

# The Yellow-shouldered Blackbird —present and future

William Post and James W. Wiley

The species' population seems drastically reduced since 1927. What are the factors leading to this decline?

Photo/William Post

The Yellow-shouldered Blackbird (*Agelaius xanthomus*) is endemic to Puerto Rico and Mona Island. Once abundant and widespread in Puerto Rico, the species is now uncommon and restricted in range. In 1972 we began studying the Yellow-shouldered in an attempt to determine the reasons for its decrease, which we now believe to be owing to multiple factors, but most significantly to the activities of a recent invader of the West Indies, the Shiny Cowbird (*Molothrus bonariensis*), a brood parasite of the Yellow-shouldered.

The Yellow-shouldered Blackbird aroused our interest because it is part of an endangered endemic fauna. Other rare species that have been studied in Puerto Rico are the Puerto Rican Whip-poor-will (*Caprimulgus noctitherus*) (Kepler and Kepler 1973), the Puerto Rican Parrot (*Amazona vittata*) (Snyder, Kepler, Taapkan and Snyder MS) and the Plain Pigeon (*Columba inornata*) (Wiley MS). The Yellow-shouldered is an important resource for the study of the evolution of behavior. Its North American congeners, the Red-winged Blackbird (*A. phoeniceus*) and the Tricolored Blackbird (*A. tricolor*) have been

thoroughly investigated (Orians and Christman 1968). The Yellow-shouldered provides many points of comparison to other icterids in its displays, social organization and adaption to tropical habitats. Moreover, as an occupant of the mangrove zone, the species is an indicator of the health of the coastal ecosystem.

## FORMER DISTRIBUTION AND STATUS

Taylor (1864), who visited the San Juan region, described the Yellow-shouldered as "excessively abundant." Wetmore (1927) found the species common throughout lowland Puerto Rico, and even collected specimens in the mountainous interior at Lares. As late as 1936, the Yellow-shouldered was still common in the lowlands (Danforth 1936). From published reports and from localities given on museum specimens, we conclude that the Yellow-shouldered was still common and widespread in Puerto Rico until the 1940's, after which time we have no information until our work began in 1972.

## PRESENT DISTRIBUTION AND STATUS

After three years of field work in Puerto Rico and Mona Island we estimate the total world

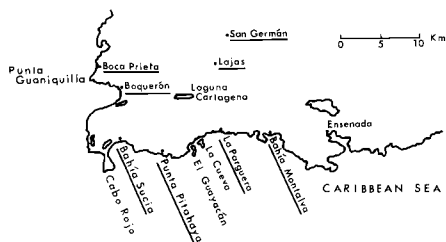
1 Research Section, North Carolina Division of Mental Health Services, Raleigh, N.C. 27611. 2 Institute of Tropical Forestry, U.S. Forest Service, Box 21, Palmer, Puerto Rico 00721.

population of the Yellow-shouldered Blackbird to be about 2400. This estimate is based on roost counts (Table 1) and on surveys of nesting areas. The Yellow-shouldered population is now concentrated in three centers (Fig. 1) in the approximate numbers given: 1) coastal southwestern Puerto Rico: 2000; 2) coastal southeastern Puerto Rico 200; 3) Mona Island: 200.

**Table 1**  
**Winter Roost Counts of Icteridae in SW Puerto Rico**

Date	Locality	Yellow-shoulder Blackbird	Shiny Cowbird	Greater Antillean Grackle
10 Dec 74	Punta Pitahaya	1050	11	321
15 Dec 74	La Parguera	156	45	506
5 Jan 75	Bahía Montalva	284	897	1538
11 Jan 75	Bahía Sucia	147	203	1513
12 Feb 75	Lajas	7	45	405
12 Feb 75	San Germán	6	1175	3525
16 Feb 75	Boca Prieta (Buey)	9	0	250
16 Feb 75	Boquerón	17	10	1400
	Total	1676	2386	9458

Within these restricted coastal population centers, the Yellow-shouldered has been found nesting in the vicinities of La Parguera (71 nests located) and Ceiba (19 nests) and on Mona (5 nests). Other, marginal nesting localities (Fig. 1) are Guánica (1 nest; G. H. Orians, pers. comm.), San Germán (8 nests), and Carolina (1 nest; H. Snyder, pers. comm.). At Boquerón and Boca Prieta we saw birds carrying nest material, but have no additional evidence of breeding. In addition, Wetmore (1927) found nests at Laguna Cartagena. We searched inland Puerto Rico extensively, but did not find any breeding populations farther inland than San Germán. In contrast, Wetmore's (1927) list of localities indicates that the Yellow-shouldered occurred throughout Puerto Rico, although more commonly in the coastal zone.

