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THE PREVALENCE OF SOME ECTOPARASITES, DISEASES, AND ABNORMALITIES IN THE YELLOW-SHOULDERED BLACKBIRD

By William Post

The Yellow-shouldered Blackbird (*Agelaius xanthomus*), of Puerto Rico, Mona, and nearby islands, has become uncommon and restricted in range since about 1940, and probably fewer than 3,000 individuals remain (Post and Wiley 1976). As part of a long-term investigation of the biology of this species, I began in 1972 to capture and mark Yellow-shouldered Blackbirds. At the same time, I collected information on diseases and ectoparasites of birds that I handled. This effort was directed at answering the question of whether individuals of the study population were affected by avian pox, such as reported for other insular species (Warner 1968).

STUDY AREA AND METHODS

The investigation was conducted at La Parguera, Puerto Rico (17°50′N) during the period December 1972–September 1975. This semiarid site (rainfall 56–68 cm per year) borders the Caribbean, and is characterized by sclerophyllous vegetation and cacti, described elsewhere (Post and Wiley 1977). I captured birds in mist nets, Potter traps, and manually-operated drop traps, baited with bread, cooked rice, bananas, sugar, or monkey chow. Individuals were marked, measured, and examined for ectoparasites and outward signs of disease, and released unharmed; I examined 265 birds for ectoparasites, 215 for signs of disease, and 495 for signs of injury. Initially my procedure was to examine the whole body of an individual. I soon established that this method was inefficient, since most ectoparasites were confined to the head region, and signs of pox were only evident on bare areas (e.g., legs, base of beak, bend of wing). I then confined my examination to these areas. My procedure was to examine the head region for 1 min with the naked eye, parting the feathers by blowing apart and lifting with moistened fingers and estimating the number of ectoparasites of all stages. Most Mallophaga I found were eggs (nits), and in my inventory I did not differentiate between stages. The method was not designed to give a complete inventory of all parasites present, but since the examination method and time were standardized, it gave a reliable estimate of the differing degrees of infestation of different hosts. Similarly, to assess avian pox lesions, I examined the appendages and the head of each bird for 1 min.

To gather information on survival, I made monthly censuses for color-marked individuals at 7 stations around La Parguera. During the 3 years of the study I captured 505 Yellow-shouldered Blackbirds, recaptured 114 and made 4,034 sightings of color-marked individuals. For survival estimates disappearance is equated with death.

TABLE 1.

Occurrence of Mallophaga on Yellow-shouldered Blackbirds captured at La Parguera, Puerto Rico 1974–1975.

	Adult males		Adult females	All adults		All juveniles
Number examined	173		59	232		33
Number infested	138 (80%)	***	31 (53%)	169 (73%)	**	14 (42%)
Average number of Mallophaga per bird examined	21.4 ± 2.5		13.0 ± 3.9	19.7 ± 2.1		6.4 ± 2.6
Average number of Mallophaga per infested bird	26.9 ± 3.0		24.7 ± 6.8	26.8 ± 2.7		15.0 ± 5.5
Maximum on any bird	200		200	200		75

*** Between 2 values: $\chi^2 = 15.14$; $P < .001$; 1 d.f.
** Between 2 values: $\chi^2 = 11.13$; $P < .01$; 1 d.f.

In this paper χ^2, corrected for continuity, is used to determine whether the observed distribution of frequencies in 2 × 2 contingency tables could have occurred under a null hypothesis, with direction of difference predicted (one-tailed test).

