Yalata Bush Blitz

Acari (mites and ticks) *23 Nov 2021 to 3 Dec 2021*

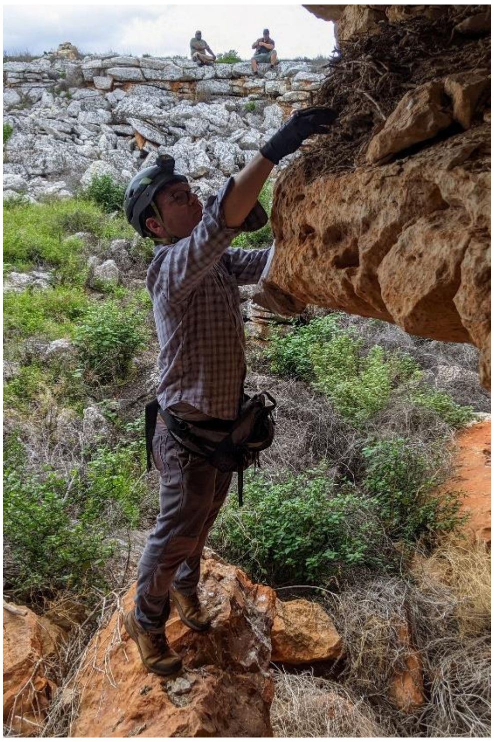
(cave pitfall sampling until 9 Mar 2022)

Submitted: 5 July 2022

Matthew Shaw

Nomenclature and taxonomy used in this report is consistent with:

The Australian Faunal Directory (AFD)



Kestrel nest sampling / cultural monitoring

Image: Steve Milner

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List of contributors

List of contributors to this report.			
Name	**Institution/affiliation**	**Qualifications/area of expertise**	**Level/form of contribution**
Dr Matt Shaw	South Australian Museum	PhD/mites	Survey participant, principal report author

Abstract

This is the first detailed report of mites from the Yalata region and from the Nullarbor karst. Mites and ticks were extracted from samples collected from leaf litter and soil, cave sediment, beach wrack and bird nests in the Yalata region. Many mites were collected in pitfall traps left in caves. Summary notes are provided on 12 new mite species, from 10 families and three suborders. At least 10 other taxa distributed between 9 families are also noted as possibly new but requiring more detailed research. Five previously described species have range extensions ranging from 600 to 2500km. Notable findings are high diversity of mites in caves. One cave on the Nullarbor Plain, in addition to the blind mygalomorph spider *Troglodiplura beirutpakbarai*, harbours a suite of at least three disparate mite genera, each group previously recorded only from wet habitats, particularly wet forests.

1. Introduction

Mites are poorly known in Australia with ca 95% of the estimated ca 70,000 Australian species undescribed. Forty-four families have been recorded from Australia without any identified species (Australian Faunal Directory, updated 30 Dec 2019). Our ability to identify Yalata mites benefits from the proximity of the South Australian Museum which has been a centre for Australasian mite research particularly since 1933. However, the only systematic surveys done in South Australia are those of David Lee who focussed on a few sites close to Adelaide and then only on two groups of soil/litter mites. Of Lee's sites, the one that is most relevant to compare with the Yalata region is Lee's mallee site at Ferrles McDonald Conservation Park. ANIC staff also undertook surveys of mallee at Bookmark Biosphere Reserve which is also east of Adelaide. From these collections two relevant genera have been revised (Colloff, 2009, 2012).

The mite fauna of caves has been remarkably neglected in Australia with small but important exceptions. This is despite mites already known to be one of the most diverse inhabitants of caves and including many troglophiles. Some small collections reported from Jenolan Caves, NSW (Eberhard et al., 2014), Cape Range (Harvey et al., 1993) and Weelawadji Cave in Western Australia provide useful comparisons with Yalata/Nullarbor caves. However existing surveys of Nullarbor caves that mention mites contain no detailed information (Eberhard and Moulds, 2007).

