PROC. N.S. INST. SCI. (1997)
Volume 41, Part 3, pp. 93-102.

WINTER DISTRIBUTION OF THE COMMON LOON (*Gavia immer*) AND RED-THROATED LOON (*Gavia stellata*) IN THE BAY OF FUNDY

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Common Loons (*Gavia immer*) and Red-throated Loons (*Gavia stellata*) are shown to overwinter along the coastal zone of the Bay of Fundy. The Christmas Bird Count, a volunteer monitoring survey, was used to trace 30 year trends in Common Loon population distribution and abundance. The population of Common Loons along the Nova Scotia shore appeared stable though variable while the New Brunswick population appeared to be increasing. There is an indication that the change in numbers reflects a true increase in abundance of over wintering Common Loons within the Bay of Fundy and not simply a change in distribution.

Introduction

Fundy National Park (NP), New Brunswick, Canada was established in 1948 and in the same year loons were recorded on some of the first Bird Sighting Cards of the park. These observations were along the coast of the Bay of Fundy at Herring Cove. The first recorded observation of Common Loons (*Gavia immer*) in the park on fresh water occurred in 1965 at Wolfe Lake, a small (22 ha) oligotrophic lake 14.5 km inland. Only irregular sightings were recorded until the first pair, and later juvenile, were observed on Wolfe Lake in 1976. Intermittent sightings occurred for the next decade. Confirmed nesting has taken place every year since 1989 (Clay and Clay, 1997). Common Loons are reported occasionally on other park lakes but none has become resident.

The focus of this investigation was to understand the likely movement of the Common Loons that had taken up residence in Fundy NP and determine if the presence of the newly established loons was due to an increasing population in eastern North America or the reduced recreational use of Wolfe Lake since the end of the brook trout (*Salvelinus fontinalis*) stocking program in 1980. Most smaller protected areas, such as Fundy NP, are not sufficiently large to protect an entire ecosystem, especially of migratory species such as loons. To accommodate this deficiency, the concept of ecosystem management beyond the boundaries of the national park has been adopted. This is a very plastic concept that can vary by species and thus the Greater Fundy Ecosystem for the Common Loons breeding within the park would include the Bay of Fundy shores (Figure 1).

Loons are considered an indicator of 'wilderness quality' in northern freshwater lakes in Canada and the northern USA. Despite this association with interior lakes they are sea-birds for their first 2 to 3 years (as juveniles (McIntyre, 1986)) and later, as mature adults, for more than half the year. Where individuals go when they leave their summer breeding sites is still a subject of conjecture, however they are known to over-winter along both the Atlantic and Pacific coasts. This study used observations from volunteer surveys to define the distribution of the Common Loon and the Red-throated Loon (*Gavia stellata*) on the nearest over-wintering grounds in the Greater Fundy Ecosystem of the Bay of Fundy.

