

THE AUK

A QUARTERLY JOURNAL OF ORNITHOLOGY

VOL. 76

APRIL, 1959

No. 2

A TWENTY YEAR BANDING STUDY OF THE PIPING PLOVER

BY LE ROY WILCOX

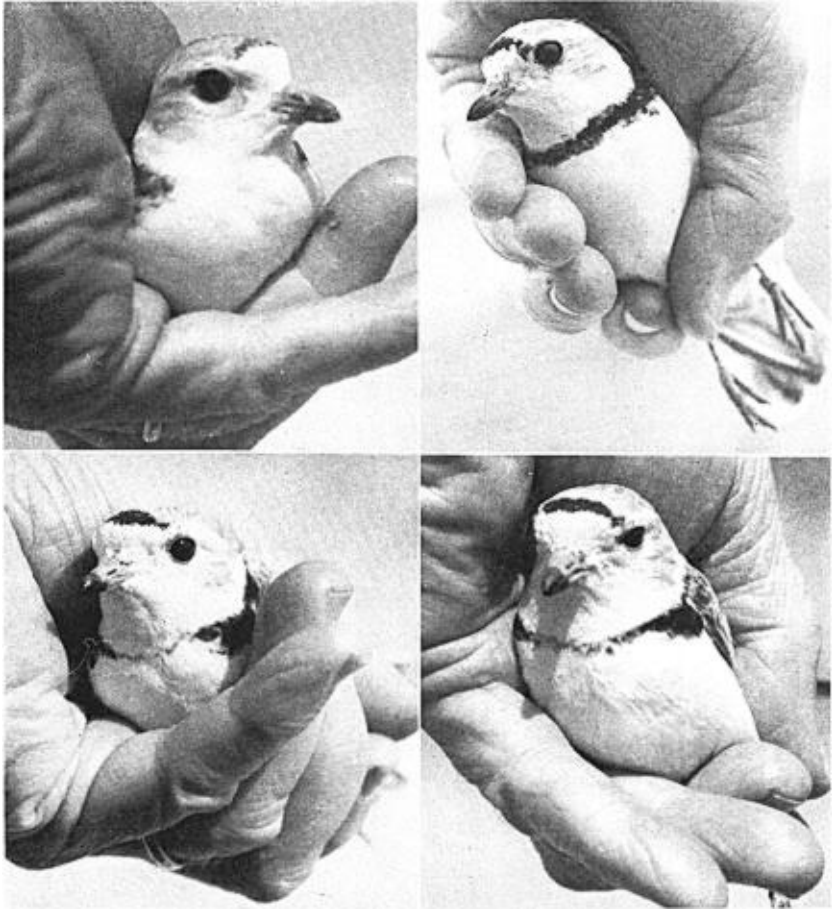
Relatively little has been published about the life history of the Piping Plover (*Charadrius melodus*). The account by Tyler (*in* Bent, 1929: 236-246) is brief. Banding is probably the best means of learning the intimate details of the home life of many birds. The initial work of this nature with the Piping Plover began in 1911 with the banding of a young bird by Howard Cleaves on Gardiner's Island, off eastern Long Island, New York. For the next twenty-six years, until 1937, Fish and Wildlife records indicate that only 275 young were banded, of which there were but two returns.

In 1937 I started systematic trapping of as many adult nesting Piping Plovers as possible, in an effort to learn various aspects of their life history. Up to that time we did not know the incubation period, whether both sexes incubated, whether more than one brood was reared in a season, whether the adults nested in the same general locality from year to year, whether birds returned to the nest in the area where they were hatched, or whether the sexes could be identified in the field. Between 1937 and 1958 I banded a total of 1,723 individuals in an area on the south shore of eastern Long Island, New York. Only my results for the first two years—1937 and 1938—have been published (Wilcox, 1939). This is a summary of the salient results.

For comparative purposes, I checked the files of the Bird Banding Office, United States Fish and Wildlife Service, for all banding records of the Piping Plover up to December, 1956.

NUMBERS BANDED AND RETURNS

By July, 1958 I had banded 744 adults and 979 young. The annexed Table 1 shows details as to my own banding and return



Types of chest markings in Piping Plover (*Charadrius melodus*) trapped on nests on Long Island, New York. *Above left*: 'White gap.' Male, May 9, 1957. Banded as adult 1956, returned 1957, 1958. *Above right*: 'Full belt.' Male. June 8, 1951. Banded as adult 1950, returned 1951, 1952. *Below left*: 'Intermediate' with light connecting ring. Male. June 3, 1955. Banded as adult 1955. *Below right*: 'Intermediate' with medium connecting ring. Male. May 24, 1956. Banded as adult 1951, returned 1953, 1956, 1957. (Photos. by L. Wilcox.)

data by years. Up to July, 1958, omitting 71 young and 57 adults banded that year, my returns were 433 out of 1,595 banded—amounting to about 27%.

Up to December, 1956 the total number of Piping Plovers reported banded in the United States and Canada by 80 banders was 2,377, of which I had banded 1,504. Of the 662 adults banded, I had banded 642. The remaining 1,715 were young, of which I had banded 862 (979 by July 1958). By far the largest numbers have been banded in the three states of New York, Massachusetts and New Jersey.

New York heads the list to December 1956 with 1,934, of which 1,910 were banded on Long Island. Massachusetts is next with 207, and New Jersey with 118. Other banding areas were: Canada 31, Michigan 30, Ohio 12, Maryland 10, Rhode Island 8, Pennsylvania 7, New Hampshire 5, Minnesota 5, Wisconsin 4, Virginia 3, Illinois 2, and Maine 1.

Up to December, 1956 the total number of all returns for this species was 390; of these 380 bore my bands. This is the largest number of returns of any North American shorebird.

Of the 433 returns bearing my bands 425 were trapped by me on their nests; 5 were found dead on their nesting grounds during the nesting season (killed by cars or by flying into telephone wires); and 3 were collected by other persons, two of them near the area where they previously nested.

The 5 found dead were as follows: female banded on June 3, 1939 at Moriches Bay and found dead on May 24, 1940, 102 feet from its nest; male banded on June 3, 1939 at Moriches Bay (retrapped there on June 1, 1940 and May 31, 1941) and found dead there on May 13, 1942, 57 feet from its 1941 nest; female banded on May 17, 1941 at Shinnecock Bay and found dead there on June 2, 1944, 200 feet from its 1941 nest; male banded on May 19, 1944 at Moriches Bay (retrapped there on May 12, 1945) and found dead there on April 3, 1948, 300 feet from its 1944 nest; female banded on May 31, 1947 at Shinnecock Bay and found dead there on June 24, 1948, about 9,430 feet west of its 1947 nest.

The 3 collected were as follows: female banded on June 21, 1940 at Moriches Bay and collected on April 2, 1941 at Hog Island, Virginia, probably on its way north to nest again on Long Island as it had done the previous year; banded as young on June 13, 1947 at Shinnecock Bay, trapped on its nest on June 24, 1950 as full belted male at Moriches Bay and collected on August 28, 1954 at Moriches Inlet, about two miles west of where it nested in 1950; male banded on June 9, 1950 at Moriches Inlet and collected there on July 31, 1954.