2. Methods

2.1 Site selection

Focus was on habitats that are undersampled and that were judged likely to produce new taxa from the Yalata region. Additionally, we looked for groups that perform ecosystem services and hence will be ultimately relevant to sustainability questions. Thus, we targeted litter habitats which are known to support diverse arthropod including microarthropod communities, and which are involved in key ecosystem functions including litter breakdown, nutrient cycling, and carbon cycling. Of soil and litter habitats, mallee leaf litter remains one of the most neglected and important habitats warranting further survey and research. Bushfire drives the composition of mallee communities (Clarke et al., 2021). Litter breakdown, which in a narrow sense can also be called fuel load reduction, is facilitated by a diverse suite of arthropods. Paradoxically many litter invertebrates are regarded as highly vulnerable to fire (Marsh et al., 2021) yet post-fire re-establishment of litter arthropod communities is probably essential for healthy ecosystem functioning. Mallee habitats supports more diversity than is widely realised, including old and rare endemic arthropod lineages (Matthews, 2000)(Stys, 1980).

Another type of site proposed for biodiscovery on this Bush Blitz were native grasslands. Despite their widespread decline in Australia, grassland communities are rarely sampled for soil microinvertebrates.

Finally, cave ecosystems are decomposer communities, yet the mite decomposer fauna from caves and cave sediments are poorly sampled in Australia overall and essentially unsurveyed in the Nullarbor karst region so this was seen as an important gap to address.

Many other habitats mites occupy were not practical to sample during this survey due to sample processing, permit and time constraints. Mites largely not collected on this survey were those associated with plants, lichens, marine waters, invertebrate animals, deeper mineral soils, and vertebrate animals (some ticks and nests excepted). Rocky shores in the Yalata region hold promise as a rich habitat for mite communities but were too inaccessible during this Bush Blitz.

2.2 Survey techniques

Mites and many co-occurring arthropods were collected from accumulated organic material including leaf litter, cave sediment, beach wrack and bird nests. These substrates were placed in desiccating extraction funnels. Desiccating funnels are also termed Berlese funnels or Tullgren funnels which all refer to the same technique in modern usage. Funnels were also supplemented by larger extraction vessels (stormwater pits) fitted with 45cm x 45cm square sieves. All extraction funnels/vessels were covered with fine mesh to avoid contamination. Because of limited availability of electric light bulbs and powerpoints, and the cool wet weather, extractions were not as efficient as desired on this expedition.

A large sampling effort during this survey were pitfall and ramp traps left in many caves. Cave pitfall traps were white screw top polyethylene containers 83mm diameter buried to their rim and filled with ca 2cm of propylene glycol. The lid was left as a marker – with red reflective tape for easy relocation, and propped up a short distance away from the trap,

Ramp traps are shallow yellow plastic square trays that have 4 square ramps on each edge that invertebrates can ascend and fall over the rim into the tray of propylene glycol collecting fluid. These were useful in the occasional situations where the cave floor consisted of large coarse rocks. All pitfall and ramp traps were left for 4 months.

A line of small pitfall traps filled with a shallow layer of propylene glycol was left in a salt lake at Allala Well Rd for eight days and checked daily.

