The feeding ecology of the Adelaide Rosella *Platycercus elegans adelaidae* in cherry growing districts of the Adelaide Hills

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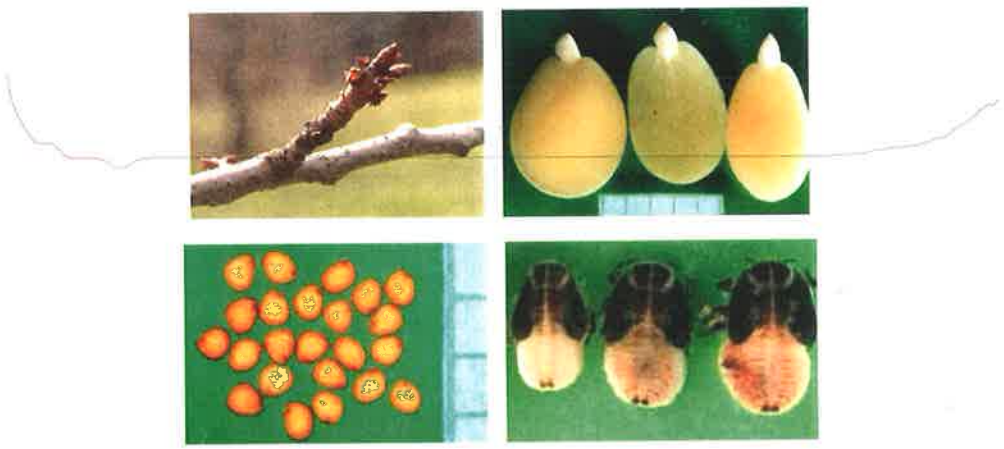

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ABSTRACT

The Adelaide Rosella *Platycercus elegans adelaidae* has been one of the main bird pests of commercial cherry (*Prunus avium*) orchards in the Adelaide Hills. The greatest effect on production has been prior to fruit development through destructive feeding on dormant flower buds in autumn and winter and on flowers in spring. This is the only bird species that has been recorded in Australia to feed on and damage cherry flower buds. Although more than fifty varieties of cherries are commonly grown in the Adelaide Hills, severe damage to buds and flowers by rosellas has usually been restricted to one variety or its derivatives. Rosellas also feed on ripening and ripe cherry fruit.

The specific aims of this study were to:

- gather baseline information on diets of Adelaide Rosellas around cherry orchards at different times of the year;
- determine the importance of cherry primordia relative to other foods in the diet, and
- investigate some of the factors that might influence food use and food choice (e.g. energy content of foods, accessibility of foods) as precursors for proposing management strategies for reducing damage to cherry buds caused by rosellas.

The diets of Adelaide Rosellas were determined principally from crop contents, complemented by opportunistic field observations of feeding birds. Adelaide Rosellas in the Adelaide Hills are predominantly seed-eaters but supplement their diet at times with other foods such as fruit, bulbs, buds and insects. The birds are generalists, feeding on a wide range of foods. The high proportion and variety of non-indigenous foods in the diet of the rosellas sampled indicate that they can be highly adaptable in their foraging behaviour and that they probably forage opportunistically according to the seasonal availability of foods.

Adelaide Rosellas consumed a greater volume and number of food items in autumn than in other seasons. The higher quantity of food consumed in autumn was to a large extent attributable to the availability of apples at this time of year. A lesser number of food items and volume of food were consumed by rosellas in summer when seeds and insects were usually more abundant compared to autumn. Non-indigenous foods comprised the bulk of the diet throughout the year but were of least

importance in summer possibly reflecting the relative availability of these and indigenous foods. Weeds were an important food source in all seasons, providing seeds, buds and bulbs to the diet, but were of greatest importance in spring. Fruit pulp represented a large component of the diet based on the volume consumed although it is likely to be of lesser relative importance than seeds in terms of the total energy contribution to the diet.

Rosellas damaged flower buds of cherry for the sole purpose of removing and eating flower primordia. Although significant levels of cherry bud damage occurred within the study area, flower primordia were a food of minor importance in the diet in terms of the volume consumed relative to other foods. Cherry primordia were absent in the diet in summer and occurred in negligible amounts in autumn and spring. In winter, primordia comprised less than 2% by volume of all foods but were consumed by 43% of birds in the sample.

Apple (*Malus sylvestris*) flesh was the most frequently occurring food item (39% of birds) followed by the seeds of sub-clover *Trifolium subterraneum*, apple, wild radish *Raphanus raphanistrum*, and fat hen *Chenopodium album*. The foods of greatest importance based on volumetric proportions in birds' crops were apple flesh (18% of all foods), wild radish seed (9%), apple seed (9%), *Trifolium* spp. seed (mainly sub-clover; 8%) and olive (*Olea europaea*) fruit (5%).

Insects represented only 1.4% of the diet by volume of all foods but were recorded in the crops of 41% of all birds. On a seasonal basis, the order Hemiptera was the major insect group represented in the diet. The percent contribution of all hemipteran insects to the volume of insect material in the diets was highest in summer (93% of all insects) and lowest in winter (58%). The Psylloidea (jumping plant lice and lerp insects) were the main component of hemipteran insects in the diet in each season except summer. Triozid nymphs (Psylloidea) were the dominant insect group in winter and spring and were represented by two species *Schedotrioza marginata* and *S. multitudinea*.

