



Thesis writing

Results



UNIVERSITY
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BIOLOGY EXAMPLE

In this example thesis, each chapter reports on a separate issue of the behavioural ecology of the yellow-bellied glider, and each chapter has a results section.

Example: results section of a thesis

2.3 RESULTS

2.3.1 Eucalypt Sap

Two species of eucalypt were frequently incised by yellow-bellied gliders at Bombala to obtain sap. The sap of *Eucalyptus viminalis* accounted for 94% of the feeding observation time (FOT) during January 1984, 1% in February 1985, 83% in April 1985 and 3% in January 1986 and 14% in July 1986 (Fig 2-2). *Eucalyptus fastigata* sap accounted for 44% of the FOT during May and 58% in June and 48% in January 1986. Fresh incisions were observed on *E viminalis* during the Oct/Nov 1984 field trip, suggesting that sap had been harvested prior to this time. One glider group, consisting of 4-6 individuals, made almost continual use of *E fastigata* sap (suggested by relatively fresh incisions) from May through to December 1984 (pers obs, Kavanagh 1987a). However, frequent checks on these sap-site trees (4 individual trees) during the last three field trips in 1984 did not reveal gliders feeding. Within the home range of a group of gliders, only a small number (3-6) of each of these two eucalypt species was incised for sap, although each species was very abundant. This aspect of their feeding behaviour is treated in greater detail in Chapter 3.

presents results separately for each food type

2.3.2 Honeydew

This activity varied seasonally from 0% of the total observed feeding time in July 1985 and January 1986 to 68% in July 1986 (Fig 2-2). It was a more common feeding behaviour in winter in two of the years of this study. It was absent during the winter of 1985 but only two gliders could be located on one night so that these data may not be indicative.

general comments

Two types of honeydew were harvested. One type, produced by hemipterans (Family Psyllidae) living under the bark of *E cypellocarpa* was responsible for 65% of the honeydew feeding observations in April, 76% in May, 49% in June and 87% in Aug/Sept 1984, 85% in April 1985, and 21% in July 1986. Gliders harvested this type of honeydew only by branch-licking. These observations were principally made upon one group of gliders (January 1984-July 1985) which utilised four *E capellocarpa* for this resource. Another group used *E ovata* in the same manner to obtain this type of honeydew but to a lesser extent. The areas from which gliders harvested this type of honeydew were characteristically blackened (see above) and droplets of honeydew could often be seen on this substrate glistening in the spotlight beam. Also, in June/July 1986 76% of the honeydew feeding was on the outer branches of *E fastigata* where gliders (of another glider group) licked honeydew produced by psyllids under the bark. At no time while feeding would gliders have contacted the psyllids producing this honeydew as these would have been protected by the overlying bark.

findings about 1st type of honeydew

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Example: results section of a thesis

The second type of honeydew was produced by scale hemipterans (Family Coccidae) living on the outer branches and leaves of *E fastigata*, *E obliqua*, *E viminalis* and *E radiata*. Utilisation of this coccid honeydew (by branch and leaf-licking) was significant during May, June, Aug/Sept, Oct/Nov and Dec 1984 when it comprised 9%, 51%, 13%, 96%, and 100% of the total honeydew feeding observations respectively. During Oct/Nov 1984, February and April 1985, gliders harvested honeydew only from the foliage of *E radiata* where it could be seen glistening in the spotlight beam. Some ingestion of these insects would be expected during this feeding activity.

findings about 2nd type of honeydew

2.3.3 Arthropods

Little time was spent harvesting arthropods during January, October, December 1984, February, April 1985 and January 1986 (Fig 2-2). However, this changed dramatically at certain times of the year. In April 1984 and July 1985 bark-peeling accounted for 86% and 98%, respectively, of the observed feeding time. This feeding activity was concentrated on *E fastigata* in April but *E viminalis* in July ...

results for different periods and different types of tree

During May 1984, 22% of the observed feeding time was spent gleaning arthropods from the foliage of *E viminalis*. This activity consisted of systematically searching through the foliage, rapidly drawing clumps of leaves toward the nose and eyes for inspection. This behaviour was very different to that associated with harvesting honeydew or manna from foliage. ...

2.3.5 Nectar

At various times during the study, all eucalypts flowered in the study area (Kavanagh 1984, 1987a). Certain individuals of all of these species showed an abundance of flowers and presumably also nectar. However, only during June/July 1986 were observations made of gliders using this resource, although on numerous occasions they were observed foraging in trees adjacent to these flowering individuals. During 1984, *E ovata* flowered lightly in the study area during October-December, but only 1 min of nectar feeding was observed and that occurred in December. Other trees which flowered in 1984 were apparently ignored by foraging gliders. One *E viminalis* was in flower in June/July 1986 and the two gliders in the area made extensive use of it, visiting it on consecutive nights. ...