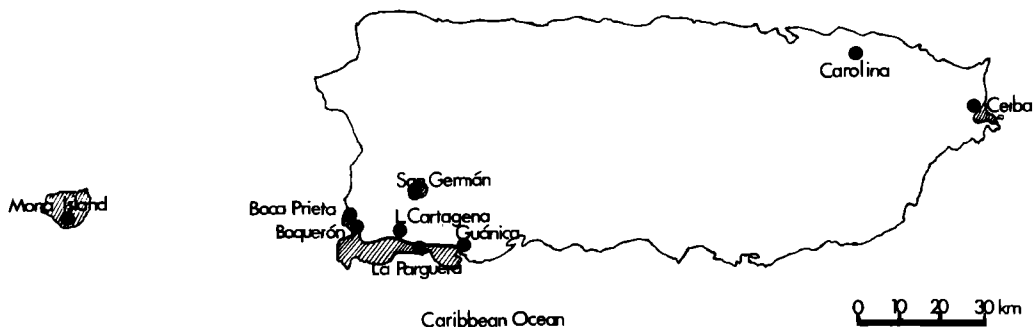


**2. SW Puerto Rico.** The main population of the Yellow-shouldered is found from Ensenada to Boca Prieta. Underlined localities are roost count sites (Table 1)

Coastal southwestern Puerto Rico, the zone from Ensenada to Punta Guaniquilla (Fig. 2), is the important Yellow-shouldered Blackbird population center. We made winter counts at all the Yellow-shouldered roosts we could find in southwestern Puerto Rico, and counted about 1600 Yellow-shouldered Blackbirds (Table 1, Fig. 2). In the non-breeding season (October-April) about half of the southwestern population stays permanently near La Parguera, principally in the vicinity of La Cueva and El Guayacán Islands. The remainder of the population disperses daily to feed at inland localities or to temporary feeding sites along the coast. All these winter flocks return daily to their mangrove roosts (Fig. 2). When nesting, most of these birds appear to stay either in the mangrove zone or in the arid coastal fringe.

#### NESTING HABITAT

We found Yellow-shouldered nesting in seven habitat types: 1. Mangrove pannes and salinas. The most important nesting habitat is abandoned



**1. Puerto Rico and Mona Island.** Cross-hatched areas represent present Yellow-shouldered Blackbird range. Black dots indicate nesting localities.



3. Panne in mangroves. The single Black Mangrove in foreground is a Yellow-shouldered Blackbird nest site. Photo/J.W. Wiley.

salinas and pannes in the coastal mangrove zone, where we found 67 of the total of 105 nests. The principal vegetation is black mangrove (*Avicennia nitida*), red mangrove (*Rhizophora mangle*) and white mangrove (*Laguncularia racemosa*). The trees were usually small (Fig. 3) and were either recolonizing an area that was once cleared of trees to form a salinas, subsequently abandoned, or recolonizing a panne, whose trees had died from overconcentration of salt due to poor water circulation.

In the salinas and pannes the blackbirds used two types of nest sites. Open, cup-shaped nests typical of *Agelaius* were placed near the mud or water in small mangrove trees (Fig. 3-4). The other, and more unusual, nest site was a cavity or hollow in a dead mangrove (Figs. 5-6). Although dead trees with cavities were common in both southeastern and in southwestern Puerto Rico, we found cavity-nesting Yellow-shouldered only in the latter region.



4. Yellow-shoulder nest in Black Mangrove. The nest contains 2 young cowbirds. Photo/J.W. Wiley.

2. Offshore red mangrove cays. Yellow-shouldered nested on small (100-1000 m<sup>2</sup>) islands that were 250-550 m offshore. Nests were usually built on main branches, 0.2-4.0 m above water. On these nesting cays we found aggregations of 2-6 pairs. Yellow-shouldered nesting on offshore islands flew to the mainland to forage Blackbirds were found nesting on offshore cays only in southwestern Puerto Rico, around La Parguera.



