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Little Gull at Lake Simcoe, Ontario and review of status in Ontario

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Introduction

In Lake Simcoe, during the fall and early winter of 2015, there was an unprecedented run of the Emerald Shiner (*Notropsis atherinoides*) in Kempenfelt Bay, near Barrie, Ontario. Although there are runs of this species every year, this one was notable because of the enormous numbers of fish involved. Indeed, local fishermen could not remember such large numbers of this small bait fish, (J. Nightingale, pers. comm.). The huge numbers in relatively shallow waters attracted large numbers of fish-eating birds, including large numbers of gulls of several species. In fact, on 13 December 2015, nine species of gulls were recorded (J. Iron, pers. obs.). Among the gulls, there were at least 1,300 Bonaparte's Gulls (*Chroicocephalus philadelphia*). Birdwatchers were aware that Little Gulls (*Hydrocoloeus minutus*) tend to associate with Bonaparte's Gulls and, as a result, were careful to look for them. On 26 October 2015, I recorded 14 Little Gulls at one time at the Barrie Marina in Kempenfelt Bay. It is highly probable that there were more Little Gulls on Lake Simcoe at this time; however, it is a large lake and access to the lakefront and shoreline for bird watching is optimal only around the west shore of Kempenfelt Bay, basically in downtown Barrie. The feeding frenzy and concentration of gulls lasted until mid-December and only ceased at freeze-up. The relatively large numbers of Little Gulls on Lake Simcoe during this period created some interest among birders. Questions were raised as to whether or not these numbers were a normal course of events and just not previously reported or whether it was a one-off event as Little Gulls, other gulls and waterfowl exploited the unusually abundant food source. It was suggested to me by C. Weseloh, R. Pittaway and J. Iron, that I do some research into the occurrence and abundance of Little Gulls on Lake Simcoe. What follows is a compilation of my findings. The primary purpose of this article is to track the history of Little Gull sightings on Lake Simcoe to determine their seasonal occurrence and abundance.

Little Gull in first winter plumage at Minet's Point in Barrie, Ontario, on 13 September 2019. *Photo: Jean Iron*

Methods

I solicited information on the locations, dates of occurrence, relative age (adult or immature) and numbers of individual Little Gulls observed on Lake Simcoe (Figure 1) or immediately adjacent areas (e.g., Beaverton Sewage Lagoons ~400 m from the east shore of the lake) from Ontario birders using the Ontbirds Listserv for all years from 1992 to 2018. I approached individual birders known to have birded Lake Simcoe and I examined past copies of *The Blue Heron* (the journal of the Brereton Field Naturalists [now known as Nature Barrie]) in the Simcoe

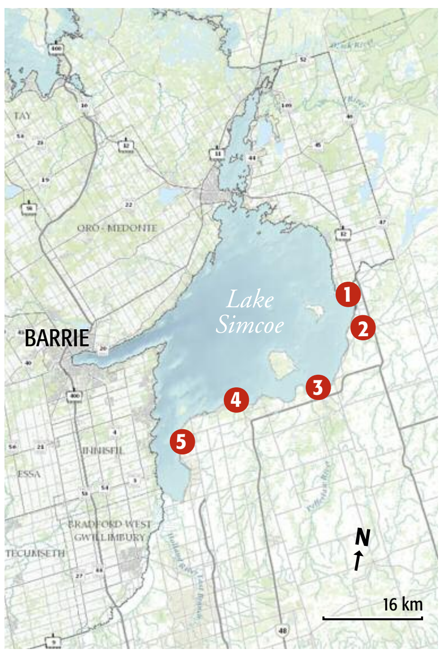

Figure 1. Lake Simcoe and areas outside of Kempenfelt Bay which are mentioned in the text: 1. Thorah Centennial Park, 2. Beaverton Sewage Lagoons, 3. Mouth of Pfefferlaw Creek, 4. Sibbald Point and 5. Roches Point.

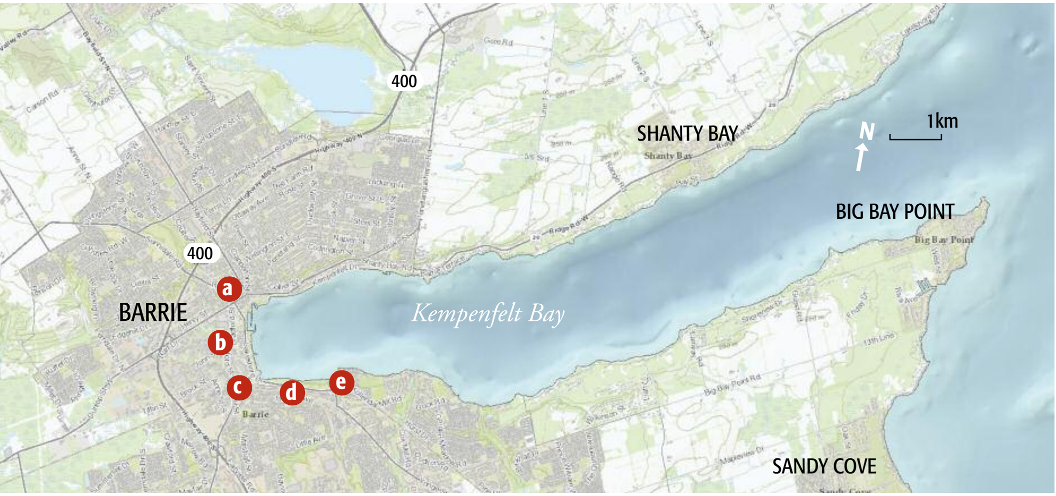

Figure 2. Kempenfelt Bay with five observation points indicated: a. Heritage Park, b. Centennial Beach, c. Tiffin Launch, d. South Shore and e. Minet's Point.

County Museum (1951 to 2009). I also searched back issues of *American Birds* and *North American Birds* (1971 and 1973). Finally, I used eBird (eBird 2019) and obtained the majority of records from this source (2005 -2019).

Background and Historical Overview

Lake Simcoe

Although not considered one of the Great Lakes, Lake Simcoe was part of Lake Algonquin, the original proglacial lake of which the Great Lakes are remnants. The lake is approximately 30 km (19 mi) long, 25 km (16 mi) wide and covers 722 km^2 (279 mi^2). It has a mean depth of 16 m and its deepest point is 47 m (North *et al.* 2013). About 60 km from the Greater Toronto area, it is renowned as a recreational lake both summer and winter. It is connected to the Great Lakes system by way of the Severn River. A number of southern Ontario rivers flow, generally north, into the lake, draining 2,581 km^2 (997 mi^2) of land. From the east, the Talbot River, part of the Trent-Severn Waterway, is the most important river flowing into Lake Simcoe, connecting the lake with the Kawartha Lakes system and Lake Ontario.

Lake Simcoe is well known as a staging point for a number of avian species both in spring and fall. Common Loons (*Gavia immer*) are regularly estimated at upwards of 2,500 individuals (C. Evans, pers. obs.). I counted 570 in one hour leaving the lake and flying in a northwesterly direction on 6 April 2006 between 06:00-07:00. Red-necked Grebes (*Podiceps grisegena*) show up on the lake in hundreds of individuals (C. Evans, pers. comm.). Common Mergansers (*Mergus merganser*) stage here as well, with flocks numbering in the thousands (pers. obs.). Common Goldeneye (*Bucephela clangula*), Bufflehead (*B. albeola*) and Long-tailed Duck (*Clangula hyemalis*) are all present in numbers during migration in spring and fall (Hawke 2019).

Regularly occurring gull species in fall include Herring Gull (*Larus argentatus*), Ring-billed Gull (*L. delawarensis*), Bonaparte's Gull, Iceland Gull (*L. glaucoides*), Glaucous Gull (*L. hyperboreus*) and Great Black-backed Gull (*L. marinus*). Numbers of these gulls remain until freeze-up and, mixed in with the Bonaparte's Gulls, in some years, are Little Gulls. Most reported bird observations come from Kempenfelt Bay (Figure 2), a long arm of Lake Simcoe proper that forms the shoreline of Barrie.

Ice Cover

The number of birds on the lake is directly affected by the amount of ice cover. An average of approximately 80 days of ice cover is to be expected on a yearly basis (Ontario Ministry of Environment and Climate Change 2014); however, duration of ice cover varies greatly from year to year. For example, at Sibbald Point (Figure 1), the longest period of ice cover recorded was 137 days in 1996 and the shortest was in 2002, when the ice cover lasted a mere 37 days (Ontario Ministry of Environment and Climate Change 2014). Freeze-up and thaw dates also vary annually, but there might be an effect of climate change as reflected in change of the mean date for an ice-free lake from 19 April during the 1960s to 15 April during the 2000s (A. Mills, pers. comm.).

Little Gull

The Little Gull is the smallest member of the gull family and is a common breeder across northern Europe and Asia. In North America, it is commonly associated with Bonaparte's Gull, which it resembles. The breeding adult has a black hood, red bill and legs and its most obvious identification feature is its dark underwings. Non-breeding adults lose the dark hood but have a dark ear patch and a smudgy forehead (Figure 3).

Figure 3. Above: A winter adult Little Gull (left) and a winter adult Bonaparte's Gull (right). Kempenfelt Bay, Barrie, 18 December 2015. *Photo: James Coey*

Figure 4. Left: Little Gulls: a first winter (left) and winter adult (right). Kempenfelt Bay, 15 December 2015. *Photo: Jean Iron*

Immatures differ from non-breeding adults. They have a distinct blackish pattern on the leading edge of the upper wing and a black band across the tail (Figure 4). They do not have the characteristic and diagnostic dark underwings of an adult which may well lead to under-reporting of Little Gulls.

Little Gull in North America, Canada, Ontario and Lake Simcoe

The first documented record in Canada and North America is a Little Gull collected during the Franklin expedition to the Arctic Ocean by naturalist John Richardson between 1819 and 1820 (Houston 1998, Ewins and Weseloh 1999). Other early records for the Americas include specimens collected in Bermuda on 22 January 1849, near Mazatlan, Mexico, on 27 March 1868, on Long Island, New York, on 15 September 1887 and 10 May 1902 and in Maine on 20 July 1910 (Norton 1910). After the Franklin expedition bird, there is no reported Canadian sighting until 1930 at Port Stanley, Ontario (Saunders 1930, Weseloh 1994), which was the first sighting in Ontario. Little Gulls have now been reported from most Canadian provinces and US states (Mlodinow and O'Brien 1996, Ewins and Weseloh 1999).

The ever-increasing sightings in the 1970s and the first recorded breeding in North America (Scott 1963, Peterjohn 1989, 2001, Ewins and Weseloh 1999) correlate with an increase in the Little Gull's European and Asian range in the 1970s and their wintering in large numbers on the west coast of Europe and the Mediterranean (Hutchinson and Neath 1978). Some Little Gulls in North America are known to be of European origin. The link to Europe was proven when an adult pair of Little Gulls was observed at Sturgeon Creek near Leamington in 2001 by Alan Wormington (Wormington 2015). One of the pair was banded and enough of the numbers on the band were identified to determine that the bird had been banded in Finland in 1998. Another link is a Swedish-banded chick in first summer plumage which was found dead on a highway in Pennsylvania (Ewins and Weseloh 1999).

The first known record for Lake Simcoe is from 1957 (Devitt 1957, 1967). Devitt (1957) wrote:

> *A casual visitant; one sight record. This Old World gull was added to the county list on October 26, 1957, when one was identified by Miss A.M. Hughes who later pointed it out to other members of the Brereton Field Naturalist Club. The bird was feeding with a flock of Bonaparte's Gulls in Kempenfelt Bay, at the foot of Toronto Street, Barrie.*

It is significant that the bird was with a flock of Bonaparte's Gulls. It is also significant that there are no further records extant for Lake Simcoe until 1990 (33 years later), at least none that I could find. It is interesting that the first Little Gulls for Point Pelee were recorded in the same year as Lake Simcoe's first Little Gull. Little Gulls were seen at Point Pelee on the 25th of April and the 24th of May 1957 (Wormington 2015).

