

Southwest National Park Tasmania

1–9 February 2016

Bush Blitz Species Discovery Program



Australian Government

Department of the Environment and Energy



bhpbilliton

Sustainable Communities



EARTHWATCH
INSTITUTE



Australian
Biological
Resources
Study

What is Bush Blitz?

Bush Blitz is a multi-million dollar partnership between the Australian Government, BHP Billiton Sustainable Communities and Earthwatch Australia to document plants and animals in selected properties across Australia.

This innovative partnership harnesses the expertise of many of Australia's top scientists from museums, herbaria, universities, and other institutions and organisations across the country.

Abbreviations

ABRS

Australian Biological Resources Study

ALA

Atlas of Living Australia

ANIC

Australian National Insect Collection

CSIRO

Commonwealth Scientific and Industrial Research Organisation

DPIPWE

Department of Primary Industries, Parks, Water and Environment (Tasmania)

EPBC Act

Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

QM

Queensland Museum

TMAG

Tasmanian Museum and Art Gallery

TSP Act

Threatened Species Protection Act 1995 (Tasmania)

TWWHA

Tasmanian Wilderness World Heritage Area

UNSW

University of New South Wales

Summary

In February 2016, a Bush Blitz expedition was conducted in southern Tasmania, including the south-eastern part of Southwest National Park and several smaller reserves also managed by Parks and Wildlife Service (Tasmania). Most of the study area is part of the Tasmanian Wilderness World Heritage Area, which is recognised for its outstanding natural and cultural values.

Thick forest and mountainous terrain make much of the region difficult to survey, and this Bush Blitz gave scientists unprecedented access to these remote wilderness areas. For most target groups, the area had only been partially surveyed prior to this Bush Blitz; the expedition provided an opportunity to build up collections and fill knowledge gaps on biodiversity and distribution. In particular, high altitude sites, including the summits of mountains such as Mt Picton, Mt Louisa and North East Ridge, were surveyed, probably for the first time for most of the target groups.

Despite drought conditions and the threat of bushfire having an impact on diversity records for some of the target groups, 1244 species were recorded during the Bush Blitz. At least 458 of these species are thought to be new records for the study area and among these 64 may be new to science (6 moths, 3 Heteroptera, 3 thrips, 46 spiders, 1 land snail, 1 vascular plant and 4 lichens). Two threatened animal species were recorded: Tasmanian Devil (*Sarcophilus harrisii*) is listed as Endangered under the EPBC Act and TSP Act, and Lake Pedder Caddisfly (*Taskiria mccubbini*) is listed as Endangered under the TSP Act. One of the vascular plant species, *Poranthera petalifera*, is listed as Vulnerable under the EPBC Act and TSP Act and four others are listed as Rare under the TSP Act: *Comesperma defoliatum*, *Crassula moschata*, *Orites milliganii* and *Ranunculus acaulis*. One of the mosses, *Ambuchanania leucobryoides*, is also listed as Rare under the TSP Act.

Some highlights of this Bush Blitz included:

- the collection of the first tissue samples from amphibians and reptiles in the study area
- significant range extensions for a number of target taxa, including several lichen species that were recorded for the first time for Australia
- the discovery of 46 putative new spider species, despite conditions being less than ideal
- the collection of little known thrips, including *Dactylothrips australis*, previously known only from a female taken at Melbourne in 1914
- the collection of 313 moth species, including species recorded for the first time for Tasmania, six putative new species and several rare and uncommon species.

One introduced bird and 16 exotic or pest invertebrate species were recorded. Many of the invertebrate pests are actually Australian natives that are considered agricultural pests. No declared weeds were encountered; however, three exotic vascular plants were recorded and three introduced moss species were collected adjacent to walking tracks and campgrounds.

Threats to the diversity of this remote area are a concern, including climate change and the introduction of diseases by bushwalkers. Land managers are encouraged to gain a better understanding of the diversity of the region—in particular, the fauna. Only through further survey effort, including the strategic collection of voucher specimens, can we develop the knowledge of distributions, habitat requirements and distinctiveness of the fauna needed for its conservation.

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Introduction

This is a report for the Bush Blitz program, which aims to improve our knowledge of Australia's biodiversity. Bush Blitz is an initiative of the Australian Government, through the Australian Biological Resources Study (ABRS), in partnership with BHP Billiton Sustainable Communities and Earthwatch Australia. Bush Blitz aims to:

- promote, publicise and demonstrate the importance of taxonomy through species discovery
- undertake a national species discovery program
- support the science of taxonomy in Australia through training of students and early career researchers, and by providing grants for species description and resolution of taxonomically problematic, nationally important groups
- promote partnerships between scientific institutions, government, industry and non-government organisations
- inform reserve managers and other stakeholders of the results of Bush Blitz projects.

The Southwest National Park Bush Blitz

This Bush Blitz took place during February 2016. The months preceding the Bush Blitz were unusually hot and dry. The late summer timing, combined with drought conditions, probably had an impact on the diversity recorded for some of the target groups.

The area covered by this Bush Blitz included several protected areas in southern Tasmania as well as some places outside protected areas, including the Far South Wilderness Camp (base camp) near Strathblane.

Bush Blitz provided the logistical coordination and overall leadership for the survey. The Tasmanian Museum and Art Gallery (TMAG) was the host institution for this Bush Blitz, providing the core group of personnel and accessioning the specimens into their collection. Experts from the following organisations also conducted the field and laboratory work:

- Queensland Museum (QM)
- University of New South Wales (UNSW)
- Australian National Insect Collection (ANIC).

Acknowledgements

The ABRS acknowledges the traditional owners of country throughout Australia and their continuing connection to land, sea and community. We pay our respects to them and their cultures and to their elders both past and present.

The Bush Blitz team consisted of Kate Gillespie, Karl Newport and Justin Forster. They would like to thank all participants, staff at Parks and Wildlife Service (Tasmania) who provided advice and facilitated access to the reserves, the helicopter company (Helicopter Resources) and pilots Dan Grant and Dave

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Pullinger, and the Far South Wilderness Lodge who provided comfortable accommodation and good food in a beautiful setting.

Reserve overview¹

Reserve names: Southwest National Park (part), Hartz Mountains National Park, Southport Lagoon Conservation Area, Arve Loop Conservation Area, Weld River Regional Reserve, Esperance River Conservation Area, Picton River Conservation Area, Narrows Road Nature Reserve, Recherche Bay Nature Recreation Area and Catamaran River Conservation Area.

Area: approximately 3,400 km².

Description

This Bush Blitz takes its name from Southwest National Park because more than half of the study area is within the boundaries of this park; however, this is the largest national park in Tasmania and only the south-eastern part of the park is within the study area. In addition, several smaller reserves, all located near the eastern boundary of Southwest National Park, are within the study area. All of these protected areas are managed by Parks and Wildlife Service (Tasmania).

The geography of the region is complex but dominated by the effects of multiple glaciations, the legacy being many formations characteristic of glacial action, such as tarn lakes and moraines. The area is mountainous, reaching, for Australia, considerable altitude; many peaks are over 1000 m. These peaks are subjected to the cold, wet and windy conditions generated by proximity to the southern seas. The climate is temperate humid and the nutritional status of the soils low.

The study area includes a wide range of vegetation types. Of note is the extensive semi-alpine environment; however, the area also includes wet eucalypt and temperate forests, buttongrass moors, coastal heath and other vegetation types. The thick forest and mountainous terrain make much of the area inaccessible except by helicopter. This significant area of wilderness is subject to very little human activity apart from bushwalking. The area has been significantly affected by wild fires and, pre-European settlement, by Indigenous burning activity, leading to a mosaic of vegetation types from climax *Lophozonia* (*Nothofagus*)-dominated rainforest to open *Gymnoschoenus*-dominated sedgeland. The eucalypt flora is dominated by one species, *Eucalyptus nitida*, which is widespread and, together with *Acacia*, *Leptospermum* and *Melaleuca*, dominates the margins of rainforest.

Conservation values

Most of the study area is part of the Tasmanian Wilderness World Heritage Area (TWWHA) that was formally recognised in 1982 as a mixed World Heritage site for its Outstanding Universal Value. World Heritage sites are places that are important to and belong to everyone, regardless of where they are located. They are an irreplaceable legacy that the global community wants to protect for the future. A mixed site is one that contains elements of both natural and cultural significance.

¹ <http://www.environment.gov.au/heritage/places/world/tasmanian-wilderness/values>

The TWWHA is a precious cultural landscape that was shaped and managed by Aboriginal people for more than 35,000 years. The TWWHA contains globally significant examples of outstanding and exceptional cultural heritage, reflecting the long occupation of the area by Tasmanian Aboriginal people. The TWWHA contains one of the longest, richest and best-preserved human occupation records from the most recent ice age. It is inscribed on the World Heritage List under the following three cultural criteria:

- Bear a unique or at least exceptional testimony to a civilisation which has disappeared
- An outstanding example of a traditional human settlement which is representative of a culture which has become vulnerable under the impact of irreversible change
- Directly or tangibly associated with events or with ideas of beliefs of outstanding universal significance.

The TWWHA is of immense importance as a natural ecosystem. It contains large expanses of remote and difficult terrain, including a great variety of interconnected habitats and landscapes that have been disturbed less by post-settlement activities than other parts of Tasmania. The TWWHA is inscribed on the World Heritage List under four natural criteria:

- Outstanding examples representing the major stages of the earth's evolutionary history (e.g. relict biota, like the King Billy Pine, *Athrotaxis selaginoides*, which shows links to ancient Gondwanan biota)
- Outstanding examples representing significant ongoing geological processes, evolution and man's interaction with his natural environment
- Contains superlative natural phenomena, formations or features, for instance outstanding examples of the most important ecosystems, areas of exceptional natural beauty or exceptional combinations of natural and cultural elements
- Contains the most important and significant habitats where threatened species of plants and animals of outstanding universal value, from the point of view of science and conservation, still survive.

Methods

Taxonomic groups studied and personnel

A number of taxonomic groups were selected as targets for study. Table 1 lists the groups surveyed and the specialists who undertook the fieldwork.

