An introduction to native insectary plants by Dr Mary Retallack

Recent PhD research found that native insectary plants can increase the presence of predatory arthropods (natural enemies and good bugs). Insectary plants provide food, shelter and alternative prey/hosts, which nourish and support the presence of predatory arthropods. In turn, predators provide 'regulating' ecosystem services, which involve biological suppression of vineyard pests. Stands of native vegetation adjacent to vineyards have been associated with increased biodiversity and provide season-long benefits to boost the activity of predators and parasitoids. This provides growers the confidence to incorporate selected native insectary plants in association with vineyards.

Growers are encouraged to explore the use of Christmas bush, *Bursaria spinosa*, prickly tea-tree, *Leptospermum continentale,* and wallaby grasses, *Rytidosperma* ssp. including common wallaby grass, *R. caespitosum*, brown-back wallaby grasses, *R. duttonianum*, copper-awned wallaby grass, *R. fulvum*, hairy wallaby grass, *R. pilosum*, slender wallaby grass, *R. racemosum*, and small-flowered wallaby grass, *R. setaceum*. These native insectary plants are introduced below.

Existing vegetation structures such as windbreaks, vegetation corridors, mid-row, under-vine, and headland areas can be enhanced to provide resources for predatory arthropods. This will further enrich the aesthetic and educational experience of tourists that visit these regions and enable a further marketing approach for the region.

Table 1. Locally-adapted native insectary plants

Habit	Genus	Species	Common name	Floral resources		Height (m)	Width (m)	Tolerance to frost	Flower colour	Flowering time
				Pollen	Nectar					
Shrub	*Bursaria*	*spinosa* ssp. spinosa	Christmas bush	yes	yes	2 to 4	1 to 3	resistant	white	late spring to late summer
	Leptospermum	*continentale*	prickly tea-tree	yes	yes	0.5 to 2	1 to 2	resistant	white	spring to summer
	Leptospermum	*myrsinoides*	silky tea-tree	yes	yes	1 to 4	1 to 4	resistant	white	spring
Ground cover	*Rytidosperma*	*caespitosum*	common wallaby grass	yes	no	0.2 to 0.8	0.1 to 0.3	resistant	cream	spring
	Rytidosperma	*erianthum*	hill wallaby grass	yes	no	0.2 to 0.7	0.4	resistant	cream	winter to summer
	Rytidosperma	*setaceum*	small-flowered wallaby grass	yes	no	0.2 to 0.6	0.1 to 0.3	resistant	cream	spring to summer
	Rytidosperma	*fulvum*	wallaby grass	yes	no	0.4 to 0.7	0.5	resistant	cream	spring to summer
	Rytidosperma	*geniculatum*	kneed wallaby grass	yes	no	0.1 to 0.5	0.1 to 0.3	resistant	cream	spring to autumn

Native insectary plants (general): It is reported that the longevity of parasitoid wasps which predominantly feed on nectar are significantly enhanced by Australian native plants including Christmas bush, *Bursaria spinosa*, crimson bottlebrush, *Callistemon* sp., Hakea, *Hakea* sp., prickly tea-tree, *Leptospermum continentale,* woolly tea-tree, *Leptospermum lanigerum*, austral trefoil, *Lotus australis*, creeping mint, *Mentha satureioides*, dryland tea tree, *Melaleuca lanceolata*, creeping boobialla, *Myoporum parvifolium*, sticky boobialla, *Myoporum petiolatum*, and wallaby grasses, *Rytidosperma* ssp.

In addition, a recent desktop review of plants native to South Australia identified a broader suite of locally-adapted native plants which are regarded as having the capacity to provide insectary benefits and may hold widespread appeal. They include wild rosemary, *Dampiera rosmarinifolia*, clasping goodenia, *Goodenia amplexans*, hop goodenia, *Goodenia ovata*, cut-leaf goodenia, *Goodenia pinnatifida*, boobialla, *Myoporum insulare*, long-leaved bush-pea, *Pultenaea daphnoides,* twiggy bush-pea, *Pultenaea largiflorens*, blue-rod, *Stemodia florulenta*, fairy fan-flower, *Scaevola aemula*, as well as species of *Acacia* ssp., *Eucalyptus* ssp., and *Lomandra* ssp. that may be suited to a particular site. Other plants previously identified for their insectary benefits in vineyards include straw wallaby grass, *Rytidosperma richardsonii*, windmill grass, *Chloris truncata*, and creeping saltbush, *Atriplex semibaccata*.