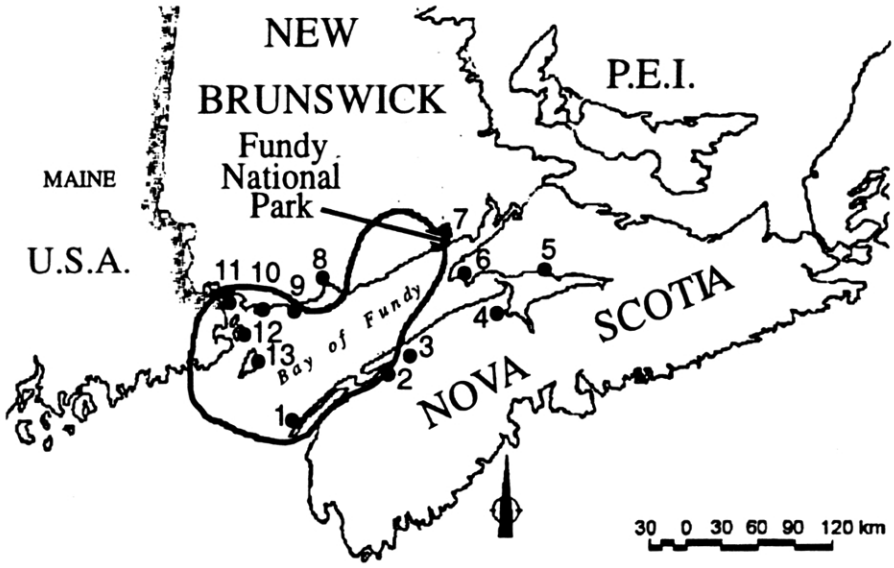

Fig 1. Bay of Fundy indicating the sites where Christmas Bird Counts have been conducted and the area considered to be the Greater Fundy Ecosystem (delineated by a solid black line) with regards the Common Loons nesting within Fundy National Park. The Christmas Bird Count survey locations, indicated by the numbers adjacent black dots are: in Nova Scotia 1 - Brier Island, 2 - Annapolis Royal, 3 - Bridgetown, 4 - Wolfville, 5 - Economy, 6 - Apple River / Advocate Harbour, and in New Brunswick 7 - Alma (Fundy National Park), 8 - Saint John, 9 - Lepreau, 10 - Blacks Harbour, 11 - St. Andrews, 12 - Campobello Island, 13 - Grand Manan Island.

Methods

Long term data sets that provide insight into loon biology, distribution, and behavior included the Bird Sighting Cards (BSC) of Fundy NP, completed by various volunteers and park employees from 1948 to 1980 and the Christmas Bird Count (CBC) data compiled by many volunteers.

The BSC are for the immediate area of Fundy NP and the adjacent coastal zone. They can be taken as an indication of presence of a species but are not a complete nor a uniform survey.

The CBC is conducted by volunteers at specific sites (Figure 1) on a more systematic basis than the BSC. These data do provide an indication of the presence, absence and relative abundance at the end of December. Although year to year variation is expected at a site, the combined data of 5 or more sites on each side of the Bay of Fundy over nearly 30 years (since 1960 for New Brunswick shore and 1965 for Nova Scotia shore) are believed to provide a true indication of trends in the loon populations.

Results

The BSC of Fundy NP, though incomplete in their coverage, provide an overview of the seasonal use of the marine environment along the coast adjacent to Fundy NP. This

distribution of coastal sightings of Common Loons (Figure 2) indicates continuous use of this coastal zone from April to early November with 2 sightings in early December. The BSC record a large offshore migration of Common Loons on 25 and 26 April, 1980, this occurred at the time when birds were moving inland to freshwater lakes. These and other inland sightings were not included in the data used in Figure 2.

