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Received December, 1965.

INFLUENCE OF SPRAYING WITH CARBARYL ON NESTING SUCCESS IN A SAMPLE OF BIRD-BOXES ON CAPE COD IN 1965

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INTRODUCTION

Records have been kept for six years (1960-1965) of the nesting, laying, hatching, and fledging of birds in nesting boxes (mostly) on a ten-acre area of rolling hills in Truro, Cape Cod, Massachusetts. The total eggs known to have been laid during this time was 309; 182 young birds hatched and 157 were fledged from 71 nests. Nesting species had been mostly tree swallow (*Iridoprocne bicolor*) and Eastern bluebird (*Sialia sialis*). During the nesting season of 1965, the area on which the boxes were disposed was sprayed from aircraft with carbaryl ("Sevin") against the gypsy moth (*Ocneria dispar*). The effect of the pesticide on the birds and their progeny was recorded.

MATERIALS AND METHODS

The chief ground cover is bearberry (*Arctostaphylos uva ursi*) with patches chiefly of blueberry (*vaccinium* of several species), broom crowberry (*Corema conradi*), and bayberry (*Myrica pennsylvanica*). Trees and shrubs are mostly pitch pine (*Pinus rigida*) with a few bear or scrub (*Quercus ilicifolia*) and white oak (*Q. alba*), beach plum (*Prunus maritima*) and wild cherry (*P. serotinas*).

Thirteen wooden boxes* were attached to 2 x 3 inch posts about six feet above the ground at least one hundred feet apart. Due to predation the poles below the boxes had been wrapped with sheet zinc for the last four years, and during the last year a garbage can lid was placed just below each box. The boxes were usually inspected once or twice daily on weekends and holidays during the nesting season. During the years 1961 through 1965 the tree swallows laid usually from the third week in May through the second week in June. Hatching usually began in the second week in June.

Just after peak laying in 1965 (June 1) the area was sprayed from low flying aircraft with carbaryl ("Sevin"). Approximately one pound of carbaryl per acre was applied. This amount was calculated from the deposit on ten glass plates (6 x 8 inches) placed about 750 feet apart along the north edge of the ten acres of land and farther.** After collection, the plates were washed with solvent and analysis done on the composite of the washings. From this it was calculated that 0.45 lbs. of carbaryl was deposited per acre (4.5 labs. for the ten acres).

In addition to these analyses, oak foliage samples were collected in duplicate from the land by National Park Service Rangers on the day of spraying and on the third, fifth, seventh, and subsequent tenth days thereafter. The results are shown in Figure 1. Rain (Figure 1) occurred for several days after the spraying. The carbaryl left small whitish spots on leaves of vegetation which were visible for several weeks after the spraying.

RESULTS

The laying and subsequent hatching and fledging in 1965 is shown in Table 1. The boxes were put up on 28 March. Nesting was begun as usual during the first two weeks in May and completed by the middle of the month. As may be seen in the Table, egg laying usually began during the third, fourth, or fifth week in May. Thus, on the day of spraying, Tuesday, June 1, at least seven of the 16 nests contained eggs. By the next weekend ten nests had eggs; one, five young. This latter nest, Number 10, the only one with young four days after spraying, may of course have

*For use of these boxes we are grateful to Mr. Wallace Bailey, Ludlow Griscom Wildlife Research Station, Massachusetts Audubon Society, South Wellfleet, Massachusetts.

**These measurements and the data concerning carbaryl deposit were made under the direction of Lewis F. Wells, Jr., Pesticide Program Supervisor, Pesticide Board, Department of Public Health, Massachusetts. His cooperation is appreciated.

