THE FEDERATION OF NEW YORK STATE BIRD CLUBS

MONOGRAPH NO. 1

A SUMMARY OF HAMLIN BEACH LAKEWATCH FALL AND WINTER WATERBIRD MIGRATION DATA 1993-1999

Brett M. Ewald

Dominic F. Sherony

2001

SPONSORED BY: Braddock Bay Raptor Research

PUBLISHED BY: The Federation of New York State Bird Clubs

THE FEDERATION OF NEW YORK STATE BIRD CLUBS MONOGRAPH NO. 1

A SUMMARY OF HAMLIN BEACH LAKEWATCH FALL AND WINTER WATERBIRD MIGRATION DATA 1993-1999

Brett M. Ewald Dominic F. Sherony

2001

CONTENTS:

Hamlin Beach Lakewatch

Lake Ontario is a very important site in the eastern migration corridor for spring, fall, and wintering waterfowl. When we characterize migration as occurring in a "corridor", we tend to think that birds come from the north and leave to the south in fall and vise versa in spring. But in fact, migration through Lake Ontario is much more complex than that. Each species is different and, indeed, some species are composed of different populations that take different paths. Lake Ontario is like a collection point or a node point. Some species come from the west and migrate east. Some come from the northwest and migrate south. One of the most common patterns is birds come from the north, migrate west across Lake Ontario, then turn south. Still others migrate to the lake and remain all winter. We recognize that this large lake is a very important feeding ground for these migrants. Many species arrive from the high arctic, a journey of 2000 miles. No doubt that over the centuries, they have traditionally used this lake as an important feeding location to replenish them on the journey to the southern US and the surrounding oceans. The broader purpose of this work is to begin to understand how different species are migrating through Lake Ontario. Although much had been understood about migration in general terms, we lack significant knowledge about details specific to species and important locations. Lake Ontario is an important location.

In a more restricted sense, the purpose of this work is to understand the timing, number and general nature of waterbird migration on Lake Ontario. Although the lakewatch records all species, our primary focus is waterbirds because they are more numerous and the lake plays a much different role in their annual journey than it does for raptors, herons, and passerines.

In former times, prior to about 1950, Lake Ontario played a significant role in the fall migration of shorebirds. It was a primary feeding ground for southbound shorebirds. The Saint Lawrence Seaway and the boating industry have forced the lake to higher water levels eliminating the exposed shoreline that occurred annually in fall. It is our hope that we can understand migration sufficiently so that we can avoid creating an environment which will adversely affect this migration pathway.

Over the years there has been considerable research work done on migration. In recent times, several authors have provided overviews of what has been learned in the form of interesting, well-written treatise. Kerlinger (1995) covers the highlights of important mechanisms in bird migration. Alerstram (1990) gives a more in-depth look at the same subject. Able (1999) provides an overview of migration and edited a collection of essays by different authors on specific research dealing with migration and ecology. Weidensaul (1999) gives a personal view of bird migration and conservation.

METHOD

A fall daily migration count has been sponsored by Braddock Bay Raptor Research and conducted at Hamlin Beach State Park (HBSP), Hamlin, New York. HBSP is located on the south shore of Lake Ontario, 25 miles west of Rochester, NY, in Monroe County (43°22'N, 77°54'W). The park is laterally central to Lake Ontario and situated on an area of land that extends northward into the lake. At this point, the predominantly east/west shoreline turns to the southeast for 21 miles. The West Bluff in Area 4 is near the northernmost point of this extension, and the location of the watch site. The count is conducted on a gentle bluff overlooking the lake (approximately 35 ft. above water level) that allows excellent viewing for both near-shore and off-shore migrants. The shoreline itself is comprised mainly of sandy beaches and occasional short jetties to deter erosion. A shelter provides relief during times of intense winds or precipitation and allows for the continuation of the watch.

The Hamlin Beach Lakewatch was conducted to monitor the fall movements of waterbirds on a daily basis for 1993-1999 (Table 1). Those counted included loons, grebes, gannets, cormorants, swans, geese, ducks, jaegers, gulls, and terns, as well as other seabirds and alcids, such as petrels and

murrelets. Ring-billed and Herring Gulls were not counted due to their constant presence and irregular movements. Unidentified birds were recorded by species type (scaup species, eider species, etc.). Effort was made to record all avian migration the first four years. Due to the overwhelming number of waterbirds, this effort was dropped in 1997.

Observers used standardized count techniques and recorded coverage and weather variables. They recorded the number, direction, distance, and time of occurrence of migrants on a daily data sheet. Age and sex information were noted for some species when time and quality of viewing allowed. Distance was coded as very close (<100 m), near shore (> 100 m), and far (> 800 m). Daily data sheets were summarized to give species totals by direction on an hourly basis. The following weather conditions were recorded hourly: wind direction (16 compass headings), wind speed (estimated as Light, Moderate, Strong, Very Strong), temperature, cloud cover (estimated), visibility (estimated), wave height (estimated), and barometric pressure (from marine weather broadcast for Rochester, NY). Precipitation was noted as it occurred.

Observers and coverage varied (Table 1), depending on quantity of migration and progression of the season. A total of 767 days were staffed over the seven year period, with an average daily coverage of 5.4 hours. Usually the lakewatch was staffed with one observer, except when overwhelming movements required another qualified individual. During these instances, the second observer would usually identify different species in mixed flocks. To further improve the accuracy of the count, scribes were used, when available. The first four years of the count were conducted by a number of volunteers, with each observer responsible for one or two days a week (Table 2). Coverage commenced near sunrise and ranged from three hours/day to six hours/day, with higher coverage during periods of more pronounced migration. Spotting scopes and binoculars were used to spot and identify migrants. Birds were counted individually, whenever possible, and some species were totaled on hand clickers. During exceptionally large movements, some flocks were counted by fives, tens, or fifties.

Initially, coverage began on 15 August and continued until 15 December, except for 1993 (Table 1). Based on the results of the first four years, changes were instituted in 1997 to improve the effectiveness of the count. For 1997-99, an experienced single principal observer was hired to conduct the watch. This individual was relieved by a qualified observer one day each week. The census period was changed (Table 1). This took advantage of the higher activity level in December (Figure 1). Daily observations started at first light (before sunrise on most days) and continued for a minimum of seven hours. The average daily coverage increased from 4.36 hours prior to 1997 to 6.84 after, an increase of 56%. Improved optical equipment (80 mm spotting scopes) also enabled identification at much greater distances. In 1997, ten days were missed in the first two weeks due to lack of coverage, with no dates missed after 15 September. In 1998, five days were missed in September due to lack of coverage and five days in December due to fog, snow, or sleet. In 1999, three days were missed in September and two days in December due to lack of coverage.

