

THE DOVEKIE INFLUX OF 1932.

BY ROBERT CUSHMAN MURPHY AND WILLIAM VOGT.

INTRODUCTION.

THE Dovekie or Little Auk, *Alle alle* (Linnaeus), is a sea bird of the Atlantic segment of the North Polar and Temperate regions, the breeding range of which extends eastward from Ellesmere Island to the Arctic archipelagoes north of Europe, or throughout about one-third of the earth's circumference in high northern latitudes. During the winter the species migrates in flocks southward in the Atlantic, to the latitudes of the Virginia Capes on the American side, and normally somewhat farther, or across latitude 30° N., on the eastern side of the ocean. It is distinctly an off-shore, rather than a littoral species, and is at times abundant even in mid-ocean.

Each winter numbers of Dovekies are stranded along parts of the Atlantic coast of North America, the phenomenon being normal and regular from eastern New England northward, and casual farther southward. At intervals, the birds travel inland in so-called "flights," of which the most notable in the records seems to be that which took place in Massachusetts in the middle of November, 1891 (Brewster, William, 1906, Mem. Nuttall Ornith. Club, No. IV, p. 90). Similar accounts exist of invasions in western Europe (Haverschmidt, Fr., 1930, *Ardea*, Vol. XIX, p. 63).

During November and December of 1932, an influx of Dovekies, on a scale apparently unprecedented within the historic period, took place along the coast of North America, from the Canadian provinces to Florida and Cuba. In response to a request by the Editor of "The Auk", published in the January, 1933 issue, there has been received at the American Museum of Natural History a mass of records and other observations, which we herewith present in summary. It is impracticable to name all of the several hundred contributors who have assisted in this inquiry, but to each of them we take this opportunity of expressing our own appreciation as well as that of "The Auk" and its readers.

The following published accounts of the recent influx have already come to our attention:

Bailey, H. H., 1932. The Dovekie in Florida. *The Oölogist*, Vol. XLIX, No. 12, pp. 140, 141.

Crandall, L. S., 1932. The Dovekie Invasion. *Bull. N. Y. Zoöl. Soc.*, Vol. XXXV, No. 6, pp. 207-213, 4 figs.

Longstreet, R. J., 1933. Dovekies in Florida. *Florida Naturalist*, Vol. VI, No. 2, pp. 38, 39.

Lunt, Helene, 1933. Dovekies in the Bronx. *Journ. N. Y. Botanical Garden*, Vol. XXXIV, No. 397, pp. 5-9, 1 fig.

May, J. B., 1933. More about Dovekies. *Bull. Mass. Audubon Soc.*, Vol. XVI, No. 9, p. 15.

Packard, Winthrop, 1932. It Rained Dovekies! *Bull. Mass. Audubon Soc.*, Vol. XVI, No. 8, pp. 3-5.

THE RECORDS.

The following tabulated data were in most cases substantiated by birds, dead or alive. A small proportion is based upon sight records but the chances of error, under the circumstances, are almost negligible. Because certain information was sent in second-hand by interested persons, the actual provenance of a particular specimen may not in every case be indicated by the accompanying place name. The discrepancy in such instances, however, would seldom amount to more than the distance between one village and the next, or a matter of a mile or two. Dates have been included whenever certainly known. They all fall within the months of November and December, 1932.

Quebec.

Cowansville, Missisquoi Co., Dec. 12, 1 alive (V. C. Wynne-Edwards).
Rivière Ouelle, Kamouraska Co., 1; Ste-Anne de la Pocatière, 2 (Father Tanguay and Dr. D. A. Dery).

Nova Scotia.

Tusket Islands and Yarmouth, many reported about Dec. 1; carcasses everywhere in last week of Dec. (R. A. Johnson).

Maine.

Kittery, Nov. 18, many on beach (J. P. Benson).

New Hampshire.

Portsmouth, Nov. 14, 2 dead in road (J. D. Smith).
Wolfboro, Nov. 7-10 (J. B. May).

Massachusetts.

- Amherst, Nov. 19, 1 alive but disabled (A. C. Bagg).
Athol, Nov. 9 and 10, 1 alive (A. C. Bagg).
Boston, Nov. ?, about 10 alive and as many dead picked up in streets; several swimming in flooded gutters (R. T. Peterson); 1 in street, Nov. 20 (?) (F. W. Benson); several swimming in Jamaica Pond (J. D. Smith).
Boylston Township, Nov. 15, 1 dead (G. E. Keogh).
Cape Cod, Nov. 10, about 28 near North Eastham; Nov. 11, 150 swimming along the Bay side of the Cape; total of 56 on land (O. L. Austin, Jr.).
Concord, Nov. 20, 1 (Miss E. Alexander).
Dedham, Nov. 11, 1 (F. V. Crane).
East Walpole, Nov. ?, 1 in Vose's Pond (F. V. Crane).
Flax Pond, Nov. 11, 1 (A. P. Morse).
Holyoke, Nov. 19, 20, "a dozen"; 1 swimming in Ashley Ponds Reservoir, Nov. 20 (A. C. Bagg).
Huntington, Nov. 19, 2 (A. A. Cross).
Islington, Nov. 5, 11 near the railroad tracks (F. V. Crane).
Martha's Vineyard, Nov. 12, numbers alive on Squibnocket Pond (Francis Marsh); still alive at the same place, Nov. 20 (Lindsey Austin).
Mystic Lakes, Nov. 11 to at least Nov. 27, several (J. B. May).
Norwood, Nov. 11, 6 or more alive on pond (Mrs. F. V. Crane).
Quincy, Nov. 25, numbers flying, some being apparently forced down into the river by the strength of the wind (William Avery).
Seekonk, Nov. 17, 2 in dooryard (Mrs. A. H. Walter).
Springfield, Nov. 19, several within the area (T. W. Burgess).
Walpole, Nov. ?, 2 in cranberry bog (F. V. Crane).
Wellesley, Nov. 11, 2 (A. P. Morse).
Westborough, Nov. 18, 1 dead in street (Robert Harrington).
Westfield, Nov. 19, 1 dying (A. C. Bagg).
Worcester, Nov. 10, 1 alive; Nov. 20, 1 swimming in park (H. C. Parker).

Rhode Island.

- Block Island, Nov. ?, "It fairly rained Dovekies" (Miss Elizabeth Dickens).
East Greenwich, Nov. 20, 1 in Potowomut River (Mrs. A. H. Walter).
Gloucester (14 miles from coast), Nov. ?, 1 (Mrs. H. P. Salisbury).
Johnston, Nov. 17, 3 swimming in a brook, 2 on land (Mrs. A. H. Walter).
North Smithfield, Nov. 17, 1 alive in road (Mrs. A. H. Walter).
Peace Dale, Nov. 20, 1 (Mrs. A. H. Walter).
Point Judith neighborhood, Nov. ?, 6 in ponds and on the shore; several escaped again to the salt water (Mrs. A. H. Walter); many washed ashore near the Point (Mrs. H. P. Salisbury).
Providence, Nov. 17, 1 alive in Roger Williams Park Lake; Nov. 20, 3 in the city streets; many brought to Angell and Cash, taxidermists, within a few days of these dates (Mrs. A. H. Walter).