More information? If you would like to find out more information about individual plants. Visit the Botanic Gardens of SA 'Plant Selector' http://plantselector.botanicgardens.sa.gov.au. Enter your postcode and press search. View the results and export data to retain a copy. The Excel spreadsheet contains detailed notes about each plant and its suggested uses. Also refer to the EcoVineyards pre-European regional plant lists www.wgcsa.com.au/ecovineyards.html

This project is supported by the Department of Agriculture, Water and the Environment through funding from Australian Government's National Landcare Program

Christmas bush, *Bursaria spinosa* and the predatory arthropods found in association

Description: Christmas bush is an erect, evergreen, native, large shrub, or small tree in most parts of SA (but can grow into a larger tree in the Limestone Coast). The dark green leaves are small (1 to 5 cm long), ovate with a narrower end at the base and clustered on the branches. Depending on the sub-species, the branches are often spiny. Groundcover plants and native grasses can be planted underneath. It's also known as sweet bursaria, or native blackthorn in NSW.

Height and width: Generally 2 to 4 metres high x 1 to 3 metres wide. Potential growing height can be based on regional habitat and there are some large, old specimens growing in the Limestone Coast. Plants can be trimmed to keep the habit 'tight and compact' in a vineyard setting.

Preferred position: Plant in an open sunny to semi-shaded position, and on well drained, to slightly water retaining soils. It is hardy once established.

Location: Commonly found throughout South Australia.

Flowers: The flowers are creamy-white, sweetly perfumed, about 10 mm in diameter and grow in dense terminal clusters. As the name suggests, flowering occurs around Christmas time from late spring to late summer (and in some cases early April in the Adelaide Hills).

Propagation: Can be grown from seed or cuttings. Fresh seeds will produce the best germination results in a standard seed-raising mix. Cuttings should be semi-hard wood, about 10 cm long and taken from the current season's new growth. However, propagation can be challenging and it is recommended growers purchase tube stock plants from commercial nurseries for the best results.

Maintenance: Ideally, young plants are watered regularly in the first year until they have established. Use mulch and tree guards for the best results. Hardy, small tree once established. Can be used as a shelter belt in a mass planting, or in combination with other native shrubs and small trees. Beautiful as a feature plant.

Habitat value: The flowers attract a wide range of predatory arthropods, and also provide a haven for small insectivorous birds. The spiny branches make this species useful as a deterrent shrub, or as a potential natural barrier to keep people out of the vineyard for biosecurity purposes.

Interesting fact: The name Bursaria comes from the Latin word 'bursa', for bag or purse, referring to the purse- or heart-shaped seed capsules and spinosa is in reference to the spines often present on the branches.

NB: *Bursaria spinosa* should not be confused with *Prostanthera lasianthos*, commonly known as the Victorian Christmas bush.

Figure 1e. Specimens of Christmas bush along the Coonawarra railway line siding. **Photos:** Mary J Retallack

Figure 1a. Christmas bush, *Bursaria spinosa* in a natural setting (Belair National Park).

Figure 1b. Christmas bush flowers from late spring until late summer (and as late as April in the Adelaide Hills).

Figure 1c. Christmas bush flowers produce plentiful supplies of pollen and nectar**.**

Figure 1d. Characteristic purse-/heart-shaped seed capsules, inside which, when mature, the seeds rattle in the wind.

