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NOTES ON THE SOUTH ATLANTIC CANADA GOOSE POPULATION

BY HAROLD C. HANSON AND RICHARD E. GRIFFITH

Recent studies (Williams, 1945; Hanson and Smith, 1950) have shown that each of the four main flyways in North America contains two or more distinct populations of Canada geese, *Branta canadensis* (Linnaeus). In a comprehensive report on the Canada geese of the Mississippi flyway population, Hanson and Smith (1950) described the range of a distinct, heretofore unrecognized population, the Southeast population, that winters in the inland regions of the southeastern states. It also outlined in brief the ranges of two other populations which winter on the Atlantic seaboard, the North Atlantic and the South Atlantic populations.

Because Canada geese tend to be segregated by distinct population groupings with strict adherence to individual breeding and wintering ranges, these birds are particularly adapted to effective management by population groups. For this reason, there is special merit in careful identification and study of these populations.

This report deals primarily with the geese of the South Atlantic population, but data and maps showing recent unpublished recoveries from the Mississippi and Southeast populations are also included for comparative purposes.

MATERIALS AND METHODS

The nucleus of this report is provided by the banding and recovery records of the Jack Miner Migratory Bird Sanctuary located near Kingsville, Ontario. The recovery records consist chiefly of the original letters received from hunters in the United States and Canada and from missionaries and fur traders in the far North. The records of Canada geese banded at the Jack Miner Sanctuary in autumn, the majority of which were of geese belonging to the Mississippi Flyway and the Southeast population, were analyzed for the Mississippi Flyway report. The recoveries of Canada geese banded at the Miner Sanctuary in spring, chiefly of the South Atlantic population, are treated here. Replies to questionnaires sent by Hanson to the principal fur trade posts around Hudson and James Bays in 1947, provided additional valuable information about conditions on the breeding grounds. Information on wintering grounds and populations is based mainly on personal knowledge and data obtained from the files of the Branch of Refuges, U. S. Fish and Wildlife Service.

ACKNOWLEDGMENTS

For permission to study the Miner records, we are indebted to Manley Miner, President of the Jack Miner Migratory Bird Foundation, Inc., acting in behalf of the Miner family and the Miner Foundation.

TABLE 1.—Recoveries on the breeding grounds of South Atlantic Flyway geese banded at Kingsville, Ontario; Earleville, Maryland; and Lake Mattamuskeet, North Carolina.

	Number of Recoveries			All Stations Total Number Recorded	Per Cent
	Banded at Kingsville, Ontario ¹	Banded at Earleville, Maryland ²	Banded at Lake Mattamuskeet, North Carolina ²		
Fur Trade District					
Rupert House	5			5	1.13
East Main	71	2	14	87	19.64
Fort George	70		1	71	16.03
Great Whale River	2	1	2	5	1.13
Belcher Islands ³	35	5	1	41	9.26
Richmond Gulf	4			4	.90
Port Harrison	140	8	15	163	36.78
Povungnituk	52		6	58	13.09
Cape Smith	6		2	8	1.81
Baffin Island	1			1	.23
Total or Per Cent	386	16	41	443	100.00

¹Includes recoveries through 1944.

²Includes recoveries through 1942.

³Includes an unknown, but relatively small, number of recoveries from the adjacent mainland coast of Quebec.

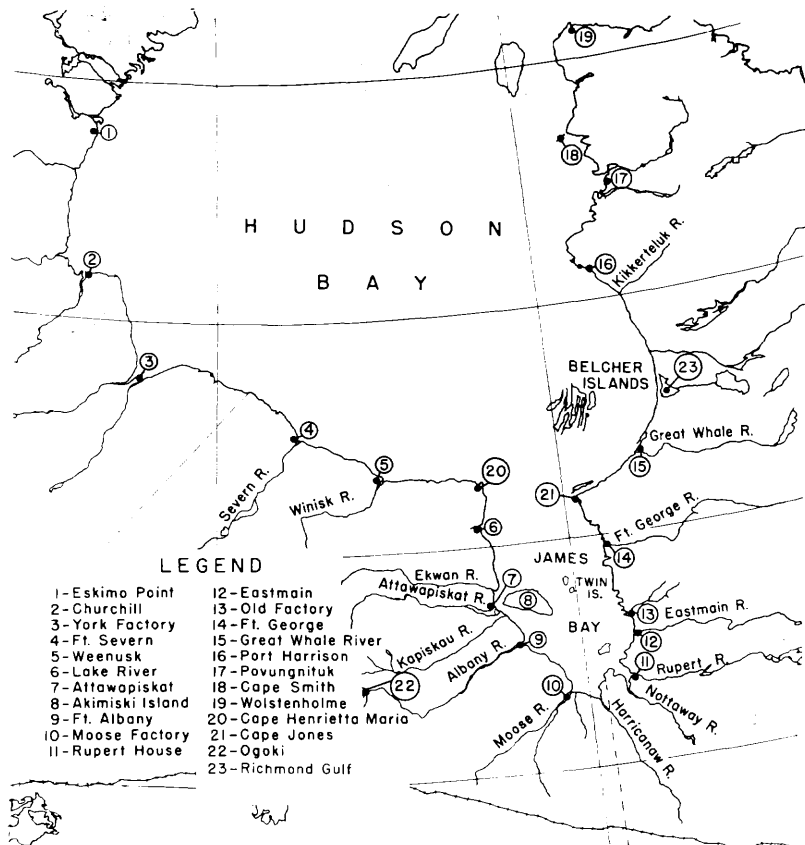


Fig. 1.—Map showing location of principal fur trade posts in the Hudson-James Bays area.

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For supplementary data on populations and kills we are indebted as follows: for New York, A. W. Holweg; for Pennsylvania, Thomas D. Frye; for New Jersey, L. G. MacNamara; and for North Carolina, T. Stuart Critcher.

BREEDING RANGE

Our knowledge of the breeding range of the South Atlantic population is based on a comparative study of the recoveries from bandings at Horseshoe Lake, Illinois; the Miner Sanctuary, Kingsville, Ontario (Hanson and Smith, 1950); Earleville, Maryland; and Lake Mattamuskeet, North Carolina, Table 1. These recovery records indicate that the range of the South Atlantic population includes suitable areas inland from the east coast of James and Hudson Bays, from perhaps as far south as the Rupert River north to Wolstenholme, Fig. 1. The Belcher Islands in Hudson Bay and the Twin Islands in central James Bay are believed to lie within the breeding range of this flock as possibly also do portions of southern Baffin Island.