RESULTS AND DISCUSSION

Ectoparasites.—The only parasites found were avian biting lice (Mallophaga). These insects were attached to the feathers of the head region, most to the bases of feathers under the ears and eyes, as well as to bare skin inside the ears. Three species of Mallophaga were present on Yellow-shouldered Blackbirds: *Philopterus agelaii, Machaerilaemus* sp., and *Myrsidea* sp. I have no information on the relative representation of each form. In all, 69% of the 265 birds had these parasites (Table 1). The frequency of infestation was significantly higher for males than for females, and significantly more adults were infested than were juveniles (Table 1). Among the different sex and age categories, however, I found no difference in the average number of Mallophaga per individual host. Certain individuals carried large numbers, 100–200 in several instances. Extreme cases of infestation were most often found in birds with injuries that apparently prevented their preening properly. For example, female AGRY had over 100 Mallophaga, and the tip of her lower mandible was missing; female RA had over 100, and her right foot was missing; female AORO had about 200, and she had a crossed beak. After her initial capture on 21 February 1974, AORO was seen on 15 March 1974, at which time it was noted that she was preening and scratching constantly. Ash (1960) cites other instances of birds that were unable to preen properly being heavily infested with Mallophaga.

In 2 other species, the Chaffinch (*Fringilla coelebs*) and the Seaside Sparrow (*Ammospiza maritima*), males also have a significantly higher prevalence of Mallophaga infestation than females (Ash 1960, Post and

Enders 1970). I found no reason for this difference, but possibly it has a hormonal basis, as several genera of Mallophaga are known to use changes in the levels of reproductive hormones in their hosts as cues for the timing of their reproductive activity (Foster 1969).

Three Yellow-shouldered Blackbird nests that I collected harbored mites (Acarina), *Ornithonyssus bursa* and *Androlaelaps casalis.* I saw mites in other nests that I examined, and found infestation to be particularly severe in cavity nests. This is to be expected, since the cavity nests were often reused in subsequent breeding seasons and old nest material served as platforms for new nests. About the time that young blackbirds were fledging, and even up to 5 weeks after they had left the nest, mites swarmed over the inside and outside of the nesting stumps, often covering my arms when I was making nest measurements. Although the mites crawled on the nestlings, I have no evidence that they were causing mortality such as described by Klaas (1970) for the Eastern Phoebe (*Sayornis phoebe*). Fledged birds undoubtedly carried these minute parasites, but my methods of examining trapped birds were too crude to reveal their presence.

Infestation of nestlings by mites may be reduced by parents which preen the young birds and the nest surface. At about 8 days of age, nestlings also preen each other (Post, unpubl. data). In this regard, it is relevant that I found no infestation of nestling Yellow-shouldered Blackbirds (17 young from 7 nests examined) by larvae of warble flies (*Philornis*). These parasites burrow under the skin of nestlings of other Puerto Rican birds, such as the Pearly-eyed Thrasher (*Margarops fuscatus*; N. Snyder, pers. comm.).

Injuries and plumage abnormalities.—Other than birds with lesions attributable to pox, I found 19 (4%) with other forms of injury among the 495 birds examined: (a) 11 had broken and healed legs, including cases of ankylosis; (b) 2 had missing parts of legs; (c) 1 had a crossed beak; (d) 1 had a missing beak tip; (e) 3 had bald spots (areas devoid of feather growth); (f) 1 had a missing toenail (Table 2).

In comparison to a Red-winged Blackbird (*Agelaius phoeniceus*) population studied in Texas in 1976–1977 (Sharp and Neill 1979), my study population had significantly fewer injuries to the wings, but the same proportion of mandible, foot, leg injuries and bald spots (Table 2). Sharp and Neill's (1979) method of assessing injuries probably underestimated their occurrence, because these authors examined birds from a distance. The use of this method also meant that they could not estimate to what degree injuries were due to pox infection; data from a coastal New York population of Red-wings show that avian pox is common in this species (unpubl. data; see below).

Plumage abnormalities were rare among 495 Yellow-shouldered Blackbirds that I examined: 13 had yellow feathers outside the epaulets, usually a single or a few feathers: 12 cases in the malar region, 2 on the belly or throat, and 1 on the back. Extrahumeral white feathers, all singles, were found on 5 birds: in 1 case on the head, 1 on the abdomen and in 3 cases on the back or wings. The latter cases included 2 birds

TABLE 2.

Deformities and plumage abnormalities of Yellow-shouldered and Red-winged blackbirds.