Table 1 Taxonomic groups surveyed and personnel

Group	Common name	Expert	Affiliation
Amphibia and Reptilia	Amphibians and reptiles	Andrew Amey	QM
		Alex Dudley	independent
Lepidoptera	Moths	Andreas Zwick	ANIC
	Moths	Catherine Byrne	TMAG
	Butterflies	Abbey Throssell	TMAG
Trichoptera	Caddisflies	Alice Wells	ANIC
Diptera	Flies	Bryan Lessard	ANIC
Coleoptera	Leaf beetles	David de Little	TMAG
Heteroptera	True bugs	Ryan Shofner	UNSW
Thysanoptera	Thrips	Alice Wells	ANIC
Odonata	Dragonflies and damselflies	Abbey Throssell	TMAG
Arachnida	Spiders	Robert Raven	QM
Gastropoda	Land snails	Kevin Bonham	independent
Vascular plants	Vascular plants (exotic)	Matthew Baker	TH
	Vascular plants (native)	Miguel de Salas	TH
Bryophytes	Mosses, hornworts, liverworts	Lynette Cave	TH
Lichens	Lichens	Gintaras Kantvilas	TH

In addition to these target groups, mammals and birds were recorded opportunistically and insects of miscellaneous groups were collected.

The Bush Blitz team would also like to acknowledge the contributions of the following people:

- Gerry Cassis and Serena Lam from UNSW assisted with specimen curation, data management and report writing for Heteroptera
- Kirrily Moore, Nicole Zehntner, Nic Merrit-Smith, Kath Sinkora, Seb Young and Di Moyle from TMAG assisted with collection, registering, labelling and pinning of specimens, and data entry

- Barbara Baehr (identification) and Robert Whyte (identification and photography) from Queensland Museum, and John Douglas from Queen Victoria Museum and Art Gallery (photography) assisted with the identification and photography of spiders
- Laurence Mound (ANIC) identified thrips
- Matilda Brown provided technical assistance to the vascular plant team
- Ted Edwards (ANIC) and Peter McQuillan (University of Tasmania) identified moths
- ANIC staff and volunteers Diana Hartley, You Ning Su and Peter Macnicol generated DNA barcode data, and assisted with staging and labelling of moth specimens
- The Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE), particularly Michael Driessen and Shannon Troy, gave advice and encouragement for vertebrate surveys.

Site selection

All scientists surveyed two standard survey sites selected by Bush Blitz using modelling prepared by CSIRO. Each standard survey site was centred on a point (permanently marked), but the actual area surveyed varied between taxa. Standard methodologies were used to sample these sites.

The use of standard survey sites provides a unique opportunity to examine broad-spectrum biodiversity. Among other benefits, this will enable Bush Blitz's partners at CSIRO to test assumptions (e.g. about relationships between the diversity of different taxa) that underpin many conservation decisions. It will also allow comparisons between sites, and establish a basis for future monitoring by reserve managers.

Aside from standard survey sites, site selection and collection methods were at the discretion of the individual scientist. Site selection depended on access, suitability for trapping and time restrictions. Other considerations included:

- **Amphibian and reptile** sites were largely determined by permit restrictions, which only allowed collection of vouchers at sites that could only be accessed by helicopter. Effort was concentrated on those sites but included the standard survey sites that were accessible by car.
- **Moth** sites were selected to maximise representation of differing vegetation communities and land systems but recently burnt or logged sites were avoided. Site selection was refined to conform to the collecting schedule of other participating scientists and the availability of adequate roads to transport collecting equipment.
- **Butterfly** sites were mostly open ground and forest edges and were chosen to cover a range of habitats.
- **Caddisflies and thrips** were collected at selected sites within reserves but also several readily accessible sites within the study area. Whenever time was available, thrips were collected intensively in the coastal vegetation around the base camp.
- **Leaf beetle** sites were selected to give maximum geographic and potential host plant diversity.
- **Dragonfly and damselfly** sites were selected in areas near water, such as waterholes and creeks, and to cover a range of habitats.
- **Spider** sites were initially chosen using Google Earth, then based upon accessibility, proximity to water and safe night access. Some sites were subsequently avoided because of concerns about Indigenous sacred sites or because rope climbing on cliff faces would be necessary.
- **Land snail** sites were chosen based on the potential for new snails (prioritising non-quartzite mountains), to the extent that this fitted in with other participants. Three further helicopter sites

were selected based on apparent interest value for snails but only one of these (on Mt Picton) could be accessed during the available time.

- **Vascular plants and bryophytes** were surveyed at eight sites scattered throughout Southwest National Park. **Lichen** surveys were conducted at two of these sites. Accessibility was a primary determinant of site selection, coupled with attempting to cover as many habitat and underlying geology types as possible within the allocated time.

Site locations were recorded using global positioning systems.

Survey techniques

A standard suite of survey techniques was used:

- **Amphibian and reptile** specimens were collected by hand and either tail-tipped and released or retained as vouchers. This was done under the Department of Primary Industries, Parks, Water and Environment (Tasmania) (DPIPWE) Permit to Take Wildlife for Scientific Purposes FA15325 and Queensland Museum Ethics Committee permit 15-01. The DPIPWE permit authorised collection of tissue samples by tail-tip throughout the study area but only authorised voucher collection at sites accessible by helicopter only. This meant that vouchers could only be collected at a small number of sites, during the day, in the time between drop off and pick up by helicopter. Consequently traps (funnel or pit), needing to be in place for several days to be effective, were not used. As night work was limited to sites that could be reached by walking or car, only observation or tail-tipping was used at these sites. Tissue samples were taken only for lizards and snakes—approximately the last 1 cm of tail was snipped using surgical scissors sterilised in ethanol. The sample was immediately placed in a vial of 90% ethanol solution and labelled. The animal was then released. The entire procedure was accomplished within a few minutes. Voucher specimens were euthanased humanely with an injection of Nembutal on the day of capture, then fixed in 10% formalin. After one week, they were rinsed and transferred to 70% ethanol solution for permanent storage.

The two standard survey sites were accessed by car so no vouchers could be collected and the standard methods used in other Bush Blitzes were modified accordingly. Two people walked an area within 100 m of the Standard Survey Site marker for one hour and noted any frogs, reptiles, birds or mammals that were seen, heard or otherwise observed (i.e. calls, scats or tracks). Only observations that could be identified to species with confidence were recorded. This was performed once during the day and once at night, with head torches for spotting.

While amphibians and reptiles were the focus of vertebrate surveys, bird and mammal observations were made whenever possible.

- **Nocturnal adult moths** were collected at night using two types of light trap—portable bucket traps with MV black lights; and a 160W MV lamp, a sheet and a portable generator. Portable bucket traps were distributed over as many different plant communities as possible.
- **Butterflies, day-flying moths, dragonflies and damselflies** were surveyed mainly by opportunistic aerial netting of active adults, with occasional sweeping of vegetation near water. The aims of collecting at each site were to maximise the diversity of species recorded in each reserve and in the reserve network as a whole. Surveying at each site was free-ranging over a small area (typically 50 m or so) around a central point. Search times varied from passing searches to around 90 minutes, depending on the interest value of the site and logistics. Butterflies and moths were preserved by killing with ammonium hydroxide and pinning with wings set. Specimens were then removed from the setting boards once fully set (after at least one week) and stored in temporary storage boxes before moving to the TMAG collection store. Odonates were starved for approximately 24 hours

before killing, to clear gut contents and help preserve colour. They were killed by immersion in acetone for a few minutes, before pinning with wings spread on pieces of cardboard and immersing in acetone again for approximately 24 hours, or in pure ethanol for approximately 48 hours. Standard sites were surveyed by aerial netting for one hour per site, during the day.

- **Caddisflies** were collected at streams by sweep-netting of vegetation for adults, and at night at light sheets illuminated by MV and UV lights, or in bucket traps (usually as “by-catch” of collecting for moths by other participants). All specimens were stored in 95% ethanol. Only very few immature stages were hand-picked from rocks in streams. The same method for collection of adults was used at standard survey sites and, while neither site was close to a freshwater body, the lights attracted caddisflies from afar.
- **Flies** were collected manually with hand nets during the day. Additionally, flight-interception traps and light traps were used. The latter consisted of two bucket light traps with 8W UV fluorescent tubes powered by batteries, as well as one sheet illuminated with a 250W mercury vapour light powered by a quiet generator (Honda EU10i), enabling the selective picking of specimens from the illuminated sheet. Bucket light traps and light sheets were operated simultaneously at different locations to cover different habitats in remote areas (bucket light traps) and sites accessible by road (light sheet). Standard survey sites were difficult to collect at with a net due to the thick vegetation and close proximity to the roadside.
- **Beetles** were collected using two methods: accessible foliage was beaten onto a standard entomological beating tray, the live beetles then transferred into tubes; loose bark was stripped from tree trunks, exposing beetles that were then collected by hand.
- **Heteroptera** were collected by beating or sweeping of vegetation, focusing on flowers, fruits and seeds. Specimens were also collected using light traps and bucket traps. For standard survey sites, specimens were collected by sweeping herbaceous and woody vegetation with a sweep net for one hour per site.
- **Thrips** were collected by beating foliage, flowers and dead wood onto a white plastic tray; the specimens were picked from the tray with a fine brush, and stored in 95% ethanol.
- **Spiders** were collected using a variety of methods depending on the habitat—eucalypt, creekside, intertidal or swamp. Methods included log-rolling, rock-rolling, bark-brushing, sorting through litter, bark-stripping, pitfall trapping and soil-brushing.
- **Land snails** were hand collected with the main aim being to record as many species as possible at each site. Surveying at each site was free-ranging over a small area (typically 50 m or so, in some situations up to 100 m) around a central point. Search times per site varied from passing searches to up to two hours, depending on the interest value of the site and logistics. Opportunistic collecting by other members of the party produced two significant range extensions. One small bag of *Astelina* leaf litter was taken at one site and sorted.

Both standard survey sites were surveyed by hand collection (with searching of litter, logs, bark, rocks, moss on trees and other available microhabitats) for two hours. Due to time and transport constraints, each site was surveyed across two separate days, partly by day and partly by torchlight at night. SSS1 was difficult to survey because of a lack of opportunities to get off the road safely for any substantial distance.

- **Vascular plants** were pressed in newspaper as they were collected or placed into plastic bags and pressed at the end of the day at base camp.
- **Bryophytes** were placed directly into pre-folded packets as they were collected, with some additional sorting later using a microscope. All plant material was allowed to dry at room temperature until transfer to the laboratory where standard drying procedures were implemented.

- **Lichens**, because of their small size and intermingled pattern of growth, were collected as mixed samples and later sorted with the aid of a dissecting microscope. They were then packeted for further study in the laboratory.

Identification

The specimens taken were identified using available literature and the holdings of museums and herbaria. Most specimens, vouchers and tissues, were lodged at TMAG, except most thrips, which were lodged at ANIC. Some caddisflies were also lodged at ANIC and a small number of vertebrate specimens were lodged at the Queensland Museum. All specimen data are available through the Atlas of Living Australia.

Results

Locational data for all flora and fauna records are available to reserve managers. At least 458 species were new records for the study area (some results are yet to be finalised and the total excludes general insects), including 64 putative new species—these await formal identification. Two threatened animal species were recorded and six threatened plants. Seventeen exotic or pest animal species and six weed species were also recorded.

