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Editorial

Timothy O. Osborne

I made the appeal in the last editorial for everyone to give out a membership form to people you know who are not members. How many of you have done this? I gave out 2 forms and one has signed up as a club member! So I am batting 50% in getting new members. Hopefully at the next annual general meeting we will see if we are perishing as a club or growing. Certainly birding is growing world-wide and I would hate to think that we are not part of that trend.

The rains have been late as usual and spotty throughout the country but the rain birds have arrived and are doing nicely. On a trip to Windhoek I counted 7200 Yellow-and-Blackbilled Kites along the B1. Fortunately the road was empty so I was not a road hazard as I was alone and watching the sky more than the road.

This issue has a paper written by a school girl who shows what sort of good scientific information can be gathered in your backyard. It also has more of Paxton exploits from the north.

of vultures at a carcass. Steyn (1982) does however mention that as many as 26 LFVs have been noticed at a carcass of an Ostrich *struthio camelus* in the Namib Desert. Mundy *et al.* (1992) states that their visits to large carcasses are possibly more for the social function and they not necessarily partake in the feast.

LFVs have a small crop – proportionately – for a large bird, which suggests that they obtain their daily food requirements on a daily basis suggesting predation rather than scavenging (Mundy *et al.* 1992). The previous authors also mention that the crop of a LFV would rarely be able to hold more than 1 kg of meat.

LFVs do not readily eat meat, organs and intestines and usually remain clean and unsoiled during feeding (something that cannot be said for White-backed Vultures *Gyps africanus* (Mundy *et al.* 1992). This preference also probably contributes to it selecting “cleaner” carcasses to feed on.

Habitat factors, such as their distribution (dry desert areas: “take-what-you-get”), general habits (solitary, late risers, kill small game, keeps clean) and build (small crop, strong claws), possibly contribute to the fact that they utilise small carcasses more frequently.

What I have also noticed is that when they feed on small roadkills they have the carcass to themselves – i.e. no competition – and usually leave very little, but feet, ears, etc., thus virtually consuming the entire carcass. This would mean that it is advantageous for LFVs to descend and consume an entire carcass (albeit small) and without competition at leisure.

I would like to acknowledge Mark Anderson (Department of Agriculture, Land Reform, Environment & Conservation - RSA) for his comments regarding a draft of this note.

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OBSERVATIONS ON THE NUTRITIONAL PREFERENCES OF GARDEN BIRDS IN WINDHOEK, NAMIBIA

Elsita Kiekebusch-Steinitz

Abstract

The primary research questions investigated in this study are, “What foods can be provided to discover what garden birds prefer to eat in Windhoek, Namibia, in autumn and in spring?” secondly “Into which outdoor garden settings should bird feeders be placed to attract certain species?” and lastly “What interactions can be observed between bird species during feeding-times? The research is valuable to birdwatchers and ecologist alike, because it addresses the issue of how to attract the greatest variety of garden birds to ones own garden with a combination of food that is preferred by the birds and is also low cost and easy to provide. The results are specific to the arid environment of urban Windhoek, and therefore of special interest to the popular practice of bird feeding in that city. The study utilized specially constructed feeding platforms where six different types of food were provided, in both a tree-covered and an open area of the garden. During two five-week periods the birds were observed while feeding at the two platforms and recorded by species, number, and type of food they consumed. In addition species dominance and co-operation was observed and recorded. Chi-square tests for both feeding platforms in both autumn and spring proved that each bird species preferred certain types of food, and that most bird species also made distinctions between the two feeding environments. Recommendations for further research are offered.

Research Question

This research tried to answer the following questions: 1) What foods do garden birds prefer to eat in Windhoek, Namibia, in autumn and in spring?

2) Which of two different outdoor garden settings is preferred by each species?

3) What interactions can be observed between bird species during feeding-times?” Based on these questions, two hypotheses were tested:

- H1 Different species of birds show preferences for specific foods
- H0 Birds show no preference for particular food types; i.e. they feed on all types of food with equal frequency
- H1 Birds prefer shaded feeding areas to open areas
- H0 The frequency of visits is not affected by the degree of shading or openness

The reasons behind these hypotheses is a belief that different species of birds prefer different foods because they are different in their nutritional requirements. Birds prefer shaded feeding areas because these provide a measure of protection against predators.

In addition, observations addressed the following issues:

1. Commercially provided seeds may not contain the optimal mixture of foods to attract the widest variety of garden birds possible.
2. Some bird species will dominate on the feeding platform and other species will co-operate.

Rationale for the Research

In recent years Namibians have shown increased interest in bird watching and the ecology of birds. Upscale supermarkets in Windhoek, Namibia sell specialized birdseed for domesticated birds, and market seed-mixtures designed for a variety of wild birds. If placed in bird feeders in urban areas, however, the rate of consumption of different kinds of food may vary. Previous observations using a commercial mixed-variety product at a single feeder in our front yard resulted in the same components of the mixture getting left behind every day – especially corn and green-vegetable pellets. This raised the question: what would happen if an optimal food-combination were made specifically to attract garden birds in Windhoek? Such a mix should attract the greatest variety of birds with the least waste at a reasonable cost. What would that combination of food include?