Category	Yellow-shouldered Blackbird	Test for difference	Red-winged Blackbird[1]
Deformity of:			
Feet and legs[2]	16 (3.2%)	NS; $\chi^2 = 0.42$; 1 d.f.	25 (2.5%)
Bill	2 (0.4%)	NS; $\chi^2 = 0.39$; 1 d.f.	18 (1.8%)
Wing	1 (0.2%)	$P < .05$; $\chi^2 = 4.14$; 1 d.f.	15 (1.5%)
Feather abnormalities:			
Bald head	3 (0.6%)	NS; $\chi^2 = 0.92$; 1 d.f.	13 (1.3%)
White feathers	5 (1.0%)	$P < .05$; $\chi^2 = 5.70$; 1 d.f.	32 (3.2%)
Yellow feathers outside the epaulets	13 (2.6%)	—	—[3]
Total examined	495		1,000

[1] Data from Neill and Sharp (1979).

[2] Includes 2 deformities due to avian pox.

[3] Colored feathers, which would be reddish in the Red-winged Blackbird (Nero 1954), were not tallied.

with single, corresponding greater secondary coverts on each wing tipped with white. The prevalence of white-spotting in the plumage of Yellow-shouldered Blackbirds was significantly lower than Sharp and Neill (1979) found for Red-winged Blackbirds (Table 2).

Data on abnormalities of the Yellow-shouldered Blackbird provide a useful point of comparison with similar data gathered for the closely related Red-winged Blackbird in agricultural areas of North America. Sharp and Neill (1979) suggest that abnormalities may result from contamination of birds by agricultural chemicals, including avicides. The area occupied by the Yellow-shouldered Blackbirds studied here is sparsely settled, and because of its aridity, not used for agriculture. Observations of color-banded birds during 3 years showed that most individuals confined their activity to the arid zone around La Parguera throughout the year (Post, in press). Blackbirds ate monkey chow, cattle ration, fruit, nectar, and human food all year, but were mainly insectivorous in the breeding season. From these observations, I conclude that Yellow-shouldered Blackbirds should be less contaminated by synthetic pollutants than Red-winged Blackbirds in Texas.

White-spotting, which was more common in the Texas Red-winged Blackbirds, probably represents a genetic polymorphism, but may, in cases such as the blackbird populations considered here, where its frequency is less than 5%, be maintained by recurrent mutation alone (Enders and Post 1971). For three of the other four categories of abnormalities, I found no significant differences between island and mainland groups (Table 2). If I accept the premise that the Yellow-shouldered

TABLE 3.

Occurrence of avian pox in Yellow-shouldered Blackbirds captured at La Parguera, Puerto Rico 1974–1975.

Degree of infection	Score[1]	Number of brids examined: Males		Females	Total
None	0	122		52	174
Trace	1–2	14		14	28
Medium	3–4	6		1	7
Heavy	≥5	5		1	6
Total examined		147		68	215
Total with signs of infection		25 (17%)	NS[2]	16 (24%)	41 (19%)

[1] For each tibio-tarsal, tarso-metatarsal, digital, wing, and head region, we scored 0 = no lesion; 1 = lesion, or swelling ≤1 mm; 2 = swelling > 1 mm.

[2] No difference between the proportions of each sex that were infected ($\chi^2 = 0.89$; 1 d.f.).

Blackbird is less contaminated by synthetic chemicals than is the Red-winged Blackbird, then I am obliged to reject Sharp and Neill's hypothesis that Red-winged Blackbird abnormalities in Texas result from chemical contamination. An alternate hypothesis, which they did not consider in their study, is that most deformities could result from avian pox.

Avian pox.—Yellow-shouldered Blackbirds often had signs of infection by avian pox virus. This virus causes lesions, usually on the tarsi, but also on areas of exposed epidermis as at the bend of the wing, the gape, and around the eyes. The etiology and signs of the disease have been described elsewhere (Worth 1956, Warner 1968). The degree of lesion varied greatly among individuals (Table 3). Of 215 birds examined for the absence or presence of pox lesions, 41 (19%) were infected. Two birds were killed so that their tumors could be examined microscopically. The location of the gross lesions and their microscopic characteristics, including the inclusion bodies, were typical of avian pox (W. M. Colwell, pers. comm.).

