



Conservation Utility of *Pimelea microcephala* subsp. *microcephala* to Arid Zone Frugivores and Pollinators

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The conservation of native fauna that inhabits semi-arid zones is aided by understanding food sources and their use in these nutrient-poor landscapes. But what determines the usefulness of a resource to a food web; How many species use it? Are those species native, introduced, or threatened? Is it nutritious? The project aims to answer all three questions about the arid zone dioecious plant – mallee rice-flower (*Pimelea microcephala*) subspecies *microcephala*.

The mallee rice-flower is a dioecious plant, meaning that male and female reproductive roles are separated to different individuals. Both sexes of mallee rice-flower produce nectar, however only male plants produce pollen which pollinators gather, and only females produce bright fleshy fruits, which frugivores may consume. The mallee rice-flower was first identified at Hiltaba Nature Reserve, South Australia, in a Bush Blitz expedition in 2012. Since discovering

the Hiltaba population, the significance of these potential pollinator and frugivore resources to Hiltaba's arid zone fauna has not been investigated, and the utility of mallee rice-flower for conservation has not been explored.

Two attributes of mallee rice-flower make this species a potentially valuable species within the arid zone food web and for conservation: dioecy and toxicity. Regarding dioecy, while separating male and female reproductive roles is seen in six percent of Angiosperm species globally, it can be highly advantageous to reproduction and survival for arid species. By separating pollen and fruit production to different sexes, the production of one sex is not compromised by the production of the other, which allows for independent optimisation. Rather than dividing vital resources like nitrogen, carbon, or water between making pollen and fruits, dioecious individuals can focus on allocating resources to produce a high quantity and quality of just one product. Meanwhile, as a by-product of the different resource allocation and use patterns caused by primary reproductive function, resources produced by both sexes are adapted to utilise available resources best. Hence, the nectar profile of males and females can vary to manipulate pollinator behaviour to direct pollen-carrying insects to female flowers for pollination.

From a frugivore or pollinator's perspective, producing such high quantities of pollen by male plants, fruit by female plants, and nectar by both sexes means that foraging effort is reduced because resources are clustered at higher densities on individual plants. Pollen and fruits may also be more concentrated in terms of specific (macro) nutrients because of the independent production of each.

Top: Jenna Draper is a PhD Candidate in the School of Biological Sciences at the University of Adelaide.



Preliminary camera trap imagery of a ringneck parrot (top) and wattletbird (bottom) searching for *Pimelea microcephala* subsp. *microcephala* fruits. Images: Jenna Draper.

The potential for mallee rice-flower to provide nutrient-dense and widely used food resources could make it a staple plant to consider during revegetation and monitoring efforts. Doing so will enable populations of pollinators and frugivores to return to or be sustained in arid habitats.

Another important factor that makes mallee rice-flower a potentially useful species for conservation is that it contains the toxin simplexin. Simplexin is a potent vasoconstrictor known to be toxic to cattle, and as a result, cattle will avoid grazing mallee rice-flower. This toxicity presents a unique conservation opportunity, as it chemically protects the mallee rice-flower from being grazed by introduced species. Grazing would counteract revegetation or prevent resources benefiting vulnerable native species. Additionally, as the fruits are attractive and appear to be consumed and dispersed by frugivores, it would be beneficial to ascertain if the fruits are also toxic. Should simplexin also occur in the fruits and native fauna are found to consume them safely, it could reveal the specificity of the resource for native fauna.

Therefore, focusing on the pollen and fruits produced by the mallee rice-flower, the project aims to: 1. Determine how many species gain sustenance from

these food resources, and 2. Identify and quantify the nutrients available to species that consume them.

To address the first aim, frugivores and pollinators will be observed to determine the diversity of species visiting the mallee rice-flower for food. Frugivores will be observed and identified in the field and by camera trap photography. Pollinators will be observed and captured for identification after confirming interaction with male and female plants. After species identification, a diversity assessment will be made to determine how broadly food resources are used by native fauna and how frequently they are used. Preliminary camera trap data and opportunistic pollinator observation have so far indicated that a variety of native birds and insects interact with the mallee rice-flower, likely seeking fruits or nectar and pollen, respectively. However, further observation of frugivores, especially by eye, will be required to confirm the consumption of the mallee rice-flower fruits.

The second aim, which has been partially undertaken and completed, will be addressed by subjecting the pollen and fruit of the mallee rice-flower to nutrient analysis. Pollen will be analysed for protein content, a key

indicator of nutritional value to insects. Protein content will be compared between the mallee rice-flower and co-flowering species to see if the protein content (nutritional value) is higher for the mallee rice-flower pollen. Fruit nutrient analysis has already been conducted and indicates that mallee rice-flower fruits are a vital source of water and antioxidants and contain high levels of the toxin simplexin.

Identification of species utilising mallee rice-flower, combined with nutrient studies of pollen and fruits, will provide a complete picture of the benefits of the mallee rice-flower as a potentially broadly used, chemically defended, and native specific food source. The project will provide conservation recommendations to inform the management of the relatively new mallee rice-flower population in Hiltaba Nature Reserve, South Australia, and potentially other native and threatened arid zone fauna species.

THE FUNDS PROVIDED BY THE AUSTRALIAN WILDLIFE SOCIETY will be used to purchase camera traps (to increase the observational coverage of frugivores) and will be used towards accommodation and associated travel costs to conduct observations at Hiltaba, South Australia.



Mallee rice-flower (*Pimelea microcephala*) subspecies *microcephala* pollen-producing male inflorescence (left) and fruit-bearing female inflorescence (right). Images: Jenna Draper.



A hoverfly (Syrphidae) interacting with male flowers of Mallee rice-flower (*Pimelea microcephala*) subspecies *microcephala*. Image: Jenna Draper.