The research has economic, social, and environmental value. Many people like to feed birds in their yards, but they probably wouldn't if it costs too much, leaves too much waste, or is too complicated or time-consuming. If commercially bought wild-bird food does not contain the right mixture, what

would need to be changed for birds in Namibia? What kinds of food do different species of birds prefer? In what setting do birds feel most “comfortable” to consume food? In this case, open air or shaded area? These questions are important for commercial bird-seed distributors, as well as for people who are just interested in attracting birds to their yards – be it to preserve a bit of nature around their homes, compete in bird-club competitions, or for enjoyment. Additionally, what foods would work if there were no commercial or wild bird-seed available and how do different species of common garden birds interact when competing for the same food source – who is dominant and who is submissive?

A study of garden birds addresses important environmental issues, as species diversity and the well being of bird populations are indicators of a well-balanced environment. Increasingly, human intervention is used to maintain biological balance and a sound eco-system. Could people, therefore, be encouraged to promote a healthy variety of bird species by varying food types and feeder-locations, especially for species at-risk due to loss of natural habitat? First one needs to ascertain the kinds of food that can be used to attract different bird species.

Literature Review

Windhoek, the capital city of Namibia, lies an hour's drive north of the Tropic of Capricorn, on a mile-high plateau (1728 meters/ 5669 feet). According to the 2001 census, Windhoek has a population of just below 250,000. Surrounded by rocky mountains and semi-arid acacia scrub, the city averages between 200 mm and 400 mm of rainfall annually, most of which falls from January through March. There are no perennial rivers, but two large and several smaller dams provide a constant source of water for bird life.

Although much is known about birds, their habitat, and their feeding habits in South Africa, this research sought to provide baseline information for Windhoek, Namibia, where this kind of investigation has never been done before. Despite that many people in the Namibia Bird Club think they know what type of food visiting garden birds prefer, each of the people interviewed claimed to “know” something different – without being able to prove their claim.

Though such popular claims may be based on truth, the study utilised the scientific methodology suggested in a comparable work by Aelred Geis on wild bird feeding preferences in suburban Maryland, USA in order to produce valid results. He used black-striped sunflower seeds and white proso millet as standards against which other foods were compared quantitatively. Geis concluded that decisions concerning the best foods depend upon the attractiveness of the foods to the desired bird species, in relation to cost. Birds also needed to feel safe at a feeding location. Among Geis' other tips were to make sure feeders were visible and on platforms. This is because – in Geis' area of study – the greatest variety of bird species was attracted to food placed on the ground or, similarly, on flat platforms, which could be cleaned and observed easily. Other construction ideas from the book *Cage and Aviary Birds*, suggested the hardboard surface with wooden dividers.

How human presence affects the habits and diversity of birds was the major theme of a symposium on “Birds and Man” held in Johannesburg, South Africa. Here it was written that the availability of commercial food and water during winter and periods of drought could greatly enhance birds survival chances, thereby compensating for some of the loss of natural habitat in urban areas, which appears very plausible in arid Namibia. Two members of the Namibian Bird Club who were interviewed for this study said that they purposefully increase the amount of food and water they offer to birds during times of relative drought, to help the birds through these periods of hardship. Anecdotal information from communications with bird watchers in the United States also suggests that some urban birds mimic the schedule of humans, and therefore begin their daily forage for food a bit later in the day than their rural counterparts. These observations however, were never deduced from scientific research and may not be valid.

Hildegard Becker, of the Namibia Bird Club, used many indigenous plants and bushes to provide a protective habitat. “Attracting Birds to your Garden in Southern Africa” supported this by emphasizing the importance of fresh water, dense foliage, indigenous plants, and an exclusion area, where the birds have privacy that serves shy and more furtive species. All books consulted were designed to aid amateurs, and they often used scientifically pro-

ven data to reinforce their suggestions, and the need to produce scientifically valid results, made this a valuable source.

Variables

Independent variables varied for the sake of the experiment were the five different types of food being varied, the location of the feeding platforms – open or shaded, and the season during which the observations took place. The dependent variables were kept constant as far as possible, to ensure fair testing and scientifically valid results. These included taking the observations at the same time each day, giving birds equal-access to all types of food, providing equal amounts of food (by mass) each time, providing water at both sites and avoiding land-predators as far as possible (adding wire mesh skirting around platforms). The feeding platforms were cleaned weekly, with brush and scooping implement, at which time the five different kinds of food were rotated in position so that birds did not favor one food over others because of its relative location to water or shelter. To avoid pressure on normal feeding behaviors, birds were observed from a location that would not disturb them.

Methodology

The methodology applied by Aelred Geis was replicated for Windhoek as far as possible. Thus, the same five kinds of food – millet, sunflower seeds, boiled brown rice, apples, and bread - were put out each day, in two different settings - a shaded front yard and an open backyard, though the food selected was different to what Geis used. Shallow bowls of fresh water were replenished daily at both sites. Birds were counted at up to five intervals of ten minutes per observation period until most or all of the food was finished. This allowed one person too collect a representative amount of data within a short period of time each day. Data collections sheets were used to record what species of birds ate what kind of food, and how many birds there were of the same species. Narrative notes documented key behaviors of dominance and co-feeding: for example, which species chased which species away, and which species comfortably ate food together.