The frequency of avian pox in Yellow-shouldered Blackbirds (19%, Table 3) is higher than reported for some bird populations (Worth 1956), but similar ($\chi^2 = 2.39$; $0.10 < P > 0.05$; 1 d.f.) to that found in a population of Red-winged Blackbirds in coastal New York, where 25% of 347 individuals had signs of avian pox (Post, unpubl. data).

Avian pox has been implicated in the extinction of populations of Drepaniidae in lowland areas of the Hawaiian Islands (Warner 1968). This virus is transmitted mechanically, usually by mosquitoes, and perhaps by hippoboscid flies. It is not known if fowl pox is transmitted by Mallophaga. I found no correlation between the frequency of Mallophaga infestation and of fowl pox. My data, in comparison to those collected from Red-winged Blackbirds, do not indicate an unusually high prevalence of pox infection in the Yellow-shouldered Blackbird. In several cases, however, large tumors, probably due mainly to bacterial infection of the pox lesions, caused impeded movements in Yellow-shouldered Blackbirds.

To test for a difference between the survival of Yellow-shouldered Blackbirds with pox lesions and normal birds, I examined the survival of a group of 64 birds captured during 13 February–13 April 1974. Of this group, 26 birds had lesions (score ≥ 1), while 38 were judged to be unaffected. I then compared the numbers of affected and unaffected birds surviving 12 months and 15 months after initial capture. After 12 months 50% of the diseased birds were still sighted on censuses, while 73.7% of the normal birds were similarly sighted. The difference is not significant ($\chi^2 = 2.80$; $0.10 < P > 0.05$; 1 d.f.). After 15 months, only 23.1% of the diseased individuals still appeared in the censuses, while the corresponding figure for the normal individuals was 42.2%. The difference in survival of the two groups over the 15 months is significant ($\chi^2 = 5.19$; $P < .05$; 1 d.f.). The lowered survival of diseased birds may be due to either impairment of movement due to the location of tumors, impairment of body maintenance (see above), or to direct effects of the virus (such as toxemia) and secondary bacterial infection.

In several cases Yellow-shouldered Blackbirds with fowl pox developed large tumors, and these growths interfered with the normal movements of the birds: (1) female AGRY had a growth covering the right eye completely, and she was in a weakened condition and covered with Mallophaga; (2) female ARGB, with old pox lesions, had difficulty walking; (3) female AYOO had a tumor measuring 15×20 mm on her intertarsal joint which prevented movement at the joint; (4) male AOGO had a tumor 7×5 mm on the dorsal surface of the humerus.

SUMMARY

Of 265 Yellow-shouldered Blackbirds examined for ectoparasites, 69.0% had avian biting lice (Mallophaga), 3 species of which were identified. No other ectoparasites were found in macro examination of captured birds. Yellow-shouldered Blackbird nests held 3 species of mites (Acarina).

The frequency of deformities among 495 Yellow-shouldered Blackbirds ranged from 3.2% (feet and legs) to 0.2% (wings). In this same sample, 1.0% of the subjects had white feathers and 0.6% had bald spots. In comparison to a Red-winged Blackbird population in Texas, the frequency of deformities was the same in all categories except wing injuries and white feathers. These comparisons suggest that it is unwarranted to conclude that deformities in the Red-winged Blackbird result from contamination by synthetic pollutants, since overall frequency of deformities is about the same in the Yellow-shouldered Blackbird, which occupies a presumably less polluted habitat.

Many deformities in the Red-winged Blackbird could result from avian pox, which is common in both species of *Agelaius*. In the Yellow-shouldered Blackbird 19.0% of 215 individuals had pox lesions. The survival over a 15-month period of 26 birds with pox lesions was significantly lower than a control group of 38 birds from the same population.

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