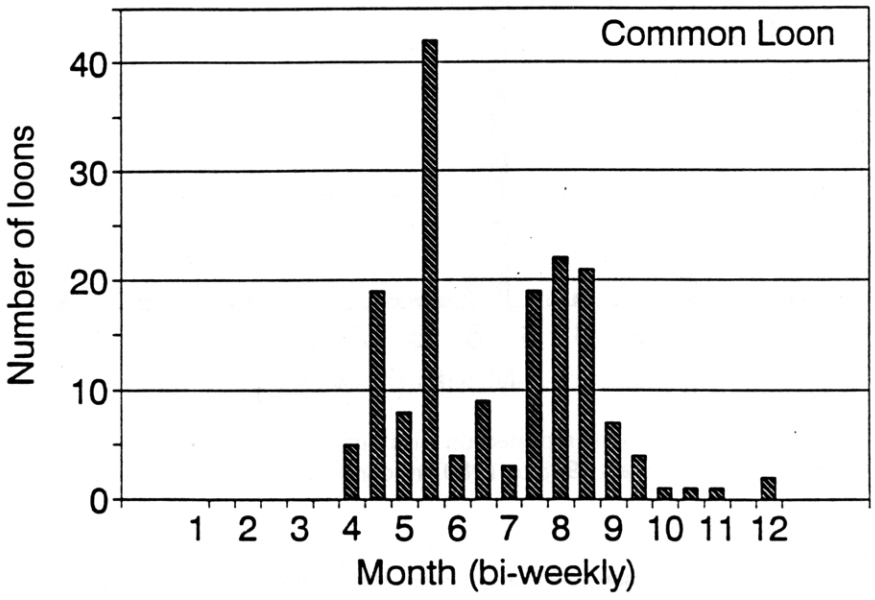

Fig 2. Common Loons reported on Bird Sighting Cards from Fundy National Park coastal zone. All years 1948 to 1980 are combined by 2 week periods.

The Red-throated Loon exhibits a different distribution from the Common Loon. They are more frequently observed in the autumn and winter (Figure 3). There were no observations of Red-throated Loons away from the coast. The large numbers in late April were probably massing for their migration north to their Arctic breeding grounds.

CBC data support the BSC records indicating a limited use of the coastline adjacent to Fundy NP by overwintering Common Loons. Over the 35 year time series, there were 5 Common Loons recorded while there were 54 Red-throated Loons.

The mean number of loons observed at each CBC site around the Bay of Fundy provides an indication of the distribution of these species in early winter (December / January). On both the north (New Brunswick) shore and the south (Nova Scotia) shore the density of Common Loons was higher towards the mouth of the bay (Tables I and II).

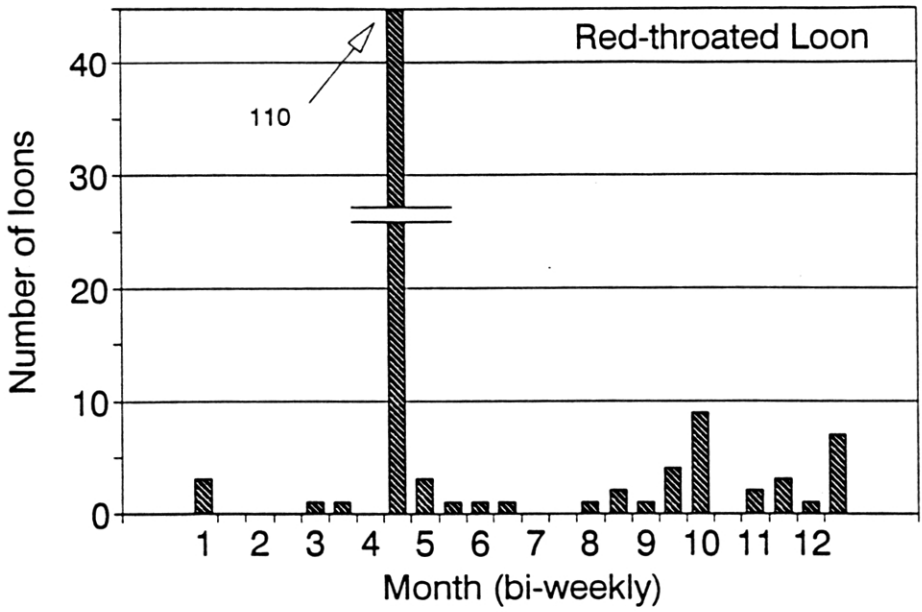

Fig 3. Red-throated Loons reported on Bird Sighting Cards from Fundy National Park coastal zone. All years 1948 to 1980 are combined by 2 week periods.

Table I. Number of Common Loons observed per 100 hours of Christmas Bird Count survey effort in 5 year time periods (e.g. 1965 is 1965 to 1969) on the New Brunswick shore of the Bay of Fundy. An asterisk indicates no survey coverage of potential loon habitat during the time period (Christie, 1996, Marys Point Shorebird Hemispheric Reserve, New Brunswick, pers. comm.).