The ten returns of birds banded by others were all banded when young: banded June 12, 1924 at Barnstable, Massachusetts, shot April 3, 1926 at Isle of Palms, South Carolina; banded July 11, 1933 at Seabrook, New Hampshire, and shot there for specimen on August 21, 1933; banded July 3, 1938 at Oak Island, Long Island, New York and found dead on August 27, 1938 at Gilgo, Long Island, New York; banded July 14, 1939 at Atlantic Beach, Long Island, New York, and trapped by me on its nest on June 29, 1940 at Shinnecock Bay, Long Island, New York;

TABLE 1
PIPING PLOVER BANDED AND RETURNS

Year	Young Banded	New Adults Banded	Returns on Nests	Total Adults Trapped on Nests	Nesting Area	Extent of Nesting Area-Miles	No. Nests	% Known Nesting Adults Trapped
1936	1	—	—	—	Mo	—	—	—
1937	21	12	—	12	Mo	1	9	66
1938	42	29	7	36	Mo	2	20	90
1939	42	37	9	46	Mo-Sh	17	25	92
1940	98	82	30+(1)	113	Mo-Sh	17	60	94
1941	162	75	44+(1)	120	Mo-Sh	17	64	93
1942	101	42	56	98	Mo-Sh	17	54	90
1943*	—	2	5	7	Mo	1/2	4	90
1944	38	53	21	74	Mo-Sh	17	41	90
1945*	3	3	2	5	Mo	1	3	83
1946*	—	—	—	—	—	—	—	—
1947	85	43	10	53	Mo-Sh	17	28	94
1948	43	44	19	63	Mo-Sh-Me	22	34	92
1949	62	62	19	81	Mo-Sh-Me	22	45	90
1950	60	57	41	98	Mo-Sh-Me	22	55	89
1951	25	28	28	56	Sh-Me	14	32	86
1952	16	17	25	42	Sh-Me	14	23	91
1953	2	12	14	26	Sh-Me	14	17	76
1954	6	7	11	18	Sh-Me	14	9	100
1955	20	20	16	36	Sh-Me	14	20	90
1956	25	17	15	32	Sh-Me	14	18	86
1957	46	45	16	61	Mo-Sh-Me	22	34	90
1958	71	57	37+(1)	95	Mo-Sh-Me	22	50	95
Total	969	744	425+(3)	1172			645	91

Omitted are 10 birds banded by me as young in 1929 and 1931 on Long Island, only 4 of which were banded (in 1929) within the area; none were retrapped. Not included under Returns are 5 of my banded birds found dead or known to have been collected. The figures in parentheses under Returns indicate birds trapped by me which had been originally banded outside the nesting area by others. "Mo" = Moriches; "Sh" = Shinnecock; "Me" = Mecox.

* As a result of gasoline limitations during war years, very little trapping was done in 1943 and 1945, and none in 1946.

TABLE 2
RETURNS OF SHOREBIRDS Banded IN NORTH AMERICA TO DEC. 1956

<i>Species</i>	<i>No. Banded</i>	<i>No. Returns</i>	<i>Percentage</i>
American Oystercatcher (<i>Haematopus palliatus</i>)	69	1	1.4
Semipalmated Plover (<i>Charadrius semipalmatus</i>)	654	1	.1
Piping Plover (<i>Charadrius melodus</i>)	2,377	390 (375)*	16.4
Wilson's Plover (<i>Charadrius w. wilsonia</i>)	96	2	2.0
Killdeer (<i>Charadrius v. vociferus</i>)	4,429	43 (7)	1.0
American Golden Plover (<i>Pluvialis dominica</i>)	49	1	2.0
Black-bellied Plover (<i>Squatarola squatarola</i>)	23	2	8.7
Ruddy Turnstone (<i>Arenaria interpres morinella</i>)	92	2	2.1
American Woodcock (<i>Philohela minor</i>)	9,070	300	3.3
Common (Wilson's) Snipe (<i>Capella gallinago delicata</i>)	1,099	36	3.3
Long-billed Curlew (<i>Numenius americanus</i>)	105	3	2.9
Whimbrel (Hudsonian Curlew) (<i>Numenius phaeopus hudsonicus</i>)	20	1	5.0
Upland Plover (<i>Bartramia longicauda</i>)	247	2	.8
Spotted Sandpiper (<i>Actitis macularia</i>)	4,311	39 (2)	.9
Willet (<i>Catoptrophorus semipalmatus</i>)	445	4	.9
Greater Yellowlegs (<i>Totanus melanoleucus</i>)	319	6	1.8
Lesser Yellowlegs (<i>Totanus flavipes</i>)	764	5	.6
Knot (<i>Calidris canutus rufa</i>)	23	2	8.7
Pectoral Sandpiper (<i>Erolia melanotos</i>)	515	1	.2
Least Sandpiper (<i>Erolia minutilla</i>)	6,989	169	2.4
Dunlin (Red-backed Sandpiper) (<i>Erolia alpina arctica</i>)	363	3	.8
Short-billed Dowitcher (<i>Limnodromus griseus</i>)	434	4	.9
Semipalmated Sandpiper (<i>Ereunetes pusillus</i>)	12,593	91	.7
Western Sandpiper (<i>Ereunetes mauri</i>)	2,113	4	.2
Marbled Godwit (<i>Limosa fedoa</i>)	277	7	2.5
Sanderling (<i>Crocethia alba</i>)	310	2	.6
American Avocet (<i>Recurvirostra americana</i>)	369	2	.6
Black-necked Stilt (<i>Himantopus mexicanus</i>)	300	4	1.3
Other Species	823	—	—

* Figures in parentheses indicate number of birds retrapped as returns on their nests in a subsequent year.

banded July 15, 1939 at Oak Beach, Long Island, New York and trapped by me on its nest on May 10, 1941 at Shinnecock Bay, Long Island, New York; banded July 15, 1939 at Oak Beach, Long Island, New York, and found injured on March 22, 1942 at Hunting Island Beach, Beaufort County, South Carolina; banded July 13, 1941 at Penn Yan, New York and trapped over its young on July 7, 1943 at Long Point Beach, Ontario, Canada; banded July 12, 1947 at Ocean City, Maryland and found dead on October 22, 1947 at Sword Fish Creek, Great Bahama Island; banded on July 24, 1954 at Beach Haven, New Jersey and shot on September 8, 1954 at Holgate, New Jersey; banded on June 17, 1956 at Mackinaw City, Michigan and shot at same place on July 5, 1956.

Aside from the Piping Plover, apparently no banding has been done of shorebirds on their nests, except for a few Spotted Sandpipers (*Actitis macularia*) and Killdeer (*Charadrius vociferus*). Of the 49,278 individuals of 47 species of shorebirds banded in the United States and Canada up to December, 1956, there have been 1,127 returns, or 2.3 per cent. Of this total, 2,377 represented Piping Plovers, of which there had been 390 returns to December, 1956, or 16.4 per cent. On the attached Table 2 are the comparative results of banding of shorebirds in North America. In Table 2, the percentage figure of 1956 is computed, to simplify comparison, by dividing the total returns by the total banded, though a more correct method might be to omit birds newly banded in the last year of computation, since there could be no returns of those birds on the nest the same year.

The much greater percentage of returns of Piping Plover is undoubtedly the result of the greater number of adults of this species trapped on their nests. Of 1,504 Piping Plovers banded by me, up to December, 1956 I had had 380 returns, or 25.2 per cent. Of the 873 Piping Plovers banded by others, very few of them on their nests, there had been only 10, or 1.1 per cent, of returns. The probability

TABLE 3
RETURNS OF SPOTTED SANDPIPER AND KILLDEER BANDED ON NESTS

Locality	Banded	Retrapped	Distance from Nest
SPOTTED SANDPIPER			
Quebec, Canada	June 15, 1950	June 27, 1952	100 feet
Quebec, Canada	June 15, 1951	July 5, 1952	50 feet
KILLDEER			
Mayfield Heights, Ohio	June 14, 1929	May 13, 1931	"about same spot"
Manorville, New York	June 4, 1937	May 31, 1938	100 feet
Long Beach, California	May 15, 1940	May 15, 1941	"about same spot"
Montreal, Canada	June 4, 1944	June 15, 1946	2,000 feet
Montreal, Canada	June 8, 1945	June 13, 1948	500 feet
Collegeville, Indiana	April 21, 1947	June 13, 1948	100 feet
Montreal, Canada	May 17, 1953	April 21, 1954	2,000 feet

that other shorebirds also return to nest in the same localities in successive years is suggested by the scanty returns of Killdeer and Spotted Sandpiper (Table 3).