The main range east of James Bay may be confined to the relatively low coastal plain that extends inland for a distance of about 60 miles. Low (1896 p. 324) writes in regard to the Canada goose: ". . . abundant on the East Main River . . . especially on lower part, where the river is cut out of clays, with good bottomlands; breeds in large numbers on the islands of James Bay."

Few band recoveries have been obtained from the country lying between Cape Jones and the Richmond Gulf area, fig. 1, the reason being that this region apparently does not afford either attractive feeding or nesting grounds. Consequently, few geese are killed in this sector. Whereas the coast of James Bay from Rupert Bay to Cape Jones is low and undulating and offers a number of feeding areas attractive to migrating geese, the coast of Hudson Bay from the neighborhood of Cape Jones to Cape Dufferin is of a different character, the land being higher and more uneven and rising gradually as it extends northward, becoming rugged and precipitous at the head of Manitounuk Sound (Bell, 1879). This coastline, as would be expected, affords no feeding areas for geese. In a letter to Jack Miner (Dec. 20, 1918) L. G. Maver, then a post manager at Great Whale, related that few geese were killed at Great Whale because there were no feeding places along that sector of the coast and that the geese made their autumn flights in his area over water. From the descriptions given by geologists (Bell, 1879; Low, 1888, 1902), large sectors of the country lying inland from the lower half of the east coast of Hudson Bay are apparently too high, rugged, and barren to afford ideal nesting habitat for Canada geese.

Reports of residents at Povungnituk and Port Harrison, the accounts of explorers (Low, 1902; Rousseau, 1948), and band recoveries, all point to the presence of large numbers of Canada geese breeding throughout the Ungava Peninsula. This belief was recently substantiated by Eklund and Cool (1949). In an aerial survey of waterfowl populations in the central sections of the Ungava Peninsula, they found the highest populations of Canada geese between the Koguluk and Povungnituk Rivers. There, they obtained a count of 2.1 geese per mile as compared with over-all averages for tundra of 0.21 and 0.17 geese per mile of rivers and lakes, respectively. Their finding of a high population of Canada geese between these two adjacent rivers in Ungava is at least reminiscent of the relation of Canada Goose produc-

tion centers to rivers in Northern Ontario (Hanson and Smith 1950).

Adequate descriptions of the exact nature of the interior of the Ungava Peninsula are scarce because few people have traversed the interior. As Flaherty (1918, p. 124) stated, knowledge of this country "is derived solely from the information of the Eskimo. According to them it is, generally speaking, a rolling plateau of low, long-sloping hills, everywhere intersected by countless thousands of lakes and connecting streams."

On the Belcher Islands, large numbers of Canada geese nest, particularly along a V-shaped lake, 65 miles long, on Flaherty Island (letter from Jack Tryer to Jack Miner, date unknown).

A portion of the breeding range of Canada geese on southern Baffin Island may be considered a part of the range of the South Atlantic population, particularly the westerly portions of the southern coast, although the species is known to nest "more or less uniformly all the way along the southern coast from Gabriel Strait to Cape Dorset, resorting to islands as well as mainland" (Soper 1946, p. 17). The Nettilling Lake Eskimos have reported that many Canada and other kinds of geese are to be found in the region of Amadjuak Lake and along the river of the same name (letter from Arnold C. Herbert to Jack Miner, April 3, 1939). A goose banded by the Miners in the spring of 1927 and shot at Amadjuak Lake lends credence to the report by these natives, but it should be pointed out that it may be principally the non-breeding geese which frequent the areas lying north of the main breeding range on the mainland. Canada geese are also reported to nest 15 miles inland from Lake Harbour along the Soper River (Constable Daoust, R.C.M.P., Hanson questionnaire, 1947, Soper 1946).

The Canada geese of the South Atlantic population which nest on the Belcher Islands and inland from the east coast of Hudson Bay as far as the height of land are a part of a single recognizable population, the race *B. c. interior*, Todd (1938).

MIGRATION

Prior to the time southward migration occurs, there are local flights to inland lakes for the purpose of molting. A. Lunan, former post manager at Port Harrison, recently stated (personal communication, 1949) that there were flights of Canada geese into the tundra lakes of the Port Harrison region from the south in early June, reportedly for the purpose of molting. Flights of Canada geese into this region from areas north of Port Harrison have also been observed. According to the Rev. H. S. Shepherd, Canada geese have appeared at favored lakes in the Port Harrison district about the end of July, with the movement extending into August.

On their autumn migration, the geese of the South Atlantic population follow the east coast of Hudson and James Bays south as far as Rupert Bay. There, a portion, if not the main body, of the flight strikes inland, following the general course of the Nottaway River to the southeast. Others continue on to Hannah Bay at the south end of James Bay, from which they fly south to the Miner Sanctuary, their migration routes merging with those of the Canada geese of the Mississippi and

Southeast populations. For reasons discussed more fully by Hanson and Smith (1950), the numbers of South Atlantic geese migrating through the region of Kingsville, Ontario, in the autumn are believed to be but a small part of the total flight. Band recoveries, fig. 2, exaggerate the importance of this latter migration route for several reasons: (1) a greater hunting pressure is associated with the more dense human population in the regions directly south of James Bay as compared with the country lying southeast from James Bay; (2) most of the area