- Usquepaugh, Nov. ?, 1 in Queen's River (Mrs. A. H. Walter).
 Watchaug Pond, Nov. 22, a number swimming (Mrs. A. H. Walter).
 Weekapaug, Nov. 20, 1 (Mrs. A. H. Walter).
 Wickford, Nov. 17, 2 (Mrs. A. H. Walter).

Connecticut.

- Branford, Nov. 19, 1 (T. A. James).
 Bristol, Nov. 22, 1 on street car track (H. C. Downs).
 Clinton, Nov. 20, 1 (G. G. Goodwin).
 Darien, Nov. 19, 1 (specimen to American Museum).
 Guilford, Nov. 19, 2 (T. A. James).
 Hadlyme, Nov. ?, "a flight" (A. W. Brockway).
 Hamden, Nov. 19, 1 (T. A. James).
 Lyme, Nov. 19, 2 (T. A. James).
 Meriden, Nov. 19 or 20, 1 (M. E. North).
 New Haven, Nov. 19, 1 (T. A. James).
 New London, Nov. 19, 2 (T. A. James).
 Old Lyme, Nov. 19, 1 (G. H. Macauley).
 Simsbury, Nov. 19, 1 (T. A. James).
 Terryville, Nov. ?, 1 (Frank Bruen).

New York.

1. (Long Island).

- Alley Pond Park, Nov. 26, 1 dead (Arthur Rorden).
 Baldwin, Nov. 19, several reported (William Vogt).
 Bayside, Nov. 23, 1 alive (Charles Easton).
 Bellmore, Nov. 20, 2 (Captain Stevens).
 Biltmore Shores, Nov. 19, 3 swimming in canal (F. F. Reichner).
 Bridgehampton, Nov. 24, 7 dead on beach, 1 inland (H. B. Squires).
 Brookhaven, Nov. 20, 1 on pond (LeRoy Wilcox).
 Brooklyn, Nov. 20, 1 (specimen to American Museum); 1 in street, released in South Oyster Bay (John Roach); Nov. 26, 1 dead in Prospect Park (Allan Cruikshank).
 Cholera Banks (12 miles off Long Beach), Dec. 1, 1 (H. C. Armin).
 Cold Spring Harbor, Nov. 19 or 20 (specimen to American Museum).
 East Moriches, Nov. 22, 1 among duck decoys in Moriches Bay (LeRoy Wilcox).
 Eastport, Nov. 19, several (LeRoy Wilcox).
 Far Rockaway, Nov. 19, 1 (specimen to American Museum).
 Greenport, Nov. 19, 1 (C. L. Fournier).
 Hempstead, Nov. 20, 3 (Kenneth Van de Water); Nov. 29, 1 carcass in the reservoir (Arthur McBride).
 Hempstead Bay, Nov. 19, "thousands" reported by baymen.
 Huntington, Nov. 19, many reported in Sound; several shot by gunners (Mrs. H. S. Hunt).
 Islip, Nov. 19, 7 (William Vogt).

- Jamaica Bay, Nov. 19, "thousands" (William Merritt); Nov. 27, 1 (William Vogt).
- Jones Beach, Nov. 17, 1 freshly dead on Ocean Boulevard; Nov. 19, 6 captured and banded, 1 swimming on bird sanctuary pond, a flock of 40 flying west, others over meadows; a total of a hundred or more (William Vogt); 75-100 east of causeway (Frank Roach).
- Lloyd's Harbor, Nov. 20, 1 swimming (Mrs. H. S. Hunt).
- Long Beach, Nov. 20, 1 flying westward (Dr. E. R. P. Janvrin); Nov. 27, 2 (Allan Cruikshank).
- Manorville, Nov. 19, 1 (LeRoy Wilcox).
- Mastic, Nov. 22, 5 on the ocean beach (LeRoy Wilcox).
- Miller Place, Nov. ?, 1 alive near railroad (Nathaniel Tuthill); Nov. 22, 2 alive on Sound Beach (G. P. Helme).
- Moriches, Nov. 19 and 20, several (Donald McKellar).
- Moriches Bay (near Swan Island), Nov. 19, many small flocks (LeRoy Wilcox).
- Moriches New Inlet to Shinnecock Bay, Nov. 19, about 3000 between 11 A. M. and 4 P. M. (LeRoy Wilcox).
- Oakdale, Nov. 19, about 150 dead in woods, and from two to three thousand on the ponds of the South Side Sportsmen's Club (A. G. Allen).
- Pon Quogue, Nov. 19, "a great flight" (J. H. Hendrickson).
- Riverhead, Nov. 19, a dozen or so (Harold Herrick).
- Rockaway Point, Nov. 24, 1 took flight from smooth water; many others reported by coast guards (Mrs. G. G. Fry).
- Shinnecock Bay, Nov. 19, many flying eastward (LeRoy Wilcox).
- South Oyster Bay, Nov. 19, generally distributed and in great numbers (Game Protector Weinberger).
- Speonk, Nov. 19, "bay black with them close to shore" (LeRoy Wilcox).
- Wading River, Nov. ?, 1 (local newspaper report).
- Wantagh, Nov. 20, 1 (William Vogt).
- Westbury, Nov. 19, 1 in the Hicks' Nursery, banded and released at Jones Beach (John Matuszewski).
- Westhampton, Nov. 19, many (LeRoy Wilcox).
- Woodhaven, Nov. 19, 1 (specimen to American Museum).

2. (Staten Island).

- Great Kills, Nov. 18-25, several continuously on a small salt pond (M. C. Rich); Nov. 19, 1 dead (F. Hansa).
- Staten Island (districts not designated), Nov. 19 and 20, 5 (specimens to American Museum).
- Waterside Park, Nov. 23, 2 on Wolcott Pond (Mrs. G. G. Fry).

3. (Manhattan and the mainland).

- Ardasley, Nov. 20, 1 in garden (C. E. Lichtenauer).
- Borough of the Bronx, Nov. 19 and 20, 6 (specimens to American Museum); Nov. 21, 1 (Helene Lunt).

- Brewster, Nov. 19 or 20, 1 (specimen to American Museum).
 Chappaqua, Nov. 19 or 20, 1 in brook (specimen to American Museum);
 Nov. 20, 1 in brook (Robert Burnap).
 Harrison, Nov. 20, 1 two miles from Sound (Frederic Atherton).
 Hopewell, Dec. 4, 1 dead near Fishkill Creek (T. R. Pell).
 Hudson River Parkway, Nov. 19, 1 (T. A. James).
 Millbrook, Nov. 20, 1 alive (Howard Dunn).
 Monroe, Nov. 20, 1 caught by cat (William Simpson).
 New York Botanical Garden, Nov. 20, several (Helene Lunt).
 Peekskill, Nov. ?, 1 (L. S. Crandall).
 Scarsdale, Nov. 19 or 20, 2 (specimens to American Museum).
 Spuyten Duyvil Creek, Nov. 20, 5 captured, cooked, and eaten by boys
 (G. T. Hastings).

New Jersey.