Originally, the winter count was not part of the scheduled lakewatch. William Symonds solely provided winter coverage; it began with the end of the lakewatch and lasted through spring. Coverage was provided when he had time available. Over the seven winter periods 161 days were covered. Only count data were recorded; weather and directional data were not taken. In a normal winter season 20 species of waterbirds are recorded, many present in small numbers. The winter data were used to calculate the timing distribution of those species whose migration extends into winter or are winter residents.

Table 1. Hamlin Beach Lakewatch Seasonal Coverage						
Year	**Dates Covered**	**Days Observed**	**Days Missed**	**Hours Observed**	**Average Hours/day**	**Total Count**
1993	25 Sep - 15 Dec	81	1	351.6	4.29	117,424
1994	15 Aug - 15 Dec	123	0	502.0	4.08	139,012
1995	15 Aug - 15 Dec	121	2	521.5	4.31	125,729
1996	15 Aug - 15 Dec	122	1	576.6	4.76	111,896
1997	1 Sep - 20 Dec	101	10	685.8	6.79	310,508
1998	10 Sep - 29 Dec	101	10	699.7	6.63	300,737
1999	1 Sep - 31 Dec	117	5	829.9	7.09	299,039

Table 2. Hamlin Beach Lakewatch Observers		
Year	**Principal Observers**	**Others**
1993	John Bounds, Carolyn Cass, Brett Ewald, Bob Marcotte, Eldon Remy, William Symonds	
1994	John Bounds, Carolyn Cass, Brett Ewald, Bob Marcotte, Eldon Remy, William Symonds	Scribes: Jack Duval, John Lehr, Kristin Schroeck
1995	John Bounds, Carolyn Cass, Brett Ewald, Bob Marcotte, Eldon Remy, William Symonds	Scribes: Harry VanBeurden and principal observers
1996	John Bounds, Carolyn Cass, Willie D'Anna, Brett Ewald, Kurt Fox, Kevin Griffith, Eldon Remy, Steve Soule, William Symonds	Observers: Mike Davids, Tom Kretchmer, Bob Marcotte, Robert Spahn, Dave Tetlow
1997	Michael Lanzone, William Symonds	Observers: John Bounds, Brett Ewald, Kurt Fox, Bob Marcotte, Eldon Remy, Dave Tetlow
1998	Gene Albanese, John Bounds, William Symonds	Observers: Brett Ewald, Kurt Fox, Dave Tetlow
1999	Brett Ewald, John Bounds, William Symonds	Observers: Kurt Fox, Steve Soule, Dave Tetlow

DATA ANALYSIS

Lakewatch data are stored as daily and monthly data sheets. The monthly data sheets were entered into an Access database and sorted by species. Data were statistically analyzed using time (date) as a stationary independent variable. Results of the analysis for each species were summarized into a standardized data sheet used in this report. The terms used are:

Count: The total number of that specie recorded that year, the sum of south, east and west movements. This metric is defined as the activity level.

Percent West: Birds seen at Hamlin Beach generally migrate east or west. If "Percent South" is not shown, it means that all birds are moving either east or west. East/West data are not available for the 1997 year.

Percent South: In the case of Double Crested Cormorant, Canada Goose and Mallard, some flocks approach the lookout from the north and are flying south from Canada. These birds are identified as the percentage flying south. When they reach the south shore of Lake Ontario, they turn east or west but occasionally will leave the south shore of Lake Ontario at Hamlin Beach State Park in daylight hours.

Single Day High Count: If more than one single day high count of equal numbers occurs in the same year only the first date is reported. In some cases, single day high counts occur in winter and are so noted. All dates in Jan, Feb, and Mar refer to the following calendar year (see Greater Scaup).

First Date: First date of appearance, when applicable.

Median Date: The date on which 50% of the total annual count occurred. The variation in median date is an indication of how much variation occurs in annual movements.

Peak Period: The shortest time period in which 70% of the annual count occurred. This is approximately plus and minus one standard deviation when the timing is normally distributed.

Last Date: Date of last occurrence, when applicable.

Timing Distribution: The calculated histogram of average annual occurrence. The histogram uses 5-day intervals. Note that the date shown under each interval is the last day of the interval. Thus, if a date of 10/20 is shown, the mid-point date of that interval is 10/18 and the interval covers the period of 10/16 to 10/20. The histogram points are calculated as follows: the average number of birds seen on any date are calculated for the seven years of data (average daily totals), then the histogram value is the average of the five days noted. For the fall period from 15 Sep to 15 Dec, each data point in the histogram is an average of 35 values. For the winter season, 1 Jan to 2 Apr, each data point is an average of 10 days of observations.

Average Annual Count: The sum of the average daily totals. Note that the average annual count is not the arithmetic mean of the annual counts. It is the integral of the timing distribution. The average total always refers to the count period of 15 Aug - 31 Dec. The Ave (Aug - Mar) is the average number seen between 15 Aug - 2 Apr for those species which have a significant winter presence. See Canada Goose as an example.

Average Percent West: Average percent west is calculated as the sum of the products of the annual percent west times the annual count divided by the sum of the annual counts.

Average Median Date: The median date of the timing distribution. For some species, two values are give. Ave (Aug - Dec) is the average for 15 Aug - 31 Dec and Ave (Aug - Mar) is the median date for species that have a significant winter presence and covers the time period of 15 Aug - 2 Apr.

Average Peak Period: The shortest time interval in which 70% of the timing distribution occurs. The average value always refers for the time period of 15 Aug - 31 Dec unless expressed as Ave (Aug - Mar) in which case it refers to the time period of 15 Aug - 2 Apr. See Greater Scaup as an example.

RESULTS – GENERAL

Lake Migration Overview

Lake Ontario plays an important role in the migration of loons, grebes, cormorant, diving ducks, wintering ducks, gulls, terns, and jaegers. An overview of the migration at HBSP shows some trends. Some species that migrate through the region in fall appear to move strictly from north to south and are not seen on Lake Ontario with any regularity or in significant numbers. These include Tundra Swan, Snow Goose, and Pied-billed Grebe. Species like Northern Shoveler and Hooded Merganser are also seen on the lake in very small numbers and may be strictly south bound migrants.

The two grebe species and two loon species have very distinct migration patterns. Generally only Horned Grebe has a significant winter presence but in warmer years Red-throated and Common Loons will occur. If temperatures continue to get very cold in January and February, we believe that loons continue to leave the lake.

Except for Mallard, Black Duck, and Northern Pintail, the dabbling ducks have a sparse presence at HBSP. Most dabbling ducks migrate early and have a predominantly eastward bias to their movements. Most of these ducks, except for Green-winged Teal, have very small breeding ranges north of Lake Ontario. Mallard and Black Duck have a winter presence and a predominantly westward bias to their directionality.

