

THE DISTRIBUTION AND ABUNDANCE OF SHOREBIRDS
ON THE NORTH AND CENTRAL NEW JERSEY
COAST, 1928-1938

BY CHARLES A. URNER AND ROBERT W. STORER

CHARLES A. URNER died in June, 1938, only a week after completing the field work for his ten-year study of the migrations of shorebirds along the New Jersey coast. Summaries of his data for the years 1929 through 1934 had been published (Urner, 1929, 1930, 1931, 1932, and 1935), and some subsequent data were included in Stone's account of the shorebirds of Cape May (Stone, 1937). It, therefore, became the junior author's task to compile data for the spring flights of the years 1935 through 1938 and for the fall flights of the years 1935 through 1937, and to summarize the data for the whole ten-year period. He has attempted to follow as closely as possible the pattern set by the previously published accounts. As before, data were received from a number of trained observers including Julian K. Potter and other members of the Delaware Valley Ornithological Club, C. D. Brown, James L. Edwards, Charles H. Rogers and other members of the Linnaean Society of New York, and F. W. Loetscher, Jr. The great majority of the data were, however, those of the senior author.

TABLE 1
NUMBER OF LOCALITY COUNTS

	<i>Northward Migration</i>				<i>Southward Migration</i>		
	1935	1936	1937	1938	1935-6	1936-7	1937-8
Newark Meadows.....	15	16	14	17	39	40	35
Manasquan River.....	8	1	5	2	3	0	0
Seaside Park.....	9	2	5	1	11	4	4
Barnegat Inlet.....	6	4	1	1	22	9	7
Barnegat Marshes.....	6	3	0	0	19	14	13
Beach Haven Inlet.....	7	7	17	10	27	22	32
Tuckerton Marshes.....	13	14	16	6	30	29	32
Brigantine and Absecon.....	11	7	6	8	27	53	21
<i>Totals</i>	75	54	64	45	178	171	144

As before, the number and seasonal distribution of the trips (Tables 1 and 2) varied from year to year, and these distributions are not exactly comparable. Unfortunately, no information was left by the senior author regarding feeding conditions on the areas covered, and there is little published information concerning them. For these reasons, it is impossible to evaluate the influence of factors of this nature on the abundance and distribution of shorebirds during the period under consideration.

TABLE 2
DISTRIBUTION OF TRIPS ON WHICH SHOREBIRDS WERE SEEN

	<i>Northward Migration</i>				<i>Southward Migration</i>			
	1935	1936	1937	1938	1935-6	1936-7	1937-8	
February....	3	1	7	3	June.....	4	6	3
March.....	18	17	10	14	July.....	35	31	33
April.....	25	15	10	6	August.....	42	43	28
May.....	20	19	28	14	September...	34	36	25
June.....	9	2	9	8	October.....	23	25	19
					November...	24	12	15
					December...	15	3	11
					January.....	0	7	8
					February.....	1	8	2
<i>Totals.....</i>	<i>75</i>	<i>54</i>	<i>64</i>	<i>45</i>	<i>Totals.....</i>	<i>178</i>	<i>171</i>	<i>144</i>

TABLE 3
RANKING OF SHOREBIRDS ON NEW JERSEY COAST AND SALT MARSHES—
NORTHBOUND FLIGHT OF 1935

	<i>Rank</i>	<i>Times seen</i>	<i>Largest number on one locality trip</i>	<i>Total number, all trips</i>
Short-billed Dowitcher.....	1	14	6000	10777
Semipalmated Sandpiper.....	2	16	3000	5978
Red-backed Sandpiper.....	3	13	2500	4692
Semipalmated Plover.....	4	13	1000	2337
Greater Yellow-legs.....	5	25	450	1025
American Knot.....	6	5	3000	3362
Sanderling.....	7	12	600	1295
Black-bellied Plover.....	8	15	500	1280
Hudsonian Curlew.....	9	10	500	1570
Least Sandpiper.....	10	14	300	850
Piping Plover.....	11	16	30	193
Killdeer.....	12	22	20	93
Ruddy Turnstone.....	13	6	300	369
White-rumped Sandpiper.....	14	7	100	109
Spotted Sandpiper.....	15	12	12	46
Woodcock.....	16	11	4	29
Wilson's Snipe.....	17	8	16	27
Solitary Sandpiper.....	18	5	10	15
Lesser Yellow-legs.....	19	4	3	9
Pectoral Sandpiper.....	20	5	2	7
Stilt Sandpiper.....	21	3	1	3
Western Sandpiper.....	22	1	1	1
Willet.....	23	1	1	1
Upland Plover.....	24	1	1	1
Red Phalarope.....	25	1	1	1

The number of species and subspecies recorded in the final three and one-half years of the study follow:

	1935	1936	1937	1938
Northbound.....	25	22	26	21
Southbound.....	35	35	35	—
<i>Totals</i>	35	35	37	—