	1965	1970	1975	1980	1985	1990	Mean
Fundy NP	0.0	0.8	0.0	1.5	0.0	0.0	0.4
Saint John	1.0	0.8	2.2	2.7	7.3	4.0	3.0
Lepreau	45.3	33.5	45.2	59.7	129.0	181.0	65.5
Blacks Hbr.	*	18.7	41.5	31.3	92.4*	113.4*	60.4
St. Andrews	6.7	23.7	20.5	27.5	81.5	146.3	36.8
Eastport-Campobello	108.0	32.1	91.8	53.7	33.0	50.8	52.5
Grand Manan	15.2	19.4	30.0	15.2	36.4	37.0	26.5

* a new organizer/compiler of the count since 1987 has increased efforts to survey the accessible shoreline.

Table II. Number of Common Loons observed per 100 hours of Christmas Bird Count survey effort in 5 year time periods (e.g. 1965 is 1965 to 1969) on the Nova Scotia shore of the Bay of Fundy. A dash indicates no survey during the time period.

	1965	1970	1975	1980	1985	1990	Mean
Economy	-	0.0	0.3	0.0	0.4	0.0	0.2
Wolfville	0.0	0.0	0.0	0.0	0.2	0.7	0.2
Apple Riv./ Advocate Hbr.	-	-	7.7	5.4	-	3.1	4.6
Bridgetown	9.5	40.0	4.9	5.5	18.2	37.1	15.8
Annapolis Royal	4.3	33.3	10.9	-	17.3	37.8	23.7
Brier Island	85.7	191.7	112.1	102.2	96.1	182.7	126.4

Reviewing the seven CBC sites on the New Brunswick shore of the Bay of Fundy (Figure 4) shows Saint John and Fundy NP provide 50% of the combined observer hours but less than 5% of the loons; therefore these two sites were dropped from the data series for the following analysis. Combining the data for the remaining five CBC sites along the New Brunswick shore of the Bay of Fundy indicates an increase in the number of Common Loons observed and an increase in the effort, the total number of observation hours (Figure 5). To identify if the increase in loon numbers is real or simply the result of increased effort we calculated the observation per unit effort (OPUE). There does appear to be a true increase in overwinter Common Loon numbers along the New Brunswick coast of the Bay of Fundy (Figure 6).

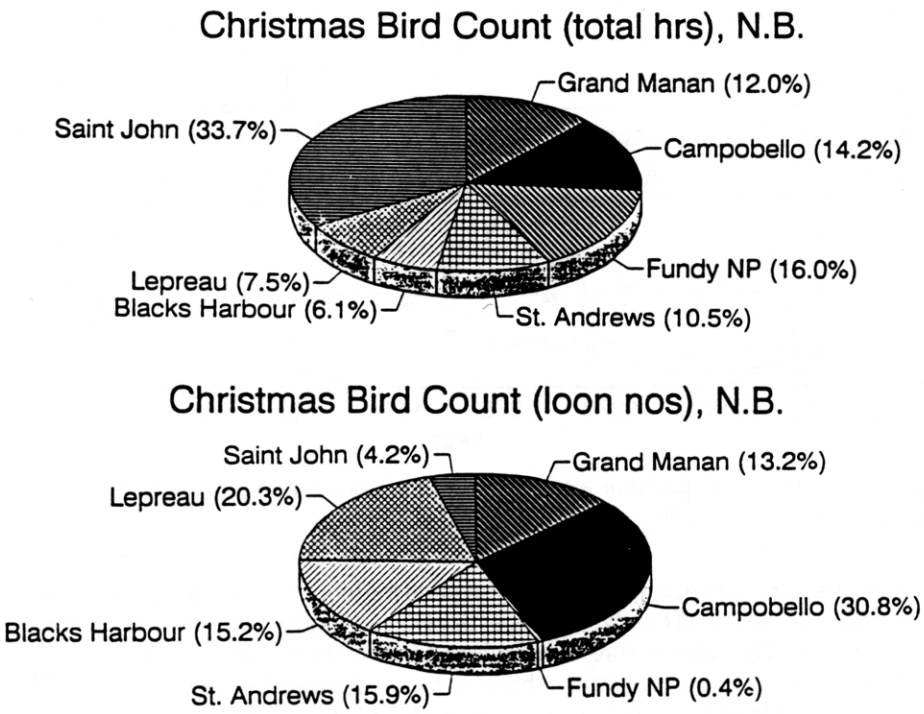

Fig 4. Christmas Bird Count data for Common Loons (numbers and effort) for 7 sites along the New Brunswick shore of the Bay of Fundy.