Until 1938, the Little Gull was unknown in the Niagara region (Beardslee and Mitchell 1965). The Niagara River (Bellerby *et al.* 2000), as well as Lakes Erie and Ontario, are now important staging areas for Little Gull (Tozer and Richards 1974, Peterjohn 1989, 2001, Weseloh *et al.* 2004). The magnitude of the change in abundance is evident when you compare the single 1938 record with the 352 individuals reported in 1989 in seasonal reports for Ontario in *American Birds* (Weseloh 1994).

Breeding

A cursory examination of regional reports in both *American Birds* and *North American Birds* shows that Little Gulls have been present during spring migration along the shores of Lake Ontario, Lake Erie and the Niagara River since the 1970s and this has led to speculation that Little Gulls may nest at isolated locations across the boreal and tundra regions of Canada. This is a vast under-explored region with many small bodies of water and marshes that Little Gulls seem to find ideal for nesting (Weseloh 2007).

The first breeding record in North America was confirmed in 1962 at Oshawa's Second Marsh in Ontario (Scott 1963, Tozer and Richards 1974). Since then, Little Gulls have been reported nesting in several additional widely scattered southern Ontario localities: Rondeau Provincial Park, Chatham-Kent (Tozer and Richards 1974, Kelley 1978); Bassett Island, Lambton County (Godfrey 1986); Cranberry Marsh, Durham R.M. (Tozer and Richards 1974) and North Limestone Island, Parry Sound District (Mills 1981, Weseloh 2007).

Elsewhere in Canada, the species has nested at Churchill, Manitoba (McRae 1984, Jehl 2004, Joos 2013), northern Ontario (Carpentier 1986), and in LaSalle, near Montreal, Quebec (Godfrey 1986, Bannon and Robert 1996). In Michigan, nesting has been reported by Chu (1994). A number of documented nestings have been reported from Wisconsin (Robbins 1991, Ewins and Weseloh 1999). A recent nest was found by Francie Cuthbert in St. Martins Bay in northern Lake Huron, Michigan, on 29 June 2013 (C. Weseloh, pers. comm.). Remarkably, Little Gulls in fresh juvenal plumage (indicating recent fledging) have twice been recorded in California – 15 August 1981 at Crescent City in Del Norte County and 3 - 5 September 1984 at Lake Elsinore in Riverside County. This suggests that the species may have nested well to the west of its known North American breeding range at Churchill, Manitoba, northern Ontario and the Great Lakes. Little Gulls also occur annually on the Salton Sea (California Bird Records Committee 2007).

Results

My requests for records of Little Gull sightings on Lake Simcoe did not generate very many responses and what follows is a synopsis primarily based on eBird and other sources. I found a total of 45 reports from 25 individual reporters from 10 locations in or adjacent to Lake Simcoe. A total of 227 Little Gulls was reported: 212 (93.4%) from Kempenfelt Bay and 15 from other locations around the lake (Table 1). Little Gulls were reported in 12 of the 62 years, 1957-2018 (Table 1). Four of the 12 years in which Little Gulls were reported occurred during 1990-94 and involved birds occurring outside of Kempenfelt Bay. Seven of the remaining eight years when Little Gulls were reported were

Table 1. Total number of individual Little Gulls reported annually on Lake Simcoe, 1957 to 2018, sorted by Kempenfelt Bay and the rest of Lake Simcoe, Ontario.

YEAR	KEMPENFELT BAY	REST OF LAKE SIMCOE	TOTALS
1957	1	0	1
1958-1989	0	0	0
1990	0	4	4
1991	0	3	3
1992	0	0	0
1993	0	3	3
1994	0	5	5
2005	42	0	42
2006-2011	0	0	0
2012	8	0	8
2013	0	0	0
2014	27	0	27
2015	61	0	61
2016	15	0	15
2017	22	0	22
2018	36	0	36
Total	**212**	**15**	**227**

between 2005 and 2018, and all reports were from Kempenfelt Bay.

In terms of seasonal distribution, 216 of the 227 (95.2%) Little Gulls were re ported in September – December (Table 2). After an August hiatus, Little Gulls begin to appear in Lake Simcoe in September, rapidly reach a peak in late October and then decline but remain elevated during November and December. The four sites which reported the largest numbers of Little Gulls were all in Kempenfelt Bay (Centennial Beach, Heritage Park, Minet's Point and Tiffin Launch) (Table 2, Figure 1); the next largest number of Little Gulls was reported from the Beaverton Sewage Lagoons (Table 2, Figure 2).

Slightly more than half of the reports of Little Gulls (127 of 227, 55.9%) identified the exact date of sighting (Table 3); the others only reported the month. From these exact reports, it was possible to identify the peak weeks of Little Gull observations on Lake Simcoe. The last three weeks of October and the first week of November accounted for 95 of the 127 Little Gulls (74.8%) where exact dates of reporting were available. Among these four weeks, the last week of October accounted for the most Little Gulls. J. Randall (pers. comm.) anecdotally reported that both adult and immature Little Gulls were seen annually in October at Minet's Point in Kempenfelt Bay from 2003 to 2015, usually in small groups of up to 10 birds, Unfortunately, detailed notes were not kept.

In terms of flock size, most sightings of Little Gulls on Lake Simcoe involved fewer than five individuals; however, on 3 November 2005, more than 20 individuals were sighted along the shores of Kempenfelt Bay (J. Iron, pers. comm.). Also, on 26 October 2015, I recorded 14 Little Gulls among the more than 1,000 Bonaparte's Gulls foraging in the same area. These sightings appear to be most unusual for Lake Simcoe.

Discussion

The first year for which I could find a documented record of Little Gull for Lake Simcoe was 1957. Then, from 1958 to 1989, there are apparently no records.

Table 2. Monthly sightings of Little Gulls by location for Lake Simcoe, Ontario since 1957.

PLACE	JAN	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
1. Thorah Cent. Park	0	0	0	0	0	0	0	0	1	1
2. Beaverton Lagoons	0	1	4	2	0	0	3	0	3	13
3. Pefferlaw	0	0	0	0	0	1	3	0	0	4
4. Sibbald Point	0	0	0	0	0	0	3	0	0	3
5. Roches Point	0	0	0	0	0	0	0	0	2	2
a. Heritage Park *	2	0	0	0	0	4	22	15	15	58
b. Centennial Beach *	0	0	0	0	0	5	44	3	7	59
c. Tiffin Launch *	0	2	0	0	0	0	8	20	8	38
d. South Shore *	0	0	0	0	0	0	0	8	0	8
e. Minet's Point *	0	0	0	0	0	3	34	4	0	41
Total	**2**	**3**	**4**	**2**	**0**	**13**	**117**	**50**	**36**	**227**

* Sub-locations of Kempenfelt Bay

Table 3. Weekly distribution of Little Gull sightings on Lake Simcoe, Ontario, 2005-2018.**

WEEKS	SEPT	OCT	NOV	DEC	TOTALS
Week 1 1st - 7th	0	7	22	7	36
Week 2 8th -15th	0	21	1	2	24
Week 3 6th - 23rd	1	17	2	2	22
Week 4 24th - 31st	4	35	4	2	45
Totals	**5**	**80**	**29**	**13**	**127**

** The total numbers shown here are less than in Table 1 because only those reported sightings that included exact dates are included.

During four of the five years from 1990 to 1994, there are annual records but all of these are from the east side of the lake (Beaverton Sewage Lagoons) where there was a small but active cadre of expert birders who were aware of the possibility of Little Gull appearances. The large number (42) reported for 2005 is the result of an individual sighting of over 20 birds at Centennial Beach, Barrie waterfront. Except for Randall's anecdotal report (pers comm.), I could find no reports of Little Gull for Lake Simcoe for the recent years 2006-2011 and 2013. Many larids, including Little Gulls, took advantage of the phenomenal bait fish run that occurred in 2015. Most sightings were from the west end of the lake and, in particular, Kempenfelt Bay. From the beginning of September to the end of December 2015, there were more sightings of Little Gull reported for Lake Simcoe than in any previous fall period or since: a total of 61 individual birds was reported. From the fall of 2016 to the fall of 2018, 34 individual birds were reported. The years 2014 to 2018 have shown an overall trend toward more sightings of Little Gull. I put this down to the birdwatching community being more aware of the possibility of Little Gulls.

Little Gulls stage in the spring at both the Niagara River (Bellerby *et al.* 2000) and at Oshawa Second Marsh on the north shore of Lake Ontario from mid-April to early-mid May (Tozer and Richards 1974, Speirs 1985, Ewins and Weseloh 1999, Weseloh *et al.* 2004). However, there are few spring records for Little Gull from Lake Simcoe. The most likely explanation is that spring migration is relatively rapid and Little Gulls simply fly over Lake Simcoe on their way north to their breeding grounds. In spring, adult Little Gulls do not leave Point Pelee and other parts of southern Ontario until mid-May or later and these sudden departures coincide with an increase in temperature and southerly winds (Wormington 2015). If the spring migration of Little Gulls takes them directly from Lake Erie and Lake Ontario to the breeding grounds then, if they stopped on Lake Simcoe even briefly, it is likely that they would be missed. As the ice cover goes out in mid- to late April, not many birders are covering the lake and most would be thinking passerine migration in early May. I visited Kempenfelt Bay on a regular basis from 9 May to 14 July 2019 and did not find any Little Gulls; significantly, I only saw one small flock of 14 Bonaparte's Gulls in breeding plumage during this period. In 1990, there was one adult Little Gull and one first summer bird at the Beaverton Sewage Lagoons from 12 June – 3 July (G. Bennett, R. Pittaway, M. Bain, pers. comm.). Little Gulls may fly directly to James Bay to avail themselves of the hatching of Dipterans (D. Szmyr, pers. comm.). This could account for the paucity of spring records for Lake Simcoe.

In fall migration, Little Gulls spend up to five months in the Lower Great Lakes region; in southern Ontario, the locations include Point Pelee and Long Point on Lake Erie, Hamilton on Lake Ontario and the Niagara River (Peterjohn 1989, 2001, Ewins and Weseloh 1999, Curry 2006, Black and Roy 2010, Wormington 2015). Fall migration of Little Gulls is first evident in southern Ontario at Point Pelee where it starts in mid-July and continues to late December (Wormington 2015). Interestingly, the autumn arrivals at Point Pelee are the result of two waves of migrants along the Great Lakes (Peterjohn 1989, 2001). The first wave shows up at Pelee in association with Bonaparte's Gulls and peaks in the third week of July (Wormington 2015). The second wave becomes apparent in the same region in late September but does not peak until late November (Wormington 2015). East of Point Pelee, records from Long Point Bird Observatory show a peak of just under 250 birds in August (Weseloh 1994) and a second peak of 266 birds in early November (McRae 1989, Weir 1989). Farther east at the Niagara River, the number of reports of Little Gulls builds from August through November and doubles from October to

First winter Little Gull (front) with adult winter Bonaparte's Gull (back). 9 December 2015, Barrie.
Photo: Jean Iron

November (Black and Roy 2010), i.e., the second wave of migrants. Nearby, at Hamilton on Lake Ontario, numbers of Little Gulls peak in late October (Curry 2006).

One must ask, are Lake Simcoe birds part of this second wave? Certainly the dates would seem to match. The very low number of Little Gulls recorded from Lake Simcoe in July (1) and August (1) suggests that the first wave of migrants misses this location. Little Gulls rarely show up on Lake Simcoe until late September. They peak in late October and then decline steadily. The latest December date I found outside of 2015 is 1 December 2016. These autumn departure dates mirror the dates for Point Pelee (Wormington 2015). In 2015, several Little Gulls lingered until January of the following year. If some birds linger until January and returning migrants are evident at Point Pelee in February (Wormington 2015), it would be interesting to speculate how long Little Gulls might linger on Lake Simcoe, if it were not for the freeze up. At Niagara, where the waters remain open all winter, the average last date of autumn migration is 6 February and the average date of first return on spring migration is 27 March (calculated from Bellerby *et al.* 2000).