- Andover, Nov. 19, 1 alive in field (W. K. Longcor).
 Atlantic Highlands, Nov. 19, 1 on beach (Dr. A. A. Brill); 2 (C. A. Urner).
 Barnegat Bay (20 miles north of Atlantic City), Nov. 19, 4 captured
 (R. H. Swarthwout).
 Barnegat Dock, Nov. 19, 12 flying, others on water (M. S. Ley).
 Barnegat Light, Nov., 200 or more about for ten days (W. A. Rothas).
 Belleville, Nov. 19, 1 alive (W. H. Patten).
 Belmar, Nov. 20, 31 within twenty minutes (C. A. Urner).
 Bernardsville, Nov. 19, several (Mrs. Theodore Herbst).
 Beverly, Nov. 19 to 21, a flock of 50 or more swimming and diving in the
 Delaware River (Allan Baird).
 Bloomfield, Nov. 19, 1 (B. S. Bowdish).
 Cape May, Nov. 20, 1 alive (John Mecray); Nov. 21, 1, which escaped,
 in the main street (Witmer Stone); Nov. 24, several dead and 2 swim-
 ming in harbor (O. H. Brown and C. C. Page); Nov. 25, others, dead
 and alive, seen by the same and other observers.
 Chatsworth, Nov. ?, 4 alive in the Pine Barrens (Joseph Evans).
 Chester, Nov. 19, several brought to a taxidermist (Mrs. Augustus
 Dalrymple).
 Cranford, Nov. 19, 2 (C. A. Urner).
 Dover, Nov. 19, 1 in road (Mrs. Augustus Dalrymple).
 Elizabeth, Nov. ?, 3 in Newark Bay (C. A. Urner).
 Forked River, Nov. 19, gunners reported upwards of a hundred near
 mouth of river (C. A. Urner).
 Freehold, Nov. 19, 1 (C. A. Urner).
 Glen Ridge, Nov. 19, 1 (B. S. Bowdish).
 Hackensack, Nov. 19, 1 (B. S. Bowdish).
 Haddonfield, Nov. 22, 1 dead (J. W. Tatum).
 Jersey City, Nov. 19, 1 (specimen to American Museum); 1 in Hudson
 River (C. A. Urner).
 Lavalette, Nov. 20, 2 dead (C. A. Urner).

- Leonardo, Nov. 19, several (Mr. Teeple).
Long Branch, Nov. 19, 1 (Mrs. L. G. Swanson).
Long Valley, Nov. 20, 3 alive (M. A. Collins).
Lovelady's Island, Nov. ?, flocks of more than a hundred each (J. W. Tatum).
Lyndhurst, Nov. 20, 1 alive in road (R. J. Fiaccavento).
Manasquan Inlet, Nov. 19, many flying south (C. A. Urner).
Milmay, Nov. 26, 1 in Pine Barrens (O. H. Brown).
Montclair, Nov. 19, several (C. A. Urner).
Newark, Nov. 19, 1 (A. W. Howland); several (C. A. Urner).
New Milford, Nov. 19, 1 (B. S. Bowdish).
Northfield, Nov. ?, 1 on meadows (A. E. O'Neil).
North Wildwood, Nov. 21, 1 (O. H. Brown).
Perth Amboy, Nov. 19, 2 (C. A. Urner).
Pine-Barrens, about 10 miles from coast, Nov. 19, 1 (C. A. Urner).
Plainfield, Nov. 19, 2 (C. A. Urner); Nov. 20, 1 (W. F. Eaton).
Point Pleasant, Nov. 19, 1 (C. A. Urner).
Preakness, Nov. ?, 1 (observer unrecorded).
Ramsay, Nov. 20, 1 (C. R. Ferguson).
River Edge, Nov. 19, 1 which had been banded on the same day at New Milford, one mile distant (B. S. Bowdish).
Sandy Hook, Nov. 24, 1 alive, 1 dead (Mrs. L. G. Swanson).
Sandy Hook to Belmar, Nov. 27, a number along beach (C. A. Urner).
Sea Isle City, Nov. 19, present all over the meadows; several swimming in every salt pool (E. W. Richman and others).
Seaside Park, Nov. 19, 2 (C. A. Urner).
Shark River Inlet, Nov. 19, 33 (C. A. Urner).
South Orange, Nov. 19 and 20, 2 (specimens to American Museum).
Springfield, Nov. 19, 1 (C. A. Urner).
Surf City, Nov. 27, 1 dead in road (J. W. Tatum).
Tenafly, Nov. 19, 2 alive (Arthur Mason and F. S. Granden).
Westwood, Nov. ?, 1 (E. S. Van Nostrand).

Pennsylvania.

- Bristol, Nov. ?, 1 (Harry Pittman); Nov. 19, 2 alive (Howard Asay).
Langhorne, Nov. ?, 1 (Witmer Stone).
Newton, Nov. ?, 2 (Ralph Ratcliffe).
Norristown, Nov. 19, 1 in center of town (R. J. Middleton).
Oxford Valley, Bucks Co., late Nov.—early Dec., 3, of which 2 were seen on a small stream for about a week (Edward Cocks).
Philadelphia, Nov. 19 and 20, 4 alive in various parts of the city (Witmer Stone).
Pottstown, Nov. ?, 1 alive on house porch (M. A. Drabinsky).
Schwenksville, Nov. 19, 1 alive in Perkiomen Creek (Hastings Zugler).

Delaware.

- Milford, Nov. 28, 1 (Herbert Buckalew).

Maryland.

Nov. ?, 1 reported (E. T. Gilliard).

Virginia.

Back Bay, Nov. 28, 1 near the North Carolina line (J. W. Mittendorf).
Chincoteague, Nov. ?, 5 (Herbert Buckalew).

North Carolina.

Cape Lookout, Nov. ?, 2 (Dr. B. F. Royal).
Lookout Bay, Dec. 13, 1 (J. S. Gutsell).
Off New River Inlet, Dec. ?, large numbers of unfamiliar "very small black and white ducks" reported by fishermen (T. G. Samworth).
Poplar Branch, Nov. 28, Dovekies numerous on ponds of Narrows Island Club (G. de F. Lord); Dec. 2, 1 (H. H. Brimley).
Wrightsville Beach, Dec. 14, 1 dead (R. E. Calder).

South Carolina.

Big Bay Island, Dec. 4, 1 (H. R. Sass, Jr.).
Folly Island (10 miles south of Charleston), Dec. 2, 1 (Mrs. Beverly Mikell); Dec. 5, 1 (C. C. West).
Pawley's Island (near Georgetown), Dec. 4, 1 (Alexander Sprunt).

Georgia.

Lightship 94, off Tybee Beach, late November, "thousands" flying southward; 3 specimens to Charleston Museum (Alexander Sprunt).

Florida.

