with bright orange colour bands placed on the upper part of the leg in various combinations with the metal band to denote year and season of marking, as well as the age of the bird.

The program has been very successful, with sightings of Surinam birds in many parts of eastern North America, and 11 records in James Bay in 1977. Although Dr. Spaans has now returned to Holland, orange-banded Semipalmated and Least Sandpipers should still be in circulation, and reports of any sightings would be very much appreciated.

Observers are asked to report details of species, location, date, and band arrangements (position and number of colour bands and metal band). Arie Spaans' present address is: Research Institute for Nature Management, Kemperbergerweg 67, Arnhem, Holland.

ARTICLES

SHOREBIRD BANDING AND COLOUR-MARKING STUDIES IN JAMES BAY, 1977

R.I.G. Morrison

Introduction

Shorebird banding studies in James Bay were started by the Canadian Wildlife Service in 1974, and a narrative account of studies up to 1976 appeared in the Wader Study Group Bulletin in that year (Morrison, 1976c). In 1977, the Canadian Wildlife Service carried out the third year of the large scale program. The west coast of James Bay is a major migration pathway for many species of shorebirds migrating between their arctic and subarctic breeding areas and wintering areas in South America. A basic objective of the work is to obtain information on migration routes and strategies of shorebirds using the James Bay coastline, and from associated biometric and moult studies, to identify the populations involved and the purposes for which they are using the coast. Canadian Wildlife Service studies have shown that the James Bay marshes and mudflats are of great international importance for both common species, such as the Semipalmated Sandpiper, as well as for less common species, such as the Red Knot and Hudsonian Godwit. In 1976, a sight record of two Eskimo Curlews was made (Hagar and Anderson, 1977).

Colour-marking is a valuable technique for migration studies, since a marked bird needs only to be observed and reported, and not captured, for a record to be established. The dye used in the James Bay studies, picric acid, lasts throughout the southward migration and into the winter months, but is lost through moult of the feathers during the spring before the birds return north.

In 1975, over 70 'bird days' of sightings resulted from 4,028 shorebirds captured in James Bay (Morrison 1976b) and in 1976, over 600 'bird days' were eventually reported from 12,402 birds marked (Morrison 1977b). The present report is intended as a general summary of the results obtained from the 1977 program.

Methods and Study Area

Banding operations were once again carried out principally at North Point (51°29'N, 80°27'W) on the southwest coast of James Bay, 27 km. northeast of Moosonee, Ontario. The coastline is very flat, with extensive marshes, and mist-netting was the most important technique used for trapping shorebirds, accounting for over 90% of the birds captured. Up to 150 nets were in operation at any one time over a 2 kilometre stretch of coastline. Nets were checked continuously during suitable weather by a team of twelve, divided into day and night shifts. Operations were carried out from 27 June to 2 September 1977.

A second camp was operated at Longridge Point (51°49'N, 80°42'W), approximately 50 km. further north up the coast, from late July until mid-August. Rocket-netting was an important technique at this location and enabled a different range of species to be caught in places where birds fed over large washed up beds of seaweed.

All birds captured were banded, colour-banded, weighed, measured, examined for moult and dyed with picric acid over the entire breast and belly (North Point) or the lower belly from legs to tail (Longridge Point). Adults and juveniles were colour-banded with yellow and light-blue bands respectively, in a combination denoting the ten-day period in which they were captured. As much advance publicity was given to the program as possible, asking observers to look for and report colour-marked birds.

Results

In 1977, 13,536 shorebirds of 25 species were captured, bringing the total number of shorebirds captured in James Bay since the operation began to 30,263 (Table 1). Of the 13,536, 12,311 were captured at North Point and 1,225 at Longridge Point. Up to 31 January 1978, reports of 615 'bird days' of sightings had been received, involving 8 species of shorebirds. One 'bird day' was counted for each day a colour-marked bird was sighted in any locality. In some cases it was not possible to distinguish whether repeated sightings in a given area may have represented the same individual or different birds: results suggested stopover periods varied from a few days to several weeks.

A. Semipalmated Sandpiper

Semipalmated Sandpipers were the most numerous bird captured, comprising 11,075 of the total of 13,536 (Table 1). Many birds (367) were captured from previous years' banding operations,

and comparison of results at North Point and Longridge indicated the same birds tended to return to preferred local areas on the coast from year to year. Twelve birds were captured that had been banded elsewhere, including 6 from the shorebird marking program being carried out in Surinam, South America, by Arie L. Spaans. At least 5 other records of South American birds were obtained through sightings of colour-banded individuals.

