FEEDING HABITS OF SIX SPECIES OF HONEYEATER IN SOUTH-WESTERN AUSTRALIA

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Received 13 October 1977.

SUMMARY

HALSE, S. A. 1978. Feeding habits of six species of honeyeater in south-western Australia. Emu 78: 145-148.

The habitats of six sympatric species of honeyeater were examined: *Phylidonyris melanops, P. niger, Acanthorhynchus superciliosus, Lichmera indistincta, Melithreptus brevirostris* and *Myzomela nigra.* All species fed on nectar; *P. melanops, P. niger* and *A. superciliosus* also fed on insects. *Dryandra sessilis* was their main source of nectar and it played an important role in their distribution.

INTRODUCTION

In recent years there have been many studies of ways by which related morphologically similar species of birds, living sympatrically, partition their habitat or 'ecological space' (Macarthur 1958; Cody 1968). In Australia, ways by which some sympatric honeyeaters partition their habitats have been examined by Recher (1971, 1977), Recher and Abbott (1970a) and Ford and Paton (1976a). This paper presents observations from a preliminary investigation of the habitats of six sympatric species of honeyeater, conducted during early spring 1976.

In my study area in south-western Australia honeyeaters were the most common birds of the avifauna, although birds that feed on insects and seeds also occurred. The species of honeyeater studied were Tawny-crowned Honeyeater *Phylidonyris melanops,* White-cheeked Honeyeater *P. niger,* Western Spinebill *Acanthorhynchus superciliosus,* Brown Honeyeater *Lichmera indistincta,* Brown-headed Honeyeater *Melithreptus brevirostris* and Black Honeyeater *Myzomela nigra.* Measurements of bills for these species are given in Table I. Little Wattlebirds *Anthochaera chrysoptera* and White-eared Honeyeaters *Meliphaga leucotis* were too scarce to be included in the study.

PROCEDURE

The study area, in the East Pingelly Wildlife Reserve (32°30′ S, 117°20′ E), 150 kilometres south-east of Perth, was four hectares of heath surrounded by woodland of Wandoo *Eucalyptus wandoo* and She-oak *Casuarina glauca.*

TABLE I

Bill length of the six species of honeyeater.

Species	Bill-length (mm)	N	SE
P. melanops	17.8	10	0.30
P. niger	21.7	8	0.51
A. superciliosus	19.4	10	0.60
L. indistincta	15.3	10	0.40
M. brevirostris	10.2	10	0.16
M. nigra	14.8	10	0.23

Ten sampling sites of thirty-metres diameter were chosen for observations and covered a range of micro-habitats. The structure of the vegetation of each sampling site was measured at intervals of one metre along two transects of thirty metres, one running north-south and the other east-west. For ease of recording the height at which birds were feeding, I divided the vegetation into five classes: ground level: 0–0.25 m (herbs, etc.); 0.25–0.75 m (small bushes); 0.75–1.75 m (larger bushes); > 1.75 m (trees).

Between August 25 and September 21, 1976, observations were made for one hour at a time at various times of the day for a total of 47 hours and the following data were collected:

numbers and species of individuals;

feeding behaviour in terms of type of food and method of feeding and the length of time it was carried out to a limit of fifty seconds per individual occurrence;

height where feeding occurred.

OBSERVATIONS

Vegetation

The sites used for observations contained low open heath (Fig. 1); only *Dryandra sessilis* and *Banksia attenuata* were higher than two metres. Taken together, the sites were dominated by *D. sessilis,* with *Casuarina humilis* and *Melaleuca* sp prominent in the understorey (Table II). There was considerable variation in the abundance of plant species in different sites; in some sites *D. sessilis* was replaced by *B. attenuata.*

D. sessilis, covering fifteen per cent of the ground on average, flowered throughout the period of the study and was the main source of nectar for honeyeaters. In the latter part of the study *Adenanthos*

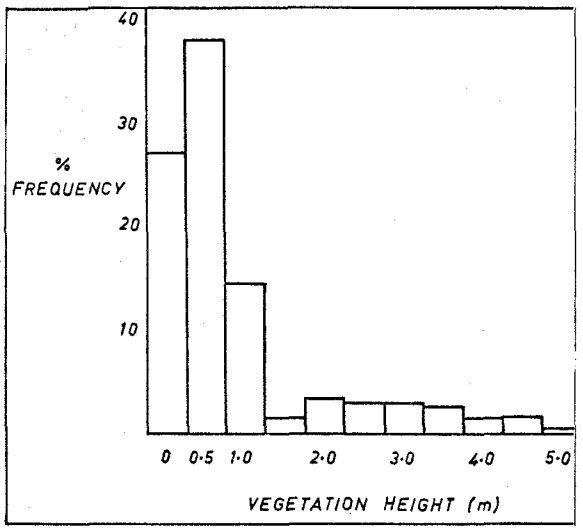

Figure 1. The height of the vegetation in the ten sites where observations were made.

sp, covering on average 0.4 per cent of the ground, flowered and honeyeaters also took nectar from it. Other species, including *C. humilis, Calytrix brachyphylla, Stirlingia latifolia* and *Acacia lasciocarpa,* flowered during the period but the honeyeaters did not take nectar from them.