Biscayne Bay, Dec. 1, many on the bay (F. M. Chapman); Dec. 4, a few dead birds (James Silver and Carlyle Carr).
Brevard Reserve (Pelican Island), Nov. 30, "fifty flying, one swimming, many dead"; by Dec. 2 the water was "full of them" (W. E. Shannon).
Daytona Beach, Nov. 30, 15 living, 15 dead, along ten miles of beach; more than fifty reported (R. J. Longstreet); Dec. ?, "beach covered by Dovekies" (W. W. Cheney); large numbers in the streets and yards (H. I. Middleton).
Fort Pierce, Dec. 2, 12 on the beach (Mrs. D. B. Upton).
Jacksonville, about Dec. 1, reported (H. H. Bailey).
Jupiter, Dec. 1, "thousands from Jupiter southward" (H. H. Bailey).
Key Largo, about Dec. 1, reported (H. H. Bailey).
Lake Worth beach, Dec. 2, 30 dead (H. H. Bailey).
Long Key (about 100 miles south of Miami), Dec. ?, 1 (F. M. Chapman).
Loxahatchee River (20 miles north of Palm Beach), Dec. 1, 1 swimming (Mrs. D. B. Upton).
Matecumbe Key (80 miles south of Miami), Dec. 3, 9 (James Silver and Carlyle Carr).
Merritt's Island, about Dec. 1, (H. H. Bailey).

Miami, Nov. 30, several on beach (F. M. Chapman); 50 live birds in shrimp pools at the Causeway (Jerry Minas).

Palm Beach, Nov. 29, several in surf and ashore; Dec. 1, 37 dead or dying, several hundred in the water or flying south (James Silver and Carlyle Carr); Dec. 2, 52 dead birds picked up (Oscar Swed); the 'Palm Beach Post' reports, "for the last day or so Dovekies have been caught in large numbers."

St. Augustine, Nov. 28-Dec. 2, Dovekies dying "by hundreds" in the vicinity (T. Van Hyning).

Cuba.

Matanzas Bay, "two or three days after the cyclone of November 9, 1932, which destroyed the town of Santa Cruz del Sur," 6 caught in cast-nets by fishermen, and brought alive to Professor Cleto Sánchez, of the Colegio "La Luz." All died within 24 hours, refusing food. Others were seen by the fishermen, but a day later none was to be found (S. C. Bruner).¹

Santa Maria del Rosario (20 kilometers from Havana), Dec. 1, 1 alive in a stream; Dec. 6, 1 dead near the same place (J. H. Bauzá).

THE FLIGHTS AND THE WEATHER.

In the northerly part of the Atlantic coastal region the inland flights of the Dovekies seem to have been immediately due to high winds from the sea. New England observers refer to a boisterous northeasterly storm, from November 7 to 10, that terminated in a heavy downpour of rain. During and after this gale the first Dovekies were reported from inland localities of New Hampshire and Massachusetts, two or three of them as far west as the Connecticut Valley. One was found in Warwick, Mass., and a second at Athol in a freight car that had just come in from the west! Professor Samuel A. Eliot, Jr., of Smith College, writes that both these birds were released in the Connecticut River, in which they disappeared down stream. The vast majority of Dovekies reported after this storm were, however, in eastern Massachusetts.

It remained for a second severe storm, raging on November 19 and 20, and coming mainly from a southeasterly quarter, to drive a larger number of Dovekies overland into the Connecticut Valley.

¹ This is the only one of the multitudinous records that does not appear to fit the probable period. A December date would seem more likely. The single Matanzas skin seen by Dr. Bruner bore no label, and the letter of information from Professor Sánchez was written on April 13, 1933. The Editor of 'The Auk' has written for confirmation or emendation of the date of capture which, it is hoped, may be published later.

To Professor Eliot, Mr. Aaron C. Bagg, and others, we are indebted for records from Springfield, Holyoke, Northampton, Huntington, Amherst and Westfield, Mass. The same storm likewise scattered others broadcast over large areas of Rhode Island, Connecticut, Long Island, New Jersey, and "practically every county of southeastern Pennsylvania." The last statement is made upon the authority of Mr. Thomas E. Winecoff, of the Pennsylvania Board of Game Commissioners.

Specific data on these two storms, from Weather Bureau reports, are as follows. The first was characterized by northerly and northeasterly gales along the northern Atlantic coast on November 8 to 10, the wind reaching a maximum velocity of 50 miles per hour at Block Island on November 10. The weather subsided on the following day and there were no further coastal winds of high force until November 18, when a meteorological low over the coastal region from Ontario to Virginia determined the prevalence of winds from the sea. On November 19, along the south shore of Long Island, the wind had a velocity of 30 miles per hour from the southeast at seven o'clock in the morning. This increased gustily to a maximum of 51 miles per hour shortly after noon, and then fell off gradually until mid-afternoon, at the same time swinging through south toward west. Intermittent rain, frequently falling in heavy bursts, continued until about four o'clock. (Those who attended football games in the Yale Bowl or elsewhere in the east will need no further reminder of either wind or rainfall.) Late afternoon was calm. Shortly before sunset, a light breeze shifted by way of west toward the northwest, from which direction it came, with clear, crisp weather, on the morning of November 20.

Dr. Oliver L. Austin, Jr., of the Austin Ornithological Research Station at North Eastham, Cape Cod, describes the Dovekie invasion of the first November storm. He writes:

The northeasterly gale commenced on Monday, November 7th and continued until Thursday, November 10th. The wind blew with almost hurricane force from Monday until Thursday evening, when it began to abate, and Friday was calm and clear. Dovekies started to come ashore either late Wednesday night or early Thursday morning. Most of them landed just inshore of the dunes on the ocean side of the Cape. On Thursday afternoon we picked up 16 in a two-mile stretch north of Nauset Light, and in the same area the coast guard patrol had given about a dozen a

helping hand onward. At that time the birds were all fat and in good condition. We banded all we found and tossed them into the air over the dunes, all of them at once flying off into the swelter. Some had dropped inland at various points in the streets and yards. On Friday morning I encountered 150 on the Bay side of the Cape, swimming close inshore along the beach. The telephone rang all day Friday as people called up to report the birds, and 22 were brought to the Station by our interested neighbors. By Friday afternoon the birds brought in were either dead or so thin and weak that they could not fly.

From what I saw, I should say that the Dovekies came ashore here by hundreds rather than thousands, and from evidence in the Boston newspapers I judge that the flight was heavier here than elsewhere in Massachusetts. We were able to band a total of 23 healthy birds which flew off in apparently good condition.

Turning now to Long Island, and the storm of November 19, we find that large numbers of Dovekies were reported by many observers along the greater part of the south or ocean shore. Writing from Pon Quogue, Hampton Bays, Mr. John H. Hendrickson states that flocks of from 25 to 300 were reported by gunners, and that many birds fell exhausted on beaches, meadows, fields, and roads throughout the Hamptons, or were killed by striking houses, poles, and wires. From the western end of the Island, Mr. Harry C. Armin tells of the constant passing of small flocks of Dovekies along the coast between Fort Tilden and Point Lookout. The birds seen were mostly over the breaking waves, though some passed above the sands of Jacob Riis Park. Groups on the ocean disappeared and reappeared very rapidly, as the birds settled in the rough water and took off again. At Jones Beach, near the central part of the south shore, many small flocks were seen by one or both authors of this paper over the land and the ocean. The peak of the flight seems to have been attained here shortly before noon. Groups of birds over the back-beach and meadows would at times fly very close to the ground, only to turn sharply upward without alighting. We suspect that they mistook the wet concrete parking spaces of the Jones Beach State Park for patches of water, at least until they skimmed the surface of such places. Single Dovekies flying above the ocean beach are reported sometimes to have stopped in air and hovered for a few moments above the heads of human beings, as if moved by curiosity.