The diving ducks appear later than the dabbling ducks. Most diving and wintering ducks have a westward bias to their migration direction. Canvasback and Ring-necked Duck are seen in small numbers, Lesser Scaup, Black and Surf Scoters in moderate numbers. Lesser Scaup is much earlier than Greater Scaup and has a sparse winter presence. Redhead is the latest duck migrant; they peak in January.

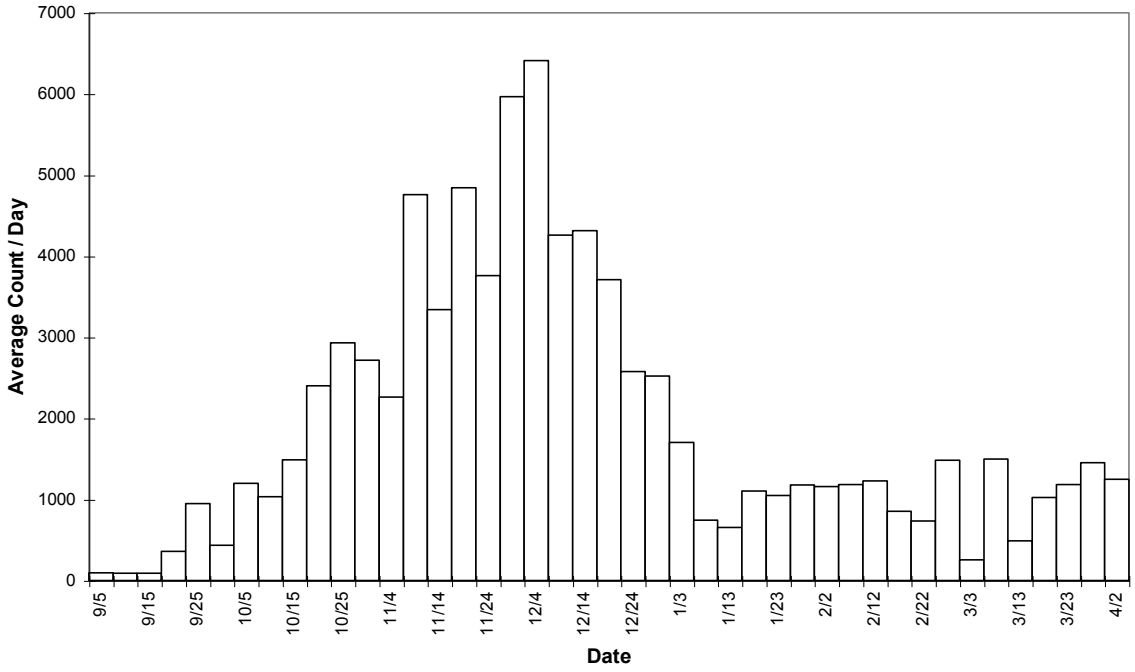
The distribution of species seen on the lake is very different from that seen on bays in winter. There are five predominant winter species on the main lake: Greater Scaup, Long-tailed Duck, Common Goldeneye, Red-breasted Merganser, and White-winged Scoter. These five constitute 80% of all wintering birds seen at HBSP. Each one has some unique property to its average timing distribution.

Terns are early migrants. Gulls (Little, Bonapart's, and Great Black-backed) are late migrants and reasonably predictable in their movements. Jaegers and Black-legged Kittiwake are erratic in their annual numbers but their movements are usually related to weather.

Dependence on Date and Time of Day

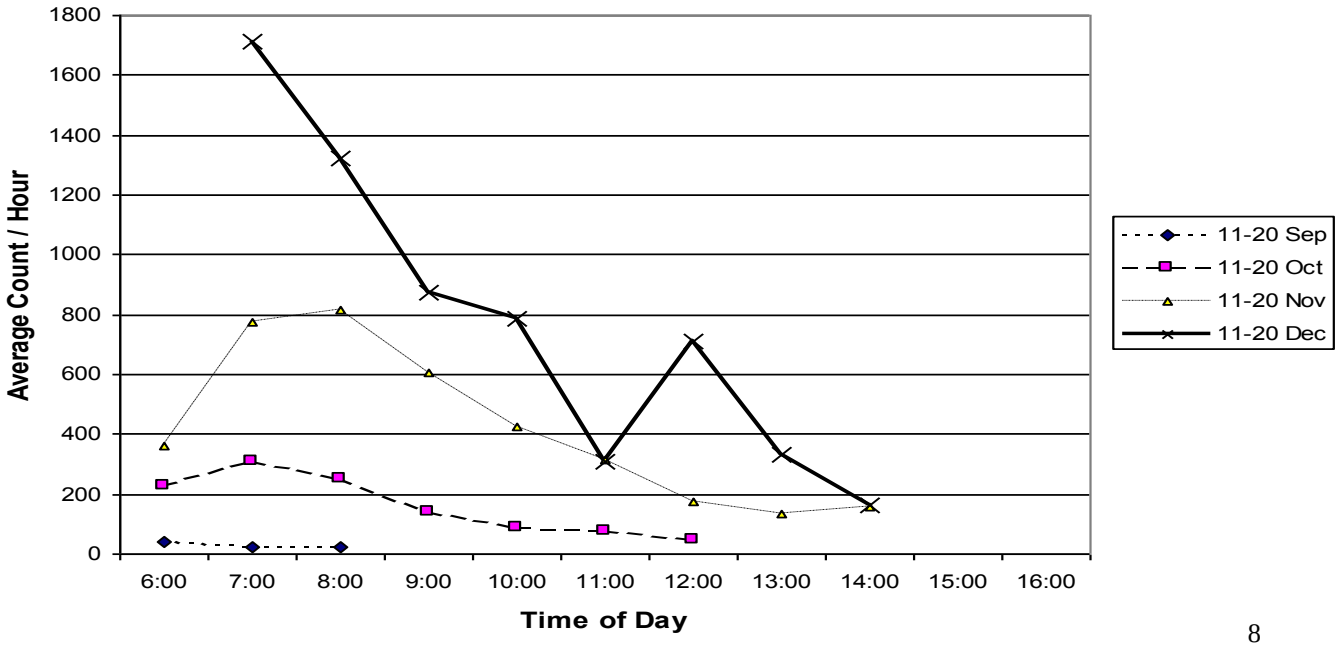
The average daily total of all waterbirds counted is shown in Figure 1. The fall data for 1997-99 were chosen for this estimate because these years are believed to be more characteristic of the total population migrating. Winter data are from all seven years but represent fewer days of observation as previously stated. The peak in migration occurs in late November to early December depending on the year. In warmer years, the peak is later as would be expected. There is a continual buildup in numbers beginning in mid September through late November, then activity rapidly drops off to the winter levels. There is an increase in activity in spring but it doesn't become apparent until after mid April. The shape of this timing distribution is most influenced by the two most numerous species, Greater Scaup and White-winged Scoter.