Table 2 provides a summary of the flora and fauna records for the study area.

Table 2 Summary of flora and fauna records

Group	Common name	Total species recorded	Species newly recorded for study area	Putative new species	Threatened species*	Exotic and pest species**
Mammalia	Mammals	6	0	0	1	0
Aves	Birds	40	0	0	0	1
Reptilia	Reptiles	8	0	0	0	0
Amphibia	Frogs and toads	5	0	0	0	0
General insects	Bees	2	N	0	0	1
	Scorpionflies	1	N	0	0	0
	Beetles (excl. leaf beetles)	52	N	0	0	1
	Lacewings	1	N	0	0	0
	Cicadas and leaf hoppers	5	N	0	0	0
	Grasshoppers	3	N	0	0	0
Lepidoptera	Moths	313	264	6	0	6
	Butterflies	6	0	0	0	0
Trichoptera	Caddisflies	52	3	0	1	0
Diptera	Flies	17	7	0	0	0
Coleoptera	Leaf beetles	6	6	0	0	1
Heteroptera	True bugs	34	33	3	0	1
Thysanoptera	Thrips	39	39	3	0	3
Odonata	Damselflies and dragonflies	6	0	0	0	0
Arachnida	Spiders	68	68	46	0	1
Gastropoda	Snails and slugs	35	3	1	0	2

Group	Common name	Total species recorded	Species newly recorded for study area	Putative new species	Threatened species*	Exotic and pest species**
Vascular plants	Vascular plants	273	14	1	5	3
Bryophytes	Mosses, liverworts and hornworts	156	7	0	1	3
Lichens	Lichens	116	14	4	0	0
Total		1244	458	64	8	23

* Species listed as Threatened under the Commonwealth EPBC Act or an equivalent listing under the TSP Act.

** Includes native species that at times are pests or are exotic to this region.

N Data was not provided on whether general insects were newly recorded for the study area.

Species lists

Lists of all species recorded during the Bush Blitz are provided in [Appendix A](#). Species lists were compiled using data from participating institutions.

Some specimens have been identified only to family or genus level. This is partly because identification of specimens is very time-consuming, with detailed microscopic examination needed in many cases. Also, some groups are 'orphans': currently no experts are working on them, or are available to work on them, and the taxonomic literature is out of date; species-level identification is not possible for these groups. Unidentified Bush Blitz specimens are held in institutional collections where they are available for future study. Collections hold many such specimens, among them species not yet described (i.e. unnamed species) as well as described species that have not been identified. For example, ANIC holds tens of thousands of unidentified specimens. Specimens often wait decades before the resources become available for their study. A key component of Bush Blitz is the funding of studies of specimens collected on Bush Blitz surveys.

Nomenclature and taxonomic concepts used in this report are consistent with the Australian Faunal Directory, Australian Plant Name Index, Australian Plant Census, AusMoss, and the Catalogue of Australian Liverworts and Hornworts.

Discussion

Putative new species

Here we use the term ‘putative new species’ to mean an unnamed species that, as far as can be ascertained, was collected for the first time during this Bush Blitz. It is confirmed as a new species once it is named and its description published. Specimens collected during the Bush Blitz also include unidentified taxa that are already known from museum and herbarium collections—these are not counted as putative new species.

Fauna

Invertebrates

Moths

While most of the undescribed species had been collected previously in other parts of Tasmania, specimens from six species in six families were collected that had probably never been collected before. These specimens could not be identified from other collections, including ANIC. One specimen of a new genus and species from the family Depressariidae was collected in semi-alpine heathland in the Southwest National Park. Four specimens of a new species of *Lackrana* (Geometridae), were collected at Southport Lagoon Conservation Area. This latter species is an exciting find as the Tasmanian Geometridae are relatively well known. One specimen only of a new species of the tiny micro-moth family Nepticulidae was collected at Glovers Bluff.

Heteroptera

One putative new genus and two putative new true bug species were collected, belonging to the families Miridae and Tingidae. In total, 27 heteropteran taxa will require further taxonomic work in order to be identified as established species or described as new species.

Thrips

One putative new thrips species, ?*Cryptothrips* sp.n., was beaten from among stem galls on an *Allocasuarina* species at E. Louisa Bay, Southwest National Park. Two other putative new species were collected from Strathblane Wilderness Camp. *Anaphothrips* sp.n., a member of a worldwide genus, was beaten from dead wood. *Nesothrips* sp.n. was beaten from *Sarcocornia quinqueflora* and is from a genus that is widespread, in the Oriental, Pacific and Australian regions.

Spiders

The 46 undescribed taxa collected during the Bush Blitz are likely to be new species; however, their descriptions cannot be published until additional male specimens are collected. The *Migas* sp was identified from its distinctive nest but no specimens were found.

Land snails

One new, very small (shell width <2 mm), punctid species was collected at a site on a minor summit of a mountain called Mesa, near Adamsons Peak in Southwest National Park. A single crumpled dead shell was collected, found under a large rock on a bare slope in low alpine heathland. The specimen was initially thought to be Punctidae gen “Snow” sp “Hartz”, which was collected at the same site, but post-

survey examination under the microscope found that its sculptural features were not consistent with that species. Only one specimen was found in almost one hour of searching. The shell sculpture most closely resembles that of *Pedicamista* sp. "Chisholm", a common lowland arboreal species that occurs statewide in wet forests, but the shell has a globular appearance more similar to that of other alpine punctids (*P.* sp. "Chisholm" is turbinate) and is less calcareous. The species also appears to be much smaller although possibly the specimen is juvenile.

Table 3 Putative new invertebrate species

Family	Species
Moths	
Depressariidae	Genus nov. sp. nov.
Geometridae	<i>Lackrana</i> sp. CB06 BB SWTas
Nepticulidae	<i>Stigmella</i> sp. CB19 BB SWTAS
Oecophoridae	<i>Artiastis</i> sp. CB01 BB SWTas
Plutellidae	<i>Phalangitis</i> sp. CB17 BB SW
Tortricidae	<i>Acropolitis</i> sp. BB SWTas CB21
Heteroptera	
Miridae	Gn_" <i>Bilbonotus</i> " sp_BBSWT15_Msp.003
Tingidae	<i>Tingis</i> sp_BBSWT15_Msp.019
Tingidae	<i>Ulonemia</i> sp_BBSWT15_Msp.020
Thrips	
Phlaeothripidae	? <i>Cryptothrips</i> sp.n.
Phlaeothripidae	<i>Nesothrips</i> sp.n.
Thripidae	<i>Anaphothrips</i> sp.n.
Spiders	
Agelenidae	Agelenidae spTas
Anyphaenidae	<i>Amaurobioides</i> sp nov
Araneidae	<i>Araneus</i> sp_ft1
Araneidae	<i>Araneus</i> sp2_rhom
Arkyidae	<i>Arkys</i> "xarchem1"
Arkyidae	<i>Arkys</i> sp2
Clubionidae	<i>Clubiona</i> sp1
Clubionidae	<i>Clubiona</i> sp2_smRed

Family	Species
Cycloctenidae	<i>Cycloctenus</i> sp.
Desidae	Desidae N1
Desidae	Desidae N2
Desidae	Desidae sp1
Desidae	Desidae sp2_sm
Gnaphosidae	Gnaphosidae sp_amoxepi
Idiopidae	<i>Arbanitis</i> sp.
Linyphiidae	<i>Erigoninae</i> sp1_hiHd
Linyphiidae	<i>Laetesia</i> sp.
Linyphiidae	<i>Laperousea</i> sp1
Lycosidae	<i>Artoria</i> sp?
Mimetidae	<i>Australomimetes</i> sp.
Miturgidae	<i>Hestimodema</i> spi5
Orsolobidae	<i>Tasmanoonops</i> sp1
Salticidae	<i>Prostheclina</i> sp1
Salticidae	Salticidae 7_longBsh
Salticidae	Salticidae sp1
Salticidae	Salticidae sp10_dkflnks
Salticidae	Salticidae sp11BgPLE
Salticidae	Salticidae sp2
Salticidae	Salticidae sp3
Salticidae	Salticidae sp4
Salticidae	Salticidae sp5
Salticidae	Salticidae sp6
Salticidae	Salticidae sp8_dk1
Salticidae	Salticidae sp9_ft
Segestriidae	<i>Ariadna</i> sp.
Stiphidiidae	<i>Baiami</i> sp?
Stiphidiidae	Stiphidiidae sp1

Family	Species
Tetragnathidae	<i>Metinae</i> sp1
Tetragnathidae	<i>Orsinome</i> sp.
Theridiidae	cf <i>Steatoda</i> sp?
Theridiidae	Theridiidae sp_liny
Toxopidae	<i>Midgee</i> spT1
Toxopidae	<i>Toxopsoides</i> Tk1
Zodariidae	<i>Habronestes</i> sp1
Zodariidae	<i>Pentasteron</i> sp?
Land snails	
Punctidae	<i>Pedicamista</i> sp "Mesa"

Flora

Vascular plants

One potentially new vascular plant was collected during the survey. *Craspedia* sp. Northeast Ridge (M.F. deSalas 1559) Tas Herbarium is an undescribed daisy collected only from a south-east facing gully in montane forest, on alkaline conglomerate at North East Ridge.

Lichens

Four putative new species of lichens were collected. The unknown *Arctomia* sp. is a minute, squamulose lichen with a Nostoc cyanobiont. While there is insufficient material to describe the species, this is a very interesting collection worthy of further study. *Diploschistes* sp. is a remarkable, probably new, lichen of uncertain affinity, but with insufficient material for further investigation. *Protopannaria* was collected on alpine limestone. It is highly likely to be an undescribed lichen but further work is required. *Trapelia* sp. was found on alpine limestone, an unusual substrate for this genus and, if the generic placement is correct, it is probably a new species of lichen.

Table 4 Putative new flora species

Family	Species
Vascular plants	
Asteraceae	<i>Craspedia</i> sp. Northeast Ridge
Lichens	
Arctomiaceae	? <i>Arctomia</i> sp.
Graphidaceae	? <i>Diploschistes</i> sp.
Pannariaceae	? <i>Protopannaria</i> sp.
Trapeliaceae	? <i>Trapelia</i> sp.