Several of the Long Island accounts for November 19 and 20 tell

of definite directional movements, the birds all flying east or all flying west. Since there seems to be no consistency in this testimony, however, the reports doubtless refer to chance "follow the leader" flights of bewildered birds along shore.

On Sunday, November 20, the gathering of spoils went ahead throughout the countryside, and on Monday morning the department of birds at the American Museum of Natural History began to be deluged with inquiries. About thirty specimens from three states were also received during the day. By Tuesday, the 22nd, nothing more was heard of live birds away from the sea, except for a few that elected to remain in coves and ponds where they evidently found food. The great ocean flight also passed southward or off to sea very quickly, although now and then a free and active Dovekie was reported in the waters off Long Island up to December 12. Only normal numbers, meaning very few, appeared in the Christmas census of 'Bird-Lore.'

For the compilation of the tabulated records and other data from New Jersey, we are greatly indebted to Mr. Beecher S. Bowdish who not only handled many Dovekies himself but also, through his post as Secretary of the New Jersey Audubon Society, received records from all parts of the State.

Mr. Charles A. Urner, of Elizabeth, N. J., writes that the first New Jersey birds were driven ashore during the night of Nov. 17-18. On the morning of the 18th, flocks were observed in the heavy rain in Barnegat Bay. More of them had come in by the following day, and groups were to be seen scattered about the area until at least the end of November.

Mr. Alexander Sprunt, Jr., of Charleston, sends the following data regarding the migration of the birds along the South Carolina and Georgia coasts:

The first intimation of the occurrence of Dovekies in South Carolina was the finding of a dead bird on the beach of Folly Island, about ten miles south of Charleston, on Dec. 2d. It was greatly emaciated, as were others found later near the same place and at Big Bay and Pawley's Islands.

Captain T. Danielson, of Lightship 94, stationed off Tybee Beach, Georgia, brought three birds to the Charleston Museum in fluid, on Dec. 12th. He stated that "thousands" of them had passed his ship in late November, all flying southward. Some stopped about the ship and he succeeded in catching several with a dip-net from the deck. He made an

attempt to keep them alive in a tub of salt water, providing them with fish, but they all refused to eat.

Dr. Frank M. Chapman, writing from Miami, Florida, reports that the flight reached Biscayne Bay about December 1, on which date numbers of Dovekies were seen. Very many were picked up dead or dying and large numbers were received by Mr. Al Pflueger, taxidermist, in whose possession Dr. Chapman saw them. All the birds examined were emaciated and had apparently died from starvation and exhaustion. According to Mr. R. J. Longstreet, of Daytona Beach, Florida, a heavy northeasterly storm had lashed the coast from November 27 to 29, and on the latter date he saw the first Dovekies in the surf. The Palm Beach News of February 2, 1933, published a photograph of ten mounted Dovekies, said to represent a few of "hundreds" picked up along the beach by Mr. J. E. Wallace during early December. At noon of December 3, Dr. Chapman saw a single bird flying southward at Miami. He writes: "It is probable that the momentum of the flight and lack of objective carried many birds still farther south." This is abundantly confirmed by other observers, and Messrs. James Silver and Carlyle Carr, of the United States Biological Survey, call particular attention to the fact that the southward flight continued long after the cessation of the storms credited with initiating it. By December 1, the vanguard had reached Cuba, for on this date a record for that island was established by a living bird in a small stream at Santa Maria del Rosario, as reported by Sr. José Hernandez Bauzá to Dr. Thomas Barbour of Cambridge and Dr. Herbert Friedmann of Washington.

The report of Mr. LeRoy Wilcox of the flight on Long Island, New York is so graphic that it is presented in full:

We arrived at Swan Island, Moriches Bay about 11 A. M. November 19, and I began to realize that the wind was beginning to blow up rather briskly. Then it was that I had my first sight of the Dovekies. I chanced to look out over the bay and saw a flock of ten birds flying west. At first sight they appeared to be small ducks and for their size were flying very fast. But after a good look at them I realized they were not ducks, but as they were at quite some distance away and I had no glasses with me, I was unable to place them. Then I noticed a large sedan stop in the beach road near the Coast Guard Station while the driver looked at some object ahead of him in the road. Then I saw a small bird fly up from the road, alight again and then go over the beach hills out into the ocean. I knew

that it was a Dovekie so I ran as fast as possible over to the ocean and saw several flying out over the surf. I resolved to go home at once to get my glasses and gun to collect a couple of the birds. Little did I realize then that I would have no need for a gun to collect them.

Accordingly I drove home some eight miles as fast as possible. I had no sooner arrived there than my brother-in-law informed me that there were two Dovekies swimming in a creek only a short distance away on the mainland and nearly two miles in a straight line from the ocean. I immediately drove there and found them only about fifty feet from the road. I then drove down to the bay and saw four others close in shore. These as well as all others seen on the water were not once seen to dive but were simply floating on the water with head and neck drawn in close to the body apparently riding out the storm and waiting for it to subside. I then realized that an unusual invasion of these birds was going on.

I immediately decided to drive back over to the beach without spending any more time searching around the bay as I would have an opportunity to observe the birds from the ocean side as well as the bay side of the beach.

I had no sooner crossed the bridge at Westhampton and come on to the beach road than I saw a Dovekie alight in the grass near the road. I stopped the car and soon had the bird which had a good part of the breast feathers soaked with oil. I drove west to the end of the beach road near the Moriches Coast Guard Station and saw that the birds were becoming more numerous as time went on. It was now about 1 P. M. and a heavy downpour kept me inside of the car for a few minutes. After the rain slackened up I decided to walk the one-half mile west to the Moriches Inlet. Water from the ocean was running over the beach road to a depth of several inches. I soon found one Dovekie nearly dead that had just been washed up in the surf. It was covered with foam but had no oil on it. It died within a minute or so. Two were seen flying east over the beach right in a flock of fifteen Sanderlings. At the inlet I found two dead, apparently not fresh but from the storm of the week before.

Dovekies were now flying all over the ocean, over the beach hills, meadows and out over the bay. Because of another heavy downpour I had to run for shelter under a small overturned building that was washed out by the storm of the week before. While crouching here I saw one Dovekie flying with the wind at great speed hit the telephone wires and go hurtling down to the ground. The rain soon slackened so I went and picked up this bird. It was still alive but soon died as it had a big gash in its neck where the wire had cut it.

It was now about 2 P. M. and up to this hour they had been flying in all directions. But after 2 P. M. at what seemed to be some mysterious command they all began to move east and I did not see a single bird flying west after that hour.