TRAPPING

In the large majority of trappings, the bird caught first on the nest when released would start flying around the area, calling to locate its mate, which would then go on the nest. Some males and females remained on the nest after the trap dropped over them, but most, though first moving off, in a few seconds went back on the nest to incubate the eggs. There were no fatalities in the trapping of any adults on their nests. In several instances both nesting birds were caught together on the nest.

The quickest and easiest way to find nests is to retire to a car, or other place of concealment and watch the adults with binoculars. They will soon go back to the nest, if one is at least 300 feet from the nest. For example, in 1943 I started operations on May 15 and found 17 nests, of which 11 were found in one hour. Seven adults were trapped that first day on their nests.

I use drop traps about thirty inches square and four inches high of one-quarter inch mesh wire. One side of the trap is rested on the ground while a stick under the opposite side raises it about seven to eight inches above the ground. It is very important to place the trap so that the nest is near the back part of the trap and the stick must be resting on a large piece of shell or other hard object on the ground or else the stick will dig into the sand and the trap will not drop quickly or properly. The string is tied to the bottom of the stick and must be run out 300 to 500 feet from the nest to a convenient hiding place. On windy days the back part of the trap must be worked down into the sand and small piles of sand placed at each corner of the back part of the trap. The average time required to trap 206 males was 9.2 minutes each and for 206 females 10.5 minutes.

NESTING AREA

Piping Plovers on Long Island favor dry sandy outer beaches. They normally arrive on their nesting grounds in this area during the last week in March (for the status on Long Island, see Cruickshank, 1942: 168-170).

For the first year (1937) of my study, the Piping Plover nesting area was a one mile stretch of outer beach, and in 1938 a two mile stretch of such beach, just east of Moriches Inlet, between the Atlantic Ocean and Moriches Bay on the south shore of Long Island, New York, about 70 miles east of New York City. In 1929, when I banded my first young, only two or three pairs had been nesting at Moriches Bay and one pair at Shinnecock Bay, an area about seventeen miles long. In March 1931 the ocean broke through the outer beach into Moriches Bay, forming Moriches Inlet. This Inlet has moved one mile west

from 1931 to 1956. That 1931 storm and subsequent storms increased the nesting sand area, so that twenty pairs were nesting in the two miles of beach by 1938. Then the center of the great hurricane of September 21, 1938 hit this area a devastating blow, levelling the sand dunes at Moriches and Shinnecock Bays and opening a new inlet into the latter bay, known as Shinnecock Inlet. The 1938 storm produced about a three mile continuous strip of nesting area at Shinnecock and about a four mile continuous sand strip at Moriches.

The peak number of nesting plovers in this seventeen mile stretch of sand beach—from Moriches Inlet east to the village of Southampton at the east end of Shinnecock Bay—was reached in 1941 when there were 64 pairs. This maximum number was maintained for about three years (1940, 1941 and 1942). After that there was a gradual decline due to the dredging of sand from the bay bottom in both bays and its deposition upon the beach to build up the sand dunes to about their former height. Then the native beach grass (*Ammophila breviligulata*) was planted by hand to hold the sand from blowing. Plovers still continued to nest for two or three years on these artificial sand dunes but they deserted them after this period because of growth of the grass. They preferred to nest in large open grassless sand areas north of the sand dunes, but a few nested in sand areas as small as 200 to 300 feet long. After the grass covered the sand dunes again, most of the nesting plovers left the area for more suitable habitat, probably on other parts of Long Island. But a few scattered pairs continued to nest south of the sand dunes between the surf and the dunes, where the nesting area was wide and high enough so that the high tides did not reach it.

Beginning in 1939 and up to 1950 I worked the area from Moriches Inlet to Southampton. During World War II rationing of gasoline and the banning of pleasure driving and of binoculars along the outer beaches greatly curtailed work on the plovers in 1943 and 1945, and prevented any work in 1946. By 1951 there were hardly any plovers nesting at Moriches Bay in their former nesting area, in part because of the growth of grass, but mainly because of the extensive building of summer homes in this area, leaving no large dry sand areas, except one of about a mile just east of Moriches Inlet. There is a road running parallel with the outer beach the entire distance of seventeen miles from Moriches Inlet to Southampton, except for this one mile of beach just east of Moriches Inlet. On this entire nesting strip running east and west there were hardly any areas wide enough from north to south for more than one pair.

From 1948 to 1958 I extended operations a little farther east to include Mecox Bay, about five miles east of Shinnecock Bay, which is the next nesting area eastward across Shinnecock Inlet.

Most of the nesting birds were trapped from my car. This provided a "blind" which made trapping much easier than if I had been forced to hide in the grass. The birds settled down more quickly and went under the trap much sooner.

TERRITORY

Seldom will one pair nest nearer than 100 feet from the nest of another pair. Nests found were usually spaced 200 feet or more apart.

If a bird is on the nest, it usually will chase away adult plovers other than its mate when they approach within about 100 feet. Even after the downy young are out of the nest, the parents will chase away other adults if they come near, for the young remain a few hundred feet from the nest site until they are able to fly, unless forced to run by some predator or other disturbing factor.

TENDENCY TO RETURN TO NESTING AREA

The Piping Plovers at Moriches Bay, Shinnecock Bay and Mecox Bay comprise three nesting populations. Though on the same continuous strip of barrier beach, the nesting area at Mecox is separated from that at Shinnecock by about five miles where no plovers nested, owing to a built up section of summer homes and absence of sandy areas. Likewise between Shinnecock and Moriches there is also a five mile gap (including a narrow water separation) where none have nested.

Adults. My data indicate that adults banded on their nests return in succeeding years to the same nesting area, with few exceptions. Of the 1,173 adults trapped on their nests up to July 1958, 288 individuals were retrapped in later years (many of them several times), and only three were found to have left their original nesting area to nest in one of the other two areas.

These three adults were: female banded May 30, 1942 at Shinnecock returned June 2, 1949 at Moriches, 15.6 miles west of its 1942 nest; male banded as young June 23, 1949 at Mecox, taken as adult on nest May 17, 1951 at Shinnecock, 5.5 miles west of where hatched, taken again on nest June 12, 1953 back at Mecox, 600 feet from where it was hatched in 1949; female banded June 16, 1950 at Moriches taken on June 18, 1952 at Shinnecock, 11.1 miles east of its 1950 nest.

Young birds. Young hatched in any of these three areas (Moriches, Shinnecock, or Mecox) may come back to nest in any of them—not

necessarily the one in which they were hatched. Moreover the trapping for the past five years in these areas of from 39 to 73 per cent of unbanded adults suggests that part of the population consists of birds hatched outside my study area. But some of these unbanded birds are doubtless local individuals that I failed to band, especially young, for I only banded about 36 per cent of the young in nests found.

Out of 979 young banded to July 1958, 47 returned to nest in one of the three areas, of which 34 returned to the area in which they were hatched and 13 to an area in which they were not hatched. The 34 young returning to nest in the area in which they were hatched nested at distances between 650 feet and about six miles from the spot where they were hatched (Table 4). Distances could be estimated because of known spacing of telephone poles.