Threatened species

Australia is home to an estimated 580,000–680,000 species, most of which have not been described. Approximately 92% of Australian plants, 87% of mammals, 93% of reptiles and 45% of birds are endemic. Changes to the landscape resulting from human activity have put many of these unique species at risk. Over the last 200 years, many species have become extinct; many others are considered to be threatened, i.e. at risk of extinction.²

Fauna

Vertebrates

Mammals

Numbers of the Tasmanian Devil (*Sarcophilus harrisii*) have declined dramatically as Devil Facial Tumour Disease spreads across Tasmania, leading to upgrade of its status to Endangered under the Threatened Species Protection Act 1995 (Tasmania) (TSP Act) in 2008 and the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) in 2009. During the Bush Blitz, a scat was found at the summit of Mt Anne and prints were seen in sand at Cockle Creek. While abundance cannot be estimated from two observations, any indication of their continuing presence is noteworthy.

Table 5 Threatened vertebrate species

Family	Species	Common name	Status	Comments
Mammals				
Dasyuridae	<i>Sarcophilus harrisii</i>	Tasmanian Devil	Endangered (EPBC Act and TSP Act)	Cockle Creek (prints), Mt Anne (scat); abundance unknown

Invertebrates

Caddisflies

Among the few insects listed as threatened in Tasmania are 17 caddisflies. During the Bush Blitz, a single male kokiriid caddisfly, the Endangered Lake Pedder Caddisfly (*Taskiria mccubbini*), was taken at a light sheet at Moores Garden. Details are given in the Atlas of Living Australia of three specimens (the holotype and one paratype, and one further specimen) in the collection of the Museum Victoria; two 'sightings' are also listed. Other adults and larvae are reported to have been collected at the shores of the expanded Lake Pedder. Kokiriid larvae are generally associated with streams with sandy bases; larvae appear to be predatory.

² Chapman, A. D. 2009, Numbers of Living Species in Australia and the World, 2nd edn. Australian Biological Resources Study, Canberra.

Table 6 Threatened invertebrate species

Family	Species	Common name	Status	Comments
Caddisflies				
Kokiriidae	<i>Taskiria mccubbini</i>	Lake Pedder Caddisfly	Endangered (TSP Act)	One male taken by sweep net; probably uncommon

Flora

Six threatened plant species were encountered, including five species of vascular plants and one species of moss.

Ambuchanania leucobryoides is a poorly known Tasmanian endemic that is not often collected. During the Bush Blitz, several specimens were found with fruiting bodies—this was a significant find, given that only one fertile plant had been previously found.

No listed lichen species were collected; however, *Cladia oreophila*, an extremely uncommon endemic known only from a few peaks in the south-west, was collected from the Crest Range.

Table 7 Threatened flora species

Family	Species	Status	Abundance
Vascular plants			
Crassulaceae	<i>Crassula moschata</i>	Rare (TSP Act)	Locally common
Euphorbiaceae	<i>Poranthera petalifera</i>	Vulnerable (TSP Act and EPBC Act)	Locally common
Polygalaceae	<i>Comesperma defoliatum</i>	Rare (TSP Act)	Rare and inconspicuous
Proteaceae	<i>Orites milliganii</i>	Rare (TSP Act)	Rare
Ranunculaceae	<i>Ranunculus acaulis</i>	Rare (TSP Act)	Rare
Bryophytes			
Ambuchananiaceae	<i>Ambuchanania leucobryoides</i>	Rare (TSP Act)	Occasional

Exotic and pest species

Conservation reserves help to protect Australia's Rare and Threatened Ecosystems and provide refuge for species at risk. Invasive species can have a major impact on already vulnerable species and ecosystems, as well as economic, environmental and social impacts. The inclusion of exotic and pest

species records as part of this report is designed to provide land managers with baseline information to assist with further pest management programs.

Fauna

Vertebrates

The Southern Superb Lyrebird (*Menura novaehollandiae victoriae*) was introduced from Victoria between 1934 and 1949 to prevent its extinction from foxes.

Table 8 Pest or exotic vertebrate species

Family	Species	Common name	Comments
Birds			
Menuridae	<i>Menura novaehollandiae victoriae</i>	Southern Superb Lyrebird	Observed in standard survey sites; probably common; impacts uncertain

Invertebrates

Moths

Six of the moth species collected during the survey are recognised as pests and all of these are Australian natives. Several of them are most likely to be vagrants from the mainland. The most abundant of these was the Southern Armyworm (*Persectania ewingii*), which was recorded, as adults, from multiple high altitude sites. Southern Armyworm is an agricultural pest of *Pisum sativum*, *Linum usitatissimum* and *Hordeum* species and is not a pest in natural ecosystems. This vagrant is often 'blown over' Bass Strait from mainland Australia in strong northerly airflows.

Beetles

Tasmanian Eucalyptus Leaf Beetle (*Paropsisterna bimaculata*) is a species native to Tasmania that is considered a pest by the Tasmanian forest industry. Large populations of this species regularly defoliate commercial regrowth forests and plantations of *Eucalyptus regnans*, *E. obliqua*, *E. delegatensis* and *E. nitens*, causing considerable retardation of growth. The species has potential to spread to other *Eucalyptus*-growing regions of the world, as have closely related species.

The record of the dung beetle *Geotrupes spiniger* is surprising as this species is associated primarily with cattle dung; previous records are from open agricultural country further east or north. While the species is still spreading from its original points of introduction (in Victoria and northern Tasmania), its presence was unexpected in the cool, wet, continuous forest of southern Tasmania.

Heteroptera

The Rutherglen Bug (*Nysius vinitor*) is a pest of many crops in Australia, including sunflower, sorghum, canola and safflower.

Thrips

Three of the thrips species collected are pests of horticultural crops; however, they are not problem in native bushland.

Spiders

The money spider *Diplocephalus cristatus* has been introduced from Europe.

Snails and slugs

The exotic Hedgehog Slug (*Arion intermedius*) was recorded in small numbers at SSS2 at Arve Loop. The Cellar Snail (*Oxychilus cellarius*), which eats some native snails, was introduced from Europe. It was seen near the gates of Benders Quarry and, as a result, a site intended to be surveyed there was moved down the road to an area where it is not present. No listed pest species were recorded and no control measures are recommended.

Table 9 lists the pest and exotic invertebrate species that were collected or observed during the Bush Blitz.

Table 9 Pest or exotic invertebrate species

Family	Species	Common name	Comments
Bee			
Apidae	<i>Apis mellifera</i>	European Honey Bee	
Moths			
Erebidae	<i>Achaea janata</i>	Castor Semi-looper	Very likely to be a vagrant as this is probably a new record for Tasmania
Geometridae	<i>Chloroclystis approximata</i>		Pest of <i>Prunus avium</i> (cherry), <i>Malus domestica</i> (apple)
Noctuidae	<i>Agrotis infusa</i>	Bogong Moth	Pest on a wide variety of agricultural crops; frequently blown over Bass Strait and occasionally establishes populations, particularly in the north of Tasmania
Noctuidae	<i>Agrotis porphyricollis</i>	Variable Cutworm	Pest on <i>Beta vulgaris</i> (beet) and <i>Solanum tuberosum</i> (potato); likely to be a vagrant
Noctuidae	<i>Persectania ewingii</i>	Southern Armyworm	Migratory species; abundant and widespread
Nolidae	<i>Uraba lugens</i>	Gumleaf Skeletoniser	Pest on eucalypts in forestry plantations
Beetles			
Chrysomelidae	<i>Paropsisterna bimaculata</i>	Tasmanian Eucalyptus Leaf Beetle	Native pest; few
Geotrupidae	<i>Geotrupes spiniger</i>		Introduced dung beetle

Family	Species	Common name	Comments
Heteroptera			
Lygaeidae	<i>Nysius vinitor</i>	Rutherglen bug	Native pest
Thrips			
Phlaeothripidae	<i>Haplothrips victoriensis</i>		Horticultural pest
Thripidae	<i>Thrips imaginis</i>		Horticultural pest
Thripidae	<i>Thrips tabaci</i>		Horticultural pest
Spiders			
Linyphiidae	<i>Diplocephalus cristatus</i>		Introduced money spider
Snails and slugs			
Arionidae	<i>Arion intermedius</i>	Hedgehog Slug	
Zonitidae	<i>Oxychilus cellarius</i>	Cellar Snail	

Flora

Vascular plants

No declared weeds listed under Tasmanian legislation (*Tasmanian Weed Management Act 1999*) were encountered within the reserve; however, three introduced species were recorded. American Sea Rocket (*Cakile edentula*) was widespread and common at the coastal areas that were surveyed and is considered to be a significant environmental weed. The lack of exotic species at the inland sites highlights the wilderness nature of Southwest National Park. Spear Thistle (*Cirsium vulgare*) was recorded growing in river sand/gravel close to the margin of rainforest at the New River survey site. A small number of mature thistles were also recorded at the eastern end of Louisa Bay, growing on a sandy bank just above the high tide mark.

Bryophytes

Three introduced moss species were recorded during the survey. All were collected adjacent to highly visited walking tracks and campgrounds.

Table 10 lists the exotic plant species that were collected or observed.

Table 10 Non-gazetted weeds

Family	Species	Common name
Vascular plants		
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle
Asteraceae	<i>Leontodon saxatilis</i>	Hairy Hawkbit

Family	Species	Common name
Brassicaceae	<i>Cakile edentula</i>	American Sea Rocket
Bryophytes		
Brachytheciaceae	<i>Eurhynchium praelongum</i>	
Brachytheciaceae	<i>Pseudoscleropodium purum</i>	
Pottiaceae	<i>Barbula unguiculata</i>	

Range extensions

Fauna

Vertebrates

New locality records were made for four vertebrate species: Moss Froglet (*Crinia nimba*) (Mt Louisa and Crest Range), *Niveoscincus metallicus* (Prion Bay and Cockle Creek), *Niveoscincus pretiosus* (Prion Bay) and *Vombatus ursinus tasmaniensis* (Moore's Garden). The *C. nimba* records are particularly significant as it is a narrowly distributed species known only from alpine habitats in this region and any new localities significantly increase its known area of occupancy. All four species had been recorded previously within Southwest National Park and all except *C. nimba* are common species widely distributed in Tasmania. The new locality records reflect a lack of previous sampling effort.

Invertebrates

Moths

The third most commonly collected moth species was the endemic, semi-alpine geometrid, *Acalyphes philorites*. This moth was collected in large numbers at three high altitude sites including Mt Anne. These new records represent a significant range extension for this species as previously the species has only been found as far south as Tarn Shelf, Mt Field National Park, Tasmania. This is an interesting discovery as the species was thought to be restricted to Pencil Pine (*Athrotaxis cupressoides*) in Tasmania, which does not occur in the south-west. The finding of larvae of the species on King Billy Pine (*Athrotaxis selaginoides*) and Drooping Pine (*Pherosphaera hookeriana*) at sites where the moth was found, confirmed that these pines are also hosts for *A. philorites*. This has conservation implications for this species as the survival of high altitude native pine species in Tasmania will be compromised by climate change. The previous diversification of this endemic moth onto two hosts may assist its survival in the future. One specimen of a related species, the endemic Pencil Pine Moth (*Dirce aesiodora*) was also collected. Similarly, this species has never been collected so far south. This species is known to feed on King Billy Pine.

