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INTEROBSERVER DIFFERENCES IN RECORDING FORAGING BEHAVIOR OF FUSCOUS HONEYEATERS

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Abstract. We independently recorded foraging of the Fuscous Honeyeater (*Lichenostomus fuscus*), a small, generalized insectivore-nectarivore, at the same site in northern New South Wales, SN from January to July 1981, LB from August 1981 to January 1982, and HF throughout this period. Single observations were recorded for each bird at each encounter, with behavior being classified by method and substrate. All observers recorded leaf-gleaning as the most frequent activity (47–59%) with probing flowers second (12–27%). Hawking, hovering at foliage, gleaning and probing at bark, and ground foraging were less frequent. Significant differences were noted in the use of some categories by HF and the other two observers for the common time periods. HF apparently overestimated feeding at flowers, perhaps because he was attracted to flowering trees. All three observers differed in the incidence of aerial foraging, probing into bark for insects, and hovering they recorded. Nevertheless, all three observers presented the same general pattern of foraging. Interobserver overlaps were high (73–83%), despite the latter two observers recording data at different times. Differences in the foraging behavior of the species between the two periods were not great, as HF's data overlapped 91% between the two periods.

Key Words: Foraging behavior; observer bias; honeyeaters; eucalypt woodlands; Australia.

Quantifying an animal's behavior in the field is difficult. Species, individuals, and activities differ in their conspicuousness. In addition, because field recording is a skill requiring many hours of practice, it is usually impossible to employ naive recorders, as can be done in the laboratory (Balph and Romesburg 1986). Observers will probably bias their results compared with the true behavior, and bias may differ among observers. For instance observers may differ in experience, which will not only result in different levels of skill but also different expectations. They could also differ in visual or aural acuity and in classification of behaviors.

This paper describes differences among three observers in their observations of foraging behavior of the Fuscous Honeyeater (*Lichenostomus fuscus*). We sought significant differences in foraging methods or substrates. If these occurred, using the same method in the same area, they would indicate caution when comparing observations between different observers in different areas or years.

METHODS

Most data were collected in about 30 ha of Eastwood State Forest, 10 km SE of Armidale (30°35′S, 151°44′E), with a few collected at Hillgrove Creek State Forest, 12 km E of Armidale (<10% for each observer). Both sites have been described in detail elsewhere (Ford et al. 1985). They were both in eucalypt woodland with 345–415 trees/ha and a canopy cover of 16–32%. The habitat was open with good visibility into the canopy. As eucalypts are evergreen, the conspicuousness of birds in the canopy varied little through the year. Fuscous Honeyeaters are small (18 g), active, vocal, and aggressive throughout the year. They were also the commonest bird in eucalypt woodland near Armidale (3–5 birds/ha at Eastwood) at the time of the study. SN collected data from January to July 1981, LB from August 1981 to January 1982, and HF throughout this period. We compared data between HF and SN and between HF and LB (same sites and periods in both cases, and between SN and LB (same sites, different periods). In a separate study, Fuscous Honeyeaters showed seasonal changes in foraging (Ford, Huddy, and Bell, this volume), though these were not substantial.

Foraging observations were recorded by walking slowly through the habitat until a bird was sighted. It was then observed until it foraged, when a single record was taken. For birds that were already foraging when sighted, the next foraging move was recorded to reduce the bias in favor of conspicuous activities. No particular effort was made to seek Fuscous Honeyeaters, because we collected data on all species. Although the sites were not homogeneous, we made an effort to cover different sub-habitats in the proportion in which they occurred. Data were analyzed and observers did not discuss their results until after field work was completed.

The overall foraging behavior of Fuscous Honeyeaters has been discussed previously along with that of 39 other species (Ford et al. 1986). Here we concentrate on foraging substrates and methods. Substrates were: flowers, leaves, bark (twigs, branches and trunks), ground, and air. Methods were: gleaning, probing, hovering (includes snatching), and hawking.

Observers were compared using a 2 × N contingency test in which N = 5 substrates and 4 methods. If a significant difference was found, cells were examined to identify the factors that contributed to this difference.