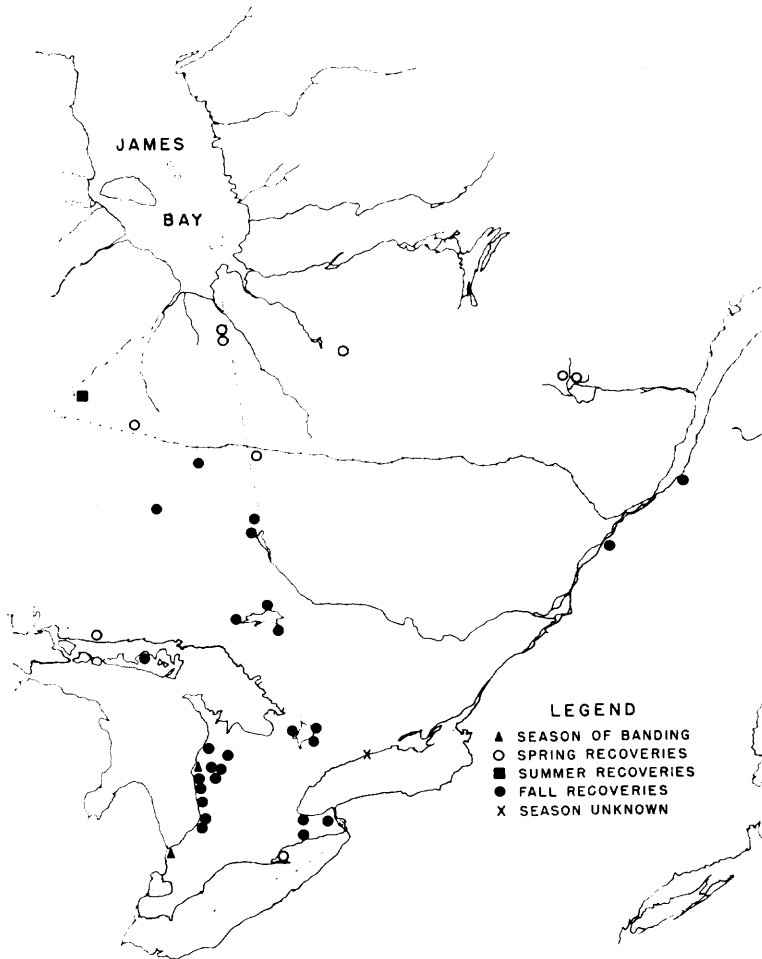


Fig. 2.—Location of band recoveries from Canada geese banded at the Jack Miner Bird Sanctuary, Kingsville, Ontario, in the spring, 1915-49, and reported recovered south of James Bay in Canada. Recoveries reported from fur trade posts on the east coasts of Hudson and James Bays are given in table 1.

to the southeast between James Bay and the northern border of western New York is a forested wilderness whereas between the south end of James Bay and Kingsville there are considerable areas of farmland attractive to Canada geese for feeding; (3) overlaps occur in banding operations at the Miner Sanctuary owing to the variable migration behavior of the geese themselves, some geese from both the Mississippi Valley and Southeast populations stopping at the Miner Sanctuary in the spring and receiving "S" marked bands from the series used in spring mainly on the South Atlantic geese. When these spring-banded geese are shot in autumn along their normal migration route between

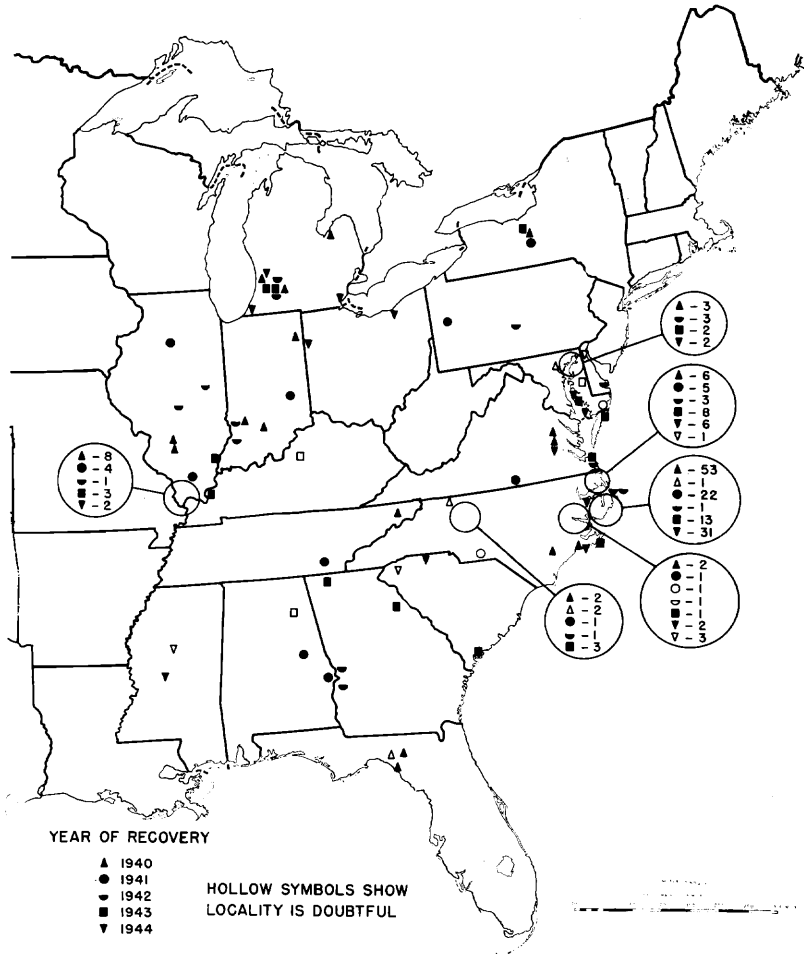


Fig. 3.—Location of band recoveries from Canada geese banded at the Jack Miner Bird Sanctuary, Kingsville, Ontario, in the spring of 1944 or earlier springs and reported recovered in the United States during 1940-44.

TABLE 2.—Time of kill of South Atlantic Flyway geese on the breeding grounds by natives as shown by band recoveries. Data from bandings at Kingsville, Ontario; Earleville, Maryland; and Lake Mattamuskeet, North Carolina.

	Number of Band Recoveries										Total	
	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.				
Fur Trade District												
James Bay												
East Main	3	1	7				2	1			14	
Fort George			10				1				11	
Cape Jones							2				2	
Subtotal	3	1	17				5	1			27	
Subtotal by percent	11.11	3.70	62.96				18.53	3.70			100.00	
Hudson Bay												
Great Whale River			1				3				4	
Belcher Islands			3		1						5	
Port Harrison					4	2	20		1		27	
Subtotal			4		5	3	3		1		36	
Subtotal by percent			11.11		13.89	8.33	8.33		2.77		100.00	
Total	3	1	21	5	3	20	8	2			63	
Total by percent	4.76	1.59	33.33	7.94	4.76	31.75	12.70	3.17			100.00	

James Bay and the Miner Sanctuary, the recovery records are presumed to be of South Atlantic geese, although for reasons stated this is not true in many cases.

The flights of Canada geese which fly southeastward from Rupert Bay on James Bay are believed to be the same as those that cross into the United States in the region of western New York, fig. 3. These flights continue on across eastern Pennsylvania, attaining the middle Atlantic coast in the region of Chesapeake Bay. Little is yet known regarding the pattern of the "distributary flights" whereby the various components of the population segregate out on the different wintering areas. Perhaps the geese wintering at Lake Mattamuskeet tend to use somewhat more westerly routes than the geese wintering further north along the coast. In all likelihood, the geese using any one sector of the wintering grounds tend to return to the same sector in subsequent years.