Figure 1. Average Daily Total Count



The lakewatch records all sightings on an hourly basis. Figure 2 shows the average hourly count for mid September, October, November, and December. The data point above each time covers the hour period from that time to the next hour. Each data point is an average of the ten-day period from the eleventh to the twentieth of the month and all data are from 1998. Daily migration is usually most concentrated in the morning. The highest activity starts about one-half hour after sunrise and lasts for two to three hours.

Figure 2. Average Count / Hour



East and West Movements and Minimum Annual Number

More than 99% of all migrants move east or west at HBSP. Most species show a preference for westward movement except for Brant and some dabbling ducks: Pintail, Blue-winged Teal, Wood Duck, and American Wigeon. Note that the percentage west is tabulated in the summaries following and in Table 3.

Some species show an extremely high bias to their directionality. Red-throated Loons are seen migrating west with a 94% probability and Brant migrate east with a 93% probability. All other species are between these limits. Most species show a westward bias of 70% or greater. A few species have average biases of 55% to 65%. As the probability of western movement decreases, we can be certain that we get some double counting. We believe that the degree of double counting depends upon the westward bias and is greatest when the bias is 50%. Recognize that the annual total count reported includes these double counts and is a measure of activity.

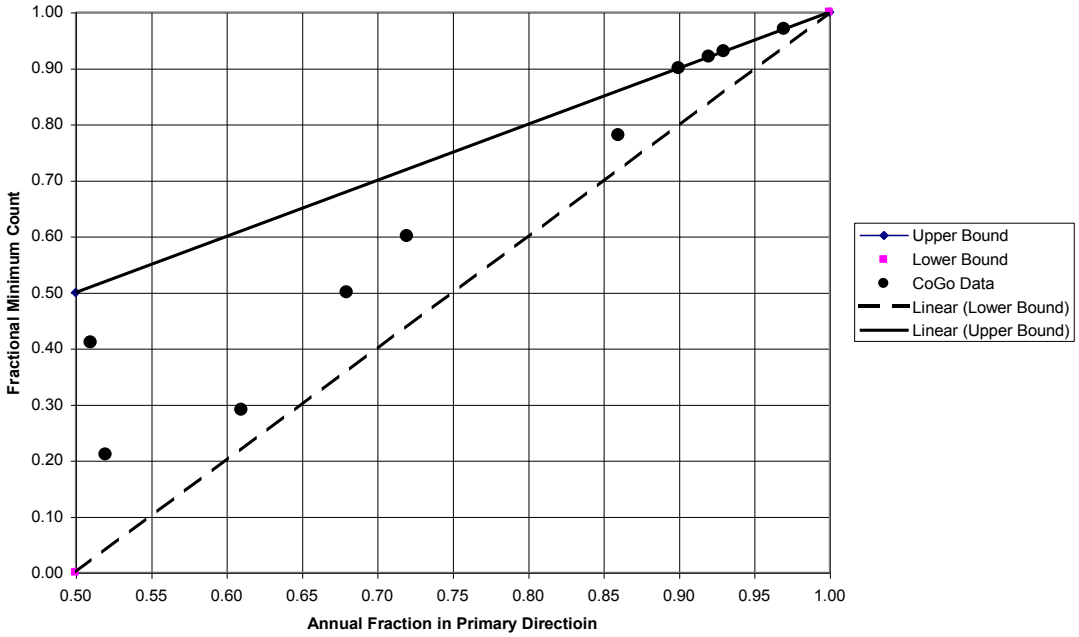
The most conservative estimate of the minimum number present on any day is the net difference between the primary direction (west) and the alternate direction (east). For a full year estimate, the absolute value of the difference is summed. Because of the need to use absolute values, this limit cannot be estimated from annual totals but it is greater than 2*X-1 times the annual count where X is the annual fraction moving in the primary direction

Upton (1985) developed a counting mechanism to estimate the minimum number of birds present in a day from an observation point where birds are moving in two opposite directions. His method requires that each observation be recorded serially and entered into an algorithm for a running log of netted east and west totals. By using the daily data sheets, this method can be applied to lakewatch data for all species except those that were totaled on a hand counter and entered into the data sheet hourly. Upton's method has an upper and lower bound. The upper bound for any day is the fraction moving in the primary direction, X, and the lower bound is the fraction given above, 2*X-1. If we assume that every bird flying in the opposite direction to the preferred direction crosses the observation point twice (once in each direction), then an estimate of the minimum number is exactly the average percentage in the preferred direction, X. This is the physical meaning of the upper bound of Upton's method. Multiplying these fractions by the total daily count gives a range for the minimum count of that day. The average value of this fraction for many individual days is the midpoint between the upper and lower bound or (3*X -1)/2. Figure 3 shows these boundaries and some daily data for Common Goldeneye using Upton's method.

The lakewatch separates migrating birds by three ranges of distance from the shore. To be most accurate, Upton's method should be applied to each distance range. This gives higher values than the boundaries discussed above for a single day. Upton's method can be extended to a series of days where the results from single days are used with the same algorithm to give an estimate for a week, month, or season. In this case, the annual average bias applies to the equations above. However, the method is only valid if birds are not missed.

It is our belief that the upper boundary of Upton’s method, X, can be used to give a best estimate of the minimum fractional number for transient migrants. Transient migrants are those that move through Lake Ontario. A more conservative estimate would be to use the average value, (3*X -1)/2. Multiplying this fraction by the total annual count for the period of August to December gives the minimum number seen over that period. As an example in using this technique to estimate the annual minimum number, consider the data for Red-breasted Merganser (see Red-breasted Merganser). The annual average count for Red-breasted Merganser is 19,058 with an average westward bias of 85.2%. Thus the minimum annual number would be 16,200 using X or 14,800 using the more conservative estimate. These numbers do not include the wintering birds. Obtaining an estimate for the winter season cannot be treated by this method.

Figure 3. Minimum Count



There are two patterns to the east/west movements based on an analysis of the data for Common Loon, Greater Scaup, Common Goldeneye, and White-winged Scoter. These species are present in migration in large numbers. They have an average annual westward direction ranging from 55% to 85% and the trends become more apparent as the directional bias approaches 50%. The first trend is that the east movements are high at the same time that west movements are high. The second trend is that migration occurs in pulses or periods of 7 to 14 days (see Figures 4 and 5 which show the effect for Common Loon and White-winged Scoter). When counts peak within the period, there is a maximum in both east and west movements. This appears to mean that birds arrive and they are present in large numbers, fly back and forth but do show net movement. The net movement is expressed as the percentage in the dominant direction. The pulses in the second trend are interpreted to mean that groups eventually move out and are replaced by other migrants. It would be expected that these periods are related to weather (see Effects of weather on the occurrence of birds at HBSP). It is most likely that birds arrive and remain on the south shore of Lake Ontario feeding for a short time before they move on and are replaced by another wave of the same species.