TABLE 4

RANKING OF SHOREBIRDS ON NEW JERSEY COAST AND SALT MARSHES—
NORTHBOUND FLIGHT OF 1936

	Rank	Times seen	Largest number on one locality trip	Total number, all trips
Semipalmated Sandpiper.....	1	13	1800	9661
Short-billed Dowitcher.....	2	9	3650	6344
Black-bellied Plover.....	3	9	1650	3881
Red-backed Sandpiper.....	4	10	1000	2973
American Knot.....	5	7	1530	2001
Semipalmated Plover.....	6	9	250	788
Greater Yellow-legs.....	7	20	150	576
Least Sandpiper.....	8	8	210	628
Sanderling.....	9	10	200	487
Ruddy Turnstone.....	10	6	200	667
Killdeer.....	11	22	25	115
Piping Plover.....	12	12	20	93
Hudsonian Curlew.....	13	6	50	161
Spotted Sandpiper.....	14	7	15	53
Willet.....	15	1	50	50
Woodcock.....	16	7	5	20
Pectoral Sandpiper.....	17	3	9	18
Wilson's Snipe.....	18	5	6	16
Solitary Sandpiper.....	19	3	6	9
White-rumped Sandpiper.....	20	3	2	5
Lesser Yellow-legs.....	21	1	1	1
Upland Plover.....	22	1	1	1

The following annotated list summarizes the pertinent data for the period from February 15, 1935, to June 15, 1938. In instances where an extreme date of occurrence for a species for one year is very different from those for other years, the extreme date for the next most extreme year has been added in parentheses. The dates for the high counts, as in previous papers, are chronological, the first date for the northbound flight referring to the 1935 flight, the second for the 1936 flight and so on. In the accompanying tables (Tables 3 to 9) the

TABLE 5
RANKING OF SHOREBIRDS ON NEW JERSEY COAST AND SALT MARSHES—
NORTHBOUND FLIGHT OF 1937

	Rank	Times seen	Largest number on one locality trip	Total number, all trips
Red-backed Sandpiper	1	20	4000	11767
Semipalmated Sandpiper	2	17	3000	11093
American Knot	3	19	1100	2044
Short-billed Dowitcher	4	9	3000	6226
Black-bellied Plover	5	24	300	930
Semipalmated Plover	6	16	600	2059
Least Sandpiper	7	18	500	897
Greater Yellow-legs	8	25	125	465
Sanderling	9	19	125	703
Killdeer	10	26	16	118
Ruddy Turnstone	11	14	100	335
Piping Plover	12	16	26	112
Hudsonian Curlew	13	5	70	128
Spotted Sandpiper	14	14	12	76
Lesser Yellow-legs	15	6	40	68
Purple Sandpiper	16	5	30	38
White-rumped Sandpiper	17	7	6	21
Woodcock	18	8	3	21
Western Sandpiper	19	6	4	12
Long-billed Dowitcher	20	2	6	10
Wilson's Snipe	21	6	2	9
Solitary Sandpiper	22	3	3	5
Stilt Sandpiper	23	2	1	2
Upland Plover	24	1	1	1
Northern Phalarope	25	1	1	1
Red Phalarope	26	1	1	1

TABLE 6
RANKING OF SHOREBIRDS ON NEW JERSEY COAST AND SALT MARSHES—
NORTHBOUND FLIGHT OF 1938

	Rank	Times seen	Largest number on one locality trip	Total number, all trips
Semipalmated Sandpiper	1	21	3830	12178
Red-backed Sandpiper	2	14	900	3864
Sanderling	3	16	833	2184
Short-billed Dowitcher	4	9	5000	5130
Semipalmated Plover	5	17	500	1197
Black-bellied Plover	6	15	500	795
Greater Yellow-legs	7	25	100	423
American Knot	8	11	500	1086
Ruddy Turnstone	9	13	300	663
Least Sandpiper	10	10	500	586
Killdeer	11	21	10	103
Hudsonian Curlew	12	1	500	500
Piping Plover	13	12	20	91
Spotted Sandpiper	14	14	15	77
Pectoral Sandpiper	15	3	20	43
Woodcock	16	3	4	12
Lesser Yellow-legs	17	2	5	6
Western Sandpiper	18	2	4	5
Wilson's Snipe	19	3	2	5
White-rumped Sandpiper	20	3	2	4
Upland Plover	21	1	1	1

TABLE 7
RANKING OF SHOREBIRDS ON NEW JERSEY COAST AND SALT MARSHES—
SOUTHBOUND FLIGHT OF 1935

	Rank	Times seen	Largest number on one locality trip	Total number, all trips
Semipalmated Sandpiper	1	92	1550	21430
Sanderling	2	52	1500	16473
Short-billed Dowitcher	3	70	1400	6758
Semipalmated Plover	4	77	510	5502
Lesser Yellow-legs	5	85	350	3629
Red-backed Sandpiper	6	27	1520	7609
Black-bellied Plover	7	76	440	2626
Hudsonian Curlew	8	30	1414	4337
Greater Yellow-legs	9	88	57	1183
Least Sandpiper	10	69	175	1295
Killdeer	11	89	24	690
American Knot	12	25	725	2161
Pectoral Sandpiper	13	56	80	635
Ruddy Turnstone	14	41	84	602
Spotted Sandpiper	15	55	48	551
Piping Plover	16	40	40	398
Western Sandpiper	17	46	37	349
Upland Plover	18	23	15	87
American Golden Plover	19	12	38	84
Stilt Sandpiper	20	23	15	60
Wilson's Snipe	21	19	10	52
White-rumped Sandpiper	22	26	4	40
Willet	23	20	6	51
Long-billed Dowitcher	24	9	12	34
Solitary Sandpiper	25	11	3	13
Baird's Sandpiper	26	5	3	7
Marbled Godwit	27	5	1	5
Hudsonian Godwit	28	3	2	5
Wilson's Phalarope	29	3	2	4
Purple Sandpiper	30	3	1	3
Woodcock	31	3	1	3
Red Phalarope	32	2	1	2
Wilson's Plover	33	2	1	2
Northern Phalarope	34	1	2	2
Buff-breasted Sandpiper	35	1	1	1