Mostly, the birds were fed early in the morning, just before sunrise, allowing for an hour of observation before school, Mondays through Fridays. On weekends, the observation-times were extended to a bit later in the morning. Each observation period lasted 35 days, the first from 10 April 2002 until 15 May 2002 in the Southern Hemisphere autumn, and the second observation period from 8 August, 2002 until 16 September, 2002 in early spring. Because it was important to ensure that the observations were not the result of random variations, a chi-square statistical test was performed on the data. This test was chosen because it calculates the probability that the observed data are statistically equivalent to the data expected by the null hypothesis.

Constructing the feeding platforms used advice from Roy Trendler and Lex Hes, recommending sizes of platforms. For this study the feeding platforms were elongated to accommodate five different kinds of food, each in its own section (see Illustrations 1 & 2).

The feeding platforms were approximately a meter above ground, 2.4 meters in length, and each had five separate and equidistant sections. Hardboard provided a base, while dividers were placed between sections. On recommendations by ornithologist Robert Simmons of the Ministry of Environment and Tourism, feeding platforms were placed in two different settings – one situ-

ated under trees offering shade and protection against predators, and one in the open, in direct sunlight with less protection but greater free access. Dieter Ludwig, Chairman of the Namibia Bird Club, reviewed the two platform locations to make sure that the birds would be unable to see the movements of an observer.

Equally important to this process was bird identification. Two field books were used for this purpose: SASOL's Birds of Southern Africa and Newman's Birds of Southern Africa: The Green Edition. During the course of the investigation, no threat to personal safety was expected or encountered.

Five food-groups were selected. On a daily basis, 100 grams of each of the following food-groups were provided. These 100 grams were then divided equally between the two feeding platforms, open and shaded.

- millet for small seed-eaters,
- sunflower seeds in their shells for large seed-eaters,
- boiled brown rice for omnivores,
- apples for fructivores,
- bread for omnivores

Based on long-time bird-feeding, Susan Mallet-Veale suggested various recipes for cooked-foods she personally prepares and gives to wild birds who



Illustration 1:
Platform Feeder (open area) with White-backed Mousebird, House Sparrows and Southern Masked Weavers



Illustration 2:
Section of Front Feeder (shaded area) with White-backed Mousebirds

come to her feeders in Windhoek. However, following the literature review and further discussions with bird-rehabilitation specialist Liz Komen, only rice was selected as a home-cooked food, because it is relatively cheap, easily prepared, and harmless to birds. Otherwise, readily available, low cost, uncooked foods were selected which are easily obtained in stores or commonly found in a natural outdoor-urban setting.

Of all the food-types provided, only the seeds were bought commercially and separately. The “Wild Bird Food” mixture, marketed in local stores, included the seeds used and also corn and other ingredients. Because it had been observed previously as less desirable to garden birds in the area it was not selected for this study.

The following questions were always kept in mind during the observations and measurement:

I: To be recorded in periodic intervals, for both feeding areas - quantitative data:

- What species come to what type of food?
- How many birds come of each species?
- Whether there is any difference between the two feeding platforms.
- Which type of food is finished first, second, last, etc.?

II: To be recorded, if observed, via narrative notes – qualitative data:

- Is there a dominance or pecking order between different species, for example, does the presence of one kind of bird chase others away, and if so - which species?
- What unanticipated interference or changes occurred, if any; for example, major changes in weather conditions, other animals attracted to feeding areas, e.g. predators, mammals etc.?
- Other interesting behavior patterns.

Data Analysis of Results

One month prior to the experiment, all regular bird-feeding was stopped at the feeding sites. Then, a ten-day trial period was implemented to see what would happen. By the end of the first week, several bird-species came regularly, particularly Laughing Doves and house sparrows, and other bird species followed. Originally a sample of bone-meal was set out as one of the

five types of food, with insectivores in mind. Unfortunately, during the trial period it was observed that, although both feeders were protected by wire mesh, the family dogs and the resident mongoose clan in the yard managed to consume all of the bone-meal each day, before any birds could come close. So, for the “official” study period, the bone-meal was replaced with bread, which was suggested for omnivores in earlier interviews. This meant that there was no longer any food-type specifically for insectivores.

Eleven different species and a cumulative total of 1171 observations of birds were recorded at the feeders during the 35-day autumn study period, of which 379 were observed at the open backyard feeding platform, and 792 in the shaded front yard. By contrast, in the same number of 35 days, the spring feedings attracted fifteen different species with a cumulative total of 3485 sightings, of which 1523 were in the open and 1962 in the shade, amounting to an average increase of 198 percent. As illustrated in Tables 1 & 4 (see Appendix), it became clear that millet and sunflowers were generally the first food-type to be eaten, usually in less than a half hour. These two food types also attracted the greatest variety of birds. An alternate pattern occurred when clusters of mousebirds and Laughing Doves got to the feeders early and would quickly consume all of the apple and seeds respectively, and afterwards turned to the rice and bread. This happened regularly in spring at the open feeding platform. During the spring, mousebirds increasingly congregated near the feeding platforms early in the morning, which suggested that over time they had come to expect the sliced apple. With so many large birds around, many of the other birds had to wait their turn. Some birds also nibbled on the seed husks all day long, most notably house sparrows.