Species with low annual counts or those with low average directional bias can give east-west results that fluctuate from year to year. For instance, Gadwall generally migrate east but in 1998, 72% were directed westward. This variation is probably due to the low annual count.

Figure 4. 1998 WWSc Count West (+) and East (-)

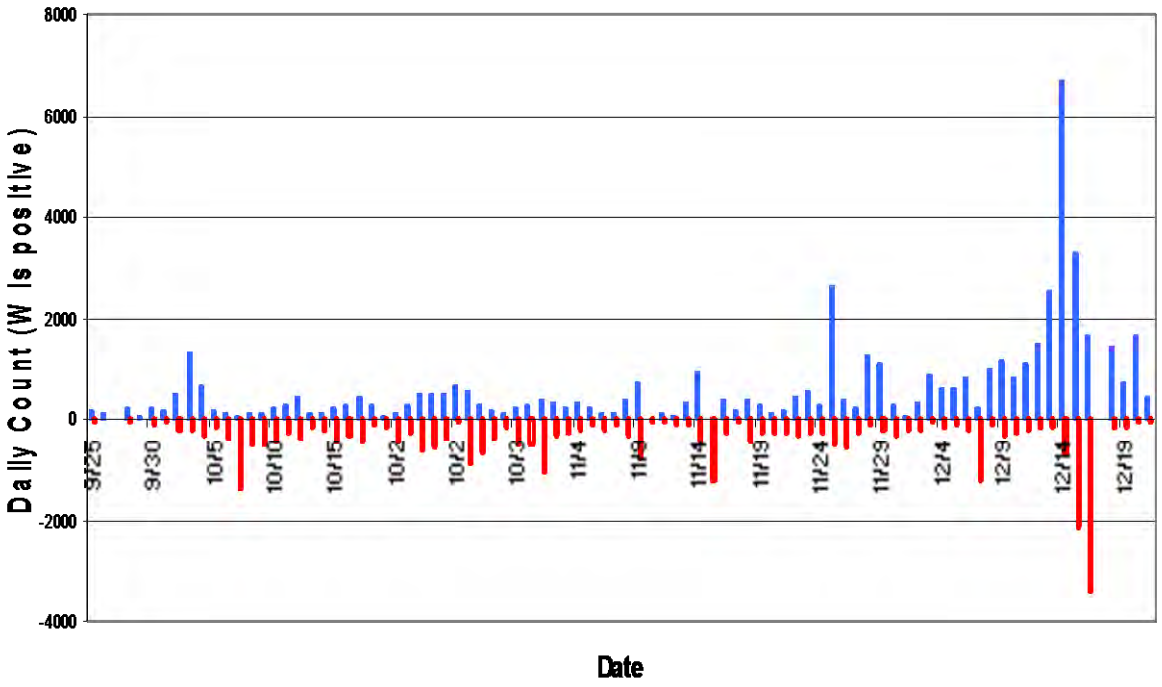
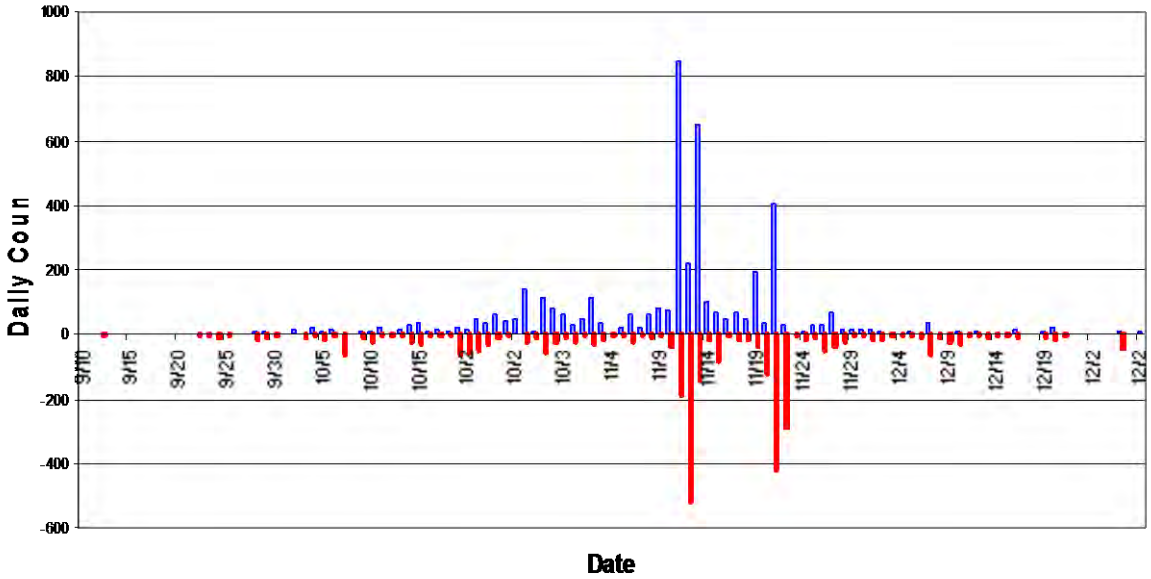


Figure 5. Common Loon 1998 Count West (+) and East (-)

