

INCIDENCE OF COMMUNAL NESTING IN THE EUROPEAN STARLING AT BELMONT, NEW ZEALAND¹

JOHN E. C. FLUX AND MARGARET M. FLUX

Ecology Division, Department of Scientific and Industrial Research, Private Bag, Lower Hutt, New Zealand

Key words: Communal nesting; European Starling; *Sturnus vulgaris*; solitary roosting.

Stouffer et al. (1988) detailed the first reported case of two female European Starlings (*Sturnus vulgaris*) laying in the same nest in three breeding attempts and co-operating with a single male to rear the young. We have recorded similar behavior in New Zealand, where starlings were introduced from Britain in 1862. To study the effects of artificial selection for large clutch size in a wild population (Flux and Flux 1982) we put up 100 new nest boxes each year from 1970 through 1974 and have maintained 500 boxes since 1974. The study area was situated on a 1,500-ha sheep farm 16 km northeast of Wellington. Because the habitat was open grassland there were no nest sites for starlings within 3 km of the boxes. For a full description of the area and methods see Flux and Flux (1981).

From 1970 through 1980, while capturing females for banding, we examined 2,804 completed clutches at night and twice found communal nesters, as defined by Stouffer et al. (1988). On 26 November 1978 two 2-year-old females were incubating a clutch of six eggs, one bird sitting on the other's back. Both females fed the chicks with the assistance of one male, and four chicks fledged. One of the females was a third-generation resident in the study area, the other an unbanded newcomer. Thus, they were not closely related.

The second case was similar to that described by Stouffer et al. (1988), involving three breeding attempts. On 27 October 1979 two females were found side by side on eight eggs in the same nest bowl. These eight eggs were clearly separable by size, color, and texture as two clutches of four. After being handled they deserted these eggs and relaid in separate bowls at opposite sides of the same nest box, both completing their clutches (4 + 3) on 13 November. All the eggs hatched but only the chicks from the clutch of four fledged. The following year they nested again in the same box, sitting side by side on seven eggs (4 + 3) in the same nest bowl. One of these females was a 5-year-old bird that had nested in two previous years in a box 5 m away; the other was at least 2 years old. Neither had been fledged on the study area, and hence their relationship was undetermined.

In our rectangular boxes with a central hole, 30% of 957 birds became confused and built a nest with two bowls, one at each end of the box. Many females laid

one egg in the wrong bowl, and one bird laid two, but this was a "psychological" problem caused by the central hole. Only one female occupied each box, despite the appearance of twin nests. Boxes of the same shape with the entrance hole off-centered by 3 cm, placed alternately with central-hole boxes, had occupancy rates 27% higher and none contained nests with two bowls (Flux and Flux 1981).

As in the starlings described by Stouffer et al. (1988), we consider communal nesting aberrant and due to crowding and competition for limited nest sites. Our population increased from 300 birds in 1969 to at least 3,000 in 1978 (Flux and Flux 1981). Most of these birds must have been unable to nest with only 500 boxes available, especially towards the end of the study when the communal nesting was found. The presence of local starlings ready to breed but unable to do so was verified by an experiment on 31 October 1980 when 18 incubating females were killed in adjacent boxes. By 22 November 1980 all except one of these boxes contained eggs or newly hatched young, and the age of the chicks showed that at least five of the new females had laid on the seventh day after the box became available. Frequent fights over boxes, sometimes leading to the death of both contestants, were another sign of overcrowding in relation to the number of nest sites. On the other hand, the larger the number of observations, the greater the chance of recording aberrant behavior.

We also found one female which laid and attempted (unsuccessfully) to incubate two eggs in one box and three in another box 2 m away in October 1971. In October 1978 another female laid three eggs in one box and four in the adjacent box, being caught at night on each in turn while the other clutch was cold; male starlings in our study area often controlled two or three adjacent boxes, as in Europe (Gromadzki 1980). Finally, although male starlings incubate only by day, we found males roosting with incubating females five times in the 2,804 visits to boxes at night, behavior hitherto unrecorded for starlings. Several other males roosted in empty boxes in the breeding season, although no starlings roosted in nest sites in the nonbreeding season as they do regularly in parts of Europe and America (Clergeau 1981). Nonbreeding female starlings, and most males through the year, roosted on islands 11 km and 12 km from our study area.

Evans (1988) defines four categories of intraspecific nest parasitism in starlings, ranging from paired females contesting a nest box occupied by another pair to "professional" nest parasites distributing their eggs in nests other than their own. The communal nesting

¹ Received 9 February 1989. Final acceptance 18 May 1989.

we record here seems a variant of the first category in which the females were unusually tolerant of each other or were so evenly matched that neither could take over the box.

We thank Malcolm Crawley, Tony Pritchard, Linda Romagnano, and an anonymous referee for helpful comments.

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The Condor 91:993-995

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RED BANDS AND RED-WINGED BLACKBIRDS¹

LES D. BELETSKY AND GORDON H. ORIANS

*Department of Zoology, NJ-15, and Institute for Environmental Studies,
University of Washington, Seattle, WA 98195*

Key words: Red-winged Blackbird; color bands; mate choice; color preferences; reproductive success.

Burley (1981, 1985, 1986a, 1986b) has presented evidence that in monogamous estrildid finches colored leg bands can influence individual mate choice, reproductive success, and mortality. Most strikingly, male Zebra Finches (*Poephila guttata*) with red bands, attractive to females, fledged on average about twice as many offspring as males with bands of relatively "unattractive" colors, and they also lived longer. If such preferences by females for particular leg-band colors are widespread, interpretations of many aspects of the behavior and breeding of color-banded individuals could be affected. Therefore, data on different species with varying breeding biologies are needed to evaluate the generality of color-band preferences and their potential effects. Here we present an analysis of the effects of red color bands on male mortality and reproductive success in a color-banded population of polygynously breeding Red-winged Blackbirds (*Agelaius phoeniceus*) studied from 1977 through 1987. Red is probably an important color signal of male redwings (Smith 1972, Røskaft and Rohwer 1987; see also Burley 1986a). Our particular concern was whether red bands we used in our population studies influenced mate choice and breeding success. Burley (1986b) found that male finches also had color-band preferences for females, but because male redwings did not choose among females

that arrived on their territories, we tested only for effects of male color bands.

Redwing breeding biology at our study site, the Columbia National Wildlife Refuge in Washington State, was described by Orians and Christman (1968) and Orians (1980). Males were present throughout the year. Females arrived in March and April to settle on male territories. Nesting began in early April and continued through June. We monitored breeding success for 65 to 85 territorial males each year (Beletsky and Orians 1987). Adult males were jet black with bright red epaulets and black legs. The red epaulet feathers were often covered but were exposed and erected during sexual and agonistic displays (Orians and Christman 1968). A narrow yellow or buff band bordered the epaulets, but was inconspicuous during these displays.

Plastic bands were used in 1977 but #2 anodized aluminum bands were used in all subsequent years. Color combinations were made up of different numbers of red, blue, yellow, and aluminum-colored bands (combinations used in 1977 also included green, white, and purple bands). Black bands were not used because they could not be seen against the birds' legs. Males had from one to three bands placed on each leg. Most males carried four to six bands (mode = 5). A U.S. Fish and Wildlife Service numbered band was part of each combination. No combinations consisted entirely of red bands. Band combinations were generated before each breeding season and given sequentially to new adult males as they were captured in the various parts of the study area. Thus, combinations were not associated with specific age, kinship, territorial status, or location groups. Most males received color bands at the start of their first breeding (territory-owning) sea-

¹ Received 9 February 1989. Final acceptance 6 July 1989.