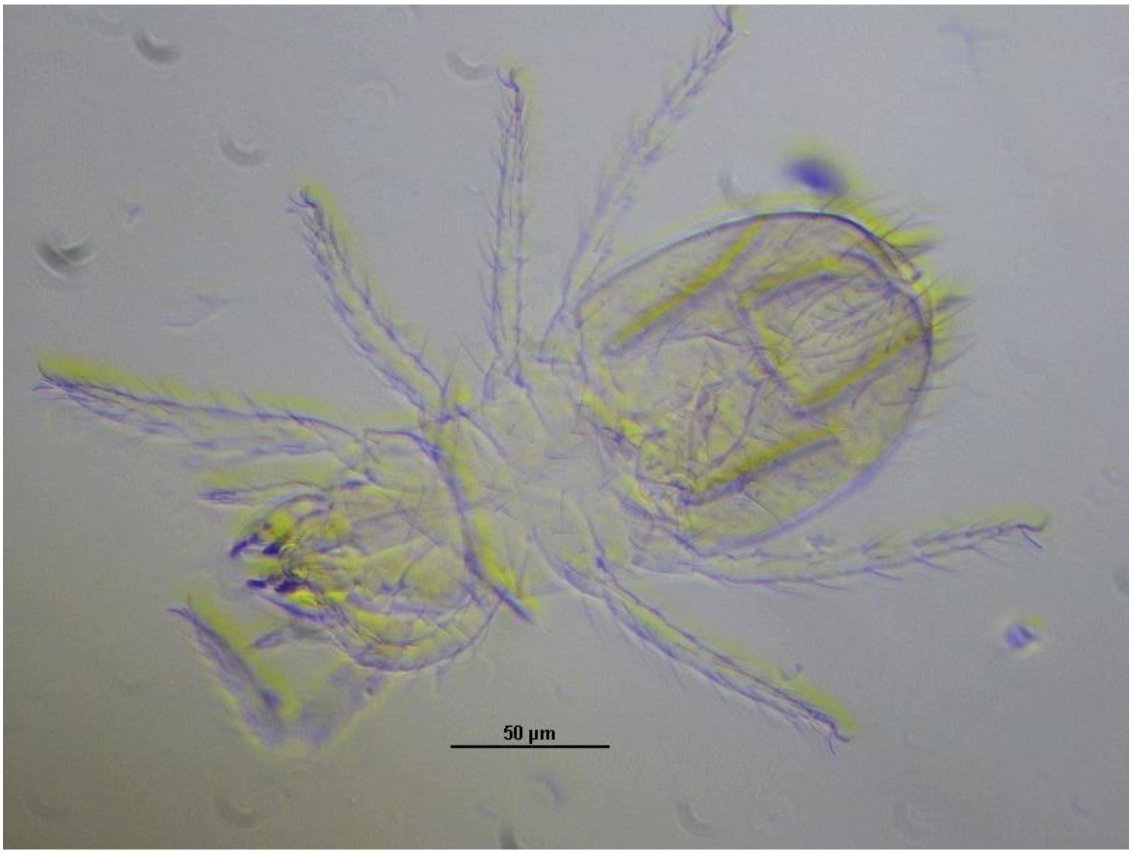
After collection, pitfall trap contents from cave and the salt lake, were protected by adding 95% DNA-safe ethanol before further processing. Small amounts of each trap catch were decanted into a sorting tray under a dissecting microscope. Mites and other microathropods tended to be concealed by similarly coloured sediment in all pitfall trap samples. It was assumed (correctly), that interesting new microarthropods might be present but essentially invisible in pitfall trap catches. Thus, excess fluid was only removed by pouring through a 108 µm sieve and inspecting the sieve afterwards under a microscope, or washing sievings back into their collecting containers. The sieve pore size chosen allowed fine occluding sediment to be washed away while retaining most adult microarthropods.

The largest mites (eg adult erythraeids) were also rarely detected in vertebrate pitfall traps lines at Standard Survey sites and manually collected by Bush Blitz expeditioners.

Representative specimens were cleared in lactic acid, rinsed twice in water, and then soaked in 25%, then 50% ethanol, before mounting in Hoyers medium on glass slides.

The bodies of *Stigmalychus* specimens were heavily coated in a white mineral deposit, perhaps acquired directly from their salt lake habitat. This coating did not clear with lactic acid, however it cleared instantly in stronger acid (Nesbitt’s fluid).

It was not practical to process all the several thousands of individual mite specimens collected on this expedition. However, most mites have been separated from bulk extracts and sorted to major groups and mites of interest are readily and quickly available. Mites highlighted in this report are sorted to putative species, and where additional unmounted specimens are available these allow a variety of preparation and analysis as required depending on future research requirements. Also, since some microarthropods of interest will have escaped notice sofar, bulk residues are retained at SAM to allow future searching for additional mites and also other microarthropods mostly not treated in this survey (eg Heterostigmata).



The primitive oribatid mite, *Ctenacarus araneolus*, abundant in Yalata/Nullarbor caves. Image: M Shaw

2.2.1 Methods used at standard survey sites

For SSS1 and SSS3 (samphire and native grassland sites), surface material− mostly sediment and soil with some sparse litter, was scraped from the soil to a depth of a few centimetres. Leaf litter from the mallee site (SSS2) was sieved with a litter sifter to exclude large sticks and leaves and make extraction more efficient.

Vertebrate pitfall traps at SSS3 (native grassland site) yielded erythraeid mites.

2.3 Identifying the collections

Resources for initial mite identification are the many unpublished keys as distributed at the 2018 Ohio State University Acarology Course, supplemented by the latest edition of “the Manual” (Krantz and Walter, 2009). The most important resources for identification were the primary literature, including publications of David Lee, Ron Southcott and Herbert Womersley. Many specimens were compared against these authors’ collections in the South Australian Museum often including types.

3. Results and Discussion

Appendix 1 lists all mites (Acarina) recorded during the Bush Blitz. Collections made during this Bush Blitz will result in many hundreds of specimens being added to a public collection with 215 records representing all the identified taxa and collection events added to publicly accessible databases.

