

Notes on the interspecific behavioral relationships of marsh-nesting passerines.—Interspecific territoriality is relatively frequent among birds utilizing structurally simple habitats where relatively few divergent modes of exploitation may be available (Orians and Willson, *Ecology*, 45: 736-745, 1964). Although the available vegetative diversity in a marsh may permit considerable habitat selection, the resultant habitat segregation is often reinforced by interspecific aggression, whether or not mutually exclusive territories are defended. In some cases habitats overlap broadly, but nest locations are often sharply segregated; this has been observed in Washington for Long-billed Marsh Wrens, *Telmatoodytes palustris*, and Red-winged Blackbirds, *Agelaius phoeniceus* (Orians and Willson, *op. cit.*) and for the marsh wrens and Yellow-headed Blackbirds, *Xanthocephalus xanthocephalus* (Willson, *Ecol. Monogr.*, 36: 51-77, 1966).

During the spring and summer of 1965, I made a number of observations of the interspecific interactions of passerines in two marshes in eastern Massachusetts. A large marsh, composed largely of dense cat-tail (*Typha*) and scattered bushes, was located just west of Wayland on the Sudbury River. The second study area was the Great Meadows National Wildlife Refuge at Concord; this marsh supported a variety of vegetation and had considerable open water.

Red-winged Blackbirds and Common Grackles.—In the Wayland marsh, grackles (*Quiscalus quiscula*) commonly flew in and out of the marsh with food in their bills, or moved around, both singly and in small groups, from perch to perch. The territorial Red-wings were frequently aggressive toward the grackles; male Red-wings often chased individual grackles or groups of grackles vigorously, but in some cases the Red-wing merely flew to a perch near the intruding grackles. In almost all cases the outcome was the immediate departure of the grackles from the vicinity of the aggressive Red-wing. Probably most of the grackles nested outside of the marsh, for many were seen carrying insects out of the marsh, and only a few were seen carrying food into the marsh (these few went to an area inaccessible to me).

Grackles were less common at Great Meadows where they mostly nested on shore but frequently foraged on the marsh, especially in unoccupied vegetation. One nest with young was located in a patch of dense bushes in the marsh, between two Red-wing territories. The adult grackles flew in and out with food and excrement, and seldom landed outside the immediate vicinity of the nest site. On the other hand, the neighboring Red-wings were not observed to forage around the grackle nest and did not molest the grackles while they were within their small area, but upon those rare occasions when the grackles perched outside that area, Red-wings chased them away. The grackles' area was clearly used primarily for a nest site, as reported also by R. Ficken (*Auk*, 80: 52-72, 1963) and J. Wiens (*Auk*, 82: 356-374, 1965), and most of their foraging was done elsewhere.

Nero (*Wilson Bull.*, 68: 129-150, 1956) has also noted aggressive behavior of territorial Red-wings toward trespassing grackles. Wiens (*op. cit.*) studied the interactions of these two species in a Wisconsin marsh and reported that grackle activities tended to center in areas outside Red-wing territories and that most of the frequent aggressive encounters were initiated by the strongly territorial Red-wing.

Long-billed Marsh Wrens and Swamp Sparrows.—Marsh wrens and Swamp Sparrows (*Melospiza georgiana*) generally showed marked habitat segregation in both marshes. The marsh wrens were almost always found in rather uniformly dense vegetation of a variety of types: cat-tail (two varieties), bulrush (*Scirpus*), bur-

reed (*Sparganium*), various grasses, or sometimes pickerelweed (*Pontederia*) or shrubs. When these plants occurred in mixed stands, the wrens tended to inhabit only the densest areas. Swamp Sparrows, on the other hand, were frequently found in vegetation of more variable and lower density with a more variable height profile, and in stands composed of many diverse plant species (including loose-strife, *Lythrum*). Although the marsh wrens were never seen to forage in the woods on shore, the Swamp Sparrows frequently did so, and the male sparrows often sang from the trees at the edge of the marsh.

In a few cases neighboring Long-billed Marsh Wrens and Swamp Sparrows seemed to hold territories that were very similar in vegetation. But the areas of activity (singing and foraging) of these neighbors always tended to be decidedly segregated.

Habitat segregation between these two species is probably reinforced by interspecific aggression. Swamp Sparrows were sometimes seen chasing marsh wrens that intruded on their territories. Furthermore, by July, when territorial defense of the Swamp Sparrows had greatly decreased, and the density of vegetation on their territories had increased slightly due to the summer growth of weeds, marsh wrens at Concord began to forage more and more frequently and with decreasing furtiveness on the area held by the sparrows, and they were chased by the sparrows with decreasing frequency. By the end of July, some Swamp Sparrow territories, deserted by their former owners, were used daily by families of foraging wrens.