Thus, even with open water, there is a seven week period when Little Gulls are absent, or not recorded.

Do the Lake Simcoe Little Gulls join the lower Great Lakes birds before heading to the wintering grounds in the eastern Atlantic states from Maine to the Carolinas? A speculative answer to this question might come from observations of Bonaparte's Gulls, a well-known flocking associate of Little Gulls (Sibley 2014). Pittaway (1990) has suggested that Lake Simcoe is part of an important staging and migration corridor for Bonaparte's Gulls stretching from Georgian Bay in Lake Huron, south through Lake Simcoe and Sturgeon Lake, down through Lake Scogog and into Lake Ontario. Pittaway (1990) extrapolated from his estimate of 2,500 Bonaparte's Gulls at Beaverton on 9 September 1990 that there could have been over 10,000 Bonaparte's Gulls on Lake Simcoe at this time as they occur in numbers across the lake. Since Little Gulls are known to associate with Bonaparte's Gulls, it may be that this migration corridor might also apply to them.

Nothing is known about the origins of the Little Gulls that appear in Lake Simcoe in fall. The most consistent and recent North American nestings have been at Churchill, Manitoba, where the species has nested regularly, but not annually, in small numbers at least into the 2000s (McRae 1984, Jehl 2004, Joos 2013). Juvenal plumaged young of the year have also been reported annually, 2013-2018, along the Ontario shore of James Bay from mid-July to early September (C. Friis, pers. comm.). It would be interesting to discover whether these Little Gulls migrate through southern Ontario and possibly come through Lake Simcoe.

Conclusions

It can be assumed that most Little Gulls will spend the winter on the east coast of North America (Ewins and Weseloh 1999). Southern Ontario and the Great Lakes in general, appear to be the centre of the known migration of the Little Gull in North America but much of their life history is still a mystery. Little Gulls are present in spring and fall in Ontario and migrate north in the spring to nesting habitat presumably in the tundra areas of northern Ontario and other provinces. Very small numbers are observed in spring on Lake Simcoe. After breeding in the north, they migrate south to the US mid-Atlantic coast (the Carolinas) but spend considerable time enroute on Lakes Erie and Ontario and the Niagara River. Some spend time on Lake Simcoe during the fall migration and numbers fluctuate from year to year. In autumn 2015, Lake Simcoe had its largest numbers of Little Gulls ever recorded.

To answer the question posed earlier in this paper on the numbers and regularity of Little Gulls on Lake Simcoe, it might at first appear that the large influx (61 birds) in 2015 was a one-off occurrence. It was the largest annual number of Little Gulls ever reported on Lake Simcoe by nearly 50%. On the other hand, since the huge run of Emerald Shiners in the fall of 2015, notable numbers of Little Gulls (at least 25% of the 2015 total) have been noted every year on Lake Simcoe in Kempenfelt Bay. This strongly suggests that Barrie birders are now paying closer attention to the waterbirds and gulls that visit Kempenfelt Bay in the autumn and especially to the flocks of Bonaparte's Gulls to make sure that Little Gulls do not get missed. Their efforts are showing that Little Gulls do appear to be annual visitors to Lake Simcoe and that 2015 was, indeed, an unusual year for the large numbers reported. Hopefully, this paper will encourage birders to carefully inspect flocks of Bonaparte's for Little Gulls and I would urge birders to report their findings to eBird.

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Highly nutritious marsh vegetation as a magnet for swans

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Summary

This study revealed an unusual movement of Mute and Trumpeter swans to Cranberry Marsh in 2017 following a severe drought and drawdown. The swans were non-breeding birds of various ages that typically do not move much in the May-June period as they prepare for wing moult. They were apparently attracted by an abundance of highly nutritious food, especially high protein sago pondweed. This concentration of swans lasted only as long as the nutritious food lasted and swans left as soon as the supply of this desirable food was exhausted. In addition to high protein content, sago pondweed phosphorus levels in Cranberry Marsh were considerably higher than adjacent marshes. This is attributed to differences in watershed characteristics and phosphorus sources.

Introduction

Cranberry Marsh in Whitby, Ontario (43°50.5' N, 78°57.5'W), is an ancient bay of Lake Ontario (Figure 1). It is unusual in that it is separated from Lake Ontario only by a barrier beach which is not particularly stable and through which seepage occurs which lowers water levels over the summer (Lumsden 2018). The bottom of the marsh is lined with blue clay through which there can be little or no seepage into the subsoil. At intervals, the marsh has dried out, usually because the beach washed out when high water topped it at breakup time or once after a thunderstorm in June (Lumsden, pers. obs.).

When water levels are stable in a marsh, bacteria sequester nutrients into the substrate where they accumulate. The water column gradually loses fertility. When water is withdrawn and the marsh dries out, oxygen then reaches the mud. With the return of water, stored nutrients are oxidized and return to solution. They create fertile, productive marsh conditions to which vegetation and marsh birds respond (Kadlec 1962, Neckles *et al.* 1990, Lumsden *et al.* 2015).

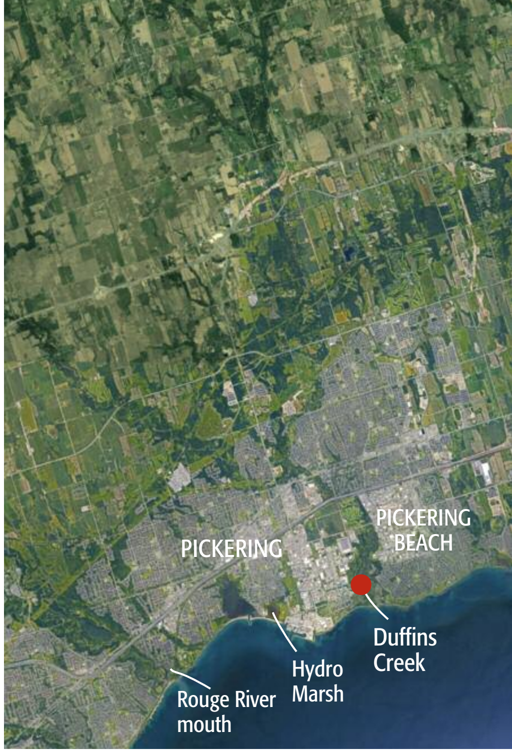
Mute Swans (*Cygnus olor*) (hereinafter Mutes) have responded over the years to the alternating sequestration and release of nutrients in Cranberry Marsh

Figure 1. Cranberry Marsh, near Whitby, Ontario, where an unusual concentration of swans occurred in spring-early summer 2017. Observation locations for swan counts (see text) are indicated by symbols.(✦)

(Lumsden 2018). Following repair of a breach in 1983, eight pairs nested and in 1984, seven pairs nested in the marsh. The Central Lake Ontario Conservation Authority, with assistance from Ducks Unlimited Canada, conducted a complete drawdown and constructed an overflow spillway on the barrier beach in 2001. When this was completed, water level was returned to normal. On 11 May 2004, an aerial survey found six Mute nests and 15 Mutes in the marsh. In 2011, after seven years of stable water levels, a search of the marsh by canoe in May found only one Mute nest. In 2012, only one Mute brood, six Mutes and six Trumpeter Swans (*C. buccinator*) were present.

Water levels remained stable until 2016 when an unusually severe drought due to low winter and spring precipitation dried the marsh. It started to fill with the fall and winter rains. Runoff in the spring of 2017 filled the marsh completely and we assume there was the usual strong flush of nutrients from the substrate that usually follows such events. Starting in February 2017, unusually large numbers of swans, mostly Mutes but some Trumpeter Swans,

Figure 2. Locations of Cranberry Marsh and neighbouring marshes from which sago pondweed samples were collected for nutrient analysis comparison. (●)



visited the marsh (Lumsden *et al.*, pers. obs.). This study reports on swan numbers, aquatic vegetation nutrient content and the factors that influenced swan movements in 2017.

Methods

Between 10 April and 8 June 2017, we counted swans eight times, starting in the morning between 10:54 hr and 11:02 hr each day. Counts were the first thing done upon our arrival and were completed in just over one hour. They were made from three observation platforms, one on the east side of the marsh and two on the west (Figure 1).

Samples of sago pondweed (*Stuckenia pectinata,* formerly *Potamogeton pectinatus*) were collected for nutrient analysis on 5 June from five sites about 50 m apart across the middle of Cranberry Marsh. Water depth at these sites on 5 June was 122.20 cm ± 44.38 cm (range 80-160 cm, N = 5). The upper parts of the sago pondweed plants had been grazed by the swans so that only the root portion was left (length = 21.66 cm ± 6.62 cm, range 12.7-33.0 cm, N = 5). These portions were scraped from the substrate with a leaf rake. They were washed and dried for one hour and frozen. Nutrient analysis on all samples was performed by Laboratory Services (Agriculture and Food Laboratory), University of Guelph. Percentage of protein (protein= nitrogen x 6.25) (Leeson and Summers 1997), calcium, phosphorus and magnesium were measured on freeze-dried material.

Adjacent to Cranberry Marsh, three marshes with Mute territories were chosen for comparison: Duffins Creek (43°49' N, 079° 02' W), 6.5 km west of Cranberry containing two territories, St. Mary's on the West Side Creek (43°53' N, 078°41' W), 24 km east of Cranberry, containing one territory and Bowmanville Creek (43°53' N, 078° 40' W), also 24 km east of Cranberry, containing two territories (Figure 2). Samples of sago pondweed were collected on 30 July (N= 5) and 3 September (N= 4) from each Mute territory in these marshes. The percentage values and standard deviations of protein, calcium, phosphorous and magnesium in these marshes are given in Table 2. T-tests were used to determine if differences were significant at the $P < 0.05$ level.

Results

Our eight counts between 10 April and 8 June 2017 recorded varying numbers of swan visitors (Table 1, Figure 3). Three groups of swans (2, 2 and 10) were seen arriving but none were seen leaving during our one-hour counts. Origins of the birds are unknown as were their daily movements. After 16 May, there was a steady rise to a peak on 27 May (107 swans) and then a rapid decline in numbers (Figure 3). Swans probably left because of depletion of food (see below).

In adjacent marshes (Duffins Creek East and West, St. Mary's Marsh and Bowmanville North and South), the collection from 30 July had an overall mean protein content of 10.85 ± 3.36% compared with a 3 September overall mean of 9.45 ± 2.00%. The difference was not significant ($t = 0.5943$, DF 9, $P > 0.05$). These samples were therefore combined (10.15%) for comparison with the Cranberry Marsh collection of 5 June (23.31%). The difference between Cranberry Marsh and these marshes in pondweed protein content was highly significant ($t = 14.8616$, DF 14, $P < 0.001$) (Table 2).

Phosphorus content in pondweed from Cranberry Marsh on 5 June was relatively high (0.81%) compared to the collections from the five neighbouring marshes made on 30 July (0.21%) and on 3 September (0.15%). The difference was highly significant ($t = 5.0166$, DF 15, $P < 0.001$).

Table 1. The number of Mute territory holders and visiting Mute and Trumpeter Swans on eight counts in early spring and summer in Cranberry Marsh in 2017.

Date	Territory Holders ♂ and ♀	Visitors Mutes	Visitors Trumpeters	Total Visitors	Total Swans
10 April	11	29	6	35	46
18 April	9	27	4	31	40
16 May	10	63	0	63	73
22 May	12	80	2	82	94
27 May	13	80	14	94	107
30 May	13	61	0	61	74
1 June	12	46	6	52	64
8 June	10+	18	5	23	33

Table 2. Mean (± Standard Deviation) percentage nutrient content on a dry weight basis of sago pondweed in Cranberry Marsh on 5 June and in five neighbouring marshes along Lake Ontario on 30 July and 3 September 2017.

