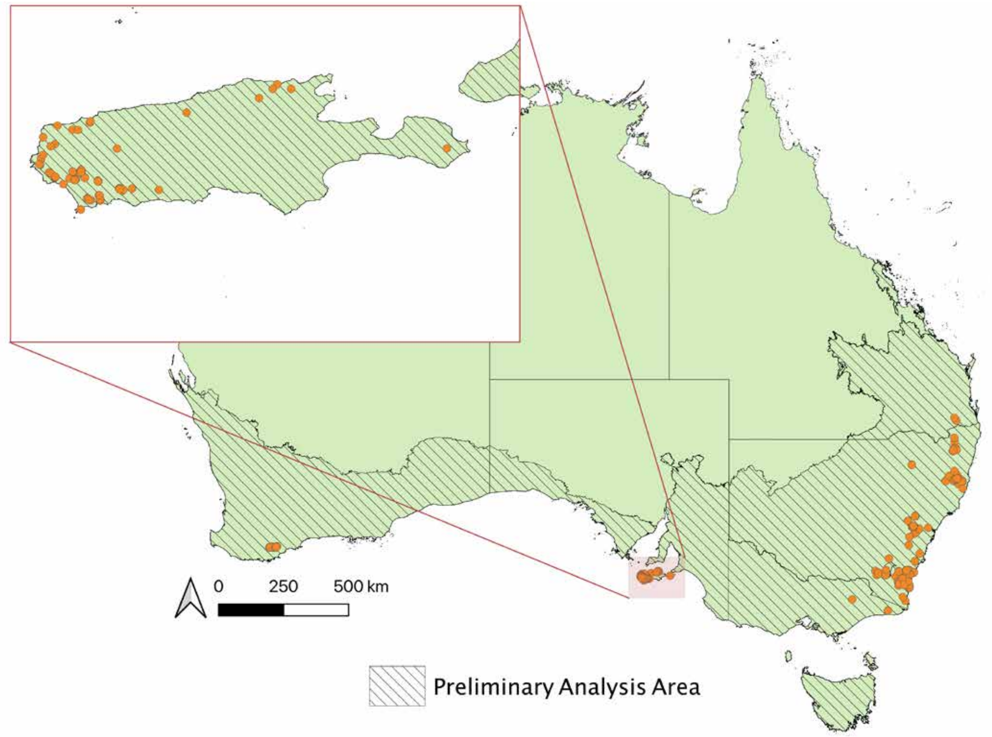


Figure 2.3. Distribution of species recommended for conservation assessment, with inset showing detail of Kangaroo Island.

Table 2.19. Species recommended for assessment under the EPBC Act (N=57) or for up-listing of current conservation status (N=3), species with N/a for fire overlap are those expert-nominated species for which fire overlap data could not be calculated. Species marked with * are expert nominated species for which our measured overlap is below the threshold for highly fire impacted, or fire overlap could not be calculated, but that experts deem to be at risk. RRI and FSI values are given for every species in Appendix 2.

Scientific Name	Common Name	Order (Family)	State (Region)	% overlap SEVERE fire	% overlap TOTAL fire	Threatened status
Austrarchaea mcguiganae	Southern Highlands assassin spider	Araneae (Archaeidae)	NSW (Sth Coast)	76	89	$IUCN_{pending}$
Zephyrarchaea melindae	Toolbrunup assassin spider	Araneae (Archaeidae)	WA	58	71	WA (VU), $IUCN_{pending}$
Austrarchaea monteithi	Gibraltar Range assassin spider	Araneae (Archaeidae)	NSW (Nth Coast & Tablelands)	50	85	$IUCN_{pending}$
Zephyrarchaea barrettae	Talyuberlup assassin spider	Araneae (Archaeidae)	WA	50	50	WA (VU), $IUCN_{pending}$
Zephyrarchaea robinsi	Eastern Massif assassin spider	Araneae (Archaeidae)	WA	40	47	WA (VU), $IUCN_{pending}$
Austrarchaea cunninghami	Main Range assassin spider	Araneae (Archaeidae)	QLD (SE Qld)	0	75	
Cataxia colesi	Spiny-legged trapdoor spider	Araneae (Idiopidae)	WA	71	75	
Bertmainius colonus	Eastern Stirling Range pygmy trapdoor spider	Araneae (Migidae)	WA	35	43	EPBCA (VU), WA (VU), $IUCN_{pending}$, $EPBCA_{uplisting}$
Bertmainius pandus	Pygmy trapdoor spider	Araneae (Migidae)	WA	32	67	WA (CR), $IUCN_{pending}$
Maratus sarahae	Peacock spider	Araneae (Saltcidae)	WA	13	35	WA (EN), $IUCN_{pending}$
*Notonomus (Conchitella) clivinoides**	Ground beetle	Coleoptera (Carabidae)	Vic	N/a	N/a	$IUCN_{pending}$
Notonomus rainbowi	Ground beetle	Coleoptera (Carabidae)	NSW (Sth Coast)	16	74	
Matthewsius rossi	Scarab beetle	Coleoptera (Scarabaeidae)	NSW (Blue Mountains)	57	81	$IIUCN_{pending}$
Diorygopyx duplodentatus	Scarab beetle	Coleoptera (Scarabaeidae)	NSW (Nth Coast & Tablelands)	10	76	$IUCN_{pending}$
*Opaluma opulens**	Stratiomyid fly	Diptera (Stratiomyidae)	Qld	N/a	N/a	$IUCN_{pending}$
Acanthokara kaputensis	Velvet worm	Onychophora (Peripatopsidae)	NSW	100	100	
Kumbadjena toolbrunupensis	Velvet worm	Onychophora (Peripatopsidae)	WA	100	100	

Scientific Name	Common Name	Order (Family)	State (Region)	% overlap SEVERE fire	% overlap TOTAL fire	Threatened status
Cephalofovea tomahmontis	Velvet worm	Onychophora (Peripatopsidae)	NSW (Blue Mountains)	42	70	
Ruhbergia rostroides	Velvet worm	Onychophora (Peripatopsidae)	NSW (Sth Coast)	0	100	
*Kosciuscola cuneatus**	Skyhopper	Orthoptera (Acrididae)	NSW (Aus Alps, Sth Coast)	1.3	14.4	
*Kosciuscola tristis restrictus**	Skyhopper	Orthoptera (Acrididae)	NSW (Aus Alps, Sth Coast)			
Pseudococcus markharveyi	Banskia montana mealybug	Hemiptera (Pseudococcidae)	WA	50	50	EPBC (CR), IUCN (CR) WA (CR)
Trioza barrettae	Banksia brownii plant louse	Hemiptera (Triozidae)	WA	69	73	EPBC (EN), IUCN (CR), WA (EN), $EPBCA_{uplisting}$
Xylocopa (Lestis) aeratus	Green carpenter bee	Hymenoptera (Apidae)	NSW (Blue Mountains), SA (KI)	75	81	$IUCN_{pending}$
Leioproctus (Andrenopsis) douglasiellus	Short-tongued bee	Hymenoptera (Colletidae)	WA	18	38	EPBC (CR), WA (EN)
Leioproctus (Leioproctus) nigrofulvus	Bee	Hymenoptera (Colletidae)	NSW (Nth Coast & Tablelands, Blue Mountains, Sth Coast)	0	53	$IUCN_{pending}$
Strumigenys xenos	Ant	Hymenoptera (Formicidae)	NSW, Qld	15	41	IUCN (VU)
Oreixenica latialis theddora	Alpine silver xenica	Lepidoptera (Nymphalidae)	Vic	17	35	Vic (En)
*Pollanisus hyacinthus**	KI forester moth	Lepidoptera (Zygaenidae)	SA (KI)	N/a	N/a	$IUCN_{pending}$
Temnohaswellia breviumbella	Parasitic flatworm	Neorhabdocoela (Temnocephalidae)	VIC (E Gippsland)	100	100	
Temnosewellia unguiculus	Parasitic flatworm	Neorhabdocoela (Temnocephalidae)	NSW (Sth Coast)	100	100	
Temnosewellia acicularis	Parasitic flatworm	Neorhabdocoela (Temnocephalidae)	ACT, VIC (E Gippsland, Alps)	50	100	

Scientific Name	Common Name	Order (Family)	State (Region)	% overlap SEVERE fire	% overlap TOTAL fire	Threatened status
Temnosewellia gracilis	Parasitic flatworm	Neorhabdocoela (Temnocephalidae)	NSW (Sth Coast)	50	100	
Georissa laseroni	Land snail	Neritopsina (Hydrocenidae)	NSW	19	47	IUCN (VU)
Petalura gigantea	Giant dragonfly	Odonata (Petaluridae)	NSW	23	43	NSW (EN)
Nunciella kangarooensis	Harvestman	Opiliones (Triaenonychidae)	SA (KI)	100	100	$IUCN_{pending}$
*Metaballus mesopterus**	Kangaroo Island marauding katydid	Orthoptera (Tettigoniidae)	SA (KI)	24	26	$IUCN_{pending}$
Atelomastix poustiei	Millipede	Spirostreptida (Iulomorphidae)	WA	73	79	WA (VU), $IUCN_{pending}$
Atelomastix danksi	Millipede	Spirostreptida (Iulomorphidae)	WA	40	65	WA (VU), $IUCN_{pending}$
Atelomastix tigrina	Millipede	Spirostreptida (Iulomorphidae)	WA	19	39	WA (VU), $IUCN_{pending}$
Bothriembryon (Bothriembryon) glauerti	Land snail	Stylommatophora (Bothriembryontidae)	WA	29	49	IUCN (VU)
Bothriembryon brazieri	Land snail	Stylommatophora (Bothriembryontidae)	WA	25	41	IUCN (VU)
Glyptorhagada bordaensis	Lland snail	Stylommatophora (Camaenidae)	SA (KI)	67	82	IUCN (VU)
Cupedora tomsetti	Land snail	Stylommatophora (Camaenidae)	SA (KI)	49	71	
Austrochloritis abrotonus	Land snail	Stylommatophora (Camaenidae)	NSW (Sth Coast)	36	54	$IUCN_{pending}$
Austrochloritis marksandersi	Land snail	Stylommatophora (Camaenidae)	NSW (Nth Coast & Tablelands)	32	75	$IUCN_{pending}$
Pommerhelix depressa	Jenolan Caves woodland snail	Stylommatophora (Camaenidae)	NSW	26	61	IUCN (VU)
Austrochloritis kippara	Land snail	Stylommatophora (Camaenidae)	NSW (Nth Coast & Tablelands)	12	78	$IUCN_{pending}$

Scientific Name	Common Name	Order (Family)	State (Region)	% overlap SEVERE fire	% overlap TOTAL fire	Threatened status
Hedleyropa yarrangobillyensis	Land snail	Stylommatophora (Charopidae)	NSW	65	91	$IUCN_{pending}$
Coricudgia wollemiana	Land snail	Stylommatophora (Charopidae)	NSW (Blue Mountains)	49	73	$IUCN_{pending}$
Macrophallikoropa stenoumbilicata	Land snail	Stylommatophora (Charopidae)	NSW (Blue Mountains)	44	75	$IUCN_{pending}$
*Gyrocochlea gibraltar**	Land snail	Stylommatophora (Charopidae)	NSW (Nth Coast & Tablelands)	32	32	$IUCN_{pending}$
Rhophodon kempseyensis	Land snail	Stylommatophora (Charopidae)	NSW (Nth Coast & Tablelands)	31	55	$IUCN_{pending}$
Egilodonta bendethera	Land snail	Stylommatophora (Charopidae)	NSW (Sth Coast)	30	100	$IUCN_{pending}$
*Gyrocochlea janetwaterhouseae**	Land snail	Stylommatophora (Charopidae)	NSW (Nth Coast & Tablelands)	25	25	$IUCN_{pending}$
Macleayropa kookaburra	Land snail	Stylommatophora (Charopidae)	NSW (Nth Coast & Tablelands)	20	73	
Letomola lanalittleae	Land snail	Stylommatophora (Charopidae)	NSW (Nth Coast & Tablelands)	18	55	$IUCN_{pending}$
Kaputaresta nandewarensis	Land snail	Stylommatophora (Punctidae)	NSW	50	100	
Triaenodes resima	Caddisfly	Trichoptera (Leptoceridae)	Vic, NSW	100	100	Vic (VU)
Ramiheithrus virgatus	Caddisfly	Trichoptera (Philorheithridae)	NSW (Sth Coast), VIC (Alps)	50	75	Vic (VU)

2.3.4.2. Prioritising species for response and research

We identified 99 Priority One or Two species, with expected ranges of restricted (N=68), highly restricted (N=6), which were likely SRE (16), or previously documented SRE (N=9), and for which available data indicated a high risk of extinction or extirpation, but had few relevant data on ecological or life history traits, or needed clarification of fire impact on known range. These species were prioritised for urgent response and research to elucidate aspects of their biology, ecology and distribution and to assess whether any populations had persisted. They were classed as high priority for research (Table 2.20).

A further 80 species, from Priority Three or Four, with moderate FSI and RRI scores and with estimated ranges of restricted (N=47), or highly restricted (N=10); or from Priority One or Two, with high FSI and RRI scores, but for which we had very low confidence in their likely range (N=24). These species were classed as Moderate priority for research.

Table 2.20. Species proposed as high priority for research. Species which are high priorities for research are marked with # and sorted by priority group. Species which are a moderate priority for research are marked by ^^ and sorted by priority group. Species marked with * are expert nominated species for which our measured overlap is below the threshold for highly fire impacted, or fire overlap could not be calculated, but that experts deem to be at risk. *Certainty* refers to the average number of traits a species could be scored for and *Confidence* refers to the confidence in the trait assignations, measured by 'Confident' (published literature or expert data for that species), 'Inferred' (trait inferred by using confamilials or congeners, and where there is little variability in that trait for the taxon), 'Inferred' (inferred from confamilials or congeners but where there is variability in that trait in that taxon). FSI (Fire Susceptibility Index) is a measure of a species' susceptibility to fire as determined by microhabitat, with a higher score indicating increased mortality. RRI (Recovery Risk Index) is a measure of ability of a species to recover post-fire, with higher score indicating highest risk of incomplete or delayed recovery. Estimated range: RR (restrwicted range); HR (highly restricted); LSRE (likely SRE); SRE (documented SRE).

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Neoniphargus richardi#	Amphipod	Amphipoda (Neoniphargidae)	RR	100	100	NSW (Sth Coast)	1	4	0.6	50 (37.5-62.5)	0.73	1
Neoniphargus secus#	Amphipod	Amphipoda (Neoniphargidae)	RR	100	100	NSW (Sth Coast)	1	4	0.6	50 (37.5-62.5)	0.73	1
Austrarchaea smithae#	Assassin spider	Araneae (Archaeidae)	RR	100	100	NSW (Blue Mountains)	2	14	0.45	100 (87.5-100)	0.69	1
Austmusia kioloa#	Desid spider	Araneae (Desidae)	RR	100	100	NSW (Sth Coast)	1	4	0.38	75 (62.5-87.5)	0.61	1
Stenygrocercus australiensis#	Spider	Araneae (Dipluridae)	RR	100	100	VIC (E Gippsland)	1	8	0.53	75 (62.5-87.5)	0.64	1
Caledothele australiensis#	Curtain-web spider	Araneae (Euagridae)	RR	0	100	VIC (E Gippsland)	1	6	0.7	50 (37.5-62.5)	0.83	1
Arbanitis horsemanae#	Spiny-legged trapdoor spider	Araneae (Idiopidae)	LSRE	100	100	NSW (Sth Coast)	1	9	0.6	58.3 (37.5-79.2)	0.75	1
Flavarchaea badja#	Shield spider	Araneae (Malkaridae)	RR	100	100	NSW (Sth Coast)	2	8	0.53	87.5 (75-100)	0.75	1
Ozarchaea bodalla#	Shield spider	Araneae (Malkaridae)	RR	100	100	NSW (Sth Coast)	1	7	0.47	87.5 (75-100)	0.75	1
Ozarchaea wiangarie#	Shield spider	Araneae (Malkaridae)	RR	100	100	QLD (SE Qld)	1	7	0.47	87.5 (75-100)	0.75	1
Perissopmeros quinguni#	Shield spider	Araneae (Malkaridae)	RR	100	100	NSW (Sth Coast)	1	7	0.47	87.5 (75-100)	0.75	1

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Perissopmeros arkana#	Shield spider	Araneae (Malkaridae)	RR	0	100	NSW (Blue Mountains)	1	6	0.5	75 (62.5-87.5)	0.75	1
Tasmanoonops elongatus#	Six-eyed ground spider	Araneae (Orsolobidae)	RR	100	100	NSW (Sth Coast)	1	4	0.45	87.5 (75-100)	0.62	1
Tasmanoonops grayi#	Six-eyed ground spider	Araneae (Orsolobidae)	RR	100	100	NSW (Blue Mountains)	1	5	0.72	75 (62.5-87.5)	0.62	1
Tasmanoonops hunti#	Six-eyed ground spider	Araneae (Orsolobidae)	RR	100	100	NSW (Blue Mountains)	1	5	0.72	75 (62.5-87.5)	0.62	1
*Moggridgea rainbowi#**	KI micro-trapdoor spider	Araneae (Migidae)	SRE	N/a	N/a	SA (KI)	3	15	0.68	N/a	0.71	1
Zephyrarchaea austini#	KI assassin spider	Araneae (Archaeidae)	SRE	100	100	SA (KI)	1	15	0.52	100 (87.5-100)	0.81	1
Isacanthodes monilis#	Primitive weevil	Coleoptera (Belidae)	RR	100	100	NSW (Blue Mountains)	1	4	0.3	75 (37.5-100)	0.62	1
Diphucrania williamsi#	Jewel beetle	Coleoptera (Buprestidae)	RR	100	100	NSW (Blue Mountains)	1	16	0.49	87.5 (37.5-100)	0.63	1
Notonomus wentworthi#	Ground beetle	Coleoptera (Carabidae)	RR	100	100	NSW (Blue Mountains)	1	9	0.63	87.5 (37.5-100)	0.82	1
Buburra jeanae#	Leaf beetle	Coleoptera (Chrysomelidae)	HR	100	100	VIC (Alps)	2	23	0.47	93.8 (75-100)	0.75	1
Paraschizognathus elgatus#	Scarab beetle	Coleoptera (Scarabaeidae)	RR	100	100	ACT	1	15	0.3	87.5 (37.5-100)	0.68	1
Seirotrana bimetallica#	Darkling beetle	Coleoptera (Tenebrionidae)	RR	100	100	NSW (Blue Mountains)	1	7	0.3	87.5 (75-100)	0.69	1
Seirotrana vicina#	Darkling beetle	Coleoptera (Tenebrionidae)	RR	100	100	NSW (Blue Mountains)	1	7	0.3	87.5 (75-100)	0.69	1
Austrocerus emarginatus#	Leafhopper	Hemiptera (Cicadellidae)	RR	100	100	SA (KI)	1	13	0.3	91.8 (79.2-100)	0.71	1
Pascoepus insularis#	Leafhopper	Hemiptera (Cicadellidae)	RR	100	100	SA (KI)	1	11	0.33	100 (87.5-100)	0.68	1

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Rosopaella flindersi#	Leafhopper	Hemiptera (Cicadellidae)	RR	100	100	SA (KI)	1	12	0.3	100 (87.5-100)	0.71	1
Merulana boydensis#	Isopod	Isopoda (Armadillidae)	RR	100	100	NSW (Blue Mountains)	1	5	0.54	58.3 (45.8-70.8)	0.73	1
Anisynta cynone anomala#	Mottled grass skipped	Lepidoptera (Hesperiidae)	RR	100	100	NSW (Nth Coast & Tablelands)	2	4	0.68	96.9 (75-100)	0.6	1
*Aenetus tindalei#**	Hepialid moth	Lepidoptera (Hepialidae)	RR	NA	NA	SA (KI)	0	17	0.65	NA	0.6	1
*Aenigmatinea glatzella#**	Enigma moth	Lepidoptera (Aenigmatineidae)	SRE	NA	NA	SA (KI)	NA	13	0.5	NA	0.8	1
Nanodectes platycercus#	Katydid	Orthoptera (Tettigoniidae)	RR	100	100	SA (KI)	1	18	0.52	100 (87.5-100)	0.64	1
*Kosciuscola cognatus#**	Skyhopper	Orthoptera (Acrididae)	RR	N/a		NSW, Vic (Alps)		N/a	N/a	N/a	N/a	1
*Kosciuscola tristis tristis#**	Skyhopper	Orthoptera (Acrididae)	RR	N/a		NSW, Vic (Alps)		24	0.8	N/a	0.7	1
*Kosciuscola usitatus#**	Skyhopper	Orthoptera (Acrididae)	RR	N/a		NSW, Vic (Alps)		24	0.8	N/a	0.7	1
Leptoperla dakota#	Stonefly	Plecoptera (Gripopterygidae)	RR	100	100	NSW (Blue Mountains)	1	12	0.5	56.3 (37.5-87.5)	0.7	1
Dicladosomella mesibovi#	Keeled millipede	Polydesmida (Paradoxosomatidae)	LSRE	100	100	NSW (Sth Coast)	1	10	0.45	65 (52.5-77.5)	0.79	1
Somethus `deua` #	Keeled millipede	Polydesmida (Paradoxosomatidae)	LSRE	100	100	NSW (Sth Coast)	1	11	0.44	65 (52.5-77.5)	0.78	1
Dicladosomella pollex#	Keeled millipede	Polydesmida (Paradoxosomatidae)	LSRE	100	100	ACT	1	9	0.6	62.5 (50-75)	0.79	1
Hesperisiphon peckorum#	Millipede	Polyzoniida (Siphonotidae)	LSRE	100	100	WA	1	5	0.36	75 (62.5-87.5)	0.75	1
Pseudotyrannochthonius `Harms sp. Stirling Range 1` #	Pseudoscorpion	Pseudoscorpiones (Pseudotyrannochthoniidae)	LSRE	100	100	WA	2	10	0.42	75 (62.5-87.5)	0.65	1

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Pseudotyrannochthonius `NSW-17` #	Pseudoscorpion	Pseudoscorpiones (Pseudotyrannochthoniidae)	LSRE	100	100	NSW (Blue Mountains)	1	10	0.42	75 (62.5-87.5)	0.65	1
Pseudotyrannochthonius `NSW-22` #	Pseudoscorpion	Pseudoscorpiones (Pseudotyrannochthoniidae)	LSRE	100	100	NSW (Nth Coast & Tablelands)	1	10	0.42	75 (62.5-87.5)	0.65	1
Pseudotyrannochthonius `NSW-27` #	Pseudoscorpion	Pseudoscorpiones (Pseudotyrannochthoniidae)	LSRE	100	100	NSW (Sth Coast)	1	10	0.42	75 (62.5-87.5)	0.65	1
Pedrocortesella kanangra#	Mite	Sarcoptiformes (Pedrocortesellidae)	RR	100	100	NSW (Blue Mountains)	1	4	0.6	87.5 (75-100)	0.73	1
Lopholiodes ceroplaste#	Mite	Sarcoptiformes (Pheroliodidae)	RR	76	94.3	NSW (Blue Mountains)	3	4	0.6	77.9 (64.6-92.0)	0.73	1
Fastosarion robusta#	Land Snail	Stylommatophora (Helicarionidae)	RR	0	100	NSW	1	8	0.49	62.5 (50-75)	0.75	1
Sigaloeista gracilis#	Land Snail	Stylommatophora (Helicarionidae)	RR	0	100	NSW (Nth Coast & Tablelands)	1	10	0.48	50 (37.5-62.5)	0.74	1
Psalidothrips wellsae#	Thrip	Thysanoptera (Phlaeothripidae)	RR	100	100	NSW (Sth Coast)	1	5	0.66	87.5 (75-100)	0.71	1
Barwontius lunoka#	Mite	Trombidiformes (Aturidae)	RR	100	100	NSW (Sth Coast)	1	2	0.3	87.5 (75-100)	0.73	1
Leptus baudini#	Mite	Trombidiformes (Erythraeidae)	RR	100	100	SA (KI)	1	7	0.47	75 (62.5-87.5)	0.73	1
Procorticacarus aloonus#	Mite	Trombidiformes (Hygrobatidae)	RR	100	100	NSW (Sth Coast)	1	4	0.6	50 (37.5-62.5)	0.78	1
Austrogammarus saycei#	Amphipod	Amphipoda (Paramelitidae)	RR	100	100	VIC (Alps)	1	7	0.39	50 (37.5-62.5)	0.61	2
Teyl `MYG634` #	Open-holed trapdoor spider	Araneae (Anamidae)	RR	54.5	65.8	WA	3	7	0.43	35.6 (25.5-47.8)	0.7	2
Risdonius lind#	Open-holed trapdoor spider	Araneae (Anapidae)	RR	0	100	VIC (E Gippsland)	1	4	0.45	62.5 (50-75)	0.62	2

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Procambridgea kioloa#	Desid spider	Araneae (Desidae)	RR	50	100	NSW (Sth Coast)	2	4	0.68	50 (37.5-62.5)	0.62	2
Carrai afoveolata#	Curtain-web spider	Araneae (Dipluridae)	LSRE	19.2	90.8	NSW (Nth Coast & Tablelands)	3	8	0.53	36.5 (10.8-64.2)	0.7	2
Meedo bluff#	Long-jawed ground spider	Araneae (Gallieniellidae)	RR	0	100	NSW (Blue Mountains)	1	3	0.4	50 (37.5-62.5)	0.62	2
Ixamatus fischeri#	Mygalomorph spider	Araneae (Microstigmatidae)	HR	24.3	67.1	NSW (Nth Coast & Tablelands)	5	10	0.48	30.5 (20.1-43.3)	0.78	2
Opopaea magna#	Goblin spider	Araneae (Oonopidae)	RR	11.5	71.5	NSW (Nth Coast & Tablelands)	3	6	0.5	40.1 (21.6-64.9)	0.71	2
Opopaea sown#	Goblin spider	Araneae (Oonopidae)	RR	22.2	63	NSW (Nth Coast & Tablelands), QLD (SE Qld)	5	6	0.5	39.8 (27.4-55.3)	0.71	2
Tasmanoonops drimus#	Six-eyed ground spider	Araneae (Orsolobidae)	RR	0	100	VIC (E Gippsland)	1	5	0.48	50 (37.5-62.5)	0.62	2
Tasmanoonops pallidus#	Six-eyed ground spider	Araneae (Orsolobidae)	RR	0	100	NSW (Sth Coast)	1	5	0.54	50 (37.5-62.5)	0.62	2
Pillara macleayensis#	Platform spider	Araneae (Stiphidiidae)	RR	50.7	91.2	NSW (Nth Coast & Tablelands)	3	8	0.49	50.7 (37.3-65.6)	0.69	2
Borrala webbi#	Platform spider	Araneae (Stiphidiidae)	RR	50	75	NSW (Nth Coast & Tablelands)	2	5	0.3	50 (31.25-75)	0.62	2
Astraeus (Astraeus) yarrattensis#	Jewel beetle	Coleoptera (Buprestidae)	RR	100	100	NSW (Blue Mountains)	1	9	0.43	62.5 (37.5-100)	0.66	2
Tachys bolus#	Ground beetle	Coleoptera (Carabidae)	RR	100	100	NSW (Nth Coast & Tablelands)	1	5	0.3	87.5 (75-100)	0.55	2
Notonomus variicollis#	Ground beetle	Coleoptera (Carabidae)	HR	42.1	67.6	NSW (Sth Coast)	13	9	0.63	48 (18.7-59.3)	0.8	2
Notonomus resplendens#	Ground beetle	Coleoptera (Carabidae)	HR	42.4	62	NSW (Sth Coast)	40	9	0.63	45.7 (18.0-56.4)	0.8	2

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Notonomus lateralis#	Ground beetle	Coleoptera (Carabidae)	RR	0	75	NSW (Blue Mountains)	2	9	0.63	32.8 (6.3-62.5)	0.82	2
Paraschizognathus elgatus elgatus#	Scarab beetle	Coleoptera (Scarabaeidae)	RR	0	100	NSW (Blue Mountains)	1	15	0.3	53.1 (12.5-75)	0.68	2
Cardiothorax undulaticostis#	Darkling beetle	Coleoptera (Tenebrionidae)	RR	77.1	90.6	NSW (Sth Coast)	3	6	0.3	78.7 (63.8-88.4)	0.55	2
Seirotrana major#	Darkling beetle	Coleoptera (Tenebrionidae)	RR	0	100	NSW (Nth Coast & Tablelands)	1	7	0.3	62.5 (50-75)	0.69	2
Pterohelaeus montanus#	Darkling beetle	Coleoptera (Tenebrionidae)	RR	100	100	NSW (Blue Mountains)	1	8	0.45	59.38 (37.5-81.25)	0.62	2
Glochocoris gippslandicus#	Flat bugs	Hemiptera (Aradidae)	RR	100	100	VIC (E Gippsland)	1	14	0.36	54.7 (37.5-81.3)	0.67	2
Kumaressa carraiensis#	Flat bugs	Hemiptera (Aradidae)	RR	19	68.6	NSW (Nth Coast & Tablelands)	3	8	0.45	34.9 (22.4-50.9)	0.76	2
Austronysius sericus#	True Bug	Hemiptera (Lygaeidae)	RR	100	100	WA	1	17	0.39	39.6 (12.5-95.8)	0.74	2
Glycaspis (Glycaspis) montana#	Plant louse	Hemiptera (Psyllidae)	RR	0	100	NSW (Nth Coast & Tablelands)	1	6	0.5	50 (37.5-62.5)	0.65	2
Holonuncia dispar#	Harvestman	Opiliones (Triaenonychidae)	RR	100	100	NSW (Sth Coast)	1	7	0.51	68.8 (56.3-81.3)	0.61	2
Agathodesmus bonang#	Keeled millipede	Polydesmida (Haplodesmidae)	SRE	40.7	61.3	VIC (E Gippsland)	3	11	0.55	34.5 (23.6-47.9)	0.78	2
Agathodesmus carorum#	Keeled millipede	Polydesmida (Haplodesmidae)	HR	11.2	67.7	NSW (Sth Coast), VIC (E Gippsland)	5	11	0.55	31.7 (18.6-48.4)	0.78	2
Antichiropus equinus#	Keeled millipede	Polydesmida (Paradoxosomatidae)	LSRE	0	100	WA	1	10	0.51	43.8 (31.3-56.3)	0.79	2
Gigantowales latescens#	Keeled millipede	Polydesmida (Paradoxosomatidae)	LSRE	0	100	NSW	1	9	0.6	43.8 (31.3-56.3)	0.79	2

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Dicladosomella cerberus#	Keeled millipede	Polydesmida (Paradoxosomatidae)	SRE	38.6	79	NSW (Sth Coast)	6	9	0.6	41.8 (28.8-57.3)	0.79	2
Dicladosomella anaticula#	Keeled millipede	Polydesmida (Paradoxosomatidae)	SRE	0	100	NSW (Sth Coast)	1	10	0.45	40 (27.5-52.5)	0.79	2
Hoplatessara nigrocingulata#	Keeled millipede	Polydesmida (Paradoxosomatidae)	SRE	20.2	85.7	NSW (Blue Mountains)	4	10	0.45	39.3 (28.3-50.6)	0.79	2
Hoplatessara anulata#	Keeled millipede	Polydesmida (Paradoxosomatidae)	HR	39.4	69.2	NSW (Nth Coast & Tablelands, Blue Mountains)	4	10	0.45	37.5 (27.6-48.6)	0.77	2
Dicladosomella abstrusa#	Keeled millipede	Polydesmida (Paradoxosomatidae)	SRE	54.6	61.1	NSW (Sth Coast)	3	9	0.6	37 (28.8-45.6)	0.79	2
Somethus biramus#	Keeled millipede	Polydesmida (Paradoxosomatidae)	RR	33.2	68.3	NSW (Sth Coast), VIC (E Gippsland)	14	11	0.44	35.6 (25.3-47.6)	0.74	2
Hoplatessara clavigera#	Keeled millipede	Polydesmida (Paradoxosomatidae)	RR	29.8	69.4	NSW (Sth Coast), VIC (E Gippsland, Alps)	12	10	0.45	35.2 (25.2-46.4)	0.75	2
Dicladosomella cygnea#	Keeled millipede	Polydesmida (Paradoxosomatidae)	SRE	24.2	64.5	NSW (Sth Coast)	3	9	0.6	32.8 (19-51.2)	0.79	2
Dicladosomella claridgei#	Keeled millipede	Polydesmida (Paradoxosomatidae)	SRE	34.2	58.8	NSW (Sth Coast)	8	9	0.6	32.1 (23.5-41.9)	0.79	2
Pseudotyrannochthonius `NSW-30` #	Pseudoscorpion	Pseudoscorpiones (Pseudotyrannochthoniidae)	LSRE	50	75	NSW (Nth Coast & Tablelands)	2	8	0.38	53.1 (34.4-81.3)	0.65	2
Pseudotyrannochthonius `Harms sp. Stirling Range 3` #	Pseudoscorpion	Pseudoscorpiones (Pseudotyrannochthoniidae)	LSRE	54.7	66	WA	3	8	0.38	50.1 (38.6-67.2)	0.65	2
Pseudotyrannochthonius australiensis#	Pseudoscorpion	Pseudoscorpiones (Pseudotyrannochthoniidae)	LSRE	0	100	NSW (Blue Mountains)	1	5	0.42	50 (37.5-62.5)	0.65	2
Pommerhelix depressa#	Land snail	Stylommatophora (Camaenidae)	RR	26.3	60.7	NSW (Blue Mountains)	4	10	0.45	31.9 (21.3-45)	0.74	2

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Parmavitrina flavocarinata#	Land snail	Stylommatophora (Helicarionidae)	LSRE	0	75	NSW (Nth Coast & Tablelands)	2	10	0.54	37.5 (18.8-62.5)	0.78	2
Barynema australicum#	Caddisfly	Trichoptera (Odontoceridae)	RR	100	100	NSW (Nth Coast & Tablelands)	1	6	0.6	62.5 (37.5-87.5)	0.64	2
*Chasmocephalon alfred^^*	Ground orb-weaving spider	Araneae (Anapidae)	RR	0	100	VIC (E Gippsland)	1	6	0.45	41.7 (29.2-54.2)	0.61	3
*Austmusia lindi^^*	Desid spider	Araneae (Desidae)	RR	0	100	VIC (E Gippsland)	1	5	0.42	37.5 (25-50)	0.61	3
*Procambridgea montana^^*	Desid spider	Araneae (Desidae)	RR	45	67.8	NSW (Nth Coast & Tablelands), QLD (SE Qld)	4	4	0.68	36.7 (27.8-46)	0.62	3
*Progradungula carraiensis^^*	Long-clawed spider	Araneae (Gradungulidae)	RR	0	100	NSW (Nth Coast & Tablelands)	2	8	0.56	37.5 (25-50)	0.62	3
*Venatrix allopictiventris^^*	Wolf spider	Araneae (Lycosidae)	RR	100	100	NSW (Nth Coast & Tablelands)	2	4	0.6	87.5 (75-100)	0.41	3
*Molycria bundjalung^^*	Long-spinneret ground spider	Araneae (Prodidomidae)	HR	10.9	73.8	NSW (Nth Coast & Tablelands)	8	3	0.4	39.6 (28-52.9)	0.65	3
*Jotus braccatus^^*	Jumping spider	Araneae (Salticidae)	RR	100	100	NSW (Nth Coast & Tablelands)	1	5	0.3	91.7 (79.2-100)	0.41	3
*Karaops toolbrunup^^*	Wall crab spider	Araneae (Selenopidae)	RR	70.9	74	WA	4	3	0.5	36.2 (26.9-45.6)	0.62	3
*Molytria vegranda^^*	Cockroach	Blattodea (Blaberidae)	HR	23.7	59.9	NSW (Sth Coast)	7	6	0.6	30.7 (21.2-41.7)	0.65	3
*Eutrechopsis ovalis^^*	Ground beetle	Coleoptera (Carabidae)	HR	0	100	NSW (Sth Coast)	1	5	0.54	62.5 (50-8)	0.58	3
*Neonomius laevicollis^^*	Ground beetle	Coleoptera (Carabidae)	RR	25.3	74.9	NSW (Sth Coast)	3	6	0.5	53.1 (39-69.7)	0.55	3
*Austropseudomorpha insignis pilosa^^*	Ground beetle	Coleoptera (Carabidae)	RR	0	100	NSW (Nth Coast & Tablelands)	1	4	0.38	50 (37.5-62.5)	0.55	3

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Nurus popplei^^	Ground beetle	Coleoptera (Carabidae)	RR	0	100	NSW (Nth Coast & Tablelands)	2	4	0.6	37.5 (25-50)	0.62	3
Diaspirus crenaticollis^^	Darkling beetle	Coleoptera (Tenebrionidae)	RR	100	100	NSW (Blue Mountains)	1	9	0.43	59.4 (37.5-81.3)	0.55	3
Cardiothorax alternatus^^	Darkling beetle	Coleoptera (Tenebrionidae)	RR	19.3	68.8	NSW (Nth Coast & Tablelands, Blue Mountains)	9	6	0.3	52.1 (28-79.9)	0.58	3
Faecula cristata^^	Ironclad beetle	Coleoptera (Zopheridae)	HR	48.4	67.5	NSW (Sth Coast)	5	4	0.3	45.8 (36.8-55.3)	0.63	3
Caenoprosopon niger^^	Fly	Diptera (Tabanidae)	RR	100	100	NSW (Sth Coast)	1	4	0.53	78.1 (37.5-100)	0.36	3
Cydistomyia hardyi^^	Fly	Diptera (Tabanidae)	RR	100	100	NSW (Blue Mountains)	2	3	0.5	78.1 (37.5-100)	0.31	3
Euryglossina (Euryglossina) macrostoma^^	Plasterer bee	Hymenoptera (Colletidae)	RR	56.9	95.1	NSW (Blue Mountains)	3	23	0.64	47.5 (25.7-70.6)	0.66	3
Platypyga subpetrae^^	Isopod	Isopoda (Amphisopodidae)	RR	100	100	WA	2	7	0.47	50 (37.5-62.5)	0.59	3
Coracistis erythrocosma^^	Moth	Lepidoptera (Oecophoridae)	RR	54.8	90.1	ACT	3	4	0.45	81.3 (68.2-88.2)	0.38	3
Metapherna salsa^^	Tineid moth	Lepidoptera (Tineidae)	RR	100	100	NSW (Sth Coast)	1	7	0.39	91.7 (70.8-95.8)	0.38	3
`GEN008` `sp.6, dna - S Zuiddam study` ^^	Harvestman	Opiliones (Triaenonychidae)	RR	0	100	WA	1	6	0.3	43.8 (31.3-56.3)	0.62	3
Dinotoperla arcuate^^	Stonefly	Plecoptera (Gripopterygidae)	RR	0	100	QLD (SE Qld)	1	8	0.56	33.3 (12.5-54.3)	0.64	3
Kimminsoperla kaputaris^^	Stonefly	Plecoptera (Notonemouridae)	RR	50	75	NSW	2	7	0.56	33.6 (18.8-62.5)	0.64	3
Synsphyronus `PSE025` ^^	Pseudoscorpion	Pseudoscorpiones (Garypidae)	RR	0	100	WA	1	4	0.3	33.3 (20.8-45.8)	0.6	3

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Pseudotyrannochthonius `NSW-1`^^	Pseudoscorpion	Pseudoscorpiones (Pseudotyrannochthoniidae)	RR	0	100	NSW (Sth Coast)	1	8	0.38	40.4 (32-51.2)	0.65	3
Samichus `Mt Trio` ^^	Millipede	Spirostreptida (Iulomorphidae)	RR	100	100	WA	1	6	0.3	41.7 (29.2-54.2)	0.65	3
Daternomina warrook^^	Caddisfly	Trichoptera (Ecnomidae)	RR	100	100	NSW (Nth Coast & Tablelands)	1	7	0.6	59.4 (37.5-100)	0.58	3
Ecnomina attunga^^	Caddisfly	Trichoptera (Ecnomidae)	RR	0	100	NSW	1	7	0.6	43.8 (12.5-62.5)	0.67	3
Ecnomina manicula^^	Caddisfly	Trichoptera (Ecnomidae)	HR	21.3	67.4	VIC (E Gippsland)	5	9	0.63	36.8 (12.8-54.9)	0.63	3
Notalina gungarra^^	Caddisfly	Trichoptera (Leptoceridae)	RR	100	100	VIC (E Gippsland)	1	6	0.6	62.5 (37.5-87.5)	0.58	3
Hydrobiosella lorum^^	Caddisfly	Trichoptera (Philopotamidae)	RR	21.9	84.6	NSW (Sth Coast), VIC (E Gippsland)	4	10	0.63	34.6 (14.6-59.3)	0.61	3
Maddisonia richardsoni^^	Jumping spider	Araneae (Salticidae)	RR	0	100	NSW (Sth Coast, Nth Coast & Tablelands)	2	4	0.3	62.5 (50-75)	0.41	4
Helpis merriwa^^	Jumping spider	Araneae (Salticidae)	RR	0	100	NSW (Blue Mountains)	1	6	0.45	43.8 (31.3-56.3)	0.41	4
Paratrachys (Paratrachys) australia^^	Jewel beetles	Coleoptera (Buprestidae)	RR	100	100	NSW (Blue Mountains)	1	7	0.47	68.8 (37.5-87.5)	0.41	4
Scitala nana^^	Scarab beetle	Coleoptera (Scarabaeidae)	RR	0	100	NSW (Blue Mountains)	1	8	0.3	43.8 (12.5-75)	0.54	4
Thyregis monteithi^^	Scarab beetle	Coleoptera (Scarabaeidae)	HR	27.8	77.4	NSW (Nth Coast & Tablelands)	4	8	0.41	40.8 (15.2-73.5)	0.42	4
Eristalopsis rubra^^	Bee fly	Diptera (Bombyliidae)	RR	0	100	NSW (Blue Mountains)	2	6	0.4	37.5 (12.5-62.5)	0.41	4
Clisa australis^^	Fly	Diptera (Cypselosomatidae)	HR	14.4	60.7	NSW (Nth Coast & Tablelands)	5	2	0.6	34 (21.6-49.5)	0.36	4
Austrosciapus riparius^^	Long-legged fly	Diptera (Dolichopodidae)	HR	46.7	61.6	NSW (Sth Coast, Blue Mountains)	11	8	0.53	47.7 (32.9-57.3)	0.42	4

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Antyx werrikimbe^^	Long-legged fly	Diptera (Dolichopodidae)	RR	34.3	73.6	NSW (Nth Coast & Tablelands)	3	11	0.52	40.9 (25.1-62)	0.48	4
Fergusonina manchesteri^^	Fly	Diptera (Fergusoninidae)	RR	29.3	61.5	ACT, NSW (Sth Coast)	5	4	0.6	34.1 (24.8-44.8)	0.43	4
Rectilamina torquate^^	True Bug	Hemiptera (Schizopteridae)	RR	0	100	QLD (SE Qld)	1	5	0.42	58.3 (45.8-70.8)	0.4	4
Leioproctus (Andrenopsis) flavorufus^^	Plasterer bee	Hymenoptera (Colletidae)	RR	0	100	NSW (Blue Mountains)	1	7	0.47	41.7 (20.8-62.5)	0.38	4
Trichocolletes burnsi^^	Plasterer bee	Hymenoptera (Colletidae)	RR	50.9	74.6	NSW (Nth Coast & Tablelands, Blue Mountains)	3	13	0.51	34.5 (20.7-57.6)	0.5	4
Orectognathus kanangra^^	Ant	Hymenoptera (Formicidae)	RR	100	100	NSW (Blue Mountains)	1	26	0.37	64.6 (50-79.17)	0.45	4
Chrysolarentia polyxantha^^	Geometer moth	Lepidoptera (Geometridae)	RR	38.3	70.1	ACT, VIC (Alps)	6	4	0.68	49.4 (35.1-54.7)	0.41	4
Conopomorpha heliopla^^	Moth	Lepidoptera (Gracillariidae)	RR	100	100	NSW (Sth Coast)	1	4	0.53	62.5 (37.5-100)	0.41	4
Pellopsis aerodes^^	Moth	Lepidoptera (Oecophoridae)	HR	50.1	85.4	ACT	6	5	0.3	55.2 (43.6-67.5)	0.41	4
Tortricopsis aulacois^^	Moth	Lepidoptera (Oecophoridae)	RR	0	100	ACT	1	5	0.54	50 (37.5-62.5)	0.41	4
Zacorus montivaga^^	Moth	Lepidoptera (Oecophoridae)	RR	0	100	NSW	1	5	0.3	50 (37.5-62.5)	0.38	4
Endotricha ignealis^^	Grass moth	Lepidoptera (Pyralidae)	HR	38.6	84	ACT	5	7	0.39	46 (33.5-60.49)	0.41	4
Nannochorista eboraca^^	Scorpionfly	Mecoptera (Nannochoristidae)	RR	0	100	ACT	1	4	0.9	34.4 (12.5-50)	0.51	4
Ecnomina rostrata^^	Caddisfly	Trichoptera (Ecnomidae)	RR	0	100	QLD (SE Qld)	1	7	0.6	43.8 (12.5-62.5)	0.58	4

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Ecnomina kepin^^	Caddisfly	Trichoptera (Ecnomidae)	RR	0	100	VIC (E Gippsland)	2	7	0.6	37.5 (12.5-62.5)	0.57	4
Hydrobiosella nandawar^^	Caddisfly	Trichoptera (Philopotamidae)	RR	0	100	NSW	1	6	0.6	37.5 (12.5-62.5)	0.58	4
Paralampona cobon^^	White-tailed spider	Araneae (Lamponidae)	DD	100	100	VIC (E Gippsland)	1	5	0.3	75 (62.5-87.5)	0.63	1
Storosa `sp. nov. 6`^^	Ant spiders	Araneae (Zodariidae)	DD	100	100	SA (KI)	1	6	0.3	81.3 (68.8-93.8)	0.63	1
Scaptodrosophila claytoni^^	Fly	Diptera (Drosophilidae)	DD	100	100	NSW (Nth Coast & Tablelands)	1	8	0.41	87.5 (75-100)	0.65	1
Scaptodrosophila sydneyensis^^	Fly	Diptera (Drosophilidae)	DD	100	100	NSW (Nth Coast & Tablelands)	1	8	0.41	87.5 (75-100)	0.65	1
Heterohesma clypeata^^	Plasterer bee	Hymenoptera (Colletidae)	DD	100	100	NSW (Blue Mountains)	1	20	0.54	87.5 (75-100)	0.61	1
Labiostrongylus (Labiomultiplex) eugenii^^	Nematode	Strongylida (Strongylidae)	DD	100	100	SA (KI)	1	3	0.5	75 (62.5-87.5)	0.75	1
Wombeyanus botulosus^^	Amphipod	Amphipoda (Neoniphargidae)	DD	100	100	NSW (Sth Coast)	1	6	0.4	50 (37.5-62.5)	0.61	2
Storenosoma picadilly^^	Hackled-mesh weaver	Araneae (Amaurobiidae)	DD	0	100	NSW (Blue Mountains)	1	4	0.45	50 (37.5-62.5)	0.63	2
Poecilipta micaelae^^	Swift ant spider	Araneae (Corinnidae)	DD	70.9	81.2	NSW (Nth Coast & Tablelands, Blue Mountains)	3	8	0.41	58.3 (47.9-69)	0.61	2
Cycloctenus abyssinus^^	Scuttling spider	Araneae (Cycloctenidae)	DD	50	75	NSW (Blue Mountains)	2	5	0.48	56.3 (35.4-83.3)	0.63	2
Jamberoo boydensis^^	Platform spider	Araneae (Stiphidiidae)	DD	33.2	48.9	NSW (Blue Mountains)	4	4	0.6	38.9 (28.0-52.1)	0.75	2
Sphallomorpha atrata^^	Ground beetle	Coleoptera (Carabidae)	DD	100	100	WA	1	6	0.5	68.75 (50-75)	0.6	2

Scientific Name	Common Name	Order (Family)	Estimated range	Severe fire %	Total fire Overlap %	Region	No. points	Certainty	Confidence	FSI (lower-upper bounds)	RRI	Priority group
Athemistus puncticeps^^	Leaf beetle	Coleoptera (Cerambycidae)	DD	100	100	NSW (Blue Mountains)	1	6	0.4	87.5 (37.5-100)	0.58	2
Trigonodera subparallela^^	Wedge-shaped beetle	Coleoptera (Ripiphoridae)	DD	0	100	NSW (Blue Mountains)	1	5	0.36	43.8 (12.5-75)	0.75	2
Carinatala meridiana^^	True bug	Hemiptera (Schizopteridae)	DD	0	100	NSW (Sth Coast)	1	6	0.3	62.5 (50-75)	0.63	2
Notodryas aeria^^	Moth	Lepidoptera (Oecophoridae)	DD	100	100	ACT	1	9	0.33	83.3 (70.8-95.8)	0.58	2
Opostegoides gephyraea^^	White-eyecap moth	Lepidoptera (Opostegidae)	DD	100	100	NSW (Sth Coast)	1	8	0.3	87.5 (62.5-87.5)	0.58	2
Australiscutum triplodaemon^^	Harvestman	Opiliones (Neopilionidae)	DD	35.3	56.4	NSW (Nth Coast & Tablelands, Blue Mountains)	4	4	0.3	41.4 (30-55.7)	0.75	2
Oligodectes urostegus^^	Katydid	Orthoptera (Tettigoniidae)	DD	100	100	WA	1	5	0.3	100 (87.5-100)	0.54	2
Neotrichozetes spinulosus^^	Mite	Sarcoptiformes (Neotrichozetidae)	DD	100	100	NSW (Nth Coast & Tablelands)	1	5	0.3	75 (62.5-87.5)	0.58	2
Daternomina hamata^^	Caddisfly	Trichoptera (Ecnomidae)	DD	50	100	NSW (Sth Coast)	2	7	0.56	60.9 (25-81.3)	0.67	2
Leptus utheri^^	Mite	Trombidiformes (Erythraeidae)	DD	100	100	NSW	1	7	0.3	75 (62.5-87.5)	0.58	2
Leptus agrotis^^	Mite	Trombidiformes (Erythraeidae)	DD	0	100	NSW	1	6	0.35	50 (37.5-62.5)	0.69	2
Neocheylus collis^^	Mite	Trombidiformes (Pseudocheylidae)	DD	100	100	WA	1	8	0.3	75 (62.5-87.5)	0.58	2

2.3.4.3. Summary figures for prioritisation.

The prioritisation and shortlisting process resulted in species being split into one of four groups, based upon analysis of fire-susceptibility, post-fire recovery ability and identification of key areas of uncertainty (Figs. 2.4 and 2.5):

a. Conservation assessment: Species with sufficient data to be plausible candidates for conservation assessment. Note these species are not necessarily more threatened than the species prioritised for research.

b. High priority research (marked with # in Table 2.20): Species likely at high risk of decline, but with uncertainties in ecological, biological or distributional data that preclude confident assessment of risk. That is, Priority 1 or 2 species, scoring highly on both RRI and FSI (the worst case using upper bounds) and where estimated range, based on public sources or expert elicitation was restricted (RR), highly restricted (HR), likely SRE (LSRE) or documented SRE (SRE), indicating higher certainty of estimation of fire overlap on species' distributions.

c. Moderate priority for research (marked with ^^ in Table 2.20): Species in Priority 1 or Priority 2, for which FSI and RRI indicate high susceptibility to fire and reduced recovery capacity, but with substantial uncertainties in ecological, biological or distributional data that preclude confident assessment of risk; or species in Priority 3 or 4, with moderate FSI and RRI scores and with likely restricted ranges.

d. Lower priority for research: Species for which there may be significant data deficiencies, but for which available data does not flag particularly elevated risk.

The entire known range of the Kangaroo Island assassin spider (*Zephyrarchaea austini*) was burnt at high severity. The species lives in leaf litter suspended amongst understorey vegetation and very little of its habitat remains following the fires. Image by J. Marsh

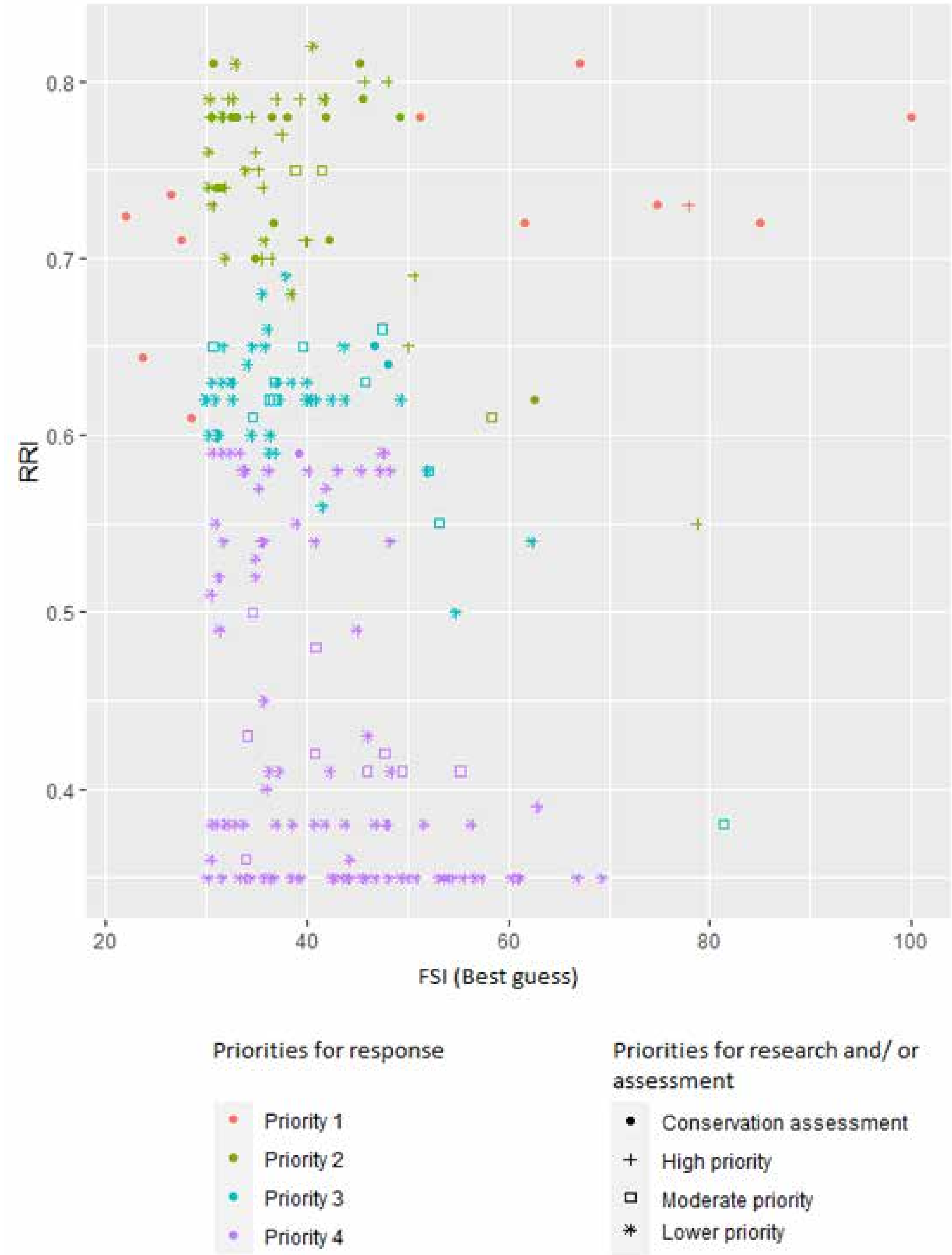


Figure 2.4. Scatterplot of species by Fire Susceptibility Index (FSI) against Recovery Risk Index (RRI), for species with >2 acceptable occurrence records for fire overlap analyses. Colours indicate prioritisation levels for species for response (based on average estimated risk category), and shapes indicate species proposed for conservation assessment and/or priority species for research. Priority 1 species are those estimated to have experienced highest proportional population losses (x axis; high average FSI) and to have highest recovery risks (y axis; high average RRI). Priority 4 species are those which are less vulnerable to direct immediate fire impact (x axis; low average FSI), and able to recolonise or persist in the post-fire ecosystem (y axis; low average RRI). Priority 2 and 3 species are those that have low average FSI and high average RSI, or vice versa. Priorities for research are as follows: + High priority research- Species likely at high risk of loss, extirpation, or extinction, but for which ecological, biological or distributional data are insufficient to allow confident assessment of risk; X Moderate priority for research: Species in Priority 1 or Priority 2, for which FSI and RRI indicate high susceptibility to fire and reduced recovery capacity, but for which distributional data are sparse, so analysis of risk was not possible; * Lower priority for research: Species for which there may be significant data deficiencies, but for which available data does not flag particularly elevated risk. Species for Conservation Assessment in the top left of the figure (y axis high; high average RSI; x axis low; low average FSI) are those nominated by experts, for which our analyses may have underestimated fire overlap.

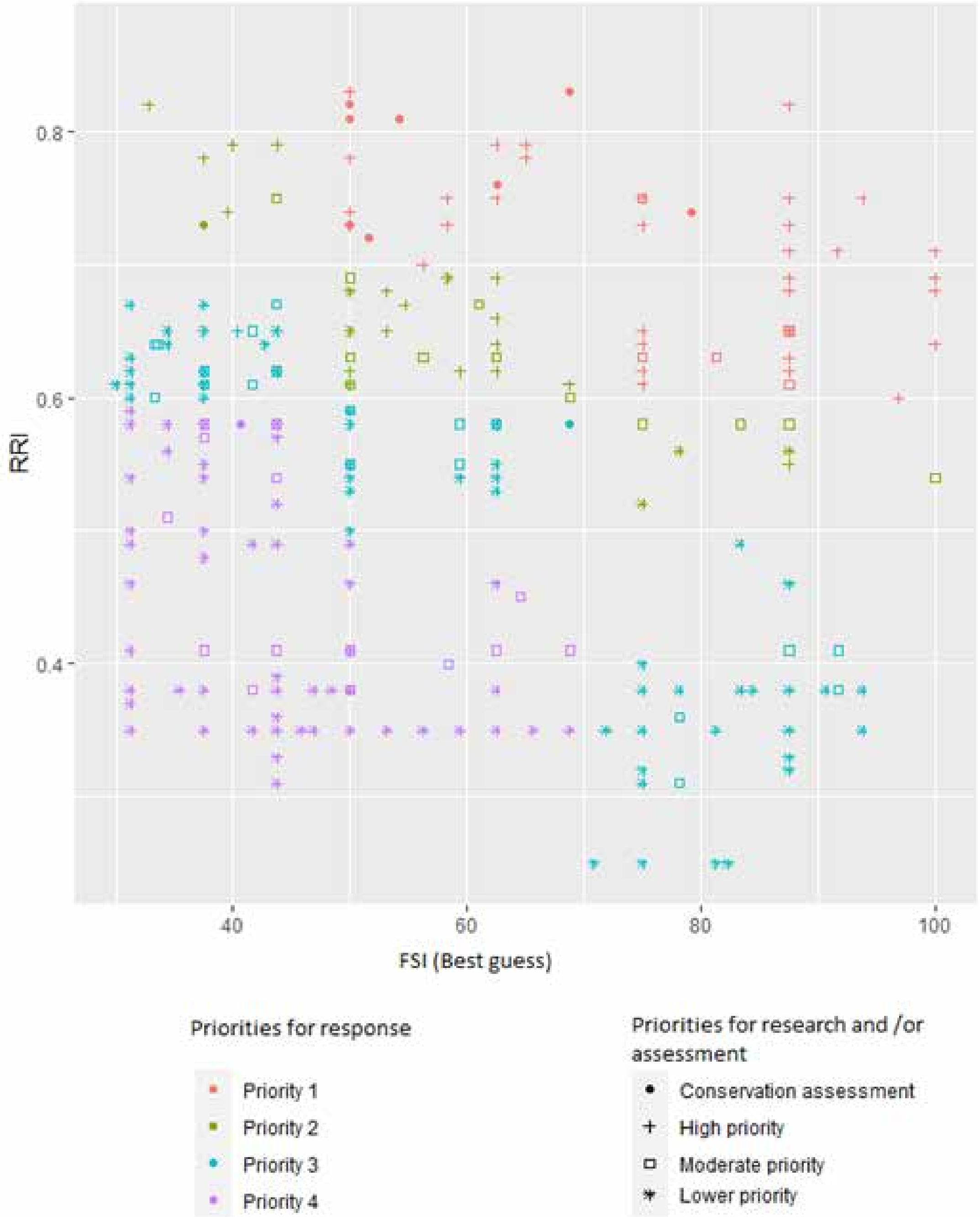


Figure 2.5. Scatterplot of species by Fire Susceptibility Index (FSI) against Recovery Risk Index (RRI), for species with only one or two acceptable occurrence records for fire overlap analyses. Colours indicate priority species for response and shapes indicate priority species for research (both survey and trait assessment), and those species deemed eligible for further conservation assessment. Priority one species are those estimated to have experienced highest proportional population losses (x axis) and to have highest recovery risks (y axis).