TABLE 4
DISTANCE OF NEST FROM PLACE OF HATCHING

Males				Females			
<i>Hatched</i>	<i>Nested</i>	<i>Locality</i>	<i>Approximate Distance in Feet</i>	<i>Hatched</i>	<i>Nested</i>	<i>Locality</i>	<i>Approximate Distance in Feet</i>
1939	1940	Moriches	950	1937	1940	Moriches	650
1939	1940	Moriches	1,000	1937	1939	Moriches	990
1947	1950	Shinnecock	1,580	1940	1941	Moriches	1,340
1940	1942	Moriches	2,500	1938	1940	Moriches	1,420
1957	1958	Shinnecock	4,260	1941	1942	Moriches	2,480
1942	1949	Moriches	5,060	1937	1938	Moriches	2,640
1936	1940	Moriches	5,280	1948	1950	Shinnecock	3,260
1949	1950	Shinnecock	5,740	1940	1941	Shinnecock	4,400
1938	1940	Moriches	5,800	1940	1942	Shinnecock	4,750
1944	1947	Shinnecock	6,330	1942	1947	Moriches	7,390
1950	1952	Shinnecock	8,210	1951	1952	Shinnecock	7,560
1957	1958	Shinnecock	8,360	1957	1958	Shinnecock	8,230
1950	1951	Shinnecock	8,370	1950	1951	Shinnecock	10,540
1949	1954	Shinnecock	9,900	1940	1942	Moriches	11,610
1939	1944	Shinnecock	16,890	1947	1958	Shinnecock	13,410
1940	1944	Shinnecock	30,620	1939	1941	Moriches	22,700
				1950	1951	Shinnecock	24,550
				1956	1957	Shinnecock	22,620

The thirteen young found nesting in an area where they were not hatched nested at distances of from five to about 18 miles from the spot where they were hatched (Table 5).

To July 1958 out of 979 young banded, only 47 were trapped on nests in or near the area where they were hatched—4.7 per cent. This seems like a very low percentage of returns. No doubt a few more than the 47 young actually returned, as I was only successful in trapping 90.5 per cent of all nesting adults on the 646 nests found. On these 646 nests, 1,173 adults were trapped out of a possible 1,292,

TABLE 5
DISTANCE OF NEST FROM PLACE OF HATCHING OF BIRDS
BANDED AS YOUNG WHICH MOVED

		Males		<i>Approximate Distance, Feet</i>
<i>Hatched</i>		<i>Nested</i>		
1949	Mecox	1954	Shinnecock	28,560
1949	Mecox	1951	Shinnecock	28,850
1938	Moriches	1939	Shinnecock	66,000
1947	Shinnecock	1950	Moriches	79,460
1947	Moriches	1951	Shinnecock	80,250
1956	Shinnecock	1958	Moriches	83,050
		Females		<i>Approximate Distance, Feet</i>
<i>Hatched</i>		<i>Nested</i>		
1948	Mecox	1949	Shinnecock	28,910
1949	Mecox	1954	Shinnecock	36,430
1950	Moriches	1952	Shinnecock	59,660
1955	Shinnecock	1958	Moriches	65,100
1940	Shinnecock	1941	Moriches	66,000
1938	Moriches	1939	Shinnecock	81,840
1948	Moriches	1950	Shinnecock	85,940

missing 119. I estimate that I found about 90 per cent of all nests in the areas worked.

Probably we can never ascertain what per cent of the 979 banded young survived the first winter to return north to nest for the first time, and what per cent nested in other parts of the Piping Plover's breeding range (Canada to North Carolina), rather than in my area of Long Island. Of course, many of them could have returned to other parts of Long Island, as the area that I worked was only about one-sixth of the total nesting area on the south shore of Long Island. Unfortunately there has been almost no trapping of nesting plovers elsewhere on Long Island. Out of 374 young banded by others on western Long Island (28 to 55 miles west of my study area) only two were recovered breeding in my area (at Shinnecock Bay).

To 1956 out of the 853 young banded by others in North America only three had been trapped in later years on their nests. The three were: female, banded on July 14, 1939 at Atlantic Beach, Long Island, New York, which I trapped on its nest on June 29, 1940 at Shinnecock Bay about 63 miles east of where it was hatched; female, banded on July 15, 1939 at Oak Beach, Long Island, which I trapped on its nest on May 10, 1941 at Shinnecock Bay about 39 miles east of where it was hatched; one banded on July 13, 1941 at Penn Yan, New York, which was trapped over its young on July 7, 1943 at Long Point Beach, Ontario, Canada, about 150 miles west of where it was hatched. Of birds banded by others since 1956 one male banded as young, June 22, 1957 at Tobay Beach, Long Island, was trapped by me on its nest on May 29, 1958 at Moriches Bay, 41 miles east of where hatched.

NESTING

Character of nest. The nest is usually a slight hollow in the sand, but many times these hollows are lined with bits of shell. Occasionally one sees additional hollows in sand not far from the hollows in which the eggs are laid. I have not determined whether the hollow is made by the male or female or by both sexes.

Replacement Nesting. One brood is reared in a season, but if the nest or eggs are destroyed in the first half of the nesting season, the plovers will build another nest, not in the same place, but usually within 100 to 200 feet. There must be a few unmated birds in the area during the nesting season, as on a few occasions a male or a female had a second nest in the same year with a new mate, probably following the death of the mate of the first nest.

For example, a female was trapped on a nest on May 17, 1951 and a male, badly oiled on the breast, was trapped on the same nest the same day. The nesting was not successful. Then on June 21 the same female was trapped on a new nest 6,754 feet west of her earlier nest of the year. An unbanded male was also trapped on this nest the same day. The male of the first nest probably had died from the oiling.

On June 5, 1957 the beach road at Shinnecock Bay was freshly oiled and before the trucks could spread sand on top of this oil I observed two adult plovers alight in the oil with heavy accumulation on their feet and some smeared on their breasts. They alighted on their nest of three newly-hatched young, transferring so much oil that the young were dead three hours later, completely covered with oil.

Change of Mates. Of the 1,173 nesting adults that I have trapped, 288 have been retrapped, but only 39 pairs were mated together more than one year. Only two pairs remained mated for three years, the other 37 pairs for only two years (not always consecutive).

Adults that paired together one year after another nested nearer, on the average, to the nest site of previous years than a male or female that took on a new mate. The average distance between the nests of the same pair from one year to another was 204 feet, and ranged from two nests that were built in the same spot up to a maximum of 1,150 feet. On the other hand when a male or female took a new mate the following year, I found that they had moved a much greater distance than the previously paired birds. Of 120 males that took a new mate the average distance that a male moved from the nest site of the previous years was 788 feet and ranged from eight nests that were built in the same spot up to a maximum of 8,600 feet.

Only 20 (16 per cent) of the 120 males moved more than 1,000 feet. Of the 103 females that took a new mate the average distance moved from the nest site of the previous years was 4,077 feet and ranged from

six nests that were built in the same spot up to a maximum of 82,368 feet. Fifty-one (50 per cent) of the 103 females moved more than 1,000 feet.

It would thus seem that the male exerts more influence in either choosing the nest site or the nesting area, as we find that on the average a female when taking a new mate moves about four times the distance of a male that takes a new mate.

Change of mates is not limited to cases of the death of one bird. One male (38-135147) had four different mates in four years, although all four females were alive and paired in one year, 1940 (Table 6).

TABLE 6

ONE MALE AND HIS SUCCESSIVE MATES, THEIR CHANGES OF MATE AND OF NESTING SITE

1938	1940	1941	1942
♂ 1 ♀ A	♂ 1 ♀ B (♂ 5992, ♀ 6492)	♂ 1 ♀ C (♂ 350, ♀ 12,672)	♂ 1 ♀ D (♂ 72, ♀ 4737)
	♂ 3 ♀ A (♀ 5100)	♂ 3 ♀ A (♂ and ♀ 162)	
♂ 2 ♀ B			
	♂ 4 ♀ C		
	♂ 5 ♀ D		

The numbers in parentheses are the distance in feet that a male or female moved its nesting site from one year to the next recorded year.