Castor Semi-Looper (*Achaea janata*) was collected on the top of Mt Louisa. It is most likely a migratory vagrant and is unlikely to establish a breeding population in Tasmania. This is a new record for the state, which represents a large range extension for this species. Other new records for Tasmania were the hypertrophid *Thudaca trabeata* and the geometrid *Amelora* sp.TASSWCBO6. *Amelora* sp.TASSWCBO6 is a known undescribed species on the mainland, including Victoria, and both specimens were taken at the Southport Lagoon.

Table 11 includes further range extensions for moths, some of which are very substantial; however, the nearest known record is based on the ALA and Bold Systems, which might not be representative of the specimens recorded in Australian collections. In particular, species might be far more widely distributed than the ALA and Bold Systems suggest.

Caddisflies

The known ranges for two caddisfly species were extended.

Flies

The published distributions of several fly species were extended into the south-west region of Tasmania, in some cases very substantially.

Heteroptera

The distribution records for all taxa identified in this report represent range extensions; however, these are not considered significant at present due to the lack of any existing baseline data.

Thrips

Only two thrips species were recorded previously from Southwest National Park and neither was collected on this Bush Blitz. Consequently, the known ranges of all thrips species recorded on this Bush Blitz have been extended by the collections taken.

Dragonflies

One widespread and common dragonfly species, Eastern Swamp Emerald (*Procordulia jacksoniensis*), was collected in Catamaran River Conservation Area, approximately 30 km further south than the nearest known record.

Spiders

Plesiothele fentoni, the most primitive (mygalomorph) spider in Australia, is a major range extension, showing that we have probably totally misunderstood the species. The species was described from Lake Fenton and has since only been found at one locality in the Central Highlands, so it would appear that those two known localities are actually very northern extensions of the range that is predominantly the south-west.

Land snails

Two large and eight small to medium range extensions were recorded within Southwest National Park. Minor extensions for common widespread species have not been included in Table 11 and there were no significant infill records.

Flora

Vascular plants

The ranges of several taxa recorded previously in Southwest National Park were extended significantly by the new records: *Oreomyrrhis gunnii*, *Pimelea cinerea*, *Lachnagrostis collicola*, *Lachnagrostis morrisii* and *Lepidium desvauxii*.

Bryophytes

Records of six moss taxa are noted as range extensions. Two additional named taxa were newly recorded from Southwest National Park: *Heteroscyphus ammophilus* is a poorly known species in Tasmania and *Hymenodontopsis mnioides* is common in other parts of Tasmania but not previously found in this area.

Lichens

Due to the difficulty of comparing the lichen data with earlier collections from the area, only records new for Tasmania or Australia are listed as range extensions. In total, 10 known species were listed as new records for Tasmania; four of these are considered new records for Australia.

Table 11 Range extensions

Family	Species	Comments
Frogs		
Myobatrachidae	<i>Crinia nimba</i>	Recorded at Mt Louisa (25km from nearest previous voucher at Mt La Perouse) and Crest Range (22km from nearest previous voucher at Mt Esperance)
Moths		
Bucculatricidae	<i>Ogmograptis scribula</i>	Recorded at Glovers Bluff, Weld; approx. 900 km from only previous record in the southern ACT/NSW border area.
Bucculatricidae	<i>Tritymba pamphaea</i>	Recorded at Arve Loop; approx. 650 km from nearest records in S QLD, NSW and E VIC
Depressariidae	<i>Thudaca trabeata</i>	New record for Tasmania
Erebidae	<i>Achaea janata</i>	Approx. 1500 km (based on ALA records)
Gelechiidae	<i>Ardozyga invalida</i>	Recorded from plateau at upper Arve River; approx. 950 km from nearest records in E NSW
Geometridae	<i>Acalyphes philorites</i>	Approx. 30 km; associated with host extension
Geometridae	<i>Amelora</i> sp.TASSWCB 06	New record for Tasmania
Geometridae	<i>Dirce aesiodora</i>	Approx. 30 km
Oecophoridae	<i>Oresitropha melanotypa</i>	Approx. 50 km; previously collected from Cradle Mountain and Pelion Hut, Central Plateau
Plutellidae	<i>Phalangitis</i> aff. <i>pellochroa</i>	Recorded from plateau at upper Arve River; close to, but not identical with, <i>P. pellochroa</i> from SW WA.
Pyralidae	<i>Assara</i> aff. <i>holophragma</i>	Recorded at Glovers Bluff, Weld; approx. 500 km from nearest records in QLD, NSW, VIC, SA, WA

Family	Species	Comments
Tineidae	<i>Opogona comptella</i>	Recorded at Lune River Rd, Southport Lagoon CA; approx. 500 km from nearest records in ACT, NSW, VIC
Tortricidae	<i>Cryptoptila crypsilopha</i>	Recorded at Glovers Bluff, Weld; approx. 650 km from nearest records in SE corner of NSW/VIC border
Tortricidae	<i>Dichelia cosmopis</i>	Recorded at Arve Loop; approx. 550 km from nearest records in SE NSW, SW WA
Tortricidae	<i>Glyphidoptera</i> aff. <i>insignana</i>	Recorded at Arve Loop; approx. 400 km from nearest records in S QLD, NSW, VIC, Flinders Island
Tortricidae	<i>Meritastis</i> aff. <i>trissochorda</i>	Recorded from plateau at upper Arve River; approx. 950 km from nearest records in E NSW
Tortricidae	Unplaced <i>placoxantha</i>	Recorded at New River, Southwest NP; 600 km from nearest records in VIC
Caddisflies		
Philorheithridae	<i>Austrheithrus glymma</i>	Collected at Glovers Bluff; nearest previous record Wedge River, Derwent Valley; uncommon
Plectrotarsidae	<i>Nanoplectrus truchanasi</i>	Collected in Picton CA; nearest previous record Derwent Valley; known from 3 type specimens only
Flies		
Stratiomyidae	<i>Boreoides subulatus</i>	Found in leaf litter at Hartz Mountains NP (SSS 1) and Mt Picton Summit; approx. 50 km SW of nearest record
Stratiomyidae	<i>Chiromyza prisca</i>	Found on sand near forest edge at Prion Beach; approx. 50 km SW of nearest record
Stratiomyidae	<i>Lecomyia caerulea</i>	Southwest National Park, bed of New River; taken in Malaise trap in dry creek bed; approx. 50 km SW of nearest record

Family	Species	Comments
Tabanidae	<i>Dasybasis</i> sp.	Southwest National Park, Old River; North East Ridge, nr Mt Anne; Hartz Mountains NP, Arve Loop Rd (SSS 2); attracted to humans and taken in Malaise trap near river bank; approx. 50 km SW of nearest record
Tabanidae	<i>Scaptia jacksonii</i>	Southwest National Park, Old River; North East Ridge, nr Mt Anne; Hartz Mountains NP, Arve Loop Rd (SSS2); Mt Picton Summit; attracted to humans and taken in Malaise trap near river bank; approx. 50 km SW of nearest record
Dragonflies		
Corduliidae	<i>Procordulia jacksoniensis</i>	30 km extension; South Cape Rd crossing D'Entrecasteaux River, Catamaran River CA
Spiders		
Hexathelidae	<i>Plesiothele fentoni</i>	Described from Lake Fenton; only found subsequently at one locality in the Central Highlands
Land snails		
Charopidae	<i>Allocharopa</i> sp "Adamsons"	22 km extension; new westernmost record for far SE Tasmania species
Charopidae	<i>Allocharopa</i> sp "Teepookana"	25 km extension; significant eastward range extension for widespread western Tasmanian species
Charopidae	<i>Dentherona dispar</i>	27 km extension; new southernmost record, previous record was from near Mystery Creek Cave
Charopidae	<i>Mulathena</i> cf. (<i>tranquilla</i>)	100 km southward extension for western Tasmanian species; highly surprising (perhaps translocated) as species was not expected to overlap with <i>M. fordei</i> which was also present at this site
Charopidae	<i>Pernagera</i> sp "Emily"	13 km extension; previously known only from two sites in Hartz Mountains NP

Family	Species	Comments
Charopidae	<i>Planilaoma</i> sp "Lake Esperance"	13 km extension from nearest previous record in Hartz Mountains NP
Punctidae	<i>Magilaoma penolensis</i>	150 km extension; previously confirmed Tasmanian records of this mostly coastal species are from western and north-western Tasmania and King Island; other Tasmanian records are misidentified; nearest previous correct record is from Hibbs Lagoon
Punctidae	<i>Paralaoma</i> gen "Snow" sp "Hartz"	14 km extension; previously known only from two sites in Hartz Mountains NP
Rhytididae	<i>Prolesophanta</i> sp "Marriotts"	20 km extension; slight western extension of records for widespread but uncommon species
Rhytididae	<i>Victaphanta</i> sp "Western Arthurs"	22 km extension into far south-east corner; poorly known S/SW species
Vascular plants		
Apiaceae	<i>Oreomyrrhis gunnii</i>	9 km from the nearest previous record at the Weld River, 4.5km E of Mt Bowes
Brassicaceae	<i>Lepidium desvauxii</i>	42 km from the nearest previous record at Recherche
Poaceae	<i>Lachnagrostis collicola</i>	69.5 km from the nearest previous record at the Saddle between The Hippo and Moonlight Ridge Hill 3
Poaceae	<i>Lachnagrostis morrisii</i>	71.2 km from the nearest previous record at Longley
Thymelaeaceae	<i>Pimelea cinerea</i>	22 km from the nearest previous record at the Saddle between Mystery Creek and N reach of D'Entrecasteaux River
Bryophytes		
Ambuchananiaceae	<i>Ambuchanania leucobryoides</i>	Easternmost population of the 11 that are known
Grimmiaceae	<i>Bucklandiella pycnotricha</i>	Possible range extension but taxonomy not resolved

Family	Species	Comments
Lepidoziaceae	<i>Telaranea tasmanica</i>	Nearest previous record is from Manuka Rd, west of Tahune Bridge
Lophocoleaceae	<i>Chiloscyphus longiciliatus</i>	Previously only known from the Cradle Mtn area
Pottiaceae	<i>Barbula unguiculata</i>	Nearest previous record is from Hobart; introduced
Radulaceae	<i>Radula australiana</i>	Previously known from Mt Field NP and Mt Wellington
Lichens		
Catillariaceae	<i>Catillaria lenticularis</i>	New record for Tasmania
Lecanoraceae	<i>Lecanora demersa</i>	New record for Tasmania
Lecideaceae	<i>Porpidia umbonifera</i>	New record for Tasmania
Lichinaceae	<i>Phyllisciella aotearoa</i>	New record for Australia
Ochrolechiaceae	<i>Ochrolechia africana</i>	New record for Tasmania
Parmeliaceae	<i>Menegazzia hypernota</i>	New record for Australia
Rhizocarpaceae	<i>Rhizocarpon intersitum</i>	New record for Tasmania
Stereocaulaceae	<i>Lepraria jackii</i>	New record for Tasmania
Trapeliaceae	<i>Placopsis subcribellans</i>	New record for Australia
Verrucariaceae	<i>Staurothele succedans</i>	New record for Australia

Other points of interest

Fauna

Reptiles and amphibians

This Bush Blitz provided an opportunity to fill some gaps in the herpetological record. Despite several earlier herpetological collecting efforts in the study area, several peaks had never been surveyed and, importantly, no tissue samples had been collected. During the Bush Blitz, amphibian and reptile surveys in the Southwest and Hartz Mountains National Parks resulted in the collection of 37 tissue and voucher samples from ten localities.