There were seven foods that each comprised more than 10% of the diet by volume in at least one season. Of these foods, three collectively represented 42% by volume of the summer diet, three represented 48% of the autumn diet, three represented 51% of the winter diet and four foods represented 49% of the spring diet. Seasonally, the most important foods by percentage volume were soursob bulb in

spring (16%), cherry fruit in summer (20%) and apple fruit in autumn and winter (27% and 18% respectively). The seasonal peak in consumption of apple fruit was autumn (27% by volume) when cherry fruit was not recorded.

Based on general observations of relative abundance and availability of foods in relation to their representation in the diet, selection for cherry flower primordia by rosellas was low and may therefore be considered a food of relatively low importance. The dietary information collected during this study indicated several food sources of high dietary importance (e.g. apples, sub-clover, and soursobs *Oxalis pes-caprae*) with promising potential for use as an alternative food source to divert feeding activity of rosellas from cherry trees.

The opportunity to maximise energy intake (or net energy gain) during bud feeding appeared to be a key factor influencing varietal preference by rosellas. Although the energy density (J mg^{-1} dry mass) of cherry flower primordia did not differ significantly between the heavily damaged variety (William's Favourite) and two lesser damaged varieties (Lustre and Makings), the difference in mean energy content per bud was significant, due to the difference between varieties in number (means of 3.8, 3.0 and 2.5 respectively) and dry weight of primordia per bud. This difference provides rosellas with the opportunity to increase the rate of energy intake, thereby influencing their choice between varieties. The differences in the estimated rate of energy intake between the three varieties broadly corresponded with bud damage levels observed for each of these varieties within the same orchard at Basket Range over a five-year period (1988 to 1992). Measurements of bud density for the three varieties indicated that the bud feeding rate may also differ between varieties, reflecting the observed varietal differences in mean number of primordia and mean energy content per bud. Thus, bud density differences indicated that feeding on buds of William's Favourite compared to the other varieties was energetically more profitable than differences in bud energy content alone suggested.

Although cherry buds were not a staple part of rosellas' diet this food was possibly sought when birds were able to meet their minimum daily energy requirement from more energetically profitable foods. I propose a number of reasons as to why rosellas feed on cherry buds in orchards when other foods may be available:

- Cherry buds are an abundant, relatively constant and predictable food resource;

- Some varieties (e.g. William's Favourite) provide the opportunity for increasing foraging profitability;
- Despite the small size and low energy content of buds as individual food units, high harvesting rates are possible (due to bud and primordia density and the bill structure of rosellas allowing a higher rate of energy intake compared to some other foods such as seed of salvation jane *Echium plantagineum* or wireweed *Polygonum aviculare*);
- As a tree crop, feeding on cherry buds allows birds to avoid the higher risk of predation when feeding on the ground, particularly in wet conditions;
- Cherry trees may provide birds with the opportunity to manage their daily energy expenditure: for example, basking in the leafless canopy in winter as a form of behavioural thermo-regulationrequires less effort to avoid predation compared to ground feeding and provides the opportunity to continue feeding when weather conditions are adverse for ground feeding;
- There is no competition for this food resource by cohabiting species; and
- Cherry buds may provide minor nutrients that occur in very low amounts, or are not present, in other foods.

A further consideration is the availability of other food resources in the orchard pasture, and the close proximity to favoured roosts or day-time resting sites, which may increase the attractiveness of cherry orchards to rosellas.

A habitat manipulation experiment involving the cultivation of small replicate plots supporting soursob plants to expose bulbs elicited a significant feeding response by rosellas. At each field site there was an increase in rosella visits to treated plots following the exposure of soursob bulbs to the surface by hand tilling. On plots that were not cultivated there was no change in visitation by rosellas. These results indicated that soursobs, as an important food source of rosellas and a widespread and common weed in the Adelaide Hills, might be of value as a decoy food for reducing feeding damage to cherry trees at certain times of the year. Soursob bulbs are not normally accessible to rosellas. As rosellas do not dig for bulbs, access to them depends on cultivation or other disturbance to the soil to bring the bulbs to the surface.

The use of decoy foods appears to show some promise as a control strategy, particularly where rosellas are causing damage to trees within cherry orchards that are uneconomic to protect with netting. In these situations habitat modification in

order to change existing patterns of foraging behaviour is worth consideration. As foraging generalists, rosellas have a diverse diet for meeting their daily energy requirements throughout the year. A number of food sources of rosellas identified in this study were common weed or pasture species (e.g. soursob, wild radish, sub-clover) that could be promoted or manipulated through particular farm cultural practices, possibly involving a modest investment of time and effort by the orchard manager. As the orchard pasture may represent an important foraging resource for rosellas, the effect of its composition on bud damage levels is worthy of further investigation. Apples and cereal grain (e.g. oats or barley) are suggested as potential decoy foods; and sub-clover (as a sown pasture) and William's Favourite cherry trees are suggested as potential cultivated decoy crops. A summary is given of the type of experiments that could be carried out in order to develop practical control measures for rosellas that damage buds in commercial cherry orchards.

As a general principle, measures to discourage feeding at the susceptible crop should be counter-balanced by measures to encourage feeding at other sites. With the exception of exclusion netting, the use of any control technique should therefore be integrated with other measures to ensure that the orchard to be protected is made as unattractive to birds as possible, and that attractive alternative feeding sites are available. This approach may need to be adopted over a large area involving possibly several properties. For each locality and situation, the attributes of the orchard that rosellas utilise as a food source should be evaluated in relation to the key environmental resources that the population requires to survive during the period when trees are vulnerable to feeding damage. From this understanding more effective management strategies can be developed and implemented.

DECLARATION

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university and, to the best of my knowledge and belief, it contains no material previously published or written by another person except where due reference or acknowledgment is made.

I give my consent to this thesis being made available for photocopying and loan.

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