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Incorporating Christmas bush in and around the vineyard

Christmas bush can be incorporated as a shelter belt, or at the ends of strainers in the vineyard (Prue Henschke, C.A. Henschke and Co. has pioneered this approach). It may also provide a suitable alternative to roses and other exotic plants, which are often used at the end of strainer posts and offer no intrinsic benefit. Cylindrical, steel mesh guards may be required to stop sheep from eating the plants during establishment if they are utilised the vineyard. Steel guards support the upward growth of plants. In addition, sheep may 'trim' the sides of plants through the guards resulting in compact growth. A machine harvester can pass over the top of the shrub without causing damage. Pruning of shoots results in a greater abundance of flowers. A success rate or > 90% can be achieved when the plants are hand watered in the first season.

Figure 2. Christmas bush planted adjacent to a strainer post (a), may provide a suitable alternative to introduced species including roses (b), planted adjacent to the vineyard (c), and 30 cm apart as a dust barrier (d) [Photos: Mary J Retallack].

Predatory arthropods found in association with Christmas bush

In a recent study, 67 morphospecies (visually distinct specimens) of predatory arthropods were found in association with Christmas bush, including brown and green lacewings, spiders, predatory and parasitic wasps (Chalcid, Ichneumonid, Proctotrupoid, Tiphiid and Vespoid), predatory shield bugs, and many other 'good bugs' (Retallack, 2019). It may be possible to increase the functional diversity offered by predatory arthropods by x 3.1 when Christmas bush is incorporated adjacent to vineyards.

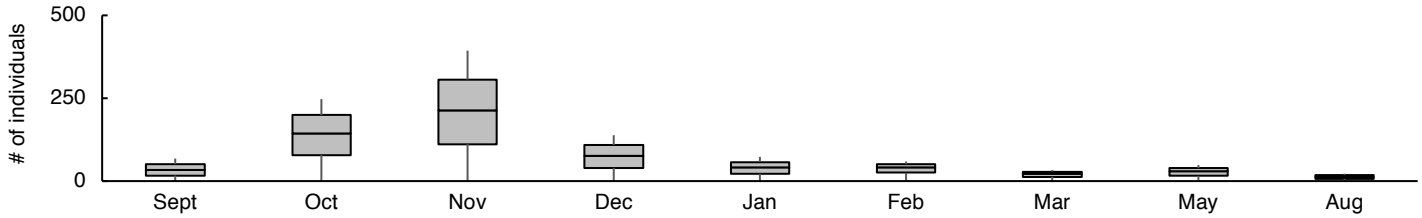

Figure 3. Temporal abundance of predator arthropods on Christmas bush over a 12-month period. The box plots represent the median (central line), first and third quartiles (grey box), and the whiskers the total range.

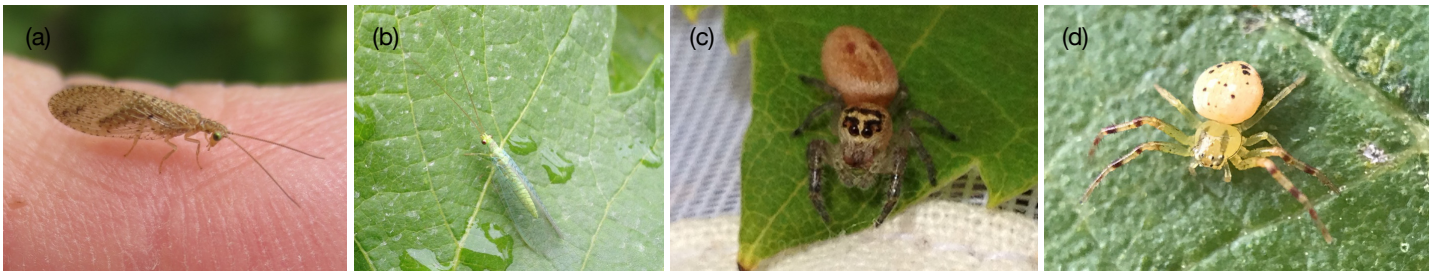

Figure 4. Brown lacewing, *Micromus tasmaniae* (a), green lacewing, *Mallada signata* (b), jumping spiders (Salticidae) are active hunters (c), flower or crab spiders (Thomisidae) ambush their prey (d) [Photos: Mary J Retallack].

