

second clutch), it would appear advisable to use Green's modification of Mayfield's method. When such separation of data cannot be made, the dilemma of the researcher will be in not knowing whether the bias of Mayfield's method towards understating success is greater or less than the bias of the conventional method in overstating it.—DOUGLAS D. DOW, *Dept. of Zoology, Univ. of Queensland, Brisbane, Australia, 4067. Accepted 20 Jan. 1977.*

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Mirror image versus conspecific stimulation in adult male Zebra Finches.—Mirror image stimulation (M.I.S.) has been used to study social responses in a variety of animals (Kaufman and Hinde, *Anim. Behav.* 9:197–204, 1961; Svendsen and Armitage, *Ecology* 54:623–627, 1973). The advantage of this technique over direct visual contact with a conspecific is control of the stimulus by the experimenter. While this procedure has been conducted with several species, only chimps have so far shown the ability to recognize their own image (Gallup, *Science* 167:86–87, 1970).

Siamese fighting fish (*Betta splendens*) exhibit a preference for M.I.S. over visual access to a conspecific (Baenninger, *Psychon. Sci.* 4:241–242, 1966). This phenomenon also has been shown to exist in House Sparrows (*Passer domesticus*) and parakeets (*Melopsittacus undulatus*) (Gallup and Capper, *Anim. Behav.* 18:621–624, 1970). I examined this phenomenon in Zebra Finches (*Poephilo guttata*).

Ten adult male Zebra Finches were tested in a continuous choice situation of M.I.S. and visual access to a conspecific. The testing apparatus was modified after the plan of Gallup and Capper (op. cit.). It consisted of a plywood box 72 cm long, 42 cm wide and 38 cm high. The ceiling had an opening 43 cm long and 26 cm wide covered by fine screen.

Two perches, 17 cm long, were placed 8 cm above the floor and centrally located on each side of the cage. One perch was associated with an 8 × 5 cm mirror; the opposite perch was placed in front of a plexiglass window of the same size. This window allowed visual access to a 14 cm long, 14 cm wide and 18 cm high target cage. The target cage contained one adult male conspecific. A cardboard partition in the test cage kept the test bird from seeing the stimulus associated with the opposite perch. A continuous supply of food and water was available in the target cage and on each side of the experimental cage.

Testing was initiated by placing one bird in the experimental cage and a conspecific in the target cage. A photoperiod of 12 h was controlled by a light source placed 40 cm above the testing apparatus. Time spent on each perch was electrically quantified. The weight of the bird on the perch triggered a microswitch hooked up to an electric timer. Timers were reset at the end of each 24 h period; this procedure was continued for a period of 9 days.

Figure 1 shows the amount of time spent on the perch associated with the mirror and the amount of time spent on the perch associated with the target cage. Day 1 was not included in the graph as this was considered an adjustment period. The data show an overwhelming preference for interaction with the conspecific compared to the almost total absence of time spent on the perch associated with the mirror. The preference for conspecific visual access continued until day 6 after which preference for M.I.S. took place. Preference for M.I.S. continued through the final 3 days of testing.

All of the 10 individuals tested showed an overwhelming initial preference for visual access to the conspecific and later exhibited a preference for M.I.S. which continued

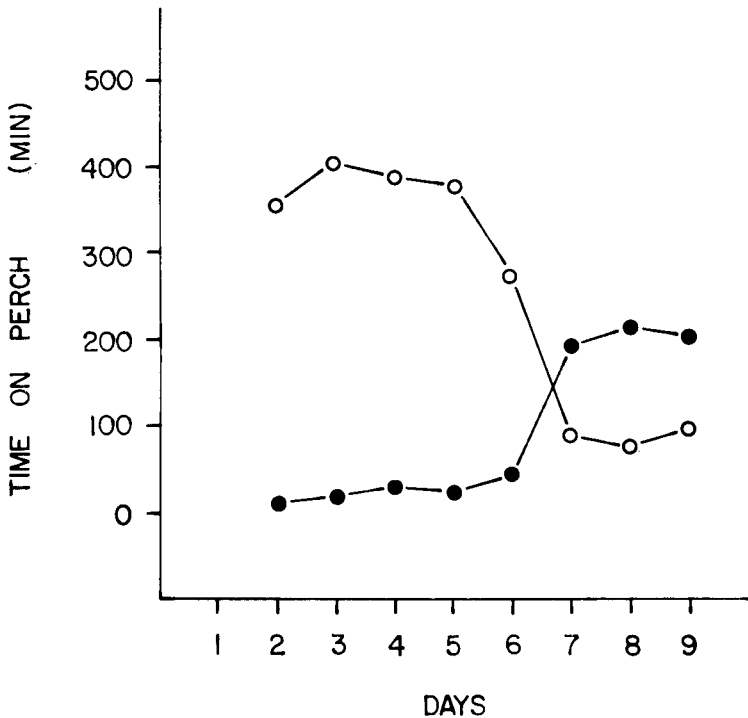


FIG. 1. Mean time in minutes spent in front of a mirror (solid circles) and in front of a conspecific (open circles) by 10 adult male Zebra Finches as a function of time.

throughout the testing period. The earliest shift in preference took place on day 4 by 1 individual, and the latest shift was exhibited on day 8 by 2 individuals. One individual shifted preference on day 5, 2 on day 6 and 4 on day 7. Due to the abbreviated period of testing it was not possible to determine whether this shift was more than a temporary phenomenon.