2.3.5 Review of fire impact for the provisional set of fire-affected invertebrate species

The Australian government – along with state and territory governments, conservation organisations, philanthropic groups, landholders and volunteers – responded rapidly to the conservation challenges imposed by the catastrophic wildfires of 2019-20. Within guidelines that included the objectives of seeking to prevent any extinctions due to the fire and to secure the recovery of the most fire-affected species, the Australian government rapidly developed provisional lists of fire-affected ecological communities, plants, vertebrates and invertebrates as particular targets for urgent and considerable post-fire conservation investment.

Developing a provisional list of priority invertebrates for post-fire recovery attention, within the short timeframe required to guide urgent post-fire response, proved to be a formidable challenge. The provisional listing, published in April 2020 (https://www.environment.gov.au/biodiversity/bushfire-recovery/bushfire-impacts/priority-invertebrates), was compiled from a combination of advice contributed by many experts (collated in large part through a virtual workshop held in late March 2020), along with spatial analysis, for some representative and/or better known groups, of a preliminary fire extent layer with invertebrate distributional data held in the Atlas of Living Australia and in the Species of National Environmental Significance spatial dataset (for EPBCA-listed species) and the Species Observation System (SOS) database (for unlisted species) of the Department of Agriculture, Water and the Environment. The provisional assessment did not aim to be comprehensive given the then available timeframe.

The provisional list comprised 191 invertebrate species, with a further 22 species of spiny crayfish (*Euastacus* spp.) included in an earlier compilation that otherwise focused on vertebrate species (https://www.environment.gov.au/system/files/pages/ef3f5ebd-faec-4c0c-9ea9-b7dfd9446cb1/files/provisional-list-animals-requiring-urgent-management-intervention-20032020.pdf).

With the benefit now of a larger compilation of distributional data and fire mapping that includes severity, we reviewed fire overlap estimates for the invertebrate species included in the provisional list. A full tabulation of fire overlap value for each of the 191 species is given in Appendix 3; and summarised in Table 2.21. Of the 191 species, we collated no acceptable distributional data for 32 species: these were mostly undescribed species for which experts expressed concern, or described species with very few records generally and no records that passed our filters. In contrast, we found that most of the provisional priority species had at least 30% fire overlap, supporting the validity of their inclusion in the initial list. Seventeen of the 191 species were found to have zero fire overlap; but these were mostly species with very few acceptable records, meaning that our current assessment of fire overlap is of low confidence.

Table 2.21. Summary of fire overlap values for the 191 invertebrate species listed as provisional priorities at April 2020.

Fire overlap class	No. (%) of species
At least 30% with severe fire, or at least 50% with total fire	64 (33.5%)
Not above, but 10-30% with severe fire, or 30-50% with total fire	41 (21.5%)
Not above, but 1-10% with severe fire, or 5-30% with total fire	31 (16.2%)
Not above, but >0 to 1% with severe fire, or >0 to 5% with total fire	6 (3.1%)
No overlap with fire	17 (8.9%)
No data	32 (16.8%)

However, more notable than the fact that some of the provisional priority species have (happily) now been found not to be as fire-affected as originally feared, is the number of invertebrate species that we found to be substantially fire-affected that were not included in the initial list. Our subsequent analysis here (section 2.3.1) shows that 1237 species meet the inclusion criteria used in the provisional listing of at least 50% distributional overlap with fire, or at least 30% distributional overlap for threatened species with fire. The likelihood of under-representation was recognised in the provisional listing; this current assessment underscores the magnitude of that under-representation.

2.3.6. Comparison of results with other published assessments

There are many sources of uncertainty in assessments of fire impacts (Table 1.3). To contextualise and help interpret our assessment, it is useful to compare our results with those of other related studies. The most substantial such published study is that of Hyman et al. (2020), who assessed overlap with the 2019-20 fires in New South Wales for 733 invertebrate species (from six taxonomic groups: dung beetles, spiny freshwater crayfish, drosophilid flies, landsnails, mygalomorph and archaeid spiders), based on records held by the Australian Museum. That study found that all of their locational records for 29 of these species were in areas burnt in the 2019-20 fires, and a further 46 species had at least half of their known records in areas that were burnt.

Our results for these 75 species are cross-matched in Table 2.22 and illustrated in Fig. 2.6. There are several key conclusions from this comparison:

i. Fifteen of these species were not included in our study, because we accessed no acceptable records (because we used different filters, we didn't include some undescribed species, or we didn't access the relevant databases). This indicates that our listing of the most fire-affected invertebrate species is likely to be conservative – many other relatively poorly known species that we did not include are likely to have also experienced significant fire impacts. It further illustrates that knowledge held by relevant specialists may substantially enhance inference from spatial analysis alone.

ii. For the species that were included in the two studies, there was general agreement about the broad extent of fire overlap. Of the 39 species included in both studies that Hyman et al (2020) assessed as having >60% overlap with fire, our analysis found that 33 (85%) had at least 30% overlap with severe fire or at least 50% with some fire.

iii. We reported a far smaller proportion of these species to have 100% overlap with fire. Whereas Hyman et al. (2020) found 29 of these species to have 100% of their point locations burnt, we reported such total overlap for only six of these species. We consider that this disparity is due mostly to our use of polygons as one of two mechanisms to assess extent of fire overlap. It is much more likely that all points will fall within burnt areas (especially where there are few points) than that the entire extent of a polygon will be burnt. There are different assumptions and biases in the use of polygons and of points, and we attempted to balance these through calculating overlaps for both points and for polygons, and averaging the overlap values. Notably all six of the species in this set that we reported to have 100% fire overlap had only one or two records in our assessment, such that we did not (could not) include polygons in our evaluation.

iv. Two species have notable discrepancies in overlap values between the two studies: *Rhophodon palethorpei* was reported to have 100% fire overlap by Hyman et al. (2020) whereas we considered it to have 0% overlap; and *Arbanitis paulaskewi* was reported to have 50% fire overlap by Hyman et al. (2020) whereas we considered it to have 0% overlap. Notably, these species were represented by only two and one records, respectively, in our collated database. These cases illustrate that assessments based on very few records may have low confidence, and even minor interpretative or mapping differences for species with very few records may result in very marked changes in estimates of fire overlap. Much more confidence can be allocated to overlap values for species represented by more records.

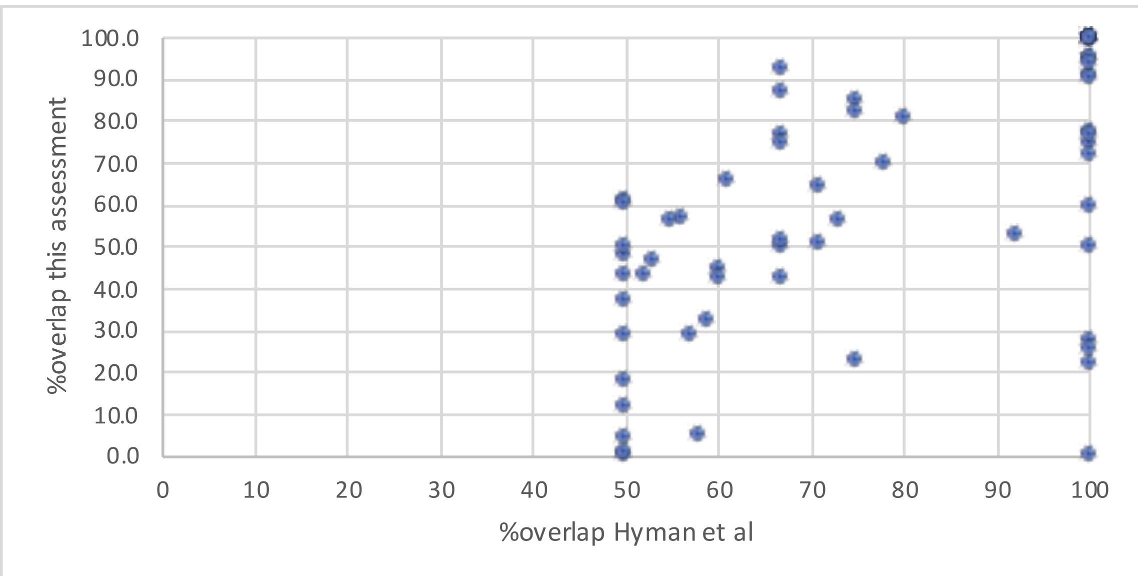


Figure 2.6. Scatterplot of estimates of fire overlap from this study and Hyman et al. (2020) for the 75 invertebrate species reported by Hyman et al. (2020) to have at least 50% fire overlap

Table 2.22. Cross-matching of fire overlap estimates for individual species from this study and Hyman et al. (2020) for 75 species reported by Hyman et al. (2020) to have at least 50% fire overlap. ND indicates species not evaluated in our study because we accessed no acceptable records. The table includes two of our estimates for total fire overlap, one including GEEBAM2 (G2) as burnt, and one using the average estimate for mild fires with and without inclusion of GEEBAM2 (G2/3).

Species	Fire overlap [Hyman]	No. records [this study]	Total fire overlap G2 [this study]	Total fire overlap G2/3 [this study]	Overlap with severe fire [this study]
Acletoxenus formosus	100	ND			
Aname caeruleomontana	100	ND			
Arbanitis helensmithae	100	ND			
Arbanitis horsemanae	100	1	100.0	100.0	100.0
Arbanitis macei	100	1	100.0	100.0	0.0
Austrarchaea mcguiganae	100	4	90.8	88.7	76.3
Austrarchaea monteithi	100	3	90.4	84.9	49.9
Austrarchaea smithae	100	2	100.0	100.0	100.0
Austrochloritis kippara	100	5	95.0	78.2	11.8
Carrai afoveolata	100	3	95.0	90.8	19.2
Coricudgia wollemiana	100	5	74.8	73.2	48.6
Egilodonta bendethera	100	2	100.0	100.0	100.0
Egilomen sebastopol	100	2	50.0	50.0	0.0
Euastacus bidawalus	100	5	76.9	73.8	56.7
Euastacus guwinus	100	3	99.1	97.9	73.5
Euastacus vesper	100	2	100.0	100.0	50.0
Euastacus "spinifer"	100	40	27.6	23.5	7.8
Gyrocochlea janetwaterhouseae	100	18	71.7	62.9	25.3
Hedleyropa yarrangobillyensis	100	7	93.6	90.6	64.9
Letomola lanalittleae	100	3	59.4	55.4	17.5
Leucophenga subpollinosa	100	ND			
Macrophallikoropa stenoumbilicata	100	6	76.5	74.9	43.6
Onthophagus weringerong	100	6	22.3	21.5	1.9
Planorbacochlea dandahra	100	ND			
Rhophodon palethorpei	100	2	0.0	0.0	0.0
Scaptodrosophila eluta	100	ND			
Scaptodrosophila jackeyi	100	ND			
Sigaloeista gracilis	100	1	100.0	100.0	0.0
Thyregis kershawi	100	4	25.6	25.6	25.3
Matthewsius illawarrensis	92	12	52.9	51.7	31.2
Euastacus clarkae	80	19	80.7	67.5	32.7
Scaptodrosophila ehrmanae	80	ND			
Austrochloritis seaviewensis	78	12	69.5	57.7	16.0
Austrochloritis marksandersi	75	8	84.6	75.2	31.3
Matthewsius rossi	75	9	81.9	81.0	56.6
Onthophagus squalidus	75	24	22.6	20.3	8.6

Species	Fire overlap [Hyman]	No. records [this study]	Total fire overlap G2 [this study]	Total fire overlap G2/3 [this study]	Overlap with severe fire [this study]
Euastacus pilosus	73	11	56.3	51.7	21.1
Austrochloritis wollemiensis	71	22	64.2	55.7	25.4
Vitellidelos kaputarensis	71	17	50.6	43.8	9.4
Diorygopyx duplodentatus	67	3	92.2	75.9	10.4
Euastacus girurmulayn	67	2	50.0	25.0	0.0
Gyrocochlea gibraltar	67	7	87.0	74.1	31.7
Ixamatus fischeri	67	5	76.8	67.1	24.3
Meredithena marysvillensis	67	5	51.6	48.1	25.6
Paraembolides boydi	67	3	74.7	63.7	26.4
Protorugosa alpica	67	24	42.4	30.0	6.4
Euastacus yanga	61	25	65.7	61.1	40.0
Aulacopris reichei	60	3	44.7	43.1	13.8
Austrochloritis kaputarensis	60	14	42.7	39.4	0.6
Onthophagus msp cbcr3-001	60	ND			
Amphistomus trispiculatus	59	42	32.0	25.9	8.0
Onthophagus rubicundulus	58	234	5.2	4.3	1.1
Prolesophanta occlusa	57	10	28.8	25.5	14.0
Austrochloritis abrotonus	56	48	57.0	54.2	35.9
Pommerhelix monacha	55	50	56.2	52.0	22.5
Oreomava cannfluviatilus	53	18	46.4	39.6	24.3
Aulacopris maximus	52	22	42.9	33.6	14.0
Arbanitis paulaskewi	50	1	0.0	0.0	0.0
Atrax yorkmainorum	50	8	28.5	26.7	13.1
Austrochloritis paucisetosa	50	6	47.9	30.3	4.5
Cethegus barraba	50	2	50.0	50.0	50.0
Euastacus claytoni	50	9	36.8	35.9	31.8
Hadronyche emmalizae	50	3	43.0	40.6	13.9
Ixamatus musgravei	50	3	11.8	7.5	0.8
Kandoschloritis pustulosus	50	9	17.6	13.8	8.7
Lepanus msp NSW-2	50	ND			
Lepanus nr pisoniae	50	ND			
Lepanus ustulatus	50	130	4.0	3.1	0.9
Leucophenga domanda	50	ND			
Macleayropa boonanghi	50	6	61.1	50.9	19.5
Onthophagus kokereka	50	87	1.2	1.1	0.1
Planorbacochlea manningensis	50	ND			
Rhophodon kempseyensis	50	11	60.5	55.5	31.3
Scaptodrosophila anthemon	50	ND			
Scaptodrosophila insolita	50	ND			

One other comparison for our results is notable. Moir (2021) published a detailed account of the impacts of fires, including the 2019-20 wildfires, on the Critically Endangered mealybug *Pseudococcus markharveyi*. She concluded that the 2019-20 fires killed the last known adult individuals of its obligate host plant, *Banksia montana*, thereby leading to the co-extinction of *Pseudococcus markharveyi*. In contrast, our analysis included two locational records for this species, one of which was burnt in severe fire in 2019-20 and the other unburnt in 2019-20: hence we concluded that 50% of the population was affected by the 2019-20 fires. However, as reported in Moir (2021), the two known populations of this highly restricted species have been affected (incrementally lost) by fires spanning several years, with one of the two populations probably extirpated by fire in 2018. In this case, one of our two locational records represented a population that had already been extirpated by fire, preceding 2019-20: hence we under-estimated the proportionate loss due to the 2019-20 fires, notably not recognising that the 2019-20 fire likely caused the extinction of this species. There are several interpretative lessons we conclude from this example:

1. Although we generally excluded all distributional records with collection dates prior to 1990, to attempt to exclude areas in which a species may not now occur, this case demonstrates that for rapidly declining species, that exclusion filter may have been insufficient. A clear consequence evident in this case is that where the range at the onset of the 2019-20 fires was significantly more restricted than the range at 1990, there is a risk that we may have significantly under-estimated fire overlap and impact.
2. Our assessment relates to fire events across a single (exceptional) year. However, the impacts of this single year's fire should be contextualised by the history of fire events and fire regimes more generally. Although the 2019-20 fires had major impacts on many invertebrate species, these impacts may be but part of more profound impacts caused by a series of fire events.
3. As with the comparison with the results from the Hyman et al. (2020) study, this example also illustrates that knowledge held by relevant specialists may substantially enhance inference from spatial analysis alone.

Our assessment is national in geographic scope and as comprehensive as possible in taxonomic scope, but we recognise that more local and specialised knowledge may also provide necessary context and knowledge for interpreting fire impacts on particular species.

2.4. Comparison of fire overlaps of invertebrate and vertebrate species

Much concern about the impacts of the 2019-20 fires has been directed to losses sustained by vertebrate species, particularly charismatic mammals (Phillips et al. 2020; van Eeden et al. 2020; Ward et al. 2020), and many fire-affected vertebrate taxa have now been prioritised for conservation management response and for assessment for listing nationally as threatened

(Listing assessments under the EPBC Act | Department of Agriculture, Water and the Environment)

Such attention is justified; however, it is useful to contextualise the extent of loss for vertebrate species with that of other components of biodiversity, and to more explicitly recognise the extent of loss in components of biodiversity that are sometimes perceived as less charismatic. Our assessment of the impacts of fire on Australian invertebrate species can readily be counterpointed with a complementary recent assessment of the impacts of fire on Australian vertebrates (Legge et al. 2021), to provide such a coarse comparison. Tables 2.23 and 2.24 provide such a summary, tallying the numbers of invertebrate and vertebrate species whose distributions overlap substantially with all fires (including GEEBAM2, to allow for comparability) and with severe fires (GEEBAM classes 4 and 5). Note that the Legge et al. (2021) report also included assessments of fire overlap for spiny crayfish (*Euastacus* spp.); the estimates there for that group are not included here, to avoid double-counting.

Table 2.23. Tallies of the number of species of invertebrate and vertebrate taxa with extensive overlap with the 2019-20 wildfires. Tallies in brackets for invertebrates exclude those species with only one or two records in our analysis.

	No. of species					
% overlap with total fire	Invertebrates	Fish	Frogs	Reptiles	Birds	Mammals
100%	541 (0)	4	0	0	0	0
90-99.9%	44 (44)	1	1	1	0	1
80-89.9%	29 (29)	0	1	1	0	1
70-79.9%	60 (60)	0	3	1	0	1
60-69.9%	75 (75)	0	3	1	17 #	1
50-59.9%	412 (155)	4	8	1	4	5
Total 50+	**1161 (363)**	**9**	**16**	**5**	**21**	**9**

mostly a set of endemic Kangaroo Island subspecies.

Table 2.24. Tallies of the number of species of invertebrates and vertebrates with extensive overlap with *severe* wildfires. Tallies in brackets for invertebrates exclude those species with only one or two records in our analysis.

	No. of species					
% overlap with severe fire	Invertebrates	Fish	Frogs	Reptiles	Birds	Mammals
100%	193 (0)	1	0	0	0	0
90-99.9%	0 (0)	2	0	0	0	1
80-89.9%	0 (0)	2	0	0	0	0
70-79.9%	10 (10)	0	0	0	0	0
60-69.9%	6 (6)	0	0	0	0	0
50-59.9%	151 (26)	2	0	0	16	1
40-49.9%	44 (44)	2	0	1	0	0
30-39.9%	130 (130)	0	3	3	0	0
Total 30+	**534 (216)**	**9**	**3**	**4**	**16**	**2**

This comparison is constrained also by the limited information available for many invertebrate species – notably that we could not include in our analysis many invertebrate species known to occur in the PAA, but for which we could obtain no acceptable records and hence were not included in our analysis and in the tallies in these tables. Many of these species are also likely to have had extensive overlaps with fire. In contrast, there was sufficient distributional data to evaluate fire overlap for all vertebrate species occurring in the PAA.

Nonetheless, the tables clearly show that invertebrate species comprise by far the majority of animal species that experienced high fire overlap, with invertebrate species contributing 95% of the animal species with at least 50% distributional overlap with fire, and 94% of the animal species with at least 30% distributional overlap with severe fire. It remains a considerable but important conservation challenge to complement the management response efforts directed to fire-affected vertebrate species with analogous conservation responses for the far larger number of fire-affected invertebrate species.

Invertebrate species for which we could access only one or two acceptable records comprised a large proportion of the tally of species with high fire overlap. Although high fire overlap may well be valid for such species, our assessment for them is of low confidence, in part because no polygons could be developed from so few records, so assessment is based solely on the very few available points of occurrence. Exclusion of such species substantially reduces the tally of invertebrate species known to have high fire overlap. Nonetheless, the remaining invertebrate species (i.e., those with >2 records) still comprise the vast majority of animal species with high overlap: 86% of all animal species with at least 50% overlap with any fire, and 86% of animal species with at least 30% overlap with severe fire.

2.5. Discussion

Our analyses revealed a large number of invertebrate species, across a range of taxonomic groups, that were heavily impacted by fire, many of which are likely to have suffered significant population decline and are at risk of extirpation or extinction.

We identified 60 species that are likely at immediate threat and which have sufficient data for assessment of conservation status. We list a further 99 species which are highly susceptible to fire and now likely to be threatened, but which require urgent surveys to confidently define this and to assess post-fire population trends and 80 species that are likely at threat, but need further research to resolve uncertainties: current knowledge gaps for these species are likely to constrain assessments of conservation status. It is likely that the actual number of invertebrate species now threatened following the 2019-20 fires will far exceed the numbers we can confidently assess as priorities; the limiting factor being insufficient data, rather than lack of threat. Indeed, one of the greatest challenges facing invertebrate conservation is this: that the large number of species and the proportion with restricted ranges, suggests a far greater number of invertebrates are likely to be at risk of extinction (compared to vertebrates); however, the large number of species has resulted in wide-scale data deficiency, meaning for most species there is currently no way of confidently assessing population trends. For this reason, our wide scale analysis, using the best possible data available to identify the invertebrate species most at risk, and requiring conservation assessment, response or urgent research, is critical. The trait framework we have developed to assess fire susceptibility and recovery potential of species is a resource available to use to prioritise species for threat following other large scale disturbance events. Of the species proposed here as candidates for conservation assessment, 37% are short-range endemic species (SRE) and 14% are likely short-range endemics; of the high priority species, 7% are SRE, 18% are likely SRE. With their highly restricted distributions, low fecundity, slow growth rate and low dispersal abilities, short-range endemic taxa may be at a heightened risk of extinction following large-scale fire and are of conservation concern (Harvey 2002; Harvey et al. 2011), particularly those species also with traits that render them particularly susceptible to fire.

An organism's susceptibility to fire can be viewed as an interaction between i) its vulnerability to mortality through exposure to radiant heat or smoke (direct effects of fire), as measured here by our Fire Susceptibility Index (FSI), and ii) its ability to recover or recolonise following fire and persist in the altered post-fire ecosystem (indirect effects of fire) (Whelan et al. 2002), as measured here by our Recovery Risk Index (RRI) – with both response characteristics governed by life history and ecological traits (Swengel 2001). Some taxa may be highly vulnerable to direct immediate fire impact (score highly for FSI), but be able to recolonise or persist in the post-fire ecosystem (low score for RRI), or vice versa. For example, many orb weaving spiders (Araneidae) live in webs suspended in midstorey vegetation and thus are highly vulnerable to burning, but most are generalist predators and are frequent aerial dispersers by ballooning (Bell et al. 2005; Framenau et al. 2014) and thus have relatively good post-fire recolonisation potential. Whilst species such as these likely suffered high levels of mortality and may now be threatened, especially following large-scale fire, their lack of range restriction and strong dispersal abilities means they were not prioritised in this project. For such species, further data collection is required to assess actual threat levels and devise management plans, where needed.

For some taxa, such as velvet worms (Onychophora), or some land snails (Stylommatophora), which live in rotting logs, or under rocks, their habitat may provide sufficient protection from lethal radiant heat for them to survive the fire front passing through. However, for these groups, mortality may largely be through indirect effects of fire. Velvet worms are soft bodied invertebrates, typically living in or under rotting logs in moist habitats, they are highly sensitive to desiccation and most species exhibit extreme levels of short-range endemism (Harvey 2002; Oliveira et al. 2012). Biota living within, or under, logs may receive protection from the lethal effects of radiant heat (Swengel 2001), however, given the sensitivity of velvet worms to desiccation, exposure to fluctuations in temperature and humidity in the altered post-fire ecosystem following burning of leaf litter, organic woody debris and shade-providing vegetation, may result in a further decline, as has been shown for other desiccation sensitive SRE groups (Mason et al. 2019). Taxa such as these were prioritised for assessment or research given their highly restricted ranges and traits that make them potentially vulnerable following fire.

Native millipedes are another desiccation sensitive, low dispersive SRE group. Typically millipedes live in leaf litter, and under rocks and logs, but studies have shown that some groups may burrow deep into the soil during summer, thereby providing significant protection from summer fires (Harvey and Rix 2019). As a case study, *Dicladosomella anaticula* is a species of millipede from New South Wales, which lives in leaf litter, is low dispersing, likely short-range endemic and is only known from a couple of occurrences points (Car 2016), both of which burnt at high severity. It is not known whether this species buries in to the soil over summer, but in consultation with experts, this species and other SRE millipedes have been classified as high priorities for urgent research, with data required to determine post-fire persistence or loss and any threats to recovery. Taxa such as these may now be in decline, especially if any additional threats are acting on populations and further impacting recovery.

Post-fire surveys of these, and similar groups, are urgent, to assess which species are most imperilled, so targeting species for conservation assessment or response, but also for predicting those taxa likely most vulnerable from impact by future fire events.

Species with high host-specificity, and especially those where the host is fire-susceptible and already threatened, are at elevated risk of co-extinction. Our trait framework identified several taxa which were at particular risk of co-extinction, including the Banksia montana plant louse (*Pseudococcus markharveyii*), which may now be extinct (Moir 2021) and the temnocephalid parasitic flatworms of threatened species of spiny crayfish (*Euastacus* spp.) (Hoyal Cuthill et al. 2016). Accordingly, both these examples have been prioritised for conservation assessment, or uplisting.

Among the most imperilled species in the prioritised list are those with susceptibility to direct fire impact (high FSI score) and with high risk of incomplete post-fire recovery (High RRI), for example the Assassin spiders (Archaeidae). Assassin spiders are primitive short-range endemic, low dispersive spiders that live in highly flammable elevated leaf litter, suspended in low lying vegetation (Rix and Harvey 2011), meaning species in the group are highly fire susceptible, scoring highly on FSI and RRI.

Whilst research shows that SREs may be of elevated conservation concern, many non-SRE species may now be threatened; the exceptional scale of the 2019-20 fires and the cumulative effect of other threats means that many species have been impacted across large proportions of their ranges. Of the species prioritised for conservation assessment, one species (the green carpenter bee *Xylocopa aeratus*) occurred across multiple states, and 11 were restricted to within a single state, but not SRE.

Fire susceptibility and post fire recovery potential, as measured using the trait framework, varied across and within taxonomic groups and for large, highly variable families there was much variation in the FSI and RRI for constituent members. In terms of numbers of species prioritised, for recovery action, the highest-ranking orders were Lepidoptera (butterflies and moths), Coleoptera (beetles), Araneae (spiders) and Diptera (flies).

Of the butterflies and moths, species from three families made up 61% of all species in the prioritised list; these were all families of moth – Oecophoridae, Geometridae and Tortricidae. These families mostly comprise little known, diverse and abundant groups (Common 1994; Horak and Komai 2006), and we found 74% of the prioritised species in these families were poorly known for expected range. The assessment of fire impact for these families therefore has a high level of uncertainty and many susceptible species may be underestimated in terms of conservation concern. The beetles had a more even spread of species amongst families, with representatives from a number of large, abundant and diverse families, for some of which there was little data available on individual species (for example Curculionidae, the weevils). However, within most families there were species for which species-level data were relatively more available, or inferences based on better known congeners or confamilials could be made, and so conservation assessment was more robust. The spiders consist of a mix of families for which conservation biology is relatively well understood and so a relatively robust assessment of risk could be made, for example Archaeidae, the assassin spiders (Rix and Harvey 2011), but also groups with a high level of data deficiency for distribution, ecology and biology. Dipteran species are diverse, abundant and generally little known (Pape et al. 2009) and, in our analyses, were characterised by a large amount of data deficiency, resulting in a high level of uncertainty in assessing FSI and RRI, with many susceptible species likely under-represented in terms of our prioritisation of conservation concern.

Eleven orders were represented in the priority lists by only one species. Of these 11 orders, most consist of highly diverse, data poor taxa and the small number of species in the prioritised list is more a reflection of data deficiency, rather than accurate reflection of risk. Across all taxonomic groups, there was a relative paucity of species-level ecological or biological information, however, some groups, such as the Trombidiformes and Sarcoptiformes (mites), entirely comprised species which had low confidence and low certainty scores. This is a reflection of the huge diversity and number of species and the limited number of specialist experts of these taxa; and for many species in such groups, there was insufficient trait, distributional or life history data to make a justified assessment of fire susceptibility.

Some groups, such as the Stylommatophora (land snails) are relatively better known. These had relatively robust data, with experts actively working on their taxonomy and biology and with conservation biology and fire ecology relatively well understood, at least compared to other invertebrate groups (Parkyn and Newell 2013; Ray and Bergey 2015). However, there remain knowledge significant gaps in data for these taxa and many species are in need of further research and response.

The use of the trait-based framework developed in this study allowed us to prioritise fire-impacted species based upon expected mortality in fire, and recovery ability following fire, and then to categorise these species in terms of priorities for conservation assessment, response or research. Prioritised species were likely at higher risk of extinction or extirpation following the 2019-20 fires, but also at increased risk from future fire events.

A key challenge in the conservation of Australian invertebrates is the large level of uncertainty and data deficiency. Even for relatively well studied species, there were significant gaps in data, making species-based analysis of Australian invertebrates fraught with challenges. A key component of the framework was to allow the use of inferences based upon higher level taxonomic groups to assign traits and, importantly, to provide a metric to record certainty in a species' data. This method allowed more species to be assessed, but also identified those with particular data deficiency and highlighted priorities for research. There is a need for greater research effort to elucidate the distributions, taxonomy, biology and ecology of most of Australia's invertebrate species, including describing the more than two thirds of species yet to be described (Chapman 2009), a substantial task, given the size of the current workforce, funding availability and limited political and public support. Predictions of increasing frequency and scale of wildfires as a result of climate change and drought (Hennesy et al. 2005; Abatzoglou et al. 2019; Boer et al. 2020) suggest fire events such as those of 2019-20 will not be an isolated occurrence. For this reason, it is vitally important to categorise and prioritise species in terms of risk of extinction or extirpation and to prioritise response and research efforts towards those species most at risk. The fire susceptibility framework is a method to perform this prioritisation, and can direct focus to taxonomic groups likely at higher risk.

2.5.1. Recommendations and future directions

The exceptional scale of the 2019-20 fires meant that there were few existing templates available for assessing and responding to such an event. For Australian invertebrates, it highlighted the significant deficiencies in data and the challenges facing the meaningful interpretation of them. In this study, we demonstrated a robust, justified and replicable method to identify those species of highest fire overlap and then to prioritise these species in terms of extinction risk using analyses of life history and ecological traits to assess susceptibility to fire and post-fire recovery potential. This large-scale project is, to our knowledge, the first to attempt such an assessment of Australian invertebrates. With the likelihood of a continued increase in the frequency and scale of fires as a result of climate change (Abatzoglou et al. 2019), the findings of this study, and the development of the methods to assess species are of key importance. It is important we use the lessons we have learnt from the 2019-20 fires to better inform and prepare for future fire events, and to understand likely declines or extinctions resulting from these fires. This is especially important for invertebrate species, many of which are especially susceptible to extinction from large scale fire, but are also highly data poor.

We proposed 60 species as candidates for further conservation status assessment: most of these had most or all of their range impacted by fire and had traits that increased vulnerability to fire. We recommend these species for urgent assessment. We further identified 99 species as high priority species for targeted research and 80 as moderate priority. These species are likely amongst the most affected by the 2019-20 fires, but currently have insufficient data to confidently define that risk, and we recommend a program of targeted surveys and research, to more robustly assess their extent of loss, and to guide recovery efforts. These surveys are important to better define extinction risk, provide a more detailed assessment of fire overlap, map threats and inform management actions: they therefore should be viewed as a core part of conservation management response, rather than tangentially as research priorities alone. It is possible that some of these species with high levels of overlap and with traits that increase susceptibility to fire, or reduce recovery potential, may now be extinct. One species, *Pseudococcus markharveyi*, the Banksia montana mealybug, is now likely extinct because of the 2019-20 fires (Moir 2021). Another species, *Zephyrarchaea austini* the Kangaroo Island assassin spider, has not yet been found post-fire despite dedicated surveys of its habitat, including of all known sites of its pre-fire occurrence (J. Marsh pers. obs.). Given their small size and often cryptic nature, demonstrating the extinction of an invertebrate species is difficult and requires much survey effort; for *Zephyrarchaea austini*, more surveys are needed. However, dedicated and extensive survey effort of species at risk of extinction is important and necessary in order to i) more precisely and robustly quantify the extent of loss, particularly irretrievable loss (such as extinctions) and ii) where survivors are found of species with very high fire overlap, these populations may now be critically important to safeguard and manage, and thereby avert extinction.

During this study the focus of analyses have been species, however, by doing this we have identified groups and higher-level taxa that are likely vulnerable to fire, for example families or genera with a high proportion of SREs or highly fire-susceptible traits. Such information is important and can be used to identify species likely at risk from future fires, or to direct response on a higher taxonomic level basis.

2.5.1.1. Synopsis of priority species for further conservation assessment.

Species were selected as priorities for further conservation assessment based upon a combination of the following criteria; percentage overlap with fire, susceptibility to fire, post-fire recovery potential, and the robustness of these assumptions. Priority species for conservation assessment were spread across each of the seven extensively burnt fire-affected regions identified by the Australian Government (https://www.environment.gov.au/biodiversity/bushfire-recovery/consultation/workshops-and-roundtables), with representatives also from locations outside of these regions (e.g., PAA section of Western Australia).

Species already listed under the EPBC Act, IUCN Red List or state legislation were considered for further assessment under EPBC Act if their total fire overlap was at least 30%. Such already listed species have defined threats that were acting on populations prior to the 2019-20 fires and therefore the fires can be seen as having compounded existing threats and conservation concern. Two listed species, *Strumigenys xenos* (Formicidae, ant), IUCN (VU) and *Georissa laseroni* (Neritopsina, Hydrocenidae), a land snail IUCN (VU) were not proposed for assessment under the EPBC Act because, despite having at least 30% fire overlap, *Strumigenys xenos* is an inquiline living in the burrow of another widespread species of ant and *G. laseron*i is a cave-living land snail and, as such, it is unlikely that either of these species has been severely affected by fire.

The Kangaroo Island assassin spider and Kangaroo Island micro trapdoor spider already have EPBC Act assessments and IUCN assessments pending and so they are not included in the assessment list, however there remain significant questions as to their post-fire statuses, especially for the KI assassin spider, which has not been detected in post-fire surveys, and so they have been prioritised for further research.

2.5.1.2. Species currently listed under the EPBC Act

Species already listed under the EPBC Act and with at least 30% total overlap by fire were considered to be priorities for further assessment and/or up-listing:

Bertmainius colonus, Eastern Stirling Range Pygmy Trapdoor Spider (currently listed EPBCA (VU), WA (VU), IUCN pending);

Trioza barrettae, Banksia brownii plant louse (currently listed EPBC (EN), IUCN (CR), WA (EN)) are proposed for up-listing.

Pseudococcus markharveyi, Banksia montana mealybug (currently listed EPBC (CR), IUCN (CR) WA (CR)), including consideration of listing as Extinct.

Leioproctus (Andrenopsis) douglasiellus, a short-tongued bee (currently listed, EPBC (CR), WA (EN)) is proposed for further conservation response.

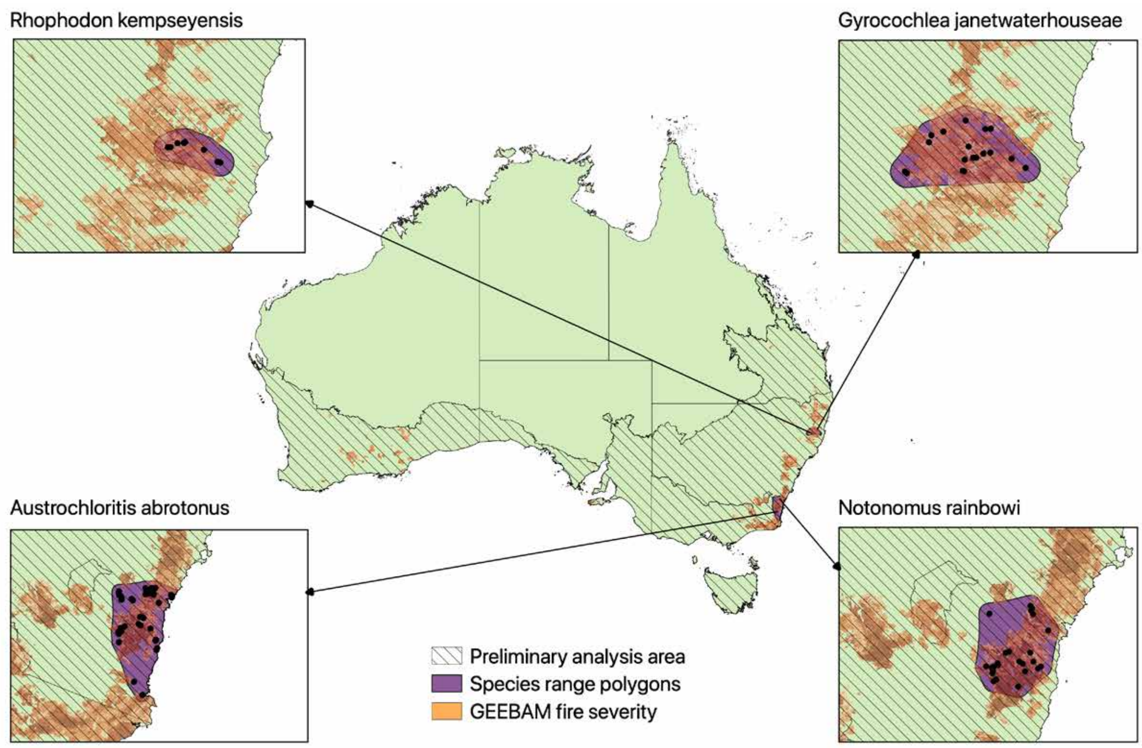


Figure 2.6. Map showing fire overlap on the occurrence points and alpha hull polygons for 4 species proposed as priorities for conservation assessment

2.5.1.3. Species proposed as candidates for assessment under EPBC Act

Araneae (Spiders)

Archaeidae (Assassin spider)

Zephyrarchaea barrettae, Talyuberlup assassin spider (WA, currently listed WA (VU), IUCN pending),

Zephyrarchaea melindae, Toolbrunup assassin spider (WA, currently listed WA (VU), IUCN pending)

Zephyrarchaea robinsi, Eastern Massif assassin spider (WA, currently listed WA (VU), IUCN pending).

Austrarchaea cunningham (SE Qld; IUCN pending),

Austrarchaea mcguiganae (NSW, South Coast; IUCN pending),

Austrarchaea monteithi (NSW, South Coast; IUCN pending).

These species are highly susceptible to fire, occupying leaf litter suspended in low lying vegetation, have low dispersal abilities and highly restricted ranges (Rix and Harvey 2011, 2012). All six species scored highly for both FFI and RRI, indicating high susceptibility to fire and a high risk of incomplete or delayed recovery. These species have IUCN assessments pending.

Migidae (Pygmy trapdoor spider)

Bertmainius pandus, a pygmy trapdoor spider; (currently listed WA (VU), IUCN pending), SRE, Stirling Range National Park, WA (Harvey et al. 2015), short burrow may offer little protection from fire. Scored highly for RRI and FSI, showing reduced recovery potential and sensitive to desiccation thereby face threats as a result of the altered post-fire ecosystem Pending assessment under IUCN.

Idiopidae (Spiny-legged trapdoor spider)

Cataxia coles spiny-legged trapdoor spider; SRE, restricted to sky islands in the Stirling Range National Park (Rix et al. 2017). Scored highly for RRI and FSI, showing reduced recovery potential and sensitive to desiccation thereby face threats as a result of the altered post-fire ecosystem (Mason et al. 2019).

Salticidae (Jumping spider)

Maratus sarahae, peacock spider, (currently listed WA (EN), IUCN pending), known only from a small area in Stirling Range National Park, WA.

Coleoptera (Beetles)

Carabidae (Ground beetle)

Notonomus clivinoides (Vic; IUCN pending) and *Notonomus rainbowi* (NSW South Coast) (Fig. 2.6). These are flightless species with restricted ranges and high fire overlap on known distributions (M. Nash, pers. comm.). *Notonomus clivinoides* has an assessment pending under the IUCN Red List.

Scarabidae (Scarab beetle)

Diorygopyx duplodentatus (North Coast & Tablelands, NSW; IUCN pending) and *Matthewsius rossi* (Blue Mountains, NSW; IUCN pending). Both are flightless species with highly restricted ranges (M. Nash, pers. comm.), a high level of fire overlap and high values for FSI and RRI.

Diptera (Flies)

Stratiomyidae (Stratiomyid fly)

Opaluma opulens only known from Cainbable and Lamington NP, Queensland, and all known localities were impacted by fire (B. Lessard, pers. comm.).

Antissella purprasina, only known from the type locality of Lamington National Park, Qld, which was severely burnt (B. Lessard, pers. comm.).

Both species have IUCN assessments pending.

Hymenoptera (Bees, ants, wasps)

Apidae

Xylocopa (Lestis) aeratus (Green carpenter bee, currently listed Vic (Ex), IUCN pending), has a distribution that spans from southern Qld, NSW, ACT and SA. The species has experienced a historic range retraction and the sub-population on KI was impacted significantly by fire (R. Glatz, pers. coms.).

Colletidae

Leioproctus (Leioproctus) nigrofulvus (NSW; IUCN pending) lives in short burrows in termite mounds, which likely provide little protection from fire (Maynard and Rao 2010) (Fig 2.6.).

Lepidoptera (Butterflies, moths)

Nympahlidae

Oreixenica latialis theddora, (Alpine Silver Xenica (Vic (En)), this subspecies is known only from the Australian Alps.

Zygaenidae

Pollanisus hyacinthus, Forester moth, (KI, SA; IUCN pending). Adults of the species are weak fliers with low dispersal abilities and are expected to be host plant specialist making them susceptible to fire and expert elicitation suggests a high proportion of the species' known range impacted by fire (D.A. Young, pers. comm.).

Neorhabdocoela

Temnocephalidae (Parasitic flatworms)

The four species of Parasitic flatworms are range restricted and species-specific parasites of spiny crayfish, *Euastacus* spp. *Temnohaswellia breviumbella* (Vic, East Gippsland) a parasite of *Euastacus claytoni* (EPBCA Endangered), *Temnosewellia unguiculus* (NSW South Coast) a parasite of *Euastacus bidawalus* (EPBCA Endangered), *Temnosewellia acicularis* (ACT, VIC (East Gippsland, Alps) a parasite of *Euastacus bidawalus* (EPBCA EN) and *Temnosewellia gracilis* NSW South Coast) a parasite of *Euastacus guwinus* (EPBCA CR). All four species of flatworm had 100% of their known range impacted by fire and are at risk of co-extinction with their host species (Hoyal Cuthill et al. 2016).

Onychophora (Velvet worms)

Peripatopsidae

Four species of Velvet worm *Acanthokara kaputensis* (NSW), *Kumbadjena toolbrunupensis* (WA), *Ruhbergia rostroides* (NSW South Coast), *Cephalofovea tomahmontis* (Blue Mountains).

Velvet worms are SRE with low dispersal abilities and highly sensitive to desiccation (Harvey 2002). All four species had large proportions of their known range impacted by fire and score highly on FSI and RRI. Velvet worms live in rotting logs, which likely offers some protection from fire, however their sensitivity to desiccation (Reid 1996) puts them at risk from further decline and restricted recovery in the altered post-fire ecosystem.

Opiliones (Harvestmen)

Triaenonychidae

Nunciella kangarooensis is a species of harvestman from KI, SA. The species is SRE and only known from the north west of KI, where is found in leaf litter and underneath logs close to creeklines (Hunt 1971) The species was heavily impacted by fire and scored highly for both RRI and FSI. It is pending assessment under the IUCN Red List.

Orthoptera (Grasshoppers, crickets, katydids)

Acrididae

Kosciuscola cuneatus (Skyhopper) is known from the Alps and South Coast, NSW. The species is vulnerable to fire, has a restricted range and faces other threats from climate change and drought. Recent data estimates the species' known range has been impacted by around 50% by fire (K. Umbers, pers. comm.). An IUCN assessment is pending for this species.

Tettigoniidae

Metaballus mesopterus (KI marauding katydid), is only known from KI, SA. A large proportion of the species known range was impacted by fire (R. Glatz, pers. comm.). The species is pending assessment under the IUCN Red List.

Spirostreptida (Millipedes)

Iulomorphidae

Atelomastix poustie WA (VU), *Atelomastix danksi* WA (VU), *Atelomastix tigrina* WA (VU). These species are all found in WA and are pending assessment under IUCN. Millipedes may burrow beneath soil over summer and hence be protected from summer fires (Harvey and Rix 2019), however millipedes are sensitive to desiccation and so medium term post-fire survival in the altered and exposed ecosystem is not known.

Stylommatophora (Land snails) (Fig. 2.6)

Camaenidae, Charopidae, Punctidae, Stylommatophora, Bothriembryontidae

The eighteen species of land snail that we considered to have highest priority all have restricted ranges or are SREs and have large proportions of their known-range burnt. Four species *Bothriembryon (Bothriembryon) glauerti, Bothriembryon brazieri, Glyptorhagada bordaensis, Pommerhelix depressa* have existing listings as IUCN (VU) and 11 others have IUCN assessments pending.

The species are from NSW- South Coast, Blue Mountains and North Coast and Tablelands, Kangaroo Island, SA and WA. Snails typically live under rocks or logs and so may receive some protection from fire, however their limited dispersal ability and sensitivity to desiccation means that they may not persist in the post-fire ecosystem (I. Hyman, pers. comm.).

Trichoptera (Caddis flies)

Leptoceridae

Triaenodes resima (NSW, Vic, currently listed Vic (VU).

Philorheithridae

Ramiheithrus virgatus (NSW, South Coast, Vic Alps, currently listed Vic (VU)).

Both species of caddis fly have aquatic larvae, with terrestrial adults. The larvae of most Trichoptera are potentially sensitive to changes in water quality (Chapman et al. 1996; Karr and Chu 1999) and so may be threatened by fire induced changes to water systems, such as change in pH or sedimentation, which can threaten aquatic macroinvertebrates (Chessman 1986; Crowther and Papas 2005; Crowther et al. 2008).

3. Threats and conservation management of fire-affected invertebrates

3.1 Introduction

In previous sections of this report, we have focused on identifying those invertebrate species that were most affected by the 2019-20 fires. Such identification is a key ingredient in describing the toll of the fires and highlighting those species that have been most imperiled and that now most need conservation actions to help achieve or secure post-impact recovery. But across this large set of fire-affected invertebrate species, there is little existing documentation of the types of management required, or of its likely effectiveness. Many conservation agencies have had little previous history of managing large suites of fire-affected invertebrates; and there may be formidable challenges in trying to juggle the management requirements of many different fire-affected species, and across many different regions.

In this section of the report, we undertake a series of analyses to identify the main threats that may impede the recovery of priority fire-affected invertebrate species (in the short- and long-term post-fire) and assess the extent to which targeted management responses will be effective at mitigating those threats. We also consider the extent to which threats and management effectiveness vary among regions, and assess the extent to which individual priority invertebrate species are likely to be recovered or not by management actions. Our information base for these analyses derives from expert elicitation and has many uncertainties and gaps – typical of the challenges affecting invertebrate conservation. Our analyses are designed to deal with these uncertainties by exploring how priorities for management may change. We also identify species for which current knowledge gaps most impede recovery: we identify such species as priorities for research.

3.2. Methods and analysis

3.2.1. Data description

The 1228 species with highest fire overlap were selected for the current analysis, as remedial response is likely to be most needed for these species.

Following the identification of high priority fire-affected regions by the Department of Agriculture, Water and the Environment (https://www.environment.gov.au/biodiversity/bushfire-recovery/consultation/workshops-and-roundtables) (Fig. 2.2), we considered threats and response priorities across the full extent of the PAA but also for priority regions – Australian Alps, East Gippsland, Greater Blue Mountains, Kangaroo Island, rainforests of New South Wales north coast and tablelands, south coast New South Wales, and rainforests of south-east Queensland – and also Tasmania and that part of Western Australia within the PAA.

For as many of the 1228 invertebrate species as possible, experts answered a structured questionnaire, providing information about species traits and their sensitivity to threats and management interventions over shorter (1 year post-fire) and longer (2-20 year) timeframes.

Experts specified a species' vulnerability to threats by answering the question:

> *"Taking the estimated post-fire population size as the baseline, and based on your best knowledge of where the taxon is located, can you indicate the top three potential threats that may impact post-fire recovery in the first year following a fire. Provide an estimate of their possible impact as measured by relative decline in population size."*

This question is framed from the context of the immediate post-fire population size (i.e., populations of the species across burnt and unburnt areas).

For each species considered, experts could select from the following list of ***threats***: more fire, weeds, erosion/siltation of creeklines, herbivores, introduced competitors, reduced water quality, drought, desiccation risk from exposure to high temperatures and/or low humidity, and exposure to predators. The list of threats for the longer (2-20 year) timeframe was very similar, noting:

- changes to land use, fragmentation, climate change and loss of fire sensitive obligate species (i.e., host plants) were added
- herbivores, reduced water quality, desiccation risk from exposure to high temperatures and/or low humidity, exposure to predators, were omitted.

Experts could select one, or more (i.e., to account for uncertainty), of the following impact categories: no impact on the taxon, caused <10% decline, 10-30% decline, 30-60% decline, and 60-100% decline – with these percentage declines relating to the presumed post-fire population size.

Note that we did not explicitly consider interactions among, or compounding impacts of, threats. However, we recognise that such interactions are likely among some threats, for some species, and in some regions.

Experts specified a species' sensitivity to individual ***management actions*** by answering the question:

> *"Assuming you have reasonable knowledge of the taxon and that management actions can be implemented, what effect would implementation of the management actions, associated with the threats you identified, have on post-fire recovery of the species in the first year following a fire? Add any other actions in the 'Other' and record details in the free text field below."*

The actions available for this question were: tailored fire management, weed control, soil stabilisation, herbivore control, control of introduced competitors, replanting and restoration, hydrological management, and provision of artificial shelters. We recognise that, in contrast to the other management actions, 'tailored fire management' is an imprecise and complex response, and may vary across species: however, in most cases, experts conceptualized it to encompass a range of actions taken to reduce the likelihood of further fire, especially comparable high severity fires.

The question for the longer, 2-20 year, timeframe was very similar, noting:

- re-introduction of target species, ex-situ conservation and host species re-introduction was added
- provision of artificial shelters was removed

Experts could select from one or more of the following impact categories for each management action describing possible reduction in threat-induced population decline: no beneficial impact on the taxon, <25% effective (i.e., had little impact on the population loss due to the relevant threat), 25-50%, 50-75%, and 75-100%. 0% represents a management action that is completely ineffective at reducing population decline associated with relevant threats, 100% represents a management action that fully mitigates the associated threat. As above, if experts wished to express more uncertainty, they could select multiple intervals. Note that we did not consider the relative costs of these actions.

3.2.2. Data processing

Experts' categorical selections for sensitivity to threats and impacts were converted into a single range by taking the maximum and minimum values each expert had provided for each management action on each species. Data were not available, or not able to be contributed by the experts, for many species (455 in the short term and 362 in the long term): these species were assigned threats and actions based on taxonomically related species with similar life history and ecological traits. However, instead of using the categorical ranges above, these species were listed as 'suspected', 'inferred', or 'confident'. Species with such responses were not included in the main analysis but were included in a sensitivity analysis, where we assigned the minimum value 0 and maximum value 100 to represent the underlying uncertainty around the magnitude of impact from threats or actions.

The dataset comprised large numbers of NAs which experts sometimes used to signify that the threat/action had no relevance for the species and sometimes to signify that they had insufficient knowledge to assign a value for that species. To reduce the number of NAs in the dataset we assumed that, if an expert had provided an answer for a different threat/management actions for a particular question for that species, the NAs signified that the expert thought that the threat/management action was not relevant for the species, and we assigned it a 0.

For some species, more than one expert provided estimates, in these cases we took the mean minimum and mean maximum values provided by experts for the remainder of analyses.

To model the uncertainty around the impact of threats and management interventions for these species, we undertook Monte Carlo simulation with 1000 draws, where the impact of all threats and management actions were assumed to be uniformly distributed between the minimum and maximum impact specified by experts. This simulation was used for all analyses described below, in each drawing out the mean, 25th quartile and 75th quartile estimates.

3.2.3. Analysis of key questions

3.2.3.1. What are the key threats?

For both short-term and long-term threats that we considered, across all Monte Carlo simulations, what were the mean, 25th and 75th quartile estimates of the impact of each threat. We also calculated the percentage of simulations for which that threat was estimated to result in <30% decline, >30%, >50% and >80% impact on species. This analysis was repeated for the following:

- using the national (i.e., whole of PAA) dataset including only species for which experts provided threat impact intervals
- for each regional dataset including only species for which experts have provided threat impact intervals
- using the national dataset including the species (455 in the short term and 362 in the long term) with 'confident, 'suspected' and 'inferred' data
- using the national dataset for all species (n=1228) including those without numeric ranges (all threats and actions assumed to have 0-100 impact for these species, for which experts could provide no information on threats, and no inferences were provided for these species)

3.2.3.2. What are the most promising actions?

For both short-term and long-term management actions we explored, across all Monte Carlo simulations, the mean, 25th and 75th quartile estimates of the impact of each action. We also calculated the percentage of simulations for which that action was estimated to result in <30%, >30%, >50% and >80% reduction in that species' decline. As above, this analysis was repeated:

- using the national (i.e., whole of PAA) dataset including only species for which experts provided threat impact intervals
- for each regional dataset including only species for which experts have provided threat impact intervals
- using the national dataset including the species (455 in the short term and 362 in the long term) with 'confident, 'suspected' and 'inferred' data
- using the national dataset for all species (n=1228) including those without numeric ranges (all threats and actions assumed to have 0-100 impact for these species, for which experts could provide no information on threats, and no inferences were provided for these species)

3.2.3.3 How well do actions mitigate threats?

Each management action is designed to address one or more threats (Table 3.1). For the purpose of this analysis, in these instances we had to assume that the management action is equally effective at reducing each threat it is associated with.

To calculate how well threats are mitigated, we subtracted estimate impact of threats and management actions from 100 and multiplied them together to calculate the % in reduction in the population size immediately post fire.

Table 3.1. Threats and corresponding actions. Note some threats are addressed using the same actions.

Threats	Corresponding Action
desiccation risk from exposure	provision of artificial shelters
exposure to predators	provision of artificial shelters
erosion / siltation	soil stabilisation
erosion or siltation of creek lines	soil stabilisation
fragmentation	replanting and restoration
habitat	replanting and restoration
herbivores	herbivore control
introduced competitors	control of introduced competitors
loss of host species	host species re-introduction
more fire	tailored fire management
reduced water quality	hydrological management
weeds	weed control
drought	NA
climate change	NA

3.2.3.4 How are species likely to fare?

Using the Monte Carlo simulations, for each species (x), experts indicated one or more threats (T) affecting that species, with each threat evaluated by the percentage population reduction (RT) it was expected to cause over the relevant timeframe (to 1-year postfire, or 2-20 years post-fire). Experts also nominated management actions that could mitigate the threat with an effectiveness of up to 100% (M_T) (although note that some threats had no feasible management actions, and some management actions could mitigate more than one threat). For analyses, proportions rather than percentages were used, and we used the metric of proportion of population persisting (i.e., 1-the proportion of the population lost to threats) at the end of the relevant timeframe.

For a species with n threats, each assumed to be operating independently, the proportion of the population persisting at the end of the relevant timeframe, P_T, is

$$P_{xT} = (1 - R_{T1})*(1 - R_{T2})* \ldots (1 - R_{Tn})$$

Where management actions are implemented for linked threats, the population persisting at the end of the relevant timeframe, P_M, is

$$P_{xM} = (1 - (R_{T1}(1 - M_{T1})))*(1 - (R_{T2}(1 - M_{T2})))* \ldots (1 - (R_{Tn}(1 - M_{Tn})))$$

For example, if species x had three threats, fire (predicted to cause a 50% loss: R_{T1}), grazing (10% loss: R_{T2}) and weeds (25% loss: R_{T3}), then – without management – the expected proportion of the population persisting is:

$$(1 - 0.5)*(1 - 0.1)*(1 - 0.25) = 0.3375.$$

If management can mitigate 80% (M_{T1}) of the loss attributable to fire, 100% (M_{T2}) of the loss attributable to grazing, but none (0: M_{T3}) of the impact of weeds, then – with imposition of such management – the expected proportion of the population persisting is now:

$$(1 - (0.5*(1 - 0.8)))*(1 - (0.1*(1 - 1)))*(1 - (0.25*(1 - 0))) = 0.675.$$

This calculation was used to answer:

1. **Which taxa are most likely to suffer the most substantial ongoing population loss?** These are species that, if all threats occur and no management is undertaken, will have populations that are reduced to <50% of the population size immediately post fire. For order level analysis, this averaged across fire-affected species in the order. These are species which need close monitoring and management to avoid catastrophic declines, and/or are priorities for management actions.
2. **Which taxa are likely to decline despite management?** These are species where, even when all management actions are employed, they are expected to decline to a population size <50% of the population immediately post fire. For order level analysis, this averaged across species in the order. These are species which present the most pressing conservation management challenge, as the existing management portfolio will not be sufficient to enable recovery. Further research seeking more effective threat mitigation techniques will be required for these problem species.
3. **For which taxa are we unsure about whether threats and management result in further decline or improvement?** These are species for which the difference between the 25th and 75th quartile estimates of the benefit of management (benefit = the expected population size if the threats are managed – the expected population size if the threats are NOT managed) is greater than 20. For order level analysis, this averaged across species in the order. These species can be considered to be priorities for further research to better understand threat impacts and provide management direction.

3.3. Results

3.3.1. Threat and management impact, PAA-wide analysis

3.3.1.1. Across the national extent of the PAA, what are the biggest threats to fire-affected invertebrates?

On average (across species), the threat that experts considered most detrimental for Australian fire-affected invertebrates in the year after the fires was more fire (Table 3.2). More fire is expected to have a mean effect of reducing the remaining populations by a further 48.4% within one year, with 20.3% of simulations for 107 species having a greater than 80% decline with more fire. The next greatest threats in the short-term were drought and desiccation risk from exposure, which had mean impacts of reducing populations by 24.7% and 24.3% respectively. The other threats were expected to have a relatively minor impact on average in the year post fire.

Table 3.2. Short term (1 year post fire) threats across the PAA. Table shows the total number of species in the dataset for each threat (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated impact of each threat as well as the percentage of simulations in which that threat results in a population decline of less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
more fire	48.4	20.8	75.3	30.5	69.5	50.2	20.3	107	1228
drought	24.7	0	38.3	69.2	30.8	16.7	4.5	107	1228
desiccation risk from exposure	24.3	0	40.5	70.6	29.4	21	8.2	107	1228
weeds	7	0	2.4	89.2	10.8	4.8	0.5	107	1228
introduced competitors	6.4	0	4.7	92.5	7.5	3.5	0.7	107	1228
exposure to predators	4.8	0	0.9	96.6	3.4	2.4	0.9	107	1228
erosion / siltation	3.4	0	0	96.8	3.2	2	0.7	107	1228
herbivores	3.1	0	0	97.2	2.8	2.2	1	107	1228
reduced water quality	1.3	0	0	99.1	0.9	0.7	0.3	107	1228

In the longer term, more fire was still considered the greatest threat to Australian fire-affected invertebrate species with a mean effect of reducing the remaining population by 46.9% 2 to 20 years post fire, with 19.3% of simulations showing a greater than 80% decline (Table 3.3). Habitat loss, climate change and drought were also considered very important over this longer time period with mean effects of causing declines of 37.6%, 26.1% and 26.1% respectively. It is important to note that each of the other listed threats still had substantial impacts on some species, for example erosion/siltation only has a mean effect of reducing populations by 3.8% but for 1.1% of simulations, this was expected to reduce populations by more than 50%.

Table 3.3. Longer term (2-20 years post fire) threats across the PAA. Table shows the total number of species in the dataset for each threat (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated impact of each threat as well as the percentage of simulations in which that threat results in a population decline of less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
more fire	46.9	18.5	74.2	31.3	68.7	48.5	19.3	95	1228
habitat loss	37.6	7.7	60.4	45	55	35.3	12.6	95	1228
climate change	26.1	0	45.4	56.4	43.6	19.4	3.7	95	1228
drought	26.1	2.1	43.6	60.7	39.3	18.3	3.9	95	1228
loss of host species	16	0	20.7	80.4	19.6	14.9	6.3	107	1228
fragmentation	15	0	25.3	80.3	19.7	8.7	1.6	95	1228
introduced competitors	6.9	0	6.6	94.9	5.1	3.2	1	95	1228
weeds	6.6	0	4.9	92	8	3.4	0.5	95	1228
erosion / siltation	3.8	0	0	97.5	2.5	1.1	0.2	95	1228

3.3.1.2. Across the national extent of the PAA, which management actions are most effective at supporting the recovery of fire-affected invertebrates?

In the year post fire, the actions considered by far the most beneficial to fire-affected invertebrates across the PAA were tailored fire management and then replanting and restoration (Table 3.4). Relative to the post-fire decline expected under no management, the application of tailored fire management had a mean expected effect of reducing that decline by 42.7%, with just over half of simulations showing a greater than 50% reduction in decline. Replanting and restoration had a mean effect of reducing the expected population declines that would otherwise be caused by the threat they addressed by 20.9%, and 11.1% of simulations showing a greater than 50% reduction in decline.