The spring migration routes extend farther west than do the autumn migration routes, perhaps explained in part by the northwesterly progressions of the spring isotherms. En route, large numbers of these geese visit the Miner Sanctuary, particularly during the first two weeks in April. Their final flight carries them directly to the breeding grounds, the coasts of James and Hudson Bays not being followed to the extent that they were in the autumn. The more moderate climate of the interior may be one reason for their avoidance of the coasts of the bays in early spring. According to Gerald Parsons, post manager at Obijuan, located just south of Gouin Reservoir in Quebec, few flocks are seen in his area in the autumn, but many are seen in the spring flying directly north. At Great Whale River, fig. 1, few geese are seen in spring, but many are observed in the autumn (letter from L. G. Maver to Jack Miner, 1918). Thus, it is in spring, while they are still on their inland trapping territories, that the Indians who summer at the posts on the east coast of James Bay make their principal kill of Canada geese, table 2.

WINTERING GROUNDS

When the recoveries from the Miner bandings were plotted by exact locality rather than simply by states, as was the practice of Jack Miner, they revealed that the autumn flight stopping at the Sanctuary actually consisted of two populations, the Mississippi Valley population and the Southeast population, fig. 4 and table 3. Band recoveries indicated that the Southeast population wintered chiefly in the *inland* piedmont areas of Virginia, North Carolina, South Carolina, Georgia, Alabama, and on the gulf coast of Florida in the vicinity of St. Marks. Within this range, these geese used nearly every major river and reservoir of importance. For a more detailed discussion of the breeding and wintering range of the geese of the Southeast population the reader is referred to Hanson and Smith (1950). The Southeast population will be discussed here only insofar as new data are available or when it is desirable to review published data to clarify the status of the South Atlantic population. In contrast to the inland range of the Southeast geese, the South Atlantic geese frequent almost exclusively the coastal areas, from southern New Jersey to Lake Mattamuskeet.

TABLE 3.—Recoveries in eastern states, 1925-1949, of Canada geese of the Southeast Flyway banded each autumn at Kingsville, Ontario.
Recoveries by Five-year Periods

State	1925-29		1930-34		1935-39		1940-44		1945-49		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
N. Y.	1	1.33	0	0.00	0	0.00	1	0.78	2	1.89	4	.76
Pa.	0	0.00	1	0.76	1	1.18	2	1.56	3	2.83	7	1.33
N. J.	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Md.	3	4.00	6	4.58	2	2.35	5	3.91	6	5.66	22	4.19
Del.	0	0.00	1	0.76	0	0.00	1	0.78	1	.94	3	.57
W. Va.	1	1.33	1	0.76	0	0.00	2	1.56	2	1.89	6	1.14
Va.	23	30.67	36	27.49	12	14.12	31	24.22	11	10.38	113	21.53
N. C.	32	42.67	28	21.38	18	21.18	27	21.10	42	39.62	147	28.00
S. C.	7	9.34	25	19.08	11	12.94	14	10.94	8	7.55	65	12.38
Ga.	4	5.33	19	14.50	25	29.41	25	19.53	12	11.32	85	16.19
Ala.	1	1.33	11	8.40	14	16.47	19	14.84	13	12.26	58	11.05
Fla.	3	4.00	3	2.29	2	2.35	1	0.78	6	5.66	15	2.86
Total	75	100.00	131	100.00	85	100.00	128	100.00	106	100.00	525	100.00

The over-all wintering range of Canada geese of the South Atlantic population is less extensive than that of either the Mississippi Valley or Southeast populations, figs. 3 and 4, but the total refuge areas available to these geese are considerable, national refuges alone totalling about 69,000 acres. In addition, there are enormous water areas that offer these geese safe retreat from gunning. The main wintering range extends from the upper reaches of Chesapeake Bay and coastal areas of southern New Jersey south to Currituck Sound and Lake Mattamuskeet.

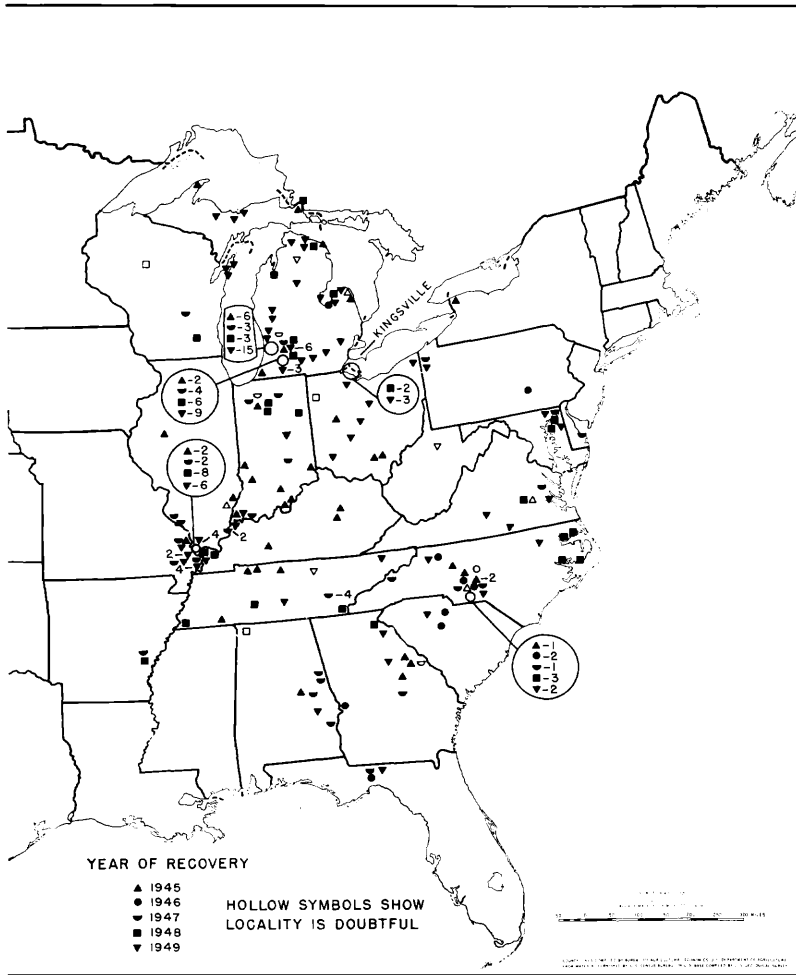


Fig. 4.—Location of band recoveries from Canada geese banded at the Jack Miner Bird Sanctuary, Kingsville, Ontario, during the autumn of 1948 or earlier autumns and reported recovered in the United States during 1945-49.