The amphibians and reptiles of Australia are characterised by high diversity and high endemism. While diversity in Tasmania is low, endemism is high—seven of the 13 species recorded during the Bush Blitz do not occur outside Tasmania and three are restricted to the south-west. The high endemism is a result of isolation and high latitude, requiring an ability to cope with cooler and wetter conditions.

Despite the World Heritage listing, there are several threats to this fauna. These species have adapted to the cool and wet climate of this region and are sensitive to any disturbance of this environment. Climate change has the potential to have severe impacts, reducing the area of suitable habitat. The fires that occurred to the north during the Bush Blitz are perhaps a herald of what is to come. Introduced diseases, such as chytrid fungus (*Batrachochytrium dendrobatidis*), have demonstrated their ability to devastate populations. Finding tadpoles of the Tasmanian Tree Frog (*Litoria burrowsae*) at Moores Garden is noteworthy as this species is sensitive to chytrid fungus, and its presence indicates that the Moores Garden area remains free of this pathogen. Unfortunately, the popularity of this beautiful region as a bushwalking mecca increases the risk of this disease and potentially others as yet unidentified. Fortunately, regional managers seem to be well aware of this potential risk.

Critical to good management of a conservation area is comprehensive and current awareness of the distributions, habitat requirements and distinctiveness of the fauna. This can only be achieved through survey efforts, including the strategic collection of voucher specimens. With careful management, this can be achieved with minimal impact on populations or risk of disease introduction. According to the ALA (accessed 4 July 2016), Common Wombats (*Vombatus ursinus*), prior to this survey, were known to occur only on the fringes of the survey area; plainly this is not the case. Likewise, one of the most common lizards in Tasmania, the Metallic Cool-skink (*Niveoscincus metallicus*), was previously unknown from the Cockle Creek area, a very popular reserve. The Spotted Grass Frog (*Limnodynastes tasmaniensis*) and the Alpine Cool-skink (*Niveoscincus greeni*) are both recorded as occurring in Southwest National Park but, in each case, the occurrence is based on a single, unvouchered observation. Without a voucher, there is no way to assess definitively the veracity of these records. While these examples may seem academic, there are consequences for this lack of documentation. The Boulder Cool-skink (*Niveoscincus microlepidotus*), occurs only in alpine areas of Tasmania. While it is extremely abundant in suitable habitat, often being the most conspicuous vertebrate, it is not found at lower altitudes. Thus it occupies a number of discrete populations on mountain peaks, potentially isolated from each other by unsuitable habitat. The extent of gene flow between these populations is unknown but will be a consequence of the geological history of the area as well as aspects of the biology of this species, such as its thermal tolerance and ability to move about freely and migrate. An assessment of the distinctiveness of the mountain peak populations would require access to vouchers for morphological analysis and to tissue samples for genetic analysis. While some vouchers have been taken in the past, no tissue samples have been available until this Bush Blitz. The samples collected may serve for a pilot study but a definitive assessment will require sampling of populations from as many of

the mountain peaks as possible. An understanding of the genetic distinctiveness of the populations is critical to active management of populations under threat, for example, when contemplating translocation due to climate change or disease impacts. While populations of Boulder Cool-skink currently seem secure, there is no guarantee this will always be the case. Patterns discerned in a non-threatened species such as this can also inform management of more vulnerable species inhabiting similar environments. Actively seeking to better understand the fauna of this very special region would seem to be incumbent on those responsible for its management.

Invertebrates

Moths

The Lepidoptera (moths and butterflies) are one of the four most advanced and mega-diverse insect orders. Australia has approximately 10,400 named moth species, but about twice as many species are already deposited in Australian insect collections. Tasmania has around 300 known species and is estimated to have around 1000 species. Despite presence of active resident lepidopterists in Tasmania, the island has been sampled less comprehensively than the eastern part of the mainland, in particular the remote wilderness areas and higher altitudes, due to limited access. This Bush Blitz provided a unique opportunity to collect in very remote areas of the island.

The identified moths represent 38 different families, and 313 taxa, mostly identified to species. This reflects the very high familial and genetic diversity in the area—over half of the Australian Lepidoptera families are represented in this small, and seasonal, snapshot of time.

The family with the highest species richness and abundance, by far, was the Geometridae with 94 species in 57 genera. This is not surprising as, numerically, this family dominates among Australian macro-moths and is widespread across most ecosystems. The Geometridae is one of the largest families of the Lepidoptera with around 25,000 species globally and over 1300 species in over 300 genera in Australia. Data on specimen-based distributions of Lepidoptera is important for our understanding of the diversity of geographical areas. These taxa are important bio-indicators for monitoring of environmental effects such as climate change, which may alter the constitution of vegetation communities. Geometridae in particular are widespread and abundant in southern Australia. Usually each species is closely associated with one host plant species. The diversity of this group, therefore, can be a direct indicator of the biodiversity of a geographical region.

All five major sub-families of the Geometridae were represented in this survey: the Archiearinae, the Ennominae, the Geometrinae, the Larentiinae, the Oenochrominae and the Sterrhinae. Archiearinae were represented by only two taxa, *Acalyphes philorites* and Pencil Pine Moth (*Dirce aesiodora*). The most species-rich geometrid sub-family was the Ennominae. In terms of generic diversity the ennomine tribe, Nacophorini, was richest. This is not surprising as the Australian Nacophorini are well represented in many ecosystems and the tribe's greatest development is in southern Australia. A commonly collected species from this tribe was *Hypsitropha euschema*. This is a Tasmanian endemic, which is rarely encountered but was found often during this Bush Blitz survey, mainly at the low altitude sites of Old River and Southport Lagoon. Little is known of the biology of this species.

The Oecophoridae showed the next highest species diversity with 40 species in 16 genera, although the number is probably an under-estimate as the unidentified moths mostly belong to this family. This family is also under-represented at light traps and so its diversity in this region is likely to be much higher. Oecophoridae are extraordinarily diverse in Australia and constitute the most species-rich moth family and the second largest family of organisms in the country with 5500 species in collections, of which less than half are named; most of these are endemic. Larval food plants are diverse but many

species feed on dead eucalypt leaves and play a very important part as decomposers in forests. As oecophorids are generally small and weak fliers they are less likely to come to light so they are likely to be unrepresented in collections. The Oecophorinae is by far the largest subfamily in the Oecophoridae and this is reflected in this collection with over 80% of the species being from this group. Almost one half of these species belong to the *Barea* group and half of these species are undescribed. *Barea* is known to occur in dry sclerophyll and rainforest. Larvae feed on the damp sapwood of dead logs and trees. An endemic species from this group, *Oresitropa melanotypa*, is rarely collected. Previously it was known from only seven specimens (in ANIC), all collected at Pelion Hut on the Tasmanian Central Plateau in 1991, and the holotype collected at Cradle Mtn (Central Plateau) in 1927. Only one specimen was taken on this survey, from a semi-alpine heathland in Southwest National Park.

The Noctuidae family showed only moderate diversity, with 19 species in 11 genera; however, the two most abundant moth species collected were noctuids—Southern Armyworm (*Persectania ewingii*) and an undescribed endemic, acronictine noctuid. Another abundant noctuid was an undescribed hadenine, *Leucania* sp. ANIC02, which showed a very similar pattern of distribution and occurrence to the above-mentioned two noctuids.

The most frequently taken species was the agricultural pest, albeit native, hadenine noctuid, the Southern Armyworm. This species is widespread and common in southern Australia, extending into Queensland. Caterpillars feed on Garden Pea (*Pisum sativum*), Common Flax (*Linum usitatissimum*), *Hordeum* species (cereal grain) and other plants. These moths were very widespread and collected on several mountaintops at high altitude (Hartz Mountain, Mt Louisa, Mt Wylly, and “The Boomerang”). It is notorious for its migratory nature and is often ‘blown over’ Bass Strait from the Australian mainland. The abundance of this species on this survey corresponds with a spike in larval records and observations in northern Tasmania in spring 2015. The adults collected here are probably imagoes of these larvae that have found their way south. Correspondingly, a large number of moths of this species were also collected in the next Tasmanian Bush Blitz survey on Bruny Island in late February of the same year.

Almost equal in abundance was the undescribed endemic, acronictine noctuid, *Neumichtis* “nr *archephanes* sp. Tarkine CB20”. This was also collected, from only one specimen in the Meredith Ranges, during the Tarkine Bush Blitz, at the same time of year in 2015. This species was also very widespread, across an even greater range than Southern Armyworm, from sea level at the Southport Lagoon, to the same mountaintops as the other common noctuid. In contrast, however, this noctuid is unlikely to be migratory but may be a mostly montane sister species to the lowland *Neumichtis archephanes*. Despite its abundance in this survey, *Neumichtis* “nr *archephanes* sp. Tarkine CB20” is uncommon in collections; only seven specimens, from three sites, are held in ANIC.

The third most commonly collected species was the endemic geometrid moth, *Acalyphes philorites*. This moth was collected in large numbers at three high altitude sites. One site was Mt Anne, the record representing a significant range extension for this montane species.

Commonly collected and widely distributed geometrid moths were the eucalypt-feeding geometrine, *Hypobapta percomptaria*, and the *Acacia*-feeding larentiine *Microdes villosata*. Both of these species are common and widespread in southern Australia. The large hepialid Pindi Moth (*Abantiades latipennis*) was also taken commonly; it came to light in large numbers at many sites. The larvae of this species feed on eucalypt roots and frequently occur in wet eucalypt forests.