Table 3.4. Short term (1 year post fire) actions across the PAA. Table shows the total number of species in the dataset for each action (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated reduction in population decline associated with each action as well as the percentage of simulations in which that action reduces population decline by less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Action	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
tailored fire management	42.7	22	62.7	32.1	67.9	50.6	0	84	1228
replanting and restoration	20.9	0	38.7	63.9	36.1	11.1	0	89	1228
weed control	9.7	0	15.5	88.1	11.9	3.4	0	89	1228
provision of artificial shelters	9.3	0	10.3	84.9	15.1	4.4	0	90	1228
control of introduced competitors	8.9	0	13.4	88.9	11.1	3	0	90	1228
soil stabilisation	8.2	0	11.9	89.8	10.2	2.2	0	90	1228
hydrological management	7.1	0	0	90.4	9.6	7.8	0	90	1228
herbivore control	4.9	0	5.9	98	2	1.1	0	90	1228
reduced water quality	1.3	0	0	99.1	0.9	0.7	0.3	107	1228

In the longer term, tailored fire management and replanting and restoration were still considered the most beneficial to fire-affected invertebrates, however, reintroduction of target species was also important for a large number of invertebrates, with 22.9% of simulations showing a greater than 30% reduction and 5.8% showing a greater than 50% reduction in population decline (Table 3.5).

Kangaroo Island robust fan-winged katydid (*Psacadonotus insulanus*). Image: Jess Marsh

Table 3.5. Long term (2 to 20 years post fire) actions across the PAA. Table shows the total number of species in the dataset for each action (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated reduction in population decline associated with each action as well as the percentage of simulations in which that action reduces population decline by less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Action	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
tailored fire management	42.4	25	61.6	30.8	69.2	46.8	0	78	1228
replanting and restoration	22.4	0	41.2	60	40	13.5	0	83	1228
re-introduction of target species	13.2	0	27.7	77.1	22.9	5.8	0	83	1228
weed control	9	0	13.6	89.3	10.7	3.6	0	84	1228
soil stabilisation	8.2	0	12.6	89.3	10.7	1.2	0	84	1228
ex-situ conservation	7.6	0	4.6	88.1	11.9	2.4	0	84	1228
host species re-introduction	7.6	0	0	88.7	11.3	5	0	84	1228
hydrological management	7.2	0	0	89.8	10.2	8.3	0	84	1228
control of introduced competitors	6.5	0	5.6	92.4	7.6	2.4	0	84	1228
herbivore control	5.1	0	7.1	97.1	2.9	0	0	84	1228

3.3.2. Are the most threatening threats and beneficial actions different in different regions?

The number of invertebrate species with data on threats and management actions varied among regions. Any conclusions drawn about regions with very little data should be considered indicative only.

The number of species with data on threats and management interventions, per region, are as follows:

- 78-107 in the whole PAA (numbers vary among threats and actions),
- 9-11 in the Alpine Region (Alps),
- 2-4 in East Gippsland (EGipps),
- 20-25 in the Greater Blue Mountains (GBM),
- 4-6 in Kangaroo Island (KI),
- 14-19 in North Coast and Tablelands (NCT),
- 15-23 in New South Wales South Coast (NSWSC),
- 3-4 in South East Queensland (SEQ),
- 1-2 in Tasmania (TAS),
- 6-10 in Western Australia (WA)

3.3.2.1. Threats

From Figure 3.1, it is clear that 'more fire' is a substantial threat in the 1-year post-fire period in all regions with drought, and desiccation risk from exposure is also important but impacts are less certain (more 25th quartile estimate = 0). Figure 3.2 shows that more fire is still considered a major threat in the long term but that there is substantially more variation in this among regions. The estimates for drought and climate change also vary substantially among regions, posing substantial threats in some regions but not so much in others. Habitat loss comes out as having a strong impact in most regions.

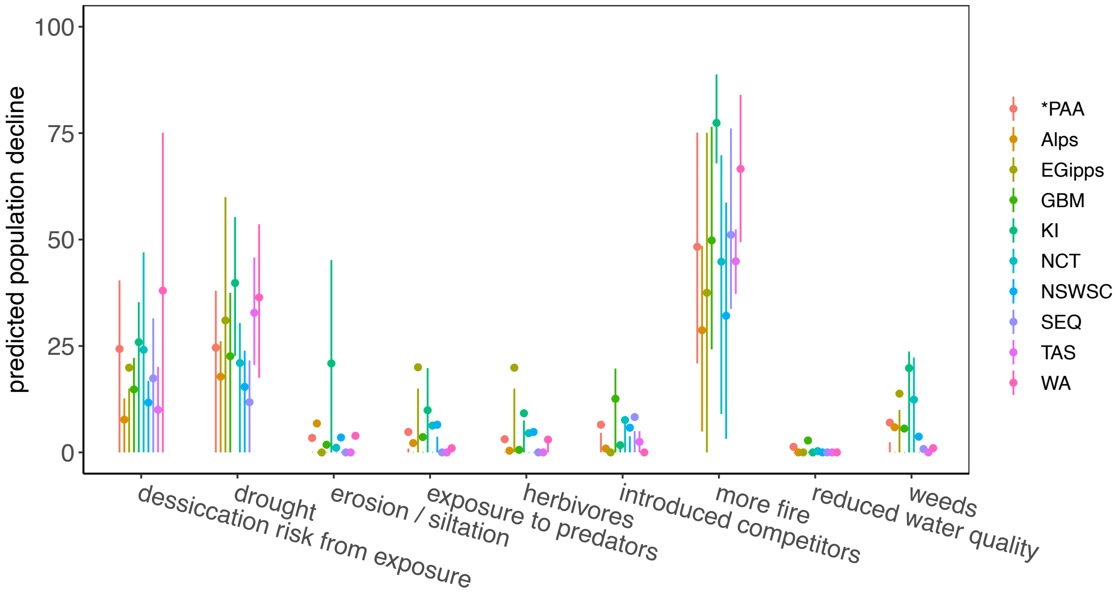


Figure 3.1. Mean, 25th quartile and 75th quartile estimates of the impact of threats in the short term (1 year post fire) in different regions.

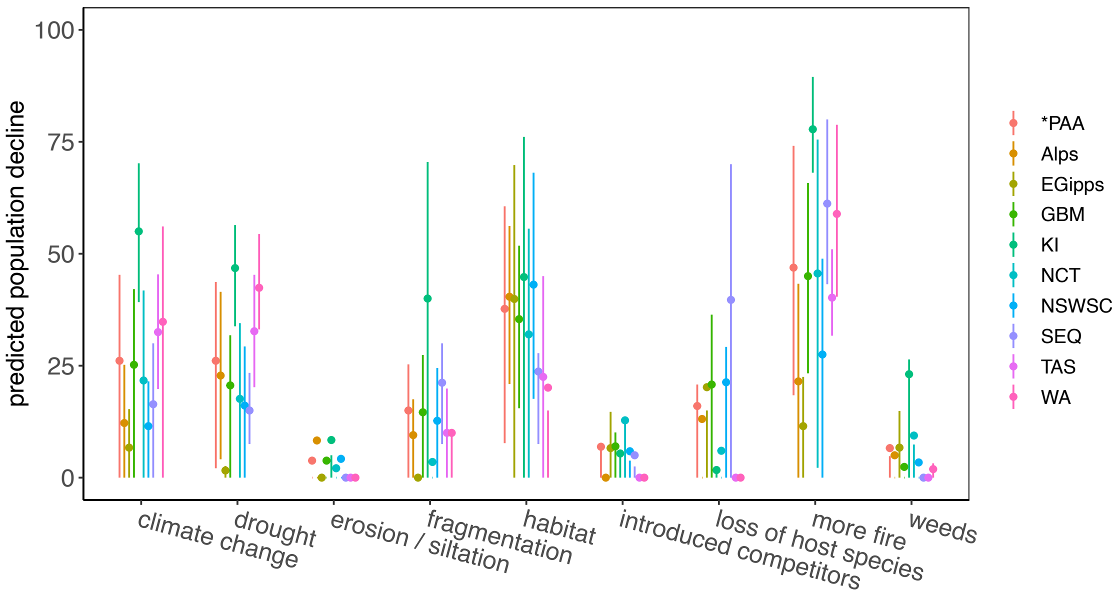


Figure 3.2. Mean, 25th quartile and 75th quartile estimates of the impact of threats in the long term (2-20 years post fire) in different regions.

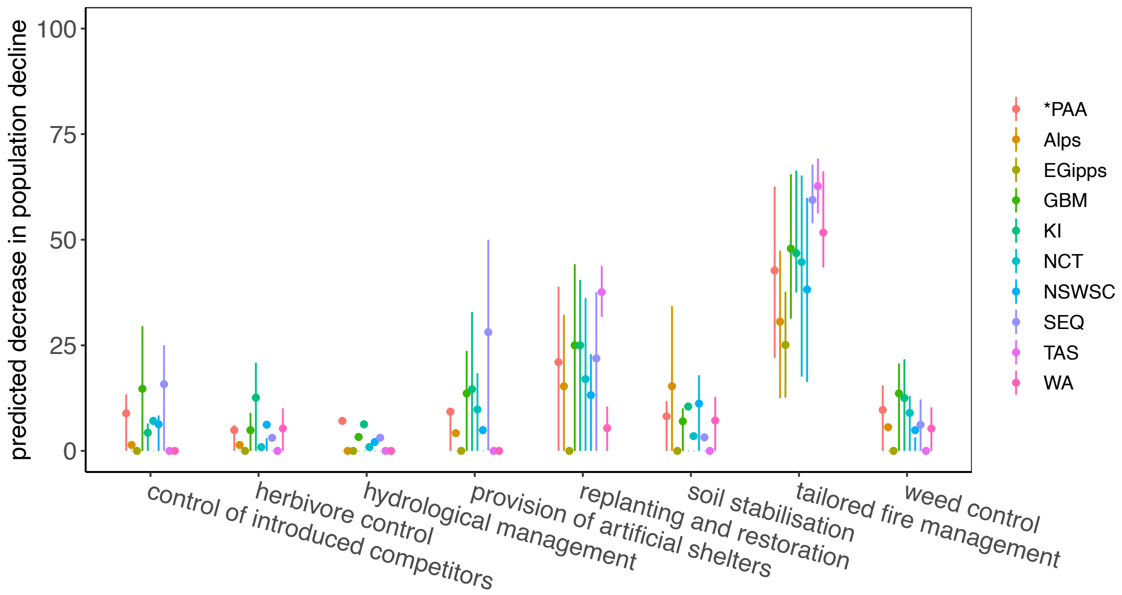


Figure 3.3. Mean, 25th quartile and 75th quartile estimates of the impact of management actions in the short term (1 year post fire) in different regions.

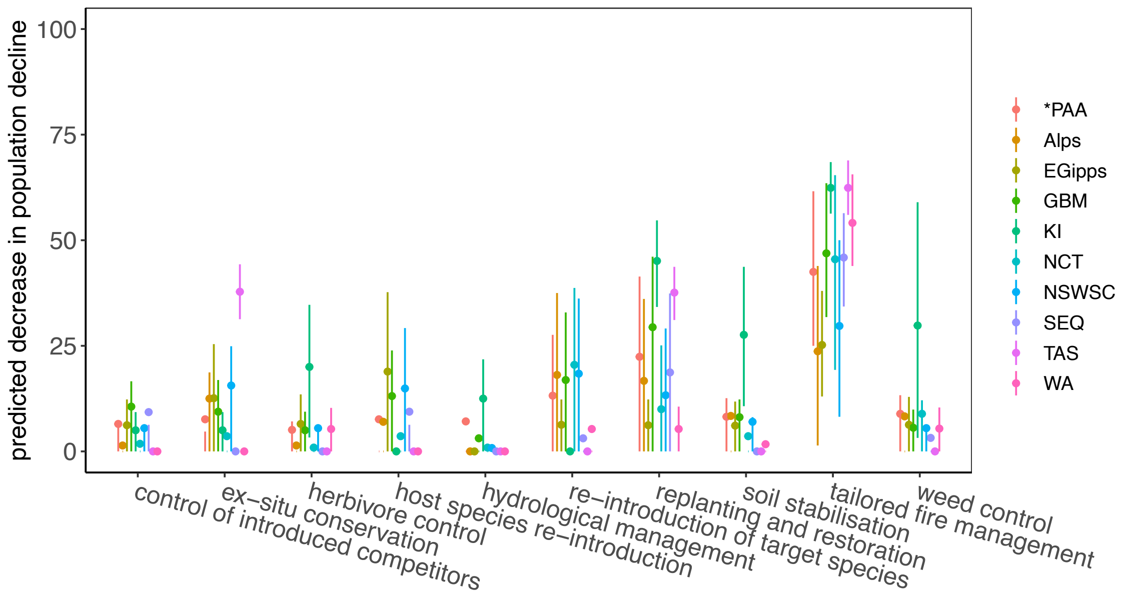


Figure 3.4. Mean, 25th quartile and 75th quartile estimates of the impact of management actions in the longer term (2-20 years post fire) in different regions.

3.3.2.2. Actions

Looking to management actions, tailored fire management has a strong impact on reducing population declines across most regions in both the short term (Figure 3.3) and long term (Figure 3.4). Other actions have much less certain impacts but replanting and restoration has a promising effect in most regions in the short and longer term.

3.3.3. Across the PAA, do candidate actions fully manage the threats to fire-affected invertebrates?

Tables 3.6 and 3.7 show that the action that most successfully reduce population decline are tailored fire management (in short and longer timeframes). Where more fire occurs in the first year post fire, the population is expected to decrease to 51.7% of the population immediately post fire, unless tailored fire management is undertaken in which case the population will only decline to 75% of the post fire population. In the longer term, more fire is expected to decrease the population to 53% of the post fire population size, if tailored fire management is implemented, the population is only expected to reduce to 78.4% of the post fire population. Replanting and restoration provides substantial benefit in managing the impacts of habitat loss and fragmentation in the long term. However, neither tailored fire management nor replanting and restoration are expected to fully mitigate their associated threats.

Management actions targeted at reducing the less drastic threats provide less net benefit but are more likely to fully mitigate those threats. For example, control of introduced competitors in the long term is expected to reduce the population decline such that 97% of the original population remains (Q25=98.6 and Q75=100, Table 3.7).

The Kangaroo Island micro trapdoor spider (*Moggridgea rainbowi*). This species was heavily impacted by the 2019–20 bushfires. Image by J. Marsh

Table 3.6. Summary of expected percentage of population persisting across different threats and their management over the short-term (1 year post fire) across all species across the PAA. Table shows the mean, 25th quartile (Q25) and 75th quartile of simulations multiplying the impact of threats and benefits of actions, as well as the number of species in the dataset (sp) and the number of these that have numeric data (non-na sp).

Threats	Actions	Unmanaged				Managed				Benefit		
		mean	Q25	Q75	non-na sp	mean	Q25	Q75	non-na sp	mean	Q25	Q75
more fire	tailored fire management	51.7	24.7	79.3	107	75	66.1	87.4	81	23.9	4.6	39.3
drought	NA	75.4	61.8	100	107	75.4	61.8	100	107	0	0	0
desiccation risk from exposure	provision of artificial shelters	75.7	59.6	100	107	77.9	66.6	100	87	2.5	0	0
weeds	weed control	93	97.6	100	107	95.7	96.6	100	86	2.1	0	0.1
introduced competitors	control of introduced competitors	93.6	95.4	100	107	96.1	95.5	100	87	1.3	0	0.3
exposure to predators	provision of artificial shelters	95.2	99.1	100	107	96.1	97.6	100	87	0.1	0	0
erosion / siltation	soil stabilisation	96.6	100	100	107	97.1	100	100	87	1.2	0	0
herbivores	herbivore control	96.9	100	100	107	98.5	100	100	87	0.5	0	0
reduced water quality	hydrological management	98.7	100	100	107	99.6	100	100	87	0.4	0	0

Table 3.7. Summary of expected percentage of population persisting across different threats and their management over the longer-term (2 to 20 years post fire) across all species nationally. Conventions as for Table 3.6.

Threats	Actions	Unmanaged				Managed				Benefit		
		mean	Q25	Q75	non-na sp	mean	Q25	Q75	non-na sp	mean	Q25	Q75
more fire	tailored fire management	53	25.8	81.2	95	78.4	69.1	88.9	77	24	5	39.2
habitat loss	replanting and restoration	62.3	39.3	92.4	95	68.6	52.4	88.6	82	9.3	0	18
climate change	NA	73.9	54.6	100	95	73.9	54.6	100	95	0	0	0
drought	NA	73.9	56.3	97.9	95	73.9	56.3	97.9	95	0	0	0
loss of host species	host species re-introduction	84	79.2	100	107	90.7	90.1	100	83	2.6	0	0
fragmentation	replanting and restoration	85	74.8	100	95	88.4	79.4	100	82	5.1	0	7.3
introduced competitors	control of introduced competitors	93.1	93.4	100	95	97	98.6	100	83	0.6	0	0
weeds	weed control	93.4	95.1	100	95	96	97.1	100	83	2.3	0	0.2
erosion / siltation	soil stabilisation	96.2	100	100	95	96.7	99.8	100	83	1.1	0	0

3.3.4. Taxon level analysis of threats and actions

3.3.4.1. Which taxa are most likely to suffer the most substantial ongoing population loss?

3.3.4.1.1. Order

Considering all threats and management actions together, averaged over the fire-affected species in each order, no orders were expected to decline to less than 50% of the post fire population size in the short term. This includes cases where all threats applied, and no management actions are undertaken. In the long term, the populations of species in orders Strepsiptera (endoparasites, n=1 non-na species) and Neorhabdocoela (flatworms, n=6 non-na species) are on average expected to reduce to less than half of the post fire population size when all threats apply and no management actions are undertaken (Table 3.8).

Table 3.8. Long term most threatened orders

Order	Unmanaged				Managed			
	mean	Q25	Q75	non-na sp	mean	Q25	Q75	non-na sp
Strepsiptera	19.7	9.5	29.9	1	100	100	100	1
Neorhabdocoela	33.2	11.6	36.1	6	100	100	100	6

3.3.4.1.2. Species

In the short term (1 year post fire), 81 species are expected to decline to a population size <50% of their post-fire population if all threats are applied and no management is undertaken; 36 of these species are expected to decline to a population size <10% of their post-fire population (Table A4.13 and A4.15 in supplementary materials for full information). This includes six species in the genus *Opaluma* (iridescent soldier flies), three species in the genus *Rhophodon* (land snails), and two species each in the genera *Atelomastix* (millipedes), *Cataxia* (trapdoor spiders), *Diorygopyx* (scarab beetles), *Matthewsius* (dung beetles), *Macrophallikoropa* (land snails) and *Zephyrarchaea* (assassin spiders).

In the longer term (2-20 years post fire), 97 species are expected to decline to a population size <50% of their post-fire population if all threats are applied and no management is undertaken; 52 of these species are expected to decline to a population size <10% of their post-fire population (Table A4.14 and A4.16 in supplementary materials for full information). This includes six species in the genus *Opaluma* (iridescent soldier flies), four in the genera *Euryglossa* (bees) and *Zephyrarchaea* (assassin spiders), and three each in the genera *Hylaeus* (yellow-faced bees), *Scaptodrosophila* (flies), and *Rhophodon* (land snails).

3.3.4.2. Which taxa are likely to decline despite management?

3.3.4.2.1. Order

There were no orders in the short or long term where the average fire-affected species was expected to decline to <50% of their post-fire population size when management actions were employed to address the threats. When management actions are employed in the two orders mentioned above (Strepsiptera and Neorhabdocoela) the declines are expected to be fully ameliorated.

3.3.4.2.1. Species

In the short term (1 year post fire), 60 species are expected to decline to a population size <50% of their post-fire population if all threats apply and all management actions are undertaken. Seven of these species are expected to decline to a population size <10% of their post fire population: *Opaluma ednae, Opaluma fabulosa, Opaluma opulens, Opaluma sapphira* (iridescent soldier flies), *Macrophallikoropa stenoumbilicata* (land snail), *Coricudgia wollemiana* (land snail), and *Xylocopa* (Lestis) aeratus (metallic green carpenter bee).

In the longer term (2-20 years post fire), 78 species are expected to decline to a population size <50% of their post-fire population if all threats apply and all management actions are undertaken. 22 of these species are expected to decline to a population size <10% of their post fire population: *Aenigmatinea glatzella* (enigma moth), *Antissella purprasina* (soldier fly), *Atelomastix danksi, Atelomastix poustiei* (millipedes), *Hedleyropa yarrangobillyensis* (Yarrangobilly Pinwheel Snail), *Hylaeus (Analastoroides) foveatus* (yellow-faced bee), *Kaputaresta nandewarensis* (pinhead snail), *Macleayropa boonanghi* (pinwheel snail), *Macleayropa kookaburra* (pinwheel snail), *Metaballus mesopterus* (katydid), *Moggridgea rainbowi* (Australian trapdoor spider), *Ogyris halmaturia* (butterfly), *Opaluma iridescens, Opaluma unicornis* (iridescent soldier flies), *Pollanisus hyacinthus* (moth), *Rhabdomastix (Sacandaga) wilsoniana* (crane fly), *Rhophodon elizabethae, Rhophodon mcgradyorum, Rhophodon silvaticus* (land snails), *Xylocopa (Lestis) aeratus* (metallic green carpenter bee), *Zephyrarchaea austini*, and *Zephyrarchaea melindae* (assassin spiders).

3.3.4.3. For which taxa are we uncertain about the efficacy of management?

3.3.4.3.1. Order

In the short-term, there was high certainty around the benefit that would be achieved by managing the threats associated with different orders of species (distance between 25th and 75th quartile estimates of benefit <20 in all cases). In the longer term, two orders had 25th and 75th quartile estimates of benefit that differed by more than 20: orders Strepsiptera (endoparasites, n=1 non-na species) and Neorhabdocoela (flatworms, n=6 non-na species) (Table 3.9).

Table 3.9. Long term benefit mean, Q25, Q75 for orders with a big difference in Q25 and Q75

order	mean	Q25	Q75	non-na sp
Neorhabdocoela	66.6	63.9	87.6	6
Strepsiptera	79.8	69.7	89.8	1

3.3.4.3.2. Species

In the short-term (1 year post fire), there was substantial uncertainty (>20 difference between Q25 and Q75 estimates of benefit) around the management efficacy for four species: *Leptoperla dakota* (stonefly), *Cataxia stirlingi, Cataxia colesi* (trapdoor spiders), and *Sondra bickeli* (jumping spider).

In the longer term (2-20 years post fire) there was substantial uncertainty around the management efficacy for eight species: *Kosciuscola tristis tristis* (grasshopper), *Matthewsius rossi, Matthewsius illawarrensis* (dung beetles), *Carrai afoveolata* (spider), *Pseudolampona warrandyte* (white-tailed spider), *Temognatha affinis* (metallic wood boring beetle), *Temnosewellia gracilis* (crayfish), and *Triozocera cooloolaensis* (twisted-winged insect).

3.4. Discussion of threats and management effectiveness

The 2019-20 wildfires caused significant detrimental impacts on hundreds, probably thousands, of invertebrate species. Many of these species are now imperiled, and face additional and compounding threats; and their post-fire recovery is likely to be contingent on the successful implementation of appropriately targeted management. Such management direction will vary across species and regions, and will be variably effective at mitigating the impacts of threats. For many of the most fire-affected species, there is little or no available knowledge of threats and their impact, and hence little knowledge of what management actions are needed, and their likely effectiveness.

Based on a sequenced set of analyses of knowledge contributed by many experts, we identified the main threats faced by fire-affected invertebrate species and the extent to which these threats could be effectively managed. We undertook these analyses at national (PAA) and regional scales, and for short (1-year) and longer (2-20 years) periods post-fire. Unsurprisingly – given that these species have all been severely affected by the 2019-20 wildfires – we found that further fire was the main threat likely to detrimentally affect the most species, and hence that ongoing fire management was the most important conservation response. However, many other threats were considered by experts to also lead to further decline in at least some fire-affected invertebrate species. Furthermore, the relative impacts of threats varied among regions and, despite being the most effective management action, targeted fire management was not sufficient to fully offset the impact of more fire in the landscape.

Our analysis also identified three sets of species with varying likelihoods of recovery and confidence of management:

i. those at risk of drastic declines; that are likely to have populations <50% as large as immediately post fire if all threats are in play are subject to the most substantial risk in the absence of management: 81 species in the short term and 97 in the long term. For these species need to be carefully monitored and managed to avoid catastrophic declines;

ii. those for which threats were considered unlikely to be effectively managed such that the populations are expected to reduce to <50% of the population size immediately post fire even if all management actions are employed: 60 species in the short term and 78 in the long term. For these species, further research to improve the effectiveness of management actions was needed;

iii. those for which it was uncertain how effective management would be at mitigating associated threats: four species in the short term and eight in the long term, where the difference in 25th and 75th estimates of benefit >20. For these species, the priority response is to undertake research to better understand threats and their impacts, and the effectiveness of a range of management options.

This assessment shows that it is possible to overcome some major shortcomings in knowledge availability for invertebrate species, including a general lack of conservation management history for most invertebrates. Given the large number of invertebrate species that rapidly became imperiled because of the 2019-20 fires, there is now an urgent need to apply the most effective management responses across many regions and many species; our assessment shows that it is possible to set this direction.

4. Invertebrate hotspots of endemism

4.1. Introduction

The use of species level conservation assessments is a valuable tool to highlight species at risk of extirpation or extinction, allowing the formulation of conservation management plans, and raising the conservation profile of invertebrates (Braby 2018). However, limited data for most species and the large number of undescribed species, present significant constraints to the use of species level assessment as a standalone conservation tool for Australian invertebrates, especially for the lesser-known invertebrate groups (Walsh et al. 2013; Gerlach et al. 2014; Kwak 2018; Taylor et al. 2018).

Of the circa 100,000 described invertebrate species in Australia (Chapman 2009), we estimate around 3% currently have sufficient distributional or ecological information for them to be eligible for formal conservation assessment, based upon number of available occurrence records (Atlas of Living Australia 2020). With incorporation of the 200,000 undescribed species, for which there is currently no way of assessing conservation status, the proportion of invertebrate species that are able to be assessed at the species level becomes very small, at approximately 1% of species. Many of these species that are not eligible for assessment will be at high risk of extinction, but there is currently no way of assessing their conservation status, for monitoring decline or extinction, or for developing meaningful conservation management plans. Inferences based on higher level taxonomic groups are possible for some taxa, however, given the high levels of diversity within many taxa, even at the genus level confidence in inferred data is inevitably low for most groups.

Conservation tools available for this three percent, include the use of flagship, or iconic species to raise public awareness and to disseminate conservation benefits to lesser-known species (Barua et al. 2012; Taylor et al. 2018) and species-level conservation assessments, both of which can be a valuable way to assess decline, delineate threats and allow formulation of conservation management plans (Braby 2018). However, inherently these assessments are biased towards well-known groups (Kwak 2018) and the species selected may be as much a reflection of public or political interest or expert availability as of direct conservation need (Gerlach et al. 2014).

An alternative, but complementary, approach to species-level conservation of invertebrates is a places approach, by which hotspots of endemism or diversity, or threatened ecological communities, can be assessed and then protected, thereby protecting a suite of species within them (Myers et al. 2000; Keith 2009; Nicholson et al. 2009; Braby 2018; Taylor et al. 2018). Given the impediments to invertebrate conservation, this approach is valuable, particularly as it does not rely on a species being described, or well known, for it to be protected. Australia's invertebrate fauna shows high levels of endemism at the continental and regional level, with many species showing patterns of non-randomly distributed regional or short-range endemism (Harvey 2002; Yeates et al. 2002; Austin et al. 2004; Moir et al. 2009; Braby et al. 2020). Centres of endemism occur where these patterns of endemism coincide and there is concentration of range-restricted species in one location. By definition, centres of endemism are particularly vulnerable to large-scale threatening processes, such as fire.

A complementary approach to the assessment of fire overlap on the known ranges of individual species, therefore, is the assessment of fire overlap on centres of invertebrate endemism. In this component of our project, we aimed to map centres of invertebrate endemism in Australia and to overlay fire extent and fire severity, so as to identify those centres of endemism most at risk and to delineate areas for priority protection in future fires.

4.2. Methodology

Datasets

Occurrence datasets and mapping of fire overlap as described in section 2.2.1 Fire Overlap Analysis.

Calculation of endemism

The phyloregion 1.0.4 package (Daru et al. 2020) was used to calculate the weighted endemism (species richness inversely weighted by species ranges). Point data (presences only, n = 45,529 species) were converted to composition data by calculating the species composition per 0.5 degree cell size across Australia. The abundance and species richness were also calculated per grid cell. To correct for different survey effort across Australia for invertebrates, the corrected weighted endemism index was calculated by: weighted endemism per cell/ species richness of that cell (Crisp et al. 2001).

To determine if patterns of endemism were randomly distributed across Australia or showed patterns of spatial autocorrelation, the Moran's I test was calculated using the spdep 1.1-5 (Bivand et al. 2013). Spatial autocorrelation was calculated as a function of distance from the neighbouring polygon centres for each cell, with a search radius within 200 km. P-values were calculated using a Monte Carlo Test using 10,000 permutations (Bivand et al. 2013). If corrected weighted endemism showed significant autocorrelation, it was assumed that patterns of invertebrate endemism were not randomly distributed and clustered into hotspots (Crisp et al. 2001).

Calculate area burnt

To calculate the area burnt across varying levels of invertebrate endemism, the corrected weighted endemism index above was categorised into percentiles (0-20%, 20-40%, 40-60%, 60-80%, 80-100%), with 80-100% representing the highest and 0-20% representing the lowest rates of endemism. The fire severity classes were then extracted from each 0.5 degree cell that contained an endemism percentile and area calculated using the exactextractr 0.6.1 package (Baston 2021). All data was re-projected to Albers equal area and clipped to the Preliminary Analysis Area. All analysis was performed in R vs 4.0.3.

4.3. Findings

Within the preliminary study area, moderate (percentile: 60-80%) to high (percentile: 80-100%) levels of invertebrate endemism occur across south-west Western Australia, south-eastern Australia, Kangaroo Island and Tasmania (Fig. 4.1). In addition, invertebrate endemism was spatially autocorrelated and thus was not randomly distributed (Moran I = -0.0004, $P < 0.05$).

Areas of moderate and high levels of invertebrate endemism had a total of 4.05% of the area burnt in 2019-20 wildfires, with 2.19% (12,175 km^2) and 1.18% (3221 km^2) of those areas experiencing the highest fire severity category (high or very high fire severity), respectively (Table 4.1; Fig. 4.2).

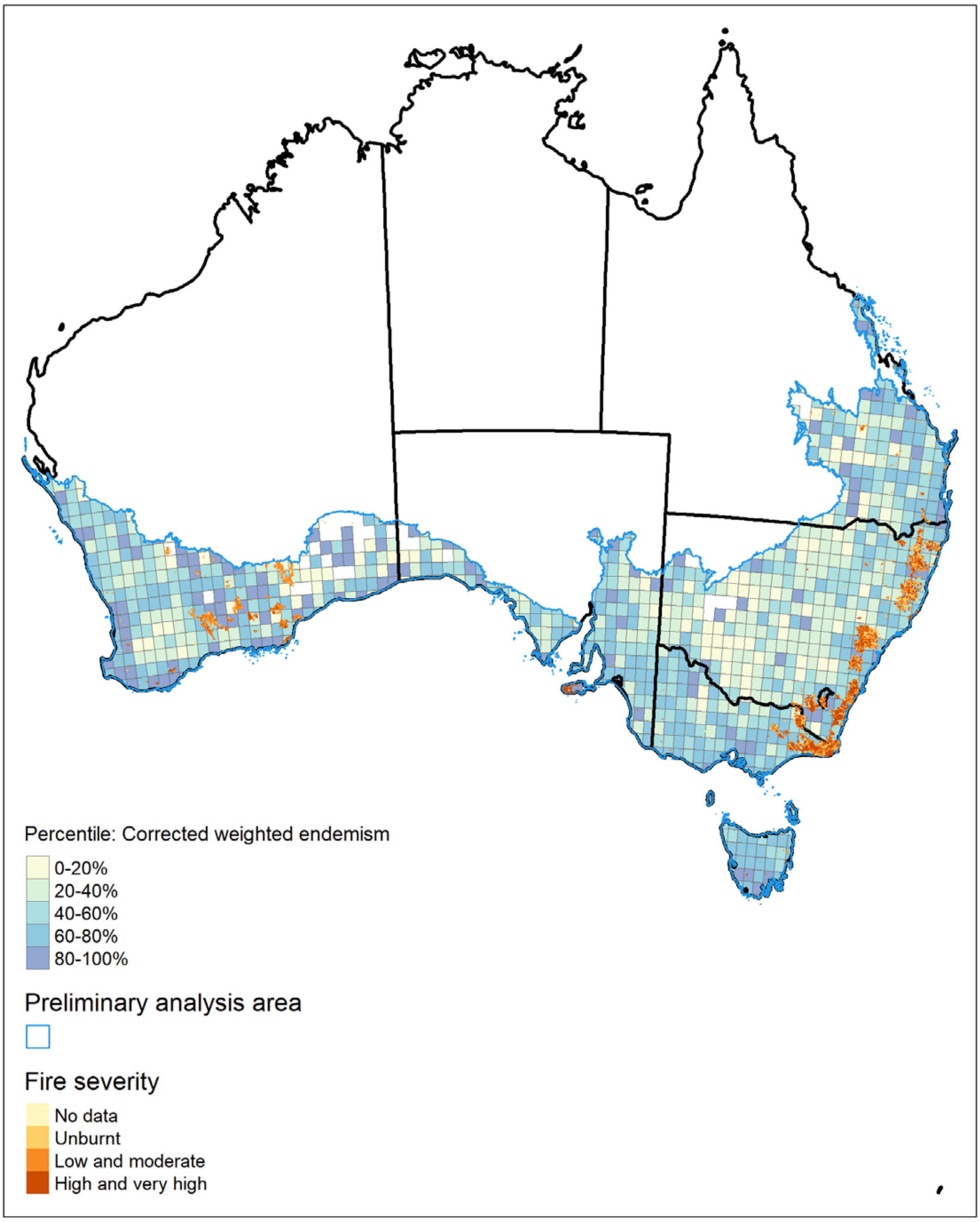


Figure 4.1. Mapping of invertebrate endemism and fire extent in PAA. Endemism class was calculated from the percentiles of corrected weighted endemism index (0-20%, 20-40%, 40-60%,60-80%, 80-100%; from lowest to highest rates of endemism).

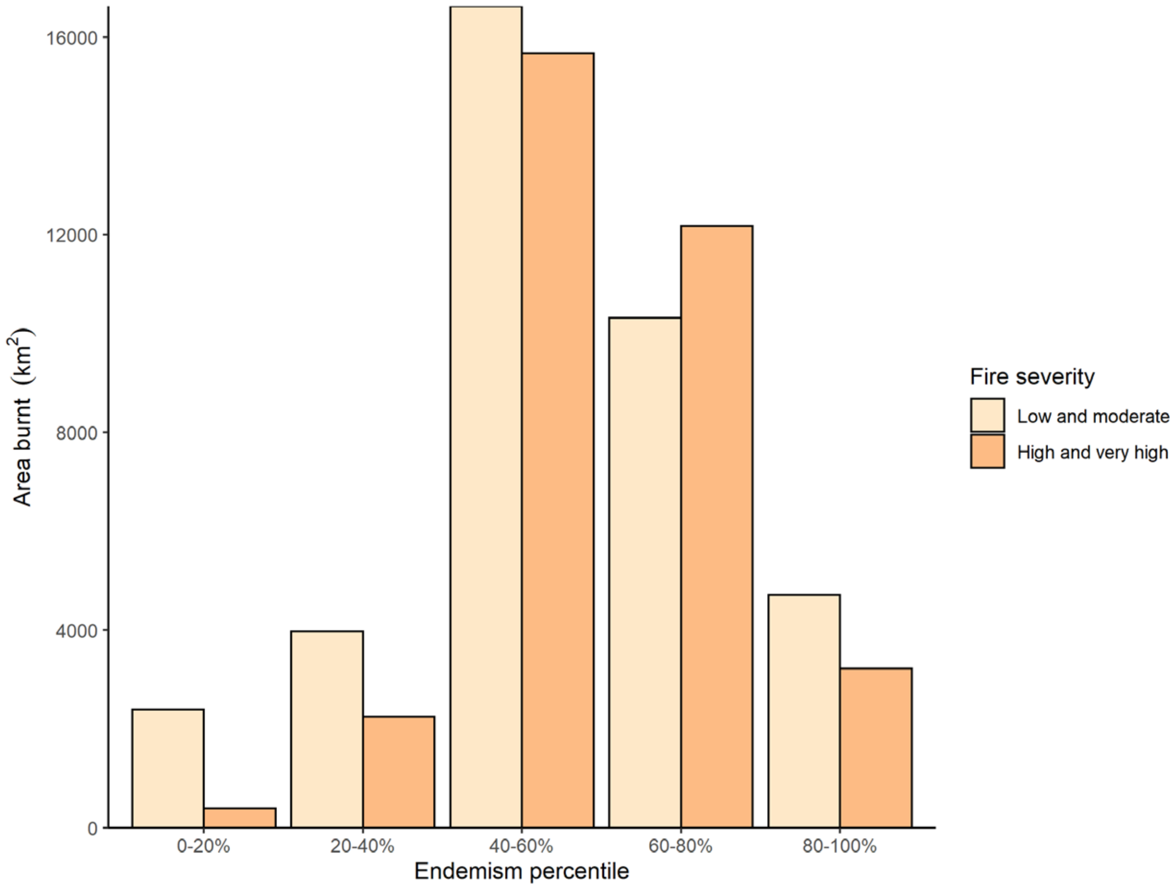


Figure 4.2. Area burnt within each fire severity class for each invertebrate endemism percentile.

Larva of the small bronze azure (*Ogyris otanes otanes*) are tended by one species of Sugar Ant (*Camponotus terebrans*) and the ants are rewarded by a sugary secretion produced by the larva. By day larvae are sheltered underground in the ant nest, then at night they are escorted up by the ants to feed on the leaves of common sourbush. Surveys after the 2019-20 fires have not recorded small bronze azures in areas where common sourbush burnt, but it has been found in small patches of unburnt vegetation. Image: Richard Glatz.

Table 4.1. The area burnt (km^2) from the 2019-20 wildfires for each endemism class and fire severity. Endemism class calculated from percentiles of the corrected weighted endemism (0-20%, 20-40%, 40-60%,60-80%, 80-100%; from lowest to highest rates of endemism). Percent represents the percentage area of each endemism percentile that each fire severity class represents.

Percentile	Fire severity	Area (km^2)	Percent (%)
0-20%	No data	2.91	0.00
	Unburnt	239 358.77	98.85
	Low and moderate	2393.54	0.99
	High and very high	387.30	0.16
20-40%	No data	125.29	0.02
	Unburnt	515 095.69	98.78
	Low and moderate	3972.40	0.76
	High and very high	2244.28	0.43
40-60%	No data	335.33	0.06
	Unburnt	520 751.47	94.11
	Low and moderate	16 618.37	3.00
	High and very high	15 667.26	2.83
60-80%	No data	378.36	0.07
	Unburnt	53 3023.84	95.89
	Low and moderate	10 314.06	1.86
	High and very high	12 174.91	2.19
80-100%	No data	61.54	0.02
	Unburnt	265 217.68	97.07
	Low and moderate	4709.85	1.72
	High and very high	3220.84	1.18

4.4. Discussion

Invertebrate endemism showed significant spatial autocorrelation that suggests hotspots of endemism occur across Australia. Within the study region, moderate to high levels of invertebrate endemism occurred across south-west Western Australia, south-eastern Australia, Kangaroo Island and Tasmania. Invertebrate patterns in endemism are similar to other Australian taxa. For example, Australian flora exhibit similar patterns of endemism across Australia, with higher rates of endemism near the coast (Crisp et al. 2001). Crisp et al. (2001) found no climatic explanation for the pattern of flora endemism, and suggest that the Pleistocene expansions of the central desert may have limited refugia for some endemic species. Future studies exploring patterns of invertebrate endemism with climatic conditions are required to test if patterns are driven by similar processes as the flora.

The 2019-20 wildfires occurred across the region of moderate to high invertebrate endemism, except for Tasmania. Approximately, 3% of the area with high endemism (percentile 80-100%) burnt during 2019-20 wildfires. In addition, Tasmania experienced large wildfires in 2018-19, with 40% located in Tasmanian Wilderness World Heritage Areas (Owen 2019). Taking these findings together, major mega-fires from the last two wildfire seasons have impacted highly endemic species across southern Australia.

5. General discussion

In Australia, and elsewhere, there are long-standing challenges to invertebrate conservation, mostly due to information shortcomings (Taylor et al. 2018). As a result, invertebrates have been disproportionately under-represented in threatened species lists and conservation investment (Walsh et al. 2013; Braby 2018), and the status of many invertebrate species is largely unknown, with such knowledge gaps likely to be masking the magnitude of loss (including extinctions) in the Australian invertebrate fauna (Braby 2019; Woinarski et al. 2019).

The 2019-20 wildfires of southern and eastern Australia caused severe biodiversity impacts across many species, other conservation assets, and regions. The catastrophic extent of biodiversity loss from this single event is likely to have been without modern precedent (Wintle et al. 2020). Typifying long-established interests and priorities, the impacts of these fires on vertebrate species, particularly iconic mammals and birds, galvanised public concern and investments in conservation response (Phillips et al. 2020; van Eeden et al. 2020; Mo et al. 2021). Largely because of the ready availability and accessibility of knowledge, the relative high number of specialists, and comparative lack of diversity of species, rapid assessments – to help guide priority conservation investments – of impacts of these fires proved much more tractable across the complement of vertebrate species (https://www.environment.gov.au/biodiversity/bushfire-recovery/bushfire-impacts/priority-animals; Ward et al. 2020; Legge et al. 2021; Legge et al. in review) and flora (https://www.environment.gov.au/biodiversity/bushfire-recovery/bushfire-impacts/priority-plants; Gallagher et al. in press) than was possible for the invertebrate fauna. Nonetheless, governments and other groups sought to encompass invertebrates in post-fire conservation planning and priority investments, based in part on a provisional (and explicitly non-comprehensive) national listing of fire-affected invertebrate species (https://www.environment.gov.au/biodiversity/bushfire-recovery/bushfire-impacts/priority-invertebrates). Subsequent to that preliminary assessment, a more spatially constrained analysis demonstrated that the known ranges of many invertebrate species were extensively burnt, with many cases of complete distributional overlap of species with the 2019-20 wildfires (Hyman et al. 2020). Such overlap is likely to have caused severe losses and impact, and there is now one well documented case of likely extinction of a highly localised invertebrate species caused by these fires (Moir 2021). In this report, we sought to provide a comprehensive national-scale assessment of the impacts of the 2019-20 wildfires on the Australian invertebrate fauna. We then identified priority conservation responses for a large subset of the species that we found to be most fire-affected.

The many and formidable challenges to this exercise were described in section one of this report. These challenges inevitably constrained our assessment: notably, it is likely that we have under-estimated the tally of fire-affected invertebrates – mostly because we could access no acceptable records for many invertebrate species known to occur in southern and eastern Australia, and because most invertebrate species are yet to be described. Furthermore, our assessments of fire impact are of low confidence for the high proportion of species for which we had only one (31%) or two (14%) acceptable records. One constraint that we addressed involved the limitations of the available distributional databases for the Australian invertebrate fauna. For this project, and with the willing collaboration of many experts and agencies, we were able to aggregate many individual distributional databases, and to demonstrate the analytical advantage of such collation. We hope that this demonstration can help catalyse the more formal and enduring aggregation of the currently unconsolidated distributional information for Australian invertebrates.

Notwithstanding such caveats, our analysis included 342,534 records of 32,164 invertebrate species. Of these species, we found that 1237 species were likely to have been severely fire-affected (mostly based on our analysis showing them to have at least 30% distributional overlap with severe fire and/or at least 50% overlap with any fire; but also including nine threatened species with at 30% overlap from any fire and 19 species nominated by experts for which we could not calculate overlap). This tally is far greater than the comparable tally for the number of fire-affected vertebrate species (ca. 60 species). The total number of invertebrate species for which at least part of their known range was burnt was 14,159. The magnitude of these tallies, of species that we considered to be severely fire-affected and those that had at least some of their range burnt, corroborates earlier conclusions that the 2019-20 wildfires had an unprecedented and catastrophic impact on Australia's biodiversity, and that accordingly there is an urgent need to implement targeted conservation management actions to priority fire-affected species to redress the losses and support recovery.

To help guide such prioritisation and management, we developed and populated a framework set of ecological and life history traits (for adult and subadult life stages) that were informative of the likely susceptibility of individual species to mild fires and to severe fires. We then complemented the fire overlap values for individual species with this trait information to estimate the likely proportion of the species' total population that was killed in the fires that they experienced. Such analysis allowed us to develop an ordered list of 646 species considered to have suffered the most severe proportional population loss in the fires and to have a reduced likelihood of recovery. We consider such species to be the major priorities for conservation response, with that response including assessment for listing as threatened 60 species, with a further 99 species identified as high priorities for research and targeted management and 80 as moderate priorities.

For many (28) of these species, our most plausible ('best guess') estimates of the extent of population loss was above 90%. Hence, we consider it likely that the 2019-20 fires may have caused the extinctions of some invertebrate species, although the exact toll is impossible to determine, and extinction may not be provable until substantial targeted survey proves fruitless.

Although such trait characterisation has been widely used previously for plants and for vertebrates (Friend 1993; Hu et al. 2020; Gallagher et al. in press) to provide inference on the extent of impacts of fire and other disturbances, and to help guide recovery, we are not aware of any precedent in its use at such scale for invertebrates. Our development, and population, of this trait database can be considered as a legacy product; if maintained and added to, it would help increase preparedness for assessment of any future event comparable to the 2019-20 fires.

We extended the application of trait information for 1228 species to help guide national and regional level priorities for (and likelihood of success of) threat mitigation actions for post-fire recovery of the most fire-affected invertebrate species. We found that nationally, and in most regions, the most detrimental threats (i.e., those most likely to result in severe population declines) were more fire, drought and desiccation from exposure. The most important management actions (i.e., those most likely to enable recovery across species) were tailored fire management and replanting and restoration. We also analysed critical uncertainties to identify those species for which recovery is most likely to be constrained by key knowledge gaps (i.e., those species for which targeted research is a priority response). Again, such a collated information base (and its analysis) about threats, mitigation actions (and their likelihood of success) and key knowledge gaps is useful not only for recovery following the 2019-20 wildfires, but will also help preparedness for any future comparable fire events, and allow much more timely conservation response.

For the 60 highly fire-affected species that we consider to be now most eligible candidates for listing as threatened species (or in the case of a few species already listed as threatened, for up-listing), we provide a brief synopsis of relevant information. We acknowledge that information shortcomings may render some of these assessments challenging, but consider that these species are likely to meet the key eligibility criteria, merit listing and may be unlikely to recover without conservation investment. We further note that our analysis was national in scale, comprehensive in scope, and mostly comprised spatial analysis. Local and specialist knowledge, where available, about individual species would complement and enhance our assessment. We accessed such knowledge for some of the species considered here, but there remains much scope for further consultation.

Listing of these species as threatened will also lead to a more accurate recognition of the extent of biodiversity loss caused by the 2019-20 wildfires. We also recognise that consideration for national listing of these invertebrate species would help balance the current portfolio of listing assessments for fire-affected species (currently two terrestrial invertebrate species cf. >30 vertebrates and >50 plants: Listing assessments under the EPBC Act | Department of Agriculture, Water and the Environment). As a coarse indicator of the magnitude of the impacts of the 2019-20 wildfires on Australian invertebrates, our shortlisting of the 239 species which we consider now at highest risk (60 eligible for conservation assessment, 99 likely severely impacted, and requiring urgent survey based assessment and 80 likely severely impacted, but that need uncertainties resolving), far exceeds the total number of invertebrate species (67 species) currently listed as threatened under the EPBC Act, although we note that this comparison is compromised because the current listing has many deficiencies.

Our study helped catalyse a substantial (5-day) IUCN workshop in February 2021 to assess fire-affected Australian invertebrates for the global Red List. Most of the ca. 100 species assessed in this workshop were deemed to meet eligibility criteria for listing as threatened, indicating that the evidence base may also be adequate for listing at Commonwealth and state/territory listing of the species that we consider to have suffered the most significant losses in the 2019-20 wildfires.

To complement our species level analysis in sections 2 and 3, and using the large dataset we collected, we sought to identify and delineate centres of endemism for the Australian invertebrate fauna. In such areas, many short-range endemic species co-occur, so such areas represent key assets for the conservation of invertebrates. Exceptionally many species may be safeguarded, or lost, in these key locations: they are irreplaceable sites (sensu Pressey et al. 1994) for conservation management. We consider such sites of significance for multiple species should also be factored into fire planning and operations. Our assessment here is preliminary and indicative, and we recognise analysis may need to extend to finer resolution spatial scales to be even more relevant to fire planning and operations.

Furthermore, our assessment of the consequences of the 2019-20 fires was focused on the impacts of fire on the status of individual invertebrate species. But losses among invertebrates because of these fires will also have had profound and potentially long-lasting ecological consequences, given the important ecological roles of many invertebrate species (Saunders et al. 2021).

A number of Australian Government funded bushfire recovery projects have been conducted around Australia to measure the impact of the fires on certain invertebrate species. These projects are critical for addressing some of the knowledge gaps identified in this project and for compiling valuable data on fire impact on species. Much of the data collection from such bushfire recovery projects is currently ongoing and so has not been included in this study, however we acknowledge their valuable contribution to our understanding of the impact of fire on invertebrates.

5.1 Recommendations and future directions

This project has demonstrated that – notwithstanding the information shortcomings and other challenges involved in invertebrate conservation in Australia – it is possible to provide an informed assessment of the impacts of a fire event, of exceptional scale, on a large proportion of Australia's invertebrate species. Although many species had few records, such that we had low confidence in their proportional fire overlap, we could with reasonable confidence estimate fire overlap for many thousand species. For the species with high fire overlap, we then developed a framework of ecological traits that could be used to estimate likely proportional population loss, likelihood of recovery and management priorities. From such an analysis, we could develop a tractable set of species that were priorities for conservation status assessment because they had experienced major impacts and for which we considered that the available information was likely to be adequate for assessment. Accordingly, we recommend:

1. The 60 severely fire-affected invertebrate species that we estimate are likely to meet thresholds for listing as threatened [section 2.3.4.1. Priority species for further conservation assessment] and are likely to have sufficient documentation to allow such assessment, should be assessed urgently for listing nationally (in collaboration with the process in range states and, where relevant, the IUCN). Note that this includes also four species currently listed under the EPBC Act that we consider should be considered for up-listing, or further assessment.

Our analysis also identified a set of 179 species (99 high priority and 80 moderate priority) with high fire overlap but with substantial uncertainties about the impact associated with that overlap [section 2.3.4.2]. For these species, we note that there is an urgent need for post-fire survey, to identify whether any populations have persisted, and other research to fill key knowledge gaps for these species. Accordingly, we recommend:

2. The 99 species with high fire overlap but major knowledge gaps should be the focus of a program of targeted survey and research, to help further resolve their extent of loss and to guide recovery efforts. The 80 species with likely susceptibility and risk of recovery, but with moderate data deficiencies should be the focus of surveys to elucidate uncertainties and assess species' status. Of the species with high fire overlap and with traits that increase susceptibility to fire, or reduce recovery potential, there is a likelihood that some may now be extinct, or at the verge of extinction. We know of one species, *Pseudococcus markharveyi*, the Banksia montana mealybug, that is now likely extinct (Moir 2021) and another species *Zephyrarchaea austini*, the Kangaroo Island assassin spider, that has not yet been found despite dedicated post-fire surveys of its habitat (J. Marsh pers. obs.). For *Zephyrarchaea austini*, more surveys are urgently needed to ascertain its status. Given their small size and often cryptic nature, demonstrating the extinction of an invertebrate species is difficult and often requires substantial dedicated survey effort. However, such effort for species at risk of extinction is important and necessary in order to a) quantify the extent of loss, particularly irretrievable loss (such as extinctions) and b) if searches are successful for species with extremely high fire overlap, surviving populations may then be targets for urgent recovery actions that may be needed to avert extinction.

Based on our development and analysis of a framework of threats and management requirements, we identified priority management actions, at national and regional scale, that were most needed to support the recovery of more than a thousand of the most fire-affected invertebrate species. Such management direction will not only help recovery from the 2019-20 fires, but will also increase preparedness for comparable future events. Accordingly, we recommend:

3. The development and implementation of management planning at regional scale, based in part on the management directions indicated here, to support the recovery of invertebrate species and groups of species, that have been most affected by the 2019-20 fires. In many cases, the highest management priority will be enhanced planning, management and control of fire, with the objective of reducing the occurrence of future fire, especially fire of the magnitude of the 2019-20 fires, for the invertebrate species whose conservation outlook has been most jeopardised by the 2019-20 fires.

We note that one of the main shortcomings in the information base currently available for Australian invertebrate species relates to population trajectories, largely because there are few current monitoring programs for Australian invertebrate species, even for most of the species listed as threatened. Given that a fundamental objective of any post-fire conservation program is to support the recovery of the most fire-affected species, and given uncertainties about the effectiveness of management options that may be used or needed, we recommend:

4. The development and implementation of a strategic monitoring program that can chart the recovery, and assess and further refine management actions, for priority fire-affected invertebrate species, including those species currently listed as threatened, and species which we consider would be eligible now for such listing. We recognise that it may be impractical to attempt to monitor all substantially fire-affected invertebrate species and that it may be feasible and efficient to target flagship or representative species as the core of monitoring efforts.

We note that, especially relative to the efforts directed towards the conservation of vertebrates, there are few resources directed to the conservation of Australian invertebrate species, even those listed as threatened. However, our analyses indicate that far more invertebrate than vertebrate species were severely affected by the 2019-20 fires, and if conservation agencies are seeking to reduce the likelihood of extinctions due to the 2019-20 fires, and enhance the likelihood of recovery, then a high proportion of the post-fire conservation management resourcing should be directed towards conservation efforts for fire-affected invertebrates.

The above recommendations focus particularly on fire-affected species. However, we recognise that knowledge gaps impede any assessment of the impacts and conservation needs of many invertebrate species. Given the challenge of species-level conservation of the Australian invertebrate fauna, we recognise the complementary need and benefit of a community level approach – identifying places, landscape features and ecological communities of importance for invertebrate endemism and diversity, such as we have indicated in section 4 of this report. Accordingly, we recommend:

5. The development and implementation of management plans for key sites of conservation significance (notably including centres of endemism) for Australian invertebrate fauna, with such planning including actions to mitigate and respond to future large scale threat events.

One major challenge we faced in this project was the relatively meagre and dis-aggregated information relating to the occurrence of Australian invertebrate species. We have demonstrated that it is possible and beneficial to collate at least some of the currently segregated databases. However, many important records, including some museum collections, are not yet digitised. In this regard, we note and commend an initiative of the Australian government (as part of its Bushfire Recovery Program for wildlife and their habitat) to use citizen science to digitise the invertebrate collection records of the Australian National Insect Collection (https://digivol.ala.org.au/project/index/192261079): this could provide an example to follow for other undigitized collections. Accordingly, we recommend:

6. The development and implementation of a program to better integrate state and museum held data sources into a centralised database of invertebrate data, accessible to the public. Such progress may require further funding for digitisation of museum collections (additional to ANIC) to increase accessibility to the wealth of data they hold; and the implementation of enhanced mechanisms and/or more incentive for individual scientific researchers to upload collections data to a centralised database.

Our analysis involved in part the development and application of a framework of ecological and other traits relevant to conservation for Australian invertebrates. This trait framework was developed de novo for this project, and complemented similar traits frameworks used for assessment of fire impacts for the vertebrate fauna and plants. With further refinement and greater comprehensiveness, the trait framework we developed would be a critical tool to allow for more urgent response to any future fire of comparable scale to the 2019-20 fires. Accordingly, we recommend:

7. That the trait framework developed for this project be maintained by an appropriate research body or information storehouse, where it would benefit from ongoing refinement and additions.

6. Application of research (to date and anticipated)

6.1. IUCN Red List assessment workshop

The NESP 8.3.1 project team formed a collaboration with the International Union for the Conservation of Nature (IUCN), funded by Toyota, to assemble a knowledge base relevant to listing assessments for fire-affected invertebrates, and then use that evidence in a week-long workshop to assess fire-impacted invertebrate species for inclusion in the IUCN Red List. This was a highly collaborative workshop, with input from experts (n=66) from multiple countries and covering a range of invertebrate taxonomic groups and disciplines, with representatives from state and federal government, museums and NGOs. In addition to active participants, student observers were invited to attend, as a learning opportunity on the assessment process, this was well received. A total of 106 species were assessed during this week, with results awaiting publication in the IUCN Red List. The most eligible species from the IUCN assessment workshop were included in the analyses of the 8.3.1 project and have been prioritised here as candidates for assessment under the EPBC Act.

Data collection for the IUCN's Species Information Service (SIS) ran in parallel with collection of ecological and trait data for the main 8.3.1 project. Trait data were compiled through expert elicitation as well as by a team of interns, using reference to published sources and checking data with experts.

A key outcome of the IUCN workshop was the opportunity for a large number of experts and students to gain experience in the assessment process and to become familiar with data requirements for a species to be listed. Many of these experts had no prior experience in threatened species assessments, thus the workshop resulted in an up-skilling in the invertebrate scientific community. Following the workshop, several experts expressed interest in a subsequent workshop to assess additional species. It is anticipated that this may provide a launchpad from which a greater number of experts become actively involved in the conservation assessment process and will lead to an increase in the number of invertebrate species assessed in Australia.

6.2. EPBC Act species nominations

During this project, nominations for two fire-impacted invertebrate species, the Kangaroo Island micro-trapdoor spider (*Moggridgea rainbowi*) and the Kangaroo Island assassin spider (*Zephyrarchaea austini*) were submitted for assessment under the EPBC Act. Both species occur on Kangaroo Island, South Australia and had a high level of fire overlap on their known ranges and scored highly on the Fire Susceptibility Index (FSI) and the Recovery Risk Index (RRI), indicating expected high levels of mortality and an expected reduced ability to recover or recolonise following fire. Members of the project team worked closely with DAWE representatives to progress these listings and compile data.

We anticipate that this project will result in further submissions for assessment of fire-impacted invertebrates under the EPBC Act (where appropriate, also through state/territory processes), initially focussing on the 60 species identified as currently eligible for assessment, and followed by assessments of a portion of the 99 priority species for research, following collection and collation of up-to-date data for these species.

6.3. Data accessibility

Data used in this project are accessible at https://doi.org/10.5281/zenodo.5091296, including AFD species list of invertebrates in Australia, cleaned ALA data, species polygons and trait databases.

7. Acknowledgements

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Jewel beetle (*Temognatha mitchellii karattae*). Image: Richard Glatz

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Appendices

Appendix 1. Fire overlap for EPBC Act listed species.

Appendix 1.1. Fire overlap values for all 451 threatened species with at least part of their distribution in the PAA.

Note that no fire overlap values are calculated for species with no included records. Acronyms for conservation status: CR Critically Endangered; EN Endangered; VU Vulnerable.