5. Yellow-shoulder nest in hollow. Photo/W. Post.

3. Black mangrove forest. At Ceiba in southeastern Puerto Rico, Yellow-shouldered nested in dense stands of black mangrove (Fig. 7). Nests appeared to be aggregated, and it is possible that social attraction between nesting pairs was causing such clumping. Large areas of similar, surrounding forest were not used for nesting. Unfortunately, we were unable to study the social behavior of these groups of blackbirds.

4. Lowland pastures. In southwestern Puerto Rico around La Parguera, Yellow-shouldered nested in large deciduous trees in pastures at the edge of the mangroves. Most of these trees were oxhorn bucida (*Bucida buceras*), 11-14 m high. The nests that we found were 6-9 m high. As in the black mangrove forest, pairs nested close together, and in two cases two pairs nested simultaneously in the same tree, 3.5 m apart. Danforth (1926) described Yellow-shouldered nesting in deciduous trees at the edge of Cartagena Lagoon



6. Yellow-shoulder nest in cavity. Photo/M.M. Browne.

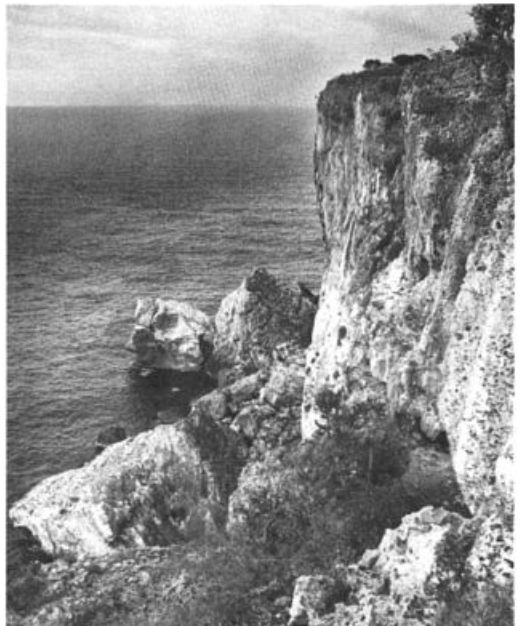


7. Black Mangrove forest at Ceiba. Yellow-shouldered Blackbird nest may be seen in tree in central foreground. Photo/J.W. Wiley.

5. Suburban. In San Germán Yellow-shoulderedreds nested on the campus of Inter-American University on the fronds of 16-18 m high royal palms (*Roystonea borinquena*), which were planted around the buildings. We studied a marked population of eight pairs, all of which placed their nests 12-15 m above the ground. Two pairs built nests in the same palm, 4 m apart. At Carolina, H. Snyder found a pair of Yellow-shoulderedreds building a nest in a royal palm on the front lawn of a factory, while in the town of La Parguera, we found a nest in an oxhorn bucida in the front yard of a private dwelling.

6. Coconut (*Cocos nucifera*) and royal palm plantations. On several occasions we saw Yellow-shoulderedreds carrying nest material to the axils of coconuts, and displaying as if nests were located there. Unfortunately we were unable to reach these sites to confirm nesting. The suspected nest sites were at Boquerón, La Parguera, Boca Prieta and Mona Island. The axils of coconuts often harbor rat nests, and some of the trees in which we suspected Yellow-shoulderedreds to be nesting had galvanized rat guards around their trunks. Wetmore (1916) and Danforth (1926) also describes coconuts and royal palms as nest sites for Yellow-shoulderedreds.

7. Coastal cliffs. Perhaps the most unusual nesting habitat used by Yellow-shoulderedreds is the sheer cliffs surrounding Mona Island (Fig. 8),



8. Cliffs on the NW coast of Mona Island, used as nest sites by Yellow-shoulderedreds. Photo/J.W. Wiley.

where the blackbirds placed their nests on ledges or in crevices. The majority of Mona's 200 Yellow-shouldered probably use cliffs or caves for nesting. In 1975, we located two nests on cliff faces: one was about 30 m below the cliff top, and the other near the base of the cliff, about 50 m down. We saw additional birds carrying food into crevices in the cliff face.