Major concentrations occur at the Blackwater National Wildlife Refuge and the shoals around Fox, Smith, and Tangier Islands in Chesapeake Bay; at Back Bay National Wildlife Refuge, Virginia; at Currituck Sound and at Pea Island and Mattamuskeet National Waterfowl Refuges in North Carolina. Smaller concentrations numbering from a few hundred to 1,000 or more are found scattered throughout Pamlico and Albemarle Sounds and along the Carolina Banks. Within this general region, about 200,000 Canada geese winter annually. The size and range of any one wintering flock varies from year to year, depending upon the quality of natural feeding grounds and the availability of supplemental feed in nearby agricultural districts.

The wintering grounds are essentially maritime in character, and in keeping with this habitat, the principal natural feeding grounds are beds of submerged aquatic vegetation and the marshlands adjoining the coast. Some flocks feed extensively on cultivated fields, but in most cases, the feeding areas lie at no great distance from salt water.

Only a very small percentage of the tidal marsh within the wintering range can be classified as productive feeding grounds. The extensive *Juncus* marshes of the North Carolina and Maryland coasts lack the succulent browse and roots sought by the geese. Where available, tidal flats of *Spartina alterniflora* supplement the submerged vegetation. Extensive beds of aquatics in the waters of Back Bay, Virginia, and Currituck Sound, North Carolina, are an important source of foods for the geese using these areas in late fall and early winter. When these aquatic beds are depleted, the geese feed upon the beds of American bulrush (*Scirpus americanus*) found along the inner beach and on the fresh-water marshes. Where present, extensive use is made of eel grass (*Zostera marina*) in Chesapeake Bay and the sound waters of North Carolina whenever tide levels and weather conditions permit. Shoal grass (*Halodule wrightii*) is taken in considerable quantity in Pamlico Sound and Widgeon grass (*Ruppia maritima*) is also important locally. Intensive seining in recent years by commercial fishermen has eliminated many beds of submerged aquatics which formerly had attracted large flocks of Canada geese as well as other waterfowl.

The practice of burning coastal marshes, formerly done to afford pasturage for livestock (and still carried out by trappers), is followed by wildlife agencies to provide additional green food for geese during late winter and early spring. To some extent, this activity affects the distribution of wintering flocks.

The numbers of Canada geese that wintered along the southern Jersey coast prior to the disappearance of the eel grass in 1931-32 are not known, but judging from Urner's records from the Cape May area (Stone 1937) they were considerable. There is no question, however, that the former eel grass beds and unditched coastal marshes afforded a more extensive wintering range in that state than now exists. Some eel grass beds survived in portions of Chesapeake Bay and in Pamlico and Albemarle Sounds even after the plant ceased to exist throughout much of its former range, and it is in these areas where eel grass is making a good recovery that Canada geese have now concentrated in numbers.

Few Canada geese winter along the Delaware coast, possibly because the coastal marshes there are relatively unproductive of natural foods, no large beds of submerged vegetation being present except at the mouth of the Delaware River (Susquehanna Flats). Large flocks of geese occur on the marshes of upper Delaware Bay and along those of southern New Jersey, but only after the wintering concentrations break up.

Agricultural trends are reflected by local distribution of the wintering flocks. Fields along the Chesapeake Bay shore, formerly planted to grain, attracted and held small wintering flocks. Later, when such areas were permitted to revert back to the natural vegetation, even the nearby shoal-water feeding grounds were abandoned. Some such areas where farming was discontinued at the turn of the century are again being put under cultivation and again attracting Canada geese. Demand for increased food supplies during World War II resulted in the clearing of additional coastal lands and the growing of such crops as peanuts, corn, soybeans, and winter grains — all attractive to wintering geese. As a result, local concentrations have increased beyond what would have been the capacity of the range in its original primitive condition.

There has been a close correlation between agricultural development and wintering goose populations in the Lake Mattamuskeet area. Available data indicate that few birds used the area prior to the draining of the lake and the farming of the bottom peat lands. Inability to dry out the lake area and intermittent cultivation of the soil contributed to the development of extensive beds of American bulrush. When flooded shallowly during the autumn, these bulrush beds provided ideal feeding grounds and attracted thousands of Canada geese. Since the restoration of the lake in 1934 the marshlands bordering the shore line have continued to hold the wintering population. The almost complete disappearance of the eel grass from Pamlico and Albermarle Sounds and the deterioration of other aquatic feeding grounds, caused in large measure by commercial fishing activities, are also believed to have influenced the gradual build-up of the wintering flock at Lake Mattamuskeet that has occurred since 1920.

As at Horseshoe Lake and other areas in the Mississippi Flyway, wherever South Atlantic Canada geese have been encouraged to become dependent upon agricultural crops, they seem to lose much of their wariness and are taken by hunters in larger numbers than are self-reliant flocks, accustomed to foraging on tidal marshes and in shallow bays. In the South Atlantic Flyway wintering grounds, about 30 per cent more geese are bagged in agricultural districts than on the marshes. Although the increased take of geese in agricultural areas is partly a result of greater availability to the hunters, the geese on these wintering grounds are partially safeguarded by the numerous bays available to them where they can rest well beyond the reach of gunners.

POPULATIONS

Complete population figures over a period of years are not available for the South Atlantic geese, partly because the identity of the various wintering flocks in the middle Atlantic states was not fully known until recently. Also, inventory data from earlier years do not match the

standards of recent inventories. For example, data from extensive areas like Chesapeake Bay for years before the use of planes can be expected to show, *at best*, only trends. In some years, the January inventory indicated as many as 200,000 geese for the entire Chesapeake Bay area, but it is doubtful that 100,000 could now be found there. The only large concentrations frequenting the adjoining mainland occur at the Blackwater National Wildlife Refuge, fig. 5. Large numbers also use the shoals around Fox, Smith, and Tangier Islands in the lower bay region.

The Mattamuskeet National Wildlife Refuge holds the greatest number of geese, the wintering flock numbering between 40,000 and 70,000 since 1943, fig. 5.

The population at the Back Bay National Wildlife Refuge has peaked at 30,000 or more for six of the last eight years, fig. 5. Some inventory records for Virginia have pointed to a total state-wide population of between 35,000 and 40,000 Canada geese. The evidence available at this time, however, strongly indicates that the geese which inhabit the inland areas, i.e., the total Virginia state-wide population minus the Back Bay population, belong to the Southeast population.