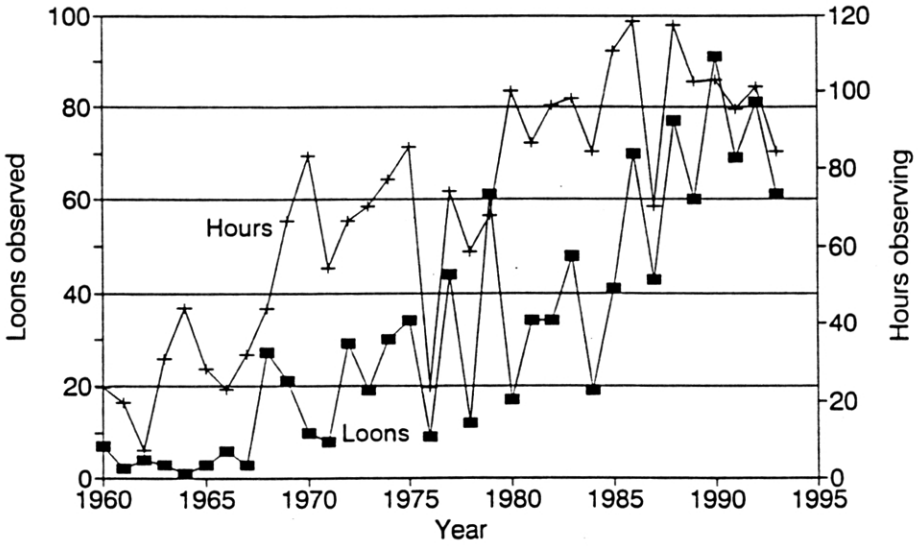

Fig 5. Common Loon Christmas Bird Count data (numbers and effort) for the 'loon areas' (see text) of the New Brunswick shore of the Bay of Fundy.

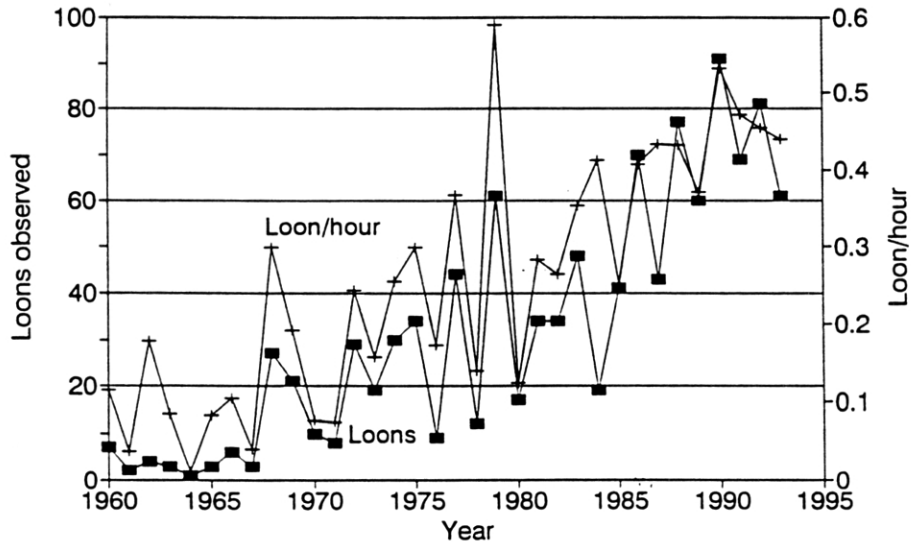

Fig 6. Observation per unit effort of Common Loons along the New Brunswick shore of the Bay of Fundy.