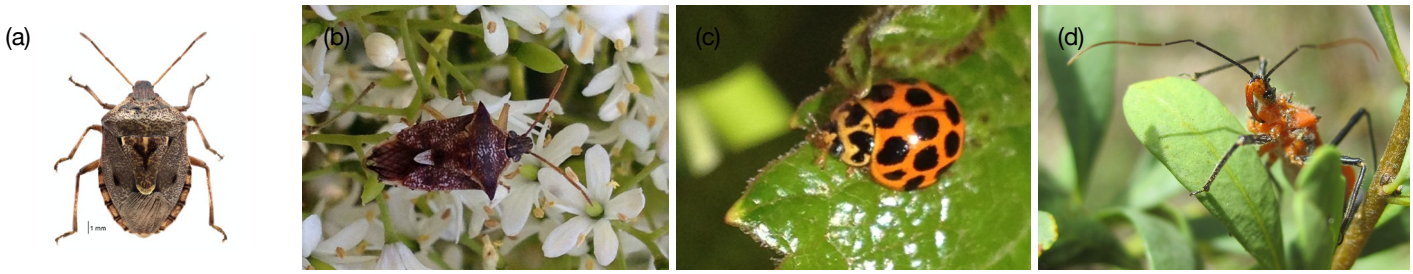

Figure 5. Glossy shield bug, *Cermatulus nasalis* [Photo: Landcare Research NZ] (a) predatory shield bug, *Oechalia schellenbergii* (b) common spotted ladybird beetle, *Harmonia conformis* (c), and orange assassin bug, *Gminatus australis* (d) [Photos: Mary J Retallack].

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Prickly tea-tree, *Leptospermum continentale* and the predatory arthropods found in association

Description: Prickly tea-tree is a fast growing, upright prickly shrub with smooth bark on smaller stems, which sheds in stringy strips. The rigid, prickly leaves (approx. 1 cm long and 3 mm wide) are a narrow, oval-shape tapering to a point at each end. The fruit is 7 mm or less in diameter.

Height and width: 0.5 to 2 metres high x 1 to 2 metres wide. Plants can be trimmed to keep the habit 'tight and compact' in a vineyard setting.

Preferred position: Full sun to partial shade. Tolerates most soil types and aspects. Suitable for poorly drained areas, is frost-hardy, and suitable as a hedge or screen plant.

Location: Commonly found throughout South Australia (Mount Lofty Ranges, Limestone Coast and Kangaroo Island in particular).

Flowers: Masses of white flowers 10 mm wide, occur from early spring to late summer, resulting in capsular fruits that persist on older wood.

Propagation:. Can be propagated easily from seed and will direct seed successfully if weeds are controlled. Smoke treatment may improve seed germination. Seed retains viability for several years if stored at room temperature. It can also be propagated from tip cuttings.

Maintenance: Young plants should be watered regularly in the first year until they have established. Use mulch and tree guards for the best results. Hardy once established. It is fast-growing and can be pruned back to a produce hedge or a screen. Can be used as a shelterbelt in a mass planting, or in combination with other native shrubs and small trees to enhance functional biodiversity.

Habitat value: The flowers attract a myriad of insects including predatory and parasitic wasps and flies, which are attracted to the nectar and pollen produced by the flowers. Nectar and seed-eating birds are also attracted. The dense canopies are excellent refuges for native birds. As the name suggests the leaves are prickly and can be used as a passive barrier to keep visitors out of vineyards to promote biosecurity. It responds well to pruning.

Interesting facts: The tea-tree derives its name from the practice of early settlers soaking the leaves in boiling water to make a tea substitute. *Leptospermum* is derived from the Greek word leptos (slender), and sperma (seed), referring to narrow seeds of some species and *continentale* refers to its mainland distribution as opposed to its close relative mānuka, *L. scoparium*, which is native to south-eastern Australia and NZ.

Figure 6e: Prickly tea-tree in a vineyard and orchard setting in the Adelaide Hills. **Photos:** Mary J Retallack

Figure 6a. Prickly tea-tree, *Leptospermum continentale* in a natural setting (Belair National Park).