Species name	Common name	No. records	% overlap SEVERE fire	% overlap ALL fire	EPBCA	IUCN	S/T
Abebaioscia troglodytes	Pannikin Plains Cave Isopod						WA (VU)
Acanthaeschna victoria	Thylacine Darner	7	1.04	9.93		EN	
Acizzia mccarthyi	McCarthy's Plant Louse					EN	WA (VU)
Acizzia veski	Vesk's Plant-louse					CR	WA (VU)
Acrodipsas brisbanensis		13	8.59	11.31			Vic (Threatened)
Acrodipsas brisbanensis cyrilus	Bronze Ant-blue, Large Ant-blue						Vic (EN)
Acrodipsas illidgei	Illidge's Ant-blue, Mangrove Ant-blue	8	0.01	0.10		EN	Qld (VU)
Acrodipsas myrmecophila	Small Ant-blue	4	1.18	5.80			Vic (CR)
Adclarkia cameroni	Brigalow Woodland Snail	22	0.05	0.43	EN		Qld (VU)
Adclarkia dawsonensis	Boggomoss Snail, Dawson River Snail, Dawson Valley Snail	60	0.00	0.00	CR		Qld (EN)
Adclarkia dulacca	Dulacca Woodland Snail	13	0.00	0.00	EN		Qld (EN)
Allanaspides helonomus	Syncarid Shrimp, Tasmanian Anaspid Crustacean	4	0.47	0.53		VU	
Allanaspides hickmani	Hickman's Pigmy Mountain Shrimp	4	0.01	0.02		VU	Tas (Rare)
Allocharopa erskinensis	land snail	8	0.00	0.00		VU	Vic (VU)
Amelora acontistica	Chevron Looper Moth	2	0.00	0.00			Tas (VU)
Ammoniropa vigens	Ammonite Pinwheel Snail	2	0.00	0.00	CR		Tas (EN)
Ancylastrum cumingianus	Australian Freshwater Limpet, Tasmanian Freshwater 'Limpet'	14	0.04	0.05		CR	
Antipodia atralba	Black and White Skipper, Diamond Sand-skipper	11	1.51	2.45			Vic (EN)
Antipodia chaostola leucophaea	Tasmanian Chaostola Skipper, Heath-sand Skipper	3	0.00	0.00	EN		Tas (EN)
Antiporus willyamsi	aquatic beetle	3	0.14	0.37			Vic (VU)
Arachnocampa sp. [Arachnocampa lucifera buffaloensis]	Mt Buffalo glow-worm						Vic (VU)

Species name	Common name	No. records	% overlap SEVERE fire	% overlap ALL fire	EPBCA	IUCN	S/T
Archaeophya adamsi	Adam's Emerald Dragonfly, Horned Urfly	4	0.04	0.61		VU	NSW (EN)
Archaeophylax canarus	caddisfly	27	0.44	2.65			Vic (Threatened)
Archaeosynthemis spiniger	Spiny Tigertail	2	0.00	0.00		VU	
Argynnis hyperbius	Laced Fritillary	3	0.01	0.07			NSW (EN)
Argynnis hyperbius inconstans	Australian Fritillary	1	0.00	0.00	CR		NSW (EN); Qld (EN)
Armagomphus armiger	Armourtail	10	0.03	0.72		VU	
Astacopsis gouldi	Giant Freshwater Crayfish, Tasmanian Giant Freshwater Lobster	19	0.00	0.00	VU	EN	Tas (VU)
Atelomastix anancita	millipede	3	3.63	15.44			WA (VU)
Atelomastix brennani	millipede	8	4.32	5.78			WA (VU)
Atelomastix culleni	millipede	5	0.00	0.00			WA (VU)
Atelomastix danksi	millipede	6	40.25	64.59			WA (VU)
Atelomastix dendritica	millipede						WA (VU)
Atelomastix flavognatha	millipede	6	0.00	0.00			WA (VU)
Atelomastix grandis	millipede	2	0.00	0.00			WA (VU)
Atelomastix julianneae	millipede	2	0.00	0.00			WA (VU)
Atelomastix lengae	millipede	12	0.00	0.00			WA (VU)
Atelomastix longbottomi	millipede	1	0.00	0.00			WA (VU)
Atelomastix melindae	millipede	3	0.00	0.00			WA (VU)
Atelomastix poustiei	millipede	7	73.02	79.07			WA (VU)
Atelomastix priona	millipede	2	0.00	25.00			WA (VU)
Atelomastix sarahae	millipede	2	0.00	0.00			WA (VU)
Atelomastix tigrina	millipede	13	19.32	39.27			WA (VU)
Atelomastix tumula	millipede	2	0.00	0.00			WA (VU)
Attenborougharion rubicundus [Helicarion rubicundus]	Burgundy Snail	8	0.00	0.00		VU	Tas (Rare)
Australatya striolata	Eastern Freshwater Shrimp	77	9.84	28.66			Vic (VU)
Austroaeschna (Austroaeschna) cooloola	Wallum Darner	2	0.00	0.00		EN	
Austroaeschna (Austroaeschna) flavomaculata	Alpine Darner	14	3.49	7.43			Vic (VU)
Austroaeschna (Pulchaeschna) eungella	Eungella Darner					VU	

Species name	Common name	No. records	% overlap SEVERE fire	% overlap ALL fire	EPBCA	IUCN	S/T
Austroaeschna ingrid						EN	
Austroaeschna muelleri	Carnarvon Darner					EN	
Austroargiolestes elke	Azure Flatwing	3	0.00	0.00		VU	
Austroassiminea letha	Cape Leeuwin Freshwater Snail	2	0.00	0.00		EN	WA (VU)
Austrocordulia leonardi	Sydney Hawk Dragonfly	4	0.18	0.40		VU	NSW (EN)
Austrogammarus australis	Dandenong Freshwater Amphipod, Sherbrooke Amphipod	16	0.00	0.00		CR	Vic (EN)
Austrogammarus haasei	An amphipod	5	0.00	0.00			Vic (VU)
Austrogomphus angelorum	Murray River Hunter					VU	
Austropeplea hispida [Kutikina hispida]		7	0.00	0.00		VU	
Austropetalia patricia	Waterfall Redspot	13	5.24	22.38		VU	
Austropetalia tonyana	Alpine Redspot Dragonfly	5	0.09	0.52			NSW (VU)
Austropyrgus grampianensis	Dairy Creek Austropyrgus Snail	4	4.94	18.74			Vic (CR)
Austrosaga spinifer		2	0.00	0.00		VU	
Basedowena hinsbyi		10	0.00	0.00		VU	
Beddomeia angulata	Hydrobiid Snail (Rapid River)	5	0.00	0.00		VU	Tas (Rare)
Beddomeia averni	Hydrobiid Snail (West Gawler)	2	0.00	0.00		VU	Tas (EN)
Beddomeia bellii	Hydrobiid Snail (Heazlewood River)	8	0.00	0.00		VU	Tas (Rare)
Beddomeia bowryensis	Hydrobiid Snail (Bowry Creek)	4	0.00	0.00		VU	Tas (Rare)
Beddomeia briansmithi	Hydrobiid Snail (Fern Creek)	7	0.00	0.00		VU	Tas (VU)
Beddomeia camensis	Hydrobiid Snail (Cam River)	5	0.00	0.00		VU	Tas (EN)
Beddomeia capensis	Hydrobiid Snail (Table Cape)	7	0.00	0.00		EN	Tas (EN)
Beddomeia fallax	Hydrobiid Snail (Heathcote Creek)	3	0.00	0.00		EN	Tas (Rare)
Beddomeia forthensis	Hydrobiid Snail (Wilmot River)	3	0.00	0.00		VU	Tas (Rare)
Beddomeia franklandensis	Hydrobiid Snail (Frankland River)	3	0.00	0.00		VU	Tas (Rare)
Beddomeia fromensis	Hydrobiid Snail (Frome River)	6	0.00	0.00		VU	Tas (EN)
Beddomeia fultoni	Hydrobiid Snail (Farnhams Creek)	5	0.00	0.00		VU	Tas (EN)
Beddomeia gibba	Hydrobiid Snail (Salmon River Road)	3	0.00	0.00		VU	Tas (Rare)
Beddomeia hallae	Hydrobiid Snail (Buttons Rivulet)	2	0.00	0.00		VU	Tas (EN)
Beddomeia hermansi	Hydrobiid Snail (Viking Creek)	3	0.00	0.00			Tas (EN)
Beddomeia hullii	Hydrobiid Snail (Heazlewood River)	3	0.00	0.00		VU	Tas (Rare)

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Beddomeia inflata	Hydrobiid Snail (Heathcote Creek)	4	0.00	0.00		VU	Tas (Rare)
Beddomeia kershawi	Hydrobiid Snail (Macquarie River)	3	0.00	0.00		VU	Tas (EN)
Beddomeia kessneri		4	0.00	0.00		VU	
Beddomeia krybetes	St Pauls Hydrobiid Snail	5	0.00	0.01		VU	Tas (VU)
Beddomeia launcestonensis	Hydrobiid Snail (Cataract Gorge)	18	0.00	0.00		VU	Tas (EN)
Beddomeia lodderae	Hydrobiid Snail (Upper Castra Rivulet)	8	0.00	0.00		VU	Tas (VU)
Beddomeia mesibovi	Hydrobiid Snail (Arthur River)	4	0.00	0.00		VU	Tas (Rare)
Beddomeia minima	Hydrobiid Snail (Scottsdale)	10	0.00	0.00		VU	Tas (Rare)
Beddomeia petterdi	Hydrobiid Snail (Blyth River)	4	0.00	0.00		VU	Tas (EN)
Beddomeia phasianella	Hydrobiid Snail (Keddies Creek)	3	0.00	0.00		VU	Tas (VU)
Beddomeia protuberata	Hydrobiid Snail (Emu River)	4	0.00	0.00		VU	Tas (Rare)
Beddomeia ronaldi	Hydrobiid Snail (St. Patricks River)	6	0.00	0.00		VU	Tas (EN)
Beddomeia salmonis	Hydrobiid Snail (Salmon River)	4	0.00	0.00		VU	Tas (Rare)
Beddomeia tasmanica	Hydrobiid Snail (Terrys Creek)	9	0.55	1.42		VU	Tas (Rare)
Beddomeia topsiae	Hydrobiid Snail (Williamson Creek)	8	0.00	0.00		VU	Tas (Rare)
Beddomeia trochiformis	Hydrobiid Snail (Bowry Creek)	3	0.00	0.00			Tas (Rare)
Beddomeia tumida	Great Lake Hydrobiid Snail	3	0.00	0.00		CR	Tas (EN)
Beddomeia turnerae	Hydrobiid Snail (Minnow River)	11	0.00	0.00		VU	Tas (Rare)
Beddomeia waterhouseae	Hydrobiid Snail (Clayton's Rivulet)	4	0.00	0.00		VU	Tas (EN)
Beddomeia wilmotensis	Hydrobiid Snail (Wilmot River)	5	0.00	0.00		VU	Tas (Rare)
Beddomeia wiseae	Hydrobiid Snail (Blizzards Creek)	6	0.00	0.00		VU	Tas (VU)
Beddomeia zeehanensis	Hydrobiid Snail (Little Henty River)	2	0.00	0.00		VU	Tas (Rare)
Benthodorbis pawpela	Glacidorbid Snail (Great Lake)	4	0.00	0.00			Tas (Rare)
Bertmainius colonus	Eastern Stirling Range Pygmy Trapdoor Spider	26	34.80	43.00	VU		WA (VU)
Bertmainius monachus	pygmy trapdoor spider	8	15.17	16.45			WA (EN)
Bertmainius pandus	pygmy trapdoor spider	9	32.01	69.91			WA (CR)
Bertmainius tingle	Tingle Pygmy Trapdoor Spider	7	0.01	4.14	EN		WA (EN)
Bertmainius tumidus	pygmy trapdoor spider	14	0.00	0.00			WA (EN)
Boeckella bispinosa						VU	
Boeckella geniculata						VU	

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Boeckella nyoraensis		4	0.00	0.00		VU	
Boeckella shieli						VU	
Bothriembryon (Bothriembryon) bradshawi		11	0.56	0.72		VU	
Bothriembryon (Bothriembryon) glauerti		3	28.82	48.78		VU	
Bothriembryon (Bothriembryon) perobesus		6	2.92	10.41		EN	
Bothriembryon (Bothriembryon) whitleyi	Whitley's Tapered Snail	2	0.00	0.00		VU	WA (Presumed EX)
Bothriembryon brazieri		7	25.29	40.59		VU	
Bothriembryon irvineanus						VU	
Branchinella apophysata	Fairy Shrimp					VU	
Branchinella basispina	Fairy Shrimp	1	0.00	0.00		VU	
Calamoecia australica	calanoid copepod	3	0.02	0.04		VU	Vic (VU)
Calamoecia australis	centropagid copepod	3	0.00	0.00			Vic (VU)
Calamoecia elongata						VU	
Caliagrion billinghursti	Large Riverdamsel	5	1.84	3.73		VU	Vic (EN)
Candalides noelkeri	Golden-rayed Blue	5	0.00	0.00			Vic (CR)
Canthocamptus dedeckkeri	copepod					VU	Vic (VU)
Canthocamptus echinopyge						VU	
Canthocamptus longipes		1	0.00	100.00		VU	
Canthocamptus mammillifurca		1	0.00	0.00		VU	
Canthocamptus sublaevis		1	0.00	0.00		VU	
Canthocamptus tasmaniae						VU	
Castiarina insculpta	Miena Jewel Beetle	5	0.00	0.00			Tas (VU)
Catadromus lacordairei	a ground beetle	5	0.00	0.00			Tas (VU)
Cavernotettix craggiensis	Craggy Island Cave Cricket	1	0.00	0.00			Tas (Rare)
Charopidae Skemps""	Skemps Snail						Tas (Rare)
Cherax destructor	Yabby	360	2.06	3.68		VU	
Cherax leckii		2	0.00	0.00		CR	
Cherax tenuimanus	Hairy Marron, Margaret River Hairy Marron, Margaret River Marron	15	4.26	4.72	CR	CR	WA (CR)
Chloritobadistes victoriae	Southern Hairy Red Snail	11	1.60	3.04			Tas (VU)
Chrysolarentia decisaria	Tunbridge Looper Moth	11	0.00	0.01			Tas (EN)

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Colubotelson joyneri	phreatoicid isopod	10	0.02	0.11			Vic (VU)
Colubotelson searlei	phreatoicid isopod	1	0.00	0.00			Vic (VU)
Cordulephya divergens	Clubbed Shutwing					VU	
Cupedora evandaleana		27	0.02	0.06		EN	
Cyliosoma sarahae	Sarah's Pill Millipede	10	2.87	3.84			WA (VU)
Cynotelopus notabilis	a millepede	46	0.11	0.13			WA (EN)
Daphnia jollyi	Water Flea	4	0.00	0.00		VU	
Daphnia nivalis	Water Flea	1	0.00	0.00		VU	
Daphnia occidentalis	Water Flea	2	0.00	0.00		VU	
Dasybela achroa	Saltmarsh Looper Moth	2	0.00	0.00			Tas (VU)
Dasyurotaenia robusta	A tapeworm						Tas (Rare)
Dinotoperla walkeri	stonefly	4	0.00	0.00			Vic (VU)
Echinodillo cavaticus	Flinders Island Cave Slater	1	0.00	0.00			Tas (Rare)
Ecnomina vega	Caddis Fly (Macquarie River)						Tas (Rare)
Ecnomus neboissi	caddisfly	1	0.00	0.00			Vic (VU)
Ecnomus nibbor	caddisfly	9	7.34	10.57			Vic (VU)
Edwardsina (Tonnoirina) gigantea	Giant Torrent Midge					EN	
Edwardsina tasmaniensis	Tasmanian Torrent Midge					VU	
Enchymus sp. nov.	Weldborough Forest Weevil						Tas (Rare)
Engaeus australis	Lilly Pilly Burrowing Cray	2	0.00	0.00			Vic (VU)
Engaeus curvisuturus	Curve-tail Burrowing Crayfish	2	0.00	0.00			Vic (EN)
Engaeus disjuncticus		3	0.00	0.00		EN	
Engaeus fultoni	Otway Burrowing Cray	3	0.08	0.11			Vic (VU)
Engaeus granulatus	Central North Burrowing Crayfish	3	0.00	0.00	EN	CR	Tas (EN)
Engaeus hemicirratulus	Gippsland Burrowing Cray	4	0.00	0.00			Vic (EN)
Engaeus karnanga	South Gippsland Burrowing Cray	4	0.00	0.01			Vic (EN)
Engaeus mallacoota	Mallacoota Burrowing Crayfish					CR	Vic (VU)
Engaeus martigener	Furneaux Burrowing Crayfish	3	0.00	0.00	EN	EN	Tas (VU)
Engaeus merosetosus	Western Burrowing Cray	3	0.00	0.00			Vic (EN)
Engaeus orramakunna	Mount Arthur Burrowing Crayfish	3	0.00	0.00	VU		Tas (VU)
Engaeus phyllocercus	Narracan Burrowing Crayfish	4	0.00	0.00		EN	Vic (EN)

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Engaeus rostrogaleatus	Strzelecki Burrowing Crayfish	2	0.00	0.00		VU	Vic (EN)
Engaeus sericatus	Hairy Burrowing Cray	5	0.00	0.00			Vic (VU)
Engaeus spinicaudatus	Scottsdale Burrowing Crayfish	2	0.00	0.00	EN	CR	Tas (EN)
Engaeus sternalis	Warragul Burrowing Crayfish	2	0.00	0.00		CR	Vic (CR)
Engaeus strictifrons	Portland Burrowing Cray	5	0.12	0.39			Vic (VU)
Engaeus tuberculatus	Tubercle Burrowing Cray	4	2.06	3.01			Vic (EN)
Engaeus urostrictus	Dandenong Burrowing Crayfish	3	0.00	0.00		VU	Vic (CR)
Engaeus victoriensis	Foothill Burrowing Cray	2	0.00	0.00			Vic (EN)
Engaeus yabbimunna	Burnie Burrowing Crayfish	3	0.00	0.00	VU	VU	Tas (VU)
Engaewa pseudoreducta	Margaret River Burrowing Crayfish				CR	CR	WA (EN)
Engaewa reducta	Dunsborough Burrowing Crayfish				CR	EN	Vic (EN)
Engaewa walpolea	Walpole Burrowing Crayfish				EN	EN	Vic (EN)
Episynlestes intermedius	Intermediate Whitetip	3	0.00	0.00		VU	
Euastacus armatus	Murray Crayfish	11	5.93	10.70			NSW (VU); ACT (VU); Vic (Threatened)
Euastacus bidawalis	Bidawal Crayfish	5	56.68	73.78		EN	Vic (VU)
Euastacus bispinosus	Glenelg Spiny Freshwater Crayfish, Pricklyback, Glenelg River Crayfish	21	0.11	3.36	EN	VU	Vic (EN)
Euastacus brachythorax		5	10.16	28.27		EN	
Euastacus clarkae	Ellen Clark's Crayfish	19	32.67	67.50		EN	
Euastacus claytoni	Calyton's Crayfish	9	31.77	35.93		EN	Vic (VU)
Euastacus crassus	Alpine Spiny Crayfish	10	16.93	22.61		EN	Vic (EN)
Euastacus dalagarbe		3	0.00	0.08		CR	
Euastacus dharawalus	Fitzroy Falls Crayfish	5	20.67	35.78	CR	CR	NSW (CR)
Euastacus diversus	Orbost Spiny Crayfish	19	55.68	77.38		EN	Vic (EN)
Euastacus eungella		5	0.00	5.06		CR	
Euastacus gamilaroi		4	1.26	8.37		CR	
Euastacus girurmulayn		2	0.00	25.00		CR	
Euastacus gumar		3	27.39	32.07		EN	
Euastacus guruhgi		4	0.06	0.22		CR	
Euastacus guwinus		3	73.47	97.89		CR	

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Euastacus hirsutus		10	0.00	0.00		EN	
Euastacus hystricosus		4	0.00	0.00		EN	
Euastacus jagabar		2	0.00	0.00		CR	
Euastacus jagara		2	0.00	25.00		CR	
Euastacus maccai						EN	
Euastacus maidae		1	0.00	0.00		CR	
Euastacus mirangudjin	Ochre-Bellied Crayfish	2	0.00	0.00		CR	
Euastacus monteithorum		1	0.00	0.00		CR	
Euastacus neodiversus	South Gippsland Spiny Cray	6	0.00	0.00		EN	Vic (EN)
Euastacus pilosus		11	21.12	51.70		EN	
Euastacus polysetosus		3	0.36	1.44		EN	
Euastacus rieki		10	16.63	21.76		EN	
Euastacus setosus		3	0.01	1.04		CR	
Euastacus simplex		17	6.44	13.71		VU	
Euastacus spinichelatus		5	12.58	41.46		EN	
Euastacus sulcatus		24	3.22	12.65		VU	
Euastacus suttoni	New England Crayfish	13	1.50	4.56		VU	
Euastacus urospinosus		10	0.00	0.02		EN	
Euastacus yanga	Southern Lobster	25	39.96	61.12			Vic (VU)
Euastacus yarreansis		6	0.00	0.00		VU	
Eucrenonaspides oinotheke		2	0.00	0.00		VU	
Eusthenia nothofagi	Otway Stonefly	22	0.06	0.09		VU	
Eusynthemis deniseae	Carnarvon Tigertail	3	0.00	0.00		VU	
Exquisitiropa agnewi	Silky Pinwheel Snail, Silky Snail	2	0.00	0.00			Tas (Rare)
Fibulacamptus bisetosus						VU	
Fibulacamptus gracilior		2	0.00	0.00		VU	
Fluvidona anodonta	North Pine River Freshwater Snail					VU	
Fluvidona dyeriana [Austropyrgus dyerianus]		3	0.00	0.00		VU	
Fluvidona petterdi [Austropyrgus petterdianus]		4	0.00	0.00		CR	
Gariwerdeus beehivensis	phreatoicid isopod	4	0.00	0.00			Vic (VU)

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Gariwerdeus ingletonensis	phreatoicid isopod	1	0.00	0.00			Vic (VU)
Gariwerdeus turretensis	phreatoicid isopod	2	0.00	0.00			Vic (VU)
Geminoropa scindocataracta	land snail					VU	Vic (VU)
Geocharax falcata	Western Cray	2	0.00	0.00		VU	Vic (EN)
Geocharax gracilis	Otways Cray						Vic (EN)
Georissa laseroni		11	19.29	47.02		VU	
Glacidorbis occidentalis		4	0.37	0.94		VU	
Glyptorhagada bordaensis		4	67.50	82.23		VU	
Glyptorhagada euglypta		5	0.00	0.00		VU	
Glyptorhagada kooringensis		49	0.00	0.00		VU	
Glyptorhagada silveri		25	0.00	0.00		EN	
Glyptorhagada tattawuppana		7	0.00	0.00		VU	
Goedetrechus mendumae	A blind cave beetle						Tas (VU)
Goedetrechus parallelus	Slender Cave Beetle, Cashion Creek Cave Beetle	1	0.00	0.00			Tas (VU)
Gramastacus insolitus	Western Swamp Crayfish	3	15.43	24.74			Vic (CR)
Griseargiolestes bucki	Turquoise Flatwing	6	3.43	15.54		VU	
Haloniscus searlei	Salt Lake Slater	4	0.00	0.00			Tas (EN)
Helicarion castanea	Albany Snail	1	0.00	0.00			WA (Presumed EX)
Helicarion leopardina [Helicarion cuvieri]		194	7.21	11.83		VU	
Hemiboeckella powellensis						VU	
Hemigomphus cooloola	Wallum Vicetail	3	1.73	6.52		EN	
Hemiphlebia mirabilis	Ancient Greenling	11	0.01	0.01			Vic (EN)
Hemisaga irregularis		4	0.30	0.53		VU	
Hemisaga lucifer		1	0.00	0.00		VU	
Hemisaga vepreculae		2	0.00	0.00		VU	
Hesperilla flavescens flavescens	Altona Skipper, Flavescens Skipper, Yellow Donnysa Skipper, Yellow Sedge Skipper, Yellowish Skipper						Vic (VU)
Hesperocolletes douglasi	Douglas' Broad-headed Bee, Rottnest Bee	1	0.00	0.00	CR		WA (CR)
Heteronympha cordace wilsoni	Bright-eyed Brown	12	0.09	0.19			Vic (Regionally EX)

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Hickmanoxyomma cavaticum	Ida Bay Cave Harvestman	5	0.00	0.00			Tas (Rare)
Hickmanoxyomma gibbergunyar	Cave Harvestman (Mole Creek)	3	0.00	0.00			Tas (Rare)
Hoplogonus bornemisszai	Bornemissza's Stag Beetle	6	0.00	0.00	CR		Tas (EN)
Hoplogonus simsoni	Simson's Stag Beetle	16	0.00	0.00	VU		Tas (VU)
Hoplogonus vanderschoori	Vanderschoor's Stag Beetle	6	0.00	0.00	VU		Tas (VU)
Hurleya sp. (WAM C23193)	Crystal Cave Crangonyctoid						WA (CR)
Hydrobiosella sagitta	Caddis Fly (St. Columba Falls)	1	0.00	0.00			Tas (Rare)
Hydroptila scamandra	Caddis Fly (Upper Scamander River)	89	8.89	17.95			Tas (Rare)
Hygrobia australasiae	screech beetle, water beetle	4	0.02	0.07			Vic (VU)
Hypochrysops ignitus ignitus	Dingy Jewel, Fiery Jewel	3	2.55	9.33			Vic (VU)
Hypochrysops piceatus	Bulloak Jewel Butterfly	1	0.00	0.00			Qld (EN)
Hypocysta adiante	Darwin Ringlet, Orange Ringlet	10	0.00	0.00			Vic (Regionally EX)
Hyridella (Protohyridella) glenelgensis	Glenelg Freshwater Mussel	7	0.15	0.38	CR	CR	Vic (CR)
Idacarabus cordicollis	Cave Beetle (Hastings Cave)	3	0.00	0.00			Tas (Rare)
Idacarabus troglodytes	Ida Bay Cave Beetle	3	0.00	0.00			Tas (Rare)
Idiosoma formosum	Ornate Shield-backed Trapdoor Spider	12	0.00	0.00			WA (EN)
Idiosoma kopejkaorum	Lake Goorly Shield-backed Trapdoor Spider	26	0.00	0.00			WA (EN)
Idiosoma nigrum	Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider	33	0.00	0.00	VU		WA (EN)
Ixalodectes flectocercus		1	0.00	0.00		CR	
Jalmenus eubulus	Pale Imperial Blue, Pale Imperial Hairstreak, Brigalow Blue	41	0.03	0.19			NSW (CR); Qld (VU)
Jalmenus icilius	Amethyst Hairstreak, Icilius Blue	8	0.03	0.21			Vic (VU)
Kawanaphila pachomai		2	0.00	0.00		EN	
Keyacris scurra	Key's Matchstick Grasshopper	4	5.74	12.07			Vic (Threatened)
Kwonkan eboracum	Yorkrakine Trapdoor Spider	4	0.00	0.00			WA (CR)
Lacuropa colliveri [Cralopa colliveri]		3	0.00	0.00		VU	
Latarima furcilla [Tamasia furcilla]	caddisfly	1	0.00	0.00			Vic (VU)
Lathrocordulia metallica	Western Swiftwing	4	0.02	0.90		VU	
Leioproctus (Andrenopsis) douglasiellus	a short-tongued bee	4	18.10	37.64	CR		WA (EN)
Leptocerus souta	caddisfly	3	0.00	0.00			Vic (VU)

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Leptoperla cacuminis	Mount Kosciusko Wingless Stonefly	2	0.00	0.00		VU	
Leptoperla kallistae	Kallista Flightless Stonefly						Vic (CR)
Leucopatus anophthalmus [Tasmanipatus anophthalmus]	Blind Velvet Worm	5	0.00	0.00	EN	EN	Tas (EN)
Lissotes latidens	Broad-toothed Stag Beetle, Wielangta Stag Beetle	17	0.00	0.00	EN		Tas (EN)
Lissotes menalcas	Mount Mangana Stage Beetle	16	0.00	0.00			Tas (Rare)
Maratus sarahae	peacock spider, jumping spider	7	12.60	34.86			WA (CR)
Marteena rubricincta	Large Yellow-spotted Cicada	6	0.00	0.00			Vic (EN)
Megascolides australis	Giant Gippsland Earthworm	668	0.00	0.00	VU	EN	Vic (EN)
Meridolum corneovirens	Cumberland Land Snail	1218	2.46	5.76		EN	NSW (EN)
Mesacanthotelson setosus	Isopod (Great Lake)	4	0.00	0.00			Tas (Rare)
Mesacanthotelson tasmaniae	Isopod (Great Lake)	3	0.00	0.00			Tas (Rare)
Michelea microphylla	ghost shrimp						Vic (VU)
Micromidia convergens	Early Mosquitohawk	5	1.54	15.14		VU	
Micropathus kiernani	Francistown Cave Cricket, Southern sandstone cave cricket	1	0.00	0.00	CR		Tas (EN)
Microrchestia bousfieldi	Bousfield's Marsh-hopper						NSW (VU)
Migas plomleyi	Plomley's Trapdoor Spider	3	0.00	0.00			Tas (EN)
Miselaoma weldii	Stanley Pinhead Snail, Weld's Pinhead Snail	3	0.13	24.09			Tas (EN)
Myrmecia inquilina		1	0.00	0.00		VU	
Myrmecia sp. 17	bullant						Vic (VU)
Mysticarion porrectus [Helicarion porrectus]		63	10.00	27.33		VU	
Naiopegia xiphagrostis	phreatoicid isopod	1	0.00	0.00			Vic (VU)
Nanocochlea monticola						VU	
Nanocochlea pupoidea						VU	
Nanodectes bulbicercus		1	0.00	0.00		CR	
Nanotrachia orientalis	a camaenid land snail	4	0.00	0.00		EN	WA (VU)
Neopasiphae simplicior	A native bee	3	0.09	0.86	CR		WA (EN)
Nothomyrmecia macrops	Australian Ant	3	0.00	0.00		CR	
Notomicrus tenellus		47	0.00	0.00			Vic (VU)

Species name	Common name	No. records	% overlap SEVERE fire	% overlap ALL fire	EPBCA	IUCN	S/T
Notopala hanleyi	Hanley's River Snail	4	0.00	0.03			NSW (CR)
Notopala sublineata	Darling River Snail	21	0.05	0.45		EN	NSW (CR); Vic (CR)
Notoperata sparsa	caddisfly	5	0.00	0.00			Vic (VU)
Nurus atlas	Atlas Rainforest Ground-beetle	1902	0.25	0.43			NSW (EN)
Nurus brevis	Shorter Rainforest Ground-beetle	1371	0.12	1.05			NSW (EN)
Occirhenea georgiana	a carnivorous land snail	1	0.00	0.00		EN	WA (Presumed EX)
Ocybadistes knightorum	Black Grass-dart, Knight's Dart	327	0.25	1.17		EN	NSW (EN)
Oecetis gilva	Caddis Fly (South Esk River)	4	0.02	0.22			Tas (Rare)
Oecetis quadrula	caddisfly						Vic (VU)
Offachloritis dryanderensis	Mount Dryander Scaly Snail	3	0.00	0.00		VU	
Ogyris genoveva araxes	Genoveva Azure, Purple Azure Southern Purple Azure						Vic (VU)
Ogyris idmo halmaturia	Large Brown Azure	7	0.00	0.01			Vic (Regionally EX)
Ogyris otanes (otanes)	Brown Azure, Western Dark Azure, Small Brown Azure	13	10.52	11.06			Vic (CR)
Ogyris subterrestris petrina	Arid Bronze Azure	5	0.00	0.00	CR		WA (CR)
Ogyris subterrestris subterrestris	Mildura Ogyris Butterfly, Arid Brown Azure, Mallee Brown Azure	12	0.00	0.01			Vic (VU)
Olgania excavata	Cave Spider (Bubs Hill Cave)	11	0.24	0.29			Tas (Rare)
Ombrastacoides denisoni		1	0.00	0.00		CR	
Ombrastacoides parvicaudatus		1	0.00	0.00		CR	
Ombrastacoides pulcher		1	0.00	0.00		VU	
Onchotelson brevicaudatus	Isopod (Great Lake & Shannon Lagoon)	2	0.00	0.00		VU	Tas (Rare)
Onchotelson spatulatus	Isopod (Great Lake)	2	0.00	0.00		VU	Tas (EN)
Oreisplanus munionga larana	Marrawah Skipper, Alpine Sedge Skipper, Alpine Skipper	1	0.00	0.00	VU		Tas (EN)
Oreixenica latialis theddora	Alpine Silver Xenica, Small Alpine Xenica, Mount Buffalo Xenica	4	16.80	34.99			Vic (EN)
Oreixenica ptunarra	Ptunarra Brown, Ptunarra Brown Butterfly, Ptunarra Xenica	17	0.00	0.00	EN		Tas (VU)
Oreomava otwayensis		26	0.00	0.00		VU	
Ornithoptera richmondia [Troides richmondia]	Richmond Birdwing Butterfly	78	0.05	0.70			Qld (VU)

Species name	Common name	No. records	% overlap SEVERE fire	% overlap ALL fire	EPBCA	IUCN	S/T
Orphninotrichia maculata	Caddis Fly (Wedge River)	14	1.21	5.70			Tas (Rare)
Orthotrichia adornata	Caddis Fly (Derwent River)	14	5.46	10.09			Tas (Rare)
Oxyethira mienica	Caddis Fly (Ouse River)						Tas (Rare)
Pachysaga munggai		4	0.01	0.10		VU	
Pachysaga strobila						CR	
Pallidelix bennetti	Bennett's Woodland Snail	10	0.54	0.86		VU	
Paralucia pyrodiscus lucida	Eltham Copper Butterfly	86	0.00	0.01	EN		Vic (EN)
Paralucia spinifera	Bathurst Copper Butterfly, Purple Copper Butterfly, Bathurst Copper, Bathurst Copper Wing, Bathurst-Lithgow Copper, Purple Copper	138	5.54	7.45	VU	EN	NSW (EN)
Paranaspides lacustris	Great Lake Shrimp, Tasmanian Anaspid Crustacean					VU	
Parartemia contracta	Brine Shrimp					VU	
Parvotettix rangaensis	Cave Cricket	2	0.00	0.00			Tas (Rare)
Parvotettix whinrayi	Whinray's Cave Cricket	1	0.00	0.00			Tas (Rare)
Pasma tasmanica	Tasmanica Skipper, Two-spotted Skipper, Grass-skipper	11	9.65	19.55			Vic (VU)
Pasmaditta jungermanniae	Cataract Gorge Pinhead Snail, Cataract Gorge Snail	8	0.00	0.00		VU	Tas (VU)
Pernagera gatliffi	land snail					VU	Vic (EN)
Peronomyrmex bartoni	ant	2	0.00	0.00			Vic (CR)
Perunga ochracea	Perunga Grasshopper						ACT (VU)
Petalura gigantea	Giant Dragonfly	292	22.97	42.46			NSW (EN)
Petalura litorea	Coastal Petaltail	102	5.80	18.17			NSW (EN)
Phasmodes jeeba		2	0.00	0.00		VU	
Phrantela annamurrayae	Hydrobiid Snail (Heazlewood River)					VU	Tas (Rare)
Phrantela conica	Hydrobiid Snail (Little Henty River)					VU	Tas (Rare)
Phrantela kutikina						VU	
Phrantela marginata	Hydrobiid Snail (Heazlewood River)						Tas (Rare)
Phrantela pupiformis	Hydrobiid Snail (Tyenna River)						Tas (Rare)
Phreatoicopsis raffae	phreatoicid isopod	8	0.00	0.01			Vic (VU)

Species name	Common name	No. records	% overlap SEVERE fire	% overlap ALL fire	EPBCA	IUCN	S/T
Phreatoicopsis terricola	phreatoicid isopod	3	0.00	0.00			Vic (VU)
Phyllodes imperialis smithersi	Pink Underwing Moth	1	0.00	0.00	EN		NSW (EN)
Plesiothele fentoni	Lake Fenton Trapdoor Spider	3	0.00	0.00			Tas (EN)
Pommerhelix depressa	Jenolan Caves Woodland Snail	4	26.31	60.66		VU	
Pommerhelix duralensis	Dural Land Snail	220	2.60	7.49	EN		NSW (EN)
Praxibulus uncinatus	Alpine Yellow-Bellied Grasshopper					VU	
Psacadonotus insulanus						EN	
Psacadonotus seriatus						VU	
Pseudalmenus chlorinda myrsilus	Australian Hairstreak, Orange Tit, Silky Hairstreak, Tasmanian Hairstreak	3	0.00	0.00			Tas (Rare)
Pseudalmenus chlorinda zephyrus [Pseudalmenus chlorinda fisheri]	Australian Hairstreak, Orange Tit, Silky Hairstreak, Victorian Hairstreak	35	7.23	10.81			Vic (EN)
Pseudocloeon hypodelum	mayfly	2	0.00	0.00			Vic (VU)
Pseudococcus markharveyi	Banksia montana mealybug	2	50.00	50.00	CR	CR	WA (CR)
Pseudotyrannochthonius typhlus	Cave Pseudoscorpion (Mole Creek)	2	0.00	0.00			Tas (Rare)
Ramiheithrus kocinus	Caddis Fly (Corinna)						Tas (Rare)
Ramiheithrus virgatus	caddisfly	2	50.00	75.00			Vic (VU)
Rhynchochydorus australiensis	Water Flea	1	0.00	0.00		VU	
Rhytidid sp. (WAM# 2295-69)	Stirling Range Rhytidid Snail						WA (CR)
Riekoperla darlingtoni	Mount Donna Buang Wingless Stonefly	3	0.00	0.00		CR	Vic (CR)
Riekoperla intermedia	stonefly	6	0.40	1.45			Vic (EN)
Riekoperla isosceles	stonefly	3	0.43	2.56			Vic (CR)
Roblinella agnewi	Silky Snail					VU	
Schayera baiulus	Schayer's Grasshopper	1	0.00	0.00		CR	Tas (EN)
Spathula tryssa	flatworm	14	0.15	0.86			Vic (VU)
Stenopsychodes lineata	Caddis Fly (Bluff Hill Creek)						Tas (Rare)
Strumigenys xenos		3	14.83	41.01		VU	
Synamphisopus ambiguus	phreatoicid isopod	4	0.00	0.00			Vic (VU)
Synamphisopus doegi	phreatoicid isopod	3	0.00	0.00			Vic (VU)
Synemon discalis	Small Orange-spotted Sun-moth	5	0.00	0.15			Vic (CR)
Synemon jcaria	Reddish-orange Sun Moth	16	3.83	7.05			Vic (CR)

Species name	Common name	No. records	% overlap SEVERE fire	% overlap ALL fire	EPBCA	IUCN	S/T
Synemon nais	Orange Sun Moth	8	0.00	0.00			Vic (CR)
Synemon plana	Golden Sun Moth	8358	0.01	0.02	CR		Vic (CR); ACT (EN); NSW (EN)
Synemon selene	Pale Sun Moth	7	0.00	0.00			Vic (CR)
Synemon theresa	A sun moth	11	0.05	0.22			Vic (Regionally EX)
Tanjistomella verna	caddisfly	8	0.00	0.00			Vic (CR)
Tartarus mullamullangensis	Mullamullang Cave Spider, Lace-web Spider	2	0.00	0.00			WA (VU)
Tartarus murdochensis	Murdoch Sink Cave Spider	1	0.00	0.00			WA (VU)
Tartarus nurinensis	Nurina Cave Spider	3	0.00	0.00			WA (VU)
Tartarus thampannensis	Thampanna Cave Spider	1	0.00	0.00			WA (VU)
Tasimia drepana	Caddis Fly (Huon & Picton Rivers)	2	0.00	0.00			Tas (Rare)
Taskiria mccubbini	McCubbin's Caddisfly	1	0.00	0.00			Tas (EN)
Taskiria otwayensis	caddisfly	5	0.10	0.15			Vic (VU)
Taskiropsyche lacustris	Lake Pedder Caddisfly	1	0.00	0.00			Tas (EN)
Tasmanipatus barretti	Giant Velvet Worm	10	0.46	1.05			Tas (Rare)
Tasmanophlebi lacuscoerulei	Large Blue Lake Mayfly					EN	
Tasmanoplectron isolatum		1	0.00	0.00		VU	
Tasmanotrechus cockerilli	Cockerill's Cave Beetle						Tas (Rare)
Tasmaphena lamproides [Austrorhytida lamproides]	Keeled Carnivorous Snail	24	0.00	0.00			Tas (Rare)
Tasniphargus tyleri	Amphipod (Great Lake)	1	0.00	0.00			Tas (Rare)
Telicota eurychlora	Dingy Darter, Sedge Darter, Southern Sedge Darter	4	31.91	52.43			Vic (VU)
Temognatha flavocincta	jewel beetle	23	0.01	0.08			Vic (VU)
Temognatha maculiventris	jewel beetle	10	0.00	0.00			Vic (VU)
Temognatha sanguinipennis	jewel beetle	5	0.00	0.01			Vic (VU)
Temognatha tricolorata	jewel beetle						Vic (VU)
Tenuibranchiurus glypticus	Swamp Crayfish	15	0.25	0.76		EN	Qld (EN)
Teyl sp. (BY Main 1953/2683, 1983/13)	Minnivale Trapdoor Spider						WA (CR)
Thaumatoperla alpina	Alpine Stonefly	17	1.36	2.97	EN		Vic (VU)
Thaumatoperla flaveola	A stonefly	12	0.19	1.26			Vic (VU)

Species name	Common name	No. records	% overlap SEVERE fire	% overlap ALL fire	EPBCA	IUCN	S/T
Theclinesthes albocinctus	Bitter-bush Blue, Grund's Blue	3	0.00	0.00			Vic (EN)
Theclinesthes serpentata lavara	Chequered Blue, Little Blue, Salt Bush Blue	1	0.00	0.00			Tas (Rare)
Thersites mitchellae	Mitchell's Rainforest Snail	177	0.12	1.12	CR	EN	NSW (EN)
Throscodectes xederoides						EN	
Throscodectes xiphos		2	0.00	0.00		EN	
Trapezites luteus luteus	Rare White-spot Skipper, Yellow Ochre	15	0.20	0.47			Vic (EN)
Triaenodes cuspiosa	caddisfly	2	0.00	25.00			Vic (VU)
Triaenodes resima	caddisfly	1	100.00	100.00			Vic (VU)
Triaenodes uvida	caddisfly	1	0.00	0.00			Vic (VU)
Triaenodes vespertina	caddisfly	2	0.00	0.00			Vic (CR)
Triboniophorus sp. nov. 'Kaputar'	Kaputar Pink Slug					EN	
Trioza barrettae	Banksia brownii plant louse, Barrett's Plant-louse	5	69.34	73.60	EN	CR	WA (EN)
Troglodiplura lowryi	Nullarbor Cave Trapdoor Spider	3	0.00	0.00			WA (VU)
Uramphisopus pearsoni	Isopod (Great Lake)	3	0.00	0.00		VU	Tas (Rare)
Victaphanta compacta	Otway Black Snail	32	0.06	0.09		EN	Vic (EN)
Victodrobia millerae						VU	
Westralunio carteri	Carter's Freshwater Mussel, Freshwater Mussel, Ambiguus Mussel				VU	VU	WA (VU)
Westriplectes angelae	caddisfly	2	0.00	0.00			Vic (VU)
Westriplectes pedderensis	caddisfly						Vic (VU)
Windbalea viride		2	0.00	0.00		VU	
Wundacaenis flabellum	mayfly						Vic (VU)
Xylocopa aeratus	Metallic Green Carpenter Bee, Southern Green Carpenter Bee	92	75.40	81.19			Vic (Regionally EX)
Zaprochilus ninae						VU	
Zephyrarchaea barrettae	Talyuberlup Assassin Spider	2	50.00	50.00			WA (VU)
Zephyrarchaea mainae	Western Archaeid Spider	38	0.62	0.70			WA (VU)
Zephyrarchaea marki	Cape Le Grand Assassin Spider	2	0.00	0.00			WA (VU)
Zephyrarchaea melindae	Toolbrunup Assassin Spider	5	58.08	71.14			WA (VU)
Zephyrarchaea robinsi	Eastern Massif Assassin Spider	9	40.31	47.46			WA (VU)

Appendix 1.2. EPBC Act listed species not assessed for fire overlap.

Species name	Common name	EPBCA	IUCN	S/T	Note
Advena campbellii	Campbell's Helicarionid Land Snail	CR	EX		probably EX; not in PAA (Norfolk I)
Agriocnemis kunjina	Pilbara Wisp		VU		not in PAA
Allora doleschallii doleschallii	Peacock Awl			Qld (Near Threatened)	not in PAA
Amphidromus cognatus	Cognate Land Snail			NT (VU)	not in PAA
Amplirhagada astuta	a camaenid land snail		EN	WA (VU)	not in PAA
Amplirhagada questroana			EN		not in PAA
Antipodogomphus hodgkini	Pilbara Dragon		EN		not in PAA
Athanopsis australis	Southern Hooded Shrimp			Vic (VU)	marine
Attacus wardi	Australian Atlas Moth			NT (VU)	not in PAA
Aulacopris matthewsi			VU		not in PAA
Austroaeschna christine	S-spot Darner		VU		not in PAA
Austroagrion pindrina	Pilbarra Billabongfly		VU		not in PAA
Austrogomphus doddi	Northern River Hunter		VU		not in PAA
Austrothelphusa tigrina			VU		not in PAA
Austrothelphusa valentula			VU		not in PAA
Bamazomus subsolanus	Eastern Cape Range Bamazomus			WA (EN)	not in PAA
Bamazomus vespertinus	Western Cape Range Bamazomus			WA (EN)	not in PAA
Basedowena squamulosa	land snail			NT (VU)	not in PAA
Bogidomma australis	Barrow Island Bogidomma			WA (VU)	not in PAA
Bothriembryon praecelsus	Kellerberin Tapered Snail		EN	WA (Presumed EX)	in PAA; few records
Bothriembryon spenceri	Spencer's Land Snail		VU	NT (VU)	not in PAA
Branchinella buchananensis	Buchanans Fairy Shrimp			NSW (VU)	not in PAA
Branchinella denticulata	Fairy Shrimp		VU		not in PAA
Branchinella simplex	Brine Shrimp		VU		not in PAA
Branchinella wellardi	Fairy Shrimp		VU		not in PAA
Bunderia misophaga	a copepod			WA (CR)	not in PAA
Calamoecia zeidleri			VU		not in PAA
Calliax tooradin	ghost shrimp			Vic (VU)	marine; in PAA few records
Caridina spelunca			VU		not in PAA
Caridina thermophila			EN		not in PAA

Species name	Common name	EPBCA	IUCN	S/T	Note
Carinotrachia carsoniana	a camaenid land snail		VU	WA (VU)	not in PAA
Chaetocneme critomedia sphinterifera	Banded Dusk-flat, Banded Red-eye			Qld (Near Threatened)	not in PAA
Cordulephya bidens	Tropical Shutwing		VU		not in PAA
Cornicandovia australica	Lord Howe Horn-headed Stick-insect		CR		LHI only
Costora iena	Great Lake Caddisfly 1			Tas (EX)	possibly Extinct; in PAA; few records
Crenoicus mixtus	phreatoicid isopod			Vic (EX)	EXtinct
Cristilabrum bubulum	a camaenid land snail		EN	WA (EN)	not in PAA
Cristilabrum buryillum	a camaenid land snail		EN	WA (CR)	not in PAA
Cristilabrum grossum	a camaenid land snail		EN	WA (CR)	not in PAA
Cristilabrum isolatum	a camaenid land snail		VU	WA (EN)	not in PAA
Cristilabrum monodon	a camaenid land snail		VU	WA (CR)	not in PAA
Cristilabrum primum	a camaenid land snail		VU	WA (CR)	not in PAA
Cristilabrum rectum	a camaenid land snail		VU	WA (CR)	not in PAA
Cristilabrum simplex	a camaenid land snail		VU	WA (CR)	not in PAA
Cristilabrum solitudum	a camaenid land snail		EN	WA (CR)	not in PAA
Cristilabrum spectaculum	a camaenid land snail			WA (EN)	not in PAA
Cupedora nottensis			VU		not in PAA
Damochlora millepunctata [Nannochlora cassiniensis]			EN		not in PAA
Davidrentzia valida	Rentz's Strong Stick-insect		CR		LHI only
Dendronephthya australis	Cauliflower Soft Coral	EN			marine
Dirutrachia sublevata	camaenid land snail			NT (VU)	not in PAA
Ditropisena whitei [Ditropis whitei]			VU		not in PAA
Divellomelon hillieri	land snail		VU	NT (VU)	not in PAA
Draculoides bramstokeri	Barrow Island Draculoides			WA (VU)	not in PAA
Draculoides brooksi	Northern Cape Range Draculoides			WA (EN)	not in PAA
Draculoides julianneae	Western Cape Range Draculoides			WA (EN)	not in PAA
Draculoides mesozeirus	Middle Robe Draculoides			WA (VU)	not in PAA
Dryococelus australis	Land Lobster, Lord Howe Island Phasmid, Lord Howe Island Stick-insect	CR	CR	NSW (CR)	LHI grp. only

Species name	Common name	EPBCA	IUCN	S/T	Note
Dupucharopa millestriata			VU		not in PAA
Eodiaptomus lumholtzi			VU		not in PAA
Euastacus balanesis			EN		not in PAA
Euastacus bindal	freshwater crayfish, spiny crayfish	CR	CR	Qld (VU)	not in PAA
Euastacus fleckeri			EN		not in PAA
Euastacus robertsi			CR		not in PAA
Euastacus yigara			CR		not in PAA
Eurysticta coolawanyah	Pilbara Pin		VU		not in PAA
Euschemon rafflesia alba	Northern Regent Skipper, Raffles' Skipper, Regent Skipper			Qld (Near Threatened)	not in PAA
Fonscochlea (Fonscochlea) accepta			VU		not in PAA
Fonscochlea (Fonscochlea) aquatica			EN		not in PAA
Fonscochlea (Fonscochlea) billakalina			EN		not in PAA
Fonscochlea (Fonscochlea) conica			VU		not in PAA
Gabbia pallidula			VU		not in PAA
Gazameda gunnii	Gunn's Screw Shell			Tas (VU)	littoral
Granulomelon arcigerens	Western Macdonnells Land Snail			NT (VU)	not in PAA
Granulomelon gilleni	Gillen Creek Land Snail			NT (VU)	not in PAA
Granulomelon grandituberculatum	land snail			NT (VU)	not in PAA
Gudeoconcha sophiae magnifica	Magnificent Helicarionid Land Snail	CR		NSW (Crtically EN)	LHI only
Hadronyche pulvinator	Cascade Funnel-web Spider			Tas (EX)	Extinct
Hedleya macleayi			VU		not in PAA
Hedleyoconcha ailaketoae			VU		not in PAA
Hemicordulia koomina	Pilbara Emerald		VU		not in PAA
Hemisaga elongata [Iinjarria elongata]			CR		not in PAA
Hemistomia flexicolumella			VU		LHI only
Hemistomia pusillior			EN		LHI only
Hemistomia whiteleggei			CR		LHI endemic
Huonia melvillensis	Forestwatcher		VU		not in PAA
Hybomorphus melanosomus	Lord Howe Island Ground Weevil			NSW (EX)	LHI only
Hypochrysops apollo apollo	Apollo Jewel			Qld (VU)	not in PAA

Species name	Common name	EPBCA	IUCN	S/T	Note
Hypochrysops elgneri barnardi	Amethyst Jewel			Qld (Near Threatened)	not in PAA
Hypolimnus pedderensis	Lake Pedder Earthworm	EX	EX	Tas (EX)	Extinct
Indohya damocles	Cameron's Cave Pseudoscorpion			WA (CR)	not in PAA
Indolestes obiri	Cave Reedling		VU		not in PAA
Jardinella acuminata [Edgebastonia (Barcaldinia) acuminata]			EN		not in PAA
Jardinella colmani [Edgebastonia (Barcaldinia) colmani]			CR		not in PAA
Jardinella coreena [Edgebastonia (Barcaldinia) coreena]			VU		not in PAA
Jardinella corrugata [Edgebastonia (Barcaldinia) corrugata corrugata]			VU		not in PAA
Jardinella edgbastonensis [Edgebastonia (Barcaldinia) edgbastonensis]			VU		not in PAA
Jardinella eulo [Eulodrobia eulo]			VU		not in PAA
Jardinella exigua [Carnarvoncochlea exigua]			EN		not in PAA
Jardinella isolata [Springvalia isolata]			VU		not in PAA
Jardinella jesswiseae Edgebastonia (Barcaldinia) jesswiseae]			EN		not in PAA
Jardinella pallida [Edgebastonia (Barcaldinia) pallida]			EN		not in PAA
Jardinella zeidlerorum [Edgebastonia (Barcaldinia) zeidlerorum]			EN		not in PAA
Kimboraga exanima			EN		not in PAA
Kimboraga koolanensis			VU		not in PAA
Kimboraga micromphala			VU		not in PAA
Kimboraga yammerana			VU		not in PAA
Kumonga exleyi	Cape Range Remipede	VU		WA (CR)	not in PAA
Leptopalaemon gibbosus			VU		not in PAA
Leptopalaemon glabrus			CR		not in PAA
Leptopalaemon gudjangah			VU		not in PAA

Species name	Common name	EPBCA	IUCN	S/T	Note
Leptopalaemon magelensis			VU		not in PAA
Lestoidea barbarae	Large Bluestreak		VU		not in PAA
Lestoidea lewisiana	Mount Lewis Bluestreak		EN		not in PAA
Liagoceradocus branchialis	Cape Range Liagoceradocus			WA (EN)	not in PAA
Liagoceradocus subthalassicus	Barrow Island Liagoceradocus			WA (VU)	not in PAA
Limnocythere porphyretica	Seed Shrimp		VU		not in PAA
Liphyra brassolis major	Moth Butterfly			Qld (Near Threatened)	not in PAA
Lithosticta macra	Rock Narrow-wing		VU		not in PAA
Malandella queenslandica	Queensland Malandella Stick-insect		VU		not in PAA
Marginaster littoralis	Derwent River Seastar	CR			marine
Mathewsoconcha grayi ms	Gray's Helicarionid Land Snail	CR			Norfolk I only
Mathewsoconcha phillipii	Phillip Island Helicarionid Land Snail	CR			Norfolk I only
Mathewsoconcha suteri	a helicarionid land snail	CR			Norfolk I only
Mesodontrachia desmonda [Vincentrachia desmonda]	a camaenid land snail			NT (CR)	not in PAA
Mesodontrachia fitzroyana	Fitzroy Land Snail	EN		NT (CR)	not in PAA
Metaprotella haswelliana	Haswell's Caprellid			NSW (Presumed EX)	marine
Monterissa gowerensis			VU		LHI only
Mouldingia occidentalis	a camaenid land snail		VU	WA (CR)	not in PAA
Mystivagor mastersi	Masters' Charopid Land Snail	CR		NSW (CR)	LHI only
Nacaduba pactolus cela	Large Line Blue			Qld (VU)	not in PAA
Nedsia fragilis	A crustacean			WA (VU)	marine
Nedsia humphreysi	A crustacean			WA (VU)	marine
Nedsia hurlberti	A crustacean			WA (VU)	marine
Nedsia macrosculptilis	A crustacean			WA (VU)	marine
Nedsia sculptilis	A crustacean			WA (VU)	marine
Nedsia straskraba	A crustacean			WA (VU)	marine
Nedsia urifimbriata	A crustacean			WA (VU)	marine
Newnhamia fuscata	Seed Shrimp		VU		not in PAA
Newnhamia insolita	Seed Shrimp		VU		not in PAA
Ningbingia australis			VU		not in PAA

Species name	Common name	EPBCA	IUCN	S/T	Note
Ningbingia australis australis	a camaenid land snail			WA (CR)	not in PAA
Ningbingia australis elongata	a camaenid land snail			WA (CR)	not in PAA
Ningbingia bulla	a camaenid land snail		VU	WA (CR)	not in PAA
Ningbingia dentiens	a camaenid land snail		VU	WA (CR)	not in PAA
Ningbingia laurina	a camaenid land snail		VU	WA (CR)	not in PAA
Ningbingia octava	a camaenid land snail		VU	WA (CR)	not in PAA
Ningbingia res	a camaenid land snail		VU	WA (CR)	not in PAA
Nososticta koolpinyah	Koolpinyah Threadtail		VU		not in PAA
Nososticta pilbara	Pilbara Threadtail		EN		not in PAA
Nososticta taracumbi	Melville Island Threadtail		VU		not in PAA
Ogyris iphis doddi	Dodd's Azure, Orange-tipped Azure			NT (EN)	not in PAA
Ordtrachia australis	a camaenid land snail			NT (EN)	not in PAA
Ordtrachia elegans	a camaenid land snail		VU	WA (CR)	not in PAA
Ordtrachia septentrionalis	Rosewood Keeled Snail	CR		NT (EN); WA (CR)	not in PAA
Panesthia lata	Lord Howe Island Wood-feeding Cockroach			NSW (EN)	LHI only
Papilio (Princeps) ulysses joesa	Blue Mountain Butterfly, Blue Swallowtail, Imperial Swallowtail, Ulysses Butterfly, Ulysses Swallowtail			Qld (Near Threatened)	not in PAA
Paradraculoides anachoretus	Mesa A Paradraculoides, a whipscorpion			WA (VU)	not in PAA
Paradraculoides bythius	Mesa B/C Paradraculoides			WA (VU)	not in PAA
Paradraculoides gnophicola	Mesa G Paradraculoides			WA (VU)	not in PAA
Paradraculoides kryptus	Mesa K Paradraculoides			WA (VU)	not in PAA
Parvulastra vivipara	Tasmanian Live-bearing Seastar	VU			marine
Pericryptodrilus nanus	Lord Howe Earthworm			NSW (EN)	LHI only
Petalura pulcherrima	Beautiful Petaltail		VU		not in PAA
Pillomena aemula	land snail			NT (VU)	not in PAA
Pilsbrycharopa tumida			VU		not in PAA
Pisidium centrale			VU		not in PAA
Placostylus bivaricosus	Lord Howe Flax Snail, Lord Howe Placostylus	EN	CR	NSW (EN)	LHI only
Platydoris galbana	A marine opistobranch			Vic (VU)	marine
Prionospio thalanji	a bristle worm			WA (CR)	not in PAA
Prototrachia sedula			VU		not in PAA
Pseudocharopa ledgbirdi	Mount Lidgbird Charopid Land Snail	CR		NSW (CR)	LHI only

Species name	Common name	EPBCA	IUCN	S/T	Note
Pseudocharopa whiteleggei	Whitelegge's Land Snail	CR		NSW (CR)	LHI only
Quintalia stoddartii	Stoddart's Helicarionid Land Snail	CR	EX		Norfolk I only; probably EX
Rhagada gibbensis			VU		not in PAA
Rhagada harti			VU		not in PAA
Semotrachia caupona	land snail			NT (VU)	not in PAA
Semotrachia elleryi	Ellery Gorge Land Snail			NT (VU)	not in PAA
Semotrachia emilia	Emiles Land Snail			NT (VU)	not in PAA
Semotrachia esau	land snail			NT (VU)	not in PAA
Semotrachia euzyga		EN	VU	NT (EN)	not in PAA
Semotrachia filixiana	land snail			NT (VU)	not in PAA
Semotrachia huckittana	land snail			NT (VU)	not in PAA
Semotrachia illarana	land snail			NT (VU)	not in PAA
Semotrachia jessieana	land snail			NT (VU)	not in PAA
Semotrachia jinkana	land snail			NT (VU)	not in PAA
Semotrachia rossana	land snail			NT (VU)	not in PAA
Semotrachia runutjirbana	land snail			NT (VU)	not in PAA
Semotrachia winneckeana	Winnecke Land Snail			NT (VU)	not in PAA
Setobaudinia spina			VU		not in PAA
Sinumelon bednalli	Bednall's Land Snail	EN	VU		not in PAA
Speleophria bunderae	a copepod			WA (CR)	not in PAA
Speleostrophus nesiotes	Barrow Island Millipede			WA (VU)	not in PAA
Stygiocaris lancifera	Lance-beaked Cave Shrimp		VU	WA (VU)	not in PAA
Stygiocaris stylifera			VU		not in PAA
Stygiochiropus isolatus	Camerons Cave Millipede			WA (VU)	not in PAA
Stygiochiropus peculiaris	A millipede			WA (CR)	not in PAA
Stygiochiropus sympatricus	A millipede			WA (VU)	not in PAA
Stygocyclopia australis	Bundera Sinkhole copepod			WA (CR)	not in PAA
Suavocallia splendens			VU		not in PAA
Talia bandumu	Western Mangrove Cricket		VU		not in PAA
Theskelomensor creon			VU		not in PAA
Tolgachloritis campbelli			VU		not in PAA
Torresitrachia thedana			VU		not in PAA

Species name	Common name	EPBCA	IUCN	S/T	Note
Trachiopsis victoriana	Victoria's Land Snail			NT (VU)	not in PAA
Trapezites symmomus sombra	Splendid Ochre, Symmomus Skipper			Qld (Near Threatened)	not in PAA
Trisyntopa scatophaga	Antbed Parrot Moth	EN		Qld (EN)	not in PAA
Trochidrobia inflata			EN		not in PAA
Trochidrobia minuta			VU		not in PAA
Trochidrobia smithi			VU		not in PAA
Trochomorpha melvillensis	land snail			NT (VU)	not in PAA
Turgenitubulus aslini			VU		not in PAA
Turgenitubulus christenseni	a camaenid land snail			WA (EN)	not in PAA
Turgenitubulus costus	a camaenid land snail		VU	WA (CR)	not in PAA
Turgenitubulus depressus	a camaenid land snail		VU	WA (CR)	not in PAA
Turgenitubulus foramenus	a camaenid land snail		VU	WA (CR)	not in PAA
Turgenitubulus opiranus	a camaenid land snail		VU	WA (CR)	not in PAA
Turgenitubulus pagodula	a camaenid land snail		VU	WA (VU)	not in PAA
Turgenitubulus tanmurrana	a camaenid land snail		VU	WA (CR)	not in PAA
Vidumelon wattii	Watt's Land Snail		VU	NT (VU)	not in PAA
Welesina kornickeri	an ostracod			WA (CR)	not in PAA
Westraltrachia alterna	a camaenid land snail		VU	WA (VU)	not in PAA
Westraltrachia inopinata	a camaenid land snail		VU	WA (VU)	not in PAA
Westraltrachia lievreana			VU		not in PAA
Westraltrachia porcata			VU		not in PAA
Westraltrachia recta			VU		not in PAA
Westraltrachia subtila			VU		not in PAA
Westraltrachia turbinata	a camaenid land snail		VU	WA (VU)	not in PAA
Youwanjela wilsoni			VU		not in PAA
Zonocypretta kalimna	Seed Shrimp		VU		not in PAA