Using the same procedure we have investigated the loon populations along the Nova Scotia shore of the Bay of Fundy. The upper bay sites at Apple River/ Advocate Harbour, Economy, and Wolfville (Figure 7) contribute 66 % of the observation hours and 1.5 % of the Common Loons. Thus these three sites were dropped from the data series. The combined data from the remaining three sites, though highly variable do not indicate any systematic change in Common Loon populations (Figure 8 and 9).

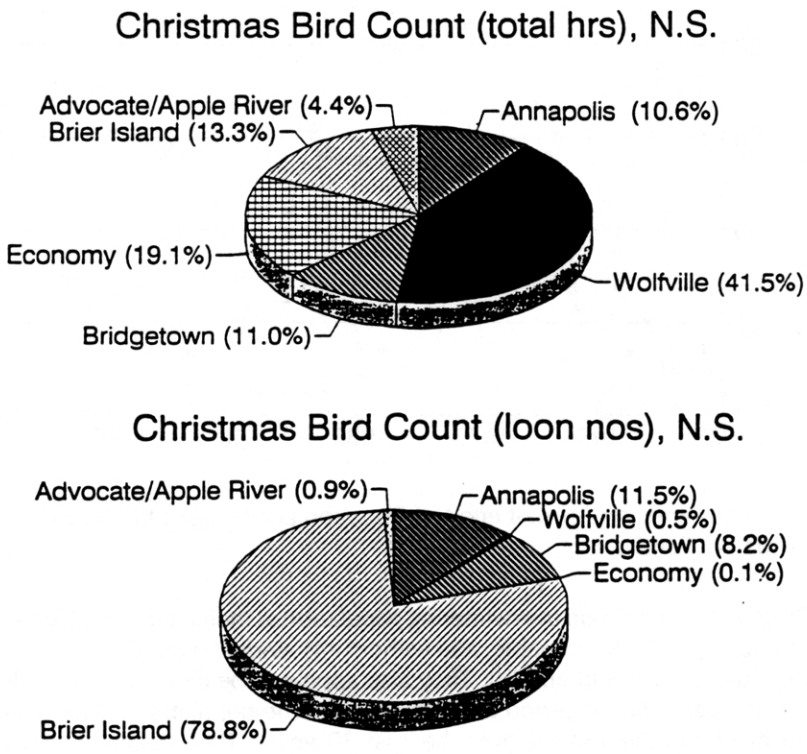

Fig 7. Christmas Bird Count data for Common Loons (numbers and effort) for 6 sites along the Nova Scotia shore of the Bay of Fundy.

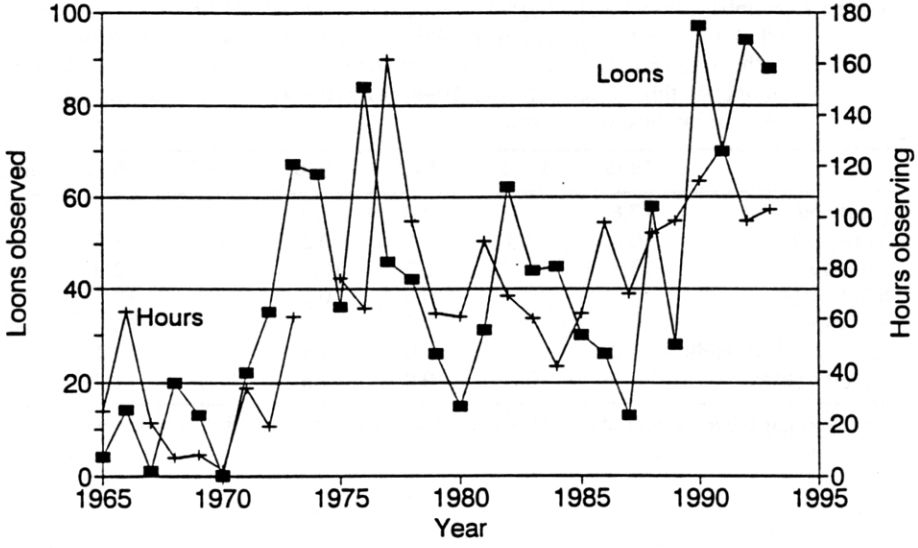

Fig 8. Common Loon Christmas Bird Count data (numbers and effort) for the 'loon areas' (see text) of the Nova Scotia shore of the Bay of Fundy.