TABLE 1. LAYING, HATCHING, AND FLEDGING 1965 SPRAY WITH CARBARYL JUNE 1

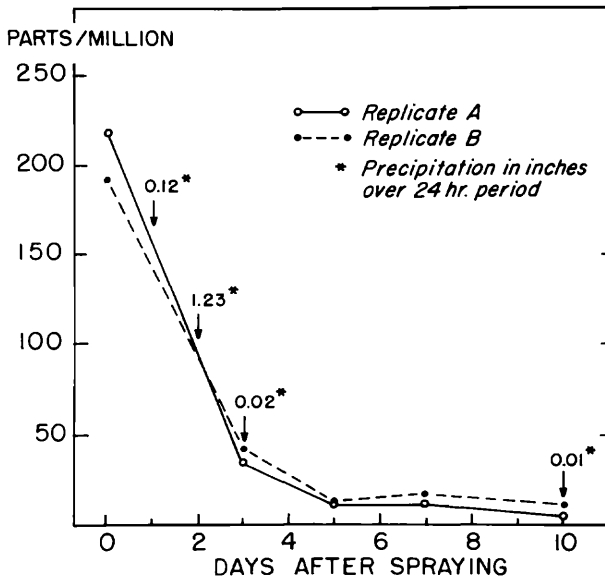
1965 Species	Box No.	Eggs		April			May			June			July			Aug. Clutch		Hatched Nest 1- 8	Undisturbed By Predation	Left Nest
		Young		1- 7	8- 14	15- 21	22- 30	1- 7	8- 14	15- 21	22- 30	1- 7	8- 14	15- 21	22- 31	1- 7	8- 14			
Black-capped Chickadee	13	E Y		0 0	0 0	0 0	0 0	0 0	0 0	0 0	5 0	5 0	0 0	0 0	0 0	0 0	5 0	5 0	5	
Eastern Bluebird	3	E Y		0 0	0 0	0 0	4 0	5 0	1 4	0 5	0 4	0 5	0 0	0 0	0 0	0 0	5 5	5 0	5	
Eastern Bluebird	4	E Y	0 0	1 0	6 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	5	
Eastern Bluebird	7	E Y	0 0	0 0	0 0	0 0	0 0	1 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	5	
1965 Total		E Y	1 0	6 0	0 0	1 0	0 0	0 0	0 0	0 0	4 5	1 5	0 0	0 0	0 0	0 0	5 5	5 0	5	
Tree Swallow	1	E Y	0 0	0 0	0 0	0 0	5 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0	
Tree Swallow	2	E Y	0 0	0 0	0 0	6 0	0 0	0 0	7 0	0 0	0 6	0 3	0 0	0 0	0 0	0 0	7 7	0 0	7	
Tree Swallow	4	E Y	0 0	0 0	0 0	0 0	0 0	0 0	4 0	0 4	0 4	0 4	0 0	0 0	0 0	0 0	4 4	0 0	4	
Tree Swallow	5	E Y	0 0	0 0	0 0	3 0	0 0	0 0	5 6	6 0	0 0	0 0	0 4	0 0	0 0	0 0	6 4	0 0	4	

TABLE 1.—Continued

1965 Species	Box No.	Eggs		April			May			June			July			Aug.		Clutch 1- 8	Hatched Nests By Predation	Left Undisturbed Nest
		Young		1- 7	8- 14	15- 21	22- 30	1- 7	8- 14	15- 21	22- 30	1- 7	8- 14	15- 21	22- 31	1- 7	8			
Tree Swallow	7	E Y		0 0	0 0	0 0	0 0	0 0	0 0	1 0	5 0	5 0	0 4	0 4	0 0	0 0	0 0	5	4	4
Tree Swallow	8	E Y		0 0	0 0	0 0	0 0	0 0	5 5	0 0	5 0	0 5	0 5	0 0	0 0	0 0	0 0	5	5	5
Tree Swallow	9	E Y		0 0	0 0	0 0	0 0	0 0	0 0	5 5	0 0	0 0	0 0	0 0	0 0	0 0	0 0			
Tree Swallow	10	E Y		0 0	0 0	0 0	0 0	0 0	0 0	5 5	0 5	0 5	0 5	0 5	0 0	0 0	0 0	5	5	0**
Tree Swallow	12	E Y		0 0	0 0	0 0	0 0	0 0	0 0	0 0	5 5	0 5	0 5	0 0	0 0	0 0	0 0			
Total Swallows	9 boxes	E Y		0 0	0 0	0 0	0 0	0 0	0 0	0 0	30 35	32 10	6 26	19 18	4 4	0 0	0 0	0	0	0
Baltimore Oriole	14	E Y									0 0	3 0	3 0	0 0	0 0	0 0				
House (English) Sparrow	3, 9	E Y		0 0	0 0	3 0	4*** 0	0 0	0 0	0 0	1 5	5 0	0 5	0 2	0 0	0 0	0 0	5	5	5
Field Sparrow	15	E Y								4 0	4 0	0 3	0 0	0 0	0 0	0 0	4	3	3	