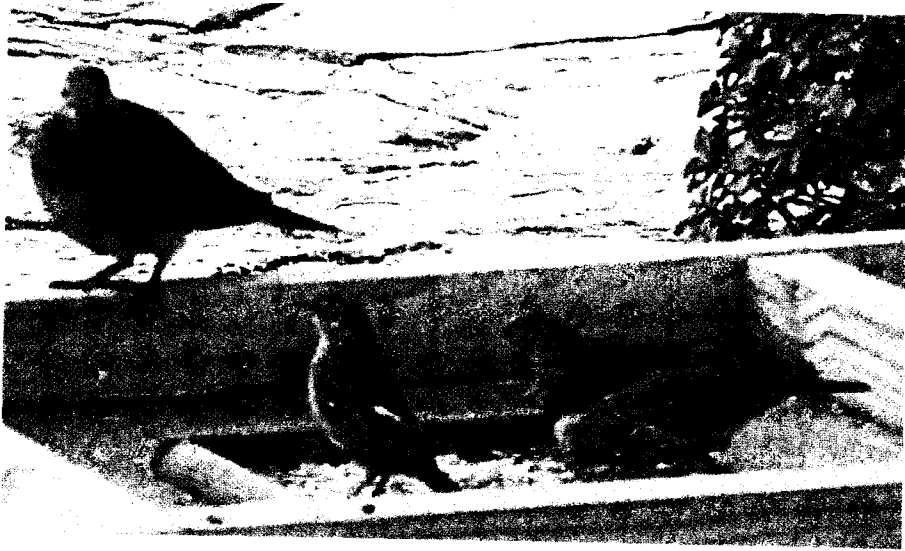
Mousebirds clearly preferred the open backyard platform. So did doves and the Masked Weavers, but seemingly only when they came in large flocks. The other bird-species seemed to prefer the relative protection and/or shade of the front-yard site, even though it was closer to house and street. Mammals were a problem only in the beginning, with the bone meal.

The narrative notes were analyzed according to type of observation, and then grouped thematically:

1. Sparrows feed co-operatively with finches and doves, but sometimes the doves push others away. Sparrows generally come to the feeders alone or

with one or two other sparrows, whereas mousebirds and doves tend to come in larger groups. They came in the largest groups observed, with as many as 23 and 45 birds respectively descending on the feeder at one time. Birds seemed to come in waves, suggesting that they find security in numbers.

2. Doves actively chased sparrows and other smaller species away from the seeds. Occasionally, a particular dove was observed as especially aggressive, as it cleared other birds out, including other doves. Finches did not seem frightened by doves, but mostly stayed clear of large flocks. Mousebirds also avoided doves, though they came in large numbers mostly to the apple, so they were not competing. Occasionally they were observed “dive-bombing” into large flocks of doves. No clear dominance pattern was observed with the other species.



3. If birds were fed shortly after dawn, the food would be eaten up quickly, mostly by a few species of birds (doves, sparrows, and mousebirds). If the food was placed on the feeders somewhat later in the day, it lasted longer and a greater variety of birds could be seen. Specifically, weavers, finches, and bulbuls came later in the morning, alone or in pairs, and only when the more

common and dominant species – such as the mousebirds, doves, and sparrows – had left already. Food was consumed faster as the weather became warmer and drier – so that latecomers no longer had a choice of favorite foods. If an apple piece was too large for a mousebird, two or more of them would sometimes play tug-of-war to break it apart. Unlike the other seed-eating species that tended to remain on the platforms while feeding, weavers were observed dropping down to the feeders, picking up seeds in their bills, and then flying way.