TABLE 8
RANKING OF SHOREBIRDS ON NEW JERSEY COAST AND SALT MARSHES—
SOUTHBOUND FLIGHT OF 1936

	Rank	Times seen	Largest number on one locality trip	Total number, all trips
Semipalmated Sandpiper	1	89	4000	33498
Sanderling	2	66	1110	18285
Short-billed Dowitcher	3	67	1370	6761
Lesser Yellow-legs	4	79	500	5970
Greater Yellow-legs	5	84	900	3151
Semipalmated Plover	6	82	281	5013
Red-backed Sandpiper	7	27	3000	13062
Least Sandpiper	8	73	300	1879
Hudsonian Curlew	9	31	1375	5028
American Knot	10	38	1100	3925
Black-bellied Plover	11	64	150	1752
Western Sandpiper	12	69	100	826
Killdeer	13	81	50	699
Pectoral Sandpiper	14	56	135	730
Ruddy Turnstone	15	53	64	693
Piping Plover	16	44	46	557
Willet	17	43	51	401
Spotted Sandpiper	18	58	25	377
Upland Plover	19	20	45	210
Stilt Sandpiper	20	15	22	133
Long-billed Dowitcher	21	8	30	71
American Golden Plover	22	13	17	56
White-rumped Sandpiper	23	18	5	35
Wilson's Snipe	24	9	4	17
Wilson's Phalarope	25	7	1	7
Purple Sandpiper	26	4	2	6
Solitary Sandpiper	27	6	1	6
Woodcock	28	3	1	3
Baird's Sandpiper	29	3	1	3
Northern Phalarope	30	3	1	3
Hudsonian Godwit	31	2	1	2
Marbled Godwit	32	1	1	1
Red Phalarope	33	1	1	1
American Oystercatcher	34	1	1	1
Long-billed Curlew	35	1	1	1

species have been ranked, as described previously (Urner, 1935: 87), and the ranking is subject to the same inaccuracies due to duplications and other factors.

TABLE 9
RANKING OF SHOREBIRDS ON NEW JERSEY COAST AND SALT MARSHES—
SOUTHBOUND FLIGHT OF 1937

	Rank	Times seen	Largest number on one locality trip	Total number, all trips
Semipalmated Sandpiper.....	1	58	1430	18114
Short-billed Dowitcher.....	2	36	2600	11233
Red-backed Sandpiper.....	3	33	2100	15351
Sanderling.....	4	53	1350	11141
Black-bellied Plover.....	5	57	1000	6911
American Knot.....	6	29	1600	8627
Semipalmated Plover.....	7	55	650	4255
Greater Yellow-legs.....	8	58	350	2673
Lesser Yellow-legs.....	9	56	270	2711
Hudsonian Curlew.....	10	22	1049	5055
Least Sandpiper.....	11	45	185	1076
Western Sandpiper.....	12	49	152	940
Killdeer.....	13	65	53	468
Ruddy Turnstone.....	14	37	107	730
Pectoral Sandpiper.....	15	29	114	633
Piping Plover.....	16	24	75	602
Spotted Sandpiper.....	17	37	33	326
White-rumped Sandpiper.....	18	17	35	129
Long-billed Dowitcher.....	19	13	40	117
Upland Plover.....	20	16	19	58
Willet.....	21	12	12	46
Wilson's Snipe.....	22	16	6	28
American Golden Plover.....	23	11	10	44
Stilt Sandpiper.....	24	11	6	23
Purple Sandpiper.....	25	6	5	16
Marbled Godwit.....	26	8	2	13
Solitary Sandpiper.....	27	8	1	8
Wilson's Phalarope.....	28	2	2	3
Hudsonian Godwit.....	29	2	1	2
Buff-breasted Sandpiper.....	30	2	1	2
Bar-tailed Godwit.....	31	2	1	2
Baird's Sandpiper.....	32	1	1	1
Northern Phalarope.....	33	1	1	1
Wilson's Plover.....	34	1	1	1
Curlew Sandpiper.....	35	1	1	1

We follow Rowan (1932) and Conover (1941) in maintaining the long-billed dowitcher as a separate species; and, as it has been established that the inland dowitcher, *Limnodromus griseus hendersoni*, occurs on the Atlantic coast in migration, it is desirable to use a vernacular to cover both races of the species. "Eastern dowitcher" is obviously inappropriate so we are using "short-billed dowitcher" which is appropriately descriptive and has the added advantage of

having been used previously. In both of these matters we are anticipating Pitelka's treatment of this genus.

Haematopus p. palliatus. American Oystercatcher.—One record, a single bird at Brigantine on September 19, 1936.

Charadrius h. semipalmatus. Semipalmated Plover.—Extreme dates: northbound, April 20 and June 8; southbound, June 15 (June 27) and January 17 (November 14). Principal movements: northbound, May 4 to June 4; southbound, July 30 to October 5. High counts: northbound, May 11, 17, 27, and 15; southbound, August 28, 31, and 14.