	Protein	Calcium	Phosphorus
Cranberry Marsh			
5 June (N=5) lower 21.66 cm	23.3 ± 1.4	3.9 ± 1.2	0.8 ± 0.1
Neighbouring marshes			
30 July N=5/marsh			
Duffins Creek East	7.8 ± 2.2	18.4 ± 4.9	0.1 ± 0.0
Duffins Creek West	6.9 ± 1.1	17.7 ± 1.9	0.2 ± 0.0
St. Mary's Marsh	14.1 ± 4.8	11.1 ± 6.1	0.3 ± 0.2
Bowmanville North	11.8 ± 5.4	13.1 ± 4.1	0.2 ± 0.2
Bowmanville South	13.8 ± 5.7	14.3 ±2.5	0.3 ± 0.4
Neighbouring marshes combined			
30 July N=25	10.9 ± 3.4	14.9 ± 3.7	0.2 ± 0.2
Neighbouring marshes			
3 September N=4/marsh			
Duffins Creek East	8.6 ± 1.5	14.7 ± 3.5	0.1 ± 0.0
Duffins Creek West	9.6 ± 1.9	11.2 ± 3.1	0.1 ± 0.0
St. Mary's Marsh	9.8 ± 0.8	8.4 ± 3.1	0.1 ± 0.0
Bowmanville North	9.5 ± 1.8	13.3 ± 4.1	0.2 ± 0.1
Bowmanville South	1.0 ± 0.7	14.3 ± 2.5	0.2 ± 0.0
Five neighbouring marshes combined			
3 September N=20	10.2 ± 1.3	12.4 ± 4.7	0.2 ± 0.2

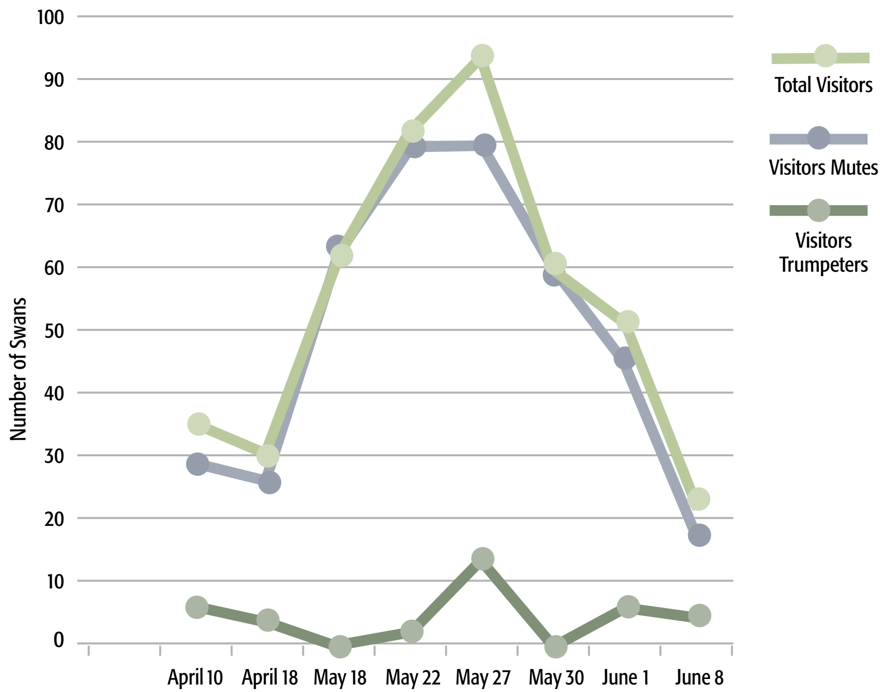


Figure 3. The number of swans visiting Cranberry Marsh by date in the spring of 2017. Note the decline in number approaching 5 June, the date on which sampling of sago pondweed showed that stems of sago pondweed had been grazed down to a length of only 21.66 cm.

Discussion

Like most neighbouring marshes, Cranberry Marsh freezes every winter and local swans must move to winter in areas of open water. It is likely that because of their travels in fall and spring, many Mutes of the region have moved regularly through Cranberry Marsh and have become familiar with the area over the years. The many visitors that came in the spring of 2017 (Figure 4) were mostly unemployed, non-territorial adults, subadults and yearling offspring ousted from their natal areas. Breeding pairs would have been anchored locally in their home marshes by their territorial duties.

The visitors did not spread evenly over the marsh; they occupied the open marsh beyond the fringe of cattail (*Typha spp.*) which framed its border. They did not enter the alder dominated south-central part of the marsh. They concentrated in the open part of Mute territories which contained rich beds of sago pondweed and covered an estimate of 14.7 ha of the 21.9 ha marsh (Lumsden 2018). The visitors were most interested in feeding and gave way on the approach of a territory holding resident. The latter were unusually tolerant of these intruders. While sometimes maintaining the threat posture, they tipped, up-ended

Figure 4. Mute Swan visitor landing in Cranberry Marsh on 31 May 2019. *Photo: Gerry Markhoff*

Figure 5. Social groups of 10-20 swans periodically occupied part of the open marsh. *Photo: Gerry Markhoff.*

and fed almost continuously and seldom stopped to chase a visitor.

Visiting swans were found in a number of social groups which could be distinguished by their flock cohesion or often as yearling broods. Observations showed that within a concentration, individuals spaced themselves approximately 2-5 m apart (Figure 5). Social groups of 10-20 swans might be separated from other groups by about 100 m or more. At any one time, the entire flock of visitors occupied only part of the marsh. At each daily check, we found that they occupied a different sector. At the peak of numbers on 27 May 2017, 80 non-territorial Mutes and 14 Trumpeters visited Cranberry Marsh. Badzinski (2017) estimated that in mid-August, there were 241 Mutes on the shore of Lake Ontario between McLaughlin Bay (43°42'N, 78° 49'W) and Toronto Harbour in 2017, a distance of about 55 km. The majority (229) were adults and most were unemployed as only seven broods and 12 cygnets were counted. Most adults (162) were in the Whitby Harbour/Lynde Creek area between Port Whitby and Pickering Beach with another 51 adults in Toronto Harbour and islands. The 80 Mute visitors to Cranberry Marsh constituted one-third of the Badzinski (2017) total and some of the visitors may have come from a considerable distance as our records show relatively small numbers in the immediate vicinity of Cranberry Marsh (Lumsden, unpublished data).

The swans imposed substantial grazing pressure on the marsh. From 10 April to 8 June (59 days) there were 13 territory holders (six pairs and one male) that exerted 767 swan-days of grazing pressure on 14.7 ha of marsh or just over 52 swan-days/ha. This was similar to that of earlier years (Lumsden, unpublished data) and we have no evidence that this level of grazing pressure was excessive. At the same time, there were 23-94 (average 55) visiting swans per day. Thus over 59 days, the visitors imposed 3245 swan-days (Table 1) of additional grazing pressure, or 221 swan-days of grazing pressure/ha; this is over four times that imposed by the residents. It is not surprising that such pressure had a similar effect on the vegetation at Cranberry Marsh as that described in Rhode Island and Chesapeake Bay. In Rhode Island, Allin and Husband (2003) found that flocks of moulting Mutes, in shallow sandy areas, reduced the biomass of submerged aquatic vegetation (SAV) by 95% causing extensive damage. Tatu *et al.* (2007) found that the social status of the Mutes present in Chesapeake Bay had an important effect on grazing pressure. Pairs reduced SAV cover by 32-75% while the impact of non-territorial flocks was 75-100%. O'Hare *et al.* (2007) documented similar grazing impact of Mutes in southern England.

The very high nutrient content of the pondweed (23.3% protein) and presumably other submerged aquatic vegetation at Cranberry Marsh in 2017, once it had been detected by the swans, apparently acted as a cue that decoyed others from a substantial area. The protein-rich food was so desirable that they grazed sago pondweed down to an average length of only 21.66 cm (above the root) by 5 June. Since water depth was 122 cm, it is probable that they ate all that they could reach, exhausting the supply and thereafter leaving the marsh by 11 June. The residents, because they were well into their nesting cycle, had no choice but to stay. Included in their territories were channels and openings in the cattail fringe surrounding the marsh, which were ignored by the visitors. There was an abundance of sago pondweed and other species, notably duckweed (*Lemna*) there. *Lemna* is an excellent nutritious swan food (Men *et al.* 2001, Lumsden *et al.* 2017). With other SAV, it provided ample rations for the local nesters.

The availability of dietary calcium has a substantial influence on well-being and the breeding distribution of many bird species including swans and geese (Lumsden 1984, Graveland and Van Gÿzen 1994, Mänd *et al.* 2000, Bureš and Weidinger 2001, Reynolds and Perrins 2010). For wild swans, any calcium level above 0.8-0.85% (that which is provided in domestic rations) can be considered to be adequate. In Cranberry Marsh in the 5 June collection, the calcium level was 3.9%, much lower than that in the adjacent marshes but more than adequate (Table 2). Cranberry is not fed by a creek; its water comes from precipitation and runoff from its small watershed. The soil type in its watershed is Smithfield Clay Loam, which is slightly above neutral with a pH of 7.2. The calcium content of the sago pondweed samples collected on 30 July and 3 September in four neighbouring marshes ranged from 11.2-18.4%. These creeks have their headwaters rising in the calcium rich Oak Ridge's Moraine. The West Side Creek, which is only about 3 km long, feeds the fifth, St. Mary's Marsh, which had 8.4% calcium (Table 2).

There is a relatively low absorption rate of calcium by birds from the daily intake of food, no matter how abundant it may be. All of these marshes (including Cranberry) provided adequate calcium for their daily needs but swans face extra demands for shell formation at the time of laying. Trumpeters (Lumsden, unpublished), and probably Mutes, solve this problem by storing medullary bone in the femur, tibiotarsus and tarsus prior to the egg-laying period (Reynolds and Perrins 2010, Lumsden 1984) and accessing these stores at the time of egg shell formation.

An important change took place within the growing season in Cranberry Marsh in 2017. On 22 July, when we checked sago pondweed in the centre of the marsh, we found that much of the surface was covered with dense floating patches of decomposing *Spirogyra* algae (blanket weed or water silk). It has been known for a long time that phosphate from detergents in sewage treatment plant effluent and runoff of phosphate rich agricultural fertilizers produces massive algal blooms (Maidstone and Parr 2002, Fried *et al.* 2003). There are no sewage outfalls in Cranberry Marsh; a large part of its very small, non-intensively farmed watershed is composed of woodland. The origin of its phosphate is unlikely to have had been external. It must have originated internally, probably from the release of the sequestered nutrients in its substrate following the drought. We have no direct measurement of phosphorus in its water column. Indirect evidence of high phosphorus levels is provided by the phosphorus content (0.81%) in the pondweed samples collected on 5 June. This must have been originally derived from years of accumulation in the substrate. For comparison, we have the phosphorus content in the five Ontario marshes which are fed by creeks draining extensive agricultural land and ultimately sewage plants. The collections from these marshes made on 30 July contained 0.21% phosphorus and on 3 September contained 0.15% phosphorus. The levels in Cranberry Marsh are three to eight times higher than those of the neighbouring marshes. It seems likely that the *Spirogyra* bloom was activated in Cranberry Marsh by the presence of unusual levels of phosphate (and other nutrients) that had accumulated in the substrate and was released by drought followed by flooding.

Within the blanket of *Spirogyra*, there were embedded stems of sago pondweed and on the surface there was some *Lemna*. Swan broods avoided the open centre of the marsh and foraged exclusively in the channels and openings in the cattail fringe. There, although *Spirogyra* was present, they found enough accessible pondweed and duckweed to satisfy their needs.

The 2017 experience with swans in the Cranberry Marsh area illustrated some of their unfamiliar capabilities. In spring, mature breeders, engaged in territorial defense and reproduction, were, as usual, not mobile. Non-territorial adults, sub-adults and yearlings are normally settled where there are ample food resources, where there is relative freedom from aggression and where they can prepare for moult. In 2017, the availability of unusually nutritious food revealed unexpected abilities of these swans to abandon their usual routine. They exhibited an ability to detect nutritious food, probably by taste, an ability to communicate with others and a willingness to travel considerable distances at a time when they are normally static and preparing to moult.