## PROBABLE FACTORS LEADING TO THE DECLINE OF THE YELLOW-SHOULDERED BLACKBIRD

From the preceding account we see that the Yellow-shouldered is adaptable in its breeding behavior, occupying a variety of habitats and using many different nesting substrates. Why, then, is the species becoming rare? A number of hypotheses may be examined: 1. Reduction in Feeding Habitat. In the winter the blackbird is often associated with livestock feeding lots and mixed agricultural cropland. For example, flocks regularly visit monkey provisioning stations on La Cueva and El Guayacán Islands, where they feed on monkey biscuits, and flocks visit cattle feed lots and dairy barns in the Lajas Valley to eat grain and cattle ration. Since 1900 increasing acreage has been devoted to sugar cane, and monoculture practices can only have had the effect of reducing feeding habitat. With the current reduction in sugar cane planting, this trend may be reversed, although cane is not usually being replaced by pasture and cropland, but rather by houses.

2 Reduction in Nesting Habitat. At least until the 1940s the Yellow-shouldered is believed to have used a wide variety of nesting habitats. No early observations are available from the mangrove zone, but Yellow-shouldered presumably used mangroves for nesting as they do now. Danforth (1926) and Wetmore (1927) found the Yellow-shouldered nesting most often in palms, and occasionally deciduous trees. Today the most important nesting habitat is mangroves, where we found 90 of 105 nests. Mangroves are particularly vulnerable to exploitation, and large areas have already been destroyed in Puerto Rico (Holdridge 1940). Coastal southwestern Puerto Rico contains one of the last extensive, undisturbed tracts of mangroves in Puerto Rico, and this is the main breeding ground of the remaining Yellow-shouldered.

3 Introduced Pest Species. Rats (*Rattus norvegicus* and *R. Rattus*) and mongoose (*Herpestes javanicus*) are now widespread in lowland Puerto Rico. Yellow-shouldered usually nest in predator-free sites such as small islands, cactus (Barnes 1946), palm fronds and steep cliffs.

These site choices suggest that ground predators have influenced the behavior of nesting blackbirds. On the coastal mangrove cays, rats have been introduced by human visitors, who build shacks and docks. Cays with such structures are usually devoid of blackbirds, as well as other breeding birds.

4. Pearly-eyed Thrasher (*Margarops fuscatus*) Wetmore (1927) described the thrasher as "far from abundant in most localities, and from its habits few are seen," but it is now becoming "more abundant and widespread" (Bond 1956) Thrashers steal the eggs and young of several species, take over nest sites and steal nest material. The Pearly-eyed Thrasher is rare in the southwestern mangrove zone and, although we have no evidence that it interacts with the Yellow-shouldered, its increase may have been a factor in the decrease of the blackbirds outside the southwest. It is notable that blackbirds nested in cavities only in the southwestern mangroves, although cavities were available in the southeastern mangroves, blackbirds did not use them. Pearly-eyed Thrashers are cavity-nesters, and they may exclude blackbirds from these sites

5. Fowl Pox. We examined 305 Yellow-shouldered for pox, and found 57 (18.7%) to have tumors. We sacrificed two blackbirds, and found that the gross lesions and the microscopic characteristics of the tumors, including the inclusion bodies, were typical of fowl pox. More data are needed on the comparative survival of birds with varying degrees of infection. In some cases, tumors were large enough to impair movement. Other studies (Amadon 1950) have implicated fowl pox as a factor leading to the decrease of island bird species.

6. The Shiny Cowbird (*Molothrus bonariensis*). The crucial factor in the decline of the Yellow-shouldered Blackbird has undoubtedly been the phenomenal spread and increase of the Shiny Cowbird (Figs. 9-12). This species arrived in Puerto Rico about 1955 (Grayce 1957), although we have strong circumstantial evidence that it arrived before that date (Post and Wiley MS). It now out-numbers Yellow-shouldered at many localities (Table 1), and by 1971, the cowbird had arrived on Mona Island (Bond 1973)

In lowland Puerto Rico the Yellow-shouldered appeared to be the exclusive host of the parasite. Of 76 Yellow-shouldered nests examined, we found 56 (73.7%) parasitized by cowbirds, while in the same habitats none of 128 other passerine nests were parasitized. Furthermore, all 56 of the parasitized nests were on the mainland, where we found no unparasitized Yellow-shouldered nests. But on the offshore cays cowbirds parasitized only 3 of 23 nests (13.0%); although they often

roost on the cays with other icterids, cowbirds seldom visit the cays during the day.