3.1 Un-named or not formalised taxa

Table 1. Putatively un-named or not formalised taxa

Taxon	**Comment**
Ixodida: Argasidae: *Argas* sp cf *Argas falco*	There are three described species of *Argas* tick from the Nullarbor Plain each from distinct and different nest situations. This is the first collection from kestrel nests in caves and dolines. These cryptic ticks are rarely collected and each known Nullarbor species is only reported sofar as single collections from their type locality. Based on the number of setae on tarsus 1 this species is similar to *Argas falco a*nd may be conspecific. However molecular work, detailed comparison with *Argas falco* types, and examination of larval specimens is necessary to determine whether this taxon is *A. falco* or a new species.
Raphignathoidea: Mecognathidae: *Mecognatha* sp	The Mecognathidae has not been revised in Australia. This species is similar to, but probably not conspecific with, *Mecognatha hirsuta* whose type locality is Auckland New Zealand. SAMA has 10 records of *Mecognatha* (all on ALA). This record from mallee litter is 559km WNW of Port Victoria SA, which is the most western previous record for a mecognathid in South Australia.
Trombidifomes: Lordalycoidea: Lordalycidae *Hybalicus* sp	The “primitive” superfamily Lordalycoidea is known from Australia only on the basis of an unidentified *Hybalicus* species, as reported in Krantz and Walter (2009). This occurrence of *Hybalicus* in a humid Nullarbor cave (N253) that hosts genuine troglobites (and in no other sampled caves) is notable.
Endeostigmata: Alicorhagioidea: Alicorhagiidae: Alicorhagiidae, sp 1	This immature specimen, with its distinctive expanded dorsal trichobothria is not *Alicorhagia usitata*, the only identified alicorhagiid in Australia (Walter, 2001). It is likely a new sp. All occurrences of alicorhagiids in Australia have been from wet forests. Hence the occurrence of this alicorhagiid in a humid Nullarbor cave that hosts genuine troglobites (and in no other sampled caves) is notable.
Endeostigmata: Alicorhagioidea: Alicorhagiidae:: Alicorhagiidae sp 2	With three pairs of genital papillae, this possibly new taxon needs to be compared against species of *Alicorhaga* described by Thor (= *Epistomalycus* Thor)
Endeostigmata: Oehserchestoidea:	This little-known family is currently known from two collections of *O. arboriger* in SE Queensland

Oehserchestidae: *Oehserchestes* sp	*Oehserchestes arboriger* (Theron), was originally described from South Africa. Only 4 spp are known worldwide. The specimen here has a pectinate *sci* trichobothria. However, the specimen is immature and more collections are needed to ascertain its status.
Pheroliodes sp	Most similar to *Pheroliodes robusta*
Mesostigmata: Ascoidea: Ascidae: *Asca* sp (*bicornis* group)	As noted by Halliday (Halliday et al., 1998) there are further possibly undescribed species of *Asca* known from Australia. This taxon does not match any species in Walter et al's (Walter et al., 1993) revision.
Androlaelaps sp cf *casalis*	This species of *Androlaelaps sensu* Shaw (Shaw, 2014) was found to be common in both dry caves and in N253. It is also in nests in caves. It is conspecific with, or closely related to, the widespread nominally cosmopolitan species *A. casalis*. However, *A casalis* is a weakly defined assemblage subsuming many forms of non-parasitic *Androlaelaps*. Forms currently attributed to *A. casalis* sometimes vary in proportions often including very long legs (as in all specimens from this Bush Blitz) but occasionally short legs. Also, in addition to thickened ventral setae on leg II, specimens here also have a mildly inflated pilus dentilus so they do not readily fit the key character of Domrow (Domrow, 1988) for *A. casalis*.
Anystidae: Erythracarinae	There are several genera represented here including *Tarsotomus*.

A soft tick, *Argas* sp cf *falco,* that lurks in kestrel nests and caves. Image: M Shaw

3.2 Putative new species (new to science)

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

Table 2. Putative new species (new to science)