Feeding

The six species of honeyeater could be divided into two groups: those that fed almost entirely on nectar (*L. indistincta, M. brevirostris, M. nigra*) and those that spent about equal time feeding on insects and nectar (*P. melanops, P. niger, A. superciliosus*) (Table III). I recorded all feeding at flowers as feeding on nectar, although Keast and Condon (1968) found that honeyeaters may take insects, as well as nectar, from flowers.

There was no apparent difference in the heights

TABLE II

Frequencies of the common species of plants in the ten sampling sites.

Species	% frequency
Dryanda sessilis	15.5
Melaleuca sp	12.5
Casuarina humilis	10.7
Leptospermum sp	8.7
Calytrix brachyphylla	7.4
Coustis dioica	5.9
Hakea ruscifolia	5.2
Banksia attenuata	5.0
Stirlingia latifolia	4.8

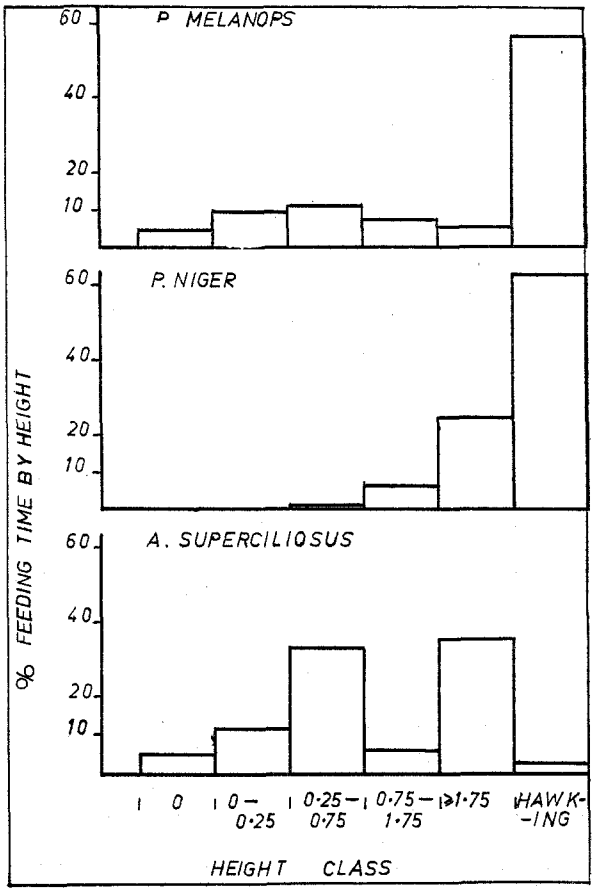

Figure 2. Comparison of the time spent feeding on insects at each height by three species of honeyeater (per cent).

at which the different species of honeyeater were recorded feeding on nectar. However, species tended to show differences in behaviour when foraging at *D. sessilis*. *P. melanops* and *P. niger* perched on small branches while feeding and fed only on flowers that they could reach from these branches. *M. brevirostris* was able to feed on the outermost flowers, which *P. melanops* and *P. niger* could not reach, by hanging upside-down from the stamens of the flower on which it was feeding. *L. indistincta* and *A. superciliosus* often fed while perched on leaves; sometimes they perched on small branches to feed or sometimes they fed on the outermost flowers by hovering for short periods. The differences in ways that the species foraged for nectar reduced the probability of several species feeding at the same flower and resulted in a fairly even use of flowers in all parts of trees of *D. sessilis*.

The three species that fed on insects and nectar fed on insects at different heights (Fig. 2). Although

TABLE III

Proportions of time spent feeding on insects and nectar by each species of honeyeater.

Species	Proportion nectar	Proportion insects	Feeding time (sec.)
P. melanops	0.45	0.55	3,283
P. niger	0.72	0.28	1,897
A. superciliosus	0.54	0.46	740
L. indistincta	0.99	0.01	1,586
M. brevirostris	0.97	0.03	660
M. nigra	0.93	0.07	172

all three species took some insects by gleaning, *A. superciliosus* was almost exclusively a gleaner in shrubs and trees whereas *P. melanops* and *P. niger* took insects mostly by hawking. *P. melanops* caught insects high above the heath (15–30 m) whereas *P. niger* caught insects on short flights just above tree height (5–10 m).

M. brevirostris foraged in flocks of five to ten individuals; *P. niger* was recorded foraging in flocks of up to five individuals.