The fact that after a period of time there is a definite preference for M.I.S. in adult male Zebra Finches suggests this phenomenon may occur among other bird species. The preference for M.I.S. was shown in the absence of auditory cues. This tends to support the hypothesis of Gallup and Capper (op. cit.) that the mirror image is being perceived as a supernormal stimulus. Superficially, there may seem to be little difference between the mirror image and the conspecific, but the mirror image will always be both predictable and compatible with the animal's behavior. The mirror image may also be considered a novel stimulus. It has been demonstrated with guppies (*Lebistes reticulata*) (Russell, Anim. Behav. 15:586-594, 1967) that novel stimuli may be investigated less in a strange environment. This may explain the initial lack of interaction with the mirror image. The fact that the animal did not habituate to the image may be due to the abbreviated duration of the experiment. The complexity of a stimulus increases its novelty (Berlyne, Conflict, Arousal and Curiosity, McGraw-Hill, New York, 1960:43).

This may be true of the mirror image and at least partly responsible for the lack of habituation. Future work considering the preference for M.I.S. over an extended period of time with a variety of species may give some idea as to the adaptive significance of this behavior.

I would like to thank Roger J. Raimist for his helpful suggestions during study. Cindy Banas made the graph. This research was partially funded by the Student Research Committee, Life Science Dept., Glassboro State College.—MICHAEL J. RYAN, *Life Science Dept., Glassboro State College, Glassboro, NJ 08028*. (Present Address: *Dept. of Zoology, Rutgers Univ., Newark, NJ 07102*). Accepted 30 Mar. 1977.

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Protocalliphora infestation in Great Horned Owls.—On 5 May 1977, 6.4 km southwest of Foley, Minnesota, I collected several dipteran larvae from the ear cavities of a nestling Great Horned Owl, *Bubo virginianus*. I raised the larvae to adult flies, which were identified by Dr. Curtis W. Sabrosky, Systematic Entomology Laboratory, U.S. National Museum as *Protocalliphora avium* Shannon and Dobrosky. The adult flies resemble blue-bottle flies, but belong to the family Calliphoridae; the blow flies. *Protocalliphora* have been found to parasitize a number of raptors, including Long-eared Owls, *Asio otus* (Shannon and Dobrosky, *J. Washington Acad. Sci.* 14:247–253, 1924), and Red-tailed Hawks, *Buteo jamaicensis*, Red-shouldered Hawks, *Buteo lineatus*, and Cooper's Hawks, *Accipiter cooperii* (Sargent, *Auk* 55:82–84, 1938). I found dipteran infestations to be quite common in Great Horned Owl and Red-tailed Hawk nestlings in central Minnesota. During the past 2 years, 41 of 73 (56%) Red-tailed Hawks, and 25 of 46 (54%) Great Horned Owls that I banded were infested. The larvae were located in the ear cavities of most nestlings although some were found in the nape area. Unfortunately, only from the one nest did I have the dipterans precisely identified. Other raptors may also be afflicted with this parasite, but there appear to be few documented cases. *Protocalliphora* eggs are apparently deposited in the nest debris; the larvae suck blood intermittently for 14–20 days and pupate for about 10 days before the adult flies emerge (Coutant, *J. Parasitol.* 1:135–150, 1915). The blood-sucking larvae usually do not seriously harm large species; however, they may weaken, kill, or force smaller passeriformes from their nests (Johnson, *Ann. Entomol. Soc. Am.* 22:131–135, 1929).—ROBERT T. BOHM, 520 7th Ave. North, Sauk Rapids, MN 56379. Accepted 21 Feb. 1978.

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Territorial defense of a nectar source by a Palm Warbler.—Territorial defense of nectar has been documented in several species of wintering parulids, for example: Cape May Warbler, *Dendroica tigrina* (Kale, *Auk* 84:120–121, 1967; Emlen, *Wilson Bull.* 85:71–74, 1973), Palm Warbler, *D. palmarum* (Emlen, *op. cit.*), and Yellow-rumped Warbler, *D. coronata* (Woolfenden, *Auk* 79:713–714, 1962). It is the purpose of this note to document further the defense of a nectar source by a Palm Warbler and the disproportionate amount of time it spent chasing conspecifics from flowers as compared with the time spent chasing 2 other parulid species.

The following observations were made over a 5 h period (07:00–12:18) in Bayside Park, Miami, Florida on 9 March 1975. An unbanded Palm Warbler was observed