Appendix 2. Fire overlap values, FSI and RRI scores for 1237 species with high fire overlap

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Neoniphargus richardi	Amphipoda (Neoniphargidae)		1	4.0	0.6	0.7	50 (37.5-62.5)	100.0	100.0	
Neoniphargus secus	Amphipoda (Neoniphargidae)		1	4.0	0.6	0.7	50 (37.5-62.5)	100.0	100.0	
Wombeyanus botulosus	Amphipoda (Neoniphargidae)		1	6.0	0.4	0.6	50 (37.5-62.5)	100.0	100.0	
Neocrypta simoni	Amphipoda (Neoniphargidae)		1	4.0	0.5	0.7	25 (12.5-37.5)	100.0	100.0	
Austrogammarus saycei	Amphipoda (Paramelitidae)		1	7.0	0.4	0.6	50 (37.5-62.5)	100.0	100.0	
Storenosoma picadilly	Araneae (Amaurobiidae)		1	4.0	0.5	0.6	50 (37.5-62.5)	0.0	100.0	
Storenosoma grayi	Araneae (Amaurobiidae)		5	5.0	0.3	0.7	43.7 (33.5-55.5)	37.2	59.0	
Storenosoma hoggi	Araneae (Amaurobiidae)		17	4.0	0.5	0.6	27.1 (18.7-37.2)	17.5	45.4	
Storenosoma altum	Araneae (Amaurobiidae)		29	4.0	0.5	0.6	25 (14.5-38.7)	11.8	44.0	
Storenosoma supernum	Araneae (Amaurobiidae)		2	4.0	0.5	0.6	12.5 (0-31.3)	0.0	25.0	
Chenistonia hickmani	Araneae (Anamidae)		2	5.0	0.8	0.8	6.3 (0-18.8)	0.0	25.0	
Kwonkan myg183	Araneae (Anamidae)		2	6.0	0.4	0.6	6.3 (0-18.8)	0.0	25.0	
Chenistonia caeruleomontana	Araneae (Anamidae)		2	8.0	0.6	0.7	58.3 (45.8-70.8)	50.0	100.0	
Teyl `MYG634`	Araneae (Anamidae)		3	7.0	0.4	0.7	35.6 (25.5-47.7)	54.5	65.8	
Proshermacha `MYG491`	Araneae (Anamidae)		1	8.0	0.6	0.7	25 (12.5-37.5)	0.0	100.0	
Risdonius lind	Araneae (Anapidae)		1	4.0	0.5	0.6	62.5 (50-75)	0.0	100.0	
Chasmocephalon alfred	Araneae (Anapidae)		1	6.0	0.5	0.6	41.7 (29.2-54.2)	0.0	100.0	
Queenslanapis lamington	Araneae (Anapidae)		1	4.0	0.5	0.6	31.3 (0-75)	0.0	50.0	
Maxanapis dorrigo	Araneae (Anapidae)		3	7.0	0.5	0.6	25.1 (17.7-33.6)	8.7	45.8	
Paralarinia `sp. (VWF1032)`	Araneae (Araneidae)		1	4.0	0.3	0.4	93.8 (75-100)	100.0	100.0	
`Viridipes group` `sp. (VWF857)`	Araneae (Araneidae)		1	4.0	0.3	0.4	50 (37.5-62.5)	0.0	100.0	
Araneus `sp. (VWF947)`	Araneae (Araneidae)		2	4.0	0.3	0.4	25 (18.8-31.3)	0.0	50.0	
Austrarchaea mcguiganae	Araneae (Archaeidae)	Y	4	15.0	0.5	0.7	84.9 (71.9-87.2)	76.3	88.7	
Austrarchaea monteithi	Araneae (Archaeidae)	Y	3	17.0	0.5	0.7	74.7 (59.7-82)	49.9	84.9	
Zephyrarchaea melindae	Araneae (Archaeidae)	Y	5	15.0	0.5	0.8	67.1 (57.2-68.1)	58.1	71.1	
Austrarchaea cunninghami	Araneae (Archaeidae)	Y	2	13.0	0.5	0.7	51.6 (25-87.5)	0.0	75.0	
Zephyrarchaea barrettae	Araneae (Archaeidae)	Y	2	15.0	0.5	0.8	50 (43.8-50)	50.0	50.0	
Zephyrarchaea robinsi	Araneae (Archaeidae)	Y	9	15.0	0.5	0.8	45.2 (37.4-47.9)	40.3	47.5	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Austrarchaea smithae	Araneae (Archaeidae)	Y	2	14.0	0.5	0.7	100 (87.5-100)	100.0	100.0	
Zephyrarchaea austini	Araneae (Archaeidae)	Y	1	15.0	0.5	0.8	100 (87.5-100)	100.0	100.0	EPBCApending, IUCNpending
Arkys gracilis	Araneae (Arkyidae)		2	4.0	0.4	0.6	25 (0-62.5)	0.0	50.0	
`Dispunna` `jeanjusti`	Araneae (Corinnidae)		1	5.0	0.3	0.4	75 (62.5-87.5)	100.0	100.0	
Poecilipta micaelae	Araneae (Corinnidae)		3	8.0	0.4	0.6	58.3 (47.9-69)	70.9	81.2	
Cycloctenus abyssinus	Araneae (Cycloctenidae)		2	5.0	0.5	0.6	56.3 (35.4-83.3)	50.0	75.0	
Austmusia kioloa	Araneae (Desidae)		1	4.0	0.4	0.6	75 (62.5-87.5)	100.0	100.0	
Procambridgea kioloa	Araneae (Desidae)		2	4.0	0.7	0.6	50 (37.5-62.5)	50.0	100.0	
Toxopsoides macleayi	Araneae (Desidae)		4	5.0	0.5	0.6	42.5 (33.9-51.7)	49.8	62.1	
Austmusia lindi	Araneae (Desidae)		1	5.0	0.4	0.6	37.5 (25-50)	0.0	100.0	
Procambridgea montana	Araneae (Desidae)		4	4.0	0.7	0.6	36.7 (27.8-46)	45.0	67.8	
Manjala plana	Araneae (Desidae)		2	5.0	0.5	0.6	31.3 (0-87.5)	0.0	50.0	
Colcarteria kempseyi	Araneae (Desidae)		3	4.0	0.3	0.6	30.6 (23.3-38.3)	39.5	55.2	
Badumna socialis	Araneae (Desidae)		2	6.0	0.3	0.4	10.9 (0-31.3)	0.0	25.0	
Stenygrocercus australiensis	Araneae (Dipluridae)		1	8.0	0.5	0.6	75 (62.5-87.5)	100.0	100.0	
Carrai afoveolata	Araneae (Dipluridae)	likely	3	8.0	0.5	0.7	36.5 (10.8-64.2)	19.2	90.8	
Cethegus barraba	Araneae (Dipluridae)		2	9.0	0.5	0.6	34.4 (28.1-40.6)	50.0	50.0	
Caledothele australiensis	Araneae (Euagridae)		1	6.0	0.7	0.8	50 (37.5-62.5)	0.0	100.0	
Meedo bluff	Araneae (Gallieniellidae)		1	3.0	0.4	0.6	50 (37.5-62.5)	0.0	100.0	
Neato kioloa	Araneae (Gallieniellidae?)		7	4.0	0.6	0.7	38.5 (26.1-48.4)	19.2	49.0	
`Genus 1` `sp. 6`	Araneae (Gnaphosidae)		1	3.0	0.3	0.4	25 (0-62.5)	0.0	50.0	
Progradungula carraiensis	Araneae (Gradungulidae)		2	8.0	0.6	0.6	37.5 (25-50)	0.0	100.0	
Kaiya bemboka	Araneae (Gradungulidae)		4	7.0	0.5	0.6	23.1 (14.7-33.4)	9.6	50.6	
Tarlina noorundi	Araneae (Gradungulidae)		9	7.0	0.6	0.6	22.5 (13.2-34.7)	10.7	39.7	
Conothele myg553	Araneae (Halonoproctidae)		2	12.0	0.5	0.8	15.6 (6.3-25)	0.0	50.0	
Paraembolides boydi	Araneae (Hexathelidae)		3	20.0	0.5	0.7	25.7 (13.2-42)	26.4	63.7	
Arbanitis horsemanae	Araneae (Idiopidae)	likely	1	9.0	0.6	0.8	58.3 (37.5-79.2)	100.0	100.0	
*Cataxia colesi***	Araneae (Idiopidae)	y	7	11.0	0.5	0.8	36.5 (27.2-46)	71.4	74.8	
Arbanitis macei	Araneae (Idiopidae)		1	9.0	0.6	0.8	29.2 (12.5-45.8)	0.0	100.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Eucyrtops `moingup_spring`	Araneae (Idiopidae)		1	9.0	0.4	0.7	29.2 (12.5-45.8)	0.0	100.0	
Idiosoma `sp. nov. (Deralinya Homestead) (Anidiops)`	Araneae (Idiopidae)		1	9.0	0.4	0.7	29.2 (12.5-45.8)	0.0	100.0	
Idiosoma `charlesi`	Araneae (Idiopidae)		2	9.0	0.4	0.7	27.1 (18.8-35.4)	50.0	50.0	
Cataxia stirlingi	Araneae (Idiopidae)	y	13	11.0	0.5	0.8	22.7 (16.7-28.8)	43.0	47.9	
Eucyrtops stirlingrange	Araneae (Idiopidae)		1	9.0	0.4	0.8	0 (12.5-45.8)	0.0	100.0	
Paralampona cobon	Araneae (Lamponidae)		1	5.0	0.3	0.6	75 (62.5-87.5)	100.0	100.0	
Longepi cobon	Araneae (Lamponidae)		7	4.0	0.5	0.6	49.4 (38-62.2)	28.6	67.5	
Queenvic kelty	Araneae (Lamponidae)		3	3.0	0.5	0.6	47.8 (38-57.6)	56.5	78.2	
Centroina dorrigo	Araneae (Lamponidae)		2	4.0	0.5	0.6	43.8 (37.5-50)	50.0	50.0	
Centroina sawpit	Araneae (Lamponidae)		6	4.0	0.5	0.6	43.8 (35.8-52.3)	32.9	57.0	
Paralampona kiola	Araneae (Lamponidae)		18	6.0	0.7	0.6	41.9 (34.7-47.1)	20.4	49.1	
Centroina enfield	Araneae (Lamponidae)		3	4.0	0.5	0.6	40.9 (16-74.5)	12.6	60.4	
Longepi boyd	Araneae (Lamponidae)		3	4.0	0.6	0.6	40.3 (32.8-48.6)	39.7	48.7	
Graycassis bulga	Araneae (Lamponidae)		3	4.0	0.5	0.6	37.3 (24.8-53)	25.2	49.7	
Centroina macedon	Araneae (Lamponidae)		3	4.0	0.5	0.6	37.1 (25.6-51.3)	26.8	48.6	
Graycassis boss	Araneae (Lamponidae)		3	6.0	0.5	0.6	32.7 (13.5-60.8)	15.3	63.7	
Graycassis bruxner	Araneae (Lamponidae)		29	4.0	0.5	0.6	31.6 (21.8-43.4)	13.4	45.2	
Lampona fife	Araneae (Lamponidae)		4	6.0	0.3	0.6	30.6 (20.9-42.7)	22.0	54.2	
Pseudolampona warrandyte	Araneae (Lamponidae)		13	5.0	0.5	0.6	30.1 (22.4-38.7)	35.8	54.4	
Lampona lamington	Araneae (Lamponidae)		1	4.0	0.3	0.6	25 (0-62.5)	0.0	50.0	
Lampona superbus	Araneae (Lamponidae)		3	4.0	0.3	0.6	20.4 (8.7-36.7)	1.5	40.1	
Venatrix allopictiventris	Araneae (Lycosidae)		2	4.0	0.6	0.4	87.5 (75-100)	100.0	100.0	
`Kochosa` `obelix`	Araneae (Lycosidae)		2	3.0	0.3	0.4	37.5 (31.3-43.8)	50.0	50.0	
Artoria `sp. 13`	Araneae (Lycosidae)		2	3.0	0.3	0.4	25 (18.8-31.3)	0.0	50.0	
Venator `sp. 10`	Araneae (Lycosidae)		2	3.0	0.3	0.4	25 (18.8-31.3)	0.0	50.0	
Venator `sp. 9`	Araneae (Lycosidae)		2	3.0	0.3	0.4	25 (18.8-31.3)	0.0	50.0	
Kangarosa pandura	Araneae (Lycosidae)		4	6.0	0.7	0.4	21.9 (13.7-30.5)	34.2	42.6	
Flavarchaea badja	Araneae (Malkaridae)		2	8.0	0.5	0.7	87.5 (75-100)	100.0	100.0	
Ozarchaea bodalla	Araneae (Malkaridae)		1	7.0	0.5	0.7	87.5 (75-100)	100.0	100.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Ozarchaea wiangarie	Araneae (Malkaridae)		1	7.0	0.5	0.7	87.5 (75-100)	100.0	100.0	
Perissopmeros quinguni	Araneae (Malkaridae)		1	7.0	0.5	0.7	87.5 (75-100)	100.0	100.0	
Perissopmeros arkana	Araneae (Malkaridae)		1	6.0	0.5	0.7	75 (62.5-87.5)	0.0	100.0	
Ixamatus fischeri	Araneae (Microstigmatidae)		5	10.0	0.5	0.8	30.5 (20.1-43.3)	24.3	67.1	
Bertmainius pandus	Araneae (Migidae)	Y	9	14.0	0.6	0.8	30.7 (19.3-40.3)	32.0	66.9	WA (CR), IUCNpending
Bertmainius colonus	Araneae (Migidae)	Y	26	15.0	0.7	0.8	26 (18.4-29.3)	34.8	43.0	EPBC (VU), WA (VU), IUCNpending
Moggridgea rainbowi	Araneae (Migidae)	Y	3	16.0	0.7	0.8	18 (13-19.9)	25.6	27.2	
Australomimetus kioloensis	Araneae (Mimetidae)		3	4.0	0.6	0.6	40 (31.4-49.3)	26.8	59.9	
Opopaea magna	Araneae (Oonopidae)		3	6.0	0.5	0.7	40.1 (21.6-64.9)	11.5	71.5	
Opopaea sown	Araneae (Oonopidae)		5	6.0	0.5	0.7	39.8 (27.4-55.3)	22.2	63.0	
Opopaea milledgei	Araneae (Oonopidae)		9	6.0	0.5	0.7	35.8 (26.8-46)	17.9	58.2	
Ischnothyreus pterodactyl	Araneae (Oonopidae)		2	4.0	0.6	0.6	31.3 (0-75)	0.0	50.0	
Opopaea acuminata	Araneae (Oonopidae)		11	6.0	0.5	0.7	30.6 (21-42.4)	13.0	51.5	
Opopaea ottoi	Araneae (Oonopidae)		2	5.0	0.7	0.6	17.2 (0-43.8)	0.0	25.0	
Tasmanoonops elongatus	Araneae (Orsolobidae)		1	4.0	0.5	0.6	87.5 (75-100)	100.0	100.0	
Tasmanoonops grayi	Araneae (Orsolobidae)		1	5.0	0.7	0.6	75 (62.5-87.5)	100.0	100.0	
Tasmanoonops hunti	Araneae (Orsolobidae)		1	5.0	0.7	0.6	75 (62.5-87.5)	100.0	100.0	
Tasmanoonops drimus	Araneae (Orsolobidae)		1	5.0	0.5	0.6	50 (37.5-62.5)	0.0	100.0	
Tasmanoonops pallidus	Araneae (Orsolobidae)		1	5.0	0.5	0.6	50 (37.5-62.5)	0.0	100.0	
Tasmanoonops `sp. SEM-1`	Araneae (Orsolobidae)		3	4.0	0.3	0.6	28.1 (24-32.4)	30.0	33.0	
Hickmanolobus nimorakiotakisi	Araneae (Orsolobidae)		1	4.0	0.5	0.6	18.8 (0-50)	0.0	50.0	
Tasmanoonops complexus	Araneae (Orsolobidae)		2	5.0	0.7	0.6	12.5 (0-31.3)	0.0	25.0	
Tasmanoonops mysticus	Araneae (Orsolobidae)		2	5.0	0.7	0.6	12.5 (0-31.3)	0.0	25.0	
Wugigarra eberhardi	Araneae (pholcidae)		5	4.0	0.5	0.6	14.8 (6.8-23.8)	20.8	59.1	
Dolomedes venmani	Araneae (Pisauridae)		1	3.0	0.5	0.4	25 (12.5-37.5)	0.0	100.0	
Molycria bundjalung	Araneae (Prodidomidae)		8	3.0	0.4	0.7	39.6 (28-52.9)	10.9	73.8	
Prodidomus seemani	Araneae (Prodidomidae)		1	4.0	0.5	0.6	31.3 (0-75)	0.0	50.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Stanwellia `MYG420, (=stirlingensis)`	Araneae (Pycnothelidae)		7	6.0	0.5	0.7	24.8 (16.9-32.7)	36.6	62.5	
Stanwellia `MYG421`	Araneae (Pycnothelidae)		1	6.0	0.5	0.6	12.5 (0-37.5)	0.0	50.0	
Maratus sarahae	Araneae (Salticidae)		7	NA	NA	NA	NA	12.6	34.9	WA (EN)
Jotus braccatus	Araneae (Salticidae)		1	5.0	0.3	0.4	91.7 (79.2-100)	100.0	100.0	
Maddisonia richardsoni	Araneae (Salticidae)		2	4.0	0.3	0.4	62.5 (50-75)	0.0	100.0	
Paraplatoides christopheri	Araneae (Salticidae)		2	4.0	0.5	0.4	50 (43.8-50)	50.0	50.0	
Helpis merriwa	Araneae (Salticidae)		1	6.0	0.5	0.4	43.8 (31.3-56.3)	0.0	100.0	
Maratus harrisi	Araneae (Salticidae)		4	5.0	0.4	0.4	42.3 (34.7-49)	37.7	50.9	
Jotus auripes	Araneae (Salticidae)		5	5.0	0.5	0.4	35.7 (28.4-42.6)	25.4	50.2	
`Lycidas` `speckled`	Araneae (Salticidae)		1	4.0	0.3	0.4	31.3 (0-75)	0.0	50.0	
`Maratus` `stirling`	Araneae (Salticidae)		1	4.0	0.3	0.4	31.3 (0-75)	0.0	50.0	
Sondra bickeli	Araneae (Salticidae)		2	4.0	0.3	0.4	31.3 (0-75)	0.0	50.0	
Hypoblemum griseum	Araneae (Salticidae)		4	6.0	0.3	0.4	24.7 (16.2-35.2)	10.3	47.8	
Sondra convoluta	Araneae (Salticidae)		3	4.0	0.5	0.4	20.9 (9.7-35.8)	7.6	34.2	
Karaops toolbrunup	Araneae (Selenopidae)		4	3.0	0.5	0.6	36.2 (26.9-45.6)	70.9	74.0	
Delena kosciuskoensis	Araneae (Sparassidae)		2	6.0	0.5	0.6	37.5 (31.3-43.8)	50.0	50.0	
Neosparassus festivus	Araneae (Sparassidae)		1	5.0	0.3	0.6	20.8 (0-54.2)	0.0	50.0	
Pillara macleayensis	Araneae (Stiphidiidae)		3	8.0	0.5	0.7	50.7 (37.3-65.6)	50.7	91.2	
Borrala webbi	Araneae (Stiphidiidae)		2	5.0	0.3	0.6	50 (31.3-75)	50.0	75.0	
Jamberoo boydensis	Araneae (Stiphidiidae)		4	4.0	0.6	0.8	38.9 (28-52.1)	33.2	48.9	
Jamberoo johnnoblei	Araneae (Stiphidiidae)		10	6.0	0.5	0.6	31 (24.7-37.7)	32.4	45.9	
Stiphidion adornatum	Araneae (Stiphidiidae)		4	4.0	0.6	0.6	17.4 (8.9-29)	6.3	42.1	
Wabua crediton	Araneae (Stiphidiidae)		2	5.0	0.3	0.6	12.5 (0-31.3)	0.0	25.0	
Therlinya bellinger	Araneae (Stiphidiidae)		2	9.0	0.7	0.6	10.7 (0-28.1)	0.0	25.0	
Procambridgea carrai	Araneae (Stiphidiidae?)		4	10.0	0.6	0.6	22.6 (13.6-34.2)	8.7	40.8	
`new genus` `sp.`	Araneae (Tetragnathidae)		2	3.0	0.3	0.4	50 (43.8-50)	50.0	50.0	
`Genus green alive`	Araneae (Theridiidae)		1	5.0	0.3	0.4	83.3 (70.8-95.8)	100.0	100.0	
`Genus linear spots`	Araneae (Theridiidae)		1	5.0	0.3	0.4	83.3 (70.8-95.8)	100.0	100.0	
Argyrodes margaritarius	Araneae (Theridiidae)		1	5.0	0.3	0.4	83.3 (70.8-95.8)	100.0	100.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Thwaitesia nigronodosa	Araneae (Theridiidae)		1	5.0	0.4	0.4	83.3 (70.8-95.8)	100.0	100.0	
Phoroncidia rotunda	Araneae (Theridiidae)		2	5.0	0.4	0.4	12.5 (0-31.3)	0.0	25.0	
Stephanopis `Barrett sp. 1`	Araneae (Thomisidae)		1	4.0	0.3	0.4	75 (62.5-87.5)	100.0	100.0	
Stephanopis `Barrett sp. 4`	Araneae (Thomisidae)		1	3.0	0.3	0.4	50 (37.5-62.5)	0.0	100.0	
`Genus, tiny`	Araneae (Thomisidae)		3	3.0	0.3	0.4	31.9 (27.7-32.4)	30.3	33.5	
Trachycosmus turramurra	Araneae (Trochanteriidae)		12	3.0	0.4	0.6	36.8 (28.9-45.2)	30.8	58.3	
Platorish flavitarsis	Araneae (Trochanteriidae)		6	3.0	0.4	0.6	36.2 (28.4-44.5)	30.7	57.1	
Trachycosmus cockatoo	Araneae (Trochanteriidae)		3	3.0	0.4	0.6	32.5 (25.8-39.4)	27.5	51.3	
Rebilus brooklana	Araneae (Trochanteriidae)		4	3.0	0.3	0.6	30 (23.1-37.9)	31.2	44.5	
Desognaphosa yabbra	Araneae (Trochanteriidae)		10	5.0	0.5	0.6	17.1 (11-24.8)	2.6	26.4	
Storosa `sp. nov. 6`	Araneae (Zodariidae)		1	6.0	0.3	0.6	81.3 (68.8-93.8)	100.0	100.0	
Asteron reticulatum	Araneae (Zodariidae)		5	4.0	0.5	0.6	46.2 (37.1-55.8)	23.6	64.5	
Storena cochleare	Araneae (Zodariidae)		2	5.0	0.5	0.6	25 (18.8-31.3)	0.0	50.0	
Huntia murrindal	Araneae (Zoropsidae)		1	4.0	0.5	0.6	25 (12.5-37.5)	100.0	100.0	
Richardsonianus australis	Arhynchobdellida (Hirudinidae)		7	2.0	0.6	0.5	19.1 (12.7-25.7)	26.1	50.1	
Glyptophysa gibbosa	Basommatophora (Planorbidae)		1	2.0	0.6	0.3	25 (12.5-37.5)	0.0	100.0	
Calolampra fraserensis	Blattodea (Blaberidae)		1	7.0	0.4	0.5	50 (37.5-62.5)	0.0	100.0	
Molytria vegranda	Blattodea (Blaberidae)		7	6.0	0.6	0.7	30.7 (21.2-41.7)	23.7	59.9	
Drymaplaneta communis	Blattodea (Blattidae)		2	7.0	0.6	0.4	31.3 (25-37.5)	50.0	50.0	
Polyzosteria viridissima	Blattodea (Blattidae)		7	23.0	0.4	0.7	29.9 (17.9-42.5)	43.7	57.9	
Kalotermes pallidinotum	Blattodea (Kalotermitidae)		6	7.0	0.5	0.4	18.1 (12.9-23.5)	32.5	39.8	
Paralamyctes (Thingathinga) grayi	Chilopoda (Henicopidae)		6	10.0	0.6	0.6	31.6 (24.4-39.5)	29.6	48.3	
Paralamyctes (Nothofagobius) cassisi	Chilopoda (Henicopidae)		6	10.0	0.6	0.6	22.5 (11.7-37.3)	11.6	39.2	
Aderus bimaculiventris	Coleoptera (Aderidae)		1	6.0	0.6	0.3	87.5 (62.5-100)	100.0	100.0	
Microhoria brevicollis	Coleoptera (Anthicidae)		2	4.0	0.4	0.5	50 (43.8-50)	50.0	50.0	
Isacanthodes monilis	Coleoptera (Belidae)		1	4.0	0.3	0.6	75 (37.5-100)	100.0	100.0	
Rhinotia parallela	Coleoptera (Belidae)		2	5.0	0.3	0.6	18.8 (6.3-31.3)	0.0	50.0	
Elephastomus terraereginae	Coleoptera (Bolboceratidae)		2	5.0	0.4	0.6	31.3 (18.8-43.8)	50.0	50.0	
Diphucrania williamsi	Coleoptera (Buprestidae)		1	16.0	0.5	0.6	87.5 (37.5-100)	100.0	100.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Paratrachys (Paratrachys) australia	Coleoptera (Buprestidae)		1	7.0	0.5	0.4	68.8 (37.5-87.5)	100.0	100.0	
Temognatha affinis	Coleoptera (Buprestidae)		3	7.0	0.7	0.4	62.9 (29.7-88.5)	72.2	95.6	
Astraeus (Astraeus) yarrattensis	Coleoptera (Buprestidae)		1	9.0	0.4	0.7	62.5 (37.5-100)	100.0	100.0	
Castiarina eborica	Coleoptera (Buprestidae)		2	8.0	0.6	0.5	43.8 (18.8-50)	50.0	50.0	
Melobasis conica	Coleoptera (Buprestidae)		2	8.0	0.6	0.5	43.8 (18.8-50)	50.0	50.0	
Diphucrania inops	Coleoptera (Buprestidae)		1	8.0	0.6	0.5	43.8 (12.5-62.5)	0.0	100.0	
Temognatha sexmaculata	Coleoptera (Buprestidae)		1	7.0	0.7	0.4	43.8 (12.5-62.5)	0.0	100.0	
Castiarina flavoviridis	Coleoptera (Buprestidae)		6	8.0	0.6	0.5	35.5 (13.2-47.2)	30.7	50.5	
Castiarina kerremansi	Coleoptera (Buprestidae)		4	3.0	0.8	0.3	33.9 (15.1-49.2)	31.4	58.9	
Diphucrania cupripennis	Coleoptera (Buprestidae)		3	8.0	0.6	0.5	31.3 (13.6-46.5)	27.4	55.9	
Astraeus (Astraeus) intricatus	Coleoptera (Buprestidae)		3	8.0	0.6	0.5	31.3 (12.8-37.8)	32.5	39.1	
Temognatha grandis	Coleoptera (Buprestidae)		4	7.0	0.7	0.4	29.1 (12.1-45.4)	23.2	54.4	
Stigmodera jacquinotii	Coleoptera (Buprestidae)		6	8.0	0.6	0.5	28.7 (12.5-43.5)	27.1	49.5	
Diphucrania duodecimmaculata	Coleoptera (Buprestidae)		6	7.0	0.7	0.4	28.4 (13.4-40.2)	33.6	42.2	
Castiarina media	Coleoptera (Buprestidae)		4	8.0	0.6	0.5	27.9 (13.9-37.4)	36.9	37.6	
Temognatha suturalis	Coleoptera (Buprestidae)		6	7.0	0.7	0.4	27 (10.7-43.3)	18.4	53.5	
Temognatha variabilis	Coleoptera (Buprestidae)		12	8.0	0.6	0.5	25.9 (10.5-41.1)	19.6	49.5	
Castiarina indigoventricosa	Coleoptera (Buprestidae)		2	8.0	0.6	0.5	21.9 (6.3-31.3)	0.0	50.0	
Castiarina pseudasilida	Coleoptera (Buprestidae)		2	8.0	0.6	0.5	21.9 (6.3-31.3)	0.0	50.0	
Melobasis wannerua	Coleoptera (Buprestidae)		2	8.0	0.6	0.5	21.9 (6.3-31.3)	0.0	50.0	
Castiarina alternozona	Coleoptera (Buprestidae)		3	10.0	0.6	0.5	19 (11.4-26.6)	30.2	30.6	
Castiarina earina	Coleoptera (Buprestidae)		2	8.0	0.6	0.5	18.8 (6.3-31.3)	0.0	50.0	
Diphucrania nigrita	Coleoptera (Buprestidae)		2	8.0	0.6	0.5	18.8 (6.3-31.3)	0.0	50.0	
Castiarina kempsteri	Coleoptera (Buprestidae)		2	8.0	0.6	0.5	15.6 (6.3-31.3)	0.0	50.0	
Heteromastix simplex	Coleoptera (Cantharidae)		1	4.0	0.3	0.3	62.5 (37.5-87.5)	0.0	100.0	
Tachys bolus	Coleoptera (Carabidae)		1	5.0	0.3	0.6	87.5 (75-100)	100.0	100.0	
Notonomus wentworthi	Coleoptera (Carabidae)		1	9.0	0.6	0.8	87.5 (37.5-100)	100.0	100.0	
Sphallomorpha atrata	Coleoptera (Carabidae)		1	6.0	0.5	0.6	68.8 (50-75)	100.0	100.0	
Eutrechopsis ovalis	Coleoptera (Carabidae)		1	5.0	0.5	0.6	62.5 (50-75)	0.0	100.0	
Meonis (Meonis) magnus	Coleoptera (Carabidae)		1	6.0	0.4	0.6	62.5 (50-75)	100.0	100.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Neonomius laevicollis	Coleoptera (Carabidae)		3	6.0	0.5	0.6	53.1 (39-69.7)	25.3	74.9	
Austropseudomorpha insignis pilosa	Coleoptera (Carabidae)		1	4.0	0.4	0.6	50 (37.5-62.5)	0.0	100.0	
Pericompsus (Upocompsus) pubifrons	Coleoptera (Carabidae)		1	5.0	0.4	0.6	50 (37.5-62.5)	0.0	100.0	
Teraphis cavicola	Coleoptera (Carabidae)		1	6.0	0.5	0.6	50 (37.5-62.5)	100.0	100.0	
Zuphium thouzeti thouzeti	Coleoptera (Carabidae)		1	5.0	0.4	0.6	50 (37.5-62.5)	0.0	100.0	
Notonomus variicollis	Coleoptera (Carabidae)		13	9.0	0.6	0.8	48 (18.7-59.3)	42.1	67.6	
Notonomus rainbowi	Coleoptera (Carabidae)		26	6.0	0.4	0.7	46.8 (36.1-58.5)	57.1	74.3	
Notonomus resplendens	Coleoptera (Carabidae)		40	9.0	0.6	0.8	45.7 (18-56.4)	42.4	62.0	
Nurus popplei	Coleoptera (Carabidae)		2	4.0	0.6	0.6	37.5 (25-50)	0.0	100.0	
Anomotarus (Anomotarus) ruficornis plagiatus	Coleoptera (Carabidae)		6	4.0	0.5	0.5	34.9 (27.1-43.3)	25.4	57.1	
Acrogenys (Paracrogenys) longicollis	Coleoptera (Carabidae)		7	3.0	0.4	0.7	34.6 (26.7-43.1)	24.2	57.1	
Notonomus australis	Coleoptera (Carabidae)		15	5.0	0.5	0.8	33 (21.1-46.6)	16.0	50.0	
Notonomus lateralis	Coleoptera (Carabidae)		2	9.0	0.6	0.8	32.8 (6.3-62.5)	0.0	75.0	
Notonomus colossus	Coleoptera (Carabidae)		3	9.0	0.6	0.8	29 (8.3-46.2)	12.7	53.6	
Helluo costatus	Coleoptera (Carabidae)		17	4.0	0.3	0.6	28.9 (20.8-37.8)	27.0	61.5	
Rhytisternus miser	Coleoptera (Carabidae)		3	6.0	0.3	0.7	28.9 (13.6-40.8)	33.5	43.5	
Eurylychnus regularis	Coleoptera (Carabidae)		10	4.0	0.3	0.6	28.8 (18.4-42.3)	19.8	47.8	
Sphallomorpha discoidalis	Coleoptera (Carabidae)		3	5.0	0.5	0.6	27.9 (21.1-35.1)	35.8	51.8	
Carenum bonellii	Coleoptera (Carabidae)		4	4.0	0.5	0.6	26.8 (18.6-35.2)	27.1	62.3	
Mystropomus subcostatus chaudoiri	Coleoptera (Carabidae)		2	4.0	0.5	0.6	25 (18.8-31.3)	0.0	50.0	
Siagonyx amplipennis	Coleoptera (Carabidae)		2	7.0	0.3	0.6	25 (18.8-31.3)	0.0	50.0	
Agonocheila vittula	Coleoptera (Carabidae)		1	5.0	0.4	0.6	25 (12.5-37.5)	0.0	100.0	
Amblytelus montiswilsoni	Coleoptera (Carabidae)		1	5.0	0.4	0.6	25 (12.5-37.5)	0.0	100.0	
Meonis (Meonis) interruptus	Coleoptera (Carabidae)		1	6.0	0.4	0.6	25 (12.5-37.5)	0.0	100.0	
Mimotrechus obscuroguttatus	Coleoptera (Carabidae)		1	5.0	0.3	0.6	25 (0-62.5)	0.0	50.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Notonomus polli	Coleoptera (Carabidae)		2	5.0	0.3	0.6	25 (0-62.5)	0.0	50.0	
Rhaebolestes lamingtonensis	Coleoptera (Carabidae)		1	3.0	0.5	0.3	25 (0-62.5)	0.0	50.0	
Castelnaudia speciosa	Coleoptera (Carabidae)		16	8.0	0.6	0.7	21.6 (12-34.6)	12.4	37.0	
Dystrichothorax plagifer	Coleoptera (Carabidae)		3	5.0	0.4	0.6	21.5 (13.4-32.5)	22.3	52.4	
Mystropomus subcostatus	Coleoptera (Carabidae)		33	5.0	0.4	0.4	17.9 (10.7-27.3)	14.4	43.0	
Amblytelus longior	Coleoptera (Carabidae)		3	5.0	0.4	0.6	16.5 (9.3-26.3)	11.8	48.4	
Meonis (Meonis) cordicollis	Coleoptera (Carabidae)		2	6.0	0.4	0.6	12.5 (6.3-18.8)	0.0	50.0	
Sphallomorpha thouzeti	Coleoptera (Carabidae)		2	6.0	0.4	0.6	12.5 (6.3-18.8)	0.0	50.0	
Amblytelus barringtonensis	Coleoptera (Carabidae)		1	6.0	0.4	0.6	12.5 (0-37.5)	0.0	50.0	
Amblytelus bellorum	Coleoptera (Carabidae)		1	6.0	0.4	0.6	12.5 (0-37.5)	0.0	50.0	
Dystrichothorax convexior	Coleoptera (Carabidae)		1	6.0	0.4	0.6	12.5 (0-37.5)	0.0	50.0	
Dystrichothorax similis	Coleoptera (Carabidae)		1	5.0	0.4	0.6	12.5 (0-37.5)	0.0	50.0	
Dystrichothorax verticis	Coleoptera (Carabidae)		1	6.0	0.4	0.6	12.5 (0-37.5)	0.0	50.0	
Anomotarus (Anomotarus) lamingtonensis	Coleoptera (Carabidae)		2	4.0	0.5	0.5	12.5 (0-31.3)	0.0	25.0	
Notonomus (Conchitella) clivinoides	Coleoptera (Carabidae)		1	13.0	0.6	0.9	0 (0-0)	0.0	0.0	
Oricopis guttatus	Coleoptera (Cerambycidae)		2	6.0	0.4	0.6	9.4 (0-31.3)	0.0	25.0	
Athemistus puncticeps	Coleoptera (Cerambycidae)		1	6.0	0.4	0.6	87.5 (37.5-100)	100.0	100.0	
Athemistus armitagei	Coleoptera (Cerambycidae)		2	6.0	0.4	0.6	43.8 (18.8-50)	50.0	50.0	
Phoracantha longipennis	Coleoptera (Cerambycidae)		2	5.0	0.4	0.5	43.8 (18.8-50)	50.0	50.0	
Tropis rubea	Coleoptera (Cerambycidae)		2	7.0	0.4	0.6	43.8 (18.8-50)	50.0	50.0	
Macrones subclavatus	Coleoptera (Cerambycidae)		3	5.0	0.5	0.3	36 (24.4-44)	34.1	48.2	
Buburra jeanae	Coleoptera (Chrysomelidae)		2	23.0	0.5	0.7	93.8 (75-100)	100.0	100.0	
Eboo insignis	Coleoptera (Chrysomelidae)		1	5.0	0.3	0.3	87.5 (75-100)	100.0	100.0	
Paropsides calypso	Coleoptera (Chrysomelidae)		1	5.0	0.4	0.3	87.5 (75-100)	100.0	100.0	
Paropsides opposita	Coleoptera (Chrysomelidae)		1	5.0	0.4	0.3	87.5 (75-100)	100.0	100.0	
Paropsisterna pulverulenta	Coleoptera (Chrysomelidae)		1	5.0	0.3	0.3	87.5 (75-100)	100.0	100.0	
Trachymela impressa	Coleoptera (Chrysomelidae)		1	5.0	0.3	0.3	87.5 (75-100)	100.0	100.0	
Edusella abdominalis	Coleoptera (Chrysomelidae)		1	5.0	0.3	0.3	75 (62.5-87.5)	100.0	100.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Geloptera angulicollis	Coleoptera (Chrysomelidae)		1	4.0	0.3	0.3	50 (37.5-62.5)	0.0	100.0	
Microdonacia (Tantawangalo) eucryphiae	Coleoptera (Chrysomelidae)		1	4.0	0.4	0.3	50 (37.5-62.5)	0.0	100.0	
Paropsis pictipennis	Coleoptera (Chrysomelidae)		1	4.0	0.3	0.3	50 (37.5-62.5)	0.0	100.0	
Peltoschema mansueta	Coleoptera (Chrysomelidae)		1	4.0	0.5	0.3	50 (37.5-62.5)	0.0	100.0	
Semelvillea acaciae	Coleoptera (Chrysomelidae)		3	4.0	0.3	0.3	45.9 (39-48)	41.1	50.7	
Aporocera (Aporocera) conspicienda	Coleoptera (Chrysomelidae)		2	5.0	0.5	0.3	37.5 (31.3-43.8)	50.0	50.0	
Cadmus (Lachnabothra)	Coleoptera (Chrysomelidae)		2	5.0	0.5	0.3	37.5 (31.3-43.8)	50.0	50.0	
Edusella impressiceps	Coleoptera (Chrysomelidae)		1	5.0	0.3	0.3	37.5 (25-50)	0.0	100.0	
Edusella melanoptera	Coleoptera (Chrysomelidae)		1	5.0	0.3	0.3	37.5 (25-50)	0.0	100.0	
Microdonacia (Microdonacia) pilosa	Coleoptera (Chrysomelidae)		2	4.0	0.4	0.3	37.5 (18.8-62.5)	0.0	75.0	
Rhyparida ruficeps	Coleoptera (Chrysomelidae)		1	7.0	0.5	0.3	31.3 (12.5-50)	0.0	100.0	
Edusella virgatipes	Coleoptera (Chrysomelidae)		3	5.0	0.3	0.3	29.3 (22.4-36.4)	26.1	51.9	
Longitarsus victoriensis	Coleoptera (Chrysomelidae)		4	7.0	0.5	0.3	26.3 (15.3-37.7)	38.9	45.4	
Agetinus hackeri	Coleoptera (Chrysomelidae)		2	5.0	0.3	0.5	25 (18.8-31.3)	0.0	50.0	
Macrolema marginata	Coleoptera (Chrysomelidae)		2	3.0	0.4	0.4	25 (18.8-31.3)	0.0	50.0	
Bruchidius despicatus	Coleoptera (Chrysomelidae)		1	4.0	0.3	0.3	25 (0-62.5)	0.0	50.0	
Cheiloxena frenchae	Coleoptera (Chrysomelidae)		1	3.0	0.4	0.4	25 (0-62.5)	0.0	50.0	
Cadmus (Lachnabothra) lawrencei	Coleoptera (Chrysomelidae)		2	5.0	0.5	0.3	18.8 (12.5-25)	0.0	50.0	
Lemidia sexmaculata	Coleoptera (Cleridae)		1	7.0	0.3	0.3	31.3 (12.5-50)	0.0	100.0	
Eleale alboscutellata	Coleoptera (Cleridae)		5	7.0	0.5	0.3	27.2 (17.6-34.8)	32.7	44.4	
Bucolus frater	Coleoptera (Coccinellidae)		1	5.0	0.3	0.3	93.8 (75-100)	100.0	100.0	
Halmus viridis	Coleoptera (Coccinellidae)		2	4.0	0.3	0.3	25 (18.8-31.3)	0.0	50.0	
Diomus kioloa	Coleoptera (Coccinellidae)		1	4.0	0.3	0.3	25 (0-62.5)	0.0	50.0	
Scymnomorphus hirtus	Coleoptera (Coccinellidae)		3	4.0	0.3	0.3	21.7 (12.4-33.3)	4.3	39.0	
Mandalotus granicollis	Coleoptera (Curculionidae)		1	8.0	0.3	0.5	83.3 (70.8-95.8)	100.0	100.0	
Mandalotus irrasus	Coleoptera (Curculionidae)		1	8.0	0.3	0.5	83.3 (70.8-95.8)	100.0	100.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Mandalotus squamosus	Coleoptera (Curculionidae)		1	8.0	0.3	0.5	83.3 (70.8-95.8)	100.0	100.0	
Neolaemosaccus dubius	Coleoptera (Curculionidae)		1	9.0	0.4	0.5	83.3 (54.2-100)	100.0	100.0	
Notoplatypus elongatus	Coleoptera (Curculionidae)		2	4.0	0.5	0.3	8.6 (0-25)	0.0	25.0	
Neolaemosaccus ater	Coleoptera (Curculionidae)		1	9.0	0.4	0.5	41.7 (20.8-62.5)	0.0	100.0	
Cyllorhamphus tuberosus	Coleoptera (Curculionidae)		3	6.0	0.3	0.5	31.3 (27.3-31.6)	30.5	32.2	
Mandalotus acutangulus	Coleoptera (Curculionidae)		2	7.0	0.3	0.5	31.3 (25-37.5)	0.0	50.0	
Mandalotus carinatipes	Coleoptera (Curculionidae)		2	7.0	0.3	0.5	31.3 (25-37.5)	0.0	50.0	
Mandalotus longicollis	Coleoptera (Curculionidae)		2	7.0	0.3	0.5	31.3 (25-37.5)	0.0	50.0	
Pelororhinus grandis	Coleoptera (Curculionidae)		2	9.0	0.4	0.5	31.3 (18.8-43.8)	50.0	50.0	
Amycterus carteri	Coleoptera (Curculionidae)		3	6.0	0.5	0.6	31.2 (12.9-37.3)	33.5	37.9	
Genuacalles trivirgatus	Coleoptera (Curculionidae)		8	9.0	0.4	0.5	30.5 (13.8-43.8)	15.9	50.6	
Catasarcus rugulosus	Coleoptera (Curculionidae)		4	8.0	0.4	0.5	26.9 (13.3-36.2)	34.7	36.9	
Cydmaea dorsalis	Coleoptera (Curculionidae)		2	5.0	0.4	0.5	25 (18.8-31.3)	0.0	50.0	
Oxyops concretus	Coleoptera (Curculionidae)		2	3.0	0.5	0.5	25 (18.8-31.3)	0.0	50.0	
Alphitopis nivea	Coleoptera (Curculionidae)		3	7.0	0.8	0.8	24.5 (20.1-29.2)	31.4	34.0	
Storeus specularis	Coleoptera (Curculionidae)		2	9.0	0.4	0.5	20.8 (10.4-31.3)	0.0	50.0	
Paleticus laticollis	Coleoptera (Curculionidae)		1	9.0	0.4	0.5	20.8 (0-62.5)	0.0	50.0	
Parorthorhinus meleagris	Coleoptera (Curculionidae)		1	9.0	0.4	0.5	20.8 (0-62.5)	0.0	50.0	
Hyparinus tenuirostris	Coleoptera (Curculionidae)		30	5.0	0.3	0.3	20 (12.2-30)	8.7	44.6	
Methidrysis afflicta	Coleoptera (Curculionidae)		2	9.0	0.4	0.5	10.4 (0-31.3)	0.0	25.0	
Onidistus araneus	Coleoptera (Curculionidae)		2	9.0	0.4	0.5	10.4 (0-31.3)	0.0	25.0	
Carabhydrus janmillerae	Coleoptera (Dytiscidae)		2	4.0	0.3	0.4	43.8 (37.5-50)	50.0	50.0	
Batrachomatus daemeli	Coleoptera (Dytiscidae)		3	4.0	0.5	0.4	28.5 (19.7-38)	46.8	67.1	
Carabhydrus andreas	Coleoptera (Dytiscidae)		4	4.0	0.3	0.8	28.1 (20.2-36.5)	51.1	61.4	
Copelatus gapa	Coleoptera (Dytiscidae)		1	5.0	0.4	0.5	25 (12.5-37.5)	0.0	100.0	
Sternopriscus hansardii	Coleoptera (Dytiscidae)		8	4.0	0.6	0.3	18 (12.3-24.8)	30.3	41.9	
Crepidomenus aenescens	Coleoptera (Elateridae)		2	8.0	0.3	0.3	43.8 (31.3-50)	50.0	50.0	
Crepidomenus carri	Coleoptera (Elateridae)		2	6.0	0.3	0.3	43.8 (31.3-50)	50.0	50.0	
Crepidomenus dusha	Coleoptera (Elateridae)		2	6.0	0.3	0.3	43.8 (31.3-50)	50.0	50.0	
Agrypnus mjobergi	Coleoptera (Elateridae)		2	9.0	0.3	0.3	40.6 (25-50)	50.0	50.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Crepidomenus luteipes	Coleoptera (Elateridae)		3	8.0	0.3	0.3	37 (22-50.9)	24.2	62.1	
Glypheus piceus	Coleoptera (Elateridae)		2	8.0	0.3	0.3	20.8 (10.4-31.3)	0.0	50.0	
Glypheus subfasciatus	Coleoptera (Elateridae)		2	8.0	0.3	0.3	20.8 (10.4-31.3)	0.0	50.0	
Austrolimnius (Neosolus) ochus	Coleoptera (Elmidae)		1	7.0	0.3	0.4	25 (12.5-37.5)	0.0	100.0	
Austrolimnius (Telmatelmis) amanus	Coleoptera (Elmidae)		1	7.0	0.3	0.4	25 (12.5-37.5)	0.0	100.0	
Austrolimnius (Telmatelmis) alcine	Coleoptera (Elmidae)		3	7.0	0.3	0.4	22.3 (12.6-36.7)	30.4	58.8	
Simsonia cotterensis	Coleoptera (Elmidae)		1	7.0	0.3	0.4	12.5 (0-37.5)	0.0	50.0	
Acritus (Acritus) australasiae	Coleoptera (Histeridae)		1	8.0	0.3	0.5	12.5 (0-37.5)	0.0	50.0	
Tympanogaster (Tympanogaster) obcordata	Coleoptera (Hydraenidae)		2	5.0	0.5	0.3	6.3 (0-18.8)	0.0	25.0	
Tympanogaster (Hygrotympanogaster) spicerensis	Coleoptera (Hydraenidae)		1	4.0	0.5	0.3	25 (12.5-37.5)	0.0	100.0	
Gymnanthelius lamingtonensis	Coleoptera (Hydraenidae)		1	4.0	0.4	0.3	12.5 (0-37.5)	0.0	50.0	
Tympanogaster (Tympanogaster) tenax	Coleoptera (Hydraenidae)		1	4.0	0.5	0.3	12.5 (0-37.5)	0.0	50.0	
Ceronocyton obscurum	Coleoptera (Hydrophillidae)		6	6.0	0.4	0.5	25.2 (12.9-31.4)	28.4	48.2	
Pseudonemadus (Pseudonemadus) compactus	Coleoptera (Leiodidae)		1	10.0	0.3	0.5	41.7 (29.2-54.2)	0.0	100.0	
Lissapterus grammicus	Coleoptera (Lucanidae)		2	5.0	0.5	0.7	21.9 (6.3-31.3)	0.0	50.0	
Safrina moorei	Coleoptera (Lucanidae)		2	5.0	0.3	0.3	15.6 (6.3-25)	0.0	50.0	
Porrostoma (Porrostoma) militaris	Coleoptera (Lycidae)		1	7.0	0.3	0.5	62.5 (37.5-87.5)	0.0	100.0	
Zeugophora (Pedrillia) williamsi_58876	Coleoptera (Megalopodidae)		2	5.0	0.5	0.3	25 (18.8-31.3)	0.0	50.0	
Helcogaster obliquiceps	Coleoptera (Melyridae)		1	5.0	0.5	0.3	93.8 (75-100)	100.0	100.0	
Helcogaster ttuberculatus	Coleoptera (Melyridae)		1	4.0	0.4	0.3	50 (37.5-62.5)	0.0	100.0	
Hypattalus mucronatus	Coleoptera (Melyridae)		1	4.0	0.4	0.3	50 (37.5-62.5)	0.0	100.0	
Pseudolycus carteri	Coleoptera (Oedemeridae)		2	5.0	0.7	0.3	12.5 (0-31.3)	0.0	25.0	
Trigonodera subparallela	Coleoptera (Ripiphoridae)		1	5.0	0.4	0.8	43.8 (12.5-75)	0.0	100.0	
Trigonodera marmoratus	Coleoptera (Ripiphoridae)		2	5.0	0.4	0.4	37.5 (18.8-50)	50.0	50.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Anoplognathus hilleri	Coleoptera (Scarabaeidae)		2	5.0	0.7	0.3	9.4 (0-31.3)	0.0	25.0	
Odontolochus weiri	Coleoptera (Scarabaeidae)		2	5.0	0.7	0.3	9.4 (0-31.3)	0.0	25.0	
Paraschizognathus elgatus	Coleoptera (Scarabaeidae)		1	15.0	0.3	0.7	87.5 (37.5-100)	100.0	100.0	
Lepidiota ciliata	Coleoptera (Scarabaeidae)		1	7.0	0.5	0.3	70.8 (37.5-100)	100.0	100.0	
Paraschizognathus frazieri	Coleoptera (Scarabaeidae)		3	9.0	0.3	0.5	62.4 (24-78.8)	59.8	78.7	
Paraschizognathus elgatus elgatus	Coleoptera (Scarabaeidae)		1	15.0	0.3	0.7	53.1 (12.5-75)	0.0	100.0	
Matthewsius rossi	Coleoptera (Scarabaeidae)		9	15.0	0.6	0.6	48.1 (24.2-72.4)	56.6	81.0	
Rhopaea verreauxii	Coleoptera (Scarabaeidae)		7	8.0	0.3	0.6	45.4 (15.8-60.6)	35.4	62.5	
Scitala nana	Coleoptera (Scarabaeidae)		1	8.0	0.3	0.5	43.8 (12.5-75)	0.0	100.0	
Thyregis monteithi	Coleoptera (Scarabaeidae)		4	8.0	0.4	0.4	40.8 (15.2-73.5)	27.8	77.4	
Paraschizognathus miskoi	Coleoptera (Scarabaeidae)		2	8.0	0.3	0.5	37.5 (18.8-50)	50.0	50.0	
Saprosites clydensis	Coleoptera (Scarabaeidae)		2	7.0	0.3	0.5	37.5 (18.8-50)	50.0	50.0	
Microvalgus fasciculatus	Coleoptera (Scarabaeidae)		1	6.0	0.5	0.6	37.5 (12.5-62.5)	0.0	100.0	
Diorygopyx duplodentatus	Coleoptera (Scarabaeidae)		3	14.0	0.5	0.7	36.8 (11.3-61.1)	10.4	75.9	
Alepida picticollis	Coleoptera (Scarabaeidae)		5	7.0	0.4	0.4	36 (15.2-57)	36.4	56.3	
Matthewsius illawarrensis	Coleoptera (Scarabaeidae)		12	14.0	0.6	0.7	35.6 (18-54.1)	31.2	51.7	
Monteithocanthon peckorum	Coleoptera (Scarabaeidae)		3	7.0	0.4	0.5	31.7 (14-45.7)	31.1	50.3	
Liparetrus insularis	Coleoptera (Scarabaeidae)		2	8.0	0.6	0.5	31.3 (18.8-43.8)	50.0	50.0	
Onthophagus nammuldi	Coleoptera (Scarabaeidae)		3	7.0	0.3	0.5	25.8 (10.4-40.3)	23.5	45.5	
Amphistomus primonactus	Coleoptera (Scarabaeidae)		19	5.0	0.4	0.4	23.4 (7.6-44.9)	15.3	42.5	
Aulacopris reichei	Coleoptera (Scarabaeidae)		3	14.0	0.6	0.6	22.8 (10.4-35.7)	13.8	43.1	
Chondropyga gulosa angustiflava	Coleoptera (Scarabaeidae)		2	5.0	0.4	0.3	21.9 (6.3-37.5)	0.0	50.0	
Podotenus coffensis	Coleoptera (Scarabaeidae)		1	8.0	0.3	0.5	21.9 (0-75)	0.0	50.0	
Anoplognathus debaari	Coleoptera (Scarabaeidae)		1	5.0	0.7	0.3	21.9 (0-62.5)	0.0	50.0	
Anoplognathus storeyi	Coleoptera (Scarabaeidae)		1	5.0	0.7	0.3	21.9 (0-62.5)	0.0	50.0	
Diorygopyx incrassatus	Coleoptera (Scarabaeidae)		6	11.0	0.5	0.7	21 (9.1-38.2)	19.1	55.3	
Microvalgus vagans vagans	Coleoptera (Scarabaeidae)		2	6.0	0.5	0.6	18.8 (6.3-31.3)	0.0	50.0	
Diorygopyx niger	Coleoptera (Scarabaeidae)		22	11.0	0.5	0.7	15.7 (7.5-26.2)	13.4	42.8	
Austrocyphon ovensensis	Coleoptera (Scirtidae)		2	6.0	0.5	0.3	7.8 (0-25)	0.0	25.0	
Briara impressifrons	Coleoptera (Staphylinidae)		1	6.0	0.3	0.5	50 (37.5-62.5)	0.0	100.0	

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Euconnus (Euconophron) gulosus	Coleoptera (Staphylinidae)		1	6.0	0.3	0.5	50 (37.5-62.5)	0.0	100.0	
Austroeuplectus oz	Coleoptera (Staphylinidae)		2	6.0	0.3	0.5	50 (31.3-75)	50.0	75.0	
Noota incisiuris	Coleoptera (Staphylinidae)		2	6.0	0.3	0.5	50 (31.3-75)	50.0	75.0	
Xyts vetustasilvus	Coleoptera (Staphylinidae)		2	6.0	0.3	0.5	50 (31.3-75)	50.0	75.0	
Scabritia microphthalmus	Coleoptera (Staphylinidae)		3	6.0	0.3	0.5	48.3 (33.8-66.2)	43.7	74.7	
Calarus robustus	Coleoptera (Staphylinidae)		2	6.0	0.3	0.5	37.5 (31.3-43.8)	50.0	50.0	
Eupinopsis perforata	Coleoptera (Staphylinidae)		2	6.0	0.3	0.5	37.5 (31.3-43.8)	50.0	50.0	
Thyreocephalus lorquini	Coleoptera (Staphylinidae)		11	6.0	0.3	0.6	36.2 (27.5-45.8)	29.9	57.4	
Hesperus haemorrhoidalis	Coleoptera (Staphylinidae)		11	6.0	0.3	0.6	31 (22.7-40.6)	24.0	50.0	
Baeocera australica	Coleoptera (Staphylinidae)		2	6.0	0.3	0.5	25 (18.8-31.3)	0.0	50.0	
Scaphisoma inaequale	Coleoptera (Staphylinidae)		2	6.0	0.3	0.5	25 (18.8-31.3)	0.0	50.0	
Sepedophilus quartus	Coleoptera (Staphylinidae)		2	6.0	0.3	0.5	25 (18.8-31.3)	0.0	50.0	
Bruxner ligneus	Coleoptera (Staphylinidae)		1	6.0	0.3	0.5	25 (0-62.5)	0.0	50.0	
Neurum macgregorae	Coleoptera (Staphylinidae)		1	6.0	0.3	0.5	25 (0-62.5)	0.0	50.0	
Tyxs sparsisetosus	Coleoptera (Staphylinidae)		1	6.0	0.3	0.5	25 (0-62.5)	0.0	50.0	
Unumgar siccus	Coleoptera (Staphylinidae)		1	6.0	0.3	0.5	25 (0-62.5)	0.0	50.0	
Wollomombi ligniphilus	Coleoptera (Staphylinidae)		1	6.0	0.3	0.5	25 (0-62.5)	0.0	50.0	
Seirotrana bimetallica	Coleoptera (Tenebrionidae)		1	7.0	0.3	0.7	87.5 (75-100)	100.0	100.0	
Seirotrana vicina	Coleoptera (Tenebrionidae)		1	7.0	0.3	0.7	87.5 (75-100)	100.0	100.0	
Cardiothorax undulaticostis	Coleoptera (Tenebrionidae)		3	6.0	0.3	0.6	70.2 (52.6-80.7)	77.1	90.6	
Seirotrana major	Coleoptera (Tenebrionidae)		1	7.0	0.3	0.7	62.5 (50-75)	0.0	100.0	
Lepturidea paradoxa	Coleoptera (Tenebrionidae)		1	7.0	0.5	0.5	62.5 (37.5-87.5)	100.0	100.0	
Euomma lateralis	Coleoptera (Tenebrionidae)		2	6.0	0.6	0.3	6.3 (0-18.8)	0.0	25.0	
Diaspirus crenaticollis	Coleoptera (Tenebrionidae)		1	9.0	0.4	0.6	59.4 (37.5-81.3)	100.0	100.0	
Pterohelaeus montanus	Coleoptera (Tenebrionidae)		1	8.0	0.5	0.6	59.4 (37.5-81.3)	100.0	100.0	
Pterohelaeus oblongus	Coleoptera (Tenebrionidae)		1	9.0	0.4	0.5	59.4 (37.5-81.3)	100.0	100.0	
Cardiothorax alternatus	Coleoptera (Tenebrionidae)		9	6.0	0.3	0.6	47.8 (22.2-79.9)	19.3	68.8	
Cardiothorax aeneus	Coleoptera (Tenebrionidae)		5	6.0	0.3	0.6	41.3 (21.9-53.7)	8.5	57.0	
Cardiothorax laticollis	Coleoptera (Tenebrionidae)		2	6.0	0.5	0.6	37.5 (31.3-43.8)	50.0	50.0	
Daedrosis carteri	Coleoptera (Tenebrionidae)		2	6.0	0.5	0.6	37.5 (31.3-43.8)	50.0	50.0	

