

The importance of flowering resources
to the ecology of the Western Pygmy
possum, *Cercartetus concinnus*



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**Pictures taken by Gavin Hedrick, Briony Horner, Leanne Schneider and other field helpers.*

Abstract

The basic requirements of a species are food, space and shelter. The presence of these resources and their availability and quality will influence population patterns. This relationship is not a simple one as both the resources being used and the consumers' needs are variable. Resources are generally heterogeneous rather than homogeneous, in that their availability is subject to spatio-temporal variation. Consumers' needs are driven by their resource requirements which may vary over time, for example, the needs of each animal will change with age and reproductive patterns. Species that depend on heterogeneous resources will often reflect this in their ecological patterns including abundance, distribution, reproductive success and timing, physiology, movements, use of space, territorial behaviour, foraging behaviour and diet.

The aim of this study was to describe the influence of a spatially and temporally heterogeneous food resource on the ecological patterns of an animal species that uses them. This relationship was considered in the demographic patterns, foraging behaviour, diet and feeding preferences of the western pygmy possum, *Cercartetus concinnus*. The study was based on 261 individuals captured 452 times over 43,200 trap nights and 24 trapping periods between July 1997 and June 1999. This species is a small marsupial that is known to use pollen and nectar in its diet. Nectarivorous animals are particularly vulnerable to the fluctuations of their highly variable food resource and provide a good case for the study of the effects of heterogeneous resources. Newland Head Conservation Park in southern South Australia was chosen as the study site since it provides a year round cycle of flowering resources and the opportunity to monitor a population as it responded to spatial and temporal resource heterogeneity without the extreme fluctuations in population density that can occur in arid areas.

The influence of heterogeneous food resources was evident in most aspects of this species' ecology, from dietary choices to their distribution and abundance. Floral resources were the primary dietary resource for this species although, as is often found with species that rely on heterogeneous resources, they did use other food resources. The timing and distribution of flowering of a few key species could be used to predict the distribution and abundance of *C. concinnus*. This indicates that *C. concinnus* can and does track floral resources, moving

spatially to follow particular flowering species as they become available. While the distribution of the species could be predicted, the low recapture rates found during trapping and the distribution pattern of those animals that were recaptured may indicate a nomadic movement pattern in which animals move randomly when foraging to increase their potential for encountering an unpredictable food resource. At the population level, reproductive timing was associated with peaks in flowering of two dominant flowering species, suggesting a dependence on these resources for reproduction.

Cercartetus concinnus also showed a capacity to switch from one food resource to the next as the flowering of one species finished and the next commenced. Both sex and seasonal patterns were evident in foraging behaviour and appeared to relate to the reproductive requirements of each sex. As the key floral resources tended to be available seasonally in pairs, paired dietary preference trials were used to determine whether *C. concinnus* made choices between the species and what floral characteristics might be driving those choices. Some preference was shown for eucalypt over non-eucalypt (*Banksia* and *Callistemon*) species where flowering periods overlapped. The strength of the preferences displayed depended on the species pair combination, the sex of the animal and floral characteristics. The preference of male *C. concinnus* for eucalypt species over non-eucalypt was clear, with the strength of this preference being defined by the species pairing. In contrast females showed a preference for eucalypts unless they were paired with *B. ornata*, at which point their preference appeared to shift to the non-eucalypt species. This preference appears driven by the females' reproductive requirements with *B. ornata* flowering at the same time as the larger peaks in reproductive activity and the densities of flowers produced being greater than the other species. The relationship with floral characteristics is much stronger for males than females with males being associated with plants containing low nectar volumes and high sugar concentrations.

This study has revealed that a species thought to use an opportunistic dietary pattern can show a preference for a heterogeneous food resource as it becomes available and that the availability of this resource can be used to predict demographic patterns such as distribution, abundance and reproductive timing. These results also emphasise the importance of considering the influence of spatio-temporal patterns of both the resources and consumers when studying their interactions.

Statement of Originality

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution to Briony Horner and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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