TABLE 1. Urine osmotic concentrations from fruit and nectar-feeding birds of the desert.

Species	n*	Air temperature (°C + 1 SD)	Urine concentration (mOsm/kg + 1 SD)
Black-chinned Hummingbird (*Archilochus alexandri*)	30 (20)	30 ± 4.9	89 ± 52
Verdin (*Auriparus flaviceps*)	1 (1)	30	222, 167
Hooded Oriole (*Icterus cucullatus*)	2 (2)	28	104, 300
House Finch (*Carpodacus mexicanus*)	9 (5)	30 ± 3.5	183 ± 75.2

* n = number of samples (number of birds in parenthesis).

from nectar of flowers or artificial feeders by the guts of the Black-chinned Hummingbird, Verdin, and Hooded Oriole would tend to leave behind a very dilute fluid. Hainsworth (J. Comp. Physiol. 88:425–431, 1974) found that Black-chinned Hummingbirds were 97–99% efficient in assimilating the sucrose from solutions of 0.5 to 2.0 M concentration.

The water remaining in their guts could be assimilated osmotically, and any excess over that required for evaporative cooling would be filtered into the nephrons of the kidney. Braun and Dantzler (Am. J. Physiol. 222:617–629, 1972; 226:1–8, 1974; 229:22–228, 1975) have demonstrated that reptilian-type nephrons in the avian kidney are functioning during diuresis but cease to filter during anti-diuresis, so that filtration is via the mammalian-type, or looped, nephrons which can conserve water by concentrating the urine.

If the birds of this study had been partially dehydrated by the demands of evaporative cooling, the fluid arriving in the cloaca from the kidneys would be hyperosmotic to plasma. The cloaca could function to reabsorb more of the fluid.

One might question whether the hypo-osmotic urine was not merely a "nervous diuresis" resulting from handling. However, three Black-chinned Hummingbirds caged over oil and fed on a 0.77 M sucrose solution produced 48-h urine samples with a concentration of 26–46 mOsm. Samples taken while the birds were hand-held immediately before or after these pooled samples were collected ranged from 51 to 64 mOsm.

While the three passerine species were not similarly caged, the possibility that the hypo-osmotic urine was a handling artifact can be reasonably excluded simply because of the unlikelihood that osmotic work would be done during anti-diuresis in the kidney only to be undone in the cloaca, where the action is one of further water reabsorption, not dilution in any case. Handling should stimulate premature ejection of a larger volume but not of hypo-osmotic fluid. Furthermore, a House Finch captured and handled identically on 2 November 1979, after the *Opuntia* fruits were no longer available, voided two samples with concentrations of 770 and 380 mOsm/kg.

Despite the warm environment and evidence of heat stress, the birds were left with a water excess and the necessity of performing osmotic work to reduce the urine concentration to slightly over one half the concentration of body fluids. One wonders what portion of the desert summer actually poses a threat of desiccation to birds with these feeding habits.

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NEST DISCOVERY AND SELECTION BY BROWN-HEADED COWBIRDS

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Recent observations by Norman and Robertson (1975) and experiments by Rothstein (1976), Thompson and Gottfried (1976), and Lowther (1979) focused attention on how Brown-headed Cowbirds (*Molothrus ater*) find and select nests to parasitize. However, the relative importance of host activities and characteristics of nest, nest site, and nest contents to discovery and selection of nests by cowbirds remains unclear. The purposes of this note are to evaluate current knowledge, to present additional evidence, and to encourage additional experimentation on this subject.

Deposition of a cowbird egg in a host's nest is probably the culmination of two processes: discovery of nests and selection from these of the nest in which to lay an egg. Little is known of the process of nest discovery, although observation by cowbirds of nest building is widely considered to be important (e.g., Friedmann 1929, Hann 1941, Laskey 1950, Payne 1973, Norman and Robertson 1975). However, Norman and Robertson (1975) saw female cowbirds apparently searching for and finding nests, and V. Nolan (pers. comm.) and Thompson (pers. observ.) occasionally have found recently deposited cowbird eggs in unused nests, which suggests that host activity may not be absolutely essential for nest discovery.

Selection of a nest in which to deposit an egg may depend on some or all of the following: nest-building

or other evidence of host activity; location, size, shape, and structure of the nest; and shape, volume, weight, color, and pattern of host eggs. The only direct evidence that characteristics of the eggs (in this case, size or weight) are important in nest selection comes from King's (1973) work on captive cowbirds. That cowbirds regularly parasitize some species but not others provides little evidence for the importance of egg characteristics in nest selection because of the wide range of sizes, colors, and patterns of the eggs of regularly parasitized species (e.g., see Fig. 2 of Lowther [1979]). We know of no information concerning the importance of nest and nest-site characteristics, except Lowther's (1979) reference to King's observation that nest variation is of little importance.

Host activities probably play an important role in cowbird nest selection for two reasons. First, observation of the potential host species is one way cowbirds could avoid laying eggs in the nests of species that are poor hosts. Second, there are likely to be strong selection pressures on cowbirds to synchronize their laying with that of the host, and watching the host female's activities may be one way to achieve this. As a test of the importance of host activities, Thompson and Gottfried (1976) studied 159 undisturbed, unattended nests, each containing two eggs in typical nest sites. None of the experimental nests was parasitized, whereas 33 of 76 host-attended control nests received at least one cowbird egg. But as they pointed out, their results may have been influenced by use of the unusually large eggs of Common Quail (*Coturnix coturnix*). Laskey (1950) and Lowther (1979) used eggs of a more appropriate size in experimentally placed nests. None of Laskey's nests received cowbird eggs, whereas two of Lowther's 33 experimental nests did. However, Lowther set out his empty nests on one day (P. Lowther, pers. comm.), then simulated host egg-laying by adding single eggs each day until a completed clutch was achieved. By so doing, he potentially provided *indirect* evidence to cowbirds of host activity at his experimental nests, thereby weakening his conclusion that cowbirds need not observe some form of host activity.

In order to examine the roles of indirect and direct observation of host activity, we performed the following experiment during May and June 1979 in an old field near St. Paul, Minnesota. We placed 50 recently abandoned nests of Cardinals (*Cardinalis cardinalis*), American Robins (*Turdus migratorius*), and Red-winged Blackbirds (*Agelaius phoeniceus*) in locations resembling typical nest sites of host species. Into each of 25 of these nests selected by lot, we placed three House Sparrow (*Passer domesticus*) eggs on the same day the nests were set out. After the other 25 empty nests had been in place for one day, we put in them one egg each day for three consecutive days. None of the 25 nests in the first category received a cowbird egg, whereas one (4%) of the 25 nests in which daily egg laying was simulated did receive a cowbird egg. Cowbirds were present on the study area during the experiment, for of 22 active nests found during the experiment, five (23%) were parasitized.

Although all experimental studies to date, including ours, have been plagued to varying degrees by small sample sizes of parasitized nests and by problems with experimental design, their results can be summarized as follows: no cowbird eggs have been laid in experimental nests that were without direct or indirect evidence of host activity (this study, Laskey [1950], and, possibly, Thompson and Gottfried [1976]); a few cowbird eggs have been laid in experimental nests that provided indirect evidence of host activity (Lowther [1979], this study); and, of course, many eggs have been laid in natural nests that provided direct evidence of host activity. Thus the observational and experimental evidence remains insufficient to clarify what, if any, roles are played by host activity and the characteristics of nest sites, nests, and eggs in nest discovery and selection by cowbirds. Such questions can be answered only by employing large-scale field experiments that include proper controls.

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