Charadrius m. melodus. Piping Plover.—Fall records indicate some increase over previous years. Extreme dates: March 14 and October 24. Principal southbound movement, July 4 to September 5. High counts: southbound, July 13, August 3, and July 17.

Charadrius w. wilsonia. Wilson's Plover.—Three records, September 4 and 5, 1935, and July 4, 1937, all single birds.

Charadrius v. vociferus. Killdeer.—Present all year. Numbers fairly constant. High counts: northbound, March 24, March 1, May 16, and March 27; southbound, August 30, November 8, and August 28.

Pluvialis d. dominica. American Golden Plover.—Numbers recorded vary greatly from year to year; peak of 1932 never approached again. Extreme dates: fall, July 29 and November 5. Principal movements: September 5 to October 2. High counts: southbound, September 28, September 18, and October 2.

Squatarola squatarola. Black-bellied Plover.—Present most or all the year. Apparently increasing in numbers. Principal movement: northbound, May 9 to 30; southbound, September 27 to December 5. High counts: northbound, May 18, 10, 23, and 15; southbound, September 30, November 15, and October 3.

Arenaria i. morinella. Ruddy Turnstone.—Extreme dates: northbound, February 22 and June 8; southbound, July 4 and February 7. Principal movement: northbound, May 15 to June 1; southbound, July 31 to September 8. High counts: northbound, June 1, May 30, May 29, and May 15; southbound, August 28, 15, and 14.

Philohela minor. American Woodcock.—Scattered records, on the coast. Extreme dates: March 13 and January 17.

Capella g. delicata. Wilson's Snipe.—Extreme dates: March 14 and May 17; August 8 and January 30. Principal movements not conclusively shown. High counts: northbound, April 14, 19, 11, and 9; southbound, November 3, December 27, and December 12.

Numenius a. americanus. Long-billed Curlew.—One bird seen on July 26, 1936, at Absecon in company with Hudsonian curlew with which it was compared.

Numenius p. hudsonicus. Hudsonian Curlew.—Further increase indicated. Extreme dates: northbound, April 20 and June 7; southbound, June 29 and October 10. Principal movements: northbound, May 2 to 18; southbound, July 3 to August 17. High counts: northbound, May 11, 10, 9, and 15; southbound, July 27, August 1, and July 31.

Bartromia longicauda. Upland Plover.—Numbers recorded vary considerably from year to year. Flight of 1936 largest recorded, indicating some increase. Principal movement: south, July 11 to August 22; latest, September 12. High counts, southbound, August 17, July 15, and August 12.

Actitis macularia. Spotted Sandpiper.—Extreme dates: April 20 and September

19. Principal southbound movement, July 6 to August 29. High counts, southbound, August 3, 5, and 14.

Tringa s. solitaria. Solitary Sandpiper.—Extreme dates: northbound, May 2 and 18; southbound, July 13 and September 18.

Caioptrophorus semipalmatus. Willet.—Extreme dates: spring, May 5 and June 7; fall, July 19 and October 17. Principal movement, August 10 to September 5. High counts, August 28, 11, and 28.

Totanus melanoleucus. Greater Yellow-legs.—A pronounced increase indicated. Extreme dates: northbound, February 27 and June 13; southbound, June 15 and January 17. Principal movements: northbound, April 11 to May 25; southbound, August 1 to November 1. High counts: northbound, April 28, April 11, May 8, and May 6; southbound, August 24, October 12, and October 10.

Totanus flavipes. Lesser Yellow-legs.—Extreme dates: northbound, April 23 and June 11, with a maximum of 40 on June 8, 1937; southbound, June 26 and December 1. Principal movements: northbound, April 24 to June 13; southbound, July 15 to September 27. High counts, southbound, September 5, July 29, and August 21.

Calidris c. rufus. American Knot.—Large increase in numbers over previous years. Extreme dates: northbound, February 22 and June 13; southbound, July 4 and February 7. Principal movements: northbound, May 9 to June 7; southbound, July 24 to November 1. High counts: northbound, May 25, 30, 29, and June 5; southbound, July 27, August 8, and July 31.

Erolia maritima. Purple Sandpiper.—Extreme dates, November 7 and May 23.

Erolia melanotos. Pectoral Sandpiper.—Spring records more numerous, March 19 to May 18. Extreme dates, southbound, July 17 and December 1. Principal southbound movement, July 25 to October 11. High counts, southbound, September 6, July 25, and August 28.

Erolia fuscicollis. White-rumped Sandpiper.—Extreme dates: northbound, April 27 and June 8; southbound, June 15 and November 11. Principal movements: northbound, May 9 to 30; southbound, August 28 to October 20. High counts: northbound, May 11, 10, 23, and 28; southbound, September 3, June 15, and September 4.

Erolia bairdii. Baird's Sandpiper.—No spring records. Extreme dates, August 17 and September 7. High counts, August 30 and September 5.

Erolia minutilla. Least Sandpiper.—Extreme dates: northbound, April 18 and June 13; southbound, June 15 and October 27. Principal movements: northbound, May 4 to 30; southbound, July 4 to August 4. High counts: northbound, April 20, May 30, May 16, and May 15; southbound, August 3, July 18, and July 17.

Erolia ferruginea. Curlew Sandpiper.—One seen at Beach Haven on October 3, 1937.

