

THE DIRECTION OF FLIGHT IN THE FALL MIGRATION AT NEW HAVEN, CONNECTICUT.

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How birds find their way in their long journeys between their summer and winter homes is in a large part yet unsettled, and a recent writer on migration appears doubtful as to what degree they guide themselves by natural landmarks, such as coast lines and river valleys (Cooke, 'Some New Facts about the Migration of Birds'). It is in the hope of throwing a little light on this subject that I have brought together a few facts witnessed by myself regarding the flight of birds during the fall migration at New Haven. Mr. Brewster has shown that land birds collect in the fall migration at Point Lepreaux, New Brunswick, on their way south ('Bird Migration,' *Memoirs Nutt. Ornith. Club*, No. 1), and Dr. Merriam, the same fact regarding the Straits of Mackinac in the northward movement ('Bird Migration at the Straits of Mackinac,' *Auk*, Vol. II, p. 64); Mr. W. Eagle Clarke has studied the movement of birds past various English lighthouses (Ibis, 1902, p. 246, and 1904, p. 112, etc.), and Mr. Loomis, the migratory movements of water-fowl at Monterey Bay, California ('California Water Birds,' Nos. 1 to 5); but few continued observations of the direction of flight of land birds as they pass a given point some distance from the shore seem to have been placed on record. For several autumns past I have watched in the early morning on a number of different occasions the flight of migrants over a hill near New Haven, and give here in full the result of my observations in 1904, with the most important flights noticed in previous years.

To explain the peculiarity of flight witnessed it is necessary to give some description of the country around New Haven, and especially of the point where this migration was observed. The southern coast line of Connecticut, formed by Long Island Sound, runs nearly east and west, turning toward the southwest near New Haven, and a gap in it, extending about four miles due north and one to two miles broad, constitutes New Haven Harbor. At the northeastern extremity of the harbor the Quinnipiac River,

here about one quarter to one third of a mile in width, extends northward for about a mile. North of this stretch the Quinnipiac Marshes, almost a mile wide, with the river shrunk to modest proportions. West and north of the harbor, where the city is situated, the land is low and level, with few hills of any height within a mile of the coast. At the eastern entrance to the harbor and for about a mile into the interior the land is also low. There begins a series of parallel ridges of trap and sandstone, with valleys between, running north and south and gradually rising, but frequently broken by transverse valleys. Such a ridge, starting from the harbor at about a mile from its mouth and forming the eastern boundary of the Quinnipiac River where it is widest, extends a mile or more further north and broadens into a small tableland, elevated 150 to 250 feet above the surrounding country. This small, elevated plateau slopes gradually toward the east and south, a somewhat lower ridge parallel to the first extending from the southeastern corner, but descends abruptly on the west to almost the harbor level. Where the trap dyke broadens into the tableland a shallow pass exists, which the removal of the trees at this point has emphasized, this absence of trees giving a clear view of approaching migrants. Near here a wooded valley, lying between the two trap ridges, finds its origin. This point is about six and one half miles slightly east of north of the eastern entrance of the harbor, and about four miles from my home in New Haven, and here at the brink of the steep western slope the following notes were obtained.

Sept. 5, 1904.— Clear, cool, and calm; temperature 58° at 9 A. M.; following a day that was hot in the morning and cool in the afternoon with wind changing from north to south, after two hot days. Period of observation, 5:10 to 7:30 A. M. Many Warblers were heard flying over as I wheeled out and numbers were seen passing all the time I was on the hill, flying north or north-northeast, at 100 to 200 feet from the ground. A few small flocks of Bobolinks passed, flying high, northwest.

Sept. 6, 1904.— Clear and cool with north wind; 54° at 8 A. M. 5:15 to 7:30 A. M. Few birds seen; no migration.