Up to 31 January 1978, 545 'bird days' of sightings of Semipalmated Sandpipers had been received (Table 2, Figure 1). The distribution of sightings was generally similar to that observed in 1976, showing a wide dispersal of Semipalmated Sandpipers to the east coast, ranging from the Gulf of St. Lawrence south to Georgia. Many reports came from the Upper Bay of Fundy, the coastline of Massachusetts including Cape Cod, and areas around Long Island, N.Y.; significant numbers of sightings were also reported from the coasts of Maine and New Jersey. The large numbers of sightings around the Upper Bay of Fundy result partly from regular coverage by participants in the Canadian Wildlife Service Maritimes Shorebird Survey scheme: at Mary's Point, New Brunswick, colour-dyed birds were seen on most days when counts were made between mid-July and mid-September, with a maximum of 8 dyed birds seen together on 30 August 1977. Similar considerations apply to other areas which are covered regularly by birdwatchers (e.g. in Massachusetts). However, shorebird counts obtained through the International Shorebird Survey scheme, organized jointly by the Canadian Wildlife Service and Manomet Bird Observatory, Massachusetts, as well as the Maritimes scheme, have demonstrated that these areas are indeed of particular importance for Semipalmated Sandpipers (Morrison 1977a), and the large numbers of sightings from such areas reflects this fact.

There was again little evidence that birds passing through James Bay in the autumn used interior 'flyways' during their southward migration. Sightings of birds from the St. Lawrence valley and Great Lakes probably involved individuals which had broken their flight between James Bay and major stopover areas on the Atlantic seaboard.

Further south, reports of James Bay birds came from Antigua, Venezuela and Guyana, while on Bermuda, two birds were reported, one of which was considered to be present from 10-24 September 1977.

The current picture emerging from the banding, colour-marking and measurement studies is that populations of Semipalmated Sandpipers from different parts of the arctic breeding range differ in their routes, timing and strategy of migration (Harrington and Morrison, in press). Birds passing through James Bay include many from central and western arctic breeding areas. After dispersal to the east coast, present evidence suggests most birds make an overseas flight to South America or the Caribbean, rather than moving down the east coast. This fact underlines the critical importance of east coast estuaries as refuelling stops for birds about to make a long trans-ocean flight.

B. Other Species

Patterns of sightings of other species were generally similar in 1976 and 1977, and the Sanderling and Semipalmated Plover were again notable for the large number of reports received relative to the number of dyed birds released (Table 2), presumably because both are conspicuous and occur in habitats where they are likely to be observed. Two Sanderling reports were of particular interest. The first was of a bird reported at New Haven, Connecticut, on 31 July 1977, which banding records indicate would have been banded only 2 to 5 days previously, at either Longridge Point or North Point, respectively. The second bird, reported as being present on Brier Island, Nova Scotia, between 29 August and 4 September 1977, was identified from its dye pattern and colour bands as being the only juvenile bird that had been banded at Longridge Point, two weeks earlier on 16 August 1977. Reports again indicated Sanderling dispersed from southern James Bay to the middle of the Atlantic seaboard. Forty bird days of sightings resulted from 253 Semipalmated Plovers, Massachusetts again having many sightings. Information from the colour-band arrangement of one Semipalmated Plover reported on Bonaire, Netherlands Antilles, from 29-31 August 1977, indicated that a minimum of 9 and a maximum of 18 days had elapsed since it had been banded in James Bay.

Notable again was the absence of reports of dyed White-rumped Sandpipers, despite the substantial number captured (599). This presumably reflects the relatively north and easterly passage of the species through eastern Canada, where few would likely be seen: the White-rumped Sandpiper is fairly common in parts of the Maritime Provinces and on the Magdalen Islands (Morrison 1976a) and has been described as the commonest shorebird in Labrador (Austin 1932).

Discussion

The banding and colour-marking studies are continuing to provide valuable information on the migration routes and strategies of shorebirds passing through major migration areas in James Bay in the autumn. Basic, detailed information on the migration routes of particular populations and the purposes for which they use specific areas is needed to assess the likely effects of developments which have been proposed for many areas throughout the birds' ranges. The Fundy Tidal Power project in the Upper Bay of Fundy is one such scheme that has a potential to affect shorebirds considerably in an area that is of outstanding importance in eastern North America, and which is used by many species to lay down essential fat reserves to enable a long, trans-ocean flight to wintering areas in South America to be made. Studies in James Bay, the Maritime Provinces of Canada, and areas on the eastern seaboard of the United States will be essential in providing integrated information essential for the future management and conservation of shorebirds.