The smallest major concentration frequents the Pea Island National Wildlife Refuge and the adjoining areas of Pamlico Sound. It would appear from migration dates and flock movements that the geese at Back Bay and Pea Island probably belong to the same wintering population. On the other hand, the Mattamuskeet flock appears to be a distinct entity during the fall-winter period.

The trend of the combined populations using these four major wintering grounds has been sharply upwards in recent years, fig. 5. As the annual total numbers at the four federal refuges represent at least 60 per cent of the total flyway population, it seems probable that total flyway numbers have also increased, but because of the tendency of geese to concentrate in the vicinity of refuges, it is debatable whether the over-all increase has been proportional to the increase at the refuges.

ANNUAL BAG

The South Atlantic geese are hunted on the breeding grounds by two groups of natives — the Eskimos and the Cree Indians. The Eskimos concerned are distributed along the east coast of Hudson Bay; the Indians that inhabit the breeding grounds of these geese hunt over the areas lying inland from the east coast of James Bay, fig. 6. Their combined population in the early 1940's was approximately 2,800 (Anon, 1945, Robinson 1944). The seasonal aspect of the kill by these natives is evident in table 2.

Information regarding the number of Canada geese taken by these natives who hunt out from the various posts is limited. According to studies made by A. J. Kerr, an anthropologist in residence at Rupert House in 1947-48, the kill of Canada geese by Rupert House Indians from July, 1947, to June, 1948, was 417 birds (letter from J. G. Honigman to H. C. Hanson, Sept. 10, 1948).

The kill made between Nastapoka Sound and Povungnituk is estimated by Rev. H. S. Shepherd to be between 1,500 and 2,000 geese

(Hanson questionnaire, 1947). D'Arcy Monroe of the Hudson's Bay Company recently informed Hanson (August, 1949) that the native kill at Povungnituk for the years when he was stationed at this post, around 1946 and 1947, was about 2,000. The Royal Canadian Mounted Police at Port Harrison estimated the Canada goose kill in their district

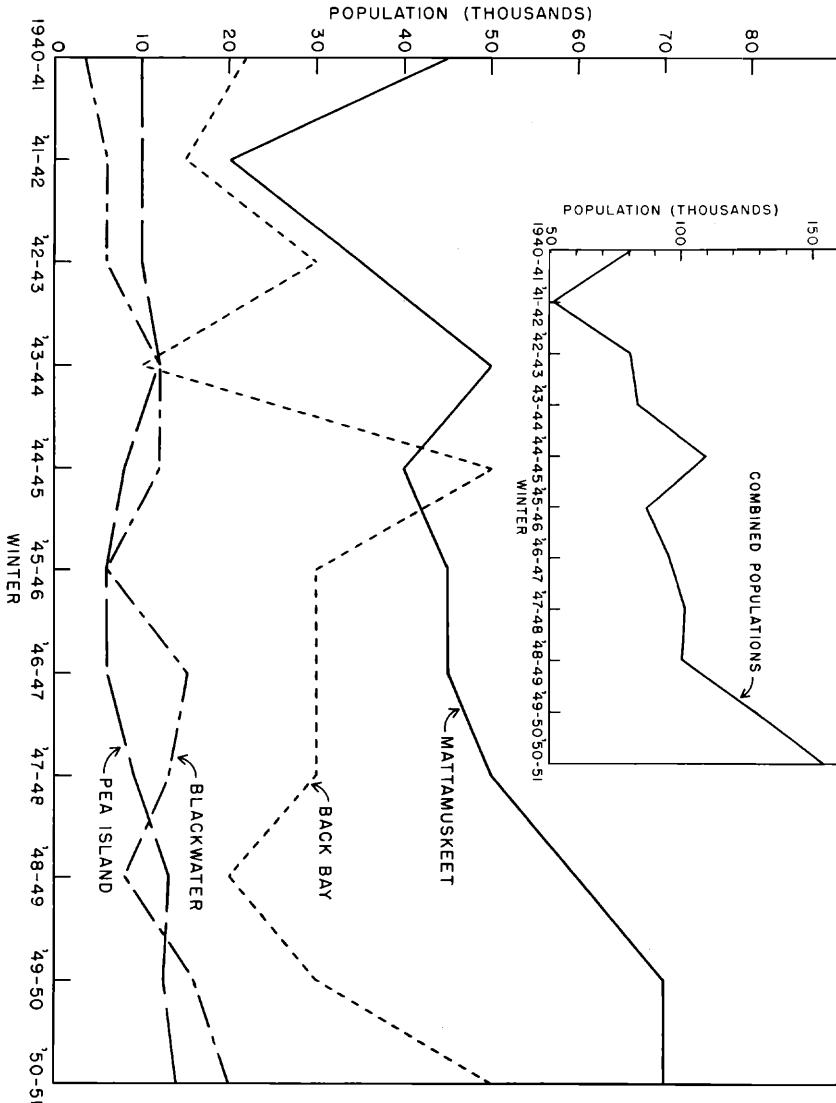


Fig. 5.—Populations of Canada geese at four principal wintering areas on the middle Atlantic coast, 1940-41 — 1950-51.

TABLE 4.—Recoveries, 1925-49, of Canada geese of the South Atlantic Flyway banded each spring at Kingsville, Ontario.
Recoveries by Five-year Periods

State	1925-29		1930-34		1935-39		1940-44		1945-49		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Mass.	1	0.96	0	0.00	0	0.00	0	0.00	5	3.27	17	1.75
N. Y.	2	1.92	7	2.60	1	0.43	2	0.86	6	3.92	25	2.57
Pa.	1	0.96	7	2.60	9	3.91	2	0.86	3	1.96	26	2.67
N. J.	4	3.85	4	1.49	0	0.00	15	6.47	9	5.88	85	8.73
Md.	6	5.77	48	17.84	20	8.71	2	0.86	0	0.00	0	0.00
Del.	0	0.00	11	4.09	3	1.30	0	0.00	0	0.00	7	0.72
W. Va.	0	0.00	6	2.23	0	0.00	0	0.00	1	0.65	42	4.32
Va.	6	5.77	14	5.20	8	3.48	8	3.44	6	3.92	702	72.14
N. C.	75	72.12	161	59.85	183	79.57	182	78.45	101	66.02	24	2.47
S. C.	6	5.77	3	1.12	3	1.30	6	2.58	6	3.92	20	2.06
Ga.	1	0.96	4	1.49	3	1.30	5	2.16	7	4.58	12	1.23
Ala.	1	0.96	1	0.37	0	0.00	5	2.16	5	3.27	13	1.34
Fla.	1	0.96	3	1.12	0	0.00	5	2.16	4	2.61	973	100.00
Total	104	100.00	269	100.00	230	100.00	232	100.00	153	100.00		

at about 1,000. In the Port Harrison and Povungnituk districts the principal kill is made during the summer, table 2, when the geese are in flightless condition. The Reverend Mr. Shepherd knew of one instance of three hunters killing 130 geese on a single trip. A. Lunan of the