Eggs

Laying intervals and clutch size. Eggs are laid with an interval of one day between layings, as May 1, 3, 5, 7. The usual clutch is four eggs. Of 526 nests examined by me, 448 contained four eggs, 70 contained three eggs, and eight contained two eggs. Some of these nests with only two or three eggs may have contained a greater number before I found them, as I have definite evidence that 15 nests contained fewer eggs later than when originally found.

Egg Predators. Loss of individual eggs I suspect may be caused by House Rats (*Rattus norvegicus*) or House Mice (*Mus musculus*). House Mice can easily take an egg, as they commonly gnaw through the hard shell of eggs of our Pekin Ducks to eat the contents.

Common Crows (*Corvus brachyrhynchos*) ate the eggs out of two nests, Red Fox (*Vulpes fulva*) took the eggs from one nest, Opossum

(*Didelphis marsupialis*) took the eggs from one nest, three nests were destroyed by Army truck, car and tractor, and several nests by fishermen. One plover egg was slightly cracked while I marked it with pencil and one egg was cracked by an adult plover as it was trapped on its nest—the only two so damaged. Both were removed from the nests within a few days by the nesting plovers.

Appearance, Dimensions and Weight. The eggs are of some shade of light buff, evenly and sparsely marked with fine spots of blackish brown, sometimes with a few larger spots of pale grayish. The average weight of 35 fresh eggs was 9.6 grams and ranged from 8.5 to 10.7 grams. The average dimensions in millimeters of 26 eggs were 25.1 x 31.7 and ranged from 24.1 x 29.7 to 25.4 x 34.3. The last egg of the clutch tends to be the longest, and often the widest and heaviest. Weights and measurements in millimeters of eggs in order of laying from six nests are given in Table 7.

TABLE 7
WEIGHTS AND DIMENSIONS OF SIX FRESH CLUTCHES

	Grams	Millimeters		Grams	Millimeters
1	9.8	24.6 x 31.7	1	9.8	25.4 x 32.5
2	10.0	24.8 x 31.7	2	9.7	25.4 x 30.9
3	9.8	24.8 x 31.2	3	9.7	25.4 x 31.7
4	9.8	24.8 x 31.9	4	9.7	24.8 x 32.5
1	9.5	24.6 x 31.2	1	9.9	24.6 x 31.7
2	9.5	24.6 x 30.2	2	9.9	24.8 x 31.7
3	9.3	24.1 x 29.7	3	9.3	24.1 x 31.7
4	9.3	24.1 x 31.2	4	10.0	24.8 x 32.2
1	10.0	24.1 x 32.5	1	8.5	—
2	10.3	24.6 x 32.5	2	9.8	25.4 x 30.9
3	10.5	24.6 x 32.5	3	9.8	25.4 x 31.7
4	10.7	25.4 x 32.5	4	10.0	25.4 x 32.5

Egg Dates. The earliest date for a complete set of four eggs in my area was April 26, 1949. The latest date for a set of eggs was July 23, 1950. I believe incubation may start in some nests with the laying of the third egg. On four nests I started trapping when the nests contained three eggs each and the males were trapped on each nest. These nests later had four eggs each.

INCUBATION

Both sexes incubate. I have never checked one nest for an entire day to determine the relative participation of male and female in incubation. The fact that in 206 nests, of the first bird to be trapped

on the nests, 104 were females and 102 were males, would seem to indicate that incubation was about evenly divided. In these cases I trapped both sexes on the nest the same day.

Incubating birds usually leave the nest by walking away when one approaches to within about 200 feet. A few will allow closer approach than this, especially one female that let me get to within 40 feet before she left the nest.

Incubation Period. Out of fourteen nests checked daily the incubation period was 27 days for five nests, 28 days for five nests, 29 days for two nests, 30 days for one nest and 31 days for one nest. Incubation periods vary with eggs from different females as well as with the length of time birds are kept off of their nests by intruders, such as fishermen and bathers (Wilcox, 1939: 7). Incubation periods were computed from the laying of the last egg to the hatching of the last egg.

HATCHING SUCCESS

612 young hatched out of 668 eggs laid in 174 nests that were checked from 1937 to 1958—a 91 per cent hatching success. This was an average of 3.83 eggs laid per nest and 3.52 young hatched per nest.

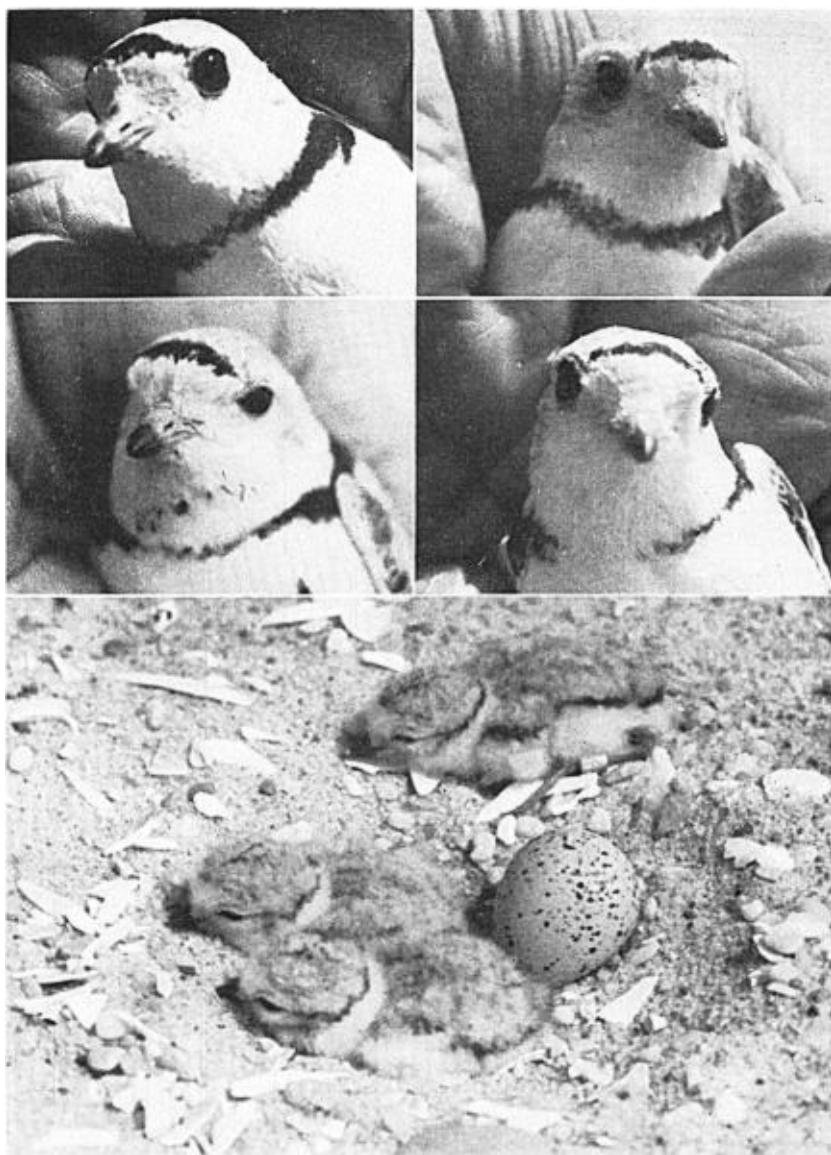
YOUNG

Hatching. In the large majority of nests the eggs in the same nest apparently hatch the same day, but there is usually a period of several hours between hatching of the first and last eggs. I will often come upon a nest where one or two dry young are 10 to 25 feet from the nest, one will be wet in the nest (just emerged), while an egg will be in the last stages of hatching and the young will not be out of the egg for another three or four hours (Plate 4).