Sept. 13, 1904.— Cloudy and cool with fresh north-northwest wind; 56° at 8 A. M.; after clear and hot day, following similar weather. 5:15 to 8 A. M. A great warbler migration, a constant succession appearing from the south and southwest and flying north and north-northeast, chiefly low

down, and many alighting and then hurrying on through the trees. All seemed to pass within a distance of one hundred yards east from the crest of the hill, as I saw very few further east and still fewer at the base of the hill on the west. This flight was in progress when I arrived and continuing when I left, but the largest number passed between 6 and 6:30. Black-and-white, Northern Parula, Magnolia, Black-throated Green, and Black-poll Warblers, Ovenbirds, Redstarts, Northern Yellow-throats and Wood Pewees were among the species noticed.

Sept. 16, 1904.—Clear, cold and calm; 49° at 8 A. M.; after two cool and showery days with fresh northwest winds. 5:20 to 8 A. M. A few Hawks flew west about 5:30. Warblers appeared at 5:35, and flew from south and south-southwest to north and north-northeast till 6:30; none seen flying at the base of the hill and none further east. A few Flickers appeared between 6 and 7.

Sept. 22, 1904.—Clear and cool with light north wind; 35° at 8 A. M.; after clear and cool day with fresh north-northwest wind, following cloudy, warmer weather. 5:40 to 8:15 A. M. About 20 Hawks passed flying west. A great flight of Flickers occurred between 5:45 and 6:30, these birds appearing chiefly from the south, alighting, and then flying down the hill north: birds in the air constantly, and often a dozen or more sitting in the trees at once. Also a few Phœbes and a number of Warblers flew north and traveled north through the tree-tops.

Oct. 1, 1904.—Clear and cool with light northwest wind; 53° at 8 A. M.; after warm and cloudy day with hard wind changing from south to north-west, following slightly cooler weather. 5:30 to 7:45 A. M. One Sharp-shinned Hawk flew west-by-south at 5:38; a few Warblers flew north at 5:47, and others flew into the tree-tops from the south later; a few Flickers appeared from the south between 5:50 and 6:30; and a small flock of Cowbirds flew south high in the air, probably from their roost in the Quinnipiac Marshes.

Oct. 7, 1904.—Clear and cold with light northwest wind; 35° at 8 A. M.; after a clear and cool but warmer day with fresh northwest wind, following similar weather. 5:40 to 8:30 A. M. A great migration of Warblers, Kinglets, Robins, Sparrows and Towhees, all flying or traveling through the trees and bushes north; a few Marsh and Sharp-shinned Hawks flew west; large flocks of Robins flew north between 5:50 and 7; and about 50 Flickers flew north. The bushes and trees were full of small birds as I climbed the hill, but none were seen or heard flying until 5:50, after which frequent flocks of Juncos, Warblers and Kinglets flew north and others traveled north through the trees and bushes. The road east and a brush-lot were full of White-throated, Song, and Field Sparrows and Towhees which flew before me along the road, none taking the first turn to the south, but many disappearing in the woods to the north, and most of the rest taking the first turning in the road to the north just beyond the woods.

Oct. 14, 1904.—Clear and cool with fresh north wind; 40° at 8 A. M.;

after a colder, cloudy day with fresh northeast wind, following warmer, stormy weather. 6:35 to 8:15 A. M. About 20 Flickers, and small flocks of Robins, Bluebirds, Juncos and Sparrows were seen flying north and others traveling north in the trees and bushes.

Oct. 17, 1904.—Clear, cool and calm; 39° at 8 A. M.; after two similar days. 5:45 to 8:30 A. M. Little migration. Several flocks of Bluebirds flew northwest or west-northwest between 6 and 7:30, high in air; a flock of Blackbirds flew west; Robins arising from the trees flew west and west-northwest; and a few Sparrows and Warblers flew north.

Oct. 22, 1904.—Clear, warm and calm; 53° at 8 A. M.; after hard south-east storm the morning before and stationary temperature. 5:55 to 7:45 A. M. No migration to speak of. Frequent straggling flocks of Bluebirds flew west or west-southwest all the morning, high in air; one flock of Robins and one of Cedar Waxwings flew west; and many Tree Swallows flew high, south, from 6:10 to 7:20, probably from the roost in Quin-ni-piac Marshes, all the later ones veering to the southwest and some to the west as they passed over-head, turning while I watched them.

