birds (not moths), as follows: (1) flower beds were observed from 21:15–21:45 on 22 September 1977; temperature 24°C; 1 male and 1 female Ruby-throated Hummingbird were observed feeding on *Mirabilis* for about 5 min at 21:30; carport light on; and (2) flower beds were observed from 20:45–22:00 on 27 September 1977; temperature 20°C; a male began feeding on *Mirabilis* at 20:57; a female appeared at 21:09; both continued to feed until 21:25 when they were frightened; they did not return; the carport light was on.

The white tubular flowers of *Mirabilis* were open only late in the day and at night; they were the only flowers known to have been used. Grant and Grant (1968) mention that flowers in North America favored by birds are characteristically open throughout the day and yield large quantities of nectar. Our observations indicate that *Mirabilis* not only offered the hummingbirds a source of nectar late in the day, but with the aid of artificial light, a source of nectar that was used well into the night. During the cooler nights of October (observations on evenings of 3 and 11 October) all of the *Mirabilis* flowers remained closed with most of the blooms showing signs of deterioration by the middle of the month. No hummingbirds were present during these last 2 observations.

To what extent resident or migratory hummingbirds make use of artificial man-made light sources to feed at night is poorly documented, but this type of nocturnal feeding may be more common than realized in the presence of illumination and certain night blooming flowers around human domiciles and cities in general.—JOHN W. GOERTZ, ANGELA S. MORRIS AND STEPHEN M. MORRIS, *Dept. Zoology, Louisiana Tech Univ., Ruston, Louisiana 71272.* *Accepted 18 July 1979.*

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Response to novel food in captive, juvenile Mockingbirds.—Simple feeding experiments were made with handreared, juvenile Mockingbirds (*Mimus polygottos*) to test 2 hypotheses: (1) birds would not increase eating efficiency with regard to new foods; and (2) birds would not eat brightly-colored (and possibly distasteful) insects that are found in their habitat. These hypotheses have not been tested in Mockingbirds, although many studies have been made on aspects of their biology (Horwich, Wilson Bull. 81:87–93, 1969; Howard, Evolution 28:428–438, 1974; Barrows, Avicult. Mag. 84:51–56, 1978) and on bird avoidance of distasteful foods (Alcock, Am. Midl. Nat. 89:307–313, 1973, and references therein).

Nine nestling Mockingbirds were obtained within 32 km of Washington, D.C.; 2 birds were nestmates. Birds were handreared, and when at least 17 days old, they were individually maintained in wire and cardboard cages that were about 0.2 m^3. When birds could feed themselves, they were given liberal amounts of chopped fruits, vegetables and dog food and provided with bowls of water. Birds were between 2 and 9 months (juvenile status starts at 40 days, adulthood at 9 months [Horwich 1969]) when they were presented with novel foods. Some insects used in experiments were killed by freezing and defrosted to room temperature before presentation to birds. Fruits and dead insects were presented on white cardboard discs 10 cm in diameter. One investigator presented a given experimental food (Table 1). Live cockroaches (*Blattella*) were presented in glass bowls (6 cm deep and 12 cm in diameter) lined with white filter paper and coated with petroleum jelly on their sides to prevent escape. *Desmodium* loment articles (sections with 1 seed, 4 × 7 mm) were also presented. During food presentations, observers were 1 m from birds. A contact was recorded when a bird pecked at, or picked up, a food item. Stopwatches were used to time behavior.

Each of 9 birds was presented with *Viburnum* fruits 5 times. Presentations were made

TABLE 1
NOVEL FRUITS AND INSECTS WHICH WERE PRESENTED TO JUVENILE MOCKINGBIRDS

Fruits
Desmodium sp., tick-trefoil (Fabaceae)
Vaccinium macrocarpon, cranberry (Ericaceae)
Viburnum opulus, Guelder-rose (Caprifoliaceae)
Insects
Blattella germanica, German cockroach (Blattellidae)[1]
Chauliognathus pennsylvanicus, soldier beetle (Cantharidae)
Coccinella novemnotata, ladybird beetle (Coccinellidae)
Cycloneda munda, ladybird beetle (Coccinellidae)
Deloyala guttata, tortoise beetle (Chrysomelidae)
Diabrotica undecipunctata howardi, cucumber beetle (Chrysomelidae)
Metriona bicolor, tortoise beetle (Chrysomelidae)
Murgantia histrionica, harlequin bug (Pentatomidae)
Oncopeltus fasciatus, milkweed bug (Lygaeidae)
Tenebrio molitor, mealworm beetle (Tenebrionidae)[1]

[1] All but *Blattella germanica* and *Tenebrio molitor* were brightly colored species.

between 2- and 4-day intervals and for 5 min, or until birds ate fruits, whichever period was shorter. Birds usually swallowed fruits whole after first pecking at them. They ate fruits in 39 of 45 presentations, and particular birds ate from 2–5 fruits ($\bar{x} = 4.1 \pm 1.00$). In last presentations, during which they ate fruits, birds contacted them fewer times and ate them in less time than in first presentations (Table 2).

