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USE OF INTERSTATE HIGHWAY CUTS AS STARLING NESTING SITES

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The interconnecting system of interstate highways in the United States is becoming larger each year. Hancock (Proc. Annu. Conf. West. Assoc. Game Fish Comm. 43:183, 1963) estimated that 20.8 million hectares will be used for highways upon completion of the interstate system. Construction of these highways destroys considerable existing habitat but also creates a new environment that may be attractive to wildlife. New species may move in, and species present before construction may adapt to fit the man-made habitat.

Our purpose was to examine Starling (*Sturnus vulgaris*) use of rocky cliffs in cuts along interstate highways and other limited-access highways. These cuts are created when a section of the terrain is removed to permit construction of the road surface, leaving vertical cliffs of exposed rock. We found only one recorded observation of Starlings utilizing these highway cuts (Michael, Bird-Banding 43:123, 1971).

STUDY AREA

The study area consisted of sections of two limited-access highways in northern West Virginia. The longer of the two encompassed a 56-km section of Interstate 79, starting at the West Virginia-Pennsylvania state line, and extending south through Monongalia and Marion counties. This highway was completed in 1968. The highway bisects open pasture, farmland, abandoned fields, residential areas, small business areas, and some forest land. Right-of-way vegetation consisted of tall fescue (*Fescue arundinacea*), sericea lespedeza (*Lespedeza cuneata*), and crown vetch (*Coronilla varia*). There were 58 cuts along the highway.

The other portion of the study area was a 31-km section of U.S. Highway 48 starting at the West Virginia-Maryland state line and running west through Preston County. Construction was completed in 1972. The highway was bordered mainly by woodlands, some farmland, and pasture. Right-of-way vegetation consisted of tall fescue and sericea lespedeza, with scattered clumps of crown vetch. The forest bordering the highway was a relatively homogeneous second growth of northern hardwoods. This section of the study area contained 47 cuts.

METHODS

During May, June, and July 1976, we examined highway cuts for signs of Starling nesting activity. We watched with the aid of binoculars throughout morning and afternoon from the opposite side of the highway.

Each cut was numbered and the following characteristics were described: cut location, length, height, facing aspect, cliff structure, background and cut face vegetation, and land use opposite cut. Length and height were measured with a rangefinder. Cliff material was classified as sandstone, shale, limestone, or earthen. Land use opposite cuts was listed as residential, right-of-way fills, pasture, woods, field or old field. Fields were defined as areas with agricultural crops, while old fields were defined as those reverting to forest through natural succession. Any area supporting livestock was listed as a pasture. The abundance of vegetation in these areas was described as sparse, moderate, or heavy. A small sketch of each cut was drawn indicating ledges, vegetated areas, and the overall layout.

Rock cliffs were observed for a period of 30 min, 3 days per week, to determine if Starlings were using the area for nesting. We found nests by watching adult Starlings carrying food and/or nesting material to cavities in the cut face. When a nest site was spotted, we recorded its location on a sketch of that cut. Each nest cavity was then numbered and the number inconspicuously spray painted on the rocks near the cavity. If the cavity could not be reached, the number was painted directly below the nest site. We measured the following dimensions of the nest sites: nest height from the ground surface, horizontal distance from the nest to the road surface, and distance between the two closest nests.

After the initial observations, we inspected the nest sites weekly to monitor nesting habits and possible occurrence of second broods. Additional nests and nesting failures were also documented in the weekly inspections. No attempt was made to mark individual adult or nestling birds. Observations continued until no further nesting activity was apparent.

RESULTS AND DISCUSSION

During the three-month period, we examined 105 cuts for Starling nesting activity, and 17 (16%) contained nesting Starlings. These 17 cuts held 81 first-brood nests and 46 second-brood nests. We found 56% (46) of the first-brood nest cavities reoccupied by Starlings during the renesting period. No other species were found nesting on the cuts during the study period.