Oct. 28, 1904.—Clear, cold and calm; 27° at 8 A. M.; after a rather windy, warm day, following still warmer weather, 6 to 7:45 A. M. Several flocks of Bluebirds flew west, high, between 6 and 6:30; a few small birds, chiefly Juncos, flew north at 6:20; and numbers of Robins flew low north and northwest from 6:30 to 7:30, many stopping.

In 1898 the early morning hours of Sept. 28, were spent at this spot; in 1900, the same hours on Sept. 19 and 20 and Oct. 11; in 1901, on Sept. 26, and Oct. 1, 4, 7, 11, 16, 25, and 30; in 1902, on Sept. 6, 11, 15, 18, 23, and 30, and Oct. 2, and 10; and in 1903, on Aug. 14, Sept. 4, 19, 21, 29 and 30, and Oct. 5, 14, 20 and 30; and the same general direction and manner of migration was observed. Of these dates, I give only the most interesting flights noticed.

Sept. 28, 1898.—Clear and warm; 58° at 8 A. M.; after a cool night and a rather cool, quite windy day. 6 to 7 A. M. About 15 Hawks, between 200 and 300 Flickers, and many flocks of Blue Jays, Tree Swallows, Robins, Bluebirds, Sparrows and Warblers appeared from the east and southeast and flew west and northwest.

Sept. 19, 1900.—Clear and cold, with light north wind; 46° at 4 A. M.; after clear, cool and windy day, following warmer weather. 5:20 to 7:30 A. M. Two Cooper's Hawks and 21 small hawks, chiefly Sharp-shinned, passed between 5:20 and 5:35, all flying high and swiftly west. About 6:30, 15 to 30 Flickers passed. All the morning Warblers and other small birds passed incessantly, appearing from the south and flying low, often from tree to tree, due north and down the hill.

Oct. 11, 1900. — Cool and clear, after two days of cold storm, following a week of hot weather. 5:50 to 7 A. M. About 15 Hawks passed over, flying west, and many small birds flew north.

Oct. 25, 1901. — Clear and cold with hard frost, after clear, cool and windy day, following warm weather. 6 to 8 A. M. Large flocks of Robins and Bluebirds flew north.

Sept. 15, 1902. Clear and cold; 49° at 8 A. M.; after clear and cool day, following warm weather. 5:30 to 7:30 A. M. A large migration of Warblers, all appearing from the southeast and flying northwest; very few stopping.

Oct. 2, 1902. — Clear and warm; 60° at 8 A. M.; after warm and occasionally stormy weather for a week. 5:45 to 7:30 A. M. Large flocks of Blue Jays appeared from the northeast and flew southwest, and a few Flickers appeared from the south and flew north.

Sept. 19, 1903. — Clear and cold, with moderate northeast wind; 51° at 8 A. M.; after a clear and cool day with fresh north wind, following a sudden drop in temperature. 5:25 to 8:15 A. M. A large migration of Warblers appeared from the south a little before 6, and lasted until 7, the birds coming from the south in twos and threes and dropping into the trees on the hill and flying north from tree to tree, and others continuing north without stopping; chiefly Black-poll and Black-throated Green. A number of Flickers and a few Sharp-shinned Hawks flew over from southeast to northwest between 6:30 and 7.

Sept. 29, 1903. — Clear and cold, with northwest wind; 44° at 8 A. M.; after a clear, cool and windy day, following warmer weather. 5:30 to 8:30 A. M. A great migration of Warblers, Kinglets, Sparrows, etc., flying north. Many Flickers and Blue Jays flew west or northwest from east or southeast.

Sept. 30, 1903. — Clear, calm and cold, with heavy frost, and fog in the valleys. 5:30 to 8:30 A. M. Many Flickers and Jays migrating; the former flying northwest and the latter, west and higher in the air.

