color-banded adults at feeding stations (G. Foster and J. Balda, pers. comm.). Males with eggs or young visit feeders alone or with other males and carry large amounts of food away. In non-nesting pairs, both male and female visit feeders together and do not carry food away. Fledglings were brought to the feeders by parents, at which time nest success could be assessed. There was no statistically significant difference ($P > 0.05$) in number of young fledged between visited and unvisited nests. It therefore appears that human intrusion had no effect on nestling mortality (or, by implication, on nest desertion) in Piñon Jays.

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The Impact of Loggerhead Shrikes on Nesting Birds in a Sagebrush Environment

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Although shrikes (*Lanius* spp.) are known to prey on small vertebrates, most authors consider birds to be a minor portion of their diet (Beal and McAtee 1912, Bent 1950, Sprunt 1950). Miller (1931, 1950) states that "birds at no time comprise more than 15% of the food." Craig (1978), in his analysis of the predatory behavior of Loggerhead Shrikes (*L. ludovicianus*) in California, does not record a single instance of shrikes preying on other passerines. Analysis of the stomach contents of Loggerhead Shrikes indicates that birds account for only 1–8% of their annual food intake (Howell 1932, Graber et al. 1973). Thus, in most situations the incidence of avian prey in a shrike's diet is relatively low. However, the impact of this limited predation on the avifauna of a particular area has not been assessed. This paper documents a situation in which Loggerhead Shrikes reduced the density of other passerines nesting in a sagebrush environment and effectively eliminated the production of young by the three species commonly nesting in this habitat.

Information presented here was gathered in conjunction with an investigation of avian populations on the Idaho National Engineering Laboratory (INEL) Site, approximately 48 km west of Idaho Falls, Idaho. A 4-ha study grid (Reynolds 1978) was established in each of two areas, dominated by big sagebrush (*Artemisia tridentata*), that were nearly 12 km apart. During 1976 and 1977, the breeding activities of all birds nesting within the study areas were carefully monitored. Nests were located by flushing a bird from a nest or by observing nest building, courtship, or food-carrying behavior and then rigorously searching the area for the nest. Nests were checked at 1–2-day intervals. Nesting success was calculated as the number of successful nests (those producing at least one fledged young) divided by the total number of nests in which eggs were laid.

The Loggerhead Shrike is a conspicuous and fairly common nesting species in the sagebrush habitat of the Snake River Plain (Larrison et al. 1967). Shrikes did not nest in either study area in 1976, although they were occasionally (albeit rarely) observed hunting in the grid systems. In 1977, a pair of shrikes nested in each of the study areas. This provided the opportunity to compare the nesting density and success rates of other species with and without the presence of shrikes. The Chi-square test (Snedecor and Cochran 1967) was used for statistical comparisons.

There were no significant differences in nesting density or nesting success between the two study areas in 1976 or 1977. This permitted the data from both areas to be pooled for a comparison between the 2 yr. During 1976, 22 of 29 (76%) passerine nests within the grids were successful (Table 1). In 1977, only 14 nests (excluding shrike nests) were in the study areas. This was significantly fewer ($P < 0.01$) than the previous year. Additionally, only one nesting pair successfully fledged young. This success rate (7%) was significantly ($P < 0.005$) below that calculated for 1976. During 1977, one pair of shrikes fledged 7 young, while the other fledged 9.

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TABLE 1. Nesting success of avifauna in the presence (1977) and absence (1976) of Loggerhead Shrikes in a sagebrush habitat.

	1976		1977	
Species	Number of nests	Number successful	Number of nests	Number successful
Sage Thrasher	14	12	6	1
Sage Sparrow	9	9	7	0
Brewer's Sparrow	6	1	1	0
TOTAL	29	22	14	1

The fact that both the nesting success rate and the nesting density for birds were lower during the year the shrikes nested in the study areas does not necessarily indicate that shrikes were responsible for these decreases. Circumstantial evidence, however, indicates that shrikes were a major force in determining the density and success of other birds. First, shrikes were observed to attack and kill two territorial Sage Sparrows (*Amphispiza belli*) and two Brewer's Sparrows (*Spizella breweri*). In addition to these successful attacks, unsuccessful attempts were recorded on 14 separate occasions for the Sage Sparrow, 9 times for the Brewer's Sparrow, and twice for the Sage Thrasher (*Oreoscoptes montanus*). The majority of the attacks occurred when these birds were establishing territories. Thus, it is probable that harassment by shrikes made the areas less desirable as nesting sites and contributed significantly to the decrease in the 1977 nesting density. Second, on three separate occasions, Loggerhead Shrikes were observed carrying nestlings. In one instance, the shrike was being vigorously pursued by two adult Sage Thrashers, presumably the parents of the victim. Last, during 1977, the altricial young in 12 of the 13 unsuccessful nests disappeared from their nests within 7 days after hatching, when the adult birds were frequently absent from the nest collecting food. Without exception, 1 or 2 young were taken from the nest each day until the nest was empty. In all cases, damage to the nest structure was not apparent.