Acknowledgements

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Table 1. Totals of shorebirds banded in James Bay, 1977 and previous years.

1 9 7 7

	ADULT					JUVENILE			TOTAL	PREVIOUS YEARS	GRAND TOTAL
	NR	RT	RC	C	TOTAL	NR	RT	TOTAL			
Semipalmated Plover	111	16	1	-	128	141	38/1*	180	308	205	513
Killdeer	2	1	-	-	3	12	1	13	16	4	20
American Golden Plover	1	-	-	-	1	2	-	2	3	4	7
Black-bellied Plover	1	-	-	-	1	-	-	-	1	8	9
Ruddy Turnstone	60	-	3	1	64	49	1	50	114	141	255
Common Snipe	2	-	-	-	2	24	-	24	26	19	45
Whimbrel	1	-	-	-	1	-	-	-	1	-	1
Spotted Sandpiper	-	-	-	-	-	14	-	14	14	8	22
Solitary Sandpiper	5	-	-	-	5	4	4	8	13	3	16
Greater Yellowlegs	15	-	-	-	15	15	-	15	30	14	44
Lesser Yellowlegs	32	-	-	-	32	50	-	50	82	106	188
Red Knot	10	-	-	-	10	53	-	53	63	87	150
Pectoral Sandpiper	51	2	-	-	53	7	-	7	60	130	190
White-rumped Sandpiper	534	30	30	-	594	5	-	5	599	1,093	1,692
Baird's Sandpiper	-	-	-	-	-	-	-	-	-	1	1
Least Sandpiper	53	2	1	-	56	622	50	672	728	433	1,161
Dunlin	229	12	4	-	245	35	-	35	280	624	904
Short-billed Dowitcher	2	-	-	-	2	14	1	15	17	8	25
Stilt Sandpiper	-	-	-	-	-	2	-	2	2	1	3
Semipalmated Sandpiper	5,722	764	327	12	6,825	3,676	571/3*	4,250	11,075	13,634	24,709
Buff-breasted Sandpiper	-	-	-	-	-	4	-	4	4	2	6
Marbled Godwit	-	-	-	-	-	1	-	1	1	8	9
Hudsonian Godwit	13	-	1	-	14	2	-	2	16	10	26
Sanderling	67	1	-	-	68	2	-	2	70	144	214
Wilson's Phalarope	-	-	-	-	-	1	1	2	2	4	6
Northern Phalarope	2	-	-	-	2	9	-	9	11	36	47
	6,913	828	367	13	8,121	4,744	667/4*	5,415	13,536	16,727	30,263

NR = Newly Ringed
RT = Retrap, same season, same place
RC = Recapture, previous year, same place
C = Control, bird banded elsewhere (other bander), >5 km away
* = Second number indicates records of movements between North Point and Longridge Point

Table 2. Sightings of shorebirds colour-marked in James Bay, 1977 to 31 January 1978.

	Semipalmated Plover	Ruddy Turnstone	Lesser Yellowlegs	Red Knot	Least Sandpiper	Dunlin	Semipalmated Sandpiper	Sanderling	
Ontario	-	-	2	-	1	-	7	-	10
Quebec	-	-	-	-	-	-	31	-	31
Prince Edward Island	-	-	-	-	-	-	2	-	2
New Brunswick	11	-	-	-	1	-	176	-	188
Nova Scotia	1	-	-	-	2	-	51	7	61
Maine	6	-	-	-	1	-	35	2	44
New Hampshire	-	-	-	-	-	-	1	-	1
Massachusetts	11	1	-	1	1	1	118	4	137
Rhode Island	-	-	-	-	1	-	-	-	1
Connecticut	1	-	-	-	-	-	3	2	6
New York	3	-	-	-	-	-	40	-	43
New Jersey	4	-	-	-	-	-	24	-	28
Pennsylvania	-	-	-	-	-	-	7	-	7
Delaware	-	-	-	-	-	-	10	-	10
Maryland	-	-	-	-	-	-	1	-	1
Washington, D.C.	-	-	-	-	-	-	1	-	1
Virginia	-	-	-	-	1	-	9	-	10
North Carolina	-	-	-	-	-	-	4	1	5
Georgia	-	-	-	-	-	-	1	-	1
Florida	-	-	-	-	-	1	-	-	1
Ohio	-	-	-	-	-	-	2	-	2
Bermuda	-	-	-	-	-	-	16	-	16
Caribbean Islands	3	-	-	-	-	-	2	-	5
South America	-	-	-	-	-	-	4	-	4
	40	1	2	1	8	2	545	16	615
No. dyed birds released	253	113	82	63	676	268	9,737	69	11,261
'Bird days' as % dyed birds released) 1977	15.8	0.88	1.2	1.6	1.2	0.75	5.6	23.2	5.46
)(1976	19.8	7.1	4.8	12.5	2.6	1.5	5.1	30.8	5.18)