Lack of parasitism of the nesting cays gave us the opportunity to compare nesting success of blackbirds with and without the burden of cowbird eggs. This comparison is possible because nest losses due to other factors such as predation were the same for the nesting cays and the mainland. While 50% of the non-parasitized nests fledged young, only 25% of the parasitized nests did so (Table 2). The greater failure of parasitized nests is mainly due to losses incurred during the period when eggs are in the nest (Table 2). However, once the eggs have hatched, there is no difference in success between nests containing and not containing cowbirds: once hatched, Yellow-shouldered young are able to compete with their smaller, parasitic nest mates.

The impact of the cowbirds on the Yellow-shouldered has been much more severe in southeastern Puerto Rico than in southwestern Puerto

Rico. In southeastern Puerto Rico, 18 nests produced 17 cowbirds, but only three blackbirds, while in southwestern Puerto Rico 35 nests pro-

**Table 2**

**Success of Open Yellow-shouldered Blackbird Nests Parasitized or Not Parasitized by Shiny Cowbirds 1973-1975**

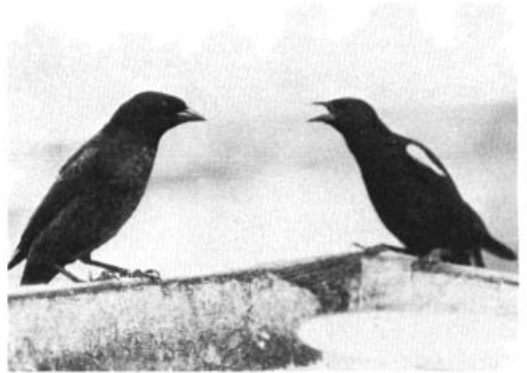
<i>Component of Success</i>	<i>Parasitized</i>	<i>Not Parasitized</i>
Nest Success <sup>1</sup>	12/48 (25.0%)* <sup>2</sup>	10/20 (50.0%)
Number of Fledglings Per Egg	19/105 (18.1%)*	15/40 (37.5%)
Number of Nestlings Per Egg	31/105 (29.5%)*	20/40 (50.0%)
Number of Fledglings Per Nestling	19/31 (61.3%)	15/20 (75.0%)

<sup>1</sup>Proportion of nests producing at least one young.

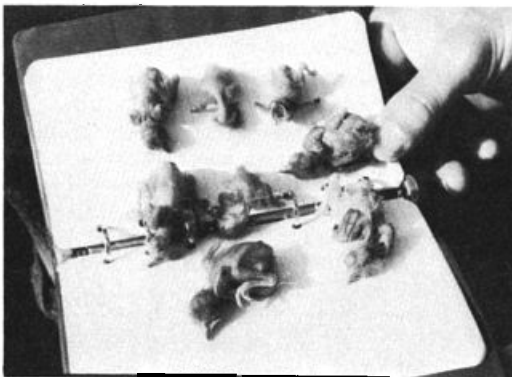
<sup>2</sup>An asterisk between two values indicates that they are significantly different ( $P < .05$ ).



**9. Male Shiny Cowbirds at feeding dish - La Parguera, Puerto Rico. Photo/W. Post.**



**10. Yellow-shouldered Blackbird threatens juvenile male Shiny Cowbird. Photo/W. Post.**

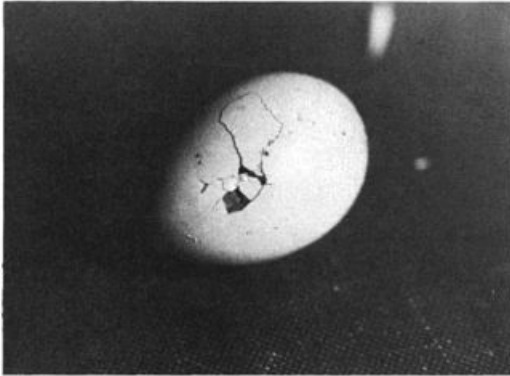


**11. Contents of one Yellow-shouldered Blackbird nest: 3 blackbirds and 5 cowbirds. Two blackbirds and 3 cowbirds fledged. Photo/M.M. Browne.**