Figure 6b. Flowers produce plentiful amounts of nectar and pollen.

Figure 6c. Flowering occurs from early spring to late summer.

Figure 6d. Masses of white flowers result in capsular fruits that persist on older wood

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Incorporating prickly tea-tree in and around the vineyard

Prickly tea-tree can also be incorporated as a shelter belt or at the ends of strainers in the vineyard. It responds well to pruning and its habit can be pruned to a desired shape. It is suggested that it is used in combination with Christmas bush, wallaby grasses and other native plants to boost functional diversity within the vineyard.

Figure 7. Prickly tea-tree being established as a shelter belt in a vineyard [Photos: Mary J Retallack].

Predatory arthropods found in association with prickly tea-tree

Prickly tea-tree provides habitat for natural enemies that are attracted to sources of nectar and pollen, such as predatory and parasitoid wasps (Chalcid, Ichneumonid, Proctotrupoid, Tiphiid and Vespoid), lacewings, spiders and other predators. At least 63 different types of predatory arthropods or 'good bugs' were found in association with prickly tea-trees during a recent study (Retallack, 2019), many species overlapped with Christmas bush. It may be possible to increase the functional diversity offered by predatory arthropods by x 3.2 when prickly tea-tree is incorporated adjacent to vineyards.

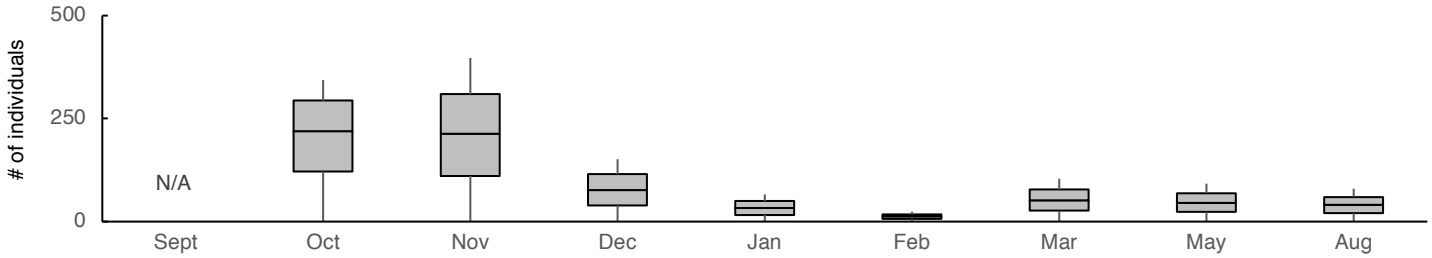

Figure 8. Temporal abundance of predator arthropods on prickly tea-tree over a 12-month period. The box plots represent the median (central line), first and third quartiles (grey box), and the whiskers the total range.

Figure 9. bird-dropping spider, *Celaenia excavata* (a), flower or crab spider (Thomisidae) (b), Pacific damsel bug, *Nabis kinbergii* (c), big-eyed bug, *Geocoris* ssp. (d) [Photos: Mary J Retallack].

Figure 10. predatory shield bug, *Oechalia schellenbergii* (a), transverse ladybird beetle, *Coccinella transversalis* (b), minute two-spotted ladybird, Diomus notescens (c), robber fly (Asilidae) (d) [Photos: Mary J Retallack].

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Wallaby grasses, *Rytidosperma* ssp. and the predatory arthropods found in association

Description: wallaby grasses, *Rytidosperma* ssp. (previously *Austrodanthonia* ssp.) are erect, perennial, tussock grasses, with fine leaves and distinctive white, fluffy seed-heads when mature.

Height and width: 0.3 to 0.8 metres high x 0.1 to 0.5 metres wide, depending on the species.

Preferred position: Plant in an open sunny to semi-shaded position, and on well drained to slightly water retaining soils. Is hardy once established, either in the mid-row, or undervine area in vineyards.