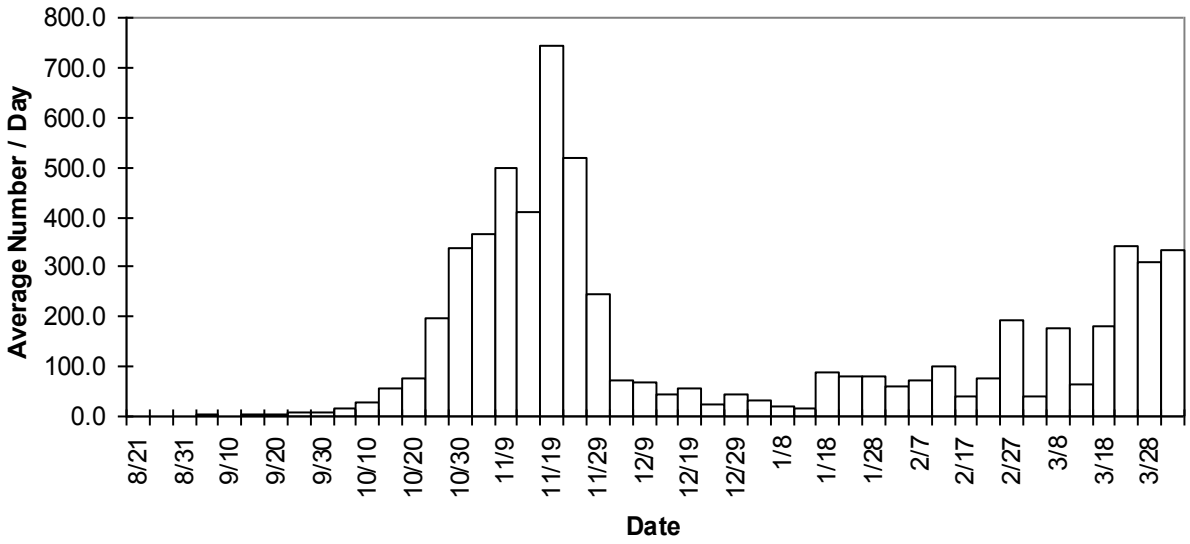


Timing Distribution

Each timing distribution has properties that can be interpreted in terms of that specie's migration pattern. Figure 6 below shows a typical timing distribution. For most species, the average timing distribution is characterized by an increase in daily counts followed by a peak and then a more rapid decrease as shown below. This means that the rate of arrival of this species is slower than its rate of departure. In this case, the daily counts drop to a plateau of 10 to 50 seen per day and remain at that level through winter until the spring when numbers increase again in mid-March.

We interpret the peak in numbers between 20 Oct and 9 Dec for Red-breasted Merganser as representing migrant birds that are transient to Lake Ontario and the plateau as representing migrants that winter. Most species show a well-defined transient period. Long-tailed Duck is one of the few species that show no transient wave, implying that they do not migrate through Lake Ontario in the fall. Both Greater Scaup and Common Merganser also show unique properties in that they do not form a stationary winter presence on Lake Ontario but are migrating throughout the winter. The winter data is not shown for species that have no significant winter presence. Discussion is given in the species account when the timing deviates from this pattern of occurrence.

Figure 6. Timing Distribution for Red-Breasted Merganser



Median Dates

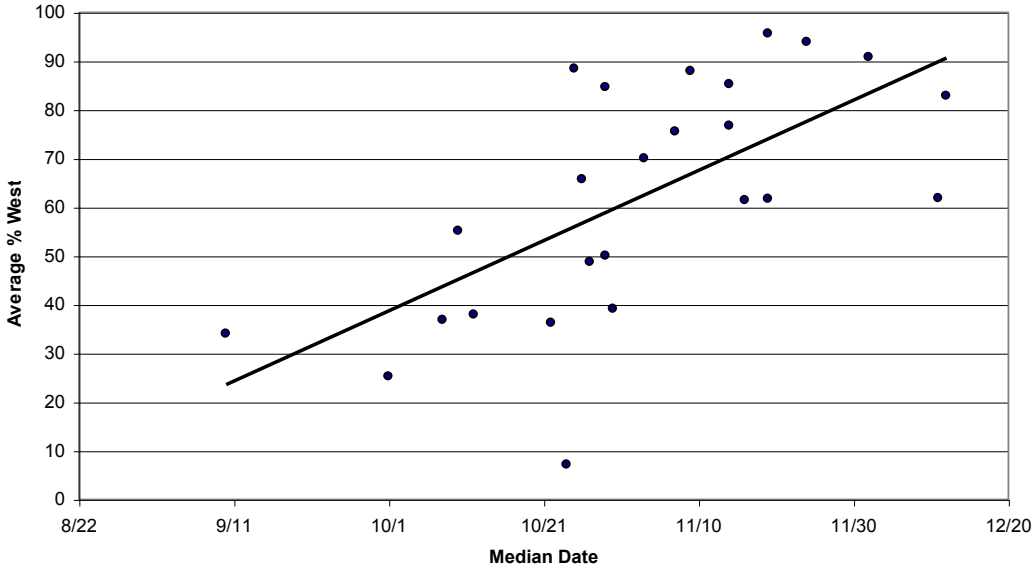
A summary of median dates for most species is shown in Table 3. This includes those species that shown timing histograms with a distinct migration peak. If the peak is separable from the wintering population, then the median value for the transient birds is shown. If the species has a winter presence and shows a peak, then that median date is listed. The percent west is the average directionality for that species.

Table 3. Median Date Summary

Species	Median Date	% West
Blue-winged Teal	9/10	34.0
Wood Duck	10/1	25.2
Northern Pintail	10/8	36.8
Green-winged Teal	10/10	55.1
American Wigeon	10/12	37.9
Canada Goose	10/22	36.2
Brant	10/24	7.1
Lesser Scaup	10/25	88.4
Ring-necked Duck	10/26	65.7
Surf Scoter	10/27	48.7
Horned Grebe	10/29	84.6
Gadwall	10/29	50.0
Black Scoter	10/30	39.1
Common Loon	11/3	70.0
Bufflehead	11/7	75.5
Canvasback	11/9	87.9
Common Goldeneye	11/14	76.7
Red-breasted Merganser	11/14	85.2
Red-necked Grebe	11/16	61.4
Hooded Merganser	11/19	61.7
Black-legged Kittiwake	11/19	95.6
Red-throated Loon	11/24	93.9
Bonaparte's Gull	12/2	90.8
White-winged Scoter	12/11	61.8
Greater Scaup	12/12	82.8
Redhead	1/15	94.8

The median dates fall into three groups. The early migrants are all puddle ducks with median dates between 9 Sep and 12 Oct and they are predominately eastward in their directional bias. The middle period, from 22 Oct to 9 Nov, includes diving ducks, geese, Brant, Common Loon, and Gadwall. The late period of 14 Nov and into January include many ducks that have a significant winter presence. The probability of winter presence generally increases as one moves down the list. These data show a correlation between the directional bias and the median date (Fig 7) ($R = 0.65$, $p = 0.005$).

Figure 7. Median Date vs. Directional Bias



Brock (1997) used data collected from daily checklists for the period of 1914 to 1996 at the south end of Lake Michigan to tabulate occurrence timing distributions for migrants and local breeding birds in the Indiana dunes region. He provides first and last dates, median date, and average arrival and departure dates for most species. Table 4 compares the median dates for his data from Lake Michigan to this work from Lake Ontario.

This table is arranged by median date from HBSP. The median dates for Lake Ontario represent transient birds only. Species that cannot be compared for lack of dates are not included. The deviation is the difference in days between Lake Michigan and Lake Ontario. A positive deviation means that the median date on Lake Michigan is later than that on Lake Ontario. Of the 22 species compared, 13 have median dates within 8 days of each other.

Three species show marked differences in median dates: Bonaparte's Gull, White-winged Scoter, and Redhead. White-winged Scoter is very different because it winters in significant numbers on Lake Ontario (see discussion on White-winged Scoter). We are uncertain why we see such differences with the other two species.