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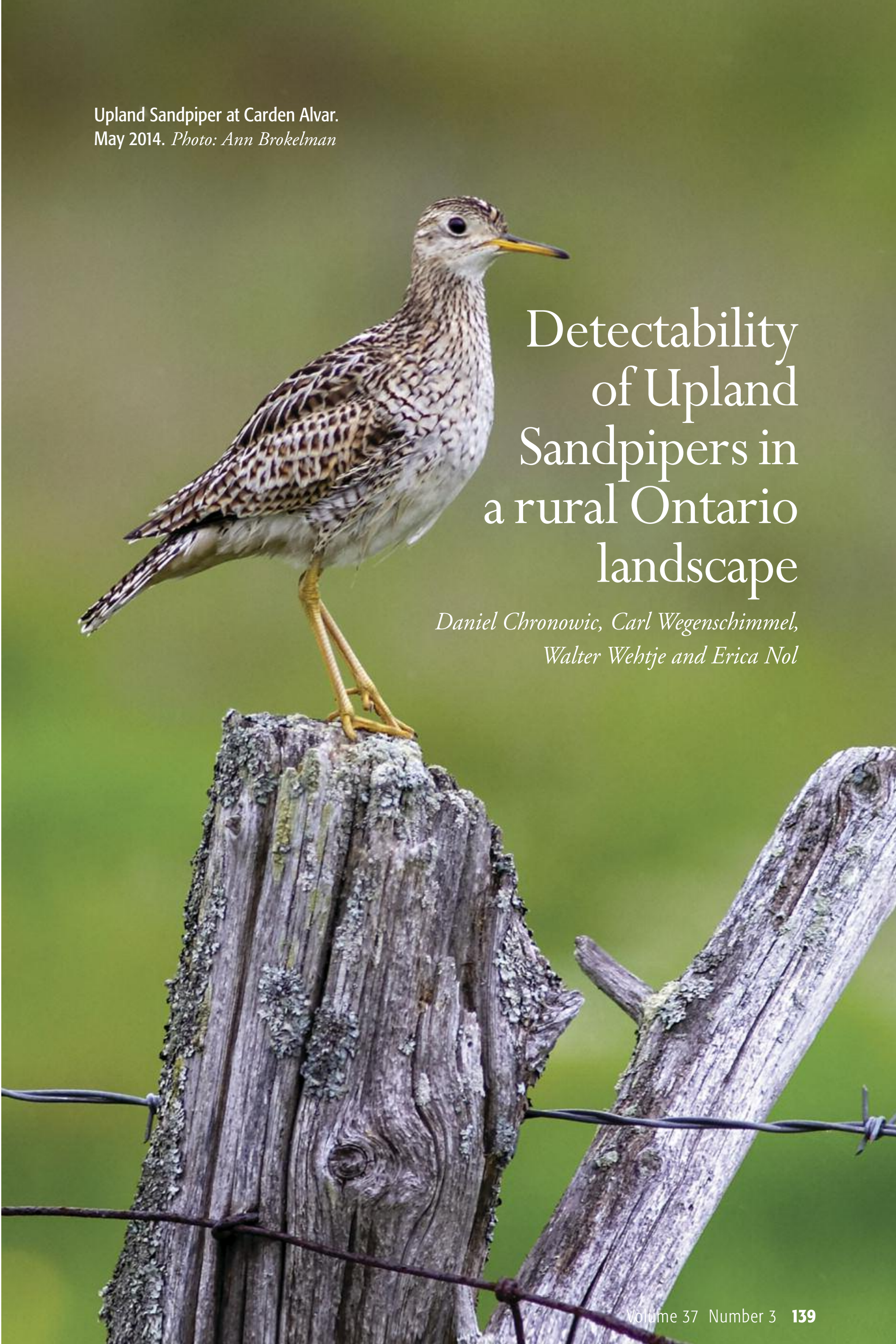


Upland Sandpiper at Carden Alvar. May 2014. *Photo: Ann Brokelman*

Detectability of Upland Sandpipers in a rural Ontario landscape

Daniel Chronowic, Carl Wegenschimmel, Walter Wehtje and Erica Nol

Abstract

We examined Upland Sandpiper (*Bartramia longicauda*) detectability in rural Peterborough and Kawartha Lakes, Ontario. Our objectives were to examine variation in detectability between surveys and among points, validate survey protocols, determine the effectiveness of call playback for enhancing detectability, and determine if landscape level habitat features could predict detectability of Upland Sandpipers in Southern Ontario. Initial point counts were conducted in 2014 at occupied point counts identified during the 2001-2005 Ontario Breeding Bird Atlas and suitable habitat. Upland Sandpipers were detected at 31 of 133 (23.3%) sites surveyed. In 2015, we chose a subset of sites occupied in 2014 to re-survey using a protocol from Wildlife Preservation Canada's Eastern Loggerhead Shrike Adopt-A-Site population monitoring program. Detectability was low, with six surveys of at least 18 minutes each needed to ensure detection during the breeding season. Detection was highest in mid-June. The Wildlife Preservation Canada protocol detects Upland Sandpiper most efficiently during the second round of point counts when birds are most vocal. Playbacks did elicit some minor response, indicating that they could potentially play a role in detecting Upland Sandpipers when they persist at low relative abundance. The proportion of open habitat did not affect detection on the landscape.

Introduction

The ability to detect birds by both sight and sound can vary greatly among species. Abundance, physical features such as colouration, size, activity level, and the frequency, length and volume of vocalizations, can all play a role in detectability. For example, the large, all black, conspicuous American Crow (*Corvus brachyrhynchos*) is easily identified by sight and their recognizable "caw-caw" vocalizations, and is, by far, more recognizable and easier to detect by human observers than the small and cryptic Grasshopper Sparrow (*Ammodramus savannarum*), with its faint ticks and insect-like buzzing. Therefore, it is important to select appropriate methods for enhancing survey detectability to ensure accuracy in detecting target species during point count surveys.

For breeding species, home range size impacts the density of individuals on the landscape. Given similar body size and audibility of territorial calls, common species with small ranges should be more likely to be detected than less common species with large home range sizes, as the former will be encountered more frequently on the landscape. An inverse relationship between home range size and density could lead to issues when attempting to detect less common species with large home ranges.

The Upland Sandpiper is sparsely distributed across southern Ontario (McIlwrick 2007). Detectability can be an issue, as this species occurs at low density. Individuals of this species in Kansas prairies have home ranges between 0.8 – 33.7 km^2 with a mean of 8.42 km^2 (Sandercock *et al.* 2015). Additionally, Upland Sandpiper have very cryptic plumage and hence, are often inconspicuous in a grassland landscape when not vocal, displaying or perching in the open. Thus, on many surveys, Upland Sandpiper detections might be limited and the resulting density estimates biased low. Male Upland Sandpipers are quite vocal during flight displays, at heights up to 100 m (Houston *et al.* 2011), giving long mellow whistles at 2 to 3 minute intervals, with displays lasting up to 15 minutes (Ailes 1976). However, if Upland Sandpipers are not displaying, the frequency of other calls, such as tattler alarm calls, is low. Thus, the frequency of Upland Sandpiper vocalizations could also be a factor in the rate of detection on the landscape.

The Upland Sandpiper occupies similar habitat to the Loggerhead Shrike (*Lanius ludovicianus*) in southern Ontario, selecting areas with open vegetation such as pastures and grasslands with available perches (Yosef 1996). The Loggerhead Shrike is critically endangered in Canada (COSEWIC 2014) and Ontario (OMNRF 2016), leading to intensive efforts by both government and non-government organizations to promote its conservation. One non-government organization, Wildlife Preservation Canada, has been organizing volunteer- and staff-run surveys of Loggerhead Shrike annually since 2003. In the process, volunteers and staff have also been recording the presence of other grassland bird species including the Upland Sandpiper. According to the Wildlife Preservation Canada protocol, grassland patches should be surveyed for Loggerhead Shrike three times during the breeding season, once during each of three survey windows: 15-30 April, 15-31 May and 15-30 June and last 20 minutes per visit (Wheeler 2015). Volunteers also select best vantage points for roadside surveys to enhance detection of all species. These data are useful for helping to understand peak periods of detectability of the Upland Sandpiper and other grassland species that potentially share habitat with the Loggerhead Shrike.

The distinct vocalizations of Upland Sandpiper should enhance detectability during the season when birds are singing or calling. However, given the large territories of this species, detectability might be reduced due to the possibility of birds calling from a portion of the territory too distant from the observer to be heard. Additionally, low detectability may result from survey timing not matching temporally restricted periods for calling. Call broadcasts can be used during point counts to enhance detectability of target species, e.g., Rusty Blackbird (*Euphagus carolinus*) (Powell *et al.* 2014). Upland Sandpiper playbacks may similarly enhance detectability.

The objectives of this study were to (1) document variation in detectability both within the breeding season and within a point count station, (2) validate the use of Wildlife Preservation Canada's sampling protocol to detect Upland Sandpiper (3) determine whether Upland Sandpiper playbacks increase detection and (4) determine whether Upland Sandpipers are detected more frequently at sites with a higher proportion of open habitat in the landscape around the point count station.

Methods

Point count surveys were conducted in 2014 and 2015 in Peterborough County and the City of Kawartha Lakes, Ontario. The survey region consisted of a mix of agriculture, forests, shrub lands, grasslands, wetlands, alvar rock plateaus, urban development, and freshwater lakes, rivers and streams. Slight variation in elevation occurred on the landscape due to sparse numbers of small- to moderate-sized hills.

In 2014, CW conducted 10 minute unlimited radius point count surveys at 133 sites that were (a) known to have been occupied 9 to 13 years ago (2001-2005) during the most recent Ontario Breeding Bird Atlas (Cadman *et al.* 2007) (n=63) and (b) sites selected as possible suitable Upland Sandpiper habitat (n=70) based on subjective examination of the presence of open (non-treed) habitat using Google Earth™ images (Figure 1). Each survey began with five minutes of passive listening and visual scanning for birds followed by Upland Sandpiper call playbacks for a duration of one minute, followed by four more minutes of passive observation (total 10 min point count). Each site was visited three times between 11 May and 31 July for a total of 399 point count surveys. Roadside surveys began after 06:00 hrs (EST) and were concluded prior to 10:00 hrs (EST). Surveys were postponed when rainy and windy conditions occurred. Detection data from 2014 surveys were not separated by detections occurring during periods with or without playback.

Using these initial 2014 surveys, we selected a subset of sites (n=20) where Upland Sandpiper were detected to explicitly test how many surveys and what duration of observation was necessary to detect Upland Sandpiper, given the assumption that these 2014 sites would again be occupied in 2015. DC conducted unlimited-radius roadside point counts between 27 April and 29 July 2015 (Figure 2). These 20 sites were surveyed eight times, on a bi-weekly basis, except between the first and second visits. The initial two visits to sites were sampled with a one week interval due to early season weather conditions and to determine if birds arrived on the landscape during the first Wildlife Preservation Canada Adopt-A-Site survey window, 15-30 April 2015. Counts took place between sunrise and 10:00 hrs (EST) on days that lacked rain, fog, strong winds (> 30km/hr) and high temperatures (> 30°C) (Wheeler 2015). Sampling occurred over three successive days, plus an additional day if sampling was halted due to weather, to cover all 20 sites prior to the end time of 10:00. If at least one Upland Sandpiper was detected, either visually or by vocalizations over the duration of the survey, it was recorded as a detection (i.e., multiple Upland Sandpipers at one site were considered a single detection).