Species	**Comment**
Mesostigmata: Castriidinychiidae: *Castriidinychus* YALBB sp1	Mites in this genus are known from South America plus 6 spp from rainforests in eastern Australia especially Tasmania (Dylewska et al., 2010). One undescribed species is reported from Jenolan Caves NSW. This new species has a divided pygidial platelet and long projections on internal malae. It is not congeneric with *Dinychus greensladeae* Bloszyk and Halliday, 1995 (Bloszyk and Halliday, 1995), a related mite which sometimes also inhabits caves. The occurrence of this new species from a genus that is apparently restricted to wet habitats, that has not been reported elsewhere in South Australia and is here found in an isolated humid Nullarbor cave (N253) is notable raising several interesting questions.
Mesostigmata: Ologamasidae: *Geogamasus* YALBB sp2	Mites in this genus are known from forests in eastern Australia and South America. The new species is closest to *Geogamasus howardi* which is only known from two wet sites in the Mt Lofty Ranges (including Waterfall Gully) and the type locality on a mountain near Mt Gambier. Its occurrence in a humid cave that harbours genuine troglobites (and in no other sampled caves) is notable, raising several interesting questions. Other unmounted putative *Geogamasus* are known from gorges and isolated patches of wet woodland in the Southern Flinders Ranges (M Shaw, unpublished). Because close relatives are known, and known to be restricted to wet habitats, this new species is a high priority for further research to ascertain implications of its climatic history.
Mesostigmata: Ologamasidae: *Laelaptiella* YALBB sp3	This new species is close to *Laelaptiella anomala.*
Oribatida: Eremaeozetidae: *Eremaeozetes* YALBB sp 4	This species appears closely related to *Eremaeozetes malleensis* which is only known from mallee in eastern South Australia, however it differs from that species in its massively projecting pteromorphs and longer phi1 solenidion on tarsus1.
Oribatida: Oribatulidae: *Oribatulida* YALBB sp 5	This species has a translamella and 4 setae on femur II (cf *Fovoribatula* Lee and Birchby). It has large and distinctive wineglass-shaped trichobothria.
Oribatida: Zetomotrichidae: *Anoplozetes* YALBB sp6	This is a common mite in several dry caves. It shares many characters including diagnostic subfamily characters with *Anoplozetes jamiesoni,* the only identified species of this family recorded from Australia (grasses from the Great Victoria Desert). The AFD reports several other unidentified family members from other dry areas in southern Australia. Note that other members of the Zetomotrichidae occur in caves overseas. This

	new species when compared with the holotype of *A. jamiesoni* shows considerably longer tarsus 1 and a highly modified trochanter IV. As with *A. jamiesoni,* fungal remains are abundant in its gut contents.
Trombidiformes: Caligonellidae YALBB sp7	The specimen is an unusual member of an existing genus or a new genus and does not key to any described genus of Calligonellidae. According to ALA records this family is known from 38 specimens collected in south-east SA and a specimen each from NSW and Qld. This collection is ca 1000km west of the most easterly collection for this family at Kangaroo Island.
Trombidiformes: Cheyletoidea: Cheyletidae YALBB sp8	This immature specimen appears to be a simplified and elongate cheyletid and is similar to the unusual overseas genus *Atarsacheylus* however it doesn't key to any cheyletoid. It could be a new parasitic cheyletid. It is not a syringophilid.
Trombidiformes: Cheyletidae: *Mexecheles* YALBB sp9	This is similar to, but definitely not conspecific with, the nest-associated *Mexecheles* figured by Domrow (1991)
Trombidiformes: Neotrombidiidae: *Neotrombidium* YALBB sp10	This mite is common in Nullarbor caves (including N12, N22, N23, N111, N112, N253 and N257) This is provisionally regarded as a new species. However, this requires more research to confirm. It would greatly assist research to recollect fresh material from the type localities for described *Neotrombidium* from NSW caves.
Trombidiformes: Scutacaridae: *Imparipes* YALBB sp11	Specimens of *Imparipes* n. sp. were sieved from the individual clean collecting containers of two large *Troglodiplura sp* spiders (Cave N6838) and had clearly detached from these spiders. Additionally, two scutacarids were collected from between coxa III and IV on a large *Troglodiplura beirutpakbarai* in Cave N253. This family of mites often disperse on and sometimes live intimately with larger animals. The associations range from non-specific to highly host and site-specific ones. Interestingly, two described *Scutacarus* spp were described from a related spider family in Argentina (Ebermann & Goloboff, 2001). At least one of these is specialised for its spider carrier and was collected in the "folds next to coxa IV". If confirmed as host-specific, these *Troglodiplura*-associated mites can potentially provide new lines of evidence for the evolutionary history of *Troglodiplura* spp.
Trombidiformes: Teneriffiidae YALBB sp12	This family is poorly known and uncommonly collected in Australia. The only species reliably reported from Australia are two highly similar *Austroteneriffia* spp [the report of *Parateneriffia* sp by Noble et al (Noble et al., 1996) may be following McDaniel et al (1976) and hence could also refer to an *Austroteneriffia* species] Despite only being known from nymphs the new taxon has several conspicuous differences to

	Austroteneriffia, and similarities with *Chulacarus.* It may belong to one of the teneriffiid genera described overseas or it is a new genus. It lives in a littoral habitat (samphire) like several other members of the Teneriffiidae. Unlike some other members of this superfamily where colour has been reported this species is bright green.