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Cardiothorax undulatus	Coleoptera (Tenebrionidae)		4	6.0	0.3	0.6	35.5 (11.8-71.3)	4.2	55.1	
Chalcopteroides versicolor	Coleoptera (Tenebrionidae)		2	7.0	0.5	0.5	31.3 (18.8-43.8)	50.0	50.0	
Strongylium punctithorax	Coleoptera (Tenebrionidae)		2	7.0	0.3	0.5	31.3 (18.8-43.8)	50.0	50.0	
Nototrintus jacksoni	Coleoptera (Tenebrionidae)		3	8.0	0.5	0.6	29.9 (9.4-61)	12.7	71.3	
Cardiothorax femoratus	Coleoptera (Tenebrionidae)		20	6.0	0.5	0.6	28 (19.5-38.2)	15.6	48.3	
Nototrintus striatus	Coleoptera (Tenebrionidae)		8	8.0	0.5	0.6	26.6 (6.6-50.4)	9.3	55.4	
Emcephalus nigrus	Coleoptera (Tenebrionidae)		3	5.0	0.4	0.3	21.8 (13.2-28.7)	31.4	44.1	
Amarygmus obtusus	Coleoptera (Tenebrionidae)		1	7.0	0.5	0.5	18.8 (0-62.5)	0.0	50.0	
Adelium neboissi	Coleoptera (Tenebrionidae)		1	9.0	0.4	0.5	17.2 (0-56.3)	0.0	50.0	
Syrphetodes punctatus	Coleoptera (Ulodidae)		1	7.0	0.3	0.6	25 (0-62.5)	0.0	50.0	
Faecula cristata	Coleoptera (Zopheridae)		5	4.0	0.3	0.6	45.8 (36.8-55.3)	48.4	67.5	
Progamotaenia macropodis	Cyclophyllidea (Anoplocephalidae)		2	2.0	0.8	0.5	37.5 (31.3-43.8)	50.0	50.0	
Pescecyclops arnaudi	Cyclopoida (Cyclopidae)		2	3.0	0.4	0.4	25 (18.8-31.3)	50.0	50.0	
Tropocyclops prasinus	Cyclopoida (Cyclopidae)		3	3.0	0.5	0.4	19.6 (14.2-25.5)	37.1	41.4	
Macrocyclops albidus	Cyclopoida (Cyclopidae)		3	3.0	0.5	0.4	17.7 (13-22.6)	34.0	36.8	
Brachylaima walterae	Diplostomida (Brachylaimidae)		4	6.0	0.5	0.5	22.2 (12.9-34.6)	10.4	46.8	
Strzeleckia major	Diplostomida (Hasstilesiidae)		2	4.0	0.4	0.7	37.5 (31.3-43.8)	0.0	50.0	
Strzeleckia minor	Diplostomida (Hasstilesiidae)		2	4.0	0.3	0.5	37.5 (31.3-43.8)	0.0	50.0	
Dasyurotrema mascomai	Diplostomida (Panopistidae)		2	4.0	0.5	0.7	50 (37.5-62.5)	0.0	100.0	
Alona setuloides	Diplostraca (Chydoridae)		1	4.0	0.5	0.4	25 (12.5-37.5)	0.0	100.0	
Rak labrosus	Diplostraca (Chydoridae)		1	4.0	0.5	0.4	25 (12.5-37.5)	0.0	100.0	
Paralimnadia saxitalis	Diplostraca (Limnadiidae)		2	10.0	0.7	0.6	6.3 (0-18.8)	0.0	25.0	
Paralimnadia stanleyana	Diplostraca (Limnadiidae)		6	8.0	0.8	0.6	19.3 (11.7-29.5)	26.2	51.1	
Mesophysa flavipes	Diptera (Acroceridae)		2	7.0	0.5	0.4	12.5 (0-31.3)	0.0	25.0	
Ophiomyia solanicola	Diptera (Agromyzidae)		1	4.0	0.4	0.3	50 (37.5-62.5)	0.0	100.0	
Cerodontha (Cerodontha) voluptabilis	Diptera (Agromyzidae)		1	5.0	0.4	0.4	25 (0-62.5)	0.0	50.0	
Sylvicola dubius	Diptera (Anisopodidae)		3	6.0	0.7	0.5	40.8 (23.4-62.9)	20.6	58.2	
Austrosaropogon palleucus	Diptera (Asilidae)		2	2.0	0.6	0.3	50 (37.5-62.5)	0.0	100.0	
Blepharotes vivax	Diptera (Asilidae)		2	2.0	0.6	0.3	50 (37.5-62.5)	0.0	100.0	

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Neodioctria australis	Diptera (Asilidae)		9	7.0	0.4	0.6	32.4 (24.2-42)	32.4	50.0	
Chrysopogon harpaleus	Diptera (Asilidae)		5	2.0	0.6	0.4	28.7 (18.2-42.5)	23.0	46.0	
Dilophus mcalpinei	Diptera (Bibionidae)		1	5.0	0.6	0.3	25 (0-62.5)	0.0	50.0	
Thraxan patielus	Diptera (Bombyliidae)		2	6.0	0.4	0.4	37.5 (25-50)	50.0	50.0	
Eristalopsis rubra	Diptera (Bombyliidae)		2	6.0	0.4	0.4	37.5 (12.5-62.5)	0.0	100.0	
Comptosia neobiguttata	Diptera (Bombyliidae)		2	6.0	0.4	0.4	18.8 (6.3-31.3)	0.0	50.0	
Amenia dubitalis	Diptera (Calliphoridae)		1	5.0	0.4	0.4	25 (0-62.5)	0.0	50.0	
Synemon gratiosa	Diptera (Castniidae)		28	8.0	0.6	0.7	36.1 (27.2-42.1)	38.9	49.2	
Pellucidomyia leei	Diptera (Ceratopogonidae)		1	4.0	0.7	0.3	68.8 (37.5-87.5)	100.0	100.0	
Rheotanytarsus barrengarryensis	Diptera (Chironomidae)		2	6.0	0.7	0.4	7.8 (0-25)	0.0	25.0	
Cricotopus (Cricotopus) varicornis	Diptera (Chironomidae)		1	5.0	0.7	0.3	31.3 (12.5-50)	0.0	100.0	
Pirara australiensis	Diptera (Chironomidae)		4	5.0	0.5	0.3	23.4 (13.5-33.9)	29.1	51.5	
Botryocladius brindabella	Diptera (Chironomidae)		2	6.0	0.6	0.3	18.8 (12.5-25)	0.0	50.0	
Procladius (Procladius) villosimanus	Diptera (Chironomidae)		1	5.0	0.6	0.3	15.6 (0-50)	0.0	50.0	
Chloropsina obscura	Diptera (Chloropidae)		1	5.0	0.4	0.3	93.8 (75-100)	100.0	100.0	
Leioproctus (Leioproctus) nigrofulvus	Diptera (Chloropidae)		1	5.0	0.4	0.3	93.8 (75-100)	100.0	100.0	
Parectecephala montana	Diptera (Chloropidae)		1	6.0	0.6	0.3	81.3 (62.5-100)	100.0	100.0	
Batrachomyia strigipes	Diptera (Chloropidae)		1	6.0	0.6	0.3	43.8 (25-62.5)	0.0	100.0	
Tricimba languida	Diptera (Chloropidae)		1	6.0	0.6	0.3	21.9 (0-62.5)	0.0	50.0	
Gymnochiromyia nigridorsum	Diptera (Chyromyidae)		2	5.0	0.5	0.3	12.5 (0-31.3)	0.0	25.0	
Tetrameringia pubescens	Diptera (Clusiidae)		2	2.0	0.6	0.3	31.3 (18.8-50)	50.0	75.0	
Heteromeringia helina	Diptera (Clusiidae)		1	2.0	0.8	0.3	25 (12.5-37.5)	0.0	100.0	
Heteromeringia hardyi	Diptera (Clusiidae)		4	2.0	0.5	0.3	16.1 (8.1-26.2)	9.8	54.4	
Heteromeringia laticornis	Diptera (Clusiidae)		10	2.0	0.8	0.4	15.5 (8.6-24.4)	14.5	47.6	
Hendelia nigriceps	Diptera (Clusiidae)		1	2.0	0.8	0.3	12.5 (0-37.5)	0.0	50.0	
Australoconops breviplatus	Diptera (Conopidae)		1	5.0	0.5	0.4	87.5 (75-100)	100.0	100.0	
Microconops atricornis	Diptera (Conopidae)		1	4.0	0.5	0.4	87.5 (75-100)	100.0	100.0	

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Camrasiconops rufofemoris	Diptera (Conopidae)		2	3.0	0.4	0.4	43.8 (37.5-50)	50.0	50.0	
Cryptochetum monophlebi	Diptera (Cryptochetidae)		1	4.0	0.5	0.4	87.5 (62.5-87.5)	100.0	100.0	
Aedes (Ochlerotatus) hodgkini	Diptera (Culicidae)		2	6.0	0.6	0.3	8.3 (0-27.1)	0.0	25.0	
Ochlerotatus (Finlaya) candidoscutellum	Diptera (Culicidae)		2	5.0	0.7	0.3	7.8 (0-25)	0.0	25.0	
Anopheles (Anopheles) tasmaniensis	Diptera (Culicidae)		4	6.0	0.6	0.3	24.6 (13-37.4)	29.2	48.2	
Clisa australis	Diptera (Cypselosomatidae)		5	2.0	0.6	0.4	34 (21.6-49.5)	14.4	60.7	
Pseudopomyza (Dete) collessi	Diptera (Cypselosomatidae)		4	4.0	0.7	0.5	22.7 (13.7-34.2)	8.5	41.1	
Australosymmerus (Ventrilobus) fuscinervis	Diptera (Ditomyiidae)		1	8.0	0.3	0.3	82.3 (54.2-100)	100.0	100.0	
Dixella nicholsoni	Diptera (Dixidae)		2	5.0	0.8	0.5	6.3 (0-18.8)	0.0	25.0	
Dixella humeralis	Diptera (Dixidae)		3	5.0	0.8	0.6	19.5 (9.5-35)	20.3	57.6	
Nothodixa geniculata	Diptera (Dixidae)		1	3.0	0.7	0.3	12.5 (0-37.5)	0.0	50.0	
Amblypsilopus williamsi	Diptera (Dolichopodidae)		3	8.0	0.5	0.4	61.1 (43-71.4)	64.1	75.0	
Heteropsilopus sugdeni	Diptera (Dolichopodidae)		3	8.0	0.5	0.4	60.3 (37.1-74.1)	35.3	92.1	
Mesorhaga gingra	Diptera (Dolichopodidae)		3	9.0	0.5	0.4	50.8 (36.7-63.6)	37.5	94.7	
Mesorhaga yarratt	Diptera (Dolichopodidae)		2	4.0	0.3	0.3	50 (43.8-50)	50.0	50.0	
Corindia capricornis	Diptera (Dolichopodidae)		1	3.0	0.5	0.3	50 (37.5-62.5)	0.0	100.0	
Pseudoparentia hangayi	Diptera (Dolichopodidae)		1	3.0	0.5	0.3	50 (37.5-62.5)	0.0	100.0	
Austrosciapus riparius	Diptera (Dolichopodidae)		11	8.0	0.5	0.4	47.7 (32.9-57.3)	46.7	61.6	
Parentia timothyei	Diptera (Dolichopodidae)		2	8.0	0.5	0.4	46.9 (31.3-50)	50.0	50.0	
Antyx werrikimbe	Diptera (Dolichopodidae)		3	11.0	0.5	0.5	40.9 (25.1-62)	34.3	73.6	
Austrosciapus tooloomensis	Diptera (Dolichopodidae)		3	8.0	0.5	0.4	37 (27.3-47.3)	40.9	49.0	
Corindia trudis	Diptera (Dolichopodidae)		1	6.0	0.6	0.5	31.3 (12.5-45.8)	0.0	100.0	
Austrosciapus muelleri	Diptera (Dolichopodidae)		6	8.0	0.5	0.4	28.7 (15.7-40)	10.1	50.2	
Teuchophorus longifrons	Diptera (Dolichopodidae)		6	7.0	0.6	0.5	24.2 (13.5-36.8)	8.5	45.0	
Scaptodrosophila eluta	Diptera (Drosophilidae)		NA	7.0	0.4	0.6	NA	NA	NA	
Scaptodrosophila jackeyi	Diptera (Drosophilidae)		NA	4.0	0.5	0.4	NA	NA	NA	
Scaptodrosophila claytoni	Diptera (Drosophilidae)		1	8.0	0.4	0.6	87.5 (75-100)	100.0	100.0	

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Scaptodrosophila sydneyensis	Diptera (Drosophilidae)		1	8.0	0.4	0.6	87.5 (75-100)	100.0	100.0	
Scaptodrosophila lativittata	Diptera (Drosophilidae)		2	6.0	0.4	0.6	50 (43.8-50)	50.0	50.0	
Drosophila (Sophophora) serrata	Diptera (Drosophilidae)		3	3.0	0.3	0.3	44.4 (32.2-56.1)	27.0	61.7	
Leucophenga cyanorosa	Diptera (Drosophilidae)		4	4.0	0.3	0.3	27.3 (16.4-40.4)	13.8	40.9	
Drosophila (Sophophora) pinnitarsus	Diptera (Drosophilidae)		1	4.0	0.3	0.3	25 (0-62.5)	0.0	50.0	
Leucophenga violae	Diptera (Drosophilidae)		1	4.0	0.3	0.3	25 (0-62.5)	0.0	50.0	
Neotanygastrella janeae	Diptera (Drosophilidae)		1	4.0	0.3	0.3	25 (0-62.5)	0.0	50.0	
Scaptodrosophila vindicta	Diptera (Drosophilidae)		1	3.0	0.5	0.3	25 (0-62.5)	0.0	50.0	
Chymomyza eungellae	Diptera (Drosophilidae)		2	4.0	0.3	0.3	12.5 (0-31.3)	0.0	25.0	
Bandella noorinbee	Diptera (Empididae)		1	7.0	0.4	0.3	75 (62.5-87.5)	100.0	100.0	
Ceratomerus macalpinei	Diptera (Empididae)		4	8.0	0.5	0.4	40.3 (27.9-54.5)	43.8	67.2	
Ceratomerus inflexus	Diptera (Empididae)		2	6.0	0.4	0.3	37.5 (31.3-43.8)	50.0	50.0	
Anaclastoctedon ancistrodes	Diptera (Empididae)		1	7.0	0.4	0.3	21.9 (0-62.5)	0.0	50.0	
Bandella allynensis	Diptera (Empididae)		2	7.0	0.4	0.3	21.9 (0-62.5)	0.0	50.0	
Ceratomerus lobatus	Diptera (Empididae)		1	6.0	0.4	0.3	21.9 (0-62.5)	0.0	50.0	
Ceratomerus orientalis	Diptera (Empididae)		5	8.0	0.5	0.3	18.5 (9.8-29.6)	7.5	40.8	
Fergusonina biseta	Diptera (Fergusoninidae)		1	4.0	0.6	0.4	75 (62.5-87.5)	100.0	100.0	
Fergusonina manchesteri	Diptera (Fergusoninidae)		5	4.0	0.6	0.4	34.1 (24.8-44.8)	29.3	61.5	
Borboroides bulberti	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	87.5 (62.5-87.5)	100.0	100.0	
Borboroides donaldi	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	87.5 (62.5-87.5)	100.0	100.0	
Borboroides doreenae	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	87.5 (62.5-87.5)	100.0	100.0	
Borboroides fimbria	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	87.5 (62.5-87.5)	100.0	100.0	
Borboroides helenae	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	87.5 (62.5-87.5)	100.0	100.0	
Borboroides menura	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	87.5 (62.5-87.5)	100.0	100.0	
Borboroides parva	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	87.5 (62.5-87.5)	100.0	100.0	
Borboroides petiolus	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	87.5 (62.5-87.5)	100.0	100.0	
Borboroides staniochi	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	87.5 (62.5-87.5)	100.0	100.0	
Borboroides stewarti	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	87.5 (62.5-87.5)	100.0	100.0	
Borboroides shippi	Diptera (Heteromyzidae)		2	5.0	0.5	0.4	75 (50-87.5)	50.0	100.0	

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Diplogeomyza hardyi	Diptera (Heteromyzidae)		2	5.0	0.4	0.4	75 (50-87.5)	50.0	100.0	
Borboroides danielsi	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	62.5 (37.5-87.5)	0.0	100.0	
Borboroides dayi	Diptera (Heteromyzidae)		1	5.0	0.5	0.4	62.5 (37.5-87.5)	0.0	100.0	
Borboroides musica	Diptera (Heteromyzidae)		3	5.0	0.4	0.4	47.9 (24.4-73.7)	31.2	64.2	
Heleomicra lenis	Diptera (Heteromyzidae)		2	5.0	0.4	0.4	43.8 (31.3-43.8)	50.0	50.0	
Waterhouseia cyclops	Diptera (Heteromyzidae)		4	5.0	0.4	0.4	41.8 (28.5-45.9)	41.0	50.5	
Borboroides tonnoiri	Diptera (Heteromyzidae)		2	5.0	0.5	0.4	31.3 (18.8-43.8)	0.0	50.0	
Diplogeomyza media	Diptera (Heteromyzidae)		9	5.0	0.4	0.4	30.7 (16.4-45.3)	20.8	40.8	
Diplogeomyza flavipalpis	Diptera (Heteromyzidae)		2	5.0	0.4	0.4	15.6 (0-43.8)	0.0	25.0	
Pentachaeta impar	Diptera (Heteromyzidae)		2	6.0	0.5	0.4	15.6 (0-43.8)	0.0	25.0	
Ortholfersia macleayi	Diptera (Hippoboscidae)		2	5.0	0.6	0.4	12.5 (0-31.3)	0.0	25.0	
Ironomyia whitei	Diptera (Ironomyiidae)		2	3.0	0.5	0.3	37.5 (31.3-43.8)	0.0	50.0	
Arachnocampa (Campara) richardsae	Diptera (Keroplatidae)		7	6.0	0.4	0.6	14 (6.6-22.2)	35.4	56.2	
Sapromyza riparia	Diptera (Lauxaniidae)		1	4.0	0.3	0.3	62.5 (37.5-87.5)	0.0	100.0	
Depressa atrata	Diptera (Lauxaniidae)		1	4.0	0.3	0.3	56.3 (37.5-87.5)	0.0	100.0	
Sapromyza pictigera	Diptera (Lauxaniidae)		2	4.0	0.3	0.3	34.4 (0-87.5)	0.0	50.0	
Sapromyza immaculipes	Diptera (Lauxaniidae)		2	4.0	0.4	0.3	15.6 (0-43.8)	0.0	25.0	
Molophilus (Molophilus) arte	Diptera (Limoniidae)		1	6.0	0.4	0.3	81.3 (62.5-100)	100.0	100.0	
Molophilus (Molophilus) johnmartini	Diptera (Limoniidae)		1	6.0	0.4	0.3	81.3 (62.5-100)	100.0	100.0	
Gynoplistia (Gynoplistia) atripes	Diptera (Limoniidae)		1	8.0	0.3	0.5	50 (37.5-62.5)	0.0	100.0	
Gynoplistia (Gynoplistia) elaphus	Diptera (Limoniidae)		1	8.0	0.3	0.5	50 (37.5-62.5)	0.0	100.0	
Gynoplistia (Gynoplistia) persephoneia	Diptera (Limoniidae)		1	8.0	0.3	0.5	50 (37.5-62.5)	0.0	100.0	
Ozeoura convoluta	Diptera (Limoniidae)		4	6.0	0.3	0.3	45.7 (30.5-63.7)	39.2	66.8	
Molophilus (Austromolophilus) heroni	Diptera (Limoniidae)		1	8.0	0.3	0.5	25 (0-62.5)	0.0	50.0	
Molophilus (Molophilus) akama	Diptera (Limoniidae)		1	8.0	0.3	0.5	25 (0-62.5)	0.0	50.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Dicranomyia (Dicranomyia) saxatilis	Diptera (Limoniidae)		1	7.0	0.4	0.3	24 (0-62.5)	0.0	50.0	
Molophilus (Molophilus) paratetrodonta	Diptera (Limoniidae)		1	7.0	0.4	0.5	24 (0-62.5)	0.0	50.0	
Molophilus (Molophilus) poecilonota	Diptera (Limoniidae)		1	7.0	0.4	0.3	24 (0-62.5)	0.0	50.0	
Ozeoura dingo	Diptera (Limoniidae)		1	7.0	0.4	0.5	24 (0-62.5)	0.0	50.0	
Rhabdomastix (Sacandaga) wilsoniana	Diptera (Limoniidae)		2	7.0	0.3	0.4	22.9 (14.6-31.3)	0.0	50.0	
Rhabdomastix (rhabdomastix) ostensackeni	Diptera (Limoniidae)		3	8.0	0.4	0.3	22.6 (17-28.2)	30.1	33.1	
Dicranomyia (Dicranomyia) flagellifera	Diptera (Limoniidae)		1	7.0	0.4	0.3	21.9 (0-62.5)	0.0	50.0	
Molophilus (Molophilus) opulus	Diptera (Limoniidae)		1	7.0	0.4	0.3	21.9 (0-62.5)	0.0	50.0	
Ozeoura tonnoiri	Diptera (Limoniidae)		3	7.0	0.4	0.3	21.5 (7.5-40)	7.9	39.1	
Metopochetus (Crus) micidus	Diptera (Micropezidae)		1	6.0	0.4	0.3	81.3 (62.5-87.5)	100.0	100.0	
Metopochetus (Seva) regius	Diptera (Micropezidae)		1	7.0	0.3	0.4	21.9 (0-62.5)	0.0	50.0	
Mycomya richmondensis	Diptera (Mycetophilidae)		2	5.0	0.6	0.4	15.6 (0-43.8)	0.0	25.0	
Trizygia flavipes	Diptera (Mycetophilidae)		2	5.0	0.6	0.4	15.6 (0-43.8)	0.0	25.0	
Pelecorhynchus nebulosus	Diptera (Pelecorhynchidae)		7	7.0	0.5	0.6	32.5 (22.2-44.2)	33.2	47.9	
Diplonevra nigroscutellata	Diptera (Phoridae)		3	5.0	0.3	0.3	31.6 (20.8-45)	10.3	55.4	
Clistoabdominalis koebelei	Diptera (Pipunculidae)		2	4.0	0.3	0.4	50 (43.8-50)	50.0	50.0	
Cephalops (Cephalops) caeruleimontanus	Diptera (Pipunculidae)		1	4.0	0.6	0.4	50 (37.5-62.5)	0.0	100.0	
Clistoabdominalis matheisoni	Diptera (Pipunculidae)		1	4.0	0.5	0.4	50 (37.5-62.5)	0.0	100.0	
Cephalops (Beckerias) argutus	Diptera (Pipunculidae)		3	4.0	0.6	0.4	31 (20.7-42.3)	14.9	47.0	
Lindneromyia albomaculata	Diptera (Platypezidae)		1	4.0	0.5	0.3	25 (0-62.5)	0.0	50.0	
Rhytidortalis cteis	Diptera (Platystomatidae)		1	5.0	0.4	0.3	62.5 (37.5-87.5)	100.0	100.0	
Euprosopia vitrea	Diptera (Platystomatidae)		3	5.0	0.4	0.3	28.2 (15.6-42.2)	39.8	48.7	
Euprosopia remota	Diptera (Platystomatidae)		2	5.0	0.4	0.3	18.8 (6.3-31.3)	0.0	50.0	
Peripsychoda gregsoni	Diptera (Psychodidae)		1	4.0	0.4	0.3	87.5 (62.5-100)	100.0	100.0	

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Osa commoni	Diptera (Pyrgotidae)		1	4.0	0.4	0.3	50 (37.5-62.5)	0.0	100.0	
Atherimorpha edgari	Diptera (Rhagionidae)		1	4.0	0.5	0.3	75 (37.5-100)	100.0	100.0	
Spaniopsis rieki	Diptera (Rhagionidae)		1	4.0	0.5	0.3	75 (37.5-100)	100.0	100.0	
Atherimorpha agathae	Diptera (Rhagionidae)		4	4.0	0.5	0.3	38.9 (14.2-66)	19.6	84.2	
Atherimorpha mcalpinei	Diptera (Rhagionidae)		1	4.0	0.5	0.3	18.8 (0-62.5)	0.0	50.0	
Chrysopilus hardyi	Diptera (Rhagionidae)		1	4.0	0.3	0.3	18.8 (0-62.5)	0.0	50.0	
Paracnephia aurantiaca	Diptera (Simuliidae)		2	7.0	0.6	0.6	7 (0-25)	0.0	25.0	
Howickia hardyina	Diptera (Sphaeroceridae)		1	3.0	0.5	0.3	31.3 (0-87.5)	0.0	50.0	
Howickia percostata	Diptera (Sphaeroceridae)		1	3.0	0.5	0.3	31.3 (0-87.5)	0.0	50.0	
Howickia wilsoni	Diptera (Sphaeroceridae)		1	3.0	0.5	0.3	31.3 (0-87.5)	0.0	50.0	
Howickia fenestrata	Diptera (Sphaeroceridae)		2	5.0	0.4	0.3	15.6 (0-37.5)	0.0	25.0	
Howickia trivittata	Diptera (Sphaeroceridae)		2	5.0	0.4	0.3	15.6 (0-37.5)	0.0	25.0	
Opaluma ednae	Diptera (Stratiomyidae)		NA	22.0	0.6	0.6	NA	NA	NA	
Opaluma fabulosa	Diptera (Stratiomyidae)		NA	25.0	0.6	0.7	NA	NA	NA	
Opaluma iridescens	Diptera (Stratiomyidae)		NA	24.0	0.5	0.6	NA	NA	NA	
Opaluma opulens	Diptera (Stratiomyidae)		NA	26.0	0.6	0.7	NA	NA	NA	
Opaluma sapphira	Diptera (Stratiomyidae)		NA	25.0	0.6	0.7	NA	NA	NA	
Opaluma unicornis	Diptera (Stratiomyidae)		NA	24.0	0.5	0.6	NA	NA	NA	
Antissella purprasina	Diptera (Stratiomyidae)		NA	24.0	0.4	0.6	N/a	NA	NA	
Inopus geminus	Diptera (Stratiomyidae)		3	3.0	0.3	0.3	53.9 (39-68.7)	22.5	85.3	
Odontomyia scutellata	Diptera (Stratiomyidae)		2	9.0	0.6	0.4	25 (18.8-31.3)	50.0	50.0	
Chiromyza longicornis	Diptera (Stratiomyidae)		2	3.0	0.5	0.3	25 (0-62.5)	0.0	50.0	
Melanostoma univittatum	Diptera (Syrphidae)		1	4.0	0.6	0.3	50 (37.5-62.5)	0.0	100.0	
Pseudotabanus mackerrasi	Diptera (Tabanidae)		1	5.0	0.5	0.3	87.5 (75-100)	100.0	100.0	
Caenoprosopon niger	Diptera (Tabanidae)		1	4.0	0.5	0.4	78.1 (37.5-100)	100.0	100.0	
Cydistomyia hardyi	Diptera (Tabanidae)		2	3.0	0.5	0.3	78.1 (37.5-100)	100.0	100.0	
Scaptia (Scaptia) alpina	Diptera (Tabanidae)		2	3.0	0.5	0.3	50 (43.8-50)	50.0	50.0	
Scaptia (Scaptia) alpina hardyi	Diptera (Tabanidae)		2	3.0	0.5	0.3	50 (43.8-50)	50.0	50.0	
Scaptia (Scaptia) monticola	Diptera (Tabanidae)		3	3.0	0.5	0.3	49.1 (39.3-56)	26.6	71.5	
Scaptia (Scaptia) alpina alpina	Diptera (Tabanidae)		6	3.0	0.5	0.3	42.8 (35.4-46.6)	33.6	52.1	

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Scaptia (Scaptia) patula	Diptera (Tabanidae)		3	3.0	0.5	0.3	34.3 (29.8-34.8)	33.5	35.2	
Anzomyia anomala	Diptera (Tabanidae)		2	3.0	0.4	0.3	25 (18.8-31.3)	50.0	50.0	
Cydistomorpha innotata	Diptera (Tabanidae)		2	4.0	0.5	0.3	25 (18.8-31.3)	50.0	50.0	
Dasybasis (Dasybasis) gemella	Diptera (Tabanidae)		2	3.0	0.5	0.3	25 (18.8-31.3)	0.0	50.0	
Dasybasis (Dasybasis) macrophthalma	Diptera (Tabanidae)		1	3.0	0.5	0.3	25 (0-62.5)	0.0	50.0	
Cydistomorpha neobasalis	Diptera (Tabanidae)		2	4.0	0.5	0.3	12.5 (6.3-18.8)	0.0	50.0	
Anabasis postica	Diptera (Tabanidae)		1	4.0	0.5	0.3	12.5 (0-37.5)	0.0	50.0	
Geraldia recessata	Diptera (Tachinidae)		1	3.0	0.5	0.4	50 (37.5-62.5)	0.0	100.0	
Chetogaster viridis	Diptera (Tachinidae)		1	3.0	0.3	0.6	25 (0-62.5)	0.0	50.0	
Trichostylum parafaciale	Diptera (Tachinidae)		1	2.0	0.5	0.3	25 (0-62.5)	0.0	50.0	
linnaemya_setulosa_41213	Diptera (Tachinidae)		2	3.0	0.3	0.6	12.5 (0-31.3)	0.0	25.0	
Oedaspis apicalis	Diptera (Tephritidae)		2	4.0	0.6	0.4	25 (18.8-31.3)	0.0	50.0	
Perissomma mcalpinei	Diptera (Tephritidae)		1	7.0	0.6	0.7	25 (0-62.5)	0.0	50.0	
Auster pteridii	Diptera (Teratomyzidae)		3	4.0	0.9	0.6	25.5 (16.4-36.1)	8.6	42.4	
Austrothaumalea spinosa	Diptera (Thaumaleidae)		2	3.0	0.7	0.3	9.4 (0-25)	0.0	25.0	
Austrothaumalea capricornis	Diptera (Thaumaleidae)		2	7.0	0.6	0.4	8.3 (0-27.1)	0.0	25.0	
Austrothaumalea theischingeri	Diptera (Thaumaleidae)		1	3.0	0.7	0.3	18.8 (0-50)	0.0	50.0	
Austrothaumalea ramosa	Diptera (Thaumaleidae)		2	3.0	0.5	0.4	12.5 (6.3-18.8)	0.0	50.0	
Acatopygia olivacea	Diptera (Therevidae)		1	6.0	0.5	0.3	81.3 (62.5-100)	100.0	100.0	
Anabarhynchus adornatus	Diptera (Therevidae)		1	6.0	0.4	0.3	81.3 (62.5-100)	100.0	100.0	
Nanexila armeniacum	Diptera (Therevidae)		1	6.0	0.6	0.3	81.3 (62.5-100)	100.0	100.0	
Nanexila gracilis	Diptera (Therevidae)		2	6.0	0.4	0.3	65.6 (50-81.3)	50.0	100.0	
Neodialineura saxatilis	Diptera (Therevidae)		4	6.0	0.4	0.3	58.6 (43.4-74.5)	44.0	89.6	
Bonjeania jefferiesi	Diptera (Therevidae)		1	6.0	0.5	0.3	50 (37.5-62.5)	0.0	100.0	
Laxotela holstoni	Diptera (Therevidae)		1	6.0	0.6	0.3	50 (37.5-62.5)	0.0	100.0	
Bonjeania argentea	Diptera (Therevidae)		3	6.0	0.5	0.3	40.7 (31.9-52.7)	45.2	56.1	
Actenomeros onyx	Diptera (Therevidae)		2	6.0	0.3	0.3	40.6 (31.3-50)	50.0	50.0	
Agapophytus antheliogynaion	Diptera (Therevidae)		2	6.0	0.4	0.3	40.6 (31.3-50)	50.0	50.0	
Anabarhynchus mcalpinei	Diptera (Therevidae)		2	6.0	0.4	0.3	40.6 (31.3-50)	50.0	50.0	

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Vomerina humbug	Diptera (Therevidae)		3	6.0	0.3	0.3	39.1 (28.9-49.8)	29.1	60.0	
Ectinorhynchus pyrrhotelus	Diptera (Therevidae)		2	6.0	0.4	0.3	25 (18.8-31.3)	0.0	50.0	
Anabarhynchus plumbeoides	Diptera (Therevidae)		1	6.0	0.4	0.3	25 (0-62.5)	0.0	50.0	
Anabarhynchus tener	Diptera (Therevidae)		1	6.0	0.4	0.3	25 (0-62.5)	0.0	50.0	
Anabarhynchus plumbeus	Diptera (Therevidae)		5	6.0	0.4	0.3	23.1 (13.4-35.7)	10.3	39.9	
Patanothrix skevingtoni	Diptera (Therevidae)		2	6.0	0.4	0.3	12.5 (0-31.3)	0.0	25.0	
Ptilogyna (Ctenogyna) bicolor	Diptera (Tipulidae)		1	5.0	0.4	0.5	87.5 (62.5-100)	100.0	100.0	
Ischnotoma (Ischnotoma) goldfinchi	Diptera (Tipulidae)		1	5.0	0.4	0.3	50 (37.5-62.5)	0.0	100.0	
Leptotarsus (Habromastix) cunninghamensis	Diptera (Tipulidae)		1	5.0	0.3	0.3	50 (37.5-62.5)	0.0	100.0	
Dolichopeza (Dolichopeza) brevifurca	Diptera (Tipulidae)		4	5.0	0.3	0.3	37 (23.9-47.6)	33.4	48.9	
Dolichopeza (Dolichopeza) bickeli	Diptera (Tipulidae)		2	5.0	0.3	0.3	25 (18.8-31.3)	0.0	50.0	
Leptotarsus (Macromastix) humilis	Diptera (Tipulidae)		1	5.0	0.4	0.3	25 (0-62.5)	0.0	50.0	
Ptilogyna (Plusiomyia) gracilis spectabilis	Diptera (Tipulidae)		4	10.0	0.6	0.5	19.8 (11.4-28.4)	10.7	43.2	
Atalophlebia maculosa	Ephemeroptera (Leptophlebiidae)		1	7.0	0.6	0.7	31.3 (12.5-50)	0.0	100.0	
Koorrnonga parva	Ephemeroptera (Leptophlebiidae)		1	7.0	0.6	0.7	31.3 (12.5-50)	0.0	100.0	
Jappa strigata	Ephemeroptera (Leptophlebiidae)		1	8.0	0.6	0.7	15.6 (0-50)	0.0	50.0	
Acanthokara kaputensis	Euonycophora (Peripatopsidae)	Y	1	18.0	0.6	0.8	68.8 (50-75)	100.0	100.0	
Kumbadjena toolbrunupensis	Euonycophora (Peripatopsidae)	Y	1	9.0	0.5	0.8	62.5 (50-75)	100.0	100.0	
Ruhbergia rostroides	Euonycophora (Peripatopsidae)	Y	1	18.0	0.6	0.8	50 (37.5-62.5)	0.0	100.0	
Cephalofovea tomahmontis	Euonycophora (Peripatopsidae)	Y	4	9.0	0.5	0.8	45.6 (35.8-56)	41.6	70.4	
Phallocephale tallagandensis	Euonycophora (Peripatopsidae)	Y	4	9.0	0.5	0.8	41.7 (34.2-49.4)	51.9	57.5	
Cephalofovea clandestina	Euonycophora (Peripatopsidae)	Y	3	18.0	0.6	0.8	40.6 (32-50)	45.9	58.2	
Baeothele saukros	Euonycophora (Peripatopsidae)	Y	3	9.0	0.5	0.8	32.7 (25.8-39.7)	26.8	51.9	
Euperipatoides kanangrensis	Euonycophora (Peripatopsidae)	Y	4	9.0	0.5	0.8	30.3 (20.8-42.4)	26.6	47.4	
Nodocapitus inornatus	Euonycophora (Peripatopsidae)	Y	1	4.0	0.6	0.7	18.8 (0-50)	0.0	50.0	

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Planipapillus cyclus	Euonycophora (Peripatopsidae)	Y	1	4.0	0.6	0.7	18.8 (0-50)	0.0	50.0	
Leuropezos eungellensis	Euonycophora (Peripatopsidae)	Y	2	9.0	0.5	0.8	12.5 (0-31.3)	0.0	25.0	
Nitocra lacustris pacifica	Harpacticoida (Ameiridae)		1	7.0	0.5	0.6	43.8 (25-50)	100.0	100.0	
Elaphoidella bidens	Harpacticoida (Canthocamptidae)		2	3.0	0.5	0.5	25 (18.8-31.3)	50.0	50.0	
Canthocamptus longipes	Harpacticoida (Canthocamptidae)		1	3.0	0.5	0.7	25 (12.5-37.5)	0.0	100.0	
Glochocoris gippslandicus	Hemiptera (Aradidae)		1	14.0	0.4	0.7	54.7 (37.5-81.3)	100.0	100.0	
Kumaressa carraiensis	Hemiptera (Aradidae)		3	8.0	0.5	0.8	34.9 (22.4-50.9)	19.0	68.6	
Drakiessa consobrina	Hemiptera (Aradidae)		3	6.0	0.3	0.6	28.8 (21.9-36.1)	22.8	50.9	
Carventus elongatus	Hemiptera (Aradidae)		2	6.0	0.3	0.6	10.4 (0-27.1)	0.0	25.0	
Austrocerus emarginatus	Hemiptera (Cicadellidae)		1	13.0	0.3	0.7	91.7 (79.2-100)	100.0	100.0	
Balocerus triozus	Hemiptera (Cicadellidae)		1	2.0	0.3	0.3	50 (37.5-62.5)	0.0	100.0	
Wiloatma liepai	Hemiptera (Cicadellidae)		1	2.0	0.5	0.3	50 (37.5-62.5)	0.0	100.0	
Rosopaella crofta	Hemiptera (Cicadellidae)		2	2.0	0.5	0.3	25 (18.8-31.3)	0.0	50.0	
Bharoopra clavosignata	Hemiptera (Cicadellidae)		2	9.0	0.3	0.6	18.8 (12.5-25)	0.0	50.0	
Putoniessa rieki	Hemiptera (Cicadellidae)		2	3.0	0.3	0.3	12.5 (0-31.3)	0.0	25.0	
Pascoepus insularis	Hemiptera (Cicadellidae)		1	11.0	0.3	0.7	100 (87.5-100)	100.0	100.0	
Rosopaella flindersi	Hemiptera (Cicadellidae)		1	12.0	0.3	0.7	100 (87.5-100)	100.0	100.0	
Carolus crispus	Hemiptera (Cixiidae)		1	2.0	0.5	0.3	25 (0-62.5)	0.0	50.0	
Pachycolpuroides monteithi	Hemiptera (Coreidae)		1	7.0	0.3	0.5	50 (37.5-62.5)	0.0	100.0	
Turrana abnormis	Hemiptera (Coreidae)		1	7.0	0.3	0.5	50 (37.5-62.5)	0.0	100.0	
Apiomorpha pedunculata	Hemiptera (Eriococcidae)		2	3.0	0.7	0.2	37.5 (31.3-43.8)	50.0	50.0	
Apiomorpha pileata	Hemiptera (Eriococcidae)		6	5.0	0.6	0.6	35.3 (13.8-44)	32.2	48.4	
Apiomorpha spinifer	Hemiptera (Eriococcidae)		19	5.0	0.6	0.6	34.5 (15.6-50.2)	35.1	56.9	
Nerthra hylaea	Hemiptera (Gelastocoridae)		2	6.0	0.5	0.6	12.5 (0-31.3)	0.0	25.0	
Bucktoniella pyramidatus	Hemiptera (Membracidae)		3	6.0	0.6	0.4	18.1 (9.9-29.3)	5.2	43.1	
Wallabicoris waitzii	Hemiptera (Miridae)		1	5.0	0.3	0.5	50 (37.5-62.5)	0.0	100.0	
Dictyotus roei	Hemiptera (Pentatomidae)		3	3.0	0.6	0.3	33.2 (28.7-33.9)	31.0	35.4	
Pseudococcus markharveyi	Hemiptera (Pseudococcidae)	y	2	7.0	0.7	0.8	50 (43.8-50)	50.0	50.0	EPBCA (CR), IUCN (CR), WA (CR)
Glycaspis (Synglycaspis) conflecta	Hemiptera (Psyllidae)		2	6.0	0.5	0.6	50 (43.8-50)	50.0	50.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Glycaspis (Glycaspis) montana	Hemiptera (Psyllidae)		1	6.0	0.5	0.6	50 (37.5-62.5)	0.0	100.0	
Platyobria lewisi	Hemiptera (Psyllidae)		3	6.0	0.6	0.4	32.1 (25.7-38.8)	37.1	48.6	
Empicoris aeneus	Hemiptera (Reduviidae)		1	11.0	0.3	0.6	87.5 (75-100)	100.0	100.0	
Thelocoris nigricans	Hemiptera (Reduviidae)		3	2.0	0.3	0.3	24.5 (20.4-28.6)	32.4	32.8	
Exomyocara trispinosum	Hemiptera (Rhyparochromidae)		1	5.0	0.6	0.4	93.8 (75-100)	100.0	100.0	
Stizocephalus brevirostris	Hemiptera (Rhyparochromidae)		1	5.0	0.3	0.3	87.5 (62.5-87.5)	100.0	100.0	
Carinatala meridiana	Hemiptera (Schizopteridae)		1	6.0	0.3	0.6	62.5 (50-75)	0.0	100.0	
Rectilamina torquata	Hemiptera (Schizopteridae)		1	5.0	0.4	0.4	58.3 (45.8-70.8)	0.0	100.0	
Duonota bimaculata	Hemiptera (Schizopteridae)		2	3.0	0.3	0.3	15.6 (0-37.5)	0.0	25.0	
Oncophysa vesiculata nigra	Hemiptera (Tingidae)		4	2.0	0.3	0.5	54.8 (47-56.4)	51.7	57.8	
Trioza barrettae	Hemiptera (Triozidae)		5	20.0	0.7	0.6	62.5 (44.3-72.2)	69.3	73.6	EPBCA (EN), IUCN (CR), WA (EN)
Xylocopa (Lestis) aeratus	Hymenoptera (Apidae)		92	14.0	0.9	0.6	39.1 (28.9-49.7)	75.4	81.2	Vic (Regionally EX)
Trachypetus clavatus	Hymenoptera (Braconidae)		2	6.0	0.4	0.4	9.4 (0-25)	0.0	25.0	
Phanerotoma australiensis	Hymenoptera (Braconidae)		1	6.0	0.5	0.4	75 (62.5-87.5)	100.0	100.0	
Miropotes burringbaris	Hymenoptera (Braconidae)		1	6.0	0.3	0.4	37.5 (25-50)	0.0	100.0	
Therophilus meridionalis	Hymenoptera (Braconidae)		1	7.0	0.3	0.6	37.5 (25-50)	0.0	100.0	
Ceratodoryctes annulatus	Hymenoptera (Braconidae)		1	6.0	0.3	0.4	18.8 (0-50)	0.0	50.0	
Phanerotoma behriae	Hymenoptera (Braconidae)		1	6.0	0.5	0.4	18.8 (0-50)	0.0	50.0	
Phanerotoma nigriscapulata	Hymenoptera (Braconidae)		1	6.0	0.5	0.4	18.8 (0-50)	0.0	50.0	
Leioproctus (Andrenopsis) douglasiellus	Hymenoptera (Colletidae)		4	NA	NA	NA	NA	18.1	37.6	EPBCA (CR), WA (EN)
Heterohesma clypeata	Hymenoptera (Colletidae)		1	20.0	0.5	0.6	93.8 (75-100)	100.0	100.0	
Euryglossina (Euryglossella) perkinsi	Hymenoptera (Colletidae)		2	12.0	0.6	0.6	9.4 (0-25)	0.0	25.0	
Euryglossina (Euryglossina) macrostoma	Hymenoptera (Colletidae)		3	23.0	0.6	0.7	57 (44.3-70.6)	56.9	95.1	
Hylaeus (Heterapoides) digitatus	Hymenoptera (Colletidae)		3	21.0	0.4	0.6	53.8 (38-70.6)	56.8	95.1	
Trichocolletes burnsi	Hymenoptera (Colletidae)		3	13.0	0.5	0.5	42.4 (30.2-57.6)	50.9	74.6	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Leioproctus (Andrenopsis) flavorufus	Hymenoptera (Colletidae)		1	7.0	0.5	0.4	41.7 (20.8-62.5)	0.0	100.0	
Euryglossina (Euryglossina) argocephala	Hymenoptera (Colletidae)		5	21.0	0.6	0.5	41.5 (26.6-53)	34.0	57.4	
Leioproctus (Leioproctus) spatulatus	Hymenoptera (Colletidae)		3	15.0	0.6	0.6	41.5 (24.1-62.8)	42.4	57.3	
Glossurocolletes bilobatus	Hymenoptera (Colletidae)		2	7.0	0.3	0.4	38.5 (27.1-39.6)	50.0	50.0	
Hylaeus (Prosopisteron) semipersonatus	Hymenoptera (Colletidae)		2	21.0	0.3	0.6	35.4 (27.1-43.8)	50.0	50.0	
Euhesma (Euhesma) nitidifrons	Hymenoptera (Colletidae)		4	3.0	0.7	0.4	33.7 (25.2-41.2)	24.2	43.2	
Hylaeus (Prosopisteron) minusculus	Hymenoptera (Colletidae)		3	22.0	0.3	0.6	33.7 (23.7-44.5)	32.0	65.3	
Hylaeus (Heterapoides) delicatus	Hymenoptera (Colletidae)		4	8.0	0.3	0.3	33.2 (22-45.4)	25.9	67.8	
Euryglossina (Euryglossina) cockerelli	Hymenoptera (Colletidae)		4	22.0	0.6	0.7	31.9 (18.5-36.8)	41.1	68.4	
Euryglossa haematura	Hymenoptera (Colletidae)		5	27.0	0.4	0.6	31 (20.5-40.9)	25.8	60.0	
Leioproctus (Leioproctus) nigrofulvus	Hymenoptera (Colletidae)		9	20.0	0.6	0.6	28.5 (16.8-50.3)	22.6	53.4	
Trichocolletes serotinus	Hymenoptera (Colletidae)		5	13.0	0.6	0.5	25.1 (19.1-32.4)	32.8	41.0	
Trichocolletes sericeus	Hymenoptera (Colletidae)		3	14.0	0.5	0.5	23.7 (13.5-29.9)	12.2	61.3	
Euryglossa trichoda	Hymenoptera (Colletidae)		3	22.0	0.4	0.6	23.5 (16-30)	22.6	50.0	
Hylaeus (Heterapoides) nigriconcavus	Hymenoptera (Colletidae)		2	4.0	0.5	0.4	21.9 (12.5-31.3)	0.0	50.0	
Hylaeus (Planihylaeus) jacksoniae	Hymenoptera (Colletidae)		2	4.0	0.5	0.4	21.9 (12.5-31.3)	0.0	50.0	
Euryglossina (Euryglossina) pseudoatomaria	Hymenoptera (Colletidae)		3	12.0	0.6	0.6	21.2 (11.5-34.5)	7.3	49.3	
Hylaeus (Analastoroides) foveatus	Hymenoptera (Colletidae)		2	20.0	0.5	0.6	17.2 (9.4-25)	0.0	50.0	
Euhesma (Euhesma) spinola	Hymenoptera (Colletidae)		2	3.0	0.7	0.4	12.5 (0-31.3)	0.0	25.0	
Tachysphex mackayensis	Hymenoptera (Crabronidae)		1	7.0	0.4	0.4	84.4 (62.5-100)	100.0	100.0	
Pison festivum	Hymenoptera (Crabronidae)		1	7.0	0.5	0.4	78.1 (62.5-100)	100.0	100.0	
Sericophorus viridis	Hymenoptera (Crabronidae)		3	7.0	0.4	0.4	43.8 (28.8-60.3)	34.6	72.2	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Podagritus australiensis	Hymenoptera (Crabronidae)		1	7.0	0.5	0.4	37.5 (20.8-62.5)	0.0	100.0	
Pison simulans	Hymenoptera (Crabronidae)		4	7.0	0.5	0.4	28.7 (16.9-43.6)	18.7	51.1	
Pison erythrogastrum	Hymenoptera (Crabronidae)		3	7.0	0.5	0.4	28.2 (19.3-42.7)	23.7	49.6	
Sericophorus nigrescens	Hymenoptera (Crabronidae)		2	7.0	0.4	0.4	20.8 (10.4-31.3)	0.0	50.0	
Pseudoturneria territorialis	Hymenoptera (Crabronidae)		1	7.0	0.4	0.4	18.8 (0-62.5)	0.0	50.0	
Rostropria simplex	Hymenoptera (Diapriidae)		1	3.0	0.5	0.3	31.3 (0-75)	0.0	50.0	
Zagrammosoma latilineatum	Hymenoptera (Eulophidae)		2	5.0	0.4	0.4	25 (18.8-31.3)	0.0	50.0	
Strumigenys xenos	Hymenoptera (Formicidae)		3	NA	NA	NA	NA	14.8	41.0	IUCN (VU)
Iridomyrmex tenebrans	Hymenoptera (Formicidae)		1	4.0	0.5	0.3	75 (62.5-87.5)	100.0	100.0	
Orectognathus kanangra	Hymenoptera (Formicidae)		1	26.0	0.4	0.4	64.6 (50-79.2)	100.0	100.0	
Rhytidoponera aspera	Hymenoptera (Formicidae)		3	6.0	0.3	0.5	45 (29.5-64.5)	29.9	75.0	
Pristomyrmex erythropygus	Hymenoptera (Formicidae)		4	5.0	0.5	0.4	30.5 (16.8-49)	19.8	51.1	
Epopostruma avicula	Hymenoptera (Formicidae)		2	12.0	0.7	0.5	28.6 (22.3-34.8)	50.0	50.0	
Camponotus suffusus bendigensis	Hymenoptera (Formicidae)		3	6.0	0.4	0.3	28.1 (20.9-35.4)	54.6	57.0	
Colobostruma cerornata	Hymenoptera (Formicidae)		2	8.0	0.6	0.3	25 (18.8-31.3)	50.0	50.0	
Tetramorium fuscipes	Hymenoptera (Formicidae)		2	8.0	0.5	0.3	25 (18.8-31.3)	50.0	50.0	
Proceratium gracile	Hymenoptera (Formicidae)		1	7.0	0.5	0.3	25 (12.5-37.5)	0.0	100.0	
Dolichoderus doriae	Hymenoptera (Formicidae)		8	7.0	0.5	0.3	23.5 (15.9-31.7)	29.0	57.7	
Monomorium sculpturatum	Hymenoptera (Formicidae)		9	5.0	0.6	0.3	22.9 (15-33)	28.6	47.2	
Iridomyrmex cyaneus	Hymenoptera (Formicidae)		12	4.0	0.5	0.3	22.9 (13.7-34.9)	9.4	51.6	
Leptomyrmex ramorniensis	Hymenoptera (Formicidae)		5	5.0	0.5	0.3	22.8 (12.4-35.8)	19.1	72.0	
Myrmecia browningi	Hymenoptera (Formicidae)		4	4.0	0.5	0.3	22.6 (16.7-28.7)	43.7	45.6	
Myrmecia loweryi	Hymenoptera (Formicidae)		6	5.0	0.5	0.3	21.5 (15.5-27.9)	37.4	45.8	
Probolomyrmex greavesi	Hymenoptera (Formicidae)		3	10.0	0.8	0.4	21.4 (15.7-27.2)	40.6	44.6	
Tetramorium confusum	Hymenoptera (Formicidae)		8	8.0	0.5	0.3	21.4 (11.6-34.2)	17.0	61.1	
Camponotus pallidiceps	Hymenoptera (Formicidae)		3	7.0	0.3	0.3	20.9 (11.4-33.9)	26.4	48.9	
Myrmecia midas	Hymenoptera (Formicidae)		5	5.0	0.6	0.3	20.7 (14.1-28.1)	20.7	46.4	
Melophorus castanopus	Hymenoptera (Formicidae)		4	7.0	0.6	0.3	19.1 (12.6-25.8)	31.8	38.2	
Nebothriomyrmex majeri	Hymenoptera (Formicidae)		2	7.0	0.4	0.5	18.8 (12.5-25)	0.0	50.0	