In 2015, point count surveys were conducted for a total duration of 18 minutes. During the first five minutes of the survey, the observer stayed in one location. Between minute 5 and 15, the observer moved about the roadside, not exceeding 50 m from the point count centroid, while remaining parallel to the

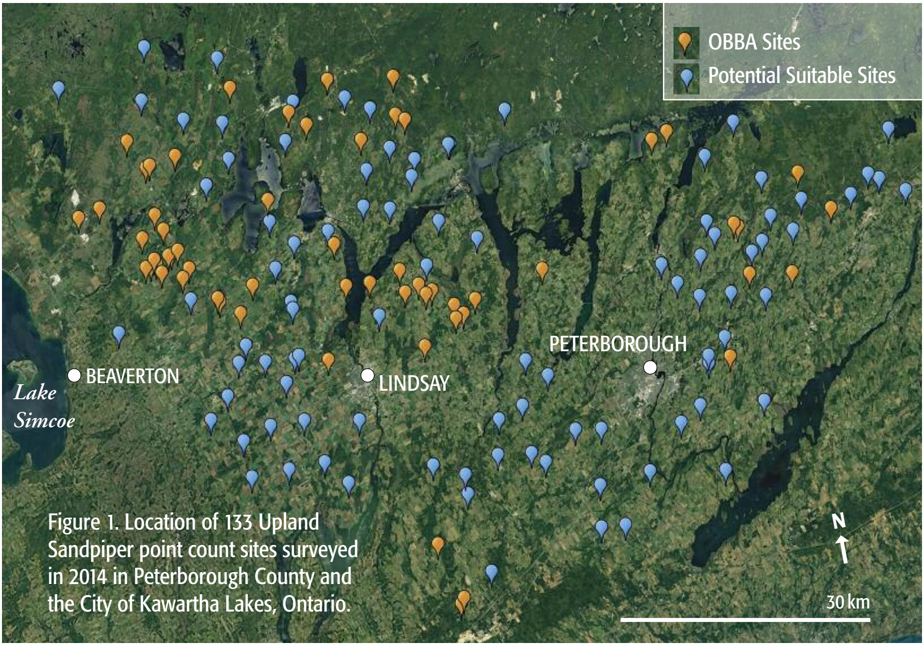


Figure 1. Location of 133 Upland Sandpiper point count sites surveyed in 2014 in Peterborough County and the City of Kawartha Lakes, Ontario.

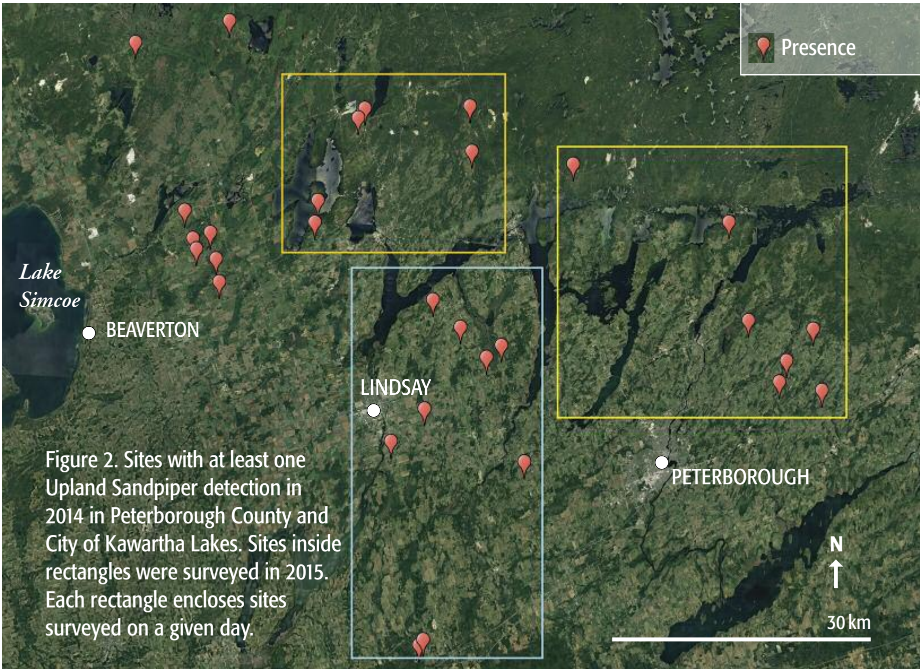
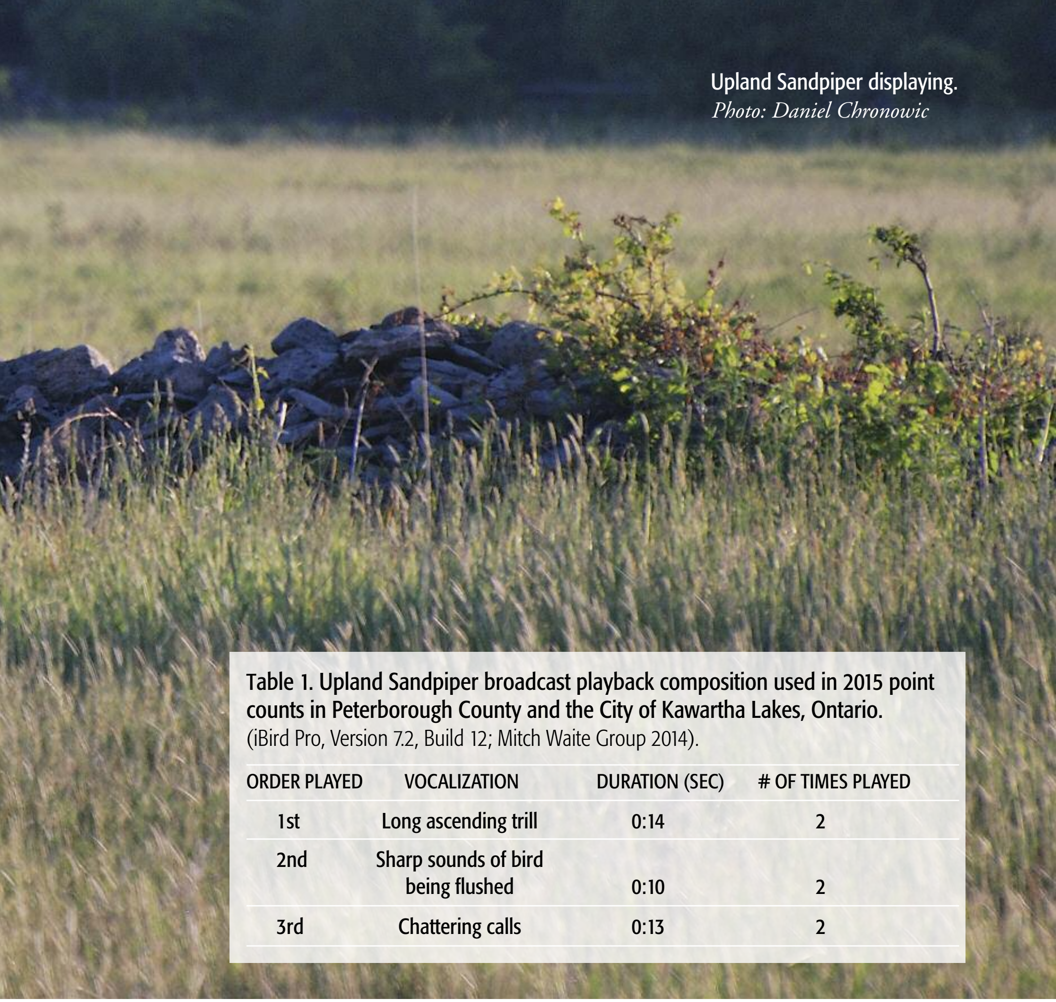


Figure 2. Sites with at least one Upland Sandpiper detection in 2014 in Peterborough County and City of Kawartha Lakes. Sites inside rectangles were surveyed in 2015. Each rectangle encloses sites surveyed on a given day.

road, to modify and expand the vantage points for both visual and auditory detections. These movements occurred as part of the protocol because Wildlife Preservation Canada surveys did not use specific UTMs for surveys, thus leaving roadside vantage points to the discretion of the observer (Wheeler 2015). Visibility was, therefore, site and observer specific.

Call playbacks were used in an attempt to enhance detection. Upland Sandpiper vocalizations were obtained from iBird Pro, Version 7.2, Build 12 (Mitch Waite Group 2014). Playbacks included three types of vocalizations (Table 1). Broadcast playback began at the beginning of minute 15 of the survey, using an iPhone 4s connected with a 3.5 mm stereo audio cable to a Sony – SRS-X2 Personal Audio System. The total duration of Upland Sandpiper vocalizations was one minute and fourteen seconds. Sequence of playbacks was arbitrary with song first, followed by associated calls, as listed in iBird Pro. The playback was, followed by a period of passive observation (2 min: 46 sec), at the original point count location.



Upland Sandpiper displaying.
Photo: Daniel Chronowic

Table 1. Upland Sandpiper broadcast playback composition used in 2015 point counts in Peterborough County and the City of Kawartha Lakes, Ontario.
(iBird Pro, Version 7.2, Build 12; Mitch Waite Group 2014).

ORDER PLAYED	VOCALIZATION	DURATION (SEC)	# OF TIMES PLAYED
1st	Long ascending trill	0:14	2
2nd	Sharp sounds of bird being flushed	0:10	2
3rd	Chattering calls	0:13	2

The audibility of each of the three vocalizations was tested by an observer standing at varying distances from the speaker in a flat, open agricultural landscape while an assistant held the playback setup and repeated each vocalization. All broadcast vocalizations were clearly audible by DC at 100 m and 250 m. Vocalization playbacks started to become unclear at a distance of 403 m. Broadcasts were not audible at a distance of 500 m. As a result of these distances, we established that buffers for habitat-related analyses would have a radius of 500 m.

Annual Crop Inventory (ACI) data (Government of Canada 2017) from 2015 were used to obtain landscape-level habitat features. Circular buffers with a radius of 500 m, covering an area of 0.7854 km^2, were drawn around the centroid of each of the 20 sites using ArcGIS (ESRI 2011). Buffers did not overlap. Agricultural landscape data were extracted around each of the sites using RStudio (Rstudio Team 2015) and the raster package in r (Hijmans *et al.* 2019). Of the 67 crop classifications within the Annual Crop Inventory dataset, 14 landcover types were extracted as raw data (water, exposed/barren, urban/developed, shrubland, wetland, grassland, pasture, coniferous, mixed wood, soybeans, broadleaf, fallow, wheat, corn). The total proportion of grassland, pasture, wheat, fallow, exposed/barren and water were combined to create a single variable: proportions of open habitat.

Beta regression, with a logit link, was used to assess the relationship between proportional detectability, the proportion of detections per site and the proportion of open habitat on the landscape (Ferrari and Cribari-Neto 2004), using data from the 2015 survey season. Analyses were run using the betareg package in r (Zeileis *et al.* 2016) with $\alpha = 0.05$ set *a priori.*

Results

In 2014, we observed or heard at least one Upland Sandpiper at 31 of 133 sites (23.3%). Detections occurred during 54 of 399 point counts (13.5%) with 39 detections (20.6%) at Ontario Breeding Bird Atlas sites and 15 detections (7.1%) at CW's possible suitable sites. Upland Sandpiper abundance by site ranged from one to five birds (mean = 1.9).

In 2015, we saw or heard at least one Upland Sandpiper at 16 of 20 2014 sites (80%), over eight surveys per site. The abundance of Upland Sandpipers detected per survey ranged from one to three birds, with one bird detected during 31 surveys, two birds detected during eight surveys and three birds detected during six surveys (mean=1.4). The overall mean probability of detection was 28.1% (45 of 160 surveys). For the 16 sites with at least one detection during the eight survey visits, probability of detection was 35.2% (45 of 128 surveys). Detection of Upland Sandpiper was greater earlier during the 18 minute period and declined as time progressed (Figure 3). Of the initial detections at each site, 86.7% (39 of 45 birds) were detected in the first 15 minutes of the survey, prior to the use of playbacks and only six occurred either during the playback or the passive listening period (i.e., the final three minutes of the survey). Behavioural responses to playback were limited with 4.4% (two of 45) of surveys having birds appear to respond directly to playback by both vocalizing and approaching the source of playback. In an additional 11.1% of the surveys (five of 45), birds vocalized after playback, but did not approach the location of the call-broadcast. The six initial detections that occurred in the final three minutes of the survey occurred over six of the eight visits between 26 April and 9 July. The final three minutes of the point count surveys accounted for the only detections at 12.5% (two of 16) sites at which Upland Sandpipers were detected.