3.3 Exotic and pest species

Table 3. Exotic and pest species recorded

Exotic/pest species	Location sighted/observed	Indication of abundance	Comments
Mesostigmata: Parasitidae: *Pergamasus* sp	Cheetima Beach (beach wrack)	abundant	In Australasia most parasitids are introduced from the Northern Hemisphere and found in disturbed nutrient-rich areas. They are also abundant in beach wrack in New Zealand (M Shaw unpublished). No control measures are warranted.

3.4 Threatened species

None

3.5 Range extensions

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

Species	Location sighted/observed	Distance from nearest known record (km)	Comments
Trombidiformes: Smarididae: *Smaris prominens*	SSS2 Mallee site	690km	The closest of many records is Adelaide
Endeostigmata: Alicorhagiidae: *Stigmalychus veretrum* Theron, Meyer & Ryke, 1970	Salt lake near Allala Rd	2500km	Nearest Australian locality is North Stradbroke Island SE Queensland Type locality is South Africa. There are unanswered questions about how “cryptogenic” mite species such as this can be ancient lineages,

			widespread and yet morphologically uniform (Walter, 2001).
Mesostigmata: Ichthyostomatogasteridae: *Asternolaelaps australis*	Caves N111 and N120	Ca 600 km west of Royston Head cave (SAM J5638) and ca 1000 km from Naracoorte cave	*As. australis* is known from only a few sites in Australia. *Asternolaelaps* appear to “hitchhike” (phoresis) on vertebrates. Its presence in two Nullarbor caves implies past or current bat activity in these.
Mesostigmata: Eviphididae: *Thinoseius peltatus*	Cheetima Beach	900 km NW of Robe	Further sampling of beach wrack may uncover more *Thinoseius* spp (Halliday, 2010).
Oribatida: Ctenacaridae: *Ctenacarus araneolus*	Highly abundant in many caves	925 km W of Ferries McDonald CP	Two localities on ALA: mallee in eastern South Australia and Weelawadji Cave, WA. Type locality is Morocco. There are unanswered questions about how “cryptogenic” mite species such as this can be ancient lineages, widespread and yet morphologically uniform (Walter, 2001)

3.6 Genetic information

Erythraeids, smaridiids and argasids have been sent to colleagues for molecular systematic projects.

4. Information on species lists

The weather during the survey was cooler and much wetter than average probably due to an ongoing La Niña weather event. The lack of desiccating summer conditions would have boosted many litter invertebrate populations. However, the wet samples could not be processed efficiently so catches from extractions were actually sparse overall. Identifications would have been easier with longer series of specimens for several taxa.

The historic lack of mite collecting, and the sparse subsequent taxonomic output continues to provide multiple challenges to current day mite identifications. As just one example, identifications of a number of Anystidae: Erythracidae were anticipated given the modern revisions by Otto (Otto, 1999a, 1999b) but several specimens would not key readily. A survey of mallee at Bookmark Biosphere Reserve uncovered 4 genera and 14 unidentified species from this family (Pullen, 1997) highlighting the scale of diversity that might be concealed in Yalata region mallee here but still not easily identifiable.

Challenges in mite identification mean that deciding whether a mite taxon is truly new or is just difficult to identify requires more taxonomic research than intended for this report. A conservative approach has been taken with many various possibly new taxa listed as such in the Appendix.

Caves are fragile environments and careless visitation, or even looting, can easily cause irreparable harm to the cultural values, biological integrity, and the archaeological and palaeontological record. For these reasons, cave location and other data is regarded as restricted access data. Indeed, this was understood when the data was shared with the caving team via CEGSA. Following established practice with Australian cave data, we don't intend to publicly release, or generalise, cave data. Thus this location data would be considered as Category 1 under recommendations published by the GBIF Secretariat (Chapman, 2020). Caves already open to tourists (e.g., N7) are an exception.

One of the caverns in Cave N23. Image: M. Shaw

5. Information for land managers

While cave findings were from three different land tenures, nearly all the caves sampled here are close or very close to the boundary intersection of Yalata IPA, Nullarbor Regional Reserve and Nullarbor WPA and the findings for dry caves are broadly similar.