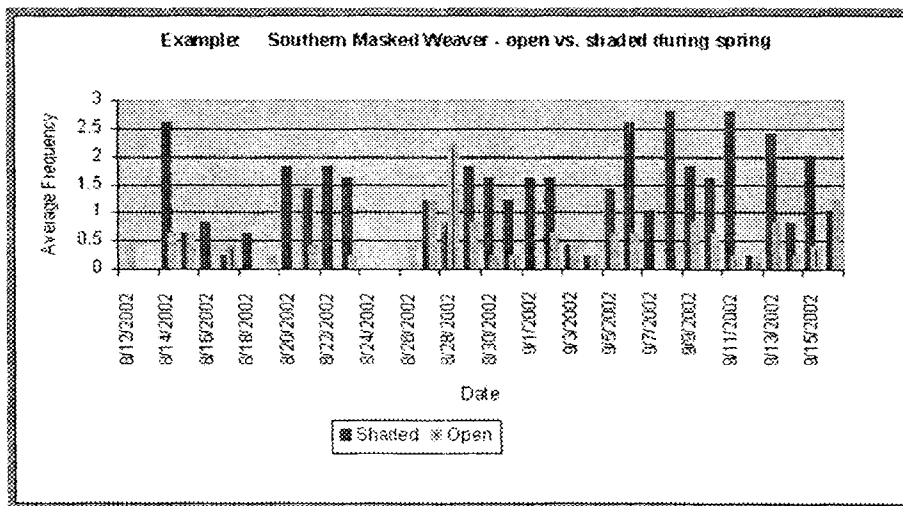
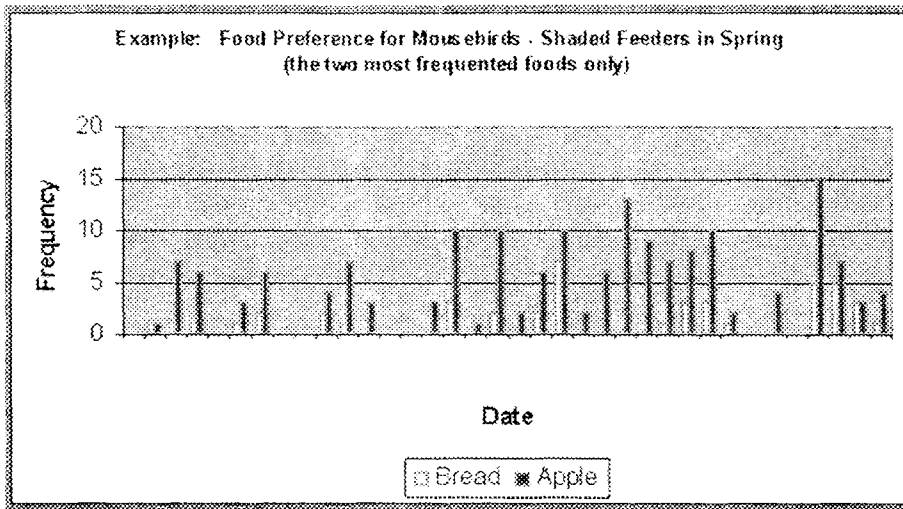
4. In spring, towards the end of the study, doves and mousebirds often appeared in such large numbers that other birds were prevented from feeding until almost all food was finished. As a consequence, observed preferences by other birds may have been determined in part by unavailability of their first choice. Altering the experiment by providing larger quantities of food might yield different results.

Graphical Analysis of Results

Common visitors did not stick to one kind of food, though they definitely had preferences. Mousebirds preferred chopped apples for food, after which they most often turned to the bread (illustrated in the graph below). The only other species that readily ate both bread and fruit were red-eyed bulbuls. Mountain Chats, canaries, Masked Weavers and Chestnut Weavers preferred bread and rice. Other common species ate the seeds first, and then went on to the rice, and finally the bread. Weavers often consumed seeds in their bills and then left. Most bird species preferred the shaded feeder (see example of Masked Weaver below), even though it was closer to the house. Only the mousebirds chose the open feeder habitually. When coming in large groups, Doves and Masked Weavers also preferred the open feeder. Chestnut Weavers seemed indifferent. Less common visitors, such as the Cape-Bunting, Redbilled Quelea, Blackthroated Canaries, and Mountain Chats were only observed at the shaded feeder.

Statistical Analysis of Results

On average, the feedings in spring attracted 99 birds per day, compared to 33 birds in autumn. Consequently, the food was finished faster in spring, as well



– usually in less than half an hour, vs. up to an hour in autumn. The spring feedings also attracted a larger number of species – fifteen compared to eleven in autumn. The Blue Waxbill was seen only once in the autumn, whereas five new species came in spring: Rosy-faced Lovebird, Mountain Chat, Pale-winged Starling, Red-billed Quelea, and Cape Bunting (see table 2.)

This evidence suggests that the birds in this area are more dependent on food being provided in spring, possibly because their natural habitat in the dry season offers them fewer options.

Many more birds were observed on the shaded feeding platform than on the open one. Although the differences seemed significant between the preferences among feeding platforms and among the foods provided, a chi-square statistical test on the data was used to prove that the results found were not randomly produced. Two null hypotheses were tested:

1. Birds show no preference for particular food types; i.e. they feed on all types of food with equal frequency
 2. Birds do not distinguish between open feeders and feeders in shaded areas
- For the autumn data, the test (performed separately for each species) showed that for all bird species where more than 30 observations were made, both null hypotheses had to be rejected with a level of significance of 0.01 (See Appendix Tables 3 & 4.) This is considered quite definitive and showed that, in fact,
1. Bird species show distinct preferences for particular food types
 2. Bird species prefer to feed either in the shaded area or, conversely, in the open.

This indicates that, if people in Windhoek want to attract certain species of birds in their gardens, they need to choose specific food types and feeder-locations.

Evaluation

One factor influencing the validity of these results was that a bird's preference may have been partly determined by the loss in availability of its first choice. The birds would therefore go far more frequently to their second choice than they would have if their first choice was more abundantly provided. Another problem was that insectivores and nectar-feeding birds were not properly provided for, so in effect, not all garden birds were accommodated by the experiment. Also, it is unclear to what extent the use of a flat platform might have discouraged birds from feeding normally.

Conclusions

The majority of the birds preferred the shaded feeder to the open feeder, but all bird species preferred one location to the other, suggesting that at least some tree-cover or other protection should always be considered when choosing the location of a feeder.