On May 30, 1940 there were two young and two pipped eggs in one nest at 3 P.M.; and the next day there were three young in the nest at 3 P.M. On July 20, 1950 there were two young and one pipped egg in a nest at 4 P.M. I went back to the car for bands without touching the two young and within four minutes I was back at the nest and found the two young 75 feet from the nest. The next day at noon the pipped egg had just hatched and this chick was the only one in the nest.

Behavior of Young. The individual young leaves the nest within two or three hours, as soon as its down is dry. The young are able to fly when thirty to thirty-five days old. Until the time of flight the young remain within 400 to 500 feet of the nest (although they do not return to it after hatching), despite miles of beach on either side of the nest area where they could wander.

When approached, young will crouch on the ground, their color blending with the sand. Some birds will hold this posture until they



Piping Plover (*Charadrius melodus*) on Long Island, New York. (Above left) one year old male with full belt, June 6, 1951. (Above right) Female with full belt, May 19, 1956. (Middle left) Male (44-103561) 5 years old, May 30, 1955. Belt is intermediate (markings on throat are oiling). (Middle right) Same male (44-103561) when 2 years old, June 12, 1952, showing a quarter inch white gap in belt. (Below) Nest with three newly hatched young and egg, June 29, 1957. (Photos. by L. Wilcox.)

are touched or almost touched. Then they run with remarkable rapidity. I timed one downy young two days old and it ran eighty-one feet in twelve seconds, a rate of 4.6 miles per hour. A ten day old bird ran one hundred eighty feet in twenty-six seconds, or 4.7 miles per hour. Usually after running some distance they crouch again, disappearing in the background. If forced, they can swim readily. A five day old bird swam fifty feet out into the bay to escape capture and then came ashore.

Several times I have observed adults knock down young while the young were running away from me. The young remained motionless on the sand as soon as the adults did this. Presumably the adults realized, before the young, that they were safe from their enemies if they remained still on the ground.

It is astonishing how well the young blend into their surroundings if they remain motionless, even right out in open sand. Sometimes it takes me minutes to find all four young of a nest after they have stopped running. Many times I cannot locate all of them the first time, so I retire to let the adults come up to them; then the young will start walking again.

Brooding. Adults brood the young in some cases until they are twenty days old. It is thus still possible to trap adults even after the eggs have hatched by catching the entire brood of young and then tying one young to a stake in the ground and setting a trap, which takes the adult as it comes to brood.

Hatching Dates. The first young of each year were usually found during the last week in May. My earliest date for first young is May 24, 1949 and latest date for first young, June 5, 1948. My latest dates for young in a nest ranged between July 14, 1948, and July 24, 1950. My latest date for an incubating bird was a nest of three eggs found on June 25, 1941, on which I found a bird still incubating on July 16, July 28, and August 6. This nest was deserted on August 13 and, upon examination, the eggs proved to be infertile. This same pair had had a previous nest in the same year on May 16, located 144 feet east of the second nest, and four young had hatched on May 31. The fact of a second nesting in the same year may indicate that the young had died or been killed.

Color of Soft Parts. Two-day-old young have legs and toes flesh color, basal third of bill dark brown and balance of bill black. Twenty-five day old young have flesh colored legs, dusky, almost black bill, and dark brown iris. Thirty day old young have flesh colored legs and entirely black bill. The adult male has basal half of bill orange with rest of bill black, and legs the same orange as the bill.

TABLE 8
DATES OF FIRST AND LAST YOUNG FOUND IN NEST

<i>First Young Found</i>				<i>Last Young Found</i>
May 25, 1937	May 29, 1942	May 24, 1949	June 4, 1954	July 21, 1940
May 26, 1938	June 1, 1944	May 31, 1950	May 30, 1955	July 21, 1941
May 30, 1939	May 25, 1945	May 29, 1951	May 30, 1956	July 23, 1947
May 30, 1940	May 31, 1947	May 31, 1952	May 30, 1957	July 14, 1948
May 25, 1941	June 5, 1948	May 28, 1953	May 31, 1958	July 24, 1950

Weight and Dimensions. Day-old young weighed 6.8 grams; 7 days old, 8.5 grams; 10 days old, 12.4 grams; 14 days old, 17.0 grams; 21 days old, 25.7 grams; 29 days old, 29.4 grams. Two young 23 days old had wing lengths of 61.9 and 65.0 millimeters. One young 26 days old had a wing length of 73.1 mm. and tail 25.4 millimeters.

DEFENSE AGAINST OTHER SPECIES AND INJURY FEIGNING

Adults defend their nest territory and young from other species. On June 8, 1939, a Robin (*Turdus migratorius*) was feeding on the ocean beach 75 feet from two young plovers and the adults chased it, driving it away. I have also seen them give chase to Herring Gulls (*Larus argentatus smithsonianus*) and to Great Black-backed Gulls (*Larus marinus*) flying low over their young.

Some males and females feign injury at least a week before the eggs hatch, to draw intruders away from their nests (see Cruickshank, 1939: 17). One female feigned injury two weeks before the eggs hatched. On June 8, 1950, one male plover feigned injury to an adult Least Tern (*Sterna albifrons antillarum*) nesting near the plover's nest. On June 1, 1951, a Least Tern nest was only four feet from a plover's nest. The Least Tern was most aggressive and repeatedly chased the plover away as it attempted to get back to its nest. On June 8, 1939, while I was hiding in the car and watching with binoculars a female approach its nest, the male feigned injury as soon as the trap dropped over the female on the nest. The male was about 25 feet from the nest. On June 4, 1940, a female did not fly when I released her on the ground but simply ran away, then when 50 feet from me she feigned injury.

LONGEVITY

Attached are tables (9 and 10) showing the various years after initial banding in which Piping Plovers were retrapped by me. Table 11 shows ages. In the case of those banded as young birds (22 males, 25 females), I know their exact age (within a few days) when they

TABLE 9
RETURNS ON NESTS OF BIRDS ORIGINALLY BANDED AS ADULTS

Year	'37	'38	'39	'40	'41	'42	'43	'44	'45	'46	'47	'48	'49	'50	'51	'52	'53	'54	'55	'56	'57	'58	
1937	12																						
1938	6	29																					
1939	3	3	37																				
1940	2	11	10	82																			
1941	3	8	8	19	75																		
1942		2	4	14	29	42																	
1943*				4			2																
1944			2	4	5	5	2	53															
1945*								2	3														
1946*																							
1947					2	1		5			43												
1948					1	1		3			13	44											
1949					1	1					4	11	62										
1950					2	1		1			6	7	18	57									
1951					1	1					1	2	2	10	28								
1952					1	1					1	2	2	7	7	17							
1953											2	2	1		3	3	12						
1954											2	1			1	2	1	2	7				
1955											2	1		5	2	1	1	3	20				
1956												1		2	1	2	2	1	4	17			
1957														1	1	2	1	1		6	45		
1958											1			5	1	1	1	1	1	3	21	57	

The first number in each column (reading vertically) represents birds banded as *adults* on nests in that year; the numbers below show how many of these were retrapped on nests in the succeeding years indicated on the left hand column. (For birds originally banded as young and thereafter trapped as adults, see Table 10).

Not included as returns in this table are 6 birds banded as adults on nests, known to have been collected or found dead in the nesting area: banded June 9, 1950, Moriches; collected Moriches July 31, 1954; banded June 3, 1939, Moriches, found dead Moriches May 24, 1940; banded June 3, 1939, Moriches, found dead Moriches May 13, 1942; banded May 17, 1941, Shinnecock, found dead Shinnecock June 2, 1944; banded May 19, 1944, Moriches, found dead Moriches April 3, 1948; banded May 31, 1947, Shinnecock, found dead Shinnecock June 24, 1948.

* As a result of gasoline limitations during war years, very little trapping was done in 1943 and 1945 and none in 1946.