Three caves are distinguished by harbouring blind *Troglodiplura* spiders (N253, N5896, N6838), These are all in **Nullarbor Regional Reserve**. In addition to *Troglodiplura,* Cave N253 has the highly distinctive mites (*Geogamaus*, *Castriidinychus*, *Hybalicus*) which are not yet known from any other South Australian caves or indeed most areas. Caves N5896 and N6838 should be now surveyed to see if they too harbour regionally unique microarthropods. Caves like this that are already known to harbour genuine troglobites (i.e., *Troglodiplura*) will potentially harbour other rare taxa such as troglobites or mesic relicts and warrant good protection. Similarly, in this region there are likely to be a proportion of unsurveyed caves that also harbour arthropods of high conservation significance.

It is difficult to draw conclusions about mallee litter fauna at Wahgunyah CP given the lack of basis for comparison with other mallee sites. However, we can say that given the number of new taxa located with modest sampling effort in Wahgunyah CP, the litter fauna of this mallee habitat seems to harbour high diversity.

6. Other significant findings

An outstanding new finding is that mites are one of the most diverse and abundant faunal elements of Nullarbor caves. For instance, *Ctenacarus araneolus,* previously only known from Australia from a small handful of records, was found to be one of the most abundant animals in many dry caves, sometimes numbering many hundreds of individuals from a single pitfall trap.

Several mite taxa uncovered here warrant investigation as possible troglophiles. The only reasonably-well sampled cave of the three caves that have *Troglodiplura* spiders (N253) showed a highly distinctive fauna compared to dry caves showing that there can be considerable heterogeneity in cave fauna.

Cave mites in Australia have often been tentatively labelled as troglophiles, i.e., an animal that is able to live its entire live within a cave. However, this label subsumes many mites with quite different biology and probably different ecological and historical relationships to caves. Specifically, the higher scientific and conservation value of cave fauna that have now disappeared from an entire region is not accounted for. This could be the situation for several taxa including some mites in Cave N253. Several species listed here are candidates as mesic relicts – wet habitat dwellers that have become stranded in an otherwise arid landscape that has been extensively affected by phases of continental aridification which commenced in the Miocene. Thus, mites known to depend on wet habitats could be restricted to Cave N253 if they can no longer live or disperse elsewhere. Note the analogous situation of the isopod genus *Haloniscus* which is known to survive in a "subterranean archipelago" of aquifers (Cooper et al., 2008), and was also collected on this Bush Blitz in Cave N253. For N253 mites this inference assumes they have negligible dispersal ability, and they are otherwise truly absent on the essentially treeless Nullarbor plain. However, for at least three genus-level taxa listed here these are reasonable though unproven assumptions. The most efficient way to examine this question would be to use dated molecular phylogenies.

Knowing what host or hosts sustain parasitic *Neotrombidium* larva in Australia has been an interesting mystery and a subject of speculation (Southcott, 1954). A tentative host record for an Australia *Neotrombidium* is here recorded for the first time. An engorged *Neotrombidium* larva was collected from underneath the elytra of a *Brises* sp. beetle (Tenebrioninae) in Cave N257. This larva was rolled within the folds of a hindwing. However, it was not attached. This reflects host records from North America, where a species of *Neotrombidium* was found to feed on a tenebrionine beetle (*Alobates*) that lives under logs and bark in eastern North America (Singer, 1966). The collections include long series of *Brises* and other large cave-inhabiting beetles from pitfall traps so specimens from this Bush Blitz provide ample opportunities to confirm this host record.

The kestrel nest sample from Cave N85 yielded a *Laelaps sp* mite. This *Laelaps* is a native *Laelaps* from a native endemic rodent. This means that that there are native rodents in the vicinity. It might have been from a native rodent captured by a raptor and brought to this doline. This *Laelaps* does not match any *Laelaps* currently known from *Pseudomys* rodents (Domrow, 1988).

7. Conclusions

Given the various new mite taxa found with minimal sampling sofar in the Yalata region there are likely to be many other new mites awaiting discovery particularly in mallee habitats.

Caves within the Nullabor karst region harbour a large diversity of rarely collected and interesting mites. Ologamasidae, Endeostigmata, and Oribatida show promise as groups for biodiscovery which will repay taxonomic effort. Central South Australia remains a large gap in taxonomic and biogeographic knowledge, Questions about the relationships and history of western versus eastern fauna in southern Australia will be assisted by continuing to fill some of these gaps.