Overall, the dabbling ducks are later on Lake Michigan than Lake Ontario and the diving ducks are slightly earlier. These two trends lead to a much more protracted migration on Lake Ontario as compared to Lake Michigan. Early migrants are earlier and later migrants are later in the east compared to the mid-west. One possible cause is that the HBSP data were taken from 1993 to1999, years when the environment was warmer than the time period Brock surveyed. There are other possible causes. Bonaparte's and Little Gulls linger on Lake Ontario as a feeding territory as long as conditions allow. Certain species might stage longer on Lake Ontario by virtue of the normal climatic differences between these two lake regions.

Table 4 Comparison of Median dates for Lake Ontario and Lake Michigan			
Species	**Median Date HBSP**	**Median Date Lake Michigan Brock (1997)**	**Differnece in days**
Blue-winged Teal	9/10	9/18	+ 8
Northern Pintail	10/8	10/17	+ 7
Green-winged Teal	10/10	10/17	+ 7
American Wigeon	10/12	10/21	+ 9
Brant	10/24	11/3	+ 10
Lesser Scaup	10/25	11/2	+ 8
Ring-necked Duck	10/26	10/30	+ 4
Surf Scoter	10/27	10/6	+ 10
Horned Grebe	10/29	11/7	+ 9
Gadwall	10/29	11/2	+ 4
Black Scoter	10/30	11/2	+ 3
Common Loon	11/3	11/4	+ 1
Canvasback	11/9	11/3	- 6
Common Goldeneye	11/14	11/7	- 7
Red-breasted Merganser	11/14	11/10	- 4
Hooded Merganser	11/19	11/14	- 5
Black-legged Kittiwake	11/19	11/16	- 3
Little Gull	11/20	11/3	-17
Red-throated Loon	11/24	11/11	- 13
Bonaparte's Gull	12/2	11/4	- 28
White Winged Scoter	12/11	11/4	- 37
Redhead	1/15	11/4	- 72

Effects of Weather on the Occurrence of Birds at HBSP

Albert Hockbaum (1955) studied waterfowl for 16 years on the south shore of Lake Manitoba on the Canadian prairie. He left a detailed description of the migratory process. The following is summarized from his work. Fall migration begins with the arrival of clear sky, northwest winds, and fair weather associated with high pressure systems (after the passage of a cold front); waterfowl generally leave in the late afternoon or early evening. Ducks leave their breeding ground in small flocks but form mass flocks with other species all leaving about the same time and all heading in the same direction. In the mass flocks, the small flocks retain their identity. Juveniles and adults migrate together at altitudes of 500 to 5000 feet over land. There is an order to departure with Northern Pintail the earliest in the fall and Mallards amongst the latest. The departure in not caused by weather but weather has a triggering effect. Once started, migrants may overtake the frontal boundary and continue through bad weather. Waterfowl tend to follow lakes, marshes and rivers but pursue overland routes when there is no direct watercourse to their wintering grounds. Many individuals migrate in fall over the same route, year after year, making the same stops.

We are uncertain how Hochbaum's observations apply to Lake Ontario migration but some aspects are clearly evident. Birds do follow the shoreline as a migratory guide. Some species appear in small flocks and leave on clear days created by high pressure cells. Some species, like Brant, will appear with bad weather on the day the front arrives, consistent with the fact that waterfowl can overtake the frontal boundary. But we see most of these flocks in the mid-morning rather than the afternoon or evening. We see all birds at low altitudes compared to his range. All the Hamlin Beach data are taken during daylight hours. We have no knowledge of how waterbirds are moving over the lake at night.

Meteorologists describe weather as the atmosphere in motion. It has been well recognized that birds use this motion as migration assistance to reduce the energy required to travel between breeding and wintering ranges. Tail winds become

favorable to assist in migration in the regions between high and low pressure cells following the passage of a front. Physically, fronts are transition zones between air masses of different density but on a macro scale, they are waves in the atmosphere. Able (1999) points out that, in fall, the highest concentrations of migrating birds occur after the passage of a cold front which occur on the back side of a low pressure cell. The next highest concentration of migrants is on the leading edge of an advancing high pressure cell.

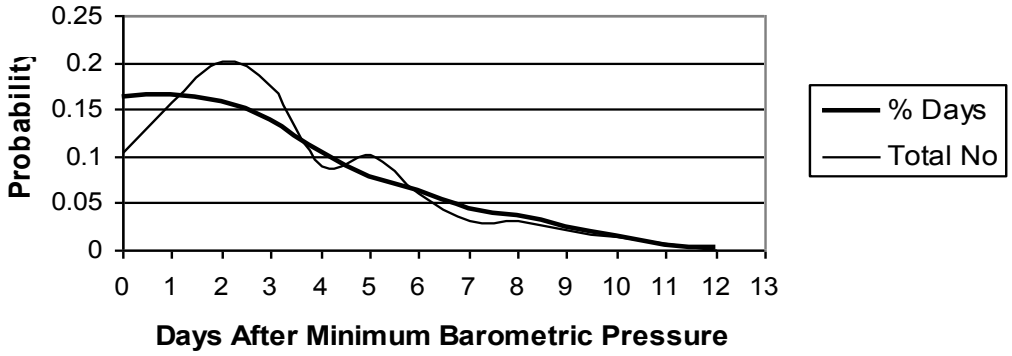
The passage of a front is characterized by a minimum in barometric pressure. Cold fronts are followed by a decrease in temperature, a wind change generally from south-southwest to north, northwest, or west and moderate to heavy precipitation. Cold fronts range in speed from slow (about 17 mph) to fast (about 34 mph) and average about 23 mph. Warm fronts are followed by a gradual rise in temperature, pressure shows a slight rise followed by a fall, winds turn from south-southwest to south-southeast, and precipitation is light before passage. Warm fronts move slower than cold fronts, averaging about 12 mph (Ahrens 1993).

In order to study the effects of weather, Hamlin Beach data were sorted by days after the passage of a front. NOAA Local Climatological Data for Rochester, NY were used to determine the dates for the passage of a front. The front occurred on the date of minimum barometric pressure, with appropriate changes in temperature, wind and precipitation. Each day from 1 Sep to 31 Dec was assigned a numerical code corresponding to the number of days after the passage of a front. The day the front passed was set as day-zero. The totals for each species were sorted and summed by days after the passage of a front for the seven years of data. The fractional number (probability) seen were then plotted versus the days after the passage of a front.