Erolia a. pacifica. Red-backed Sandpiper.—A large increase in numbers shown. Extreme dates, July 13 and June 15. High counts: northbound, May 11, March 8, March 6, and March 20; southbound, October 20, November 15, and October 3.

Limnodromus g. griseus and *L. g. hendersoni*. Short-billed Dowitcher.—Still increasing in numbers. Extreme dates: northbound, April 19 and June 8; southbound, June 21 and December 22. Principal movements: northbound, May 4 to 25; southbound, July 6 to August 24. High counts: northbound, May 11, 10, 16 and 15; southbound, July 27, 25 and 18.

Limnodromus scolopaceus. Long-billed Dowitcher.—First spring records, April 18 and May 2, 1937. Number of records increasing. Extreme dates, August 16 and

November 10. Principal movements, southbound, September 19 to October 27. High counts, October 13, September 27, and October 10.

Micropalama himantopus. Stilt Sandpiper.—Five spring records, all single birds, April 28 to May 16. Extreme dates, southbound, July 8 and October 20. Principal movements, July 22 to September 12. High counts, September 6, July 29, and August 12.

Ereunetes pusillus. Semipalmated Sandpiper.—Extreme dates: northbound, April 28 and June 15; southbound, June 27 and January 17. Principal movements: northbound, May 10 to June 7; southbound, July 13 to September 30. High counts: northbound, May 11, 30, 16, and June 5; southbound, August 28, July 29, and July 31.

Ereunetes mauri. Western Sandpiper.—Extreme dates: northbound, February 22 and May 30; southbound, July 4 and February 12. Principal movements: northbound, May 5 to 15; southbound, July 17 to September 26. High counts: northbound, May 11, 16, and 15; southbound, September 4, July 25, and September 19.

Tryngites subruficollis. Buff-breasted Sandpiper.—Three records, all single birds, August 30, 1935, and August 22 and 28, 1937.

Limosa fedoa. Marbled Godwit.—No spring records. Extreme dates, August 15 and January 9.

Limosa l. lapponica. Bar-tailed Godwit.—One bird seen July 18 and August 14, 1937, at Absecon.

Limosa haemastica. Hudsonian Godwit.—No spring records during this period. Extreme dates, August 23 and October 12.

Crocethia alba. Sanderling.—Large increase in numbers noted. Extreme dates, July 4 and June 15. Principal movements: northbound, May 8 to June 5; southbound, July 17 to November 24. High counts: northbound, May 11, 30, 9, and June 5; southbound, October 20, August 14, and September 4.

Phalaropus fulicarius. Red Phalarope.—Spring, one on May 4, 1935, and one on May 2, 1937. Fall, one each on September 6 and October 6, 1935, and October 4, 1936.

Steganopus tricolor. Wilson's Phalarope.—No spring records for this period. Extreme dates, southbound, August 7 and September 19.

Lobipes lobatus. Northern Phalarope.—One spring record, May 2, 1937. Extreme dates, southbound, August 14 and October 4.

TEN-YEAR SUMMARY, 1929 TO 1938

In summarizing material of this nature, one is tempted to express the noticed changes in abundance in precise mathematical terms. It must be remembered, however, that the variables involved are large, both in number and extent. For instance, it is possible to witness the main flight of a species one year and to miss it completely the next. Favorable weather and feeding conditions may be responsible for keeping large migrating flocks in an area for considerable periods in one year, and unfavorable conditions may force large flocks to pass quickly over the same area in another year. The principal migration routes for several species may vary from year to year. And finally, the data were not standardized. The total number and seasonal distribution of trips and the proportional number of trips to

each locality were not the same from year to year. For these and other less tangible reasons, numerical analyses which would be misleadingly exact have been avoided.

In the ten-year period, 41 species and subspecies of shorebirds have been recorded. Of these, 31 were observed on the northbound migration and all 41 on the southbound flight.

In order to present a picture of the relative abundance of the species observed toward the close of the ten-year period, the rankings of the commoner species for the last five years were averaged. Average rankings for the rarer species were determined by examination of the totals for numbers seen and number of times seen. The average ranking for the spring migrations for the years 1934 to 1938 follows:

ABUNDANT OR VERY COMMON

- | | |
|---------------------------|-------------------------|
| 1. Semipalmated Sandpiper | 4. Black-bellied Plover |
| 2. Short-billed Dowitcher | 5. Semipalmated Plover |
| 3. Red-backed Sandpiper | |

COMMON OR LOCALLY ABUNDANT

- | | |
|------------------------|----------------------|
| 6. Greater Yellow-legs | 9. Least Sandpiper |
| 7. American Knot | 10. Ruddy Turnstone |
| 8. Sanderling | 11. Hudsonian Curlew |

FREQUENTLY OBSERVED BUT NOT NUMEROUS

- | | |
|-------------------|-----------------------|
| 12. Killdeer | 14. Spotted Sandpiper |
| 13. Piping Plover | |

UNCOMMON

- | | |
|----------------------------|------------------------|
| 15. American Woodcock | 18. Wilson's Snipe |
| 16. Lesser Yellow-legs | 19. Pectoral Sandpiper |
| 17. White-rumped Sandpiper | 20. Solitary Sandpiper |

RARE

- | | |
|-----------------------|-------------------|
| 21. Western Sandpiper | 24. Upland Plover |
| 22. Purple Sandpiper | 25. Willet |
| 23. Stilt Sandpiper | |

VERY RARE

- | | |
|----------------------------|------------------------|
| 26. Long-billed Dowitcher† | 29. Wilson's Phalarope |
| 27. Red Phalarope | 30. Hudsonian Godwit* |
| 28. Northern Phalarope | 31. Golden Plover* |

* Not seen 1934-38.