While cave pitfall traps provided the numerical bulk of catches, other interesting finds only came from desiccating funnel extraction. For future sampling the importance of this underused technique for sampling sediment and litter cannot be overstressed, particularly from humid caves and mallee woodland.

Acknowledgements

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Appendix 1. List of mites recorded during the Yalata Bush Blitz						
Family	**Species**	**Common name**	**Putative new species**	**Threatened (EPBC Act)**	**Threatened (State/ Territory**	**Exotic/ pest**
Endeostigmata (primitive segmented mites)						
Alicorhagiidae	*Alicorhagiidae* sp 1	segmented mite	possibly	no	no	no
Alicorhagiidae	*Alicorhagiidae* sp 2	segmented mite	possibly	no	no	no
Alicorhagiidae	*Stigmalychus veretrum*	segmented mite	no	no	no	no
Oehserchestidae	*Oehserchestes* sp	segmented mite	possibly	no	no	no
Astigmatina						
Glycyphagidae	*Glycyphagidae* sp	mite	no	no	no	no
Ixodida (ticks)						
Argasidae	*Argas* sp cf *Argas falco*	soft tick	possibly	no	no	no
Ixodidae	*Bothriocroton hydrosauri*	hard tick	no	no	no	no
Mesostigmata (mesostig mites)						
Ascidae	*Asca* sp (*bicornis* group)	mite	possibly	no	no	no
Castriidinychidae	*Castriidinychus* YALBB sp1	mite	yes	no	no	no
Eviphididae	*Thinoseius peltatus*	mite	no	no	no	no
Ichthyostomatogasteridae	*Asternolaelaps australis*	mite	no	no	no	no
Laelapidae	*Androlaelaps sp cf casalis*	mite	possibly	no	no	no
Laelapidae	*Gaeolaelaps* sp	mite	no	no	no	no
Laelapidae	*Laelaps* sp	mite	no	no	no	no
Ologamasidae	*Geogamasus* YALBB sp2	mite	yes	no	no	no
Ologamasidae	*Laelaptiella* YALBB sp3	mite	yes	no	no	no
Parasitidae	*Pergamasus sp*	mite	no	no	no	yes
Oribatida ("beetle" mites)						
Undetermined families	Oribatida spp.	mite	no	no	no	no

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State/ Territory	Exotic/ pest
Cosmochthoniidae	*Cosmochthonius australicus*	mite	no	no	no	no
Ctenacaridae	*Ctenacarus araneolus*	mite	no	no	no	no
Eremaeozetidae	*Eremaeozetes* YALBB sp4	mite	yes	no	no	no
Oribatulidae	*Oribatula* YALBB sp5	mite	yes	no	no	no
Pheroliodidae	*Pheroliodes sp*	mite	possibly	no	no	no
Zetomotrichidae	*Anoplozetes* YALBB sp6	mite	yes	no	no	no
Trombidiformes						
Anystidae	Anystidae sp.	mite	possibly	no	no	no
Caligonellidae	Caligonellidae YALBB sp7	mite	yes	no	no	no
Cheyletidae	Cheyletidae sp	mite	no	no	no	no
Cheyletidae	Cheyletidae YALBB sp8	mite	yes	no	no	no
Cheyletidae	*Cheyletus sp*	mite	no	no	no	no
Cheyletidae	*Mexecheles* YALBB sp9	mite	yes	no	no	no
Erythraeidae	*Charletonia* sp	mite	no	no	no	no
Erythraeidae	*Erythrites* sp	mite	no	no	no	no
Erythraeidae	*Leptus* sp	mite	no	no	no	no
Lordalycidae	*Hybalicus* sp	mite	possibly	no	no	no
Mecognathidae	*Mecognatha* sp	mite	possibly	no	no	no
Neotrombidiidae	*Neotrombidium* YALBB sp10	mite	yes	no	no	no
Raphignathidae	*Raphignathus sp*	mite	no	no	no	no
Scutacaridae	*Imparipes* YALBB sp11	mite	yes	no	no	no
Smarididae	*Smaris prominens*	mite	no	no	no	no
Teneriffiidae	Teneriffiidae YALBB sp12	mite	yes	no	no	no
Pseudoscorpions (Pseudoscorpionida)						
Cheliferidae	*Protochelifer* sp	pseudoscorpion	no	no	no	no