Location: *Rytidosperma sp.* is endemic in South Australia including common wallaby grass, *Rytidosperma caespitosum,* hill wallaby grass, *R. erianthum,* small-flowered wallaby grass *R. setaceum,* wallaby grass, *R. fulvum,* and kneed wallaby grass, *R. geniculatum* (which grows < 30 cm and is suited to the undervine area).

Flowers: Flowering generally occurs in late spring and early summer.

Propagation: Mature seed can drop from the head quickly (in late November/December). Plant prior to opening rains in May while the soil temperature is still relatively warm. Do not incorporate phosphate fertilisers when planting native seeds, as this will reduce the likelihood of success. Seed may lay dormant during the winter months until soil temperatures warm up in spring.

If sown in the mid-row, wallaby grass will create a relatively sparse cover on the ground, as this mirrors its natural habit. Plant a diversity of species to benefit from the varying growth habits and attributes of different species.

Maintenance: Weed control is critical prior to sowing wallaby grasses, as well as control of weeds during establishment. Once established, wallaby grasses have the capacity to regenerate and some of the naturally occurring gaps will be filled via natural recruitment. Once wallaby grasses are established they appear to compete favourably with invasive weeds including wireweed, salvation jane, and caltrop.

Habitat value: The flowers produce pollen and the grasses provide important habitat for a range of ground dwelling predatory species, including breeding sites for brown lacewings. Wallaby grass is a perennial, tussock grass which grows actively during spring and enters dormancy when conditions dry out in summer.

Interesting fact: The mowing of grass swards can be used to manipulate the timing of flowering and the provision of pollen for predators such as predatory mites. In preference to mowing all rows, mowing of alternative rows can be used to retain habitat and shelter for predatory insects and spiders that live and reproduce in long grass. Similarly, grasses can be slashed to a minimum height of 10 cm to preserve habitat.

Kneed wallaby grass, *Rytidosperma geniculatum* will grow to a height of 30 cm and may be suitable for use under vine and in the mid-rows, without the need for slashing. A mix of *Rytidosperma* ssp. can be selected to suit the local conditions, based on the performance required.

Figure 11a. Wallaby grasses in a broad-acre setting

Figure 11b. Wallaby grass seed head

Figure 11c. Distinctive white, fluffy seedheads of wallaby grasses planted in the vineyard

Figure 11d. Wallaby grasses slashed after flowering **Photos:** Mary J Retallack

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Incorporating wallaby grasses in and around the vineyard

Wallaby grasses can be incorporated in the mid-row, under-vine area, or around the vineyard perimeter. Pre-planting weed control is paramount and a diversity of perennial grass species is encouraged to avoid planting a monoculture. Herbicide may need to be applied post-planting to selectively kill broad leaved weeds and reduce competition. Wallaby grass is well adapted to dry conditions and may go dormant when volunteer weeds die. However, it will often 'bounce back' when there is sufficient soil moisture, whereas the weeds do not rebound as quickly. The dense, fibrous root system grows to a depth of approximately 15 cm. It provides a source of organic matter and helps to maintain soil structure and water infiltration.

A team of researchers led by Chris Penfold recently completed a study looking at the use of a low growing kneed wallaby grass, *R. geniculatum,* which grows to 30 cm undervine and found that the dormancy trigger normally present is overridden when moisture is available via the dripline. This may render wallaby grass unsuitable when planted undervine on water limited sites, as it may have a detrimental effect on vine vigour. However, on high vigour sites it may provide a good option to reduce vine vigour. Slashing the grass undervine or 'knocking it back' using a contact weedicide may be an alternative way to control the vigour. It is not anticipated wallaby grass will present a vigour problem when planted in the mid-row.

Figure 12. Wallaby grasses planted under-vine [Photo: D Falkenberg] (a), in the mid-row (b), and the biomass produced by the root system (c) [Photos: Mary J Retallack].