RESULTS

Fuscous Honeyeaters spent about half of their foraging time gleaning from leaves (Fig. 1). They also hovered to take insects from leaves, and

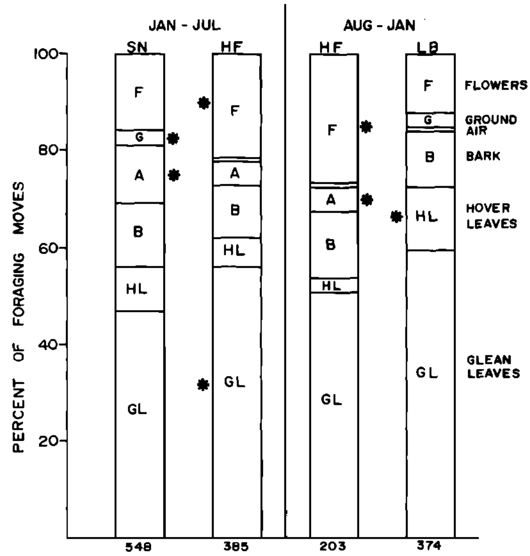

FIGURE 1. Percentage of foraging moves for each observer in the two time periods (using a method-substrate classification). An * next to the column designates an activity recorded significantly more frequently by one observer than the other in the same time period (based on χ^2 value in individual cells in contingency tests). Sample sizes at base of each column.

took insects from bark, from the air, and rarely from the ground. Many of these foraging moves were directed at items such as manna (exudate from damaged leaves), honeydew, lerp (sugary coats of psyllids), as well as at arthropods. Fuscous Honeyeaters also visited flowers of eucalypts and mistletoes (*Amyema*) for nectar.

Results of SN and LB both differed significantly from those of HF for the common periods for substrates ($\chi^2 = 24.1$ and 38.4, df = 4), and for methods ($\chi^2 = 28.8$ and 47.3, df = 3); P < 0.01 in all cases. SN and LB also differed for substrates ($\chi^2 = 51.4$, df = 4) and for methods ($\chi^2 = 48.1$, df = 3), P < 0.01 in both cases. In the case of SN and LB, observed differences may include seasonal effects. HF's observations did not differ significantly between periods, either for substrate ($\chi^2 = 4.23$, df = 4, P > 0.30) or method ($\chi^2 = 0.96$, df = 3, P > 0.80). As method and substrate were not independent (e.g., all hawking was in the air and all flowers were probed), we have shown interobserver differences in Figure 1 by six substrate-method categories. These differences were evident in most categories, HF recorded more foraging on flowers than both SN and LB, SN recorded the most aerial feeding, and LB the most foraging at leaves.

The magnitude of differences was not great, however, ranging up to 14.5% of total observations for a category. Overlaps ($100[1 - \Sigma|P_{ij} - P_{ik}|]$, where P_{ij} and P_{ik} were proportions of observations in category i for observers j and k) between observers were also high: SN × HF = 80% (common period), LB × HF = 73% (common period), and SN × LB = 83% (different periods). Overlap was highest (91%) between data from the two periods for HF.

A few significant differences also occurred among some of the lesser categories that were not represented in Figure 1. Twigs (a subset of bark) were recorded significantly more frequently by SN than HF ($\chi^2 = 6.56$, df = 2, P < 0.05), but significantly less often by LB than HF ($\chi^2 = 15.7$, df = 2, P < 0.001) when comparing twigs, branches, and trunks within the bark category, between observers. Within the bark-foraging categories, HF recorded significantly more probing than SN ($\chi^2 = 34.4$, df = 2, P < 0.01) and less gleaning than LB ($\chi^2 = 11.2$, df = 2, P < 0.01).

DISCUSSION

The size and number of statistical differences between data collected by the observers indicate that such differences are not due to sampling error. However, observations were collected by each observer on a small number of days, and usually on different days. If differences among days in weather, for instance, influence behavior of the birds, then apparent differences between observers may have been accentuated. The facts that Fuscous Honeyeaters displayed only small seasonal changes in foraging (Ford et al., this volume), and that these data for the two periods collected by HF were very similar, argue against day-to-day differences causing interobserver differences.

The observers' levels of experience differed, perhaps influencing perception and expectation. For instance, HF's greater experience with honeyeaters may have caused him to be attracted to flowering trees, thus overestimating feeding at flowers. Classification of less frequent activities may have been imprecise (e.g., twigs could be classified as leaves [petioles] or branches).

In any event, comparisons between the same species in different areas or years, recorded by different observers, need to be treated cautiously, especially when observers have not previously agreed on standard methods of observation, or classification of terms. Adoption of a universal classification for foraging methods and substrates would reduce, but probably not eliminate, interobserver variability. Indeed it may be unrealistic to attempt to differentiate between some categories. As implied above, experience may reduce or increase bias.

Perhaps the most important result from this study was the basic similarity in the results from the three observers. We should emphasize similar patterns in comparative studies rather than seek too carefully to demonstrate statistical differences that may not have much biological significance, as they may represent idiosyncrasies of individual birds or observers.

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