Oct. 14, 1903. — Clear, calm and slightly cooler; 50° at 8 A. M.; after a clearing, warm day, following several days of northeast storm, but with little change in temperature. 5:40 to 8 A. M. No birds seen flying until 6 A. M. when a few Bluebirds flew high west, and 8 to 12 Sharp-shinned Hawks also flew west. Somewhat later a number of Juncos appeared from the south and stopped; and from 6:30 to 7:30 large numbers of Robins appeared from the south-southwest and stopped.

In the spring I have seen no flight of importance at this place, although I have been there frequently shortly after sunrise, and this is what might be expected from the surrounding country.

Although I have spent the same hours on many mornings each fall at other places near New Haven I have seen comparatively

few migrants in flight, and this is especially true of the mornings spent on a sandspit that bounds the western entrance to New Haven harbor, and where birds flying across the harbor would first reach land. At Guilford — about sixteen miles east of New Haven — large numbers of migrants, closely following the coastline, flew over me on Oct. 18, 1884, Oct. 24, 1892, and Aug. 2, 1894.

The temperature conditions governing migration were what was to be expected — that the greatest movement was on a cool morning following a sudden drop of temperature on the previous day; that there was no movement when the temperature was rising, and but little when it remained stationary; and that a fresh north wind did not seem to check the birds in their flight. Rather strangely it is under the same conditions alone that I have noticed here a bird-wave of any magnitude of transient visitors in the spring; for, although our summer residents appear after warm and southerly winds, those bound to more northern homes seem to stop only when a cold north wind bars the way.

To me among the interesting things shown by these mornings on the hill were, first, that these birds did not migrate past this point all night, the chief flight occurring between a quarter of an hour before sunrise and a half hour after; for although I might have heard a number passing the evening before, all was almost invariably silent as I bicycled the three and a half miles in the early dawn, and silent except for chirps from the trees and bushes as I climbed the hill. Usually I had to wait some time before the first migrants appeared, Crows being the first birds to begin their day's wanderings, and Hawks the first to pass in migration.

Another point was the manner of flight, Cedar Waxwings, Bobolinks, and Blackbirds being practically the only species to travel in compact flocks; the others moving in straggling companies, as Robins, Bluebirds, Jays, Warblers, Sparrows, Kinglets, and occasionally Flickers, or singly, as Hawks, Flycatchers, and usually Flickers.

As regards the height from the ground: Hawks, Jays, Bobolinks, Blackbirds, Swallows and Bluebirds usually flew several hundred yards in the air, and the others, seldom more than a gunshot from the ground. This last fact probably explains the directions of

flight. Long Island Sound must have been distinctly visible from the greater elevation, and from the lower only the Quinnipiac River and Marshes, and possibly New Haven harbor, and all at the greater height were flying west, and those at the lower, north. Interesting in this connection was the change in direction of flight from south to west observed in the Tree Swallows on Oct. 22, 1904, as the reed-beds on the Quinnipiac Marshes, where they had probably spent the previous night, are almost directly north, and the Sound would not have been visible until they reached the height of the hill.

To my mind the only explanation of the direction of flight so invariably noticed is that the birds flying west were guiding themselves by the coast line, and that those flying north, which includes most of the smaller species, had been deflected from their course by New Haven harbor. This they must have seen while flying west near the coast at a low elevation, turned north to avoid it, and followed up the valley east of the trap ridge, which led them to my post of observation.

SUMMER BIRDS OF MOUNT PINOS, CALIFORNIA.

BY JOSEPH GRINNELL.

THE western portion of Ventura County, southern California, is occupied by an extensive mass of mountains fairly well marked off from other systems by intervening low divides. This mountain mass consists of irregularly arranged peaks and ridges interspersed with elevated valleys. Several of the latter are of large enough extent to warrant farming operations in wet years, but the sparse population is mainly centered around the Borax Mines. The highest peak of the group, Mount Pinos, is 8826 feet above sea level, according to the topographic map of the region recently issued by the U. S. Geological Survey. This peak, or rather, ridge, rises from a plateau of surrounding valleys themselves 5000 to 6000 feet in elevation, so that from wherever viewed, it does