TABLE 10
RETURNS ON NESTS OF BIRDS ORIGINALLY BANDED AS YOUNG

Year	'36	'37	'38	'39	'40	'41	'42	'43	'44	'45	'46	'47	'48	'49	'50	'51	'52	'53	'54	'55	'56	'57	'58	
1936	1																							
1937		21																						
1938		1	42																					
1939		1	2	42																				
1940		2	2	2	98																			
1941	1	1	1	1	3	162																		
1942	1	1	1	1	4	1	101																	
1943*			1																					
1944	1			1	1			38																
1945*										3														
1946*																								
1947							1		1			85	46											
1948						1																		
1949						1																		
1950														62										
1951												2	3	1	60									
1952											2	2	1	2	3	25								
1953											1	1	1	1	3	1	16							
1954											1	1	1	1	1	1	2		6					
1955											1	1	1	3	1	1					20			
1956														2	1	1					25			
1957											1	1	1	1	1						1	46		
1958											1	1	1	1	1						1	1	3	71

The first number in each column (reading vertically) represents the birds banded as young on nests in that year, and the numbers below show how many of these were retrapped on nests as adults in the succeeding years indicated on the left hand column. (For birds originally banded as adults, see Table 9.) Not included as a return in this table is one bird banded as young June 13, 1947, at Shinnecock, known to have been collected at Moriches, August 28, 1954.

* As a result of gasoline limitations during war years, very little trapping was done in 1943 and 1945 and none in 1946.

were retrapped. In the case of birds originally trapped as adults (117 males and 124 females), I know only the minimum age at the time of retrapping, and this is indicated by the use of +. For example, "2+" indicates that the bird was adult when first trapped, say in 1956, and caught again as a return in 1957, by which time it must have been at least two years old, but possibly much older.

TABLE II
AGE ON LATEST RECOVERY (TO JULY 1958)

Banded as Young (47)			Banded as Adult (241)		
Years Old	Males	Females	Years Old	Males	Females
1	6	7	2+	48	71
2	2	9	3+	20	22
3	1	5	4+	19	14
4	3	1	5+	14	7
5	3	1	6+	7	1
6	—	1	7+	3	4
7	3	—	8+	—	2
8	2	—	9+	3	2
9	1	—	10+	2	—
10	1	—	11+	1	1
11	—	1			
	—	—		117	124
	22	25			

A bird retrapped in more than one year is listed only under the age of latest recovery.

This table indicates that only 13 per cent of the females lived to be five years or older, while 28 per cent of the males lived to be five years or older. Twelve of my Piping Plovers achieved ages of from 8 to 11 years.

The banding returns of other North American shorebirds are so scanty that age records probably have little significance. Such returns show the oldest to be: American Woodcock, 8 years, Spotted Sandpiper, 7 years, Killdeer, 6 years, Upland Plover, Avocet, and Least Sandpiper, 5 years.

In my opinion, many shorebirds lose their bands by the abrasive action of sand after about 5 years. Many of my Piping Plovers had to be rebanded after 4 or 5 years. One male only four years old had the band worn so thin when retrapped that it was ready to come off. I would recommend that a thicker or more durable band be used for shorebirds in order to obtain more reliable longevity records.

MORPHOLOGY OF ADULTS

Sexual differences. The sexes of a known pair can be distinguished in about 95 per cent of the cases (all nesting pairs) by plumage alone. When both adults are caught together and compared, the males ap-

pear to have larger bills and a broader black band on the forehead. The sex of individual adults can be determined by examination of the cloaca, and often by call notes. I found that the sex of a majority of the adults could be told by note. The call note of the female is shriller or higher pitched than that of the male.

Age differences. Almost all one-year-old birds were lighter in weight; their wings and tail were shorter and the black patches or ring on the foreneck and the black bar on the forehead were lighter in color than in older birds.

Weights. The average weight of 49 breeding males was 54.9 grams and ranged from 46.5 to 63.7 grams. The average weight of 38 females was 55.6 grams and ranged from 46.4 to 62.3 grams. With most birds there was a slight increase in weight with age. A male weighed when four years old 53.0 grams, when five years old 56.0 grams, and when eight years old 56.8 grams. A one-year female weighed 53.7 grams.

Measurements. The mean wing length of 134 males was 117.3 mm. and ranged from 111.2 to 122.1 mm., with only 5 per cent under 114.3 mm. and 20 per cent 120.6 mm. or more. I believe those with wings under 114.3 mm. were one year old birds. A male had the wing 114.3 mm. when one year old, 115.8 mm. when two years old, 114.3 mm. when three years old and 117.3 mm. when six years old. The mean wing length of 126 females was 117.0 mm. and ranged from 109.3 to 122.1 mm., with 11 per cent under 114.3 mm. and 17 per cent 120.6 mm. or more. A one year old female had 112.7 mm. wing, 115.0 mm. when two years old and 118.3 mm. when four years old.

The mean tail length of 98 males was 51.3 mm. and ranged from 41.1 to 54.6 mm., with 15 per cent under 50.8 mm. and 18 per cent that were 53.3 mm. or more. A one year male had 41.1 mm. tail, 53.8 mm. when two years old, 50.8 mm. when three years old and 50.8 mm. when six years old. The average tail length of 97 females was 50.5 mm. and ranged from 45.9 to 55.8 mm., with 29 per cent under 50.8 mm. and 10 per cent that were 53.3 mm. or more.

STATUS OF THE "BELTED" PIPING PLOVER

(Charadrius melodus circumcinctus)

After the A.O.U. Committee on Classification and Nomenclature reinstated *C. m. circumcinctus* as a recognized subspecies (1945: 440), I began in 1948 to take notes and measurements (and in the later years photographs) of the extent of the black band on the foreneck of all adults trapped. The subspecies *circumcinctus* is supposed to be characterized by a solid black band across the neck, whereas the

nominate subspecies has black only on the sides of the neck and a pure white gap across the front. The A.O.U. Check-list (1957: 167) gives the breeding range of *circumcinctus* as from central Alberta to the southern shores of Lakes Michigan, Erie, and Ontario, while the populations from the coastal beaches extending from southeastern Quebec and southwestern Newfoundland to Virginia are regarded as typical *melodus*. Birds from the Great Lakes, though listed as *circumcinctus*, are stated to be intermediate.

Proportion in population. Of 586 nesting adults trapped by me from 1948 to 1958, 104 (18 per cent) were fully belted, 233 (40 per cent) were intermediate, and 249 (42 per cent) had a pure white gap (Table 12). Birds were regarded as fully belted where there was a complete and wide black band, as intermediate if there was a connecting band but it was light in color or broken (Plate 3). A full belt appeared in a considerably larger proportion of males (27 per cent), and in only about 8 per cent of females. This may reflect the tendency toward some reduction in blackness in females.

TABLE 12
TYPES OF CHEST BANDS 1948-1958

Sex	No.	Fully Belted	Intermediate	White Gap
Males	295	81	104	110
Females	291	23	129	139
Total	586	104	233	249

Griscom and Snyder (1955: 88-89) indicate that all three "types" are also found breeding in coastal Massachusetts. Ludlow Griscom has informed me (*in litt.*) that he estimates that about 20 per cent of the Piping Plovers breeding in New England are fully belted.

Measurements. Measurements of the three plumage types trapped in my area show no appreciable differences (Table 13).