Of the 20 sites occupied in 2014, the cumulative proportion occupied in 2015 increased throughout the breeding season between the first visit (27 April) and sixth visit (30 June) (Figure 4). After the sixth visit, site occupancy plateaued with no detections at any of the four remaining unoccupied sites, suggesting that Upland Sandpipers were not present at these sites in 2015. There was a significant positive relationship between the cumulative proportion of sites occupied and the number of visits (Pseudo $R^2 = 0.8441$, $Z_{1,6} = 6.63$, $p < 0.001$).

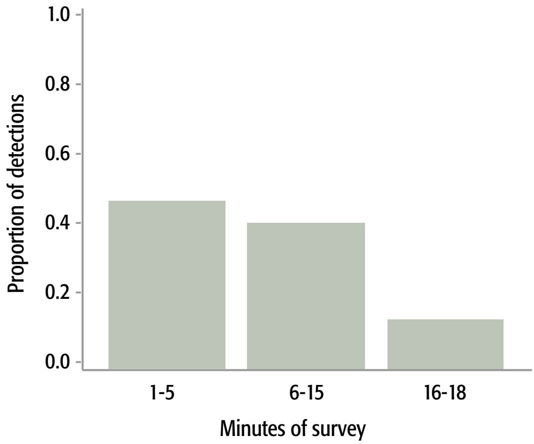


Figure 3. Temporal distribution of initial Upland Sandpiper detections (n=45) during point counts at 20 sites surveyed in Peterborough County and the City of Kawartha Lakes in 2015.

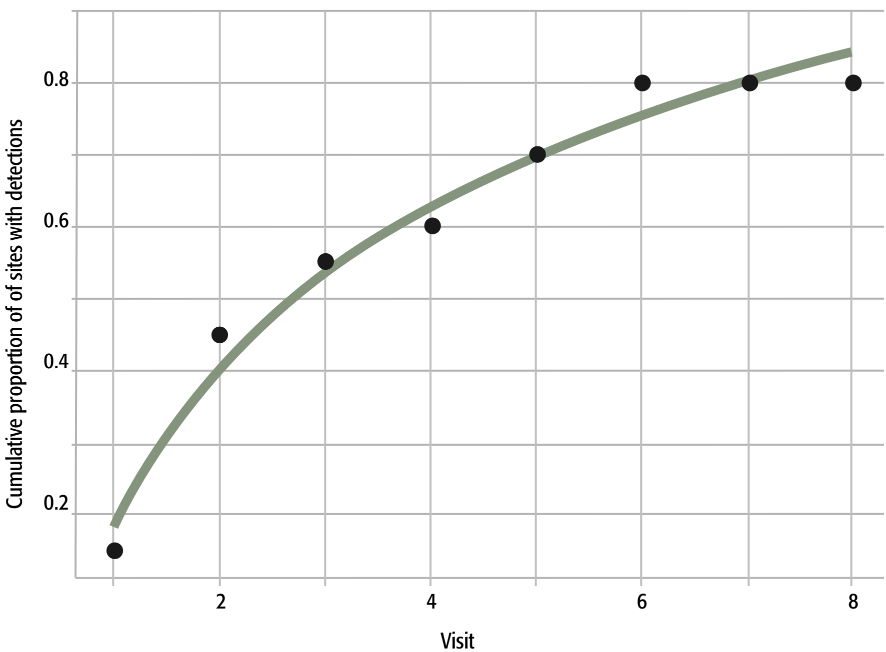


Figure 4. Cumulative proportion of point count sites in Peterborough County and the City of Kawartha Lakes (n=20) with Upland Sandpiper detections over eight visits between 27 April and 30 June 2015. (Pseudo $R^2 = 0.8441$, $Z_{1,6} = 6.63$, $p < 0.001$).

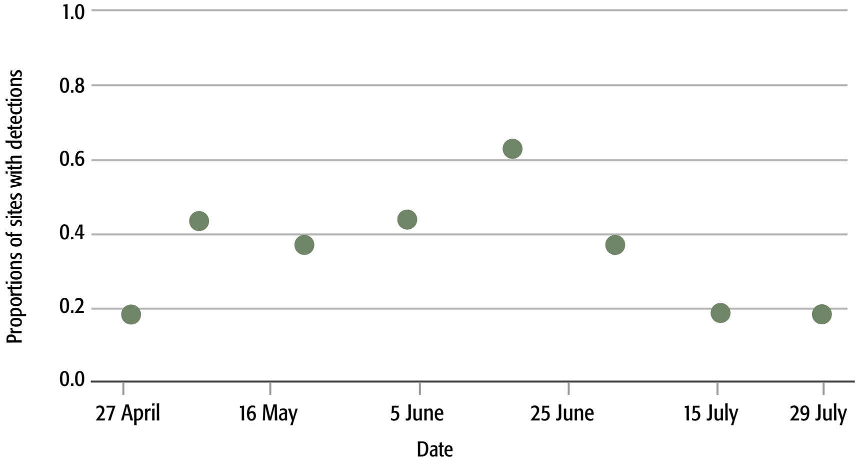


Figure 5. Proportion of 20 point count sites in Peterborough County and the City of Kawartha Lakes with Upland Sandpiper detections during each sampling period between 27 April and 30 June 2015. (Pseudo $R^2 = 0.06503$, $Z_{1,6} = -0.651$, $p = 0.515$).

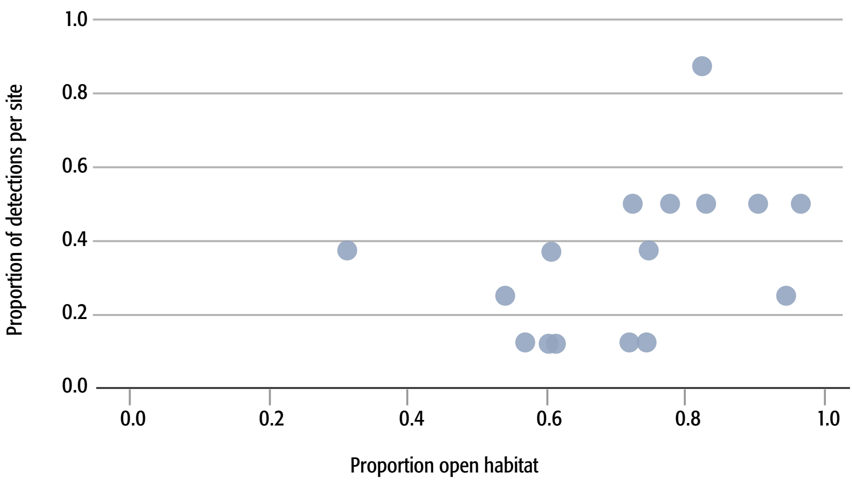
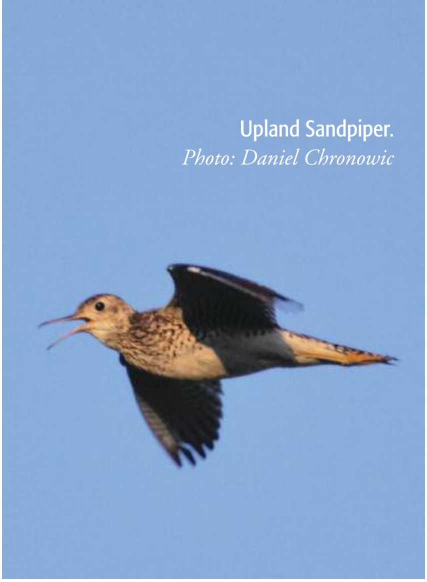


Figure 6. Relationship between proportion of detections and proportion of open habitat within a 500 m buffer around the point count centroid, at 16 occupied sites surveyed in Peterborough County and the City of Kawartha Lakes in 2015, based on eight visits per site. (Pseudo $R^2 = 0.1373$, $Z_{1,14} = 1.704$, $p = 0.0883$).

The proportion of Upland Sandpiper detections by week (Figure 5) did not vary as a function of visit (Pseudo R^2 = 0.06503, $Z_{1,6}$ = -0.651, p = 0.515). Peak detection corresponded with the fifth visit, or the middle of June. Detection was lowest in late April and at the end of the breeding season in July.

Upland Sandpiper detection was not higher in survey locations with more open habitat. Detections were marginally higher but did not significantly increase with an increase in the proportion of open habitat, as classified by the total proportion of grassland, pasture, wheat, fallow, expose/barren and water, within the 500 m buffer (Figure 6) (Pseudo R^2 = 0.1373, $Z_{1,14}$ = 1.704, p = 0.0883).



Upland Sandpiper.
Photo: Daniel Chronowic

Discussion

We detected very few Upland Sandpipers across two Ontario municipalities where the species is known to persist in low densities. Additionally, while repeated occupation between years was high (80%), the probability of Upland Sandpiper detection in each survey was low in 2015 at sites that were known to be occupied in 2014. Multiple surveys were necessary to ensure detection: a minimum of six surveys, each with a duration of at least 18 minutes, was required to detect 86% of Upland Sandpiper present. Playbacks have the potential to enhance detection when Upland Sandpiper relative abundance is low on the landscape. Habitat with a greater degree of openness on the landscape had marginally but non-significantly, higher detection than sites that were less open.

Detectability of Upland Sandpiper was greater earlier in the breeding season prior to hatching, and most likely in the laying period prior to incubation. While we did not find nests, Peck and James (1983) suggest that this species has eggs in nests between 12 May and 9 July, and thus the second visit, 4 May to 6 May, may have corresponded with territory establishment and pair formation. The earlier dates documented by Peck and James (1983) coincide with most eggs hatching prior to the end of June (incubation period of 23-24 days, Houston *et al.* 2011). Increased survey effort should occur at the beginning of the breeding season well prior to hatching, which could begin as early as the beginning of June (Peck and James 1983). After hatching, adults are harder to detect, as they become silent to avoid attracting predators to their flightless offspring. Upland Sandpiper detectability may also decrease during the breeding season as vegetation height increases on the landscape, reducing the number of visual detections. Detecting the true site occupancy increased throughout the breeding season, as more visits occurred per site, and leveled off by the sixth visit in the beginning of July.

Detectability was low in late April when birds were arriving on the breeding grounds and in July when chicks had left nests. Upland Sandpiper activity, including vocalizations and displays, may reduce in vigour and persistence as birds form pairs and initiate laying; adults may not be seen or heard as frequently during incubation. The cumulative proportion of birds detected reached a plateau in week eight, or the sixth visit (Figure 4), which corresponds with the third survey window of volunteer point count sampling of Wildlife Preservation Canada. Therefore, if Upland Sandpiper are present they should be detected prior to the third survey window as long as there has been enough survey effort early on in the breeding season.

Fragmentation of the landscape in southern Ontario changes both habitat composition and configuration (Fahrig 2003). Upland Sandpiper occurrence is driven by composition rather than configuration of habitat variables on the landscape (Shahan *et al.* 2017). It may be easier to detect Upland Sandpipers when there is more open and flat habitat due to a greater likelihood of both audible and visual detections. There was a slightly greater proportion of detections on sites with a greater proportion of open habitat, although this relationship was not significant, which we believe was due to a sample size of only 16 sites. The degree of visibility and number of obstructions on the landscape, as created by habitat configuration and variation in elevation, could potentially limit Upland Sandpiper detections.