**12. Fledgling Shiny Cowbird. La Parguera, Puerto Rico. Photo/M.M. Browne.**

duced 24 cowbirds and 27 blackbirds. The low success of parasitized nests in the southeast is in part owing to the cowbirds' habit of puncturing eggs (Fig. 13). Egg puncturing is still rare in the southwest, and the prevalence of this behavior in southeastern Puerto Rico (12 of 18 nests had



13. Yellow-shouldered Blackbird egg believed to have been punctured by a Shiny Cowbird. Photo J. W. Wiley.

punctured eggs; in the southwest one of 58) may be owing to a greater density of cowbirds there, since they have occupied the eastern end of the island about ten years longer than the western end.

## THE FUTURE

The Shiny Cowbird is increasing and spreading westward through the Caribbean. Since it arrived in Puerto Rico in 1955, it has become one of the most numerous lowland birds. Probably nothing can be done to control the cowbird, but certain management practices could be used to reduce the impact of cowbirds on the Yellow-shouldered.

Unlike the Kirtland's Warbler (*Dendroica kirtlandii*), whose nesting habitat is now completely invaded by its brood parasite, the Brown-headed Cowbird (*Molothrus ater*) (Walkinshaw, 1972), the Yellow-shouldered Blackbird still has some of its breeding habitat free of Shiny Cowbirds. In southwestern Puerto Rico Yellow-shouldered often nest on offshore cays, and the cowbirds seldom visit the cays to search for hosts. These small islands may thus act as refuges for at least a part of the blackbird population. Preservation of the cays may be crucial in reducing the impact of the newly arrived parasite upon the Yellow-shouldered, until the blackbirds evolve some defenses against brood parasitism. Unfortunately, the entire southwestern coastal zone is under heavy recreational pressure from the more populated sections of Puerto Rico. Even in the protected Boquerón State Forest, squatters are building recreational housing on the shore-

line and on isolated cays. Such a trend means that the last cowbird-free blackbird nesting habitat is threatened.

Another possible method of increasing Yellow-shouldered Blackbird nesting success is the provision of artificial nest sites. Fortunately, we found that Yellow-shouldered use hollow stumps (Fig. 5) and tree cavities (Fig. 6) for nesting. Although cowbirds also parasitize blackbird nests that are in cavities, the increased success of Yellow-shouldered nesting in cavities (Table 3) may be enough to hold blackbird reproduction up to replacement level. Experiments

Table 3  
Success of Yellow-shouldered Blackbirds Placing Nests in the Open or in Cavities<sup>1</sup>

Component of Success	Open Nests	Cavity Nests
Nest Success <sup>2</sup>	6/22 (27.3%) * <sup>3</sup>	6/7 (85.7%)
Number of Fledglings		
Per Egg	11/57 (19.3%) *	12/19 (63.2%)
Number of Nestlings		
Per Egg	16/57 (28.1%) *	14/19 (73.7%)
Number of Fledglings		
Per Nestling	11/16 (68.8%)	12/14 (85.7%)

<sup>1</sup>All data from salinas and pannes near La Parguera, 1975.

<sup>2</sup>Proportion of nests producing at least one young.

<sup>3</sup>An asterisk between two values indicates that they are significantly different ( $P < .05$ ).

should be made to determine if the Yellow-shouldered will accept nest boxes or improved natural sites. Once the blackbirds accept such sites, it may be possible to increase nesting density in certain optimal areas, such as salinas, which are relatively free of predators. Work with several European bird species has shown that nest boxes can increase population density by a factor of ten or more (von Haartman 1971). Such concentrated blackbird populations could be more closely monitored and protected, and local control of adult cowbirds and their eggs would be possible at such localities.

Yellow-shouldered Blackbird-Shiny Cowbird interactions suggest predictive models for the future impact of the Shiny Cowbird in other localities, especially North America. This species is rapidly moving westward through the Caribbean, and elsewhere we have predicted that it will soon invade North America (Post and Wiley, MS).

## CONCLUSIONS

1. The Yellow-shouldered Blackbird population size (2400) seems drastically reduced since 1927.

2 The breeding range has been considerably reduced from that described in 1927. The concentration of eighty per cent of the population in a coastal zone 35 km long means that a single event such as a hurricane might reduce numbers of this species to below replacement level.