The Crambidae may be relatively over-represented in the survey area as Scopariinae were deliberately targeted by A. Throssell as part of her PhD research. Species in this group are believed to feed mostly on non-vascular plants such as mosses and are therefore often found in wet eucalypt forests and rainforest.

Highlights of the survey included the collection of several rare and uncommon species. Several of these were geometrid moths. *Dryoptila temenitis* is a rarely seen nacophorine geometrid. One specimen only of this species was taken at Old River, in buttongrass moorland bordered by riparian vegetation including *Hakea* and *Leptospermum*. The endemic archiearine Pencil Pine Moth (*Dirce aesiodora*) is also rarely collected and, until now, had not been collected further south than Mt Field National Park. A rare larentiine, *Chrysolarentia photographica*, was collected from one specimen in semi-alpine heathland on the top of Mt Louisa. Three more uncommon larentiine geometrids were also collected, *Chloroclystis approximata* and *C. testulata*, and the striking, *Chaetolopha leucophragma*, collected from one specimen in wet eucalypt forest at Mystery Creek Cave. The large boarmiine geometrid, *Thallogama corticola*, taken at SSS2 in wet eucalypt forest from one specimen, is also an uncommon find.

Another significant record was the collection of the very rare Tasmanian endemic carposinid, *Paramorpha eburneola*. Previously this was known only from the holotype, collected in Rosebery in 1925. On this survey one specimen was taken at Glovers Bluff, Weld River Regional Reserve.

The rare *Epicyrtica lichenophora* was recorded for the first time in Tasmania in 2015 during the Tarkine Bush Blitz, from only one specimen. Here, again only a single specimen was collected in the Hartz Mountains National Park. Another moth collected in the survey, also represented by only one specimen, is a new record for Tasmania—Castor Semi-looper was collected on the top of Mt Louisa. It is most likely a vagrant, unlikely to establish a breeding population in Tasmania; this represents a large range extension for this species.

Another singleton, a rare oecophorine, *Garrha miltopsara*, was collected in the Mystery Creek Cave area in wet eucalypt forest. Previously this was known only from the specimens collected early last century: the holotype collected from Ebor, NSW, one specimen from Cradle Mountain (Tasmania), and another from Tamborine (Queensland). This is a significant find. Similarly, the endemic oecophorine *Oresitropa melanotypa* is also rare; the only other specimens known are the type from Cradle Mountain, dating from 1927, and seven specimens all collected during the same expedition, at Pelion Hut (Tasmanian Central Plateau), in 1991. Here only one specimen was collected in semi-alpine heathland at 846 m in Southwest National Park.

Some species are rarely collected because they fly early in the morning. Such a species is an undescribed lasiocampid, *Pararguda* sp. "CB09 BB SWTAS", nine specimens of which were collected from widely ranging sites. The males of this species are only collected early in the morning, in this case in overnight bucket traps.

The endemic lecithocerid species, *Crocantbes glycina*, is another notable record. Only five specimens of this species were collected previously during one expedition in 1983 in the Arve Valley and Gladstone, Tasmania. In this survey only one specimen was taken, at Glovers Bluff in the Weld River Regional Reserve. Lecithoceridae are a small family of moths in Australia with most taxa in the tropics.

Several undescribed species that were recorded in the 2015 Tarkine Bush Blitz were collected again in this survey. These included: the noctuids, *Bathytricha* sp. CB15 Tarkine, *Neumichtis* nr *archephanes* sp. Tarkine CB20 and *Neumichtis* sp. Tarkine CB20; the nolid, *Nola* sp. Tarkine CB04; and the rare endemic oecophorid, *Coesyra* sp. "BBTarkCB16".

Only two species from the family Roeslerstammiidae were collected. One was the endemic, known but undescribed species, hereby called *Thereutis* sp. CB13 SWTas. This is another rare species. As far as can be determined, only seven specimens have been collected previously. Only 23 roeslerstammiid species are recorded for Australia.

Another interesting find was the collection of one specimen of the primitive monotrysian family Palaephatidae, *Ptysoptera* sp. "BBTarkCB34". This undescribed species was previously represented in ANIC by 16 specimens from one site, Mt Ossa in the Cradle Mountain-Lake St Clair National Park in the Central Highlands, and one reared from *Bellendena* (from Mountain Rocket, Proteaceae) from Wombat Moor, Mt Field National Park. Two specimens were taken in the Tasmanian Tarkine Bush Blitz in 2015 in the Meredith Range Regional Reserve and Pieman River Reserve. This family has a Gondwanan distribution and is associated with Proteaceae. Here the species was taken by hand at over 800 m in semi-alpine heathland on Mesa in Southwest National Park.

The species collected at mountaintops were almost exclusively very strong fliers and migratory species, which is likely to be a sampling artefact. Because of the high risk of bushfires, it was not possible to stay overnight to collect manually with light sheets on isolated mountaintops that were only accessible by helicopter. Instead, bucket light traps were deployed, relying on moths circling the light and eventually hitting a transparent blade then dropping into the automated trap. In strong winds, which were present every night, and without shelter from tall, dense vegetation, bucket light traps are inefficient, as only strong, widely distributed fliers reach the traps, while weak and therefore more localised fliers do not fly at all in strong wind or are blown past the trap. In contrast, manual collecting at a light sheet allows capture with a net of even those moths that struggle with the wind and cannot reach the light entirely. Therefore, the collection of almost exclusively strong fliers on mountaintops is unlikely to be representative of the true moth diversity of these unique and remote areas.

The time of year greatly influences the suite of moth species collected so, to be replicable, any subsequent surveying would need to be conducted in summer.

Butterflies, dragonflies and damselflies

Butterflies and odonates (dragonflies and damselflies) are relatively well-studied, conspicuous groups of insects, so discovery of new species or large range extensions is unusual. While both are day-flying, they have different habitat requirements. Butterflies tend to be found in relatively open areas, particularly grasslands and heathlands, while odonates require water for their immature stages and are usually found in or around rivers, lakes, swamps, and other areas of standing or flowing water. The Bush Blitz study area included a variety of habitats of interest for these two groups. A number of previous records of butterfly and odonate species were available in online databases such as the ALA and the Natural Values Atlas.

Six species of butterfly and three Odonata species were recorded from Southwest National Park. While some of the species are endemic to Tasmania, all are widespread. Only one, a butterfly, represented a new record for Southwest National Park, but it had been previously recorded elsewhere in the study area. Few previous records were available for the other reserves surveyed. The number of species recorded in different reserves often reflects the extent of sampling—in some reserves only one site was briefly visited, while in others multiple sites of varied habitat were surveyed. No butterflies or odonates were recorded at SSS1, possibly due to cloudy and windy weather at that site. SSS2 was surveyed on a different day, with sunny and less windy weather.

Caddisflies

Although caddisflies are well documented for most of Tasmania, with a total of 194 species recorded (ABRS 2009—AFD accessed 19 April 2016), the Bush Blitz expedition provided an excellent opportunity to build up collections and increase our knowledge of the least well known part of the island, especially of some of the more inaccessible sites.

Caddisfly species in Tasmania exhibit a high level of endemism (61%), and among the 52 species collected, 24 are endemics (i.e. 46%), two of which were known previously only from the holotypes.

None of the Trichoptera species collected were indicative of enriched or polluted waters; those streams visited appeared, at least superficially, to be in healthy condition.

Flies

The Diptera are one of the most diverse insect orders and largest radiations of terrestrial eukaryotic organisms. The order comprises 10–15% of the known animal species and approximately 159,000 described species. This species-rich group has been divided into over 150 families, 22–32 superfamilies, 8–10 infraorders and 2 suborders. The suborder Brachycera comprises the “higher Diptera” with shortened antennae, and is further divided into four monophyletic infraorders: the Xylophagomorpha, Muscomorpha, Stratiomyomorpha and Tabanomorpha, with the latter two including the soldier flies (Diptera: Stratiomyidae) and horse flies (Diptera: Tabanidae), respectively. These two fly families have been the focus of Lessard who is revising the taxonomy and describing new species in these two families. Although Tasmanian specimens are well represented in State museums, including the Tasmanian Museum and Art Gallery, the Southwest National Park has not been sampled previously for these two prominent fly families.

Although no putative new fly species were collected, several key Diptera families were recorded from the Southwest National Park for the first time, extending their known distribution approximately 50 km south-west. Moreover, fresh specimens of horse flies and soldier flies were collected, and these will be useful in providing DNA data for the reconstruction of phylogenetic relationships of the families, in addition to the revision and production of novel keys to the genera.

Leaf beetles

The aim for this target group was to collect specimens to lodge in the TMAG collection and to document the leaf beetle fauna of the region, with particular emphasis on occurrences within national parks and reserve areas. The south-west region of Tasmania has not been well surveyed for leaf beetles, although some specimens are in the TMAG and DPIPWE collections.

The leaf beetle subfamily (Chrysomelinae) includes the predominantly Australian paropsine tribe/subtribe members of which are prominent defoliators of *Eucalyptus* and *Acacia*. Other known hosts include *Leptospermum* and *Melaleuca*. The hosts are unknown for some non-Paropsine genera. Sixty species of leaf beetle are known to occur in Tasmania, as well as several undescribed species.

It was hoped to improve knowledge of leaf beetles in this relatively wild and un-collected area; however, the diversity of species encountered and numbers of specimens collected during this Bush Blitz were disappointingly low. A total of six species in three genera were collected, representing approximately 8% of the known species diversity of leaf beetles in Tasmania. This is a surprisingly small number of species when compared with the collection from the similarly vegetated Tarkine region of north-west Tasmania over the same time period in the preceding year. This was attributed to the prevailing drought conditions triggered by the El Niño event, and not a reflection of the true Chrysomelinae biodiversity of the south-west region of Tasmania.

Heteroptera

The Heteroptera of Australia comprise about 2500 species and recent surveys during Bush Blitz Phase 1 revealed 1391 species of Heteroptera, of which 391 are recognised as being new to science. In a report

to the ABRS on Bush Blitz Phase 1, Prof. Cassis and Prof. Laffan indicated that the species taxonomic accumulation curve was not levelling, and they predicted that the total heteropteran fauna of Australia would amount to around 6,500 species.

The Cassis Laboratory had not sampled Heteroptera in the study area previously and focused on the discovery of plant-associated heteropterans, using survey methods previously employed in Bush Blitz Phases 1 and 2.

Collections by the Cassis Laboratory on this Bush Blitz resulted in the discovery of 33 species of Heteroptera from 15 localities and 18 host plants. One new genus and three new species were discovered, from the families Miridae and Tingidae. Ten families of Heteroptera were represented in the collection, with the greatest species richness occurring in Miridae (10 species), Acanthosomatidae (7 species), and Rhyparochromidae (7 species). Heteroptera were collected from 15 localities and 18 host plant species. A PhD candidate participated in the fieldwork and continued his entomological training. A further species of Heteroptera, the backswimmer *Anisops hyperion*, was recorded by the general insect team.