Predatory arthropods found in association with wallaby grasses

At least 38 types of predatory arthropods or were found in association with wallaby grasses during a recent study (Retallack, et al. 2019). Wallaby grasses provide habitat for a diversity of predators, with wolf spiders, brown lacewings, earwigs, glossy shield bugs, parasitoid and predatory wasps (Ichneumonid, Vespoid, and Sphecidae) and carabid beetles found abundantly in South Australian vineyards (Retallack, et al. 2018). It is also reported that predation of LBAM eggs increases when *Rytidosperma* ssp. and windmill grass, *Chloris truncata* are present. When *Rytidosperma* ssp. is included in a plant assemblage with grapevines, this could result in a net increase in predator morphospecies richness of 27%.

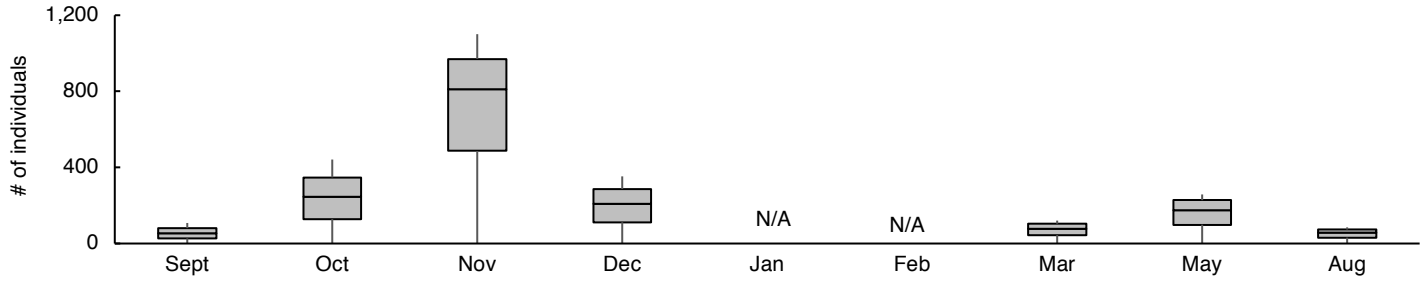

Figure 13. Temporal abundance of predator arthropods found in association with wallaby grasses over a 12-month period. The box plots represent the median (central line), first and third quartiles (grey box), and the whiskers the total range.

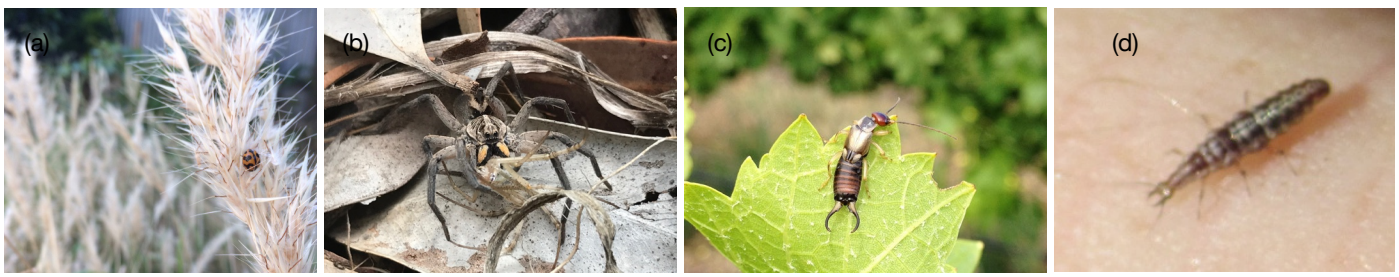

Figure 14. Transverse ladybird beetle, *Coccinella transversalis* [Photo: J Edwards] (a), Garden wolf spider, *Tasmanicosa* sp. [Photo: Mary J Retallack] (b) European earwig, *Forficula auricularia* (c), brown lacewing larva, *Micromus tasmaniae* [Photo: Mary J Retallack] (d).

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Further reading

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Thank you to our project partners!

Acknowledgement of country

The EcoVineyards project acknowledges Aboriginal people as the First Peoples and Nations of the lands and waters we live and work upon and we pay our respects to their Elders past, present and emerging. We acknowledge and respect the deep spiritual connection and the relationship that Aboriginal and Torres Strait Islander people have to Country.

For more info about the EcoVineyards project see https://www.wgcsa.com.au/ecovineyards.html

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