Six detections occurred during or after call playbacks, but whether these six detections were a result of the playbacks or of the extra three minutes of survey duration is unknown. Playbacks did elicit some minor response; two birds showed a direct response by approaching the source of playbacks, however, since these birds were initially detected at the site prior to the playbacks being played, the playbacks did not enhance survey detectability. The minor response may indicate that playbacks could potentially play a role in detecting Upland Sandpipers when they are sparsely distributed on the landscape. Bird species have varying responses to call broadcasts. The Black-capped Chickadee (*Poecile atricapillus*) is highly responsive to conspecific playbacks (Hurd 1996), yet not all bird species exhibit such a heightened response. Call playbacks did not aid in the detection of the secretive nesting Least Bittern (*Ixobrychus exilis*) (Tozer *et al.* 2007), however, other studies have shown that call-response broadcast surveys for Least Bittern did yield more detections than passive surveys (Cherukuri *et al.* 2018). With these studies indicating a contradicting effect of playbacks on the detection of Least Bittern, and with inconclusive results from our use of playback, we believe more research is needed on the effect of call playbacks on the Upland Sandpiper.

In southern Ontario, Upland Sandpiper population densities are low within suitable habitat, with few locations, other than the Carden Alvar, having a relative abundance greater than one individual per 25 point counts (McIlwrick 2007). With a limited detectability and low relative abundance, availability for detection can affect survey results. Lituma *et al.* (2017) examined calling frequency of male Northern Bobwhites (*Colinus virginianus*) using radio-transmitters and found that males called more frequently in the presence of other males, increasing their availability for detection. Future studies could consider tracking individual Upland Sandpipers to account for how availability for detection influences detectability when birds are known to be present prior to each survey.

Our second objective was to determine whether methods used by Wildlife Preservation Canada were sufficient to detect Upland Sandpiper. The second Wildlife Preservation Canada survey period coincides with peak breeding activity of Upland Sandpiper when they are most vocal. They become more secretive, both in their movements and vocalizations, once eggs have hatched, presumably to reduce exposing offspring to potential predators. Perhaps with access to the centre of grassland patches at the Wildlife Preservation Canada survey sites, methods can be used after hatching to increase detectability. Walking transects could also be used to enhance detection once Upland Sandpipers have become more secretive late in the breeding season.

These results suggest that careful consideration be put into survey methods that would ensure the greatest likelihood of detection. With accurate estimates of populations necessary to derive informed conservation initiatives and management practices, such fine tuning of methods is vital. Managers should carefully consider the biology and life history strategies of their focal species when developing sampling methods and identify the implication for data analyses prior to data collection.

Acknowledgements

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Distinguished Ornithologist Margaret Bain

Glenn Coady

Margaret Jean Christine Bain came to what was seen around the world as a very desirable Canada, flush with promise and optimism in the immediate aftermath of hosting the world at the very successful Expo '67, and one still freshly caught up in the excitement of 'Trudeaumania'. She was part of the tail end of the great post-war British 'brain drain' that was to see many highly educated and adventurous ex-patriots seek out opportunities spanning across the globe.

As with Charles Fothergill, William Pope, Thomas McIlwraith, William Loane and William Brodie in previous eras of immigration in the 19th century, the loss to the British Isles was to prove to be a source of great benefit to ornithology in Ontario.

From an early age, Margaret was clearly set on a course of achievement and pushing through established 'glass ceilings'. Between 1956 and 1961 she studied medicine on scholarship at the University of Edinburgh in Scotland, and after residency in London hospitals she specialized in obstetrics. By the end of the decade she had emigrated to Canada, where she initially worked in Toronto in the country's two busiest obstetrical departments at Women's College Hospital and Mount Sinai Hospital. In 1971, she moved to Durham Region to raise her family and begin a private practice in obstetrics and accepted a staff position in the obstetrical department at Oshawa General Hospital, where over the next two-and-a-half decades she would rise through the ranks to become Chief of the Department of Obstetrics and Gynecology, and eventually Vice-Chair of the hospital's entire Department of Surgery.

One day in the early 1970s, an initial lifelong casual interest in birds was to provide one of those pivotal 'spark moments' that most birders can instantly relate to, and it was to transform the remainder of Margaret's life. During the peak of spring migration, she went out into her garden at 210 Byron Street North in Whitby to find a very heavy grounding of warblers and other passerines literally filling every tree and bush with a blaze of colour and activity. She was stricken with awe at the wonder and joy of bird migration and soon joined the local natural history club, the Oshawa Naturalists (later the Durham Region

Field Naturalists), where she met many fine early mentors like Murray and Doris Speirs, Edge and Betty Pegg, George Scott, Naomi Le Vay, Ron Tozer, Jim Richards, Dennis Barry and Dave Calvert. She soon learned all the wonderful birding hotspots available in Durham and dove into learning and mastering Ontario's birds and in no time at all there was no stopping her. Despite a very demanding career and a young family, she seemed to effortlessly be everywhere and always in tune with where the birding was the most productive. It was not very long before she was regularly turning up rare birds and she was soon considered one of the leading local birders in Durham, and inevitably in Ontario as a whole.

This brings me to the dilemma I first considered when I proposed Margaret for the Distinguished Ornithologist Award. I knew that all of the longtime OFO members and birders in Ontario were well acquainted with Margaret, but I was trying to figure out a way make her relatable to the young generation of new birders, many of whom would not be familiar with her history. After thinking about it for some time, I think I found the perfect way to make her experience relatable to this new generation. It was crystallized in a simple analogy – Margaret Bain was Jean Iron *before* Jean Iron was Jean Iron! Judging by the response that line got at the OFO banquet where I presented Margaret with the Distinguished Ornithologist Award, I believe it achieved the desired effect.

Much like Clarence Decatur Howe, the war-time Liberal government Cabinet minister who worked on so many important files that he was nicknamed the 'Minister of Everything', Margaret soon had her finger in so many pies that in retrospect it is very hard to believe it left much time for either birding or delivering babies!

Margaret Bain at the Point Pelee National Park Visitor Centre on 14 May 2007. *Photo: Jean Iron*

In 1980, she took over summarizing the monthly notable bird sightings in the newsletter of the Durham Region Field Naturalists, a task which she continued to perform for more than two decades. One of the most interesting records for which she had uncovered the details and found material evidence was the sighting by two non-birders of Ontario's first ever Black Skimmer at Whitby Harbour in the fall of 1977. She also served on the Durham Region Field Naturalists' executive for many years, culminating in service as its President and past President.

During the first Ontario Breeding Bird Atlas from 1981 to 1985, she stepped in to serve as Regional Coordinator for Durham Region and recruited and organized atlassers and a series of square bashes to ensure that all of the region's squares achieved the desired coverage targets. During the second Ontario Breeding Bird Atlas, from 2001 to 2005, she served as Regional Coordinator for Northumberland County.

One of the most celebrated parts of her legacy involved a conservation initiative forced on her by events. In the inaugural issue of OFO's journal, *Ontario Birds,* Margaret wrote the first OFO birding site guide to one of her most cherished Durham Region birding sites, Whitby's Thickson's Woods, which she brought to the popular consciousness of the entire Ontario birding community as one of the finest bird migration traps on the north shore of Lake Ontario. Many did not realize, however, how close this site had recently come to being lost forever.

In 1982, the developer who owned the woods, frustrated by an inability to obtain permits to develop the site for lucrative condominiums, decided to sell the logging rights to the two hundred year-old eastern white pines. Work crews came in and felled 66 of the old growth pines from the woods before much could be done to stop them. Local birders and the residents of the Thickson Point community were dismayed with the pace of the destruction of this vital migratory bird stopover, and receiving little help in effectively thwarting this via government agencies, had to spring into action and come up with their own solution.

Into the breach stepped Margaret Bain and a group of other influential birders and local residents. After literally standing in the way of the chainsaws in protest and employing cheque-book bribes to send work crews away without felling any trees, they bought the time to organize that solution. In addition to frustrating the developer, Margaret had the time to organize the Thickson's Woods Heritage Trust, a land trust which would serve as the model by which she and a few key supporters could make a serious effort to outright negotiate an offer to purchase the woods from the developer. In dipping into her children's education funds and convincing other friends to make similar large donations to the cause, they were able to come up with a down payment on that purchase and to secure a mortgage for the balance of the funding. Disaster was averted and by 1984 it was clear that the woods had been saved. Margaret went on to become the long-time Chair of the Thickson's Woods Land Trust and served on its Board of Directors for more than twenty-five years, during which time countless successful donor campaigns, bake sales, wildlife art auctions and fall fairs were organized to see to it that the mortgages on the woods, as well as the addition of the adjacent meadow and a couple of privately held woodlots, were all duly paid off, thus saving the resultant Thickson's Wood Nature Reserve in perpetuity.

On 13 April 1985, Margaret discovered a new bird species for Ontario a little north of the woods on Thickson Road South when she found a Eurasian Jackdaw on a hydro pole near the railway line.

Glenn Coady presents Margaret Bain with OFO's Distinguished Ornithologist Award at the 2019 Annual Convention in Hamilton.
Photo: Jean Iron

This record was accepted by the Ontario Bird Records Committee and she documented the occurrence in a paper in *Ontario Birds.*

Perhaps Margaret's greatest contribution to ornithology in Ontario has been her trailblazing ways and her stellar example as a role model for other women in birding and ornithology. In 1982, she became only the fourth female member of the formerly all-male Toronto Ornithological Club (after Phyllis MacKay, Joy Goodwin and Linda Weseloh were accepted as members in 1980). In 1988, she became the first female President of the Ontario Field Ornithologists. The rapid succession of successful and effective female presidents in Margaret Bain, Gerry Shemilt and Jean Iron, during OFO's greatest period of growth, definitely had a transformative effect on the role of women in field ornithology in Ontario. Talented female birders like Mary Gartshore, Sarah Rupert, Barbara Charlton, Cheryl Edgecombe, Seabrooke Leckie, Sarah Lamond and Amanda Guercio now garner a respect from their male counterparts that was reflexively denied to an earlier generation like Margaret Mitchell, Doris Speirs, Naomi Le Vay and Phyllis MacKay.

Continuing on the same theme, Margaret was elected as the first female voting member of the Ontario Bird Records Committee and served as both Secretary and Chair in her time on the committee. She has also served OFO as an editorial assistant for *Ontario Birds* in the past.

Between 1990 and 1994, she teamed with Brian Henshaw to produce a series of excellent annual Durham Region Bird Reports summarizing the years 1989 through 1993 in the region.

Between 1991 and 2004, she teamed with Phill Holder as the co-founder and co-editor of the magazine *Birders Journal,* a highly respected print journal that had many exceptional articles on identification and status of birds, and she cowrote a Cross-Canada Roundup each issue, first with Matt Holder and then with Don Shanahan. In November 2000, *Birders Journal* sponsored and organized a hugely successful North American Gull Conference at Niagara Falls that was attended by birders from all across North America.

As if this wasn't enough to fill her time, Margaret also served terms as Chair of the Board of the Long Point Bird Observatory and as a board member of the American Birding Association. For many years beginning in 2000, she wrote the fall seasonal summary for the Ontario Region in the journal *North American Birds.*

In starting a draft manuscript on the Birds of the Greater Toronto Area, it quickly became obvious to me that Margaret was involved in so many of the significant bird records in Durham Region over the past 45 years, that an important consideration in staving off carpal tunnel syndrome for me, was to create a hot-key shortcut on the keyboard, so as not to have to type out her name so frequently!

Durham Region has been blessed over the years with an abundance of excellent leaders in ornithology: Charles Fothergill, George Gwynne Bird, Earl Calvert, Albert Ellis Allin, Doris and Murray Speirs, Betty and Edge Pegg, Naomi and Bert Le Vay, George Scott, Alf Bunker, Ron Tozer, Jim Richards, Dennis Barry, Ross James, Rob Nisbet, Jim Mountjoy and James Kamstra, to name but a few. All of them have one thing in common — none are any more distinguished than Margaret.

Although she has moved to Cobourg and now shares her brand of magic in Northumberland County, rest assured that many of us will always view her as the 'Grand Dame' of Durham birding.

Congratulations on a long overdue honour Margaret!

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OFO was formed in 1982 to unify the ever-growing numbers of field ornithologists (birders/birdwatchers) across the province, and to provide a forum for the exchange of ideas and information among its members.

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