2.3.6 Overall Diet

The diet of the yellow-bellied glider at Bombala consisted at times almost exclusively of plant and insect exudates (Fig 2-2). Exudates (sap, honeydew, manna and nectar) accounted for 63.1% of the feeding observation time (FOT) during the whole study (122.4h) while arthropods alone made up 14% of FOT. However, a further 22.9% of the FOT was of gliders peeling back loose shedding bark during which they harvested arthropods and honeydew together but the proportion of each could not be determined (see above). If it is assumed that each was harvested in equal proportion then exudates account for 74.6% of FOT and arthropods 25.4%. Only during April 1984 and July 1985 did arthropods feature as a main item in the diet. At other times it formed a consistent but minor portion of the diet. ...

summarises results on foodtypes

FOT %ages given for exudates and arthropods

2.3.7 Food Availability Indices

Kavanagh (1984, 1987a) provided details of flowering and bark shed at this site for November 1981-January 1985. During this time nectar was usually seasonally abundant at Bombala and relatively evenly dispersed but during the 18 months when its abundance was quantified in this study (Feb 1985-July 1986), only seven of the 150 marked trees were observed to possess flowers. All of these were in February 1985 and averaged approximately 500 flowers each. Observations of nectar feeding were few and apart from 1 min in December 1984, were made only during June/July 1986 (Fig 2-2) when one *E viminalis*, heavily laden with flowers (ca 16,000 flowers), was visited regularly by one pair of gliders. This was the only flowering tree seen in the study area.

results on indicators of food availability results of previous research



Example: results section of a thesis

Table 2-1. Seasonal changes in the abundance index (ranging from a minimum of 0 to a maximum of 4) of loose shedding bark (see text for determination of the index) on six species of eucalypt (species names have been abbreviated). Numbers of trees monitored are in parentheses beside species. Numbers in parentheses beside indices represent the proportion (%) of trees with >10% bark shed scores.

| | 1985 | | | 1986 | | |
|------------|----------|----------|----------|----------|----------|-----------|
| | Feb | April | July | Sept | January | June/July |
| Species | 1.1 (64) | 0(0) | 0(3) | 0 (0) | 0.8 (59) | 0 (0) |
| E.v. (39) | | | | | | |
| E.r. (45) | 2.3 (82) | 0.4 (27) | 0.1 (7) | 0.9 (56) | 0 (2) | 0.1 (7) |
| E.f. (20) | 2.6 (95) | 0.3 (25) | 0 (°) | 0.1 (10) | 0 (0) | 0 (°) |
| E.c. (12) | 1.2 (50) | 0.3 (17) | 0.4 (8) | 0.6 (25) | 0.1 (8) | 0.1 (8) |
| E.ov. (21) | 1.4 (71) | 0.6 (29) | 0.6 (43) | 0.4 (29) | 0.5 (29) | 1.4 (57) |
| E.ob. (13) | 1.6 (54) | 0.2 (15) | 0.1 (8) | 0.5 (31) | 0.1 (8) | 0 (°) |

Bark-shedding by eucalypts in the study area was spread across the year with substantial overlap between species (Table 2-1). These data corroborated those of Kavanagh (1987a) for earlier years and show that during any visit, some shedding bark could be observed on individuals of several species and at least one species had a large proportion of individuals with >10% bark-shed. Furthermore, *E. viminalis*, which has a very narrow period of barkshed in summer, retains the bark in ribbons (after being shed) on its major lateral branches, providing further substrate for invertebrates (Smith 1982a, Henry & Craig 1984, Goldingay pers obs). These may persist for more than one year so that arthropod abundance from this substrate is probably not markedly seasonal (eg Smith 1982a, Henry & Craig 1984). *Eucalyptus radiata* and *E. obliqua* shed bark only from their smaller branches which probably provides a substrate for honeydew-producing arthropods only.

Insect honeydew was a resource which was extremely difficult to quantify. It was mainly obtained by licking the branches of a few trees (15-40m above the ground) which appeared to be highly productive for this resource, particularly during autumn and winter in 1984 (Fig 2-2). The availability of honeydew changed during the year but average scores of its abundance were generally low due to a protracted bark shedding pattern by these individuals greatly reducing the number of suitable branches at any one time. Trees, when observed in use by gliders, had values much higher than these average scores. One tree in April 1985 had 23 blackened sections and a new tree located in July 1986 had 70 sections. The trees tagged for flower counts and bark shed scores showed little if any branch blackening (Table 2-2).

Table 2-2. Honeydew abundance index represented by the mean number of 2m blackened tree sections for five *E. cypellocarpa* used extensively by gliders for honeydew in 1984 and 11 trees not used.

| | 1985 | | | 1986 | |
|----------------|-------|------|------|------|-----------|
| | April | July | Sept | Jan | June/July |
| Honeydew trees | 10.2 | 11.8 | 5.4 | 4.8 | 7.2 |
| Trees not used | 0 | 0.3 | 0 | 0 | 0 |

Gliders were observed to harvest manna from only two *E. viminalis* (one in December 1984 and one in January 1986). The availability of this resource could not be assessed but this observation suggests that it was highly seasonal and patchy in distribution.

results in relation to previous research