Other potential predator species encountered during the study included the gopher snake (*Pituophis melanoleucus*), rattlesnake (*Crotalus viridis*), least chipmunk (*Eutamias minimus*), and long-tailed weasel (*Mustela frenata*). Snakes were found in only one of the study areas, although an extensive search was made for them in both areas. Chipmunks were equally abundant in both study areas both years (Reynolds 1978). Therefore, it is doubtful that these species were responsible for the differences in nesting success and density between 1976 and 1977. Furthermore, as none of the unsuccessful nests was damaged, it is unlikely that weasels were the nest predators (C. H. Trost pers. comm.). Shrikes nesting within both study areas in 1977 therefore appeared to be the major factor controlling the production of other nesting species. Although birds comprise only a small percentage of the annual diet of shrikes, the timing of predation on passerines in this study resulted in a profound and negative influence on the annual production of the avian community.

Cade (1967) discusses similar findings for the Northern Shrike (*L. excubitor*) and concluded that this species exercised a significant control on the breeding distribution and numbers of passerines in an Arctic riparian habitat. My data indicate that the Loggerhead Shrike performs a similar ecological function in a sagebrush environment.

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A Bill Color Polymorphism in Young Darwin's Finches

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Knowledge of bill color variation in Darwin's finches is summarized in a statement by Swarth (1929): "Color of bill varies seasonally and with age, being black or dusky in adults of both sexes during the breeding season, yellowish or otherwise light colored in adults at other seasons and in the young". This applies to all members of the sub-family Geospizinae, although R. I. Bowman (pers. comm.) has pointed out to us that, in addition, captive *Geospiza difficilis* from Islas Wolf and Darwin may breed when their bills are still partly yellow.

We report here another type of variation. We studied the breeding of ground finches (*Geospiza* spp.) on Islas Genovesa, Pinta, Wolf, and Daphne in 1978 and found that nestling bill color was polymorphic. All nestling bills could be assigned to one of two categories: pink and yellow. The color is present in both mandibles and is recognizable at hatching. During nestling growth the upper mandible becomes pigmented with melanin (brown-black) and the original color is masked or lost, but it is retained in the lower mandible for several weeks or months after fledging. We recorded the lower mandible color in nestlings and in immatures captured in mist nets. We also confirmed that, on Isla Wolf only, some breeding adults (*difficilis*) had partly yellow bills.

The polymorphism exists in all seven species studied in 1978 (Table 1), i.e. all six species of the ground finch, genus *Geospiza,* and the Warbler Finch, *Certhidea olivacea.* In addition, our notes on birds captured in a previous study (Grant et al. 1975) show that the polymorphism occurs in the tree-finch (*Camarhynchus parvulus*) at Bahía Borrero, I. Santa Cruz. R. I. Bowman (pers. comm.) has observed the polymorphism in captive *Geospiza* species. The polymorphism occurs on more islands than those shown in Table 1. Polymorphism was found in small samples of immature *G. fortis, G. fuliginosa,* and *G. scandens* netted on I. Santa Cruz and nestlings of *G. scandens* and *G. fortis* on I. Plaza Sur and *G. fuliginosa* on I. Española. Only the pink morph was found in small samples of nestling *G. fuliginosa* on I. Plaza Sur ($n = 12$) and *G. conirostris* ($n = 14$) and *Certhidea olivacea* ($n = 4$) on I. Española.

Pink and yellow morphs often occur in the same clutch. Furthermore, the presence of both morphs, or just one, tends to be repeated in successive clutches of the same parents. Thus on Genovesa, 12 out of 15 pairs of *G. magnirostris* repeatedly produced both morphs or just the pink morph in their 2–4 clutches, and 9 out of 15 pairs of *G. conirostris* were similarly consistent in their 2–4 clutches.