Collections at both standard survey sites were limited. Drought conditions reduced the availability of flowers, which impacted the number of bugs collected.

This work indicates that the discovery of new species of Heteroptera in Tasmania is ongoing; additional collecting is required, particularly in the south-west of Tasmania.

Thrips

Relatively little was known previously of the thrips of Tasmania. The AFD (accessed 19 April 2016) gives as, or includes, Tasmania for the distribution of 35 species of thrips. Most of these records derive from recent studies, particularly on the fungus-feeding thrips of Australia. The Tasmanian records in the AFD list are not exhaustive—no mention is given of some of the more common, even pest, species. In ANIC there are specimens from Tasmania of the following common Thripidae: *Apterothrips apteris*, *Frankliniella occidentalis*, *Karphothrips dugdalei*, *Limothrips cerealium*, and *Tenothrips frici*, bringing to 40 the total number of thrips species known from Tasmania prior to this Bush Blitz. A further 18 named species collected during the Bush Blitz are reported here for the first time from Tasmania, together with three putative new species.

No previous records from the study area are available for any of the thrips collected on this Bush Blitz. Only two thrips species had been recorded before from Southwest National Park, described on the basis of specimens collected from near Lake Pedder, and neither was collected on this trip.

One of the most interesting finds was the collection of what is only the second known specimen of *Dactylothrips australis*, previously known from a female taken at Melbourne in 1914. Similarly, one specimen of *Ethirothrips australiensis* was particularly interesting as this species is based on a single specimen from South Australia. A good series of *Pseudanaphothrips pallidus* confirms that this species lives on the leaves of *Nothofagus cunninghamii*, whereas the other members of this thrips genus live in flowers. Another very useful record was the confirmation that *Dendrothrips diaspora* lives on the leaves of *Notelaea* species.

The available records suggest that the thrips fauna of Tasmania is a subset of the fauna of southern Australia. However, a few species are possibly limited in distribution to south of the Bass Strait, including *Cartomothrips manukae*, *Carientothrips tasmanica*, and *Haplothrips driessenii*, whilst a few

others have a strictly southern distribution that includes New Zealand, among them *Haplothrips collyerae*, *Heptathrips cumberi* and *Karphothrips dugdalei*.

The entire south-west area is worthy of conservation and far more collecting of thrips. Further collections, especially in spring and summer, will undoubtedly lead to discovery of further new species and extend distributions for species in this group. Future collecting effort could usefully target the endemic gymnosperms in seasons when their fertile structures are present.

Spiders

Spiders are generally very poorly known for the south-west of Tasmania. The strong emphasis on helicopter sampling of remote mountaintops during this Bush Blitz generally mitigated against well-rounded ground-based spider surveys. Nevertheless, even in areas outside the reserves (e.g. base camp), spider activity was strikingly low and a number of Tasmanian scientists pointed directly at the protracted dry prior to the survey. Moreover, the density and general impenetrability of many of the habitats and the need for low vegetation for safe helicopter landings, obstructed access to many riverine sites, especially rainforests.

Because of the threat of close bushfires and frequent low cloud cover, camping out in the region was not considered safe. As night collections often give best results, the diversity was well below its real level. Equally, the south-west is intensely rugged and extremely diverse and, despite helicopter access, the extensiveness of the survey area meant less intensive site surveys. A number of the sites visited, however, had clearly never before been accessed by Europeans.

The recorded diversity was 68 spider species referred to 22 families, which is one the lowest Bush Blitz spider diversities recorded. Of those 68 species, only 22 could be identified with confidence to named species, 11 are unequivocally new species and the remaining 35 species are probably new.

Families common in eastern and central Tasmania (e.g. Corinnidae, Miturgidae, Clubionidae, Eutichuridae, Pisauridae, Cycloctenidae, Toxopidae (Toxopsoidea), Araneidae, and Nemesiidae), not far to the north, were notably absent or at best rare.

The best collections were made in the rainforests but only a few such habitats were accessible, particularly at night. The activity of spiders and beetles on nights as cold as 5°C was surprising. Inclement weather prevented surveys on at least two days, potentially six sites. A single site would be expected to have around 90–120 spider species, with totals across combined sites in the park expected to be 200–300 species. However, this number would only be approached by widespread pitfall trapping and intensive site surveys, including at night.

A highlight of the trip is the range extension of *Plesiothele fentoni*. Two other exciting finds were further discoveries of the tree trapdoor spiders (*Migas*) and the intertidal or marine spider (*Amaurobioides*); both species collected are putatively new and both were taken at Prion Beach, one in the intertidal zone and the other probably 50 m uphill from it on the forest.

Land snails

Prior to this survey there had been substantial sampling for land snails in the study area, but that sampling was patchy. Somewhat mirroring the Bush Blitz gap modelling for this part of the state, lowland wet forests in the study area had been extremely well sampled but high-altitude areas had been sampled very little, except for the Hartz Mountains and Mount Weld. The Hartz Mountains are a known hotspot for locally endemic snails, with four species known solely from that area prior to this Bush Blitz.

It was expected that collecting on different mountains in the area would produce either range extensions for some of these species, or else new species related to them. It was expected that at least 25 species would be recorded on the survey, with the exact number depending on the range of sites that could be accessed in the available time. It was considered highly likely that at least one new species, probably more, would be discovered. An audit of previous records prior to the survey found that 55 species were already recorded from Southwest National Park, while 23 species were known from Hartz Mountains National Park.

In total 33 native land snail species were recorded from the seven reserves sampled in the present survey, with most sampling conducted in Southwest National Park. One completely new species of alpine punctid, thought to be related to a widespread lowland arboreal species, was collected near Adamsons Peak; only a single damaged dead specimen was found. Two species previously known only from the Hartz Mountains were collected, each on one nearby mountain. This, together with the fact that only one new species was found, suggests that alpine species in the area may often inhabit a group of nearby mountains and not just a single mountain range. The ten significant range extensions increased the recorded overlap between eastern and western species in the far south of the state and suggested that the area is biogeographically complex. Diversity per site was mostly low to moderate, perhaps partly as a result of a very hot dry summer; however, an unusually high diversity (for an alpine site) was found around Steanes Tarn, Mt Picton, and there is potential for finding more at this site. A total of 60 native species are now recorded from Southwest National Park, far more than in any other Tasmanian reserve.

Mountaintop sites in the study area remain a very high priority for sampling. Of the three searched, one yielded a new species and another a high diversity of rare high-altitude species. At Northeast Ridge, it was not possible to safely access the most important (karst) habitat in the time available. Dry conditions in the lead up to the survey also made snails difficult to find at some sites, but overall did not greatly affect results. The low diversity of land snails recorded in SSS1 is not representative of the area.

General insects

A general insect collection was also made during this Bush Blitz and two of the species collected are worth special mention.

The mecopteran, or scorpionfly, *Nannochorista maculipennis*, is a bit of a taxonomic oddity. Nearly all other mecopterans around the world have terrestrial larvae (usually in soil), but *Nannochorista* larvae live in cold freshwater. This restricts the several Australian species to the cooler, wetter parts of Tasmania and higher-altitude parts of the SE Australian mainland. There are also related species in New Zealand and in southern Chile / Argentina: the family Nannochoristidae is a classic Gondwanan lineage. The one (adult) specimen reported on this Bush Blitz was in a sweep-net sample collected at Moores Garden, a high-altitude area dotted with small tarns.

The tenebrionid beetle *Coripera adamsi* is a high-altitude Tasmanian endemic, one specimen of which was collected in Southwest National Park. ALA records suggest that it was recorded previously somewhere in the general area.

Flora

The region's biogeography was expected to be reflected in a relatively high number of plant and lichen taxa. The summer timing of the survey was less than ideal for vascular plants—many taxa were probably inconspicuous or absent altogether after the completion of flowering. In contrast, seasonal factors did not affect the survey of lichens and bryophytes.

The high number of specimens collected matched expectations prior to the survey, and reflect the wide variety of habitats, geology and aspect of the region. Several new records were made for Southwest National Park, increasing our botanical knowledge of the area. Newly recorded species are those not previously present for that reserve, as per records in the Australia's Virtual Herbarium. Only a small number of plant taxa from each of the surveyed groups were new records for the reserve. *Poa tenera*, *Ranunculus amphitrichus* and *Pterostylis uliginosa* collected during the survey are species previously known from Southwest National Park from only few records.

For the first time, the aquatic plant *Lilaeopsis novae-zelandiae* was recognised as occurring in Tasmania from specimens collected during this survey. A taxon previously known as "*Lilaeopsis* sp. West Coast (A.Moscal 5655) Tas Herbarium" from the south-west coast of Tasmania was collected during this survey from Louisa Bay. Investigations into its identity revealed this specimen and all other collections of "*Lilaeopsis* sp. West Coast" to be *Lilaeopsis novae-zelandiae*, a species previously thought to be endemic to New Zealand.

Glossary

Devil Facial Tumour Disease: an aggressive non-viral transmissible parasitic cancer among Tasmanian Devils.

Endemic: native to or limited to a certain region.

Exotic species: a species occurring outside its normal range.

Host plant: a species of plant that is used by larvae of insects as food and a place to develop.

Pest species: a species that has the potential to have a negative environmental, social or economic impact.

Putative new species: An unnamed species that, as far as can be ascertained, was collected for the first time during the Bush Blitz.

Range extension: Increase in the known distribution or area of occurrence of a species.

Species range: The geographical area within which a particular species can be found.

Taxon (plural taxa): A member of any particular taxonomic group (e.g. a species, genus, family).

Taxonomy: The categorisation and naming of species. The science of identifying and naming species, as well as grouping them based on their relatedness.

Threatened: Threatened fauna and flora may be listed under Section 178 of the EPBC Act in any one of the following categories—extinct, extinct in the wild, critically endangered, endangered, vulnerable, conservation dependent.

Type locality: The location where the primary type specimen (holotype or syntype series) was found.

Type specimen(s) (holotype, syntypes): The specimen, or set of specimens, on which the description and name of a new species is based.

Undescribed taxon: A taxon (usually a species) that has not yet been formally described and named.

Vascular plants: A lineage of plants that possess well-developed veins (vascular tissue) in their stems, roots and leaves. Vascular plants include the majority of familiar land plants: flowering plants, ferns, conifers, cycads and fern allies, but not mosses, liverworts or algae.

Vouchers (voucher specimens): any specimen, usually but not always a cadaver, that serves as a basis of study and is retained as a reference.

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