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Strumigenys segrex	Hymenoptera (Formicidae)		1	6.0	0.5	0.4	16.7 (0-45.8)	0.0	50.0	
Camponotus versicolor	Hymenoptera (Formicidae)		4	7.0	0.3	0.3	11.3 (3.1-24.4)	0.5	38.5	
Homalictus (Homalictis) verticulus	Hymenoptera (Halictidae)		NA	18.0	0.6	0.6	NA	NA	NA	
Homalictus (Homalictus) latitarsis	Hymenoptera (Halictidae)		NA	18.0	0.6	0.6	NA	NA	NA	
Lasioglossum (Australictus) rufitarsum	Hymenoptera (Halictidae		NA	18.0	0.6	0.6	NA	NA	NA	
Lasioglossum (Chilalictus) cardaleae	Hymenoptera (Halictidae)		NA	18.0	0.6	0.6	NA	NA	NA	
Lasioglossum (Ctenonomia) blandulum	Hymenoptera (Halictidae)		NA	15.0	0.6	0.6	NA	NA	NA	
Lasioglossum (Parasphecodes) lacthium	Hymenoptera (Halictidae)		2	3.0	0.9	0.4	50 (43.8-50)	50.0	50.0	
Lasioglossum (Parasphecodes) melbournense	Hymenoptera (Halictidae)		2	3.0	0.7	0.4	50 (43.8-50)	50.0	50.0	
Lasioglossum (Parasphecodes) subrussatum	Hymenoptera (Halictidae)		3	3.0	0.7	0.4	37.2 (32.4-37.4)	36.8	37.6	
Lasioglossum (Parasphecodes) waterhousei	Hymenoptera (Halictidae)		4	20.0	0.6	0.6	21 (13.4-33.7)	24.1	45.2	
Lasioglossum (Chilalictus) grumiculum	Hymenoptera (Halictidae)		2	19.0	0.6	0.6	15.6 (6.3-22.9)	0.0	50.0	
Ankylophon obligatus	Hymenoptera (Ichneumonidae)		1	4.0	0.3	0.4	75 (62.5-87.5)	100.0	100.0	
Dimophora diabolica	Hymenoptera (Ichneumonidae)		1	4.0	0.5	0.4	15.6 (0-62.5)	0.0	50.0	
Philogalleria bobbyi	Hymenoptera (Ichneumonidae)		2	10.0	0.6	0.6	10.5 (0-28.1)	0.0	25.0	
Coelioxys (Torridapis) julia	Hymenoptera (Megachilidae)		1	19.0	0.6	0.6	21.9 (0-75)	0.0	50.0	
Monomachus antipodalis	Hymenoptera (Monomachidae)		1	3.0	0.7	0.4	75 (62.5-87.5)	100.0	100.0	
Boccacciomymar maria	Hymenoptera (Mymaridae)		1	9.0	0.5	0.3	62.5 (50-75)	0.0	100.0	
Calopompilus ornatipennis	Hymenoptera (Pompilidae)		2	5.0	0.4	0.4	9.4 (0-31.3)	0.0	25.0	
Cteniziphontes protervus	Hymenoptera (Pompilidae)		2	4.0	0.4	0.4	9.4 (0-31.3)	0.0	25.0	
Sphictostethus haoae	Hymenoptera (Pompilidae)		2	5.0	0.4	0.4	9.4 (0-31.3)	0.0	25.0	
Sphictostethus walteri	Hymenoptera (Pompilidae)		3	5.0	0.4	0.4	22.6 (10.9-36.2)	10.9	47.5	
Enoggera reticulata	Hymenoptera (Pteromalidae)		1	16.0	0.4	0.6	87.5 (75-100)	100.0	100.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Liepara dahmsi	Hymenoptera (Pteromalidae)		1	6.0	0.3	0.5	18.8 (0-62.5)	0.0	50.0	
Guerinius flavilabris	Hymenoptera (Tiphiidae)		1	4.0	0.5	0.4	37.5 (12.5-62.5)	0.0	100.0	
Aeolothynnus deductor	Hymenoptera (Tiphiidae)		2	4.0	0.5	0.4	18.8 (6.3-31.3)	0.0	50.0	
Australozethus continentalis	Hymenoptera (Vespidae)		2	1.0	0.9	0.3	25 (18.8-31.3)	0.0	50.0	
Platypyga subpetrae	Isopoda (Amphisopodidae)		2	7.0	0.5	0.6	50 (37.5-62.5)	100.0	100.0	
Merulana boydensis	Isopoda (Armadillidae)		1	5.0	0.5	0.7	58.3 (45.8-70.8)	100.0	100.0	
Acanthodillo barringtonensis	Isopoda (Armadillidae)		1	6.0	0.6	0.7	16.7 (0-45.8)	0.0	50.0	
Cubaroides pilosus	Isopoda (Armadillidae)		2	8.0	0.3	0.6	11.7 (0-31.3)	0.0	25.0	
Crenoicus buntiae	Isopoda (Phreatoicidae)		10	4.0	0.5	0.8	19 (12.5-26.3)	27.0	49.1	
Aenigmatinea glatzella	Lepidoptera (Aenigmatineidae)		NA	13.0	0.5	0.8	N/a	N/a	N/a	
Anthela heliopa	Lepidoptera (Anthelidae)		2	3.0	0.3	0.4	48.4 (37.5-50)	50.0	50.0	
Anthela guenei	Lepidoptera (Anthelidae)		2	3.0	0.3	0.4	46.9 (37.5-50)	50.0	50.0	
Ogmograptis triradiata	Lepidoptera (Bucculatricidae)		1	2.0	0.6	0.3	31.3 (12.5-62.5)	0.0	100.0	
Sosineura mimica	Lepidoptera (Carposinidae)		5	6.0	0.7	0.4	26.3 (19-35.4)	25.5	44.7	
Carposina latebrosa	Lepidoptera (Carposinidae)		2	3.0	0.5	0.3	12.5 (6.3-18.8)	0.0	50.0	
Synemon ignita	Lepidoptera (Castniidae)		2	17.0	0.6	0.7	43.8 (37.5-50)	50.0	50.0	
Tebenna micalis	Lepidoptera (Choreutidae)		2	3.0	0.6	0.2	45.3 (37.5-50)	50.0	50.0	
Limnaecia camptosema	Lepidoptera (Cosmopterigidae)		1	5.0	0.4	0.3	75 (62.5-87.5)	100.0	100.0	
Limnaecia pterolopha	Lepidoptera (Cosmopterigidae)		1	5.0	0.4	0.3	75 (62.5-87.5)	100.0	100.0	
Limnaecia scoliosema	Lepidoptera (Cosmopterigidae)		1	5.0	0.4	0.3	75 (62.5-87.5)	100.0	100.0	
Limnaecia chionospila	Lepidoptera (Cosmopterigidae)		2	5.0	0.3	0.3	56.3 (43.8-68.8)	50.0	100.0	
Macrobathra isoscelana	Lepidoptera (Cosmopterigidae)		2	5.0	0.4	0.3	56.3 (43.8-68.8)	50.0	100.0	
Labdia hexaspila	Lepidoptera (Cosmopterigidae)		4	4.0	0.8	0.4	51.6 (39.4-64.5)	45.9	91.7	
Haplochrois tanyptera	Lepidoptera (Cosmopterigidae)		1	3.0	0.3	0.3	37.5 (25-50)	0.0	100.0	
Macrobathra alternatella	Lepidoptera (Cosmopterigidae)		3	5.0	0.3	0.3	33.8 (25.9-42.1)	30.6	59.4	
Archaeoses magicosema	Lepidoptera (Cossidae)		1	5.0	0.3	0.3	50 (37.5-62.5)	100.0	100.0	
Diathrausta ochreipennis	Lepidoptera (Crambidae)		1	5.0	0.4	0.4	87.5 (62.5-87.5)	100.0	100.0	
Trichophysetis fulvifusalis	Lepidoptera (Crambidae)		1	5.0	0.4	0.3	87.5 (62.5-87.5)	100.0	100.0	
Tauroscopa callixutha	Lepidoptera (Crambidae)		2	5.0	0.4	0.3	65.6 (50-75)	50.0	100.0	
Margarosticha sphenotis	Lepidoptera (Crambidae)		3	5.0	0.3	0.3	54 (29.3-51.9)	34.7	62.1	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Parotis atlitalis	Lepidoptera (Crambidae)		2	5.0	0.3	0.3	43.8 (31.3-43.8)	50.0	50.0	
Scoparia spelaea	Lepidoptera (Crambidae)		2	5.0	0.3	0.3	43.8 (31.3-43.8)	50.0	50.0	
Strepsinoma foveata	Lepidoptera (Crambidae)		2	5.0	0.3	0.3	37.5 (18.8-62.5)	0.0	75.0	
Crocidolomia suffusalis	Lepidoptera (Crambidae)		2	5.0	0.4	0.3	25 (18.8-31.3)	0.0	50.0	
Hednota pleniferellus	Lepidoptera (Crambidae)		2	5.0	0.3	0.3	25 (18.8-31.3)	0.0	50.0	
Araeomorpha diplopa	Lepidoptera (Crambidae)		1	5.0	0.4	0.4	25 (0-62.5)	0.0	50.0	
Herpetogramma cynaralis	Lepidoptera (Crambidae)		1	5.0	0.4	0.3	25 (0-62.5)	0.0	50.0	
Cirrhochrista aetherialis	Lepidoptera (Crambidae)		2	5.0	0.3	0.3	12.5 (0-31.3)	0.0	25.0	
Culladia cuneiferellus	Lepidoptera (Crambidae)		2	5.0	0.3	0.3	12.5 (0-31.3)	0.0	25.0	
Omiodes diemenalis	Lepidoptera (Crambidae)		2	5.0	0.3	0.3	12.5 (0-31.3)	0.0	25.0	
Tetracona pictalis	Lepidoptera (Crambidae)		2	5.0	0.3	0.3	12.5 (0-31.3)	0.0	25.0	
Barantola pulcherrima	Lepidoptera (Depressariidae)		1	4.0	0.5	0.2	21.9 (0-62.5)	0.0	50.0	
Gnathifera opsias	Lepidoptera (Epermeniidae)		1	5.0	0.4	0.3	93.8 (75-100)	100.0	100.0	
Egone atrisquamata	Lepidoptera (Erebidae)		1	5.0	0.4	0.3	93.8 (75-100)	100.0	100.0	
Lophotoma metabula	Lepidoptera (Erebidae)		1	5.0	0.4	0.3	93.8 (75-100)	100.0	100.0	
Termessa nivosa	Lepidoptera (Erebidae)		4	5.0	0.4	0.3	47.3 (36.5-53.8)	37.7	61.6	
Ethmia sphaerosticha	Lepidoptera (Ethmiidae)		2	3.0	0.7	0.4	37.5 (18.8-62.5)	0.0	75.0	
Panacela nyctopa	Lepidoptera (Eupterotidae)		2	7.0	0.3	0.3	7.3 (0-22.9)	0.0	25.0	
Panacela lewinae	Lepidoptera (Eupterotidae)		4	7.0	0.7	0.3	43.9 (31.3-51.7)	46.9	77.0	
Ardozyga eurysema	Lepidoptera (Gelechiidae)		2	7.0	0.4	0.3	56.3 (43.8-68.8)	50.0	100.0	
Ardozyga porphyroloma	Lepidoptera (Gelechiidae)		3	7.0	0.3	0.3	42.8 (30.3-58)	35.9	78.1	
Ardozyga deltodes	Lepidoptera (Gelechiidae)		2	7.0	0.4	0.3	37.5 (25-50)	0.0	100.0	
Ardozyga chionoprora	Lepidoptera (Gelechiidae)		1	7.0	0.3	0.3	18.8 (0-50)	0.0	50.0	
Pycnobathra acromelas	Lepidoptera (Gelechiidae)		1	7.0	0.4	0.3	18.8 (0-50)	0.0	50.0	
Melitulias oriadelpha	Lepidoptera (Geometridae)		1	5.0	0.5	0.3	81.3 (62.5-87.5)	100.0	100.0	
Poecilasthena panapala	Lepidoptera (Geometridae)		1	5.0	0.4	0.3	81.3 (62.5-87.5)	100.0	100.0	
Dichromodes oriphoetes	Lepidoptera (Geometridae)		2	4.0	0.3	0.3	75 (62.5-87.5)	100.0	100.0	
Picromorpha pyrrhopa	Lepidoptera (Geometridae)		1	4.0	0.5	0.3	75 (62.5-87.5)	100.0	100.0	
Taxeotis anthracopa	Lepidoptera (Geometridae)		1	4.0	0.5	0.3	75 (62.5-87.5)	100.0	100.0	
Zeuctophlebia tapinodes	Lepidoptera (Geometridae)		1	4.0	0.4	0.3	75 (62.5-87.5)	100.0	100.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Taxeotis subvelaria	Lepidoptera (Geometridae)		4	5.0	0.5	0.3	66.9 (54.5-80)	45.8	88.7	
Prasinocyma lychnopasta	Lepidoptera (Geometridae)		3	4.0	0.5	0.3	57.3 (45.1-70.3)	51.6	88.9	
Chrysolarentia melanchlaena	Lepidoptera (Geometridae)		3	4.0	0.7	0.4	56.3 (42.4-63.3)	60.4	74.9	
Idaea epicyrta	Lepidoptera (Geometridae)		1	4.0	0.3	0.3	50 (37.5-62.5)	0.0	100.0	
Oenochroma alpina	Lepidoptera (Geometridae)		1	4.0	0.5	0.3	50 (37.5-62.5)	0.0	100.0	
Taxeotis endela	Lepidoptera (Geometridae)		3	4.0	0.5	0.3	50 (35.6-67.2)	37.6	81.2	
Chrysolarentia polyxantha	Lepidoptera (Geometridae)		6	4.0	0.7	0.4	49.4 (35.1-54.7)	38.3	70.1	
Chaetolopha niphosticha	Lepidoptera (Geometridae)		2	5.0	0.4	0.3	46.9 (31.3-43.8)	50.0	50.0	
Dichromodes confluaria	Lepidoptera (Geometridae)		4	4.0	0.5	0.3	43.5 (34.1-53.4)	38.7	67.6	
Chrysolarentia stereozona	Lepidoptera (Geometridae)		4	4.0	0.7	0.4	40.7 (30.1-46.4)	45.6	53.0	
Cleora illustraria	Lepidoptera (Geometridae)		4	4.0	0.5	0.3	39 (27.7-52.6)	27.7	64.2	
Chrysolarentia symphona	Lepidoptera (Geometridae)		3	4.0	0.7	0.4	38.6 (28.6-45.6)	29.2	59.0	
Scopula sublinearia	Lepidoptera (Geometridae)		2	4.0	0.3	0.3	37.5 (31.3-43.8)	50.0	50.0	
Gastrophora henricaria	Lepidoptera (Geometridae)		5	5.0	0.4	0.4	36.3 (25.8-39.8)	29.9	50.2	
Melitulias graphicata	Lepidoptera (Geometridae)		9	5.0	0.5	0.4	36.3 (25.5-38.4)	35.9	45.5	
Oenochroma orthodesma	Lepidoptera (Geometridae)		3	4.0	0.3	0.3	34.2 (27.6-41.1)	41.4	47.6	
Nisista galearia	Lepidoptera (Geometridae)		3	4.0	0.3	0.3	33.3 (26.1-40.9)	26.6	53.3	
Dysbatus stenodesma	Lepidoptera (Geometridae)		3	5.0	0.5	0.3	27.5 (19.7-27.8)	30.6	32.1	
Larentia tenuis	Lepidoptera (Geometridae)		2	4.0	0.3	0.3	25 (18.8-31.3)	0.0	50.0	
Oenochlora imperialis	Lepidoptera (Geometridae)		2	4.0	0.3	0.3	12.5 (0-31.3)	0.0	25.0	
Prasinocyma rhodocosma	Lepidoptera (Geometridae)		2	4.0	0.3	0.3	12.5 (0-31.3)	0.0	25.0	
Glyphipterix perimetalla	Lepidoptera (Glyphipterigidae)		1	3.0	0.7	0.3	50 (37.5-62.5)	0.0	100.0	
Acrocercops laciniella	Lepidoptera (Gracillariidae)		1	5.0	0.3	0.3	87.5 (37.5-100)	100.0	100.0	
Conopomorpha heliopla	Lepidoptera (Gracillariidae)		1	4.0	0.5	0.4	62.5 (37.5-100)	100.0	100.0	
Abantiades macropusinsulariae	Lepidoptera (Hepialidae)		NA	9.0	0.5	0.6	N/a	NA	NA	
Aenetus tindalei	Lepidoptera (Hepialidae)		NA	17.0	0.7	0.6	N/a	N/a	N/a	
Oncopera rufobrunnea	Lepidoptera (Hepialidae)		6	7.0	0.5	0.4	44.3 (32.1-54.2)	31.5	61.0	
Oncopera brunneata	Lepidoptera (Hepialidae)		2	6.0	0.4	0.5	25 (18.8-31.3)	0.0	50.0	
Abantiades labyrinthicus	Lepidoptera (Hepialidae)		5	10.0	0.5	0.6	23.4 (12.8-36.9)	15.3	47.0	
Aenetus montanus	Lepidoptera (Hepialidae)		2	5.0	0.6	0.4	20.8 (14.6-27.1)	0.0	50.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Anisynta cynone anomala	Lepidoptera (Hesperiidae)		2	4.0	0.7	0.6	96.9 (75-100)	100.0	100.0	
Telicota eurychlora	Lepidoptera (Hesperiidae)		4	24.0	0.6	0.5	34.9 (24.5-46.2)	31.9	52.4	
Oreisplanus munionga	Lepidoptera (Hesperiidae)		3	5.0	0.5	0.4	32.9 (22.4-36.7)	30.2	43.2	
Eupselia aristonica	Lepidoptera (Hypertrophidae)		1	4.0	0.6	0.3	90.6 (75-100)	100.0	100.0	
Hypertropha tortriciformis	Lepidoptera (Hypertrophidae)		2	6.0	0.6	0.3	18.8 (10.4-31.3)	0.0	50.0	
Chalcocelis albiguttatus	Lepidoptera (Limacodidae)		2	3.0	0.3	0.2	6.3 (0-18.8)	0.0	25.0	
Doratifera quadriguttata	Lepidoptera (Limacodidae)		3	3.0	0.7	0.2	19.8 (12.4-29.8)	29.9	49.5	
Ogyris halmaturia	Lepidoptera (Lycaenidae)		7	16.0	0.6	0.7	0 (0-0)	0.0	0.0	
Melanerythrus mutilatus	Lepidoptera (Lygaeidae)		1	5.0	0.3	0.3	50 (37.5-62.5)	0.0	100.0	
Austronysius sericus	Lepidoptera (Lygaeidae)		1	17.0	0.4	0.7	39.6 (12.5-95.8)	100.0	100.0	
Tasmantrix nigrocornis	Lepidoptera (Micropterigidae)		2	8.0	0.3	0.6	18.8 (6.3-31.3)	0.0	50.0	
Alophosoma emmelopis	Lepidoptera (Noctuidae)		1	5.0	0.3	0.4	50 (37.5-62.5)	0.0	100.0	
Bathytricha monticola	Lepidoptera (Noctuidae)		5	6.0	0.3	0.4	35.6 (27.1-41.8)	22.3	51.7	
Data ochroneura	Lepidoptera (Noctuidae)		2	5.0	0.3	0.4	25 (18.8-31.3)	0.0	50.0	
Agrotis infusa	Lepidoptera (Noctuidae)		22	18.0	0.9	0.5	2 (1.1-3)	2.8	3.5	
Acrapex albicostata	Lepidoptera (Noctuidae)		2	5.0	0.3	0.4	12.5 (0-31.3)	0.0	25.0	
Nola semograpta	Lepidoptera (Nolidae)		4	8.0	0.3	0.6	33.7 (22.2-45.8)	45.9	88.9	
Nola phaeogramma	Lepidoptera (Nolidae)		4	8.0	0.3	0.6	23.5 (15.5-32.4)	33.7	60.3	
Nola vernalis	Lepidoptera (Nolidae)		3	8.0	0.3	0.6	19.8 (13-27)	26.4	53.0	
Nola tetralopha	Lepidoptera (Nolidae)		3	8.0	0.3	0.6	14.4 (6.9-24.6)	9.4	48.0	
Nola euraphes	Lepidoptera (Nolidae)		1	8.0	0.3	0.6	12.5 (0-37.5)	0.0	50.0	
Hobartina eusciera	Lepidoptera (Notodontidae)		1	6.0	0.4	0.3	93.8 (75-100)	100.0	100.0	
Gallaba basinipha	Lepidoptera (Notodontidae)		1	5.0	0.4	0.3	50 (37.5-62.5)	0.0	100.0	
Gallaba ochropepla	Lepidoptera (Notodontidae)		3	6.0	0.4	0.4	38.4 (29.6-43.5)	33.3	47.7	
Aglaosoma variegata	Lepidoptera (Notodontidae)		6	5.0	0.5	0.4	34.4 (24.4-44.8)	14.3	54.6	
Oreixenica latialis theddora	Lepidoptera (Nymphalidae)		4	NA	NA	NA	NA	16.6	35.0	Vic (EN)
Notodryas aeria	Lepidoptera (Oecophoridae)		1	9.0	0.3	0.6	83.3 (70.8-95.8)	100.0	100.0	
Coracistis erythrocosma	Lepidoptera (Oecophoridae)		3	4.0	0.5	0.4	81.3 (68.2-88.2)	54.8	90.1	
Antipterna trilicella	Lepidoptera (Oecophoridae)		1	5.0	0.4	0.4	75 (62.5-87.5)	100.0	100.0	
Catadoceta xanthostephana	Lepidoptera (Oecophoridae)		1	5.0	0.3	0.3	75 (62.5-87.5)	100.0	100.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Delexocha ochrocausta	Lepidoptera (Oecophoridae)		1	5.0	0.3	0.3	75 (62.5-87.5)	100.0	100.0	
Hoplomorpha camelaea	Lepidoptera (Oecophoridae)		1	5.0	0.3	0.3	75 (62.5-87.5)	100.0	100.0	
Phylomictis monochroma	Lepidoptera (Oecophoridae)		1	5.0	0.3	0.3	75 (62.5-87.5)	100.0	100.0	
Temnogyropa stenomorpha	Lepidoptera (Oecophoridae)		1	5.0	0.3	0.3	75 (62.5-87.5)	100.0	100.0	
Thema endesma	Lepidoptera (Oecophoridae)		1	5.0	0.3	0.3	75 (62.5-87.5)	100.0	100.0	
Eulechria haplosticta	Lepidoptera (Oecophoridae)		1	6.0	0.5	0.3	68.8 (37.5-87.5)	0.0	100.0	
Notodryas vallata	Lepidoptera (Oecophoridae)		2	8.0	0.3	0.6	62.5 (50-75)	50.0	100.0	
Philobota auxolyca	Lepidoptera (Oecophoridae)		2	8.0	0.3	0.6	62.5 (50-75)	50.0	100.0	
Phylomictis maligna	Lepidoptera (Oecophoridae)		2	8.0	0.3	0.6	62.5 (50-75)	50.0	100.0	
Barea eclecta	Lepidoptera (Oecophoridae)		1	5.0	0.5	0.3	62.5 (12.5-87.5)	0.0	100.0	
Barea tanyptila	Lepidoptera (Oecophoridae)		1	5.0	0.5	0.3	62.5 (12.5-87.5)	0.0	100.0	
Antipterna euanthes	Lepidoptera (Oecophoridae)		1	7.0	0.6	0.4	59.4 (37.5-75)	0.0	100.0	
Antipterna lithophanes	Lepidoptera (Oecophoridae)		1	7.0	0.6	0.4	59.4 (37.5-75)	0.0	100.0	
Zacorus carus	Lepidoptera (Oecophoridae)		3	5.0	0.3	0.4	56.6 (44.7-69.3)	51.4	87.5	
Pellopsis aerodes	Lepidoptera (Oecophoridae)		6	5.0	0.3	0.4	55.2 (43.6-67.5)	50.1	85.4	
Garrha demotica	Lepidoptera (Oecophoridae)		4	7.0	0.5	0.4	54.4 (42.1-67.5)	45.9	91.6	
Tisobarica thyteria	Lepidoptera (Oecophoridae)		3	5.0	0.4	0.3	53.5 (41.5-66.3)	37.4	88.4	
Ericrypsina chorodoxa	Lepidoptera (Oecophoridae)		4	5.0	0.4	0.3	53.1 (39.2-69.2)	45.1	83.6	
Philobota impletella	Lepidoptera (Oecophoridae)		3	8.0	0.3	0.6	51.9 (40.1-64.5)	34.8	86.5	
Catoryctis sciastis	Lepidoptera (Oecophoridae)		1	8.0	0.3	0.6	50 (37.5-62.5)	0.0	100.0	
Palimmeces leucomitra	Lepidoptera (Oecophoridae)		1	8.0	0.3	0.6	50 (37.5-62.5)	0.0	100.0	
Snellenia lineata	Lepidoptera (Oecophoridae)		1	8.0	0.3	0.6	50 (37.5-62.5)	0.0	100.0	
Stathmopoda nympheuteria	Lepidoptera (Oecophoridae)		1	8.0	0.3	0.6	50 (37.5-62.5)	0.0	100.0	
Tortricopsis aulacois	Lepidoptera (Oecophoridae)		1	5.0	0.5	0.4	50 (37.5-62.5)	0.0	100.0	
Zacorus montivaga	Lepidoptera (Oecophoridae)		1	5.0	0.3	0.4	50 (37.5-62.5)	0.0	100.0	
Oxythecta acceptella	Lepidoptera (Oecophoridae)		2	8.0	0.3	0.6	50 (31.3-75)	50.0	75.0	
Telecrates melanochrysa	Lepidoptera (Oecophoridae)		4	8.0	0.3	0.6	48.2 (34.9-63.8)	32.0	80.5	
Agriophara dyscapna	Lepidoptera (Oecophoridae)		4	5.0	0.4	0.3	48.1 (34.8-63.6)	31.9	80.3	
Echinocosma catachrysa	Lepidoptera (Oecophoridae)		4	8.0	0.3	0.6	47.3 (31.9-66.5)	33.5	77.8	
Acanthodela erythrosema	Lepidoptera (Oecophoridae)		3	4.0	0.5	0.4	46.8 (39.2-51.5)	26.7	53.5	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Orthiastis hyperocha	Lepidoptera (Oecophoridae)		5	6.0	0.4	0.4	46.1 (36.4-56.3)	43.8	70.2	
Garrha limbata	Lepidoptera (Oecophoridae)		3	7.0	0.5	0.4	45.5 (29.9-66)	39.1	76.1	
Telocharacta metachroa	Lepidoptera (Oecophoridae)		4	5.0	0.3	0.3	44 (34.6-53.9)	39.9	68.0	
Merocroca automima	Lepidoptera (Oecophoridae)		5	5.0	0.3	0.4	40.6 (29.8-53.1)	33.8	64.2	
Atheropla decaspila	Lepidoptera (Oecophoridae)		4	8.0	0.3	0.6	40.2 (31.6-49.4)	41.1	59.8	
Machetis dicranotypa	Lepidoptera (Oecophoridae)		2	8.0	0.3	0.6	37.5 (25-50)	50.0	100.0	
Philarista porphyrinella	Lepidoptera (Oecophoridae)		2	8.0	0.3	0.6	37.5 (18.8-62.5)	0.0	75.0	
Ageletha elaeodes	Lepidoptera (Oecophoridae)		3	4.0	0.5	0.4	36.7 (26.1-47.9)	64.7	82.1	
Hemibela oxyptera	Lepidoptera (Oecophoridae)		3	4.0	0.4	0.4	36.7 (24.8-49.3)	54.7	92.2	
Haplodyta thoracta	Lepidoptera (Oecophoridae)		3	8.0	0.3	0.6	33.9 (25.3-43.1)	12.5	61.6	
Oxythecta alternella	Lepidoptera (Oecophoridae)		2	4.0	0.7	0.4	25 (18.8-31.3)	50.0	50.0	
Tanyzancla argutella	Lepidoptera (Oecophoridae)		2	4.0	0.5	0.6	25 (18.8-31.3)	50.0	50.0	
Compsotropha selenias	Lepidoptera (Oecophoridae)		1	4.0	0.4	0.4	25 (12.5-37.5)	0.0	100.0	
Cosmaresta canephora	Lepidoptera (Oecophoridae)		1	6.0	0.5	0.4	25 (12.5-37.5)	0.0	100.0	
Machaeritis aegrella	Lepidoptera (Oecophoridae)		1	5.0	0.3	0.3	25 (0-62.5)	0.0	50.0	
Thema macroscia	Lepidoptera (Oecophoridae)		1	5.0	0.3	0.3	25 (0-62.5)	0.0	50.0	
Crepidosceles timalphes	Lepidoptera (Oecophoridae)		3	4.0	0.7	0.4	21.4 (14.2-29.1)	29.3	56.4	
Ageletha hemiteles	Lepidoptera (Oecophoridae)		5	4.0	0.7	0.4	21.1 (14.4-28.3)	32.0	52.6	
Euchaetis crypsichroa	Lepidoptera (Oecophoridae)		3	4.0	0.5	0.4	20 (13.1-27.2)	26.7	53.2	
Thalerotricha mylicella	Lepidoptera (Oecophoridae)		6	4.0	0.7	0.4	15.4 (9.1-22.2)	12.9	48.8	
Phloeocetis symmicta	Lepidoptera (Oecophoridae)		3	4.0	0.7	0.4	13.9 (6.3-26.1)	13.6	42.0	
Opostegoides gephyraea	Lepidoptera (Opostegidae)		1	8.0	0.3	0.6	87.5 (62.5-87.5)	100.0	100.0	
Tritymba acrospila	Lepidoptera (Plutellidae)		2	5.0	0.4	0.3	56.3 (31.3-81.3)	50.0	100.0	
Tritymba pamphaea	Lepidoptera (Plutellidae)		2	5.0	0.4	0.3	50 (31.3-81.3)	50.0	100.0	
Lomera boisduvalii	Lepidoptera (Psychidae)		5	2.0	0.5	0.3	46.8 (35.4-56.9)	25.4	68.2	
Crocydopora cinigerella	Lepidoptera (Pyralidae)		1	6.0	0.4	0.4	93.8 (75-100)	100.0	100.0	
Creobota grossipunctella	Lepidoptera (Pyralidae)		4	5.0	0.4	0.3	60.9 (48.9-69.5)	33.3	88.6	
Persicoptera aglaopa	Lepidoptera (Pyralidae)		4	7.0	0.4	0.3	49.4 (36.4-64.6)	46.1	85.6	
Endotricha ignealis	Lepidoptera (Pyralidae)		5	7.0	0.4	0.4	46 (33.5-60.5)	38.6	84.0	
Ctenomeristis almella	Lepidoptera (Pyralidae)		3	5.0	0.4	0.3	35.7 (27.8-42.4)	13.4	58.1	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Stericta concisella	Lepidoptera (Pyralidae)		2	5.0	0.4	0.3	25 (18.8-31.3)	0.0	50.0	
Orthaga seminivea	Lepidoptera (Pyralidae)		1	6.0	0.5	0.3	25 (0-62.5)	0.0	50.0	
Endotricha mesenterialis	Lepidoptera (Pyralidae)		1	7.0	0.4	0.3	18.8 (0-50)	0.0	50.0	
Hypsopygia flavamaculata	Lepidoptera (Pyralidae)		1	7.0	0.4	0.3	18.8 (0-50)	0.0	50.0	
Metapherna salsa	Lepidoptera (Tineidae)		1	7.0	0.4	0.4	91.7 (70.8-95.8)	100.0	100.0	
Edosa irruptella	Lepidoptera (Tineidae)		1	6.0	0.4	0.3	62.5 (37.5-87.5)	0.0	100.0	
Opogona stereodyta	Lepidoptera (Tineidae)		2	7.0	0.3	0.4	46.9 (37.5-50)	50.0	50.0	
Erechthias symmacha	Lepidoptera (Tineidae)		1	8.0	0.4	0.3	45.8 (29.2-62.5)	0.0	100.0	
Cryptoptila sp. ANIC 2	Lepidoptera (Tortricidae)		1	6.0	0.5	0.3	93.8 (75-100)	100.0	100.0	
Sobriana GROUP arcaria	Lepidoptera (Tortricidae)		1	6.0	0.5	0.3	93.8 (75-100)	100.0	100.0	
Technitis desmotana	Lepidoptera (Tortricidae)		1	4.0	0.5	0.3	93.8 (75-100)	100.0	100.0	
Capua intractana	Lepidoptera (Tortricidae)		2	6.0	0.5	0.3	71.9 (50-75)	50.0	100.0	
Rupicolana stereodes	Lepidoptera (Tortricidae)		3	4.0	0.5	0.3	69.3 (53.4-79.2)	54.0	91.4	
Epitymbia cosmota	Lepidoptera (Tortricidae)		4	7.0	0.5	0.3	55.5 (37.1-67.6)	33.7	85.6	
Technitis amoenana	Lepidoptera (Tortricidae)		2	4.0	0.5	0.3	53.1 (37.5-81.3)	50.0	75.0	
Meritastis trissochorda	Lepidoptera (Tortricidae)		1	6.0	0.5	0.3	50 (37.5-62.5)	0.0	100.0	
Merophyas therina	Lepidoptera (Tortricidae)		5	4.0	0.5	0.4	48.3 (35.1-59.1)	34.5	66.4	
Grapholita (Grapholita) zapyrana	Lepidoptera (Tortricidae)		3	4.0	0.7	0.4	48 (39.4-52.9)	33.1	62.9	
Epiphyas asthenopis	Lepidoptera (Tortricidae)		3	4.0	0.5	0.3	44.2 (30.5-56.6)	32.7	59.8	
Meritastis laganodes	Lepidoptera (Tortricidae)		2	7.0	0.5	0.3	41.7 (27.1-39.6)	50.0	50.0	
Clarana hyperetana	Lepidoptera (Tortricidae)		3	4.0	0.5	0.3	39.4 (27-50.9)	29.1	53.3	
Isochorista acrodesma	Lepidoptera (Tortricidae)		2	6.0	0.6	0.3	37.5 (18.8-31.3)	50.0	50.0	
Strepsicrates infensa	Lepidoptera (Tortricidae)		3	5.0	0.6	0.4	30.2 (13.2-34.5)	26.8	53.7	
Asthenoptycha sphaltica	Lepidoptera (Tortricidae)		1	6.0	0.5	0.3	28.1 (0-75)	0.0	50.0	
Epitymbia alaudana	Lepidoptera (Tortricidae)		2	6.0	0.5	0.3	14.1 (0-37.5)	0.0	25.0	
Eupoecilia acrographa	Lepidoptera (Tortricidae)		1	6.0	0.5	0.3	0 (0-75)	0.0	50.0	
Yponomeuta myriosema	Lepidoptera (Yponomeutidae)		1	5.0	0.4	0.4	90.6 (75-100)	100.0	100.0	
Atteva niphocosma	Lepidoptera (Yponomeutidae)		2	6.0	0.9	0.6	9.4 (0-25)	0.0	25.0	
Pollanisus hyacinthus	Lepidoptera (Zygaenidae)		NA	15.0	0.8	0.8	NA	NA	NA	
Pollanisus reticulata	Lepidoptera (Zygaenidae)		NA	19.0	0.7	0.6	NA	NA	NA	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Australartona mirabilis	Lepidoptera (Zygaenidae)		3	5.0	0.7	0.7	37.9 (31.4-41.1)	31.2	44.6	
Pollanisus trimacula	Lepidoptera (Zygaenidae)		3	8.0	0.8	0.6	34.2 (21.3-47.7)	23.6	47.6	
Pollanisus apicalis	Lepidoptera (Zygaenidae)		3	7.0	0.8	0.6	30.9 (24.1-36.5)	14.6	47.2	
Austropyrgus ora	Littorinimorpha (Tateidae)		7	8.0	0.6	0.8	23.1 (16.7-29.6)	42.3	50.1	
Austropyrgus buchanensis	Littorinimorpha (Tateidae)		5	8.0	0.6	0.8	19.7 (11-31.8)	22.0	57.0	
Austropyrgus wombeyanensis	Littorinimorpha (Tateidae)		4	7.0	0.6	0.8	19 (11.6-27.3)	21.0	55.0	
Austropyrgus avius	Littorinimorpha (Tateidae)		1	9.0	0.6	0.7	12.5 (0-37.5)	0.0	50.0	
Tytthobittacus macalpinei	Mecoptera (Bittacidae)		2	7.0	0.6	0.4	10.9 (0-31.3)	0.0	25.0	
Nannochorista eboraca	Mecoptera (Nannochoristidae)		1	4.0	0.9	0.5	34.4 (12.5-50)	0.0	100.0	
Archichauliodes (Riekochauliodes) polypastus	Megaloptera (Corydalidae)		2	2.0	0.6	0.3	6.3 (0-18.8)	0.0	25.0	
Protochauliodes biconicus incertus	Megaloptera (Corydalidae)		3	2.0	0.8	0.3	22.3 (6.9-40.7)	17.8	36.9	
Heatherella callimaulos	Mesostigmata (Heatherellidae)		1	3.0	0.7	0.5	62.5 (50-75)	0.0	100.0	
Gamasellus cooperi	Mesostigmata (Ologamasidae)		2	4.0	0.5	0.4	31.3 (25-37.5)	0.0	50.0	
Temnohaswellia breviumbella	Neorhabdocoela (Temnocephalidae)		1	3.0	0.7	0.7	50 (37.5-62.5)	100.0	100.0	
Temnosewellia unguiculus	Neorhabdocoela (Temnocephalidae)		1	3.0	0.7	0.7	50 (37.5-62.5)	100.0	100.0	
Temnosewellia acicularis	Neorhabdocoela (Temnocephalidae)		2	3.0	0.7	0.7	37.5 (25-50)	50.0	100.0	
Temnosewellia gracilis	Neorhabdocoela (Temnocephalidae)		2	3.0	0.7	0.7	37.5 (25-50)	50.0	100.0	
Temnohaswellia cornu	Neorhabdocoela (Temnocephalidae)		1	3.0	0.7	0.8	25 (12.5-37.5)	0.0	100.0	
Temnohaswellia umbella	Neorhabdocoela (Temnocephalidae)		1	3.0	0.7	0.7	25 (12.5-37.5)	0.0	100.0	
Georissa laseroni	Neritopsina (Hydrocenidae)		11	NA	NA	NA	NA	19.3	47.0	IUCN (VU)
Georissa laseroni	Neritopsina (Hydrocenidae)		11	2.0	0.5	0.4	16.6 (10.3-23.7)	19.3	47.0	
Notherobius nebulosus	Neuroptera (Hemerobiidae)		2	4.0	0.5	0.3	12.5 (0-31.3)	0.0	25.0	
Theristria imperfecta	Neuroptera (Mantispidae)		4	4.0	0.5	0.3	41.8 (29.4-47.1)	31.0	60.3	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Escura australis	Neuroptera (Myrmeleontidae)		3	2.0	0.8	0.3	48.3 (33.7-58.8)	52.2	61.8	
Osmylops placidus	Neuroptera (Nymphidae)		1	5.0	0.5	0.3	25 (0-62.5)	0.0	50.0	
Clydosmylus montanus	Neuroptera (Osmylidae)		2	6.0	0.5	0.3	41.4 (25-62.5)	50.0	75.0	
Cordulephya montana	Odonata (Cordulephyidae)		5	4.0	0.7	0.3	23.2 (12.7-34.8)	31.2	41.1	
Spinaeschna tripunctata	Odonata (Telephlebiidae)		7	4.0	0.6	0.4	29.2 (15.1-46.3)	29.7	69.6	
Austropsopilio novaehollandiae	Opiliones (Caddidae)		1	5.0	0.3	0.6	31.3 (0-75)	0.0	50.0	
Australiscutum triplodaemon	Opiliones (Neopilionidae)		4	4.0	0.3	0.8	41.4 (30-55.7)	35.3	56.4	
Ballarra drosera	Opiliones (Neopilionidae)		7	6.0	0.3	0.6	40 (33.1-45.9)	38.4	48.0	
Megalopsalis epizephryos	Opiliones (Neopilionidae)		3	6.0	0.3	0.6	36.4 (29.1-42.9)	18.5	57.3	
Arrallaba spheniscus	Opiliones (Neopilionidae)		1	6.0	0.3	0.6	25 (0-62.5)	0.0	50.0	
Nunciella kangarooensis	Opiliones (Triaenonychidae)	y	3	16.0	0.5	0.8	75 (62.5-100)	100.0	100.0	
Holonuncia dispar	Opiliones (Triaenonychidae)	Y	1	7.0	0.5	0.6	68.8 (56.3-81.3)	100.0	100.0	
Holonuncia sussa	Opiliones (Triaenonychidae)	Y	1	8.0	0.6	0.6	60 (47.5-72.5)	100.0	100.0	
`GEN008` `sp.6, dna - S Zuiddam study`	Opiliones (Triaenonychidae)		1	6.0	0.3	0.6	43.8 (31.3-56.3)	0.0	100.0	
Holonuncia dewae	Opiliones (Triaenonychidae)	Y	1	8.0	0.6	0.6	40 (27.5-52.5)	0.0	100.0	
Holonuncia weejasperensis	Opiliones (Triaenonychidae)	Y	2	8.0	0.6	0.6	30 (23.8-36.3)	50.0	50.0	
Holonuncia hamiltonsmithi	Opiliones (Triaenonychidae)	Y	1	8.0	0.6	0.6	20 (0-52.5)	0.0	50.0	
Digaster moretonensis	Opisthopora (Megascolecidae)		1	5.0	0.5	0.7	25 (12.5-37.5)	100.0	100.0	
Spenceriella calpetana	Opisthopora (Megascolecidae)		1	5.0	0.5	0.7	25 (12.5-37.5)	0.0	100.0	
Spenceriella rubeospina	Opisthopora (Megascolecidae)		1	5.0	0.5	0.7	25 (12.5-37.5)	100.0	100.0	
Trichaeta frosti	Opisthopora (Megascolecidae)		1	4.0	0.6	0.5	25 (12.5-37.5)	100.0	100.0	
Spenceriella flava	Opisthopora (Megascolecidae)		2	5.0	0.5	0.7	18.8 (6.3-37.5)	0.0	75.0	
Spenceriella garilarsoni	Opisthopora (Megascolecidae)		2	5.0	0.5	0.7	18.8 (6.3-37.5)	0.0	75.0	
Spenceriella jenolanensis	Opisthopora (Megascolecidae)		3	5.0	0.5	0.7	16.2 (7.8-25.2)	31.6	64.7	
Diporochaeta (Vesiculodrilus) gippslandica	Opisthopora (Megascolecidae)		3	3.0	0.5	0.6	15.5 (7.6-23.8)	55.3	62.2	
Spenceriella bulla	Opisthopora (Megascolecidae)		3	5.0	0.5	0.7	14.6 (6.9-23)	28.2	58.5	
Digaster lumbricoides	Opisthopora (Megascolecidae)		3	5.0	0.5	0.7	12.7 (6.3-19.2)	30.5	50.6	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Diporochaeta (Vesiculodrilus) frenchi	Opisthopora (Megascolecidae)		2	5.0	0.5	0.7	12.5 (6.3-18.8)	50.0	50.0	
Heteroporodrilus shephardi	Opisthopora (Megascolecidae)		2	5.0	0.5	0.7	12.5 (6.3-18.8)	0.0	50.0	
Spenceriella fecunda	Opisthopora (Megascolecidae)		2	5.0	0.5	0.7	12.5 (6.3-18.8)	0.0	50.0	
Trichaeta goonmurk	Opisthopora (Megascolecidae)		2	5.0	0.5	0.7	12.5 (6.3-18.8)	50.0	50.0	
Digaster binnaburra	Opisthopora (Megascolecidae)		1	5.0	0.5	0.7	12.5 (0-37.5)	0.0	50.0	
Digaster lingi	Opisthopora (Megascolecidae)		1	5.0	0.5	0.7	12.5 (0-37.5)	0.0	50.0	
Spenceriella aemula	Opisthopora (Megascolecidae)		1	5.0	0.5	0.7	12.5 (0-37.5)	0.0	50.0	
Spenceriella lavatiolacuna	Opisthopora (Megascolecidae)		1	5.0	0.5	0.7	12.5 (0-37.5)	0.0	50.0	
Anisochaeta coxii	Opisthopora (Megascolecidae)		9	5.0	0.5	0.7	10.2 (3.7-19.3)	15.5	40.7	
Kosciuscola tristis restrictus	Orthoptera (Acrididae)		NA	20.0	0.8	0.6	NA	NA	NA	
Kosciuscola tristis tristis	Orthoptera (Acrididae)		NA	24.0	0.9	0.7	NA	NA	NA	
Kosciuscola usitatus	Orthoptera (Acrididae)		NA	24.0	0.9	0.7	NA	NA	NA	
Kosciuscola cuneatus	Orthoptera (Acrididae)		6	23.0	0.7	0.7	6.6 (4-9.7)	1.3	14.4	
Keyacris scurra	Orthoptera (Morabidae)		4	15.0	0.9	0.7	6.5 (1.4-11.6)	5.7	12.1	
Australotettix carraiensis	Orthoptera (Rhaphidophoridae)		2	4.0	0.3	0.5	25 (18.8-31.3)	0.0	50.0	
Cavernotettix montanus	Orthoptera (Rhaphidophoridae)		2	4.0	0.5	0.5	18.8 (6.3-37.5)	50.0	75.0	
Metaballus mesopterus	Orthoptera (Tetigoniidae)		5	17.0	0.6	0.6	23.6 (15.5-25.6)	24.3	25.6	
Requena kangaroo	Orthoptera (Tettigoniidae)		NA	13.0	0.6	0.7	#VALUE!	NA	NA	
Dexerra serrata	Orthoptera (Tettigoniidae)		4	4.0	0.3	0.6	32.6 (28.4-32.9)	31.7	33.2	
Nanodectes platycercus	Orthoptera (Tettigoniidae)		1	18.0	0.5	0.6	100 (87.5-100)	100.0	100.0	
Oligodectes urostegus	Orthoptera (Tettigoniidae)		1	5.0	0.3	0.5	100 (87.5-100)	100.0	100.0	
Blandicephalanema bossi	Panagrolaimida (Criconematidae)		1	2.0	0.8	0.5	25 (0-62.5)	0.0	50.0	
Hemicycliophora vitiensis	Panagrolaimida (Hemicycliophoridae)		2	3.0	0.6	0.4	12.5 (0-31.3)	0.0	25.0	
Thaumatoperla alpina	Plecoptera (Eustheniidae)		17	17.0	0.6	0.8	1.6 (1-2.6)	1.4	3.0	
Leptoperla dakota	Plecoptera (Gripopterygidae)		1	12.0	0.5	0.7	56.3 (37.5-87.5)	100.0	100.0	
Leptoperla primitiva	Plecoptera (Gripopterygidae)		2	7.0	0.5	0.6	42.7 (25-70.8)	50.0	100.0	
Dinotoperla subserricauda	Plecoptera (Gripopterygidae)		2	6.0	0.5	0.6	34.4 (18.8-43.8)	50.0	50.0	
Dinotoperla arcuata	Plecoptera (Gripopterygidae)		1	8.0	0.6	0.6	33.3 (12.5-54.2)	0.0	100.0	

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Dinotoperla cherylae	Plecoptera (Gripopterygidae)		3	8.0	0.6	0.6	26.9 (14.8-39.9)	35.1	50.0	
Riekoperla tuberculata	Plecoptera (Gripopterygidae)		4	8.0	0.6	0.6	17.5 (6.7-32.6)	10.6	43.1	
Kimminsoperla kaputaris	Plecoptera (Notonemouridae)		2	7.0	0.6	0.6	33.6 (18.8-62.5)	50.0	75.0	
Gephyrodesmus cineraceus	Polydesmida (Dalodesmidae)		12	9.0	0.3	0.6	30.2 (22.7-38.7)	21.5	49.8	
Orthorhachis inflata	Polydesmida (Dalodesmidae)		2	10.0	0.5	0.8	28.1 (21.9-34.4)	50.0	50.0	
Orthorhachis monteithi	Polydesmida (Dalodesmidae)		2	10.0	0.5	0.8	28.1 (12.5-50)	0.0	75.0	
Gephyrodesmus arcuatus	Polydesmida (Dalodesmidae)		3	9.0	0.6	0.9	27.4 (17-40.6)	22.8	61.8	
Orthorhachis catherinae	Polydesmida (Dalodesmidae)		2	10.0	0.5	0.8	18.8 (12.5-25)	0.0	50.0	
Orthorhachis celtica	Polydesmida (Dalodesmidae)		2	9.0	0.5	0.8	10.4 (0-27.1)	0.0	25.0	
Agathodesmus bonang	Polydesmida (Haplodesmidae)	Y	3	11.0	0.5	0.8	34.5 (23.6-47.9)	40.7	61.3	
Agathodesmus carorum	Polydesmida (Haplodesmidae)		5	11.0	0.5	0.8	31.7 (18.6-48.4)	11.2	67.7	
Dicladosomella mesibovi	Polydesmida (Paradoxosomatidae)	likely	1	10.0	0.5	0.8	65 (52.5-77.5)	100.0	100.0	
Somethus `deua`	Polydesmida (Paradoxosomatidae)	likely	1	11.0	0.4	0.8	65 (52.5-77.5)	100.0	100.0	
Dicladosomella pollex	Polydesmida (Paradoxosomatidae)	likely	1	9.0	0.6	0.8	62.5 (50-75)	100.0	100.0	
Antichiropus equinus	Polydesmida (Paradoxosomatidae)	likely	1	10.0	0.5	0.8	43.8 (31.3-56.3)	0.0	100.0	
Gigantowales latescens	Polydesmida (Paradoxosomatidae)	likely	1	9.0	0.6	0.8	43.8 (31.3-56.3)	0.0	100.0	
Dicladosomella cerberus	Polydesmida (Paradoxosomatidae)	Y	6	9.0	0.6	0.8	41.8 (28.8-57.3)	38.6	79.0	
Dicladosomella anaticula	Polydesmida (Paradoxosomatidae)	Y	1	10.0	0.5	0.8	40 (27.5-52.5)	0.0	100.0	
Hoplatessara nigrocingulata	Polydesmida (Paradoxosomatidae)	Y	4	10.0	0.5	0.8	39.3 (28.3-50.6)	20.2	85.7	
Hoplatessara anulata	Polydesmida (Paradoxosomatidae)		4	10.0	0.5	0.8	37.5 (27.6-48.6)	39.4	69.2	
Dicladosomella abstrusa	Polydesmida (Paradoxosomatidae)	Y	3	9.0	0.6	0.8	37 (28.8-45.6)	54.6	61.1	
Somethus biramus	Polydesmida (Paradoxosomatidae)		14	11.0	0.4	0.7	35.6 (25.3-47.6)	33.2	68.3	
Hoplatessara clavigera	Polydesmida (Paradoxosomatidae)		12	10.0	0.5	0.7	35.2 (25.2-46.4)	29.8	69.4	
Australiosoma rainbowi	Polydesmida (Paradoxosomatidae)		22	10.0	0.5	0.7	33.9 (25.4-43.4)	43.1	59.1	
Dicladosomella cygnea	Polydesmida (Paradoxosomatidae)	Y	3	9.0	0.6	0.8	32.8 (19-51.2)	24.2	64.5	
Dicladosomella claridgei	Polydesmida (Paradoxosomatidae)	Y	8	9.0	0.6	0.8	32.1 (23.5-41.9)	34.2	58.8	
Australiosoma laminatum	Polydesmida (Paradoxosomatidae)		3	10.0	0.5	0.7	29.7 (21.6-38.1)	14.5	61.6	
Hoplatessara froggatti	Polydesmida (Paradoxosomatidae)		21	10.0	0.5	0.8	28.6 (21.3-36.8)	33.4	50.7	
Hoplatessara prativaga	Polydesmida (Paradoxosomatidae)		8	10.0	0.5	0.8	28.1 (19.2-39.2)	30.1	51.5	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Cladethosoma (Cladethosoma) monticola	Polydesmida (Paradoxosomatidae		2	6.0	0.3	0.7	21.9 (0-56.3)	0.0	50.0	
Antichiropus lacustrinus	Polydesmida (Paradoxosomatidae)		3	10.0	0.5	0.8	20.4 (12.1-31)	5.7	44.3	
Hesperisiphon peckorum	Polyzoniida (Siphonotidae)	likely	1	5.0	0.4	0.8	75 (62.5-87.5)	100.0	100.0	
Rhinotus michaelseni	Polyzoniida (Siphonotidae)		1	6.0	0.3	0.8	25 (0-62.5)	0.0	50.0	
Sathrochthonius tuena	Pseudoscorpiones (Chthoniidae)		3	9.0	0.3	0.6	33.3 (22.3-47.3)	25.5	59.6	
Synsphyronus `PSE025`	Pseudoscorpiones (Garypidae)		1	4.0	0.3	0.6	33.3 (20.8-45.8)	0.0	100.0	
Synsphyronus apimelus	Pseudoscorpiones (Garypidae)		13	4.0	0.3	0.6	31.9 (25.3-38.6)	49.0	52.5	
Pseudotyrannochthonius `Harms sp. Stirling Range 1`	Pseudoscorpiones (Pseudotyrannochthoniidae)		2	10.0	0.4	0.7	75 (62.5-87.5)	100.0	100.0	
Pseudotyrannochthonius `NSW-17`	Pseudoscorpiones (Pseudotyrannochthoniidae)	likely	1	10.0	0.4	0.7	75 (62.5-87.5)	100.0	100.0	
Pseudotyrannochthonius `NSW-22`	Pseudoscorpiones (Pseudotyrannochthoniidae)	likely	1	10.0	0.4	0.7	75 (62.5-87.5)	100.0	100.0	
Pseudotyrannochthonius `NSW-27`	Pseudoscorpiones (Pseudotyrannochthoniidae)	likely	1	10.0	0.4	0.7	75 (62.5-87.5)	100.0	100.0	
Pseudotyrannochthonius `NSW-30`	Pseudoscorpiones (Pseudotyrannochthoniidae)	likely	2	8.0	0.4	0.7	53.1 (34.4-81.3)	50.0	75.0	
Pseudotyrannochthonius `Harms sp. Stirling Range 3`	Pseudoscorpiones (Pseudotyrannochthoniidae)	likely	3	8.0	0.4	0.7	50.1 (38.6-67.2)	54.7	66.0	
Pseudotyrannochthonius `NSW-1`	Pseudoscorpiones (Pseudotyrannochthoniidae)	likely	1	8.0	0.4	0.7	50 (37.5-62.5)	0.0	100.0	
Pseudotyrannochthonius australiensis	Pseudoscorpiones (Pseudotyrannochthoniidae)	likely	1	5.0	0.4	0.7	50 (37.5-62.5)	0.0	100.0	
Pseudotyrannochthonius `NSW-5`	Pseudoscorpiones (Pseudotyrannochthoniidae)	likely	3	5.0	0.4	0.6	40.4 (32-51.2)	31.0	61.4	
Pseudotyrannochthonius `Harms sp. Stirling Range 2`	Pseudoscorpiones (Pseudotyrannochthoniidae)	likely	8	5.0	0.4	0.7	35.9 (29.4-44.5)	33.7	50.6	
Pseudotyrannochthonius nsw6	Pseudoscorpiones (Pseudotyrannochthoniidae)	likely	4	5.0	0.4	0.7	31.7 (21.8-44.3)	12.7	55.4	

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Pseudotyrannochthonius jonesi	Pseudoscorpiones (Pseudotyrannochthoniidae)	likely	1	5.0	0.7	0.7	18.8 (0-50)	0.0	50.0	
Caecilius dimorphus	Psocodea (Caeciliusidae)		1	5.0	0.4	0.3	50 (37.5-62.5)	0.0	100.0	
Nepticulomima tridentata	Psocodea (Lepidopsocidae)		3	7.0	0.3	0.3	42.5 (33.9-51.8)	30.6	62.2	
Austropsocus punctatus	Psocoptera (Pseudocaeciliidae)		2	5.0	0.3	0.4	75 (62.5-81.3)	50.0	100.0	
Austropsocus suffusus	Psocoptera (Pseudocaeciliidae)		2	5.0	0.3	0.4	12.5 (0-31.3)	0.0	25.0	
Blaste panops	Psocoptera (Psocidae)		2	4.0	0.5	0.3	37.5 (31.3-43.8)	50.0	50.0	
Campylochirus brevicepsicola	Sarcoptiformes (Atopomelidae)		1	4.0	0.8	0.8	25 (12.5-37.5)	0.0	100.0	
Neotrichozetes spinulosus	Sarcoptiformes (Neotrichozetidae)		1	5.0	0.3	0.6	75 (62.5-87.5)	100.0	100.0	
Pedrocortesella kanangra	Sarcoptiformes (Pedrocortesellidae)		1	4.0	0.6	0.7	87.5 (75-100)	100.0	100.0	
Lopholiodes ceroplastes	Sarcoptiformes (Pheroliodidae)		3	4.0	0.6	0.7	77.9 (64.6-92)	76.0	94.3	
Acaroptes vombatus	Sarcoptiformes (Psoroptidae)		1	2.0	0.5	0.5	25 (0-62.5)	0.0	50.0	
Lychas `monteithi`	Scorpiones (Buthidae)		2	6.0	0.5	0.6	25 (18.8-31.3)	0.0	50.0	
Porribius bathyllus	Siphonaptera (Ischnopsyllidae)		2	5.0	0.5	0.5	25 (18.8-31.3)	50.0	50.0	
Walesbolus rainbowi	Spirobolida (Spirobolellidae)		1	4.0	0.3	0.6	25 (12.5-37.5)	100.0	100.0	
Atelomastix tigrina	Spirostreptida (Iulomorphidae)		13	NA	NA	NA	NA	19.3	39.3	WA (VU)
Atelomastix priona	Spirostreptida (Iulomorphidae)	Y	2	15.0	0.6	0.8	7.1 (0-22.3)	0.0	25.0	WA (VU), IUCNpending
Atelomastix poustiei	Spirostreptida (Iulomorphidae)	Y	7	13.0	0.6	0.8	49.3 (32.3-52.3)	73.0	79.1	WA (VU), IUCNpending
Samichus `Mt Trio`	Spirostreptida (Iulomorphidae)		1	6.0	0.3	0.6	41.7 (29.2-54.2)	100.0	100.0	
Atelomastix danksi	Spirostreptida (Iulomorphidae)	Y	6	13.0	0.6	0.8	32.5 (17.7-42.8)	40.2	64.6	WA (VU), IUCNpending
Victoriocambala bidentata	Spirostreptida (Iulomorphidae)		1	9.0	0.3	0.8	20 (0-52.5)	0.0	50.0	
Samichus `Eastern Stirling Ranges`	Spirostreptida (Iulomorphidae)		4	6.0	0.3	0.6	19.2 (11.9-26.6)	28.3	58.1	
Breinlia (Breinlia) pseudocheiri	Spirurida (Onchocercidae)		2	2.0	0.6	0.5	37.5 (31.3-43.8)	50.0	50.0	
Breinlia (Breinlia) dasyuri	Spirurida (Onchocercidae)		1	2.0	0.6	0.5	25 (0-62.5)	0.0	50.0	
Triozocera cooloolaensis	Strepsiptera (Corioxenidae)		1	7.0	0.4	0.4	14.6 (0-45.8)	0.0	50.0	
Labiostrongylus (Labiomultiplex) eugenii	Strongylida (Strongylidae)		1	3.0	0.5	0.8	75 (62.5-87.5)	100.0	100.0	

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Bothriembryon (Bothriembryon) glauerti	Stylommatophora (Bothriembryontidae)		3	NA	NA	NA	NA	28.8	48.8	IUCN (VU)
Bothriembryon brazieri	Stylommatophora (Bothriembryontidae)		7	NA	NA	NA	NA	25.3	40.6	IUCN (VU)
Bothriembryon (Bothriembryon) decresensis	Stylommatophora (Bothriembryontidae)		1	9.0	0.5	0.9	21.9 (0-56.3)	0.0	50.0	
Pommerhelix depressa	Stylommatophora (Camaenidae)		4	NA	NA	NA	NA	26.3	60.7	IUCN (VU)
Glyptorhagada bordaensis	Stylommatophora (Camaenidae)	likely	4	10.0	0.5	0.8	51.1 (40.7-61.7)	67.5	82.2	IUCN (VU)
Cupedora tomsetti	Stylommatophora (Camaenidae)	y	4	11.0	0.5	0.8	41.8 (31.1-54.3)	48.8	70.9	
Austrochloritis marksandersi	Stylommatophora (Camaenidae)	likely	8	11.0	0.5	0.8	38 (26.2-52.1)	31.3	75.2	
Austrochloritis kippara	Stylommatophora (Camaenidae)	likely	5	11.0	0.5	0.8	33 (19.1-51.2)	11.8	78.2	
Pommerhelix depressa	Stylommatophora (Camaenidae)		4	10.0	0.5	0.7	31.9 (21.3-45)	26.3	60.7	
Austrochloritis abrotonus	Stylommatophora (Camaenidae)		48	11.0	0.5	0.7	31.6 (24.1-39.7)	35.9	54.2	
Meridolum jervisensis	Stylommatophora (Camaenidae)		34	10.0	0.5	0.8	30.2 (23-37.9)	30.9	54.0	
Austrochloritis wollemiensis	Stylommatophora (Camaenidae)		22	11.0	0.5	0.8	28.8 (19.7-40)	25.4	55.7	
Pommerhelix mastersi	Stylommatophora (Camaenidae)		20	10.0	0.5	0.7	28.6 (22.2-35.4)	33.9	48.3	
Austrochloritis kosciuszkoensis	Stylommatophora (Camaenidae)		18	11.0	0.5	0.8	28.2 (21.4-35.6)	30.8	49.6	
Pommerhelix monacha	Stylommatophora (Camaenidae)		50	10.0	0.5	0.7	27.3 (19.6-36)	22.5	52.0	
Austrochloritis seaviewensis	Stylommatophora (Camaenidae)	likely	12	11.0	0.5	0.8	26.6 (16.5-39.8)	16.0	57.7	
Austrochloritis kanangra	Stylommatophora (Camaenidae)		49	11.0	0.5	0.8	24.6 (17.6-32.7)	23.0	46.4	
Austrochloritis abbotti	Stylommatophora (Camaenidae)		15	11.0	0.5	0.8	21.9 (14.3-31.2)	12.8	47.7	
Egilodonta bendethera	Stylommatophora (Charopidae)	likely	2	15.0	0.5	0.7	66.7 (54.2-79.2)	100.0	100.0	
Hedleyropa yarrangobillyensis	Stylommatophora (Charopidae)	likely	7	19.0	0.4	0.7	61.5 (49.1-74.7)	64.9	90.6	
Macrophallikoropa stenoumbilicata	Stylommatophora (Charopidae)	y	6	20.0	0.4	0.7	42.1 (32.3-52.3)	43.6	74.9	
Macleayropa kookaburra	Stylommatophora (Charopidae)	likely	3	17.0	0.4	0.7	34.9 (24.7-46)	18.5	72.6	
Marilyniropa jenolanensis	Stylommatophora (Charopidae)	likely	3	10.0	0.5	0.8	31.6 (21.2-44.9)	32.8	56.1	
Rhophodon kempseyensis	Stylommatophora (Charopidae)	y	11	19.0	0.5	0.7	30.9 (22.5-40.6)	31.3	55.5	
Coricudgia wollemiana	Stylommatophora (Charopidae)	likely	5	14.0	0.5	0.8	30.5 (21.1-40.2)	48.6	73.2	
Letomola lanalittleae	Stylommatophora (Charopidae)	y	3	19.0	0.4	0.7	27.5 (19.4-36.6)	17.5	55.4	

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Scelidoropa nandewar	Stylommatophora (Charopidae)		7	8.0	0.6	0.9	26.8 (19-35.8)	11.9	47.6	
Koreelahropa paucicostata	Stylommatophora (Charopidae)		4	10.0	0.5	0.8	26.7 (14.6-42.6)	6.9	59.8	
Meredithena marysvillensis	Stylommatophora (Charopidae)		5	16.0	0.5	0.7	26.4 (19.4-34.3)	25.6	48.1	
Gyrocochlea gibraltar	Stylommatophora (Charopidae)	y	7	15.0	0.6	0.7	26.4 (15.6-40.5)	31.7	74.1	
Macleayropa boonanghi	Stylommatophora (Charopidae)		6	18.0	0.4	0.7	26.1 (16.8-38)	19.5	50.9	
Egilodonta bairnsdalensis	Stylommatophora (Charopidae)		12	14.0	0.3	0.7	24.9 (18.8-31.9)	30.3	41.7	
Egilodonta paucidentata	Stylommatophora (Charopidae)	likely	3	15.0	0.5	0.7	24.6 (19.3-30.2)	31.8	40.0	
Macrophallikoropa depressispira	Stylommatophora (Charopidae)		5	19.0	0.4	0.7	24 (16.7-32.1)	13.9	49.2	
Gyrocochlea janetwaterhouseae	Stylommatophora (Charopidae)		18	15.0	0.5	0.7	22.1 (13.1-33.2)	25.3	62.9	
Gyrocochlea notiala	Stylommatophora (Charopidae)		8	15.0	0.5	0.7	21 (13.7-29.3)	30.4	53.4	
Egilodonta wyanbenensis	Stylommatophora (Charopidae)		2	11.0	0.4	0.7	20.8 (14.6-27.1)	0.0	50.0	
Hyaloropa brazenori	Stylommatophora (Charopidae)		1	9.0	0.3	0.7	20.8 (0-54.2)	0.0	50.0	
Rhophodon mcgradyorum	Stylommatophora (Charopidae)		1	19.0	0.5	0.7	20.8 (0-54.2)	0.0	50.0	
Rhophodon silvaticus	Stylommatophora (Charopidae)		1	9.0	0.3	0.7	20.8 (0-54.2)	0.0	50.0	
Discocharopa expandivolva	Stylommatophora (Charopidae)		3	10.0	0.5	0.8	13.4 (7-22.4)	13.9	39.6	
Egilomen sebastopol	Stylommatophora (Charopidae)	likely	2	15.0	0.5	0.7	12.5 (6.3-18.8)	0.0	50.0	
Rhophodon elizabethae	Stylommatophora (Charopidae)		2	20.0	0.5	0.7	11.5 (0-31.3)	0.0	25.0	
Fastosarion robusta	Stylommatophora (Helicarionidae)		1	8.0	0.5	0.7	62.5 (50-75)	0.0	100.0	
Sigaloeista gracilis	Stylommatophora (Helicarionidae)		1	10.0	0.5	0.7	50 (37.5-62.5)	0.0	100.0	
Parmavitrina flavocarinata	Stylommatophora (Helicarionidae)	likely	2	10.0	0.5	0.8	37.5 (18.8-62.5)	0.0	75.0	
Kaputaresta nandewarensis	Stylommatophora (Punctidae)	likely	2	11.0	0.5	0.8	54.2 (41.7-66.7)	50.0	100.0	
Vitellidelos kaputarensis	Stylommatophora (Rhytididae)		17	8.0	0.7	0.8	24.2 (16.2-33.9)	9.4	43.8	
Gelasinella powellorum	Temnocephalida (Temnocephalidae)		2	6.0	0.7	0.7	25 (18.8-31.3)	50.0	50.0	
Cycadothrips chadwicki	Thysanoptera (Aeolothripidae)		1	4.0	0.9	0.6	25 (0-62.5)	0.0	50.0	
Psalidothrips wellsae	Thysanoptera (Phlaeothripidae)		1	5.0	0.7	0.7	87.5 (75-100)	100.0	100.0	
Capillaria ornamentata	Trichocephalida (Capillariidae)		2	3.0	0.4	0.5	25 (18.8-31.3)	0.0	50.0	
Eucoleus longiductus	Trichocephalida (Capillariidae)		2	3.0	0.4	0.5	25 (18.8-31.3)	0.0	50.0	
Eucoleus plumosus	Trichocephalida (Capillariidae)		2	3.0	0.4	0.5	25 (18.8-31.3)	0.0	50.0	
Eucoleus pseudoplumosus	Trichocephalida (Capillariidae)		2	3.0	0.4	0.5	25 (18.8-31.3)	0.0	50.0	

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Caloca gippslanda	Trichoptera (Calocidae)		1	3.0	0.6	0.3	28.1 (0-87.5)	0.0	50.0	
Daternomina genoaensis	Trichoptera (Ecnomidae)		1	7.0	0.6	0.6	78.1 (37.5-100)	100.0	100.0	
Daternomina hamata	Trichoptera (Ecnomidae)		2	7.0	0.6	0.7	60.9 (25-81.3)	50.0	100.0	
Daternomina warrook	Trichoptera (Ecnomidae)		1	7.0	0.6	0.6	59.4 (37.5-100)	100.0	100.0	
Ecnomina attunga	Trichoptera (Ecnomidae)		1	7.0	0.6	0.7	43.8 (12.5-62.5)	0.0	100.0	
Ecnomina rostrata	Trichoptera (Ecnomidae)		1	7.0	0.6	0.6	43.8 (12.5-62.5)	0.0	100.0	
Ecnomina kepin	Trichoptera (Ecnomidae)		2	7.0	0.6	0.6	37.5 (12.5-62.5)	0.0	100.0	
Ecnomina manicula	Trichoptera (Ecnomidae)		5	9.0	0.6	0.6	36.8 (12.8-54.9)	21.3	67.4	
Ecnomina boogoo	Trichoptera (Ecnomidae)		2	7.0	0.6	0.6	34.4 (18.8-50)	50.0	50.0	
Ecnomina gippslandica	Trichoptera (Ecnomidae)		6	7.0	0.6	0.6	27.2 (10.7-47.2)	17.3	58.0	
Austrotinodes theischingeri	Trichoptera (Ecnomidae)		2	7.0	0.5	0.6	21.9 (6.3-31.3)	0.0	50.0	
Austrotinodes yalga	Trichoptera (Ecnomidae)		2	7.0	0.5	0.6	21.9 (6.3-31.3)	0.0	50.0	
Helicopsyche bellangrensis	Trichoptera (Helicopsychidae)		1	6.0	0.6	0.7	37.5 (12.5-62.5)	0.0	100.0	
Arcyphysa angusta	Trichoptera (Hydropsychidae)		1	6.0	0.6	0.7	34.4 (12.5-50)	0.0	100.0	
Orthotrichia rostrata	Trichoptera (Hydroptilidae)		1	7.0	0.6	0.6	34.4 (12.5-50)	0.0	100.0	
Orphninotrichia benambrica	Trichoptera (Hydroptilidae)		3	7.0	0.6	0.6	19.9 (9.8-32)	24.9	39.9	
Orthotrichia tortuosa	Trichoptera (Hydroptilidae)		13	7.0	0.6	0.6	19.9 (10-30.9)	16.0	51.0	
Mulgravia coronata	Trichoptera (Hydroptilidae)		2	6.0	0.6	0.6	18.8 (12.5-25)	0.0	50.0	
Orthotrichia orbostensis	Trichoptera (Hydroptilidae)		1	7.0	0.6	0.6	17.2 (0-50)	0.0	50.0	
Triaenodes cuspiosa	Trichoptera (Leptoceridae)		2	7.0	0.6	0.6	8.6 (0-25)	0.0	25.0	
Triaenodes resima	Trichoptera (Leptoceridae)		1	6.0	0.6	0.6	68.8 (37.5-87.5)	100.0	100.0	Vic (VU)
Notalina gungarra	Trichoptera (Leptoceridae)		1	6.0	0.6	0.6	62.5 (37.5-87.5)	100.0	100.0	
Triaenodes perissotes	Trichoptera (Leptoceridae)		2	7.0	0.6	0.6	29.7 (18.8-37.5)	50.0	50.0	
Notalina moselyi	Trichoptera (Leptoceridae)		3	6.0	0.6	0.6	29.7 (14.2-50.7)	33.7	56.8	
Barynema australicum	Trichoptera (Odontoceridae)		1	6.0	0.6	0.6	62.5 (37.5-87.5)	100.0	100.0	
Hydrobiosella bilga	Trichoptera (Philopotamidae)		1	6.0	0.6	0.6	62.5 (37.5-87.5)	100.0	100.0	
Hydrobiosella nandawar	Trichoptera (Philopotamidae)		1	6.0	0.6	0.6	37.5 (12.5-62.5)	0.0	100.0	
Hydrobiosella lorum	Trichoptera (Philopotamidae)		4	10.0	0.6	0.6	34.6 (14.6-59.3)	21.9	84.6	
Hydrobiosella prolixa	Trichoptera (Philopotamidae)		2	6.0	0.5	0.6	31.3 (25-37.5)	50.0	50.0	
Ramiheithrus virgatus	Trichoptera (Philorheithridae)		2	6.0	0.5	0.6	40.6 (25-62.5)	50.0	75.0	Vic (VU)

Species name	Order (Family)	SRE?	No. records	Certainty	Confidence	RRI (mean)	FSI mean (Lower-upper bound)	Severe fire overlap %	Total fire overlap %	Threatened status
Anisorhynchodemus woodassimilis	Tricladida (Geoplanidae)		1	10.0	0.3	0.7	20 (0-52.5)	0.0	50.0	
Australopacifica citrina	Tricladida (Geoplanidae)		2	10.0	0.3	0.7	10 (0-26.3)	0.0	25.0	
Arrenurus perplexus	Trombidiformes (Arrenuridae)		1	7.0	0.5	0.7	25 (12.5-37.5)	0.0	100.0	
Barwontius lunoka	Trombidiformes (Aturidae)		1	2.0	0.3	0.7	87.5 (75-100)	100.0	100.0	
Spinaturus ctenophorus	Trombidiformes (Aturidae)		2	6.0	0.4	0.6	25 (18.8-31.3)	50.0	50.0	
Axonopsella expansipes zodala	Trombidiformes (Aturidae)		1	7.0	0.5	0.6	25 (12.5-37.5)	0.0	100.0	
Axonopsella hopkinsi	Trombidiformes (Aturidae)		1	7.0	0.5	0.6	25 (12.5-37.5)	0.0	100.0	
Axonopsella ricala	Trombidiformes (Aturidae)		1	7.0	0.5	0.6	25 (12.5-37.5)	0.0	100.0	
Austraturus uncicoxalis	Trombidiformes (Aturidae)		2	6.0	0.4	0.6	12.5 (6.3-18.8)	0.0	50.0	
Leptus baudini	Trombidiformes (Erythraeidae)		1	7.0	0.5	0.7	75 (62.5-87.5)	100.0	100.0	
Leptus utheri	Trombidiformes (Erythraeidae)		1	7.0	0.3	0.6	75 (62.5-87.5)	100.0	100.0	
Leptus agrotis	Trombidiformes (Erythraeidae)		1	6.0	0.4	0.7	50 (37.5-62.5)	0.0	100.0	
Procorticacarus aloonus	Trombidiformes (Hygrobatidae)		1	4.0	0.6	0.8	50 (37.5-62.5)	100.0	100.0	
Kallimobates vietsi	Trombidiformes (Hygrobatidae)		2	6.0	0.4	0.6	12.5 (6.3-18.8)	0.0	50.0	
Aspidiobates bidewel	Trombidiformes (Hygrobatidae)		1	5.0	0.5	0.6	12.5 (0-37.5)	0.0	50.0	
Labidostomma malleolus	Trombidiformes (Labidostommatidae)		1	4.0	0.3	0.6	25 (0-62.5)	0.0	50.0	
Hesperomomonia similis	Trombidiformes (Momoniidae)		1	7.0	0.5	0.6	37.5 (25-50)	100.0	100.0	
Chrysomelobia vafer	Trombidiformes (Podapolipidae)		1	3.0	0.4	0.5	50 (37.5-62.5)	0.0	100.0	
Neocheylus collis	Trombidiformes (Pseudocheylidae)		1	8.0	0.3	0.6	75 (62.5-87.5)	100.0	100.0	
Guntheria megale	Trombidiformes (Trombiculidae)		1	2.0	0.6	0.5	75 (62.5-87.5)	100.0	100.0	
Paratrombium montivagum	Trombidiformes (Trombidiidae)		1	5.0	0.3	0.4	50 (37.5-62.5)	0.0	100.0	
Koenikea lemba	Trombidiformes (Unionicolidae)		1	3.0	0.5	0.8	25 (12.5-37.5)	0.0	100.0	
Koenikea saponaria	Trombidiformes (Unionicolidae)		1	3.0	0.5	0.8	25 (12.5-37.5)	0.0	100.0	
Recifella hyporheica	Trombidiformes (Unionicolidae)		1	3.0	0.5	0.8	25 (12.5-37.5)	0.0	100.0	
Recifella pectinatus	Trombidiformes (Unionicolidae)		1	4.0	0.6	0.8	25 (12.5-37.5)	0.0	100.0	

Appendix 3. Table of the distributional overlap with fire for the 191 invertebrate species listed as provisional priority species in April 2020.