Highway cuts seem to offer good nest sites as renesting was common and few nesting attempts were unsuccessful. During the entire nesting period, only one nest was destroyed by a rock slide, resulting from heavy rains. The predators most threatening to adult Starlings in these cliffs were hawks and owls; during the study we saw two such attacks by an adult Red-tailed Hawk (*Buteo jamaicensis*). When the attacker was spotted, the adult Starlings took to the air and succeeded in driving the hawk off. The nest sites could not be reached by mammalian predators, while snakes attempting to reach a nest would be exposed to avian predators that frequented the right-of-way and to mobbing by Starlings.

Mean nest height (from ground level) was 7.6 m ($SD = 3.4$, range 2–18, $n = 81$). The mean horizontal nest-to-road distance was 11.5 m ($SD = 2.1$, range 7–15). Mean distance between the two closest nests in each cut was 1.9 m ($SD = 0.9$, range 0.5–6).

All variables investigated were significantly correlated with nest site selection (Chi-square tests, $P < .01$). No differences were found between initial and renesting attempts. Expected values for Chi-

TABLE 1. Characteristics of Starling nests along highway cuts, including a comparison of observed and expected number of nests.

CLIFF STRUCTURE

	Sandstone	Limestone	Shale	Earthen
Observed	81	45	1	0
Expected	81	21	16	5

ASPECT

	N	NE	NW	S	SE	SW	W	E
Observed	16	0	0	15	0	23	59	14
Expected	30	2	2	22	2	5	35	29

CUT LENGTH (meters)

	0–60	61–120	121–180	181–240	241–300	301–360	361–540	over 541
Observed	0	27	59	0	24	0	0	17
Expected	2	28	41	14	17	12	6	8

VEGETATION ON CUT

	None	Sparse	Moderate	Heavy
Observed	84	43	0	0
Expected	29	46	32	11

BACKGROUND VEGETATION

	Lawn	Field	Woods	Pasture	Old field	Fescue
Observed	34	33	20	17	11	12
Expected	3	20	79	14	6	5

OPPOSITE VEGETATION

	Fescue	Lawn	Pasture	Woods	Lespedeza	Old field	Vetch
Observed	84	19	13	10	6	6	0
Expected	60	7	7	49	4	4	7

OPPOSITE LAND USE

	Cut	Woods	Fill	Residential	Pasture	Field	Bank
Observed	113	0	1	11	0	0	3
Expected	67	31	15	7	3	3	2

square tests were calculated by determining the percentage of total cuts falling within each category (Table 1).

Limestone cuts were preferred by Starlings while shale and earthen cuts were avoided. Limestone cuts contained more cracks and cavities that were large enough to accommodate nesting birds than did shale and earthen cliffs. The cavities were the result of erosion, weathering, and pressures from blasting and excavation during highway construction. Owing to the composition and strength of limestone, cavities formed in these cliffs were resistant to collapse and therefore relatively stable. Cavities in the shale cliffs were either too small or too shallow to serve as nest sites. The layers of shale crumbled easily, collapsing the deeper cavities. Cavities in earthen cliffs were even shorter-lived, quickly filling with sediment after rains.

Southwest- and west-facing cuts were preferred; they received more direct sunlight and, therefore, were warmer and drier. This might prove advantageous during early nesting periods when cold night temperatures are not uncommon. Although length of a cut significantly affected Starling nesting, no generalities could be made. Starlings preferred cuts between 7 and 12 m high, and avoided those of other heights. Nests closer to the ground might offer easier access to predators, but this does not explain why Starlings avoided higher cavities. Starlings preferred cuts that totally lacked vegetation and avoided those which contained moderate or thick vegetation. Bare cliffs provide a clear view of the surrounding area, which should reduce predation, and they were warmer because of the direct sunlight.

Background vegetation also affected cut selection. Cuts with a background of residential lawns were highly preferred, while those having woods as the adjacent vegetation were avoided. Starlings seemed to be attracted to cuts where lawns and low-growing vegetation prevailed on the opposite side of the highway. They avoided cuts where woods were the dominant vegetation on the opposite side. Lawns, pastures, or areas with low vegetation offered excellent feeding places. These areas support great numbers of insects and worms, which are main items in the Starling's spring and summer diet (Kalmbach and Gabrielson, U.S. Dep. Agric. Bull. 868, 1921). Starlings were also attracted to cuts that were opposite other cuts.