Seven birds were presented with orange-color-phase, dead *Metriona* beetle adults (Barrows, Coleopterists' Bull. 33:9–16,1979) for from 5–10 times on different days during a 41-day period, and presentations were made for up to 5 min. Each of 5 birds ate beetles in from 4–8 presentations. In last presentations, during which birds ate beetles, they contacted them less frequently before eating them compared to first presentations (Table 2). In eating these beetles and other insects, birds usually squeezed them in distal areas of their bills 1 or more times before moving them to their mouths and swallowing them. They often first pecked off and ate small pieces before they swallowed the remainder.

Active *Tenebrio* larvae were presented 5 times to each of 9 birds; 2–4 days elapsed between presentations. Birds always ate larvae, which they squeezed from end to end before swallowing. In last presentations, birds ate larvae in less time and contacted them fewer times before eating than in first presentations (Table 2).

Thus, after limited exprience with *Viburnum* fruits, *Tenebrio* and *Metriona*, birds ate them more efficiently by showing shorter eating times, making fewer preliminary contacts, or both. Perhaps learning, maturation of their motor coordination, or both, enabled birds to feed more efficiently on novel foods with so little experience. Quick, increased efficiency in consumption of new, palatable foods would seem advantageous to omnivorous birds.

Birds did not show increased efficiency in eating *Vaccinium*, *Desmodium*, or *Blattella*. Each bird was presented with 1 of these foods once a day for 5 days, and 2–3 days elapsed between presentations. Birds might show increased feeding on such foods if they were given more experience with these foods.

TABLE 2
MOCKINGBIRD RESPONSES TO NOVEL FOODS

Food	No. birds tested	No. contacts made with food before eating[1]		Time (sec) taken to eat food[1]	
		1st presentation	last presentation	1st presentation	last presentation
Viburnum	9	2.1 ± 0.78[2] (1–3)	1.1 ± 0.33[2] (1–2)	61.9 ± 34.52[2] (22–127)	18.6 ± 11.02[2] (7–41)
Tenebrio larvae	9	19.0 ± 23.23[3] (2–74)	3.1 ± 2.26[3] (1–6)	139.2 ± 50.31[2] (73–236)	19.6 ± 14.91[2] (3–49)
Metriona adults	7	16.6 ± 14.66[2] (2–37)	2.0 ± 1.53[2] (1-5)	—	—

[1] Mean, SD and range.
[2] $P < 0.01$, Wilcoxon's matched-pair test.
[3] $P < 0.05$, Wilcoxon's matched-pair test.

To test bird response to certain brightly-colored insects, we presented each of 7–9 birds with 1 of each of the species listed in Table 1. It is assumed that birds tasted insects if they picked them up and squeezed them in their bills. From 1–4 birds which tasted each insect species ate them. Based on frequency of consumption, no insect species was shown to be significantly distasteful. However, if distastefulness is related to vigorous head-shaking after tasting (Alcock 1973), birds found *Cycloneda, Coccinella* and *Oncopeltus* distasteful. Seven of 8 birds showed head-shaking after tasting *Coccinella*, but not when they ate *Tenebrio* on days before and after they were presented with brightly-colored insects. All 6 birds which tasted *Oncopeltus* displayed head-shaking, as did 4 of 6 that tasted *Cycloneda*. None of the birds was observed to vomit after eating any of the presumably distasteful insects. *Oncopeltus fasciatus* (Duffey, Science 169:78–79, 1970; Duffey and Scudder, J. Insect Physiol. 18:63–78, 1972) and the lady-bird beetle (*Coccinella undecimpuctata*) (Rothchild et al., Insect Biochem. 2:334–343, 1972) store poisonous cardenolides, and generally may be avoided by experienced birds. Although Mockingbirds did not appear to find *Murgantia* distasteful, Red-winged Blackbirds (*Agelaius phoeniceus*) avoid other pentatomid stinkbugs (Alcock 1973).