† Probably due to failure to identify.

The average ranking for the fall migrations for the years 1933 to 1937 follows. For comparison with the years 1928 to 1934, see Urner (1935: 88).

ABUNDANT OR VERY COMMON

- | | |
|---------------------------|-------------------------|
| 1. Semipalmated Sandpiper | 4. Lesser Yellow-legs |
| 2. Short-billed Dowitcher | 5. Semipalmated Plover |
| 3. Sanderling | 6. Red-backed Sandpiper |

COMMON OR LOCALLY ABUNDANT

- | | |
|-------------------------|------------------------|
| 7. Least Sandpiper | 12. American Knot |
| 8. Black-bellied Plover | 13. Pectoral Sandpiper |
| 9. Greater Yellow-legs | 14. Western Sandpiper |
| 10. Killdeer | 15. Ruddy Turnstone |
| 11. Hudsonian Curlew | |

FREQUENTLY OBSERVED BUT NOT NUMEROUS

- | | |
|-----------------------|-------------------|
| 16. Spotted Sandpiper | 17. Piping Plover |
|-----------------------|-------------------|

UNCOMMON

- | | |
|----------------------------|---------------------------|
| 18. Upland Plover | 22. Golden Plover |
| 19. Stilt Sandpiper | 23. Wilson's Snipe |
| 20. Willet | 24. Solitary Sandpiper |
| 21. White-rumped Sandpiper | 25. Long-billed Dowitcher |

RARE

- | | |
|------------------------|-----------------------------|
| 26. Wilson's Phalarope | 30. Hudsonian Godwit |
| 27. Marbled Godwit | 31. Northern Phalarope |
| 28. Purple Sandpiper | 32. American Woodcock |
| 29. Baird's Sandpiper | 33. Buff-breasted Sandpiper |

VERY RARE

- | | |
|-----------------------|----------------------------|
| 34. Red Phalarope | 38. American Oystercatcher |
| 35. Wilson's Plover | 39. Long-billed Curlew |
| 36. Curlew Sandpiper | 40. American Avocet* |
| 37. Bar-tailed Godwit | 41. Ruff* |

* Not seen 1933-37.

The great mass of data collected by the senior author has made possible some interesting contributions to our knowledge of the times of migration and relative abundance of our shorebirds. Table 10 summarizes the time of principal migration of the most numerous species. Extreme dates of occurrence, which have been overstressed in most local lists, are of little significance as they are based to a greater or less extent on "freak" occurrences. For this reason they have been omitted from the table. Anyone interested will find them entered in the annotated lists in this and in Urner's previous papers (1929, 1930, 1931, 1932, 1935).

Three figures have been prepared to show the relative abundance of several species throughout the year. These figures were plotted from data collected in the last three and one-half years of the study. Enough counts were made from late April through early October to permit averaging the counts for thirds of months in this period. For the rest of the year, monthly averages were computed. In calculating the data for the knot and the sanderling, trips to localities where no suitable habitat was present, as at Newark Meadows and Tuckerton, were omitted from the averages. All trips were averaged in the data for

the other species. It is hoped that the figures will give the observer an idea of the seasonal fluctuations in numbers occurring in these species and will provide a basis for comparing the flights of the years 1935 through 1938 with those of future years. In using these figures, however, several points should be kept in mind. First, shorebirds, like warblers, come through in waves, but the averaging of the seasonal abundance for several years will, for the most part, obliterate indications of these waves. Second, due to the irregularities in the numbers of trips to different localities, equal sampling of habitats was not

TABLE 10

TIMES OF PRINCIPAL MIGRATION OF SHOREBIRDS ON THE NEW JERSEY COAST

<i>Species</i>	<i>Spring</i>	<i>Fall</i>
Semipalmated Plover.....	May 4 to June 4	July 28 to Oct. 5
Piping Plover.....	—	July 4 to Sept. 9
Golden Plover.....	—	Sept. 5 to Oct. 2
Black-bellied Plover.....	May 7 to May 30	Aug. 21 to Dec. 5
Ruddy Turnstone.....	May 14 to June 1	July 31 to Sept. 8
Hudsonian Curlew.....	May 2 to May 27	July 3 to Sept. 3
Upland Plover.....	—	July 20 to Aug. 30
Spotted Sandpiper.....	—	July 6 to Sept. 3
Willet.....	—	Aug. 2 to Sept. 8
Greater Yellow-legs.....	Apr. 11 to May 25	July 30 to Nov. 1
Lesser Yellow-legs.....	Apr. 24 to June 13	July 12 to Oct. 1
American Knot.....	May 9 to June 7	July 14 to Nov. 1
Pectoral Sandpiper.....	—	July 23 to Oct. 11
White-rumped Sandpiper.....	May 7 to May 30	Aug. 28 to Oct. 20
Least Sandpiper.....	Apr. 29 to May 30	July 2 to Sept. 22
Red-backed Sandpiper.....	—	Sept. 30 to May 11
Short-billed Dowitcher.....	Apr. 29 to May 25	July 6 to Aug. 25
Long-billed Dowitcher.....	—	Sept. 6 to Oct. 27
Stilt Sandpiper.....	—	July 19 to Sept. 30
Semipalmated Sandpiper.....	May 7 to June 7	July 13 to Sept. 30
Western Sandpiper.....	May 5 to May 25	July 16 to Sept. 26
Sanderling.....	May 8 to June 5	July 12 to Nov. 24

obtained; hence, the figures are in no sense precise representations. And third, the data obtained in the winter months were not comparable in bulk to those obtained in other seasons of the year. In spite of these shortcomings, it is believed that the figures show some points of possible biological importance and may stimulate further work.