In relation to the hypothesis, it was found that birds show distinct preferences for food types. Small seeds (millet) attracted the widest variety of birds (regardless of beak size), followed in order by larger seeds (sunflowers), then rice, then chopped fruit, and finally bread. Thus, if only a single mixture is used, a combination of millet and sunflower seeds, plus rice and chopped fruit (e.g. apples) would make for the best combination. Also, to attract the largest variety of birds, the feeding should not be started at dawn, but a little later – maybe several times during the day in smaller amounts. People who regularly feed birds in this area should increase the amount of food in spring because larger number and variety of birds come compared to autumn. The time that the birds were fed influenced which birds got the food they wanted. Another important factor, was the need of individual birds for the presence of many other birds to feel secure. The doves were the only clear bullies. Other birds generally squabbled without a clear dominance pattern or else they co-operated with each other.

Although not initially anticipated, differences between autumn and spring were observed, both in terms of the total number of species observed (15 in spring versus 11 in autumn) and the average number of birds observed each day (100 in spring, compared to 33 in autumn.)

Suggestions for Further Research

Further study could include how the construction or type of bird-feeders influenced the preferences of birds. Would, for example, hanging feeders or nectar feeders give different results? Other food combinations and/or different settings, like variations in foliage, could also be tried. In particular, to maximize species diversity in a garden setting, food typically associated with less common bird species might be explored. Similarly, could less desired species be discouraged from feeders by eliminating their type of food, such

as apples for mousebirds? And would withholding of water or supplying it differently (such as a running fountain) change bird behavior? In such a way, an optimal feeding regimen and mixture could be developed for this area. Other research questions could deal with how adaptable different bird species are, if their preferred type of food isn't available.

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Mallet-Veale who feeds birds in her small backyard in the Suiderhof neighbourhood, Windhoek (interviewed on 26 March 2002)

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 - xx Newman, Kenneth (University Press of Florida, Gainesville, Fla, 1996)
 - xxi 26 March 2002, at her home in Suiderhof, Windhoek, Namibia
 - xxii 10 March 2002, at NARREC: The Namibian Raptor Rehabilitation Centre, Brakwater, Windhoek
- Exploratory interviews with Lucy Steinitz and Mary-Jane Volkmann who have regularly fed birds using commercially prepared food in Windhoek in the past (1 March 2002).
- xxiv The cumulative totals were taken by adding up all of the successive daily observations, separately for the autumn and for the spring.
 - xxv Assistance came from Patrick Graz, lecturer in the Agriculture Department, and Dr. Bernd Kiekebusch, Head of Department of Information Science, in The Polytechnic of Namibia.

Appendix

Summary of Bird Feeding Observations Autumn and Spring 2002 in Windhoek, Namibia

Table 1: Totals by Species, Food Type, and Location

Common English Name	Feeding Platform in Shaded Area												Scientific Names
	Small Seeds		Sunflower Seeds		Boiled Rice		Bread Crumbs		Sliced Apple				
	autumn	spring	autumn	spring	autumn	spring	autumn	spring	autumn	spring		autumn	spring
laughing dove	175	272	125	168	34	55	15	30	9	4			<i>Streptopelia senegalensis</i>
rosy-faced lovebird	1	1	3	3						1			<i>Agapornis roseicollis</i>
whitebacked mousebird	1		3	2	5	5	15	49	32	187			<i>Coturnix coturnix</i>
monteiro's hornbill													<i>Trochilaima leucomeles</i>
acacia pied barbet	3	3	1	3						4			<i>Pycnonotus nigricans</i>
african red-eyed bulbul				2	2	7	1	68	4	44			<i>Oenanthe monticola</i>
mountain chat				2		11		13		1			<i>Onychognathus nabouroup</i>
palewinged starling				2				7					<i>Passer domesticus</i>
house sparrow	110	225	49	167	65	106	24	39	4	2			<i>Passer domesticus</i>
whitebrowed sparrow-weaver	3	4	2	5	2	2	2	2					<i>Ploceus velatus</i>
southern masked weaver	7	42	1	8	2	115	3	45		6			<i>Ploceus rubiginosus</i>
chestnut weaver	1	3		5		2		2		1			<i>Quelea quelea</i>
redbilled quelea	4	49		7		4							<i>Uraeginthus angolensis</i>
blue waxbill	1												<i>Amadina erythrocephala</i>
redheaded finch	39	65	5	9	2	7				4			<i>Serinus atroquularis</i>
blackthroated canary	15	21	4	9	6	24	5	25					<i>Emberiza capensis</i>
cape bunting	12	12											
sub-totals:	352	697	190	390	136	339	65	281	49	255			

Common English Name	Feeding Platform in Open Area											
	Small Seeds		Sunflower Seeds		Boiled Rice		Bread Crumbs		Sliced Apple			
	autumn	spring	autumn	spring	autumn	spring	autumn	spring	autumn	spring		autumn
laughing dove	100	470	51	211	9	147	11	89	4	1		
rosy-faced lovebird												
whitebacked mousebird												
monteiro's hornbill												
acacia pied barbet												
african red-eyed bulbul												
mountain chat												
palewinged starling												
house sparrow												
whitebrowed sparrow-weaver												
southern masked weaver												
chestnut weaver												
redbilled quelea												
blue waxbill												
redheaded finch												
blackthroated canary												
cape bunting												
sub-totals:	128	530	50	234	42	214	62	268	91	277		