I decided to drive to Shinnecock Bay to observe conditions there. On the way I stopped about a mile east of the Moriches Coast Guard Station and walked over to the ocean beach. Birds were now in sight continually

and they ranged from singles up to flocks of thirty-five, with the average flock containing from fifteen to twenty birds. I did not observe many far out over the ocean, most of them flying over the breakers and many of them right over the beach. The latter did not keep on a straight course but kept continually moving out over the surf and back again over the beach. All of them were flying low, some just skimming along over the sand of the beach. As I stood by the surf some of the single birds would seem to stop and hover over my head for a few seconds. I could probably have knocked them down with a stick they came so close to me. They seemed to show no fear of man whatever and it appeared they paused out of curiosity.

On my way again to Shinnecock I saw one dead in the road with a crushed head which had been run over by a car. A short distance away was a live one sitting in the road. I walked up to it and it managed to rise up off of the ground and fly for about twenty-five feet. This extra exertion apparently tired it out again as I walked up to it and it made no further attempt to escape. A few hundred feet to the east I saw another one sitting near a hay stack by the side of the road. This bird made no attempt to escape and was easily caught.

I arrived at Shinnecock about 3 P. M. and found that all were still flying east. The wind was now blowing harder than at any time during the day. Nearly all of the Dovekies were now flying over the beach hills and only a few out over the surf. Even though the sand was wet it was carried with such force by the wind over the top of the beach hills that I could not face it. It cut my face and blinded me so that I sought shelter in a little hollow and watched the flocks fighting their way into the teeth of the gale. They were just skimming the beach hills and when they attempted to go over to the ocean the full force of the wind struck them and carried them almost straight up in the air and then back over the hills and even driving some out over the bay.

I stayed at Shinnecock for about thirty minutes and all this time stragglers were beginning to drop down out of the flocks into the grass on the hills. As soon as they alighted they hurried behind a clump of grass to try to secure shelter from the wind and sand. When approached none of them attempted to fly and seemed to show no fear of me. They would always alight in the hollows. All that I saw alighting were single birds except once when a pair came along and both alighted in the hollow next to me. Of course the visibility was poor but for the short distance that I could see on either side of me they were dropping into the grass at the rate of about one bird every three or four minutes.

It was now about 3.30 P. M. and there was another downpour so I had to hurry back to the car.

Returning to Westhampton I found one dead Dovekie in the road and two others on the sidewalk leading from the beach to the village. These last three were not injured in any way and simply died from exhaustion. I also caught another live one in the beach road near the Westhampton Coast Guard Station. While catching this last one a Coast Guardsman

from the Quogue Station told me they had caught a number of live ones in the streets of that village.

Altogether I would place the conservative estimate of Dovekies actually seen at about three thousand. By far the greater number were observed from 2 to 4 P. M. Besides about fifteen dead that I had picked up I had about a dozen live ones which I hoped to band and release as soon as the storm let up. But they all died from exhaustion in about twenty-four hours.

A duck hunter at Westhampton brought me five that he had shot not knowing what they were and said he could easily have shot a hundred of them. My brother-in-law said the bay at Speonk Shore was black with them close to shore late in the afternoon and that they were so tame he could almost catch them with his hands.

Some were driven inland to fresh water ponds, especially at Eastport where they were seen to dive repeatedly, apparently feeding. One was also seen in a fresh water pond at Brookhaven on the 20th which is about five miles from the ocean. One was found dead in a road at Manorville right in the center of Long Island.

On the next day, the 20th, the wind had changed to northwest. I found one live Dovekie hiding in the grass near the shore at Speonk and also saw a live one in a creek at Eastport about one mile from Moriches Bay. The afternoon of the 20th I spent in Great South Bay cruising off Bay Shore out almost to Fire Island Inlet but did not sight a single Dovekie.

On November 22 one alighted in some duck decoys in the bay at East Moriches and on the same day a duck hunter caught one live bird out of a bunch of five on the ocean beach opposite Mastic.

On December 2 my brother-in-law and I rigged out our duck decoys off Speonk Pt. in Moriches Bay at about 3.30 P. M. There was no wind at the time and hardly a ripple anywhere on the bay. I saw one Dovekie flying east through the bay and soon alight in the water. A few minutes later another bird was seen flying east near shore. It swung around Speonk Pt. going right over our decoys and alighted a few hundred feet off the Point and immediately began to dive. Both of these birds were flying low just skimming over the water and flew very fast much like a duck. I rowed out to this last bird and when within about fifty feet stopped to observe its actions. It did not seem to take any notice of me and kept right on diving. The water was six feet deep and the bird stayed under for about twenty seconds on each dive. It was calling continually just as it dove and again as soon as it reappeared on the surface; a faint call, repeated rather frequently and could be heard probably not over one hundred feet away. I could clearly see one bird as it swam under the water right after diving and it surprised me at the remarkable speed it made, working its wings vigorously to propel itself through the water.

Out of twenty-one stomachs examined, this bird's was the only one that held any food. It contained about twenty-five shrimp, each one-half inch long, three or four small shells, the rear half of a small fish (a whitebait

about one inch long) as well as a mass of what appeared to be some vegetable matter.

Out of about thirty Dovekies that I found only two had the breast feathers smeared with oil, all the others at the most only had a few scattered feathers with a slight trace of oil. All those that died from exhaustion were in very poor condition, the breast bone was very prominent and there was not a particle of fat on their bodies. On the other hand those that were shot were in much better condition with quite some fat.

One Dovekie was seen flying east through Moriches Bay at Speonk on December 4. Two were seen in the bay at Westhampton on December 12, which were the last observed in this region.

THE NUMBERS OF STRANDED BIRDS AND THE INLAND EXTENT OF THE FLIGHT.

The total number of Dovekies that reached our coast can never be determined even approximately, but the tabulations above suggest that it was very large. The most birds naturally were reported from thickly settled parts of the coastal region, and yet the evidence suggests that their corpses may have washed ashore and peppered the back country in equally large numbers all the way southward to the southeastern tip of the United States, and possibly also in the Bahamas and Cuba.

Mr. Winthrop Packard expresses the opinion that probably not one per cent of the birds that came inland in Massachusetts was ever observed. Most references to numbers of individuals are in general terms, such as Mr. H. H. Bailey's statement that "a tidal row" of bodies lay along the Florida beaches from Jacksonville to Key Largo. The only attempt at a statistical estimate that has come to our attention is that of Messrs. Silver and Carr. These observers believe that conditions on the Florida coast warrant a minimum estimate of 50 dead Dovekies to each mile between St. Augustine and Lower Matecumbe Key, or a total of 20,000 birds within the 400 mile stretch.

As to the maximum distance to which individual birds penetrated from the sea, this did not quite reach a hundred miles in any instance brought to our attention. We disregard the record from Cowansville, Quebec, which is about fifty miles east of Montreal and south of the St. Lawrence, because the Dovekie found there most probably had come up the river. On a few former occasions examples have reached the Great Lakes, and in November 1931

one was shot in Lake of the Woods, northern Minnesota (Roberts, T. S., *Birds of Minnesota*, 1932, Vol. I, p. 570, footnote).