Figure 1 illustrates the seasonal abundance of three species which migrate through New Jersey. The spring migration is typically of shorter duration, and thus the number observed at the peak of this migration is larger than that seen in the fall peak.

Pitelka (MS) has found, on the basis of existing specimens, that the fall migration of young long- and short-billed dowitchers takes place over a relatively protracted period. In adults, both in spring and fall, the migration appears to occur over a briefer period. The early

fall peak in the short-billed dowitcher and semipalmated sandpiper may thus represent the main flight of adult birds, and the gradual slope of the curve subsequent to the main peak may be due to the more extended migration of the young. Further work on existing collections, and more collecting, may prove this to be the rule in many species of shorebirds.

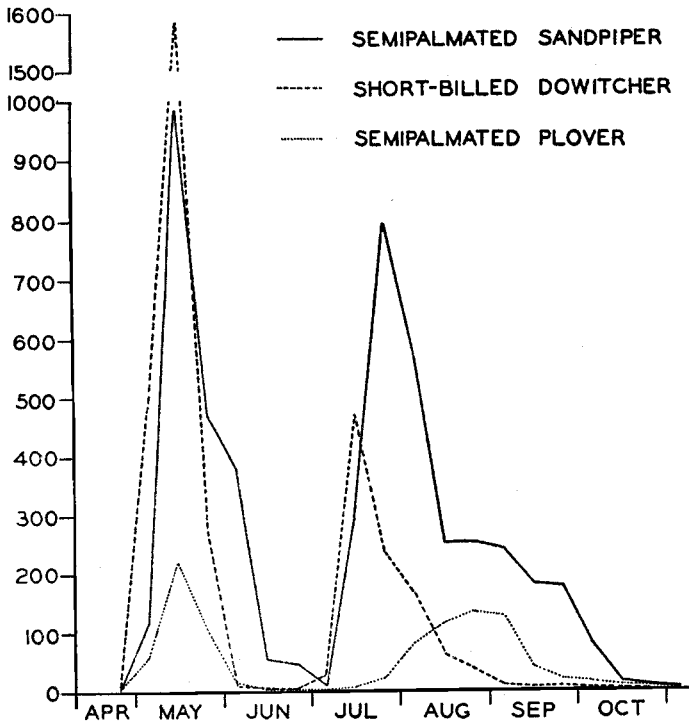


FIGURE 1. Relative abundance of semipalmated sandpiper (*Ereunetes pusillus*), semipalmated plover (*Charadrius h. semipalmatus*), and short-billed dowitcher (*Limnodromus griseus*) on the New Jersey coast. Numbers are average number seen per trip.

The curve for the least sandpiper (Fig. 2) follows the same general pattern as those shown on Figure 1. In the Hudsonian curlew, the greatest peak comes in the fall migration. A possible explanation might be that large flocks of this species do not stop in this area in the spring flight as they regularly do in the fall. The rather high point in early July is due to what is probably a "freak" record of 1000 birds on July 3, 1937. The curve for the lesser yellow-legs is typical for a species which migrates up the Mississippi Valley in the spring and

down the Atlantic coast in the fall. In the case of the greater yellow-legs, the fact that the peak is higher in the fall than in the spring may mean that some populations of this species follow a path similar to that of the lesser yellow-legs, while other populations use the Atlantic coast route exclusively. This, of course, remains to be proved. The average seasonal difference in migration between the latter two species is well shown in the graph.

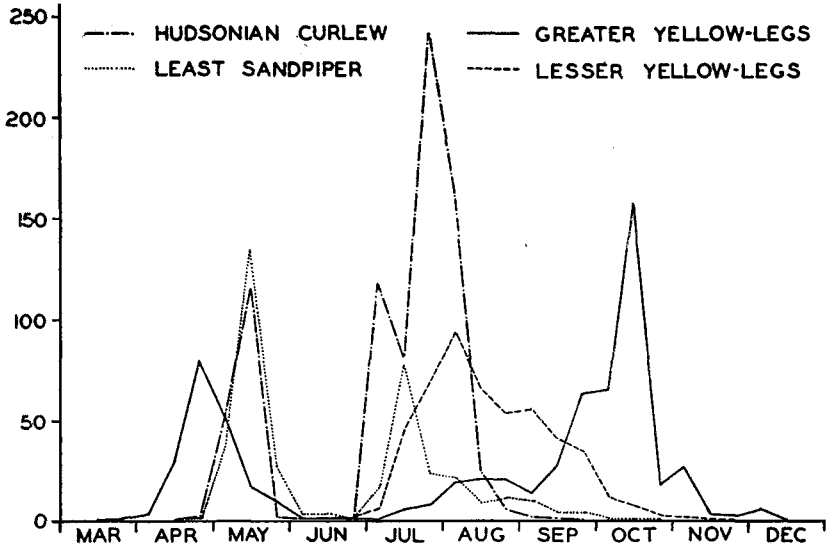


FIGURE 2. Relative abundance of Hudsonian curlew (*Numenius p. hudsonicus*), least sandpiper (*Erolia minutilla*), greater yellow-legs (*Totanus melanoleucus*) and lesser yellow-legs (*Totanus flavipes*) on the New Jersey coast. Numbers are average number seen per trip.