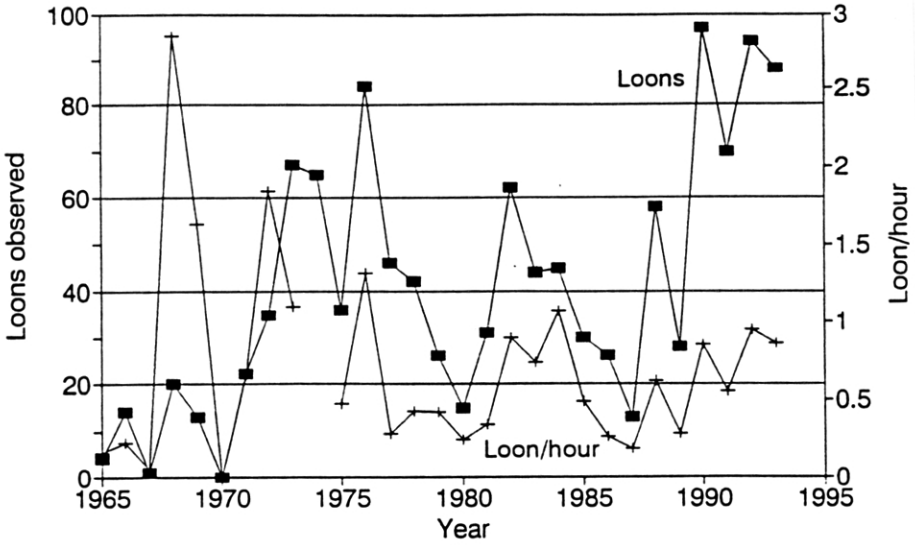

Fig 9. Observation per unit effort of Common Loons along the Nova Scotia shore of the Bay of Fundy.

The Red-throated Loon overwintering population as indicated by CBC data has been low in numbers, highly variable, and without any evident trend throughout the entire Bay of Fundy (Tables III and IV). They also appear to be more uniformly distributed during the early winter period through the bay. The population on the Nova Scotia shore has been intermittent over the past 30 years. They appear more uniformly distributed and occur in greater numbers on the New Brunswick shore than on the Nova Scotia shore of the Bay of Fundy.

Table III. Number of Red-throated Loons observed per 100 hours of Christmas Bird Count survey effort in 5 year time periods (e.g. 1965 is 1965 to 1969) on the New Brunswick shore of the Bay of Fundy. An asterisk indicates no survey coverage of potential loon habitat during the time period (Christie, 1996, Marys Point Shorebird Hemispheric Reserve, New Brunswick, pers. comm.).

	1965	1970	1975	1980	1985	1990	Mean
Fundy NP	17.6	3.1	2.0	7.0	3.1	1.6	4.2
Saint John	0.0	0.8	0.5	0.0	1.3	1.5	0.7
Lepreau	15.1	5.1	9.5	10.5	0.0	2.9	6.3
Blacks Hbr.	*	0.0	0.0	0.0	0.0*	18.9*	4.2
St. Andrews	0.0	2.0	0.0	0.0	0.0	0.0	0.4
Eastport-Campobello	0.0	7.7	1.0	5.1	1.5	11.1	4.7
Grand Manan	3.8	0.0	0.0	4.3	1.3	1.7	1.6

* a new organizer/compiler of the count since 1987 has increased efforts to survey the accessible shoreline.