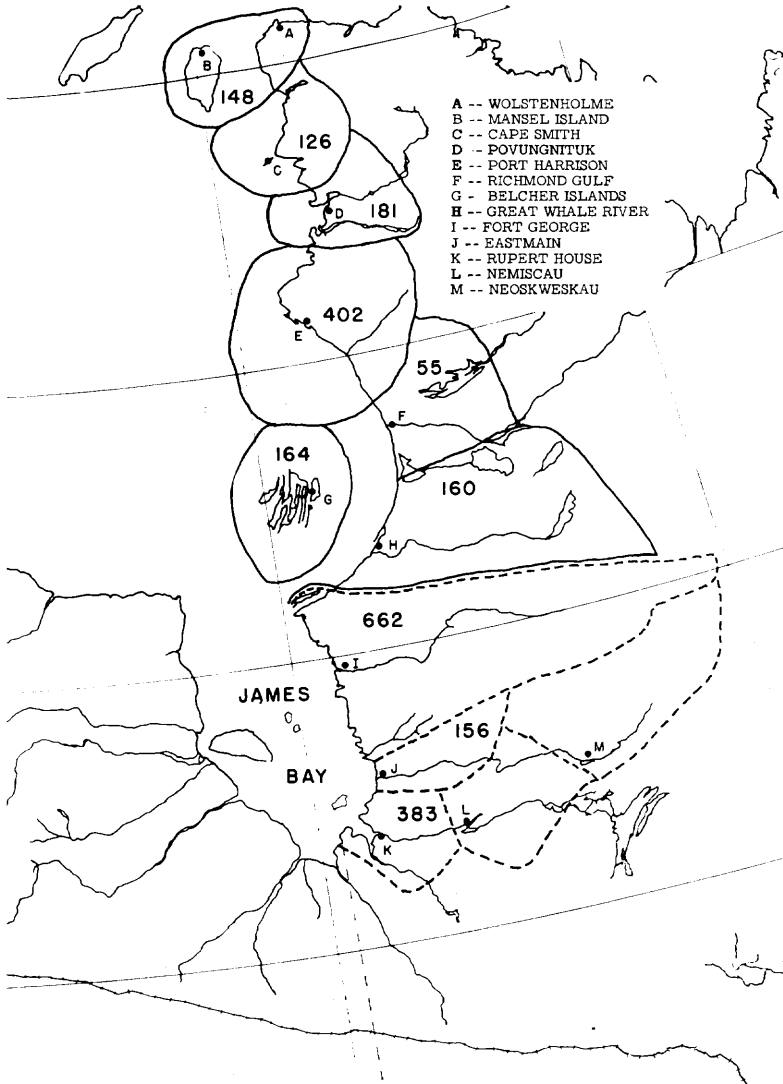


Fig. 6.—Map showing limits of the trapping and hunting grounds and size of the various bands of Indians and Eskimos east and south of Hudson and James Bays. Solid lines delineate Eskimo territories (from Robinson 1944); interrupted lines delineate Indian trapping territories. (After Cooper, 1933.)

TABLE 5.—Bag of Canada geese in some areas frequented by the South Atlantic Flyway population, 1941-50

State or Area	Year									
	1941-42	1942-43	1943-44	1944-45	1945-46	1946-47	1947-48	1948-49	1949-50	
New York ¹	791	639	514	462	754	384	212	
Pennsylvania	2,399 ²	755 ¹	915 ¹						550 ³	
New Jersey ²	491	681	856	888	1,944	965	1,963			
Delaware ²				Possibly 100						
North Carolina										
Pea Island area ⁴	Generally 2-400	annually	along	entire	beach.					
Lake Mattamuskeet ⁴	943	1,620	3,119	1,653	868		575	4,912	7,917	
Currituck Sound ⁴							1,168	2,269	1,985	
Total										

¹From license stub data furnished by New York Conservation Department.²From license stub data furnished by New Jersey Department of Conservation.³According to Richard E. Griffith.⁴According to Richard E. Griffith.⁵From Division of Refuges files, U. S. Fish and Wildlife Service.⁶From T. Stuart Critcher in personal communication and "North Carolina Conservation News," spring 1950.⁷Based on 97 percent return of hunter license kill cards.⁸Estimate by Game Protector Sickles.

Hudson's Bay Company recently stated (personal communication to H. C. Hanson, 1949) that 75 per cent of the kill around Port Harrison is of nonbreeding, molting geese.

In a letter of August 8, 1943, to Jack Miner, Brother G. Lavoie wrote regarding the goose kill by the Indians at Eastmain: "The best shots here kill about 60, average is about 20."

Inquiry of the Indians at Rupert House revealed that the largest individual spring kill of Canada geese in that area, usually 25 to 30, was 40 in the spring of 1946. At a point between Rupert House and Eastmain 6 or 7 hunters killed about 150 geese in the spring of 1946. The average kill by the Rupert House Indians is not over 7 or 8 (letter from Father Damase Couture to H. C. Hanson, Nov. 12, 1946). If Kerr's kill figure for Rupert House, 418, is divided by 111, the approximate number of hunters (men, and boys 17 or more years of age) at this post in 1944 (Anon. 1945), an average kill of 3.8 geese per native hunter is indicated. The principal kill by the Indians takes place during the migration periods. Very few Canada geese are shot during the nesting period as these Indians spend their summers at the coastal posts.

There is ample justification for the kills made by the Eskimos and Indians, as often their very survival depends on the availability of geese. The Reverend H. A. Turner (letter to Jack Miner, August 23, 1938) writes from Port Harrison: "The people here would often be in a very bad way except for the birds as there are no seals and fish are not very abundant." An explanation for the high band recovery rate from the Port Harrison-Povungnituk region is furnished by W. A. Tolboom, a post manager at Povungnituk: "Later on in the season they moult and are then unable to fly. Great numbers are thus killed by the Eskimos who hunt inland and run them down. However, being very fast of foot these birds have no trouble outrunning a human, and it's only by careful stalking that natives can get them." (Hanson questionnaire, 1947).