Swamp Sparrows and Song Sparrows.—Song Sparrows (*Melospiza melodia*) inhabit brushy areas of several sorts, while Swamp Sparrows are generally restricted to wetlands. At the east end of the Concord marsh, both species nested in a wet, grassy meadow with scattered shrubs and held territories very similar in appearance. During June, while both species were feeding young, the foraging and singing areas of the adults were adjacent but apparently mutually exclusive. No aggression was noted at this time, but by July, when the young of both species were scattering and fending for themselves, aggression between species became rather common. In most cases it was directed against the trespassing young of the other species; apparently the adults tended to trespass less frequently. Late in July, in several other parts of the marsh, Swamp Sparrows had nearly ceased to defend their areas, and Song Sparrows had moved into some former Swamp Sparrow territories.

Red-winged Blackbirds and Long-billed Marsh Wrens.—In both marshes these species often occurred together when the vegetation was composed of cat-tail or of bur-reed or cat-tail mixed with shrubs. Although their territories frequently overlapped, the Red-wings usually seemed to concentrate their activities in areas where the reed patches were interspersed with shrubs, and the wrens were more often found in the areas of densest reeds. Wrens were also found in vegetation seldom inhabited by Red-wings: a narrow-leaved cat-tail, bur-reed, or grasses (without shrubs). Only one Red-wing held a territory in bur-reed without shrubs—his territory, however, included a few heaps of dead vegetation which he used for song perches. A few Red-wings defended areas in very sparse bur-reed and used the scattered small shrubs as song perches; even their few females were seldom seen to perch anywhere but in the bushes. The sturdy stems of broad-leaved cat-tail and shrubs may furnish adequate nest support and song perches for the larger Red-wing, while the tiny wrens can probably use weaker-stemmed plants for these purposes. Aggression between Long-billed Marsh Wrens and Red-wings has been

reported for several regions (see references in Orians and Willson, *op. cit.*) and probably reinforces the tendency toward separation of activity centers.

Miscellaneous.—Interactions of other species nesting in the marsh were observed occasionally; I will mention these but briefly, since the value of isolated observations of aggressive behavior is small. Occasionally Song Sparrows and marsh wrens held adjacent territories in wet meadowland beside the Concord marsh. Foraging areas tended to be quite separate and male Song Sparrows were sometimes aggressive toward trespassing marsh wrens.

Two Yellow Warbler (*Dendroica petechia*) nests were located in the Concord marsh; one was in a thick stand of marsh grass, the other on a weedy tussock. The adults foraged mostly on shore and were seldom encountered by other marsh-nesters. Another pair of Yellow Warblers nested on shore but sometimes foraged on the marsh; the Swamp Sparrow on whose territory they trespassed usually chased them away.

Yellowthroats (*Geothlypis trichas*) sang frequently from the bushes at the marsh edge and the small trees in a wet meadow near the marsh, and occasionally they flitted a short distance out into the marsh to forage. A Swamp Sparrow pursued a neighboring Yellowthroat in a vigorous and extended chase in a wet meadow with scattered shrubs.—MARY F. WILLSON, *Department of Zoology, Vivarium Building, University of Illinois, Champaign, Illinois.*

Aggressive behavior by a migrating Cape May Warbler.—During periods of adverse weather or winds, many migrants are forced to land on the Dry Tortugas, a group of small islands located in the Gulf of Mexico approximately 70 miles west of Key West, Florida. Most of them move on as soon as weather conditions permit. However, because of depleted energy reserves many are forced to remain and search for food and water, both scarce commodities on these dry sandy keys. Birds may be seen feeding on the well-mowed lawns about Fort Jefferson and among the windrows of rotting turtle grass (*Thalassia testudinum*) drifted along the tide lines. Many fall prey to avian predators (see R. Cunningham, *Auk*, 82: 502–503, 1965) or die of starvation.

On 8 May 1965, on Garden Key, I observed a male Cape May Warbler (*Dendroica tigrina*) chasing other birds away from the flowering stalk of a century plant (*Agave* sp.) which was growing close to the outer wall of Fort Jefferson. The flowering portions of the stalk were at the level of the second floor casemates of the fort, at least 30 feet above ground level. The Cape May Warbler, presumably the same male each time, was seen chasing individuals of both sexes of its own species as well as Blackpoll Warblers (*Dendroica striata*), Myrtle Warblers (*D. coronata*), Black-throated Blue Warblers (*D. caerulescens*), Palm Warblers (*D. palmarum*), Yellowthroats (*Geothlypis trichas*), and Redstarts (*Setophaga ruticilla*) during brief periods of observation several times daily over a three-day period. Glen E. Woolfenden, Ruth Rogers, Doris Mager, and Sievert A. Rohwer also witnessed this activity. Aggressive behavior by the male Cape May Warbler was restricted to birds that flew into the upper portions of the flower stalk. He did not attack any birds that were on the leaves growing from the base of the plant, on the ground, or in two large Australian pines (*Casuarina equisetifolia*) standing a few feet away. After 11 May and until our departure on 13 May the male was not seen again and no further defense of the stalk by any bird was observed, although birds continued to frequent the flowers.