'Points' is a count of the number of filtered records considered in this analysis; overlap assessments could not be calculated for species with no filtered records. Note that SEVERE fire comprises GEEBAM 4 and 5 classes; mild fire comprises the average overlap of GEEBAM 3 class and GEEBAM 2 and 3 classes; and ALL fire is the sum of overlaps with severe and mild fires.

Species name	Common name	% distnl overlap with SEVERE fire	% distnl overlap with ALL fire	Points	Notes
Abantiades sp. n. Kangaroo Island					No filtered records
Acanthaeschna victoria	Thylacine Darner	1.04	9.93	7	
Acizzia mccarthyi	McCarthy's Plant Louse				No filtered records
Aenetus tindalei					No filtered records
aff. Helicarionidae `sp. WAM S71330`					No filtered records
Anisynta cynone anomala	Mottled Grass-skipper	100.00	100.00	2	
Antipodia chaostola chaostola		0.00	0.00	1	
Apteronomus bordaensis	Raspy Cricket				No filtered records
Apteronomus tepperi	Raspy Cricket				No filtered records
Asteron grayi		15.72	35.50	11	
Atelomastix anancita	millipede	3.63	15.44	3	
Atelomastix danksi	millipede	40.25	64.59	6	
Atelomastix poustiei	millipede	73.02	79.07	7	
Atelomastix tigrina	millipede	19.32	39.27	13	
Atelomastix tumula	millipede	0.00	0.00	2	
Aulacopris reichei	dung beetle	13.78	43.09	3	
Australatya striolata	Eastern Freshwater Shrimp	9.84	28.66	77	
Australeuma `sp.`					No filtered records
Austroaeschna (Austroaeschna) cooloola	Wallum Darner	0.00	0.00	2	
Austroaeschna (Austroaeschna) flavomaculata	Alpine Darner	3.49	7.43	14	
Austrochloritis abbotti	Yessabah Caves Bristle Snail	12.81	47.73	15	
Austrochloritis abrotonus	Bermagui Bristle Snail	35.94	54.20	48	
Austrochloritis kanangra	Jenolan Caves Bristle Snail	22.98	46.40	49	
Austrochloritis kaputarensis	Mount Kaputar Bristle Snail	0.65	39.43	14	
Austrochloritis kippara	Kippara Forest Bristle Snail	11.83	78.21	5	
Austrochloritis kosciuszkoensis	Koscuiszko Bristle Snail	30.76	49.64	18	

Species name	Common name	% distnl overlap with SEVERE fire	% distnl overlap with ALL fire	Points	Notes
Austrochloritis marksandersi	Mount Sebastapol Bristle Snail	31.28	75.22	8	
Austrochloritis paucisetosa	Macksville Bristle Snail	4.55	30.30	6	
Austrochloritis seaviewensis	Mount Seaview Bristle Snail	16.02	57.69	12	
Austrochloritis wollemiensis	Wollemi Bristle Snail	25.37	55.71	22	
Austropetalia patricia	Waterfall Redspot	5.24	22.38	13	
Austropyrgus petterdianus [Fluvidona petterdi]		0.00	0.00	4	
Austropyrgus wombeyanensis		21.01	55.00	4	
Austrorhytida glaciamans	Koscuiszko Carnivorous Snail	24.51	42.79	20	
Austrorhytida nandewarensis	Nandewar Carnivorous Snail	3.80	25.43	28	
Bertmainius colonus	Eastern Stirling Range Pygmy Trapdoor Spider	34.77	43.00	26	
Bertmainius pandus	pygmy trapdoor spider	32.01	66.91	9	
Bothriembryon (Bothriembryon) glauerti	Stirling Ranges Tapered Snail	28.82	48.78	3	
Brevisentis kaputarensis	Mount Kaputar Glass-snail	1.59	26.34	38	
Buburra jeanae	leaf beetle	100.00	100.00	2	
Caliagrion billinghursti	Large Riverdamsel	1.84	3.73	5	
Candalides absimilis edwardsi	Glistening Pencil-blue; Common Pencilled-blue	12.28	22.82	8	
Canthocamptus longipes	harpactacoid copepod	0.00	100.00	1	
Cardiothorax femoratus		15.60	48.28	20	
Cardiothorax iridipes		0.00	0.00	1	
Castiarina cf. alecgemmelli (Wollemi)	jewel beetle				No filtered records
Castiarina flavoviridis	jewel beetle	30.72	50.52	6	
Castiarina kershawi	jewel beetle	6.10	12.55	36	
Castiarina klugii	jewel beetle	6.44	12.60	36	
Castiarina luteocincta	jewel beetle	8.68	15.22	3	
Castiarina maculipennis	jewel beetle	6.82	20.72	3	
Castiarina montigena	jewel beetle	4.73	9.95	9	
Castiarina terminalis (Wollemi form)	jewel beetle				No filtered records
Cataxia colesi		71.41	74.77	7	
Ceratognathus flabellatus					No filtered records

Species name	Common name	% distnl overlap with SEVERE fire	% distnl overlap with ALL fire	Points	Notes
Ceratognathus macrognathus		0.00	0.00	1	
Cherax leckii		0.00	0.00	2	
Coenocharopa yessabahensis	Yessabah Pinwheel Snail	2.71	9.85	4	
Colubotelson joyneri	phreatoicid isopod	0.02	0.11	10	
Cordulephya divergens	Clubbed Shutwing	0.00	0.06	3	
Coricudgia wollemiana	Coricudgy Pinwheel Snail	48.63	73.23	5	
Coripera morleyana		6.21	22.50	11	
Cupedora tomsetti	Tomsett's Shrubland Snail	48.75	70.92	4	
Cyprotides sp. aff. cyprotus					No filtered records
Diorygopyx duplodentatus	dung beetle	10.36	75.88	3	
Diorygopyx incrassatus		19.14	55.27	6	
Diphyoropa illustra	Lakes Entrance Pinwheel Snail	15.68	40.00	14	
Diphyoropa macleayana	Kempsey Copper Pinwheel Snail	25.76	43.12	7	
Discocharopa expandivolva	Flared White Pinwheel Snail	13.92	39.56	3	
Ecnomus neboissi	caddisfly	0.00	0.00	1	
Ecnomus nibbor	caddisfly	7.34	10.57	9	
Edwardsina gigantea	Giant Torrent Midge				No filtered records
Egilodonta bendethera	Bendathera Pinwheel Snail	100.00	100.00	2	
Egilodonta wyanbenensis	Wyanbene Pinwheel Snail	0.00	50.00	2	
Egilomen sebastopol	Sebastopol Pinwheel Snail	0.00	50.00	2	
Elsothera kyliestumkatae	Mount Seaview Pinwheel Snail	15.45	40.93	11	
Engaeus mallacoota	Mallacoota Burrowing Crayfish				No filtered records
Epimixia vulturna					No filtered records
Eritingis trivirgata					No filtered records
Exeretonevra angustifrons		0.00	0.00	1	
Figulus trilobus		9.84	35.54	3	
Galadistes akubra	Macleay Valley Woodland Snail	19.96	42.48	23	
Georissa laseroni	Macleay Valley Microturban	19.29	47.02	11	
Glyptorhagada bordaensis	Cape Borda Corrugated Snail	67.50	82.23	4	
Graycassis bruxner		13.37	45.17	29	
Graycassis dorrigo		12.38	43.18	13	

Species name	Common name	% distnl overlap with SEVERE fire	% distnl overlap with ALL fire	Points	Notes
Gyrocochlea gibraltar	Gibraltar Range Pinwheel Snail	31.65	74.05	7	
Gyrocochlea janetwaterhouseae	Macleay Valley Pinwheel Snail	25.34	62.92	18	
Gyrocochlea planorbis	Port Stephens Pinwheel Snail	4.12	6.76	4	
Gyrocochlea wauchope	Wauchope Pinwheel Snail	5.71	37.65	14	
Hedleyropa yarrangobillyensis	Yarrangobilly Pinwheel Snail	64.91	90.63	7	
Hesperilla hopsoni	Golden Sedge-skipper	5.11	10.76	4	
Hesperisiphon peckorum		100.00	100.00	1	
Hyaloropa brazenori	Brazenor's Pinwheel Snail	0.00	50.00	1	
Hyridella (Hyridella) depressa	Depressed Mussel; Knife-shaped Mussel	9.42	28.89	73	
Hyridella (Protohyridella) glenelgensis	Glenelg Freshwater Mussel	0.15	0.38	7	
Kaputaresta nandewarensis	Nandewar Pinhead Snail	50.00	100.00	2	
Karaops toolbrunup		70.93	74.00	4	
Kirkaldyella rugosa		0.00	0.00	1	
Kirkaldyella schuhi					No filtered records
Kumbadjena toolbrunupensis		100.00	100.00	1	
Lampona fife		22.01	54.22	4	
Lepanus nr pisoniae	dung beetle				No filtered records
Leptoperla cacuminis	Mount Kosciusko Wingless Stonefly	0.00	0.00	2	
Letomola contortus	Contorted Pinwheel Snail	4.15	12.45	4	
Letomola lanalittleae	Sunburst Pinwheel Snail	17.54	55.38	3	
Lissapterus grammicus		0.00	50.00	2	
Lissapterus hopsoni					No filtered records; ALA includes within L. grammicus
Luturopa macleayensis	Macleay Waxy Pinwheel Snail	29.35	46.44	3	
Macleayropa boonanghi	Boonanghi Pinwheel Snail	19.55	50.89	6	
Macleayropa carraiensis	Carrai Pinwheel Snail	14.07	36.29	6	
Macleayropa kookaburra	Kookaburra Pinwheel Snail	18.53	72.57	3	
Macrophallikoropa stenoumbilicata	Wollemi Pinwheel Snail	43.64	74.90	6	
Maratus sarahae	peacock spider, jumping spider	12.60	34.86	7	
Marilyniropa jenolanensis	Jenolan Pinwheel Snail	32.78	56.09	3	

Species name	Common name	% distnl overlap with SEVERE fire	% distnl overlap with ALL fire	Points	Notes
Matthewsius illawarrensis	dung beetle	31.23	51.66	12	
Matthewsius rossi	dung beetle	56.64	80.99	9	
Meridolum jervisensis	Jervis Bay Forest Snail	30.86	54.05	34	
Mesodina aeluropis	Montane Iris-skipper; Aeluropis Skipper	8.05	20.19	17	
Metaballus mesopterus	Kangaroo Island Marauding Katydid	24.33	25.65	5	
Mitophyllus ocularis					No filtered records; name not in ALA
Moggdridgea rainbowi	Kangaroo Island Micro-trapdoor spider	25.64	27.23	3	
Molycria grayi		7.53	31.57	8	
Molycria mammosa		7.55	26.55	27	
Myrmecoroides grossi					No filtered records
Mysticarion porrectus [Helicarion porrectus]		10.00	27.33	63	
Nosterella nadgee [Nostera nadgee]		4.37	19.08	43	
Nunciella kangarooensis	Western Kangaroo Island Harvestman	45.55	46.53	3	
Ogyris halmaturia	Eastern Brown Azure	0.00	0.01	7	
Ogyris otanes otanes	Small Brown Azure	10.52	11.06	13	
Oreixenica correae	Orange Alpine Xenica; Correa Brown	1.15	4.27	8	
Oreixenica latialis latialis	Small Alpine Xenica	23.81	34.28	4	
Oreixenica latialis theddora	Alpine Silver Xenica, Small Alpine Xenica, Mount Buffalo Xenica	16.80	34.99	4	
Oreixenica orichora orichora	Spotted Alpine Xenica	10.48	13.65	6	
Oxycanus incanus					No filtered records
Oxycanus sp. n. 'Kartus'					No filtered records
Paralaoma annabelli	Prickle Pinhead Snail	16.18	28.34	48	
Paralucia spinifera	Bathurst Copper Butterfly, Purple Copper Butterfly	5.54	7.45	138	
Pelecorhynchus distinctus		0.60	8.06	5	
Pelecorhynchus flavipennis		0.00	0.00	2	

Species name	Common name	% distnl overlap with SEVERE fire	% distnl overlap with ALL fire	Points	Notes
Pelecorhynchus lineatus		0.00	0.00	2	
Pelecorhynchus nebulosus		33.21	47.88	7	
Pelecorhynchus niger		NA	NA	1	
Pelecorhynchus rubidus		2.24	3.92	3	
Petalura gigantea	Giant Dragonfly	22.97	42.46	292	
Pleuropoma jana	Macleay Valley Droplet-snail	14.44	35.11	35	
Pommerhelix depressa	Jenolan Caves Woodland Snail	26.31	60.66	4	
Pommerhelix mastersi	Merimbula Woodland Snail	33.92	48.34	20	
Pommerhelix monacha	Blue Mountains Woodland Snail	22.45	52.03	50	
Psacadonotus insulanus	Kangaroo Island Robust Fan-winged Katydid				No filtered records
Pseudalmenus barringtonensis [Pseudalmenus chlorinda barringtonensis]	Flame Hairstreak	3.90	9.03	9	
Pseudococcus markharveyi	Banksia montana mealybug	50.00	50.00	2	
Pseudotyrannochthonius `Harms sp. Stirling Range 1`		100.00	100.00	2	
Pseudotyrannochthonius `Harms sp. Stirling Range 3`		54.72	65.98	3	
Ramiheithrus virgatus	caddisfly	50.00	75.00	2	
Rhophodon kempseyensis	Lustrous Pinwheel Snail	31.34	55.46	11	
Rhophodon mcgradyorum	McGrady's Pinwheel Snail	0.00	50.00	1	
Rhophodon palethorpei	Palethorpe's Pinwheel Snail	0.00	0.00	2	
Rhophodon silvaticus	Thumb Creek Pinwheel Snail	0.00	50.00	1	
Rhynchochydorus australiensis	Water Flea	0.00	0.00	1	
Rhytidid sp. (WAM# 2295-69)	Stirling Range Rhytidid Snail				No filtered records
Safrina dekeyzeri		0.00	0.00	1	
Scelidoropa nandewar	Nandewar Range Pinwheel Snail	11.93	47.59	7	
Setocoris sp. MS binataphila					No filtered records
Stigmodera jacquinotii	jewel beetle	27.06	49.55	6	
Storenosoma terraneum		9.72	28.26	30	
Synsphyronus apimelus		48.97	52.49	13	

Species name	Common name	% distnl overlap with SEVERE fire	% distnl overlap with ALL fire	Points	Notes
Tasmanophlebia lacuscoerulei	Large Blue Lake Mayfly				No filtered records
Telicota eurychlora	Dingy Darter, Sedge Darter, Southern Sedge Darter	31.91	52.43	4	
Temognatha cf. mitchellii' (Blue Mountains)	jewel beetle				No filtered records
Temognatha grandis	jewel beetle	23.19	54.43	4	
Temognatha limbata	jewel beetle	8.72	19.38	16	
Temognatha mitchelli ('karratae')	jewel beetle				No filtered records
Temognatha rufocyanea	jewel beetle				No filtered records
Temognatha sexmaculata	jewel beetle	0.00	100.00	1	
Tetramorium confusum		16.98	61.13	8	
Teyl `MYG636`		27.65	32.21	3	
Thaumatoperla alpina	Alpine Stonefly	1.36	2.97	17	
Triaenodes cuspiosa	caddisfly	0.00	25.00	2	
Triaenodes uvida	caddisfly	0.00	0.00	1	
Trichophthalma (Lichtwardtiomyia) bivitta		24.35	39.17	13	
Trioza barrettae	Banksia brownii Plant Louse, Barrett's Plant-louse	69.34	73.60	5	
Venatrix australiensis		13.06	29.48	12	
Vitellidelos dorrigoensis	Dorrigo Carnivorous Snail	23.81	44.10	11	
Vitellidelos kaputarensis	Mount Kaputar Carnivorous Snail	9.36	43.78	17	
Wallabicoris helichrysi					No filtered records
Woodwardiola sp. ms lomandrae					No filtered records
Xylocopa (Lestis) aeratus	Metallic Green Carpenter Bee	75.40	81.19	92	
Zephyrarchaea austini	Kangaroo Island Assassin spider	100.00	100.00	1	
Zephyrarchaea melindae	Toolbrunup Assassin Spider	58.08	71.14	5	
Zephyrarchaea robinsi	Eastern Massif Assassin Spider	40.31	47.46	9	

Appendix 4. Supplementary Material for analysis of threats and management actions: data inclusion sensitivity analysis.

In this section we compare the three datasets: the original as described in the main text (section 3.2), the dataset including inferred and suspected data by replacing these values with ones drawn from a 0-100 distribution, and the dataset substituting all NA data with values drawn from a 0-100 distribution. The goal is to determine whether the conclusions drawn in the main report are robust to changes in data inclusion.

Appendix 4.1. Nationally with the expanded datasets, what are the biggest threats to fire-affected invertebrates?

Short term (1 year post fire)

The analysis of the original dataset includes data on only 107 species for this analysis (Table 3.2), when compared with 562 for the dataset including inferred and suspected data (Table A4.1), and 1228 for the dataset replacing all NA values (Table A4.2). For analysis of threats in the short term, more fire comes out as the most problematic in all three analyses (Tables 3.2, A4.1, A4.2). This is the only threat that had a certain negative effect in the original dataset (mean, Q25 and Q75 >0). The top three threats are the same in the original dataset (Table 3.2) and in the inferred and suspected dataset (Table A4.1), though in a different order. When all NA data are replaced with uncertain values between 0-100, all threats approach 50% efficacy and the differences between the threats becomes very small (Table A4.2).

Copy of Table 3.2: Original dataset: Short term (1 year post fire) threats across the PAA. Table shows the total number of species in the dataset for each threat (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated impact of each threat as well as the percentage of simulations in which that threat results in a population decline of less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
more fire	48.4	20.8	75.3	30.5	69.5	50.2	20.3	107	1228
drought	24.7	0	38.3	69.2	30.8	16.7	4.5	107	1228
desiccation risk from exposure	24.3	0	40.5	70.6	29.4	21	8.2	107	1228
weeds	7	0	2.4	89.2	10.8	4.8	0.5	107	1228
introduced competitors	6.4	0	4.7	92.5	7.5	3.5	0.7	107	1228
exposure to predators	4.8	0	0.9	96.6	3.4	2.4	0.9	107	1228
erosion / siltation	3.4	0	0	96.8	3.2	2	0.7	107	1228
herbivores	3.1	0	0	97.2	2.8	2.2	1	107	1228
reduced water quality	1.3	0	0	99.1	0.9	0.7	0.3	107	1228

Table A4.1: Dataset including inferred and suspected data: Short term (1 year post fire) national threats. Table shows the total number of species in the dataset for each threat (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated impact of each threat as well as the percentage of simulations in which that threat results in a population decline of less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
more fire	31.1	0	60.3	56.2	43.8	31.3	12.6	562	1228
desiccation risk from exposure	20.1	0	35.8	72.7	27.3	19.5	7.8	562	1228
drought	18	0	29.2	75.5	24.5	16.5	6.2	562	1228
erosion / siltation	10.8	0	0	85.2	14.8	10.5	4.2	562	1228
reduced water quality	10.1	0	0	86	14	10	4	562	1228
exposure to predators	5.2	0	0	93.4	6.6	4.8	1.9	562	1228
weeds	4.7	0	0	93.2	6.8	4.3	1.4	562	1228
introduced competitors	1.4	0	0	98.3	1.7	0.9	0.2	562	1228
herbivores	1.2	0	0	98.6	1.4	1	0.4	562	1228

Table A4.2: Dataset substituting all NA data with draws from a 0-100 distribution: Short term (1 year post fire) national threats. Table shows the total number of species in the dataset for each threat (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated impact of each threat as well as the percentage of simulations in which that threat results in a population decline of less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
more fire	50.2	25.3	75.2	29.5	70.5	50.4	20.1	1228	1228
reduced water quality	49.7	24.6	74.8	30.4	69.6	49.6	19.9	1228	1228
erosion / siltation	49.6	24.4	74.8	30.6	69.4	49.5	19.8	1228	1228
desiccation risk from exposure	49.3	24	74.5	31.3	68.7	49.1	19.6	1228	1228
herbivores	49.2	23.7	74.6	31.2	68.8	49.1	19.7	1228	1228
drought	49	23.8	73.9	31.8	68.2	48.3	19.1	1228	1228
exposure to predators	49	23.5	74.4	31.7	68.3	48.8	19.6	1228	1228
weeds	49	23.6	74.3	31.3	68.7	48.9	19.4	1228	1228
introduced competitors	48.9	23.4	74.3	31.7	68.3	48.6	19.5	1228	1228

Longer term (2 to 20 years post fire)

The analysis of the original dataset includes data on only 95-107 species for this analysis, depending on the threat (Table 3.3), when compared with 457-562 for the dataset including inferred and suspected data (Table A4.3), and 1228 for the dataset replacing all NA values (Table A4.4). More fire, habitat loss and climate change came out as the top three threats in all three datasets (Table 2, A4.3, A4.4). As above, values in the dataset replacing al NA values approach 50% and values for different threats have become very similar.

Copy of Table 3.3: Original dataset: Longer term (2-20 years post fire) threats across the PAA. Table shows the total number of species in the dataset for each threat (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated impact of each threat as well as the percentage of simulations in which that threat results in a population decline of less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
more fire	46.9	18.5	74.2	31.3	68.7	48.5	19.3	95	1228
habitat loss	37.6	7.7	60.4	45	55	35.3	12.6	95	1228
climate change	26.1	0	45.4	56.4	43.6	19.4	3.7	95	1228
drought	26.1	2.1	43.6	60.7	39.3	18.3	3.9	95	1228
loss of host species	16	0	20.7	80.4	19.6	14.9	6.3	107	1228
fragmentation	15	0	25.3	80.3	19.7	8.7	1.6	95	1228
introduced competitors	6.9	0	6.6	94.9	5.1	3.2	1	95	1228
weeds	6.6	0	4.9	92	8	3.4	0.5	95	1228
erosion / siltation	3.8	0	0	97.5	2.5	1.1	0.2	95	1228

Table A4.3: Dataset including inferred and suspected data: Long term (2 to 20 years post fire) national threats. Table shows the total number of species in the dataset for each threat (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated impact of each threat as well as the percentage of simulations in which that threat results in a population decline of less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
habitat loss	41.9	11.6	69.2	40.9	59.1	41.4	16.3	457	1228
more fire	40.9	6.8	69.7	42.1	57.9	41.3	16.5	457	1228
climate change	36.7	1.3	62.4	47.2	52.8	35.4	13.3	457	1228
drought	32.6	0	57.8	53.8	46.2	30.9	11.7	457	1228
fragmentation	18.2	0	30.6	74.8	25.2	16.9	6.4	457	1228
loss of host species	15.9	0	21	78.4	21.6	15.7	6.3	562	1228
introduced competitors	7.3	0	0	90.7	9.3	6.5	2.6	457	1228
weeds	6.5	0	0	91.1	8.9	5.8	2.2	457	1228
erosion / siltation	6.2	0	0	92	8	5.6	2.2	457	1228

Table A4.4: Dataset substituting all NA data with draws from a 0-100 distribution: Long term (2 to 20 years post fire) national threats. Table shows the total number of species in the dataset for each threat (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated impact of each threat as well as the percentage of simulations in which that threat results in a population decline of less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
more fire	50.3	25.6	75.2	29.3	70.7	50.4	20.1	1228	1228
habitat loss	49.8	24.9	74.6	30.1	69.9	49.5	19.7	1228	1228
climate change	49.5	24.9	74	30.2	69.8	48.9	19.3	1228	1228
loss of host species	49.2	23.8	74.6	31.3	68.7	49.1	19.6	1228	1228
fragmentation	49.1	23.9	74.1	31.4	68.6	48.6	19.2	1228	1228
drought	49	24.1	73.9	31.1	68.9	48.5	19.1	1228	1228
weeds	49	23.5	74.3	31.5	68.5	48.7	19.4	1228	1228
erosion / siltation	48.9	23.3	74.3	31.7	68.3	48.7	19.5	1228	1228
introduced competitors	48.8	23.2	74.2	32	68	48.6	19.4	1228	1228

Appendix 4.2. Nationally with the expanded dataset, which management actions are most effective?

Regardless of which dataset is being considered, tailored fire management comes out as the most effective management action in both the short term (Tables 3, S5, S6) and longer term (Table 4, S7, S8). In the short term, analysis of the original dataset shows the replanting and restoration (though uncertain with a Q25 estimate of 0) is the second most effective action, this is also true in the dataset where all NAs are replaced with values from 0-100. In the dataset including suspected and inferred data, hydrological management comes out as the second most effective action.

In the longer term, replanting and restoration comes out as the second most effective management option when analysing any of the datasets. The order of the other threats differs between the three datasets but the results contain a substantial amount of uncertainty so the changes in order are unlikely to be meaningful.

Short term (1 year post fire)

Copy of Table 3.4: Original Dataset: Short term (1 year post fire) actions across the PAA. Table shows the total number of species in the dataset for each action (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated reduction in population decline associated with each action as well as the percentage of simulations in which that action reduces population decline by less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Action	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
tailored fire management	42.7	22	62.7	32.1	67.9	50.6	0	84	1228
replanting and restoration	20.9	0	38.7	63.9	36.1	11.1	0	89	1228
weed control	9.7	0	15.5	88.1	11.9	3.4	0	89	1228
provision of artificial shelters	9.3	0	10.3	84.9	15.1	4.4	0	90	1228
control of introduced competitors	8.9	0	13.4	88.9	11.1	3	0	90	1228
soil stabilisation	8.2	0	11.9	89.8	10.2	2.2	0	90	1228
hydrological management	7.1	0	0	90.4	9.6	7.8	0	90	1228
herbivore control	4.9	0	5.9	98	2	1.1	0	90	1228

Table A4.5: Dataset including inferred and suspected data: Short term (1 year post fire) national actions. Table shows the total number of species in the dataset for each action (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated reduction in population decline associated with each action as well as the percentage of simulations in which that action reduces population decline by less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Action	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
tailored fire management	40.6	11.7	65.9	41	59	41.2	12.4	303	1228
hydrological management	9.1	0	0	87.4	12.6	9.3	2.8	307	1228
replanting and restoration	7.2	0	0	87.9	12.1	4.4	0.5	306	1228
weed control	4	0	0	94.9	5.1	2.1	0.5	306	1228
soil stabilisation	3.5	0	0	95.4	4.6	1.8	0.5	307	1228
provision of artificial shelters	3.1	0	0	95.1	4.9	1.6	0.1	307	1228
control of introduced competitors	2.8	0	0	96.5	3.5	1	0.1	307	1228
herbivore control	2.2	0	0	98.3	1.7	1.2	0.3	307	1228

Table A4.6: Dataset substituting all NA data with draws from a 0-100 distribution: Short term (1 year post fire) national actions. Table shows the total number of species in the dataset for each action (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated reduction in population decline associated with each action as well as the percentage of simulations in which that action reduces population decline by less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Action	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
tailored fire management	49.8	25.7	74	29.4	70.6	49.6	19	1228	1228
replanting and restoration	49.2	24.6	73.8	30.7	69.3	48.5	19.1	1227	1228
weed control	48.9	23.4	74.1	31.6	68.4	48.5	19.3	1227	1228
control of introduced competitors	48.8	23.2	74	31.8	68.2	48.3	19.2	1228	1228
herbivore control	48.8	23	74.2	32	68	48.6	19.4	1228	1228
hydrological management	48.8	23.2	74.2	31.7	68.3	48.9	19.3	1228	1228
provision of artificial shelters	48.6	23.2	73.9	31.8	68.2	48.2	19.2	1228	1228
soil stabilisation	48.4	22.8	73.8	32.2	67.8	48	19.1	1228	1228

Longer term (2 to 20 years post fire)

Copy of Table 3.5: Original Dataset: Long term (2 to 20 years post fire) actions across the PAA. Table shows the total number of species in the dataset for each action (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated reduction in population decline associated with each action as well as the percentage of simulations in which that action reduces population decline by less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Action	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
tailored fire management	42.4	25	61.6	30.8	69.2	46.8	0	78	1228
replanting and restoration	22.4	0	41.2	60	40	13.5	0	83	1228
re-introduction of target species	13.2	0	27.7	77.1	22.9	5.8	0	83	1228
weed control	9	0	13.6	89.3	10.7	3.6	0	84	1228
soil stabilisation	8.2	0	12.6	89.3	10.7	1.2	0	84	1228
ex-situ conservation	7.6	0	4.6	88.1	11.9	2.4	0	84	1228
host species re-introduction	7.6	0	0	88.7	11.3	5	0	84	1228
hydrological management	7.2	0	0	89.8	10.2	8.3	0	84	1228
control of introduced competitors	6.5	0	5.6	92.4	7.6	2.4	0	84	1228
herbivore control	5.1	0	7.1	97.1	2.9	0	0	84	1228

Table A4.7: Dataset including inferred and suspected data: Long term (2 to 20 years post fire) national actions. Table shows the total number of species in the dataset for each action (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated reduction in population decline associated with each action as well as the percentage of simulations in which that action reduces population decline by less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Action	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
tailored fire management	45.1	19.5	69	34.8	65.2	45.9	14.5	375	1228
replanting and restoration	35.8	0	62	48	52	33.9	12.4	378	1228
weed control	8.2	0	0	89	11	7	2.4	379	1228
hydrological management	8	0	0	88.7	11.3	8.3	2.6	379	1228
soil stabilisation	6.8	0	0	90.6	9.4	5.3	2	379	1228
re-introduction of target species	4.1	0	0	93.3	6.7	2.5	0.5	378	1228
host species re-introduction	3.1	0	0	95.5	4.5	2.6	0.6	379	1228
ex-situ conservation	1.9	0	0	97	3	0.8	0.1	379	1228
control of introduced competitors	1.7	0	0	98	2	0.8	0.1	379	1228
herbivore control	1.4	0	0	99	1	0.3	0.1	379	1228

Table A4.8: Dataset substituting all NA data with draws from a 0-100 distribution: Long term (2 to 20 years post fire) national actions. Table shows the total number of species in the dataset for each action (sp), the number of those species which included data (non-na sp), the mean, the 25th quartile (Q25) and 75th quartile (Q75) of the simulated reduction in population decline associated with each action as well as the percentage of simulations in which that action reduces population decline by less than 30% (%<30), more than 30% (%>30), more than 50% (%>50), and more than 80% (%>80).

Action	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp
tailored fire management	49.8	25.7	73.9	29.4	70.6	49.7	19	1228	1228
replanting and restoration	49.5	25.1	74	30.1	69.9	48.8	19.2	1227	1228
host species re-introduction	49.3	24	74.3	31	69	49.1	19.5	1228	1228
ex-situ conservation	49.2	24	74.3	31.1	68.9	48.8	19.4	1228	1228
hydrological management	49.1	23.6	74.3	31.2	68.8	49.2	19.4	1228	1228
re-introduction of target species	49.1	24.1	74.1	31	69	48.6	19.3	1227	1228
control of introduced competitors	49	23.5	74.3	31.4	68.6	48.8	19.4	1228	1228
weed control	49	23.5	74.2	31.5	68.5	48.6	19.4	1228	1228
herbivore control	48.9	23.2	74.2	31.8	68.2	48.6	19.4	1228	1228
soil stabilisation	48.7	23.2	74.1	31.9	68.1	48.2	19.3	1228	1228

Appendix 4.3. Threats by region

Table A4.9: Short term (1 year post fire) threats by region

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
more fire	48.4	20.8	75.3	30.5	69.5	50.2	20.3	107	1228	Australia
	28.5	4.7	48.2	58.1	41.9	23.2	6.6	11	234	Alps
	37.4	0	74.5	50	50	43	19.5	4	87	EGipps
	49.7	24.7	76.1	27.7	72.3	52	20.9	25	358	GBM
	77.5	67.7	89.2	0	100	95.2	46.6	6	36	KI
	45	9	70	29	71	45.4	16.6	19	308	NCT
	32.2	3.2	58.9	57	43	30.5	12.2	23	258	NSWSC
	50.9	33.4	75.7	20.4	79.6	53.7	20.6	6	97	SEQ
	44.9	37.5	52.4	0	100	32.9	0	2	31	TAS
	66.6	49.6	83.8	0	100	74.5	30.6	10	88	WA
drought	24.7	0	38.3	69.2	30.8	16.7	4.5	107	1228	Australia
	17.7	0	26.2	81.8	18.2	9.7	2.6	11	234	Alps
	31.4	0	60	50	50	33.2	13	4	87	EGipps
	22.6	0	37.8	69.2	30.8	16	4.3	25	358	GBM
	40.2	23.3	55.3	29.8	70.2	33.8	8.5	6	36	KI
	21	0	30.5	74.7	25.3	12.5	2.6	19	308	NCT
	15.4	0	23.7	84.8	15.2	8	2.2	23	258	NSWSC
	11.5	0	21.3	92.1	7.9	2.4	0	6	97	SEQ
	32.6	20.3	44.9	50	50	16.3	0	2	31	TAS
	36.4	17.4	53.6	50	50	30	8.2	10	88	WA
desiccation risk from exposure	24.3	0	40.5	70.6	29.4	21	8.2	107	1228	Australia
	7.7	0	12.5	90.9	9.1	2.9	0	11	234	Alps
	20.1	0	15	75	25	25	12.8	4	87	EGipps
	14.7	0	22.5	81	19	10.1	2.8	25	358	GBM
	25.8	0	35.2	73.3	26.7	19.9	8.8	6	36	KI
	24	0	47	63.6	36.4	22.9	7.4	19	308	NCT
	11.8	0	16.8	86.1	13.9	7.5	2.2	23	258	NSWSC
	17.4	0	31.9	73.4	26.6	8.8	0	6	97	SEQ
	10	0	19.9	100	0	0	0	2	31	TAS
	38	0	74.9	60	40	40	20.3	10	88	WA

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
weeds	7	0	2.4	89.2	10.8	4.8	0.5	107	1228	Australia
	5.9	0	0	90.9	9.1	3.2	0	11	234	Alps
	13.7	0	10	75	25	16.5	0	4	87	EGipps
	5.6	0	0	89.5	10.5	3.5	0	25	358	GBM
	20	0	23.8	83.3	16.7	16.7	8.2	6	36	KI
	12.3	0	22.6	78.9	21.1	8.6	0	19	308	NCT
	3.7	0	0	95.7	4.3	2.9	0	23	258	NSWSC
	0.9	0	0	100	0	0	0	6	97	SEQ
	0	0	0	100	0	0	0	2	31	TAS
	1	0	0	100	0	0	0	10	88	WA
introduced competitors	6.4	0	4.7	92.5	7.5	3.5	0.7	107	1228	Australia
	0.9	0	0	100	0	0	0	11	234	Alps
	0	0	0	100	0	0	0	4	87	EGipps
	12.7	0	19.8	83.6	16.4	8.3	2	25	358	GBM
	1.7	0	2.4	100	0	0	0	6	36	KI
	7.6	0	7.8	89.5	10.5	3.5	0	19	308	NCT
	5.9	0	3.9	95.7	4.3	3	1.2	23	258	NSWSC
	8.3	0	4.9	83.3	16.7	5.4	0	6	97	SEQ
	2.5	0	4.8	100	0	0	0	2	31	TAS
	0	0	0	100	0	0	0	10	88	WA
exposure to predators	4.8	0	0.9	96.6	3.4	2.4	0.9	107	1228	Australia
	2.3	0	0	100	0	0	0	11	234	Alps
	20.1	0	15	75	25	25	12.8	4	87	EGipps
	3.6	0	0	93.6	6.4	2.1	0	25	358	GBM
	9.9	0	19.6	100	0	0	0	6	36	KI
	6.3	0	0	94.7	5.3	5.3	2.6	19	308	NCT
	6.6	0	3.8	95.7	4.3	4.3	2.2	23	258	NSWSC
	0	0	0	100	0	0	0	6	97	SEQ
	0	0	0	100	0	0	0	2	31	TAS
	1	0	0	100	0	0	0	10	88	WA

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
erosion / siltation	3.4	0	0	96.8	3.2	2	0.7	107	1228	Australia
	6.8	0	0	93	7	5.1	2	11	234	Alps
	0	0	0	100	0	0	0	4	87	EGipps
	1.8	0	0	100	0	0	0	25	358	GBM
	21	0	44.9	66.7	33.3	22.3	8.7	6	36	KI
	1.1	0	0	100	0	0	0	19	308	NCT
	3.4	0	0	96.6	3.4	2.3	0.9	23	258	NSWSC
	0	0	0	100	0	0	0	6	97	SEQ
	0	0	0	100	0	0	0	2	31	TAS
	4	0	0	100	0	0	0	10	88	WA
herbivores	3.1	0	0	97.2	2.8	2.2	1	107	1228	Australia
	0.5	0	0	100	0	0	0	11	234	Alps
	19.9	0	15	75	25	25	12.3	4	87	EGipps
	0.6	0	0	100	0	0	0	25	358	GBM
	9.3	0	7.6	83.3	16.7	6.1	0	6	36	KI
	4.5	0	0	94.7	5.3	5.3	2.6	19	308	NCT
	4.8	0	0	95.7	4.3	4.3	2.2	23	258	NSWSC
	0	0	0	100	0	0	0	6	97	SEQ
	0	0	0	100	0	0	0	2	31	TAS
	3	0	2.5	100	0	0	0	10	88	WA
reduced water quality	1.3	0	0	99.1	0.9	0.7	0.3	107	1228	Australia
	0	0	0	100	0	0	0	11	234	Alps
	0	0	0	100	0	0	0	4	87	EGipps
	2.8	0	0	96	4	2.8	1	25	358	GBM
	0	0	0	100	0	0	0	6	36	KI
	0.3	0	0	100	0	0	0	19	308	NCT
	0	0	0	100	0	0	0	23	258	NSWSC
	0	0	0	100	0	0	0	6	97	SEQ
	0	0	0	100	0	0	0	2	31	TAS
	0	0	0	100	0	0	0	10	88	WA

Table A4.10: Long term (2 to 20 years post fire) threats by region

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
more fire	46.9	18.5	74.2	31.3	68.7	48.5	19.3	95	1228	Australia
	21.6	0	43.3	60.3	39.7	17.5	3.2	9	234	Alps
	11.7	0	22.3	80.2	19.8	6.8	0	3	87	EGipps
	45.3	23.6	66.3	28.7	71.3	43.8	14.6	25	358	GBM
	77.7	67.8	89.4	0	100	95.7	46.7	6	36	KI
	45.6	2.1	75.6	32.3	67.7	50.2	20.4	17	308	NCT
	27.5	0	48.9	59.4	40.6	24.1	7.8	19	258	NSWSC
	61.3	43.4	79.6	5.6	94.4	65.1	24.8	4	97	SEQ
	39.8	31.8	50.6	21	79	26.7	0	2	31	TAS
	58.9	40.5	78.9	9.9	90.1	61.1	23.8	8	88	WA
habitat loss	37.6	7.7	60.4	45	55	35.3	12.6	95	1228	Australia
	40.5	21.1	56.1	36.4	63.6	33.9	10	9	234	Alps
	39.7	0	69.9	40.6	59.4	41.5	16	3	87	EGipps
	35.5	15.5	51.8	40.4	59.6	27.8	6.1	25	358	GBM
	45.2	0	76.7	33.3	66.7	51.8	21.6	6	36	KI
	32.1	0	55.5	53.3	46.7	29.9	10.7	17	308	NCT
	42.8	17.1	66.8	37.5	62.5	41	15.2	19	258	NSWSC
	24	7.5	28.1	80.1	19.9	14.4	5.8	4	97	SEQ
	22.4	0	44.9	50	50	15.8	0	2	31	TAS
	20.1	0	15	75	25	21.6	10	8	88	WA
climate change	26.1	0	45.4	56.4	43.6	19.4	3.7	95	1228	Australia
	12.2	0	25.1	77.8	22.2	7.4	0	9	234	Alps
	6.7	0	15.1	100	0	0	0	3	87	EGipps
	25.3	0	42.2	60.8	39.2	16.1	2.1	25	358	GBM
	54.8	39.1	69.6	6.7	93.3	53.7	16	6	36	KI
	21.7	0	41.5	58.8	41.2	13.7	0	17	308	NCT
	11.6	0	21.5	86.3	13.7	4.6	0	19	258	NSWSC
	16.2	0	29.9	75	25	8.2	0	4	97	SEQ
	32.6	20.2	45.2	50	50	16.8	0	2	31	TAS
	35	0	56.2	37.5	62.5	33.7	9.9	8	88	WA

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
drought	26.1	2.1	43.6	60.7	39.3	18.3	3.9	95	1228	Australia
	22.9	4.1	41.4	59.8	40.2	13.5	0	9	234	Alps
	1.7	0	2.5	100	0	0	0	3	87	EGipps
	20.6	0	32.1	73.5	26.5	11.4	1.9	25	358	GBM
	47	33.9	56.6	16.7	83.3	40.2	8.7	6	36	KI
	17.7	0	34.5	70.6	29.4	10.1	0	17	308	NCT
	16.1	0	29.2	75.8	24.2	8.1	0	19	258	NSWSC
	14.9	7.5	23.1	100	0	0	0	4	97	SEQ
	32.3	19.6	45	50	50	15.7	0	2	31	TAS
	42.4	33.2	54.7	17.6	82.4	36	6	8	88	WA
loss of host species	16	0	20.7	80.4	19.6	14.9	6.3	107	1228	Australia
	13.2	0	0	81.8	18.2	15.7	7.1	11	234	Alps
	20.1	0	15	75	25	25	13	4	87	EGipps
	20.9	0	36.6	71.5	28.5	17.5	6.1	25	358	GBM
	1.7	0	2.5	100	0	0	0	6	36	KI
	6.1	0	0	94.7	5.3	5.3	2.7	19	308	NCT
	21.3	0	29	75.7	24.3	21.5	9.7	23	258	NSWSC
	40.1	0	69.4	39.8	60.2	42.9	16.7	6	97	SEQ
	0	0	0	100	0	0	0	2	31	TAS
	0	0	0	100	0	0	0	10	88	WA
fragmentation	15	0	25.3	80.3	19.7	8.7	1.6	95	1228	Australia
	9.5	0	17.6	88.9	11.1	4	0	9	234	Alps
	0	0	0	100	0	0	0	3	87	EGipps
	14.6	0	27.6	77.9	22.1	7.1	0	25	358	GBM
	40.2	0	70.4	39.8	60.2	42.8	16.6	6	36	KI
	3.5	0	0	94.1	5.9	2	0	17	308	NCT
	12.6	0	24.5	78.9	21.1	7	0	19	258	NSWSC
	21.3	7.5	30	75	25	8.3	0	4	97	SEQ
	10	0	20.2	100	0	0	0	2	31	TAS
	10	0	10	87.5	12.5	4.4	0	8	88	WA

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
introduced competitors	6.9	0	6.6	94.9	5.1	3.2	1	95	1228	Australia
	0	0	0	100	0	0	0	9	234	Alps
	6.7	0	15	100	0	0	0	3	87	EGipps
	7	0	10.2	93.8	6.2	2.1	0	25	358	GBM
	5.4	0	4.9	93.1	6.9	0	0	6	36	KI
	12.8	0	13	88.2	11.8	11.8	5.9	17	308	NCT
	5.9	0	3.7	95.6	4.4	2.6	0	19	258	NSWSC
	5	0	2.5	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	2	31	TAS
	0	0	0	100	0	0	0	8	88	WA
weeds	6.6	0	4.9	92	8	3.4	0.5	95	1228	Australia
	5	0	0	88.9	11.1	3.7	0	9	234	Alps
	6.7	0	15.3	100	0	0	0	3	87	EGipps
	2.4	0	0	100	0	0	0	25	358	GBM
	23.4	0	26.8	83.3	16.7	16.7	8.1	6	36	KI
	9.4	0	7.5	82.4	17.6	5.7	0	17	308	NCT
	3.4	0	0	100	0	0	0	19	258	NSWSC
	0	0	0	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	2	31	TAS
	1.9	0	3.4	100	0	0	0	8	88	WA
erosion / siltation	3.8	0	0	97.5	2.5	1.1	0.2	95	1228	Australia
	8.3	0	0	91.3	8.7	6.1	2.4	9	234	Alps
	0	0	0	100	0	0	0	3	87	EGipps
	3.8	0	0	97.6	2.4	0.8	0	25	358	GBM
	8.3	0	4.8	83.3	16.7	5.5	0	6	36	KI
	2	0	0	100	0	0	0	17	308	NCT
	4.3	0	0	95.9	4.1	3	1.2	19	258	NSWSC
	0	0	0	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	2	31	TAS
	0	0	0	100	0	0	0	8	88	WA

Appendix 4.4. Management actions by region

Table A4.11: Short term (1 year post fire) actions by regions

Action	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
tailored fire management	42.7	22	62.7	32.1	67.9	50.6	0	84	1228	Australia
	30.5	12.3	47.5	55.1	44.9	22.2	0	9	234	Alps
	25	12.8	37.4	60.7	39.3	0	0	2	87	EGipps
	47.8	31.5	65.4	24.3	75.7	65.2	0	23	358	GBM
	46.8	37.5	66.4	25	75	75	0	4	36	KI
	44.7	17.7	65.3	35.7	64.3	64.3	0	14	308	NCT
	38.1	16.2	59.5	42.4	57.6	40.9	0	17	258	NSWSC
	59.7	53.8	68.1	2.1	97.9	88.3	0	4	97	SEQ
	62.7	56.4	68.8	0	100	100	0	1	31	TAS
	51.8	43.4	66.5	17.4	82.6	71.4	0	7	88	WA
replanting and restoration	20.9	0	38.7	63.9	36.1	11.1	0	89	1228	Australia
	15.2	0	32.1	72.5	27.5	5.3	0	9	234	Alps
	0	0	0	100	0	0	0	2	87	EGipps
	25	0	44.2	56.5	43.5	17.4	0	23	358	GBM
	24.9	0	40.6	47	53	0	0	6	36	KI
	17	0	36	67.2	32.8	7.1	0	14	308	NCT
	13.2	0	22.9	79.4	20.6	8.9	0	17	258	NSWSC
	21.9	0	37.8	59.4	40.6	0	0	4	97	SEQ
	37.7	31.4	44.3	19.8	80.2	0	0	1	31	TAS
	5.2	0	10.1	100	0	0	0	7	88	WA
weed control	9.7	0	15.5	88.1	11.9	3.4	0	89	1228	Australia
	5.6	0	0	90.8	9.2	0	0	9	234	Alps
	0	0	0	100	0	0	0	2	87	EGipps
	13.6	0	20.8	82.6	17.4	8.7	0	23	358	GBM
	12.3	0	21.6	84.1	15.9	0	0	5	36	KI
	8.9	0	13.1	83.3	16.7	0	0	14	308	NCT
	4.9	0	3.2	95.4	4.6	0	0	18	258	NSWSC
	6.3	0	12.8	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	5.3	0	10.2	100	0	0	0	7	88	WA

Action	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
provision of artificial shelters	9.3	0	10.3	84.9	15.1	4.4	0	90	1228	Australia
	4.2	0	0	90.9	9.1	0	0	9	234	Alps
	0	0	0	100	0	0	0	2	87	EGipps
	13.6	0	23.8	78.9	21.1	8.8	0	23	358	GBM
	14.4	0	33.2	71.9	28.1	7.8	0	6	36	KI
	9.7	0	18.3	83	17	0	0	14	308	NCT
	4.9	0	0	93.5	6.5	0	0	18	258	NSWSC
	28.1	0	50	55.1	44.9	25	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	0	0	0	100	0	0	0	7	88	WA
control of introduced competitors	8.9	0	13.4	88.9	11.1	3	0	90	1228	Australia
	1.4	0	0	100	0	0	0	9	234	Alps
	0	0	0	100	0	0	0	2	87	EGipps
	14.6	0	29.3	75.7	24.3	2.8	0	23	358	GBM
	4.2	0	6.6	100	0	0	0	6	36	KI
	7.2	0	0	89.9	10.1	7.1	0	14	308	NCT
	6.3	0	8.4	93.4	6.6	0	0	18	258	NSWSC
	15.6	0	25	80.4	19.6	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	0	0	0	100	0	0	0	7	88	WA
soil stabilisation	8.2	0	11.9	89.8	10.2	2.2	0	90	1228	Australia
	15.3	0	34.1	71.1	28.9	11.1	0	9	234	Alps
	0	0	0	100	0	0	0	2	87	EGipps
	7.1	0	10.4	91.4	8.6	0	0	23	358	GBM
	10.5	0	0	83.3	16.7	16.7	0	6	36	KI
	3.6	0	0	94.3	5.7	0	0	14	308	NCT
	11.1	0	17.6	83.5	16.5	5.6	0	18	258	NSWSC
	3.2	0	0	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	7.2	0	12.8	94.4	5.6	0	0	7	88	WA

Action	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
hydrological management	7.1	0	0	90.4	9.6	7.8	0	90	1228	Australia
	0	0	0	100	0	0	0	9	234	Alps
	0	0	0	100	0	0	0	2	87	EGipps
	3.3	0	0	96.5	3.5	0	0	23	358	GBM
	6.3	0	0	86.3	13.7	0	0	6	36	KI
	0.9	0	0	100	0	0	0	14	308	NCT
	2.1	0	0	100	0	0	0	18	258	NSWSC
	3.2	0	0	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	0	0	0	100	0	0	0	7	88	WA
herbivore control	4.9	0	5.9	98	2	1.1	0	90	1228	Australia
	1.4	0	0	100	0	0	0	9	234	Alps
	0	0	0	100	0	0	0	2	87	EGipps
	4.9	0	9.2	100	0	0	0	23	358	GBM
	12.5	0	20.7	86.7	13.3	0	0	6	36	KI
	0.9	0	0	100	0	0	0	14	308	NCT
	6.2	0	3.1	94.4	5.6	5.6	0	18	258	NSWSC
	3.1	0	0	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	5.4	0	10.5	100	0	0	0	7	88	WA

Table A4.12: Long term (2 to 20 years post fire) actions by region

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
tailored fire management	42.4	25	61.6	30.8	69.2	46.8	0	78	1228	Australia
	23.4	1.5	43.3	68.8	31.2	22.2	0	9	234	Alps
	24.8	12.3	37	60.7	39.4	0	0	2	87	EGipps
	46.8	31.9	63.5	22.8	77.2	54.8	0	20	358	GBM
	62.6	56.3	68.8	0	100	100	0	4	36	KI
	45.6	19.5	65.3	32.8	67.2	64.3	0	14	308	NCT
	29.7	8.4	50	54.9	45.1	25	0	16	258	NSWSC
	46	34.9	55.7	12.3	87.7	33.3	0	3	97	SEQ
	62.7	56.7	68.7	0	100	100	0	1	31	TAS
	54.2	44	65.4	6.4	93.6	66.7	0	6	88	WA
replanting and restoration	22.4	0	41.2	60	40	13.5	0	83	1228	Australia
	16.5	0	35.4	65.3	34.7	0	0	9	234	Alps
	6.3	0	12.2	100	0	0	0	2	87	EGipps
	29.4	0	46.3	47.1	52.9	18.4	0	20	358	GBM
	44.7	33.6	54	14.3	85.7	29.7	0	5	36	KI
	9.9	0	25.2	79.8	20.2	0	0	14	308	NCT
	13.3	0	29.3	75.8	24.2	0	0	15	258	NSWSC
	18.8	0	37.5	59.7	40.3	0	0	4	97	SEQ
	37.6	31.4	43.8	19.3	80.7	0	0	1	31	TAS
	5.4	0	10.5	100	0	0	0	7	88	WA
re-introduction of target species	13.2	0	27.7	77.1	22.9	5.8	0	83	1228	Australia
	18.1	0	37.7	67	33	11.1	0	9	234	Alps
	6.2	0	12.4	100	0	0	0	2	87	EGipps
	16.9	0	32.6	72.3	27.7	6.8	0	20	358	GBM
	0	0	0	100	0	0	0	5	36	KI
	20.6	0	38.8	61.1	38.9	7.1	0	14	308	NCT
	18.3	0	35.6	68.7	31.3	10	0	15	258	NSWSC
	3.2	0	0	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	5.4	0	0	88.5	11.5	0	0	7	88	WA

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
weed control	9	0	13.6	89.3	10.7	3.6	0	84	1228	Australia
	8.3	0	0	82.2	17.8	0	0	9	234	Alps
	6.2	0	12.3	100	0	0	0	2	87	EGipps
	5.7	0	10.2	97.9	2.1	0	0	20	358	GBM
	29.8	2.9	59.5	60	40	40	0	5	36	KI
	9	0	12.7	82.5	17.5	0	0	14	308	NCT
	5.4	0	6	95	5	0	0	16	258	NSWSC
	3.1	0	0	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	5.4	0	10.7	100	0	0	0	7	88	WA
soil stabilisation	8.2	0	12.6	89.3	10.7	1.2	0	84	1228	Australia
	8.4	0	0	82.1	17.9	0	0	9	234	Alps
	6.3	0	12.6	100	0	0	0	2	87	EGipps
	8.1	0	12.5	88.2	11.8	0	0	20	358	GBM
	27.6	10.5	44	63.9	36.1	20	0	5	36	KI
	3.5	0	0	94.4	5.6	0	0	14	308	NCT
	7	0	8.3	89.9	10.1	0	0	16	258	NSWSC
	0	0	0	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	1.8	0	0	100	0	0	0	7	88	WA
ex-situ conservation	7.6	0	4.6	88.1	11.9	2.4	0	84	1228	Australia
	12.4	0	18.8	80.2	19.8	11.1	0	9	234	Alps
	12.3	0	23.7	80.7	19.3	0	0	2	87	EGipps
	9.4	0	16.9	83.8	16.2	0	0	20	358	GBM
	5.1	0	9.6	100	0	0	0	5	36	KI
	3.6	0	0	94.2	5.8	0	0	14	308	NCT
	15.6	0	25.3	77.5	22.5	12.5	0	16	258	NSWSC
	0	0	0	100	0	0	0	4	97	SEQ
	37.7	31.3	43.8	18.8	81.2	0	0	1	31	TAS
	0	0	0	100	0	0	0	7	88	WA

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
host species re-introduction	7.6	0	0	88.7	11.3	5	0	84	1228	Australia
	7	0	0	90.1	9.9	5.9	0	9	234	Alps
	18.8	0	37.7	59.2	40.8	0	0	2	87	EGipps
	13.1	0	23.7	79.6	20.4	5.8	0	20	358	GBM
	0	0	0	100	0	0	0	5	36	KI
	3.6	0	0	94.2	5.8	0	0	14	308	NCT
	14.8	0	29.2	75.5	24.5	9.2	0	16	258	NSWSC
	9.4	0	6.3	79.4	20.6	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	0	0	0	100	0	0	0	7	88	WA
hydrological management	7.2	0	0	89.8	10.2	8.3	0	84	1228	Australia
	0	0	0	100	0	0	0	9	234	Alps
	0	0	0	100	0	0	0	2	87	EGipps
	3.1	0	0	96	4	0	0	20	358	GBM
	12.5	0	21.7	83.9	16.1	0	0	5	36	KI
	0.9	0	0	100	0	0	0	14	308	NCT
	0.8	0	0	100	0	0	0	16	258	NSWSC
	0	0	0	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	0	0	0	100	0	0	0	7	88	WA
control of introduced competitors	6.5	0	5.6	92.4	7.6	2.4	0	84	1228	Australia
	1.4	0	0	100	0	0	0	9	234	Alps
	6.4	0	13.1	100	0	0	0	2	87	EGipps
	10.5	0	16.4	85.3	14.7	4.9	0	20	358	GBM
	5	0	9.5	100	0	0	0	5	36	KI
	1.9	0	0	97	3	0	0	14	308	NCT
	5.4	0	6.3	95.1	4.9	0	0	16	258	NSWSC
	9.3	0	6.3	80.7	19.3	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	0	0	0	100	0	0	0	7	88	WA

Threat	mean	Q25	Q75	% <30	% >30	% >50	% >80	non-na sp	sp	region
herbivore control	5.1	0	7.1	97.1	2.9	0	0	84	1228	Australia
	1.4	0	0	100	0	0	0	9	234	Alps
	6.5	0	13	100	0	0	0	2	87	EGipps
	5	0	9.2	100	0	0	0	20	358	GBM
	20.2	3.3	34.5	67.5	32.5	0	0	5	36	KI
	0.9	0	0	100	0	0	0	14	308	NCT
	5.5	0	6.4	94.9	5.1	0	0	16	258	NSWSC
	0	0	0	100	0	0	0	4	97	SEQ
	0	0	0	100	0	0	0	1	31	TAS
	5.4	0	10.6	100	0	0	0	7	88	WA

http://www.nespthreatenedspecies.edu.au

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Threatened Species Recovery Hub

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