Table 2: Totals by Species with Comparison of Daily Feeding Frequencies in Autumn and Spring

Common English Name	Shaded Feeding Platform		Open Feeding Platform		Combined Number of Birds Observed				
	Totals (shaded area)		Totals (open area)		number of days autumn	number of days spring	35 (daily)	35 (daily)	Percent Change (daily average)
	autumn	spring	autumn	spring					
laughing dove	368	529	175	918	633	1523	1447	41.34	171%
rosy-faced lovebird	0	5	0	0	0	0.00	5	0.14	new
whitebacked mousebird	56	243	143	415	199	569	658	18.80	231%
monteiro's hornbill	0	0	0	2	0	0.00	2	0.06	new
acacia pied barbet	1	11	0	4	1	0.03	15	0.43	1400%
african redevyed bulbul	7	121	7	11	14	0.40	132	3.77	843%
mountain chat	0	25	0	0	0	0.00	25	0.71	new
palewinged starling	0	10	0	0	0	0.00	10	0.29	new
house sparrow	272	539	3	25	275	7.86	564	16.11	105%
whitebrowed sparrow-weaver	13	216	43	73	7	0.20	20	0.57	186%
southern masked weaver	1	13	0	18	1	0.03	31	0.88	3000%
chestnut weaver	0	60	0	0	0	0.00	60	1.71	new
redbilled quelea	1	0	0	0	1	0.03	0	0.00	missing
blue waxbill	46	81	1	26	47	1.34	107	3.06	128%
redheaded finch	30	83	7	24	37	1.06	107	3.06	189%
blackthroated canary	0	13	0	0	0	0.00	13	0.37	new
cape bunting	0	13	0	0	0	0.00	13	0.37	new
sub-totals:	792	1962	379	1523	1171	33.46	3485	99.57	198%

Table 3: Chi-square Values for Preferences of Shaded or Open Feeding Location by Species

(Hypothesis: Birds show no location preferences, therefore expected equal frequency on each location type)

Autumn 2002	Observed Data			chi square level of significance by species	Expected Frequency (no location preferences)		
	Shaded Feeding Platform	Open Feeding Platform	total		Shaded Feeding Platform	Open Feeding Platform	total
	laughing dove	358	175		533	< 0.001	266.5
whitebacked mousebird	56	143	199	< 0.001	99.5	99.5	199
acacia pied barbet	1	0	1	not significant	0.5	0.5	1
african redevyed bulbul	7	7	14	not significant	7	7	14
house sparrow	272	3	275	< 0.001	137.5	137.5	275
whitebrowed sparrow-weaver	7	7	14	not significant	7	7	14
southern masked weaver	13	43	56	< 0.001	28	28	56
chestnut weaver	1	0	1	not significant	0.5	0.5	1
blue waxbill	1	0	1	not significant	0.5	0.5	1
redheaded finch	46	1	47	< 0.001	23.5	23.5	47
blackthroated canary	30	7	37	< 0.001	18.5	18.5	37
sub-totals:	792	386	1178	< 0.001	589	589	1178

	Observed Data			chi square level of significance by species	Expected Frequency (no location preferences)		
	Observed Data		total ^v		Expected Frequency		total
	Shaded Feeding Platform	Open Feeding Platform			Shaded Feeding Platform	Open Feeding Platform	
laughing dove	529	918	1447	< 0.001	723.5	723.5	1447
rosy-faced lovebird	5	0	5	< 0.05	2.5	2.5	5
whitebacked mousebird	243	415	658	< 0.001	329	329	658
monteiro's hornbill	0	2	2	not significant	1	1	2
acacia pied barbet	11	4	15	not significant	7.5	7.5	15
african redbilled bulbul	121	11	132	< 0.001	66	66	132
mountain chat	25	0	25	< 0.001	12.5	12.5	25
palewinged starling	10	0	10	< 0.01	5	5	10
house sparrow	539	25	564	< 0.001	282	282	564
whitebrowed sparrow-weaver	13	7	20	not significant	10	10	20
southern masked weaver	216	73	289	< 0.001	144.5	144.5	289
chestnut weaver	13	18	31	not significant	15.5	15.5	31
redbilled quelea	60	0	60	< 0.001	30	30	60
redheaded finch	81	26	107	< 0.001	53.5	53.5	107
blackthroated canary	83	24	107	< 0.001	53.5	53.5	107
cape bunting	13	0	13	< 0.001	6.5	6.5	13
sub-totals:	1962	1523	3485		1742.5	1742.5	3485

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Lanioturdus 36 (1)

Table 4: Chi-square Values for Feeding Preferences by Species
(Hypothesis: Birds show no food preferences, therefore expected equal frequency on each food type)