Distribution

It appeared that honeyeaters were selecting microhabitats within the area; sites were not used equally by all species (Table IV). The amount of time honeyeaters spent feeding on nectar on a site was correlated with the amount of *D. sessilis* in the site (Spearman Rank correlation $r_s = 0.705$, $n = 10$, $P < 0.05$); the abundance of *Adenanthos* sp had little effect in this respect. Thus the three species that fed only on nectar (*L. indistincta, M. brevirostris* and *M. nigra*) were found only where flowering *D. sessilis* was present.

Similar amounts of feeding on insects were observed on all sites in the study area. The species that fed on insects and nectar (*P. melanops, P. niger* and *A. superciliosus*) were found both where flowering *D. sessilis* was present and where it was absent. This meant that overlap in horizontal distribution between the group feeding on nectar only and the group feeding on nectar and insects was proportional to the abundance of flowering *D. sessilis* ($r_s = 0.708$, $n = 10$, $P < 0.05$, Index I; Whittaker 1960).

DISCUSSION

Only *P. melanops*, which is usually resident in heath all the year (Serventy and Whittell 1976), was found breeding in the study area. *P. niger* appeared to be breeding in low mallee nearby and moving into it to feed on *D. sessilis*. Recher (1977) reported that nesting colonies of *P. niger* near Albany, WA, were associated with *Dryandra* thickets, with *P. melanops* nesting in low heath nearby. These two species, which spent a considerable amount of time feeding on insects although they usually feed on nectar (I. J. Abbott, pers. comm.; Recher and Abbott 1970a), may have been feeding on insects to provide protein for breeding requirements (Ford and Paton 1976b).

The breeding status of the other honeyeaters was unknown although it is possible that nesting requirements (outside the study area) may have caused *A. superciliosus*, which normally feeds on nectar (I. J. Abbott, pers. comm.), to spend half its feeding time catching insects.

I rarely saw *M. brevirostris* feed on insects though Keast (1968a) reported that it is primarily insectivorous in other parts of Australia. It was usually found in Wandoo woodland where it may have been feeding on insects but moved in small groups into the study area to feed at flowers of *D. sessilis* and

TABLE IV

Percentage total feeding time of all species over all sites spent by each species at each site and proportion of *D. sessilis* at each site.

Species	Sites 1	4	2	3	10	6	9	5	8	7
P. melanops	4.5	0.6	18.4*	1.4	1.7	1.0	3.2	2.6	4.3	1.0
P. niger	0	0	0.9	2.2	3.9	1.0	1.3	7.5	4.9	1.0
A. superciliosus	0.5	0	0	0	2.9	0.3	1.5	0	0	0.3
L. indistincta	0	0	0	0.3	4.6	3.1	0.2	7.1	2.5	3.1
M. brevirostris	0	0	0	0	0.0	1.7	0	2.3	2.2	1.7
M. nigra	0	0	0	0	0.2	1.8	0	0	0	1.8
% D. sessilis	0	0	3.3	9.3	14.8	20.4	22.6	27.5	28.1	34.0

* Large value due to nesting pair within site.

Adenanthos. The flowering of *D. sessilis* also attracted *M. nigra*, a nomadic species at the eastern limit of its range (Serventy and Whittell 1976), into the study area.

Honeyeaters feed on nectar from the flowers of only a few species of plants (Keast 1968b). Species of honeyeater in a habitat will probably vary during the year as different species of plants flower. The study area was only a small area of heath surrounded by woodland; therefore some of the species observed in it were visitors from woodland. If the area of heath had been larger these visiting species might not have occurred in it.

Honeyeaters made up about ninety per cent of the avifauna in the study area. In the area, the diversity was lowest in sites where *D. sessilis* did not occur because the only honeyeaters found in these sites were those that fed on insects as well as nectar. Those honeyeaters that fed on insects in sites where *D. sessilis* did not occur were able to feed on nectar elsewhere. In this way large assemblages of honeyeaters may exclude insectivorous birds by exploiting populations of insects to a level below that at which they are abundant enough to support birds that take only insects (Recher and Abbott 1970b).

MacArthur and MacArthur (1961) proposed, using data collected in North America, that the diversity of bird species in an area depended chiefly on the profile of vegetation in the area and was unaffected by particular species of plants. However, the importance of *D. sessilis* in determining the distribution of honeyeaters during this study leads one to question whether diversity of bird species in an area is unaffected by the species of plants present when honeyeaters comprise a large part of the avifauna, as they do in Australia. Some workers have suggested that in Australia diversity of bird species may depend on the species of plants present (Recher and Abbott 1970a).

ACKNOWLEDGEMENTS

This study formed part of an Honours course in 1976 at the University of Western Australia. It was supervised by Drs I. J. Abbott, R. W. Black and S. J. J. F. Davies. I would like to thank the Western Australian Department of Fisheries and Wildlife for permission to work in the East Pingelly Wildlife Reserve and Dr G. M. Storr for allowing me to measure the bills of honeyeaters in the collection of the Western Australian Museum.

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