Table IV. Number of Red-throated Loons observed per 100 hours of Christmas Bird Count survey effort in 5 year time periods (e.g. 1965 is 1965 to 1969) on the Nova Scotia shore of the Bay of Fundy. A dash indicates no survey during the time period.

	1965	1970	1975	1980	1985	1990	Mean
Economy	-	0.0	0.0	0.8	1.3	1.2	0.8
Wolfville	0.0	1.5	0.2	0.8	0.6	0.1	0.5
Apple Riv./ Advocate Hbr.	-	-	7.7	1.8	-	0.0	2.1
Bridgetown	0.0	16.0	0.0	0.8	0.0	0.0	1.5
Annapolis Royal	0.0	12.5	0.9	-	2.3	1.3	1.9
Brier Island	0.0	2.4	5.8	7.5	0.0	8.7	5.1

Discussion

A recent review of Common Loon mortality on marine overwintering grounds by Spitzer (1995) has identified a potential cause for unrecorded loon mortality. When the Common Loon is flightless during its winter molt period at sea it is particularly at risk from sea borne pollutants. The loon's lack of mobility increases its risk of starvation if fish populations have moved or been removed through overfishing. Any problems encountered in this critical overwinter period could have a significant effect on the Common Loon population in seemingly unrelated sites. This may also be a factor for the Red-throated Loon which moults during autumn after their return migration from the Arctic (Godfrey, 1979).

Common Loons use the marine environment adjacent to Fundy NP in April and May as a staging area before dispersal to interior lakes (Figure 2). Clay and Clay (1997) recorded the loons arriving at Wolfe Lake as the ice was breaking up at the end of April to the first week of May. Unsuccessful nesting results in Common Loons leaving freshwater lakes at the end of July to the beginning of August and forming off shore groups (Figure 2). They leave the Fundy NP coastal areas as the temperature drops in late autumn. It is believed that the Fundy NP loons are part of this congregation. Recent banding of the birds at Wolfe Lake may provide evidence for this movement in the future. Red-throated Loons, being an Arctic species and possibly more tolerant of cold water, remain along the park coastal zone until mid January (Figure 3).

An aquaculture industry has developed in many of the sheltered coastal areas of the Bay of Fundy since the early 1980's. The region between Blacks Harbour and St. Andrews is the center of this industry. Christie (1996, Marys Point Shorebird Hemispheric Reserve, New Brunswick, pers. comm.) has suggested that wild fish attracted to aquaculture cage sites would increase the available food for fish-eating birds. Over this same time period and a few years prior there has been a reduction in fish processing plant effluent in these coastal areas. This has altered the distribution of juvenile fish, particularly pollock (*Pollachius virens* L.) (Clay *et al.*, 1989), on both sides of the Bay of Fundy from the late 1970's to the mid 1980's. Both of these food sources may be factors in loon distribution, however, natural variation in marine fish populations of the area is great and would likely overshadow any changes due to scavenging.

Common Loons appear to be increasing in numbers on their overwintering range on the north shore of the Bay of Fundy while remaining relatively stable on the south shore. This trend, particularly evident since 1980 (Figure 6), could be the reason that loons are seeking nesting sites in Fundy NP. Protected areas are important for loons since

human interference (recreation) and unstable environments can deter successful nesting behaviour. Loons have not nested on other potentially suitable lakes in Fundy NP because of high recreation pressure on these lakes. It is likely that the Common Loon could expand its summer range in other lakes (e.g. Bennett Lake and possibly Tracey Lake) in Fundy NP if recreational pressure were reduced.

Acknowledgements

David Christie, N.B. Federation of Naturalists provided the New Brunswick Bay of Fundy Christmas Bird Count (CBC) Common Loon and Red-throated Loon data. The Nova Scotia Bay of Fundy CBC Common Loon and Red-throated Loon data was purchased from Nova Scotia Bird Society Sanctuary and Scholarship Trust Fund. Both of these data sets are the results of efforts by many volunteers over more than 30 years.

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