	Observed Data (independent of location)						chi square level of significance by species	Expected Frequency (no food preferences)					
	Observed Data			total	Observed Data			total	Expected Frequency			total	
	Small Seeds	Sunflower Seeds	Boiled Rice		Bread Crumbs	Sliced Apple			Small Seeds	Sunflower Seeds	Boiled Rice		Bread Crumbs
laughing dove	275	176	43	26	13	533	< 0.001	105.8	106.6	106.6	106.6	106.6	533
whitebacked mousebird	1	3	22	55	119	199	< 0.001	39.8	39.8	39.8	39.8	39.8	199
acacia pied barbet	1	1	6	3	5	14	not significant	0.2	0.2	0.2	0.2	0.2	1
african redbilled bulbul	112	49	86	24	4	275	not significant	2.8	2.8	2.8	2.8	2.8	14
house sparrow	3	2	9	2	11	7	< 0.001	1.4	1.4	1.4	1.4	1.4	7
whitebrowed sparrow-weaver	30	6	9	11	1	56	< 0.001	11.2	11.2	11.2	11.2	11.2	56
southern masked weaver	1	1	1	1	1	5	not significant	0.2	0.2	0.2	0.2	0.2	1
chestnut weaver	1	1	1	1	1	5	not significant	0.2	0.2	0.2	0.2	0.2	1
blue whistling	40	5	2	6	1	47	< 0.001	9.4	9.4	9.4	9.4	9.4	47
redheaded finch	17	4	10	6	1	37	< 0.01	7.4	7.4	7.4	7.4	7.4	37
blackthroated canary	4	4	17	27	140	177		7.4	7.4	7.4	7.4	7.4	37
sub-totals:	480	246	178	227	140	1177		234.2	234.2	234.2	234.2	234.2	1177

Spring 2002	Observed Data (independent of location)					chi square level of significance by species	Expected Frequency (no food preferences)					
	Small Seeds	Sunflower Seeds	Boiled Rice	Bread Crumbs	Sliced Apple		Small Seeds	Sunflower Seeds	Boiled Rice	Bread Crumbs	Sliced Apple	Total
	FEEDING	FEEDING	FEEDING	FEEDING	FEEDING		FEEDING	FEEDING	FEEDING	FEEDING	FEEDING	FEEDING
burghig dove	742	379	202	119	5	1447	289.4	289.4	289.4	289.4	289.4	1447
rosy-faced lovebird	1	3	0	0	1	5	1	1	1	1	1	5
whitebacked mousebird	2	7	10	182	457	658	131.6	131.6	131.6	131.6	131.6	658
monteiro's hornbill	0	2	0	0	0	2	0.4	0.4	0.4	0.4	0.4	2
arcelia piped parakeet	3	4	1	1	6	15	3	3	3	3	3	15
african red-eyed bulbul	0	2	9	74	47	132	26.4	26.4	26.4	26.4	26.4	132
mountain chat	0	0	11	13	1	25	5	5	5	5	5	25
plawinged starling	0	2	1	7	0	10	2	2	2	2	2	10
hoopoe sparrow	238	167	112	45	2	564	112.8	112.8	112.8	112.8	112.8	564
whitebreasted sparrow-weaver	7	7	2	4	0	20	4	4	4	4	4	20
southern masked weaver	53	19	145	64	0	289	57.8	57.8	57.8	57.8	57.8	289
chestnut weaver	7	6	12	5	1	31	6.2	6.2	6.2	6.2	6.2	31
red-billed quail	49	7	4	0	0	60	12	12	12	12	12	60
red-headed finch	87	10	8	2	0	107	21.4	21.4	21.4	21.4	21.4	107
black-throated canary	24	0	36	33	5	107	21.4	21.4	21.4	21.4	21.4	107
cape bunting	12	0	0	0	1	13	2.6	2.6	2.6	2.6	2.6	13
Sub-totals	1227	924	553	549	552	3465	697	697	697	697	697	3465

Kavango Bird Observations

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During the first week of November 2002 I was out on the Kavango River, near Shamvura (18 02S, 20 51E), with some British guests (Ian & Patience Smith). I regularly count this stretch of river, so I have a reasonably good idea of what's new in the zoo. However, being the start of the summer rainy season we usually pick up some interesting changes. We've recently had some exceptionally late and strong winds lasting several days, and some extensive early rains. Generally this would result in some unusual bird sightings. We spent some hours on the river with these guests who proved to be quite ardent birders and had some interesting sightings; our first was a group of eight Yellow-billed Ducks *Anas undulata*. I had, in fact, first spotted a group of 14 in front of Shamvura on 30 September and a group of 6 birds after this visit. I've no doubt that these were not different groups but possibly the fragmented larger flock of 14 birds. These sightings were, however, over a distance of 8 kms of river, which means that they seem to be really moving around. At all sightings the birds were either flying or sitting on a sandbank quite restless before taking flight. This would probably indicate that they had popped in on their way to a possibly more suitable stretch of river. They seem, however, to be staying some time before deciding to move on.

Also seen were a small group of eight Sanderlings *Calidris alba* of which at least 2 appeared to be more darkly mottled in immature plumage. This group was seen on Sunday 3 November, on a sandbank actively foraging and could be approached to within 10 metres.

Also on the same day we saw a Lesser Gannule *Prophyryla alleni* in a lily-covered inlet, together with some Jacanas *Actophilornis africanus*. This bird was aggressively attacking the lily buds and was also actively feeding.