CONCLUSIONS

The numerous cavities contained in cuts created by construction of the interstate highway system offer excellent nesting sites for Starlings. These cavities are spacious and predator-resistant, permitting the birds to establish both first and second brood nests in the same cavity. Starlings nest in a variety of cut situations, but some cuts are more desirable as nesting sites. The characteristics of preferred cuts are: (1) west- or southwest-facing aspect; (2) cliff material of limestone; (3) cliffs devoid of vegetation; (4) adjacent vegetation either lawn or field, etc.; (5) another cut opposite the nest site; and (6) cut height of 7 to 12 m. No single characteristic seemed to distinguish a cut as a potential site. Instead, these characteristics were related, and when combined formed optimum nesting habitat. Construction of interstate highways is providing good nesting sites for Starlings in areas which formerly were not suitable. These sites are not being used by native bird species. An increased use of the highway cuts by Starlings may result in increased Starling populations.

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THE STATUS OF *SERICORNIS NIGROVIRIDIS*

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The Black-and-Green Sericornis (*Sericornis nigroviridis*), an Australasian tree warbler of the subfamily Acanthizinae (Keast 1976, Sibley 1976), was described from a single specimen collected by Alden H. Miller in the mountains of eastern New Guinea in 1962 (Miller 1964). The unique holotype is an adult male in breeding condition. No other specimen has been secured in the intervening 14 years, even though the type locality, Edie Creek (near Wau, Morobe Province) lies in one of the best-collected regions in all of New Guinea. In this note I present evidence to support my belief that *Sericornis nigroviridis* is not a good biological species but is instead a melanistic individual of the widespread Buff-faced Sericornis (*S. perspicillatus*), the eastern geographical representative of the *S. rufescens* superspecies.

I examined the holotype, a well-prepared study skin in the Museum of Vertebrate Zoology, University of California, Berkeley. In color, this specimen differs radically from all other species of New Guinea *Sericornis.* The plumage is largely dark olive green with soot-grey on the throat and breast (see Miller 1964, for full description and a color plate). A cursory examination of the plumage alone indicates that this represents a striking new form. The specimen's color pattern is unlike not only any *Sericornis* previously described, but also any of the New Guinea tree warblers in several respects. The generally uniform coloration above and below is atypical of this group, and the peculiar blackish-olive plumage is unique. Remarkable, then, is that this bird's dimensions are nearly identical to those of the average adult male of *S. perspicillatus*! Table 1 presents measurements for the specimen of *nigroviridis* and specimens of several other sympatric species of the genus. Only those forms which inhabit the environment near the type locality are included. Nonetheless, these include three widespread species; no other high mountain forms are known from New Guinea.

All measurements of *nigroviridis* lie within the range of *perspicillatus,* and all except the culmen length (measured from the base of the skull) compare closely to the means of the series measured. Both *perspicillatus* and *nigroviridis* differ from *papuensis* and *nouhuysi* (Table 1). Miller's original diagnosis (1964) noted the similarity of this new form with *perspicillatus* (= *rufescens,* cf. Mayr 1941). Miller wrote (1964:3) "The rictal bristles, which are about half the length of the bill, in number and size are the same as in *Sericornis rufescens* [= *perspicillatus*] . . . the tail feathers are pointed, the inner veins being angled at the end as in *Sericornis rufescens* and the others in the genus . . . In details of the tarsus and feet I can find no significant departures from that of *S. rufescens,* although the latter has greater development of the plantar flange distally on the tarsus." Although this single specimen of *nigroviridis* exhibits minor physical differences from that of the typical *perspicillatus,* when one excludes plumage characters, the two forms are virtually inseparable. The shorter bill of *nigroviridis* may have resulted from damage incurred when the bird was shot. Miller mentioned that this was probably so (1964:3). The plumage anomalies can be explained easily as a case of melanism. Both the dark olive and soot-grey colors could be produced by excess melanin in the feathers and soft parts of the specimen. All of the lighter and brighter plumage characters of the typical *perspicillatus* are replaced with darker and duller colors in *nigroviridis.*