Further study is required to ascertain why the birds ate presumably distasteful insects. One or more of the following reasons may account for this behavior. (1) Some brightly-colored insect species tested might not be distasteful or only slightly distasteful to Mockingbirds. The beetle *Chauliognatus pennsylvanicus* (specimens from Chicago, Illinois), had no cardenolides (Rothschild and Reichstein, Nova Acta Leopoldiana, Suppl. 7:507–550, 1976). It was not reported whether or not they are distasteful to predators. (2) Juvenile Mockingbirds may change their perceptions of distastefulness as they mature. (3) Individual Mockingbirds or populations may vary in this perception. (4) Birds may be able to eat safely at least some species of "protected" prey, as do other bird species, and highly omnivorous birds should be tolerant of ill-tasting substances, or else they might avoid nutritious foods (Alcock, Behaviour 40:1–9, 1971). (5) Eating such insects may be necessary for birds to learn to avoid them. (6) Exploratory eating of novel foods is likely to have adaptive value to highly omnivorous birds such as Mockingbirds, especially during apparently stressful post-fledgling periods as in Red-winged Blackbirds (Alcock 1973) and during seasonal change in

food availability. Mockingbirds are primarily insectivorous in May, and vegetarians in December and January (Horwich, Wilson Bull. 77:264–281, 1965). Red-winged Blackbirds show similar behavior (Alcock 1973). Thus, in juveniles and young adults, a period of exploratory feeding combined with some tolerance to unpleasant-tasting prey probably gives them familiarity with many possible food types and enables them to learn to avoid many poisonous foods.

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Bull snake kills and attempts to eat Long-eared Owl nestlings—On 22 June 1976, we were attracted by loud shrieks to a dense stand of ponderosa pine (*Pinus ponderosa*) in Big Horn County, Montana. There we saw a pair of Long-eared Owls (*Asio otus*) hovering over their nest located 7.4 m up in a ponderosa pine. During the next several minutes, we saw a 1-m long bull snake (*Pituophis melanoleucus*) kill and attempt to swallow 2 owlets. However, the snake seemingly found them too large to swallow and so rejected them. The adult owls alternately fluttered above the nest and perched 3–10 m away for 20 min and then left the area. Neither adult approached closer to the snake than 1 m, and the snake did not visibly respond to their presence. The snake remained in the nest, but was only partly visible, until we left 1 h after the start of this observation. Examination of the nest early the next morning revealed 4 dead 15- to 18-day-old owlets. Feather disturbance suggested all 4 had been partially swallowed headfirst and then rejected.

On 3 June 1977, at another Long-eared Owl nest in Big Horn County, we found 2 dead 13- to 16-day-old owlets. One owlet was found dead in the nest 6.8 m up in a ponderosa pine and the other at the base of the nest tree. Appearance of both owlets was similar to those found the previous year, indicating attempted snake predation.

Rat snakes (*Elaphe* sp.) and racers (*Coluber* sp.), as well as bull snakes, have frequently been reported as predators of birds, their eggs and young (Uhler et al., Trans. N. Am. Wildl. Conf. 4:605–622, 1939; Imler, J. Wildl. Manage. 9:265–273, 1945; Laskey, Wilson Bull. 58:217–218, 1946; Clapp and Abbott, Wilson Bull, 78:321, 1966; Jackson, Wilson Bull. 82:329–330, 1970; Niedrach, Wilson Bull. 83:317–318, 1971; Best, Condor 79:509, 1977). Although Strange, Cunningham and Goertz, (J. Wildl. Manage. 35:786–793, 1971) and Kalmbach (Trans. N. Am. Wildl. Conf. 4:591–604, 1939) reported snake predation on Wood Ducks (*Aix sponsa*) and medium sized ground nesters, most available information relates to predation on small species which are probably incapable of effective defense against snake-sized predators. The killing of a bull snake by Turkeys (*Meleagris gallopavo*) (Beasom and Pattee, Wilson Bull. 87:281–282, 1975) is the only report we could find of an encounter between a snake and a more formidable bird than the owls. Our report is apparently the first of snake predation on a raptorial species.—STEVEN C. AMSTRUP AND TERRENCE P. MCENEANEY, *Fish and Wildlife Service, P. O. Box 916, Sheridan, Wyoming 82801.* *Accepted 28 July 1979.*