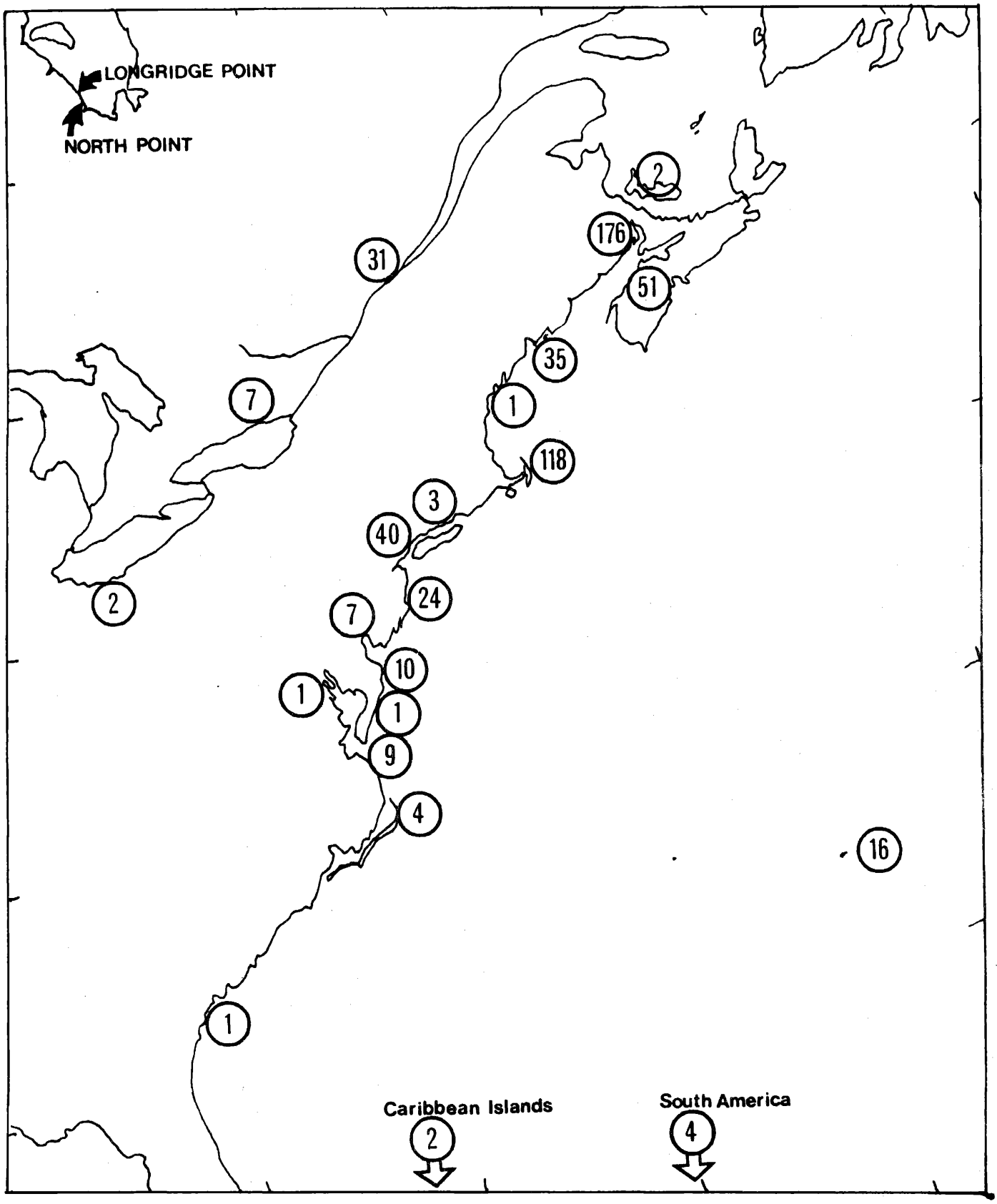

Figure 1. 'Bird days' of sightings of Semipalmated Sandpipers colour-marked in James Bay during July and August 1977: reports received to 31 January 1978.