TABLE 13
WING AND TAIL MEASUREMENTS IN MILLIMETERS OF THE THREE PLUMAGE TYPES

	Wing					
	Number	Males Range	Mean	Number	Females Range	Mean
White gap	51	111.7-122.4	117.6	69	109.4-122.1	116.3
Intermediate	44	111.2-123.9	116.8	53	109.3-122.1	116.8
Belted	29	113.5-120.6	117.0	7	111.7-120.6	114.8
	Tail					
White gap	51	48.2-54.6	51.5	69	45.9-55.3	50.2
Intermediate	44	47.7-53.8	51.3	53	45.9-55.3	50.8
Belted	29	47.5-53.8	51.3	7	45.9-52.2	50.5

Moser (1942) also states he found no mensural differences in the three plumage types from various areas.

Pairings. The pairings of 266 males (68 fully belted, 118 intermediate, 80 white gap) with various types of females are shown in Table 14.

TABLE 14
PAIRINGS OF THE THREE PLUMAGE TYPES 1948-1958

No.	Males		Females		
	Type	Full Belt	Intermediate	White Gap	
68	Full Belt	7	32		29
118	Intermediate	10	64		44
80	White Gap	4	41		35
266		21	137		108

Young of Known Parentage. The belted or non-belted condition shows up in the young birds as soon as they have acquired the juvenal plumage. There is some tendency for the band to become more solid with age (Plate 4). Table 15 shows the plumages of 13 young from known parental types.

TABLE 15
THIRTEEN YOUNG FROM PAIRINGS OF THE THREE PLUMAGE TYPES

Age in Years	Young	Male Parent	Female Parent
1 ♀	3/4 inch white gap	Full belt	1/2 inch white gap
1 ♀	1/2 inch white gap	Light connecting ring	Medium connecting ring
1 ♀	5/8 inch white gap	Full belt	3/4 inch white gap
1 ♀	Almost pure white gap	Medium connecting ring	Light connecting ring
1 ♂	Full belt	Full belt	Light connecting ring
2 ♀	1/2 inch white gap	1/4 inch white gap	Intermediate
2 ♀	3/4 inch white gap	Medium connecting ring	3/4 inch white gap
5 ♂	Almost pure white gap	Faint connecting ring	Faint connecting ring
5 ♀	Intermediate	Full belt	1/2 inch white gap
5 ♂	Medium connecting ring	Full belt	3/8 inch white gap
1 ♂	1/4 inch white gap	Medium connecting ring	1/2 inch white gap
1 ♀	Light connecting ring	Medium connecting ring	Light connecting ring
2 ♂	1/2 inch white gap	Light connecting ring	1/2 inch white gap

Discussion. The facts available raise a serious question as to the validity of the subspecies *circumcinctus*. This form has had a checkered career since it was described from Nebraska by Ridgway in 1874. It was rejected by the third and fourth editions of the A.O.U. Checklist, and by Ridgway himself in his final work (1918: 131). Its revival (A.O.U. Committee, 1945: 440) was stated to be based on the papers of Moser (1942), pointing out that museum specimens indicated almost all birds breeding in the Mississippi Valley to be of the belted type,

and of Burleigh (1944: 367-368), reporting the same situation as to winter specimens on the central Gulf Coast. The assumption seems to have been that belted birds reported from the Atlantic coast were primarily migrants. While it is likely that the relative percentage of one type or another may vary geographically, the number of breeding belted birds on the Atlantic coast makes it illogical to distinguish belted individuals as a separate race.

The larger proportion of belted individuals in the Mississippi Valley may indicate a greater concealing value from the disruptive effect of a full belt (Huxley, 1958) in the interior habitats. These, judging by the photographs and description of the Nebraska habitat (Moser, 1942), appear to consist of coarser sands, mixed with pebbles and dark mussel shells, which produce a darker and less uniform background than the Long Island coastal beaches (*cf.* Nichols 1939).

ACKNOWLEDGMENTS

I am indebted to C. K. Nichols and to the late J. T. Nichols for helpful advice in regard to this study and to Dean Amadon and Eugene Eisenmann for suggestions as to this report.

SUMMARY

From 1937 to 1958 the writer banded 744 adult and 979 young Piping Plovers. Adults were trapped on 645 nests. There were 433 returns out of 1,723 banded. Out of 979 young banded only 47 returned to nest in the 17 to 22 mile strip where they were hatched.

Nesting Piping Plovers usually return to nest in the area where they were first caught nesting. Out of the 1,173 adults trapped only 39 pairs remained mated from one year to another (37 pairs for only two years and 2 pairs for three years). When the same individuals remained paired the distance of their nest from that of the previous year averaged only 204 feet. 120 males that took on a new female moved an average of 788 feet from one year to another. 103 females that took a new mate moved an average of 4,077 feet from one year to another.

Piping Plovers arrive on the nesting grounds on Long Island the last week in March. The incubation period is 27 to 29 days. 85 per cent of the nests contained 4 eggs. Eggs are laid every other day and weighed when fresh an average of 9.6 grams each. Earliest date for a set of 4 eggs was April 26, 1949. Latest date for a set of (addled) eggs was July 23, 1950.

Day-old young weigh about 6.8 grams and leave the nest soon after hatching. Young are able to fly when thirty to thirty-five days old.

They remain within 400 to 500 feet of the nest until time of flight. 612 young hatched out of 668 eggs laid in 174 nests. Escape behavior of downy young is discussed.

The average weight of adult males was 54.9 grams and of adult females, 55.6 grams. Mean wing length of males was 117.3 millimeters and of females was 117.0 millimeters. Mean tail length of males was 51.3 millimeters, and of females was 50.5 millimeters. Other morphological sex and age characters are given.

Six Piping Plovers lived to be at least 9 years old, three at least 10 years old, and three at least 11 years, the oldest North American shorebirds recorded to date. The nearest is an 8 year old American Woodcock.

Though supposed to belong to the typical race *C. m. melodus*, of the nesting Long Island Piping Plovers 18 per cent are fully "belted," corresponding with the interior race, *C. m. circumcinctus*. Data on pairings of the various plumage types, as well as the appearance of their progeny are given. The validity of *C. m. circumcinctus* is questioned.

LITERATURE CITED

- AMERICAN ORNITHOLOGISTS' UNION COMMITTEE. 1945. Twentieth Supplement to the American Ornithologists' Union Check-list of North American Birds. *Auk*, **62**: 436-449.
- AMERICAN ORNITHOLOGISTS' UNION COMMITTEE. 1957. Check-list of North American Birds. Fifth Ed. 691 pp. Amer. Orn. Union.
- BENT, A. C. 1929. Life Histories of North American Shore Birds. Pt. 2. U. S. Natl. Mus. Bull., no. 146. 412 pp.
- BURLEIGH, T. D. 1944. The bird life of the Gulf Coast region of Mississippi. Occ. Pap. Mus. Zool. La. State Univ., no. **20**: 329-490.
- CRUIKSHANK, A. D. 1939. Injury feigning in the Piping Plover. *Birds of Long Island*, no. **1**: 14-18. Bird Club of Long Island.
- CRUIKSHANK, A. D. 1942. *Birds around New York City*. 489 pp. American Mus. Nat. Hist., New York.
- GRISCOM, L., and D. SNYDER. 1955. *The birds of Massachusetts*. 295 pp. Peabody Mus., Salem, Mass.
- HUXLEY, J. S. 1958. Why two breast-bands in the Killdeer? *Auk*, **75**: 98-99.
- MOSER, R. A. 1942. Should the Belted Piping Plover be recognized as a valid race? *Nebraska Bird Rev.*, **10**: 31-37.
- NICHOLS, J. T. 1939. Random notes on Piping Plover. *Birds of Long Island*, no. **1**: 13-14. Bird Club of Long Island.
- RIDGWAY, R. 1919. *The Birds of North and Middle America*. Pt. 8. U. S. Natl. Mus. Bull., no. 50. 852 pp.
- WILCOX, L. 1939. Notes on the life history of the Piping Plover. *Birds of Long Island*, no. **1**: 3-13. Bird Club of Long Island.

Speonk, Long Island.