3 A recent invader to Puerto Rico and Mona Island, the Shiny Cowbird, significantly reduces the Yellow-shouldered Blackbird's nesting success by parasitizing its nests. Although the Yellow-shouldered may have been declining when the cowbird arrived in Puerto Rico, cowbird depredations are a strong negative factor today.

4 The main breeding area of the Yellow-shouldered in the southwestern coastal zone of Puerto Rico is today threatened by human exploitation. The last cowbird-free nesting habitat of the Yellow-shouldered, offshore mangrove cays, is rapidly being destroyed by recreational and residential development.

#### ACKNOWLEDGMENTS

We thank the Caribbean Primate Research Center for providing laboratory space, boats and equipment. J. Herbert, scientist in charge of La Parguera primate facilities of the C.P.R.C., aided in many ways. J. Bishop, M. M. Browne, J. Taapkan, B. Wiley and K. S. Wilson aided in the field. The manuscript benefited from critical comments by F. A. Enders, C. B. Kepler, H. Snyder and N. Snyder. Our work was supported in part by a grant from the Office of Endangered Species and International Activities of the U. S. Fish and Wildlife Service. While working at La Parguera, Post was supported by U. S. Public Health Service Grant DA-00700; principal investigator, J. G. Vandenberg.

#### LITERATURE CITED

- AMADON, D. 1950. The Hawaiian honeycreepers (Aves, Drepanididae). Bull. Am. Mus. Nat. Hist. 95: 151-262.
- BARNES, V., JR. 1946. The birds of Mona Island, Puerto Rico. Auk 63: 318-327.
- BOND, J. 1956. Check-list of the Birds of West Indies Acad. Nat. Sci. Philadelphia.
- BOND, J. 1973. Eighteenth supplement to the Check-list of the Birds of the West Indies (1956) Acad. Nat. Sci. Philadelphia: 1-12.
- DANFORTH, S. T. 1926. Birds of the Cartagena Lagoon, Porto Rico. Journ. Dept. Agric. Porto Rico 10: 1-136.
- DANFORTH, S. T. 1926. Los Pájaros de Puerto Rico Rand, McNally and Co., New York and Chicago
- GRAYCE, R. L. 1957. Range extensions in Puerto Rico. Auk 74: 106.
- VON HAARTMEN, L. 1971. Population dynamics Pp. 391-459 in Avian Biology. Vol. 1 (D. S. Farner and J. R. King, Eds.) Academic Press, New York
- HOLDRIDGE, L. R. 1940. Some notes on the mangrove swamps of Puerto Rico. Caribbean Forester 1 19-29.
- ORIAN, G. H. and G. M. CHRISTMAN. 1968 A comparative study of the behavior of Redwinged, Tricolored, and Yellow-headed Blackbirds. Univ California Publ. Zool. 84.
- KEPLER, C. B. and A. K. KEPLER. 1973. The distribution and ecology of the Puerto Rican Whippoorwill, an endangered species. Living Bird 11 207-238.
- TAYLOR, E. C. 1864. Five months in the West Indies Part II. Martinique, Dominica, and Porto Rico Ibis 6: 157-173.
- WALKINSHAW, L. H. 1972. Kirtland's Warbler endangered. Am. Birds 26: 3-9.
- WETMORE, A. 1916. Birds of Porto Rico. U. S. Dept Agric. Bull. 326, pp 1-140.
- WETMORE, A. 1927. The Birds of Porto Rico and The Virgin Islands. New York Acad. Sci. Scientific Survey of Porto Rico and the Virgin Islands 9 409-571.

## The Sixth Salon of Photographs

Once again, in the forthcoming August issue of *American Birds*, we will exhibit a salon of bird photographs, with (modest) prizes being awarded for those judged best by our blue ribbon panel. This year for the first time we will have two categories: black-and-white prints, and color which can be submitted either as prints or transparencies.

Entries will be judged first on the basis of artistic merit, with the difficulty of getting the shot, the novelty of the picture, and other factors being considered.

This year, the first prize color photograph will be used as our August cover, but salon entrants must remember that for this purpose we can only use photographs with vertical orientation or ones that will crop suitably to our cover proportions.

If you wish to enter, please write first for the official entry form, which will be sent to you promptly. Do not send entries without first obtaining this form. The deadline for receipt of entries will be June 15, 1976.