*Predation **Dead in nest ***Destroyed

ANALYSIS OF OAK FOLIAGE FOR CARBARYL ("Sevin")



partially or completely hatched its eggs by the day of the spraying. These five young were alive the next week, but were found dead and infested with maggots on Friday, 17 June, 16 days after the spraying. These bird remains were collected, frozen and subsequently analyzed for the pesticide.*** These were reported as follows (each carcass was analyzed separately): 0.4, 0.7, 1.8, 2.0 and 2.0 parts per million of "apparent Sevin."

Nests in boxes numbered 2, 5, 7, 8, and 9 progressed from laying, hatching to probably fledging normally. Incubation periods, clutch sizes, and time of fledging for swallows were approximately as previously observed in undisturbed nests and as generally accepted (1).

DISCUSSION

The observations were made to determine whether spraying with carbaryl was harmful to nesting birds. Five approximately two-week-old birds died two to three weeks after the spraying. This was the only known mortality temporally related to the spraying, and whether the latter is causally related is not sure. Finding significant contents of the labile pesticide product in the birds collected at least several days after death (maggots already present) suggests that they had relatively high contents at the time

***Done under the direction and through the kindness of Mr. William A. Tompkins, Chief Aquatic Biologist, Division of Fisheries and Game, Commonwealth of Massachusetts.

TABLE 2. TOTAL CLUTCH SIZE, FERTILITY, AND SURVIVAL OVER SIX YEARS BEFORE SPRAYING AND DURING THE WEEKS FOLLOWING. LOSSES BY PREDATION ARE OMITTED

Species	Prespray = 1960 to 1 June 1965 Postspray = after 1 June 1965	Number of clutches of each size						Fertility % eggs hatched	Survival of young % of hatched
		3 eggs	4 eggs	5 eggs	6 eggs	7 eggs	8 eggs		
Black-capped	Prespray	0	0	0	0	0	2	94	100
Chicadee	Postspray	0	0	1	0	0	0	100	100
Eastern	Prespray	0	2	3	1	0	0	97	100
Bluebird	Postspray	0	0	2	0	0	0	100	100
Tree	Prespray	0	6	15	3	1	0	87	96
Swallow	Postspray	0	1	1	1	1	0	86	83
English (House)	Prespray	0	0	1	0	0	0	60	—
Sparrow	Postspray	0	0	1	0	0	0	100	—

of death, probably sufficient to kill. If this were true, presumably the carbaryl came to the young swallows in insects brought for food. Whether the parents likewise succumbed is unknown. The observation that this nest was the *only* nest with hatched young during the week of spraying lends some strength to the notion that the mortality was due to the spraying.

Thus in 1965 71 eggs were laid, 42 (59%) fledged, 19 (27%) lost eggs or young as by probably predation, and 5 (7%) lost to possible pesticide toxicity.

To gain some perspective, it may be helpful to compare nesting successes after the spray with that in the previous five years including 1965 before spray (Table 2). For the Eastern bluebird clutch size, fertility, and survival are identical before and after spray. Tree swallow fertility and clutch size were also unchanged, but survival of young dropped from 96% to 83% after spray, reflecting the loss of the five birds from Box 10. The figures for chickadees and English sparrows are too small to be significant. No dead birds were found in the nests in the previous five years when 135 birds hatched and 115 fledged.

Predation was severe in 1962 and 1964. During 1964, 64 eggs were laid but only 24 (38%) hatched. Of these 22 (92%) presumably fledged. It was this high rate of predation which led to garbage can lids being placed on the poles just under the nests early in 1965. Likewise the high rate of predation in 1962 had led to wrapping sheet metal on the poles under the nests which seemed to be effective temporarily.

CONCLUSION

1. Data from 71 nests mostly of tree swallows over six years were studied to determine whether carbaryl sprayed during the last year (1965) affected clutch size, fertility, or mortality.

2. The only evidence of a pesticide effect was on the only nest of birds hatched close to the time of spraying. These five young were found dead in the nest and contained significant concentrations of the pesticide residue.

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Received March, 1966.