The kill made in the inland areas over which the geese pass in migration south of James Bay is slight, as might be expected. Gerald Parsons, post manager at Obijuan, Quebec, estimated that not over 10 or 15 Canada geese are shot annually over an area of 50 square miles about that post. The paucity of recoveries between James Bay and the United States is further evidence of a low kill throughout this area, fig. 2. One reason for so few recoveries is that the geese migrate over this forested portion of the range with too few stops of sufficient duration to afford much shooting to the natives.

It was estimated by Hanson and Smith (1950) that only 1 to 2 per cent of the Mississippi Flyway population is bagged by hunters located between Hudson and James Bays and the United States border. Native and white hunters residing in the comparable area in Canada that lies between James Bay and eastern Lake Ontario are believed to take an even smaller portion of the South Atlantic Flyway population which is available to them in the autumn.

Information on the numbers of Canada geese killed on the wintering grounds is very unsatisfactory, few reliable data being available. Although kill card data are included in table 5, they can at best be ex-

pected to show only trends. Figures for the kill in New York and New Jersey are based on kill card data, and in all probability exaggerate the actual number of geese bagged by several times. The most dependable data are those for the coastal areas of North Carolina where close check is kept of the kill by trained observers. An indication of the share of the total kill of South Atlantic geese taken by the various states can be gained from compilations of band recoveries, table 4.

If we can assume that the geese banded at the Miner Sanctuary in the spring represent an adequate cross section of the entire population of South Atlantic geese, a not unwarranted assumption, a rough appraisal of kill of these geese in the United States in recent years can be obtained from the use of band recoveries and kill records, tables 3 and 5. Reliable kill records are available only for the 1947-48 to 1949-50 season and then only for the state of North Carolina. Some geese are killed elsewhere in North Carolina besides the localities given in table 5, but the number would be small relative to the total coastal kill. Band recovery records indicate that the kill in North Carolina, table 5, chiefly the coastal areas, fig. 3, for the period 1945-49 as well as earlier periods, amounts to at least 70 per cent of the total kill of South Atlantic geese in eastern United States. The average kill in North Carolina for the period 1947-48 plus 1949-50 was in the neighborhood of 7,000 birds. Assuming then the 70 per cent recovery level from North Carolina, table 4, is representative of the 7,000 bird kill, the total kill for all eastern states frequented by the South Atlantic geese has in recent years averaged roughly 10,000. Admittedly the trend of the kill in the Lake Mattamuskeet area has been sharply upward for the years cited; perusal of fig. 5 will reveal that the population frequenting that area also increased considerably. The kill of South Atlantic geese in individual states other than North Carolina can be roughly estimated from band recoveries by the method outlined above. While this appraisal is open to many criticisms, it is the only means available thus far for estimating the kill.

A similar appraisal of the over-all kill on the breeding grounds can also be obtained by the use of band recoveries. Assuming that the kill of 1,500 to 2,000 geese in the Port Harrison district, as reported by two resident observers, is approximately correct, and that the number of band recoveries from the various sectors of the breeding grounds is approximately proportional to the local kills, it would appear that the kill in the Port Harrison region is about 36 per cent of a total kill of about 6,000 birds. The scarcity of band recoveries between James Bay and the border is fairly reliable evidence that the kill of these geese in Canada away from the breeding grounds is negligible. Thus, the best estimate we can make of the Canadian kill at this time is that it is roughly one-half that of the kill made in the United States.

SUMMARY

The Canada geese of the South Atlantic population breed inland from the east coasts of Hudson and James Bays, probably on The Twin Islands in James Bay, on the Belcher Islands and perhaps to a very limited extent on southern Baffin Island.

In autumn, most of these geese migrate south along the east coasts of Hudson and James Bay to the region of Rupert Bay. From there they

strike south-eastward crossing over into United States in the region of western New York. On their final flights to their wintering grounds, they migrate across eastern Pennsylvania, some attaining the Atlantic seaboard in the region of Chesapeake Bay, others apparently continuing southward along a more inland course before reaching their coastal wintering grounds.

Their wintering range extends from the upper reaches of Chesapeake Bay south to Lake Mattamuskeet area (chiefly Hyde and Dare Counties) of North Carolina. It includes four national refuges totalling over 69,000 acres.

The annual bag of South Atlantic geese during the 1940's is estimated as being somewhere in the neighborhood of 16,000 birds. Roughly one-third of the annual kill is made by the Indians and Eskimos living on the breeding grounds. The relative importance of the annual kill by these natives has probably not changed appreciably in recent decades and is often necessary for their survival.

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THIRTY YEARS OF BANDING AT NORRISTOWN, PENNSYLVANIA

BY RAYMOND J. MIDDLETON

Our banding station was established just thirty years ago this spring when a single government sparrow trap was set out. During the next seven years with one trap we banded over 800 birds. In August of 1928 five sparrow, eight chardonneret and five two-section potter traps were constructed and placed in use; with this addition the fall migration brought us over 1,000 birds in the traps.

Several years later water drip traps came into use and four chardonneret traps were made to use with water as bait. Noting that robins and other thrushes would walk around this type of trap looking for a ground entrance we devised a new trap circular in shape and with two ground funnel-shaped entrances to meet this need, these being made of $\frac{3}{4}$ -inch poultry netting.

These traps were instantly a tremendous success but as some warblers and kinglets would enter and push right thru the mesh and escape as we reached in to remove them, we now made some with $\frac{1}{2}$ -inch hardware cloth and thus no small birds could go thru. Later on the multiple section chardonneret traps came out and two ten-cell Brenkle traps were made and have been in use since. Three years ago we saw a Modesto trap at one of our annual conventions and four were made; they have proved excellent for ground-feeding species.

We now have all of our thrush traps, which still carry their original name even though they now catch nearly every species we band (Fig. 1). These are made with $\frac{1}{2}$ -inch mesh hardware cloth. Each has a door in the top to remove birds, or a side door if the use of a gathering cage is preferred. The side door may be at ground level, or (particularly if many warblers are handled) near the top; the trap is sometimes made with doors at both levels. We use six of the traps all summer with a water drip, from a bucket hanging overhead into a six- or eight-inch flower pot saucer. We use five others in the summer with bread, crackers and small grain as bait; at other seasons all of these traps are used with grain as bait. Surprisingly, over half the warblers we take are caught in this, a ground entrance trap. It is definitely the best trap we have. Since using these and the four Modesto