The Dovekies found at Huntington, Amherst, and other places in western Massachusetts must have flown overland for 75 or more miles. Some of the Connecticut birds had doubtless crossed over Long Island and the Sound before passing the mainland shore. The specimen from Millbrook, Dutchess County, N. Y., was picked up alive at a point at least 85 miles from the ocean in a direct line. Several of the New Jersey birds were found 45 or more miles from the coast.

The chances against the finding of any particular bird that came down in the countryside are clearly very great. Despite the work of gulls, crows, vultures, opossums, cats, racoons, and carrion insects, all of which are reported to have devoured the carcasses, the remains of many not mentioned in our table have been stumbled upon at various dates since December. Dr. James P. Chapin, for instance, reports one on the salt meadows at Oakwood, Staten Island, on May 28, 1933.

BEHAVIOR AND CONDITION OF THE BIRDS

Free Dovekies on the ocean, during the earlier period of the influx, were seen by many observers on Long Island and elsewhere to swim strongly in rough water, plunge through the tops of combers, and take wing from the crests. Spent birds, on the other hand, particularly such as those reported by Messrs. Silver and Carr near Palm Beach, Fla., on November 29, were in obvious difficulty and would be bowled over by surf and battered ashore to succumb.

In windy waters of the Long Island south bays, on November 19, 20 and later, Dovekies were frequently seen to descend to the surface and seek the slender shelter or lee formed by wooden duck decoys. From such relatively smooth water they had no difficulty in taking flight, with or without the advantage of a breeze. They could rise equally well from the perfectly quiet surfaces of ponds, although at times they gained height too slowly to avoid obstacles back from the water. Thus Mr. F. V. Crane writes of one that struck a barrel after launching off from a tannery pond in Massachusetts. Again, Mr. A. G. Allen reports that on November 19

many Dovekies arose from a flock of between two and three thousand on ponds of the South Side Sportsmen's Club, at Oakdale, Long Island, but without attaining altitude sufficient to clear the surrounding trees. This doubtless accounted for the presence of scores of dead or moribund birds in the woods. The late Harold Herrick notes that a small flock entered another forest pond about a mile south of Peconic Bay, near Riverhead, Long Island.

Telephone wires presented obstacles beyond range of the Dovekies' experience. Many with gashed bodies were found under the lines in Massachusetts, New York, and New Jersey, and three or more observers saw birds fly full tilt against the wires.

Contrary to general opinion, and to many statements in the literature, the fresh and sound Dovekies were quite capable of taking wing from unencumbered land surfaces, at least if they had the advantage of heading into a fair breeze. No fewer than eight observers saw birds rise from concrete or other hard-surface roads, either to alight again after a short flight or to pass completely out of the range of vision. Mr. C. L. Fournier saw one take wing from the beach near Greenport, Long Island, and make its way safely out into Peconic Bay.

The swimming and feeding of the Dovekies was watched by many persons under exceptionally favorable conditions, in both salt and fresh water. At Martha's Vineyard, Mass., as reported by Mr. F. H. Kennard, a Dovekie in a pond easily outdistanced a water spaniel that pursued it. The bird would allow the dog to approach within a foot or so, and would then dive. The persistent dog finally had to be hauled into a boat, thoroughly done in, leaving the Dovekie fresh and untroubled.

At Norwood, Mass., Mr. F. V. Crane saw several swim for distances of from 30 to 50 feet beneath the clear water of a walled pond, and observed them chasing small fish and water-bugs, a thin trail of bubbles marking their erratic paths. Others likewise report the Dovekies finding food—small fish being the observed prey—in the fresh water of both streams and ponds.

The "underwater flight" of the birds was noted by Mr. Winthrop Packard in the Sharon, Mass., bird sanctuary pond. Mr. Marc C. Rich contributes the following note on diving Dovekies variously watched beneath a pier at Belmar, N. J., from a causeway

crossing Barnegat Bay, near the light-house at Barnegat Inlet, and in a salt pool at Great Kills, Staten Island. At the last locality the birds remained continuously for eight days, evidently thrive, and were seen by many visitors.

All these birds were carefully observed for some time and always under ideal conditions, as we were directly over most of them at a height of a few feet. They invariably used their wings in swimming under water, exactly as in flying. They didn't seem to use their feet while under water, but the moment they came to surface and swam, their feet were used, not as side paddles, but more like the propellers of a ship, the feet being extended at full length from their rear end and paddled from that position. They were catching small "shiners" and seemed to be feeding incessantly.

Mr. O. H. Brown writes that two Dovekies watched in the harbor at Cape May, N. J., on November 24, swam beneath the surface with the wings slightly expanded, but without being used for making strokes. Their course was every moment marked by a chain of bubbles.

The more robust of the Dovekies, captured just from the sea along the beaches, were mostly active, lusty birds, that made a great commotion when put into a box, and quarreled with one another with much clatter and squeaking. Such birds sometimes attempted to bite the hand that grasped them. The greater number of those picked up, however, were so reduced by exhaustion that they showed little spirit. Sometimes, indeed, the only sign of life would be the frequent flashing of the eyelid (Cf. C. W. Townsend, *Auk*, Jan., 1933, p. 105). Such a state was widely mistaken for tameness, and indifference to handling was interpreted as a favorable reaction toward it.

The widespread humane interest in the waifs was not the least noteworthy feature of the influx. Telephone calls for information as to how they might be helped ran probably into hundreds or thousands. Many of the Dovekies were transported long distances, and at considerable pains, in order that they might be set free upon salt water. Some such were seen to swim, dive, and apparently feed, after as long as two days in captivity. Attempts to feed the birds by hand were not as a rule successful, although Mr. A. W. Howland reports that one in Newark, N. J., ate raw beef freely, and seemed strong when it was released. Another bird, domiciled over night in a gold-fish aquarium, was in the morning discovered

to be the sole remaining occupant! Doubtless most of the birds were too far gone to react to food. The substances offered to, or forced upon, the unfortunate creatures include sardines, tinned salmon, shrimps, cod-liver oil, meat, worms, bread, rice, bird-seed, and Irish moss!

The stomachs of most of the dissected victims were empty, but a few examples taken in the north contained remains of small crustaceans, fish (*Menidia*), and bits of sea-weed. Mr. H. H. Bailey reports that "seeds of our southern gulf stream kelp" were in the stomachs of several Florida specimens.

Most of the salvaged Dovekies were inordinately thin. No visible fat remained beneath the skin, which hung loosely over the shrunken pectoral muscles so that the keel of the sternum felt like a knife-blade. The rapidity of the wasting process is indicated by Dr. O. H. Austin, Jr., who states that within twenty-four hours at Cape Cod the strong and fat Dovekies had all been replaced by greatly emaciated birds. Unfortunately, he has not recorded the weight of Dovekies in the normal pink of condition.

We have the weights of 31 random birds, mostly picked up in the New York region, all within two days of November 20. These varied extraordinarily widely, or between 70.9 g. and 141.7 g. With a class range of approximately 7 grams, the frequency distribution falls as follows:

2 weighed 70.9 g.	3 weighed 106.3 g.
9 " 78	5 " 113.4
6 " 85	1 " 120.5
3 " 99.2	2 " 141.7

A Dovekie "in very good condition," taken by Mr. R. A. Johnson at Spectacle Island, Nova Scotia, in late December, had a wingspread of 394 mm., and weighed 127 g., from which it may perhaps be assumed that the heaviest specimens in the above table were birds that had not been at all reduced by starvation.