Figure 3 shows curves of abundance for four species which are common migrants and uncommon to common winter residents. The double peaks, for the black-bellied plover, knot, and sanderling in the fall, may be indicative of flights of adults and young birds in that sequence.

One of the striking conclusions to be drawn from the observations is that there has been a general increase of shorebirds in the course of the ten-year period. None of the common species, with the possible exception of the ruddy turnstone, could be said to have decreased in numbers. On the other hand, the most conspicuous increase was that shown by the red-backed sandpiper which increased ten- to twenty-fold in numbers between 1928 and 1938. The short-billed dowitcher, sanderling, knot and western sandpiper showed large increases, al-

though in the last species the apparent increase might be due, at least in part, to observers becoming more familiar with the species through the study period. The black-bellied plover, Hudsonian curlew, greater yellow-legs, and piping plover increased substantially, and there appeared to have been an increase in the flights of willets and upland plovers. The numbers of the remaining species either remained relatively constant throughout the period or fluctuated so greatly that a trend could not be determined.

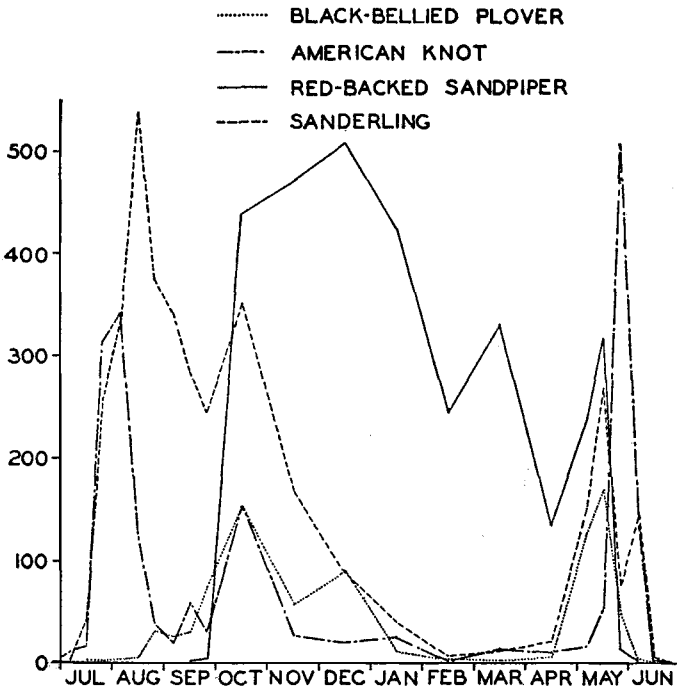


FIGURE 3. Relative abundance of black-bellied plover (*S. squatarola*), American knot (*Calidris c. rufus*), red-backed sandpiper (*Erolia a. pacifica*), and sanderling (*Crocethia alba*) on New Jersey coast. Numbers are average number seen per trip.

It is interesting to note that the increases in numbers are most noticeable in the medium-sized and large species. The accompanying table (Table 11) indicates a continuation of the trends shown by the similar table already published by Urner (1932: 474). For the sake of uniformity, this table has been prepared in the same manner as its predecessor from which the figures for the year 1928 were taken for comparison.

From this table it is obvious that the species which have increased

the most are, for the most part, those which in the past bore the brunt of the hunting pressure. Possible exceptions are the red-backed sandpiper and sanderling. However, the presence of these species in New Jersey through the winter, when the larger and more desirable game species had moved south, may have made these two species more frequent targets than they might otherwise have been.

TABLE 11
OCCURRENCE OF SHOREBIRDS BY SIZE GROUPS IN THE
FALL FLIGHTS IN NEW JERSEY

<i>Year</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>Total birds</i>
1928	35134	12194	3074	50402
1932	35662	33243	4039	72944
1933	63331	28888	3169	95388
1934	22333	22590	4864	49787
1935	29574	38902	8207	76683
1936	42191	50635	10337	103163
1937	25444	51195	14702	91341
<i>Year</i>	<i>Per cent small</i>	<i>Per cent medium</i>	<i>Per cent large</i>	<i>Total</i>
1928	69.7	24.2	6.1	100
1932	48.9	45.6	5.5	100
1933	66.4	30.3	3.3	100
1934	44.8	45.4	9.8	100
1935	38.5	50.8	10.7	100
1936	40.8	49.2	10.0	100
1937	27.8	56.1	16.1	100

The senior author's series of studies was begun when, for the first time in many years, there was little or no persecution by man of shorebirds on the New Jersey coast. The increase in numbers of these birds subsequent to the cessation of shooting is gratifying. However, it cannot be hoped that these birds will ever re-attain their former numbers. The arctic and subarctic breeding grounds of the majority of the species remain essentially unchanged. The limiting factors are, therefore, those imposed by the habitats used during the migration and wintering seasons. The continual draining, filling, and dredging operations on mud flats and salt marshes in this state are constantly reducing the available habitat for shorebirds.

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