The physiological processes of birds are extraordinarily rapid, but the katabolic sequence during starvation and exhaustion is the same as among other vertebrates. As the first stage, the glycogen or animal starch in the muscles and the liver is used. This is followed by the combustion of fat throughout the body. Until

the glycogen and fat have been practically all utilized, the destruction of muscle fiber is very slight, but thereafter the protein of muscle tissue is drawn upon rapidly for the energy of life and movement. The heart is the last muscular tissue to be diminished.

Any starving animal reaches at a certain point a sudden toxic destruction of tissue, which represents the pre-mortal breakdown, and which is irreversible. During such a process of exhaustion and starvation the loss in body weight is very great indeed. Since skeleton, skin, and feathers are composed of material that is not combustible, a bird may literally become reduced to "skin and bones." Possibly as much as 90 per cent of its muscle tissue may be destroyed to supply energy before death ends the process. It is, therefore, not surprising to find that some of the Dovekies had lost half or more of their original weight.

THE NATURE AND ULTIMATE SOURCE OF THE INFLUX.

The Dovekies, like other pelagic birds, ordinarily waste no energy in fighting the gales of their oceanic range. On the winter feeding grounds they more or less drift with the prevailing wind, slowly while on the water, but becoming part of the more rapidly moving medium as soon as they take the air. Probably their tendency to work to windward prevents undue leeway in normal weather, besides which, winds from new quarters sooner or later bring their compensating force. But doubtless even a very strong and prolonged wind lacks any particular significance for the birds, unless it may eventually cause their planktonic food to descend to deep and inaccessible levels. Ordinarily, the Dovekies would merely move along contentedly and unconsciously with the wind, still within the range of their pasturage, until a leeward coastline set in motion a new series of reactions.

The situation is exactly the same as that of the strong-winged Procellariiform species. In the southern oceans many petrels spend their lives in a region of almost perpetual gales. Probably the strongest winds that blow cannot incommode them so long as they have sea room. But when chance and gales bear them down on such a lee shore as the west coast of Australia, for example, they face the unwonted but instinctive experience of *combatting* the wind, striving to keep off shore. The result is likely to be the same

for any species, however powerful on the wing. Rapid combustion of tissue is followed by exhaustion, and dying birds are washed ashore by breezes that would have no effect whatever upon them on the high seas.

This hypothesis fits the case of the Dovekies along our Atlantic coast. While the strong coastal winds from the sea were the immediate agency in scattering the birds over so many states and counties, it is altogether likely that antecedent and somewhat irregular weather conditions over the North Atlantic had first moved masses of them close to the coast of New England and the Middle Atlantic States. The root of the matter is not that the Dovekies were blown inland, but that their oceanic population was so near our continental shore—which had been for some time prevailing a lee shore—that the birds were inevitably blown inland when buffeted by sudden onshore storms. As Mr. Lee S. Crandall has written,

—rains fall and winds blow during every winter season, without bringing us showers of Dovekies. Each year the birds are called upon to face conditions at least as severe as those of the 19th of November, and each year they triumphantly survive.

However, while the prevalence of unusual easterly winds in the normal west wind zone of the North Atlantic might offer a satisfactory explanation of the influx of the Dovekies into New England, New York and New Jersey, it hardly tells the whole story. Why did the flocks continue southward, long after the subsidence of unfavorable weather conditions, toward such new fields as Florida and Cuba? A possible suggestion as to the reason for the untoward condition and reactions of the birds is found on page 124 of Dr. G. M. Allen's 'Birds and their Attributes':

The Little Auk or Dovekie is also a plankton feeder, rather than a fisher, and finds certain times of day best for feeding when these minute animals are nearer the surface. In times of rough weather this floating life seeks deeper levels, so that the English ornithologists have explained the occasional great disasters that overtake the Little Auks, bringing hundreds of them inland with empty stomachs, as due to a continuous spell of bad weather resulting in the temporary disappearance of that plankton, and so depriving the birds of food and strength to stand against the elements.

Such an effect might well apply with even more force to littoral waters, into which the birds had drifted before the wind, than to the outer ocean.

Possibly, however, the Dovekie influx has a broader significance than any thus far suggested. In some respects the recent movement seems to fulfil the requirements of "mass emigration," as defined in, 'Emigration, Migration and Nomadism,' 1931, by the late Dr. Walter Heape of Cambridge University. This author presents a detailed study of such movements among lemmings and related rodents, ungulates, such birds as Sandgrouse, many lower vertebrates, and a wide variety of invertebrates.

Mass emigration is induced by overpopulation, which is in itself due to complex causes and which may recur within a given species at intervals of from seven to fifty or more years. The act is then performed by a surplus population, and it takes a direction away from or beyond that of the normal movements of the species, in order to avoid "territory" already fully occupied. It assumes the form of a rush emigration, implicating hordes of individuals, and is accompanied by a peculiar herd psychosis, which Heape calls animal hysteria, and which alters many of the ordinary reactions of the creatures. An inevitable result of such a movement is the death of the vast majority of the emigrants. A wealth of the factual minutiae which form the basis of this bare sketch is given in Dr. Heape's illuminating work.

As applied to the Dovekie influx, this theory is highly speculative, for we have as yet no other evidence of a rhythm of overproduction. Nevertheless, the behavior of the birds, especially along the southern Atlantic coast, fits the pattern that Heape has outlined for a variety of animals. Moreover, Messrs. Silver and Carr, who stress the fact that the southward progress of the Dovekies continued long after the alleged meteorological stimulus had ceased, remark "it seems certain that none of them survived."

As yet we have no information that might enable us to link up the Dovekie flight with any of the known rhythmic phenomena correlated with sunspot cycles, such as "plagues" of rodents, southerly incursions of Snowy Owls, etc.

To continue in the realm of the speculative, Mr. John Treadwell Nichols has made the interesting suggestion that the hordes of Dovekies along our coast may not have been the normal winter visitants from the American Arctic, but may have come from Old World breeding grounds. Long continued easterly winds in the

North Atlantic may have assisted such a movement, especially if the phenomenon of mass emigration was also involved. The Old World birds, incidentally, appear to migrate regularly to more southerly latitudes than the ordinary wintering Dovekies of our American coast. Furthermore, such visiting flocks from the eastern Atlantic would presumably become more easily "lost" in strange waters, with the extraordinary results that we have witnessed. It is highly notable that our abnormal visitors of late November and early December promptly disappeared from the whole central and southern Atlantic coast, leaving not a trace. On the other hand, the Christmas census of 'Bird-Lore' shows that from Essex County, Mass., northward, the normal winter resident birds were present as usual. May not these have represented practically the only annual guests from the Greenland region to be with us during the whole season?

Many, perhaps hundreds, of the Dovekies were banded and released during the influx. Some day a few returns may help to resolve one or more of the many puzzling questions.

Amer. Museum Nat. Hist., New York.