This probability function is always compared to the fraction of days after frontal passage (% Days). In the seven year period (854 days), there were 138 fronts giving an average of 6.2 days between fronts. All fronts were at least two days in duration so the fraction of day 1 was 0.162 (or 138/854). Since there were only 21 days where the time between fronts was 10 days or longer, the probability of day nine is 0.025 (or 21/854). If the functional probability of occurrence is the same as the fraction of days available, it means that the occurrence data for that species is random in time and the species is not utilizing fronts in its movements at Hamlin Beach. The greater the deviation of these two curves, the more likely that a species is utilizing weather patterns. In all cases, the Kolmogorov-Smirnov test was used to determine whether the occurrence of a species with respect to frontal passage was different from a uniformly distributed random occurrence.

Figure 8 shows the total daily counts of all species versus the days after the passage of a front and the % Days probability. This figure is based on data for 1997-99. In each of these three years, the total count was around 300,000 birds.

Figure 8 Total Daily Count



The total count shows several deviations from the % Days. Birds are less likely to occur on the day of frontal passage (day zero in Figure 8). The large deviation 2 to 3 days after the frontal passage accounts for most birds seen. Overall, migration is most active after the passage of a front. The second smaller peak on day five is associated with the fact that some species move as barometric pressure is reaching its maximum.

An example in which this second peak in Figure 8 becomes more striking is shown in Figure 9 for Northern Pintail. Twenty-five percent of the population passes on the fourth day after the day of lowest pressure. Most birds are seen as the barometric pressure is rising or has just reached its peak. But with Northern Pintail, 18 % also occur after a front passes (peak seen on day 1 in Figure 9). Other species that show this same effect of a high percentage of movement with rising pressure and 3 to 4 days after frontal passage include: Double-crested Cormorant, Common Merganser, American Wigeon, Blue-winged Teal, Mallard and others. Three of these species have an easterly bias to their directionality. This pattern is also more common among early migrants. Table 5 gives a summary of species following this pattern.

Red-throated and Common Loons are shown in Figure 10. The movement of Red-throated Loon had already been studied (see summary for Red-throated Loon). Notice that Common Loon and Red-throated Loon are very different in their pattern of appearance. Common Loon shows very little preference for timing of movement with respect to fronts. Their migration is close to independent of frontal movements for observations from Hamlin Beach. This could mean that the migration we see is not meaningful with respect to southbound migration or that they simply do not move on fronts. Since 70% of the Common Loons seen at HBSP are moving west, the first hypothesis above is not likely true. Red-breasted Merganser also follows this pattern.

Figure 9 Northern Pintail

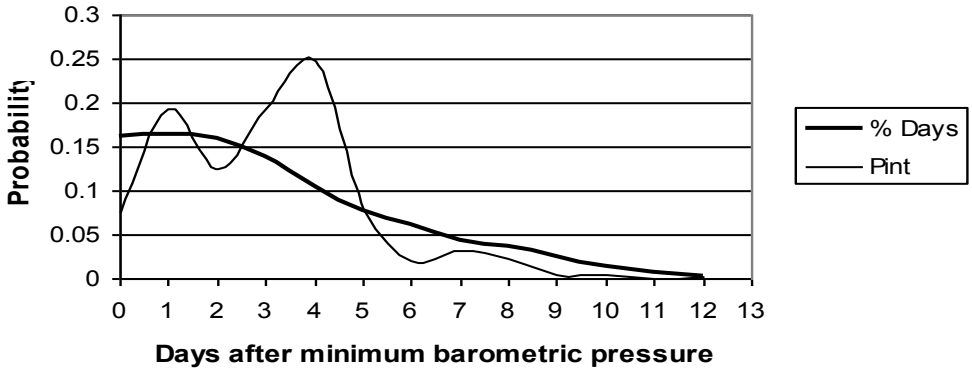
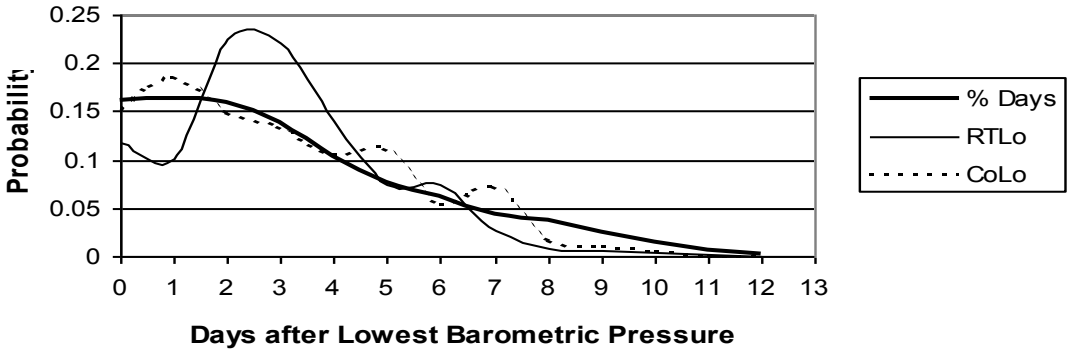


Figure 10 Loons



Most species have occurrence patterns similar to Red-throated Loon. These include; Horned and Red-necked Grebe, Green-winged Teal, Lesser and Greater Scaup, Long-tailed Duck, Bufflehead, and three species of gulls (Little, Bonaparte's, and Black-legged Kittiwake).

Table 5 gives a summary of these results. Those species not included either show no definite pattern or annual numbers are too low to draw any conclusions. The effect of frontal passage is subtle because all species can and do occur on any

given day. By sorting and accumulating all the data over a seven year period, we can see trends when specific species are more prone to appear with certain weather conditions.

Table 5 is organized by the predominant timing of migration with respect to fronts. The most apparent trend is that birds are most numerous between one and three days after the passage of a cold front and least numerous on the day of passage. Rare species usually follow this pattern.

Table 5 Effects of Fronts on Movements of Waterbirds at HBSP	
Migration unaffected by fronts	
Common Loon	Red-brested Merganser
Peak migration 1 day after cold front	
Brant	Green-winged Teal
Peak migration 2 days after cold front	
Red-throated Loon (2-3 days)	Lesser Scaup
Horned Grebe	Long-tailed Duck
Red-necked Grebe	Bufflehead
Greater Scaup	Jaegers (1-2 days)
	Gulls
Peak migration 3-4 days after front (rising barometric pressure)	
Double-crested Cormorant	Canvasback
Mallard	Blue-winged Teal
American Weigon	White-winged Scoter
Northern Pintail	Common Merganser

There is a large difference between Brant, which appear the day after a front passes, and Northern Pintail, which usually move well after frontal passage but just prior to the next front. We speculate that the fundamental differences in migration leading to the separation by days in Table 5 results from the origins of the migrant species. Species that are highly probable one to three days after frontal passage are leaving the arctic regions with the frontal system and are moving past Hamlin Beach as a part of a continuing journey. We have provided evidence that Red-throated Loon leave the arctic regions, most probably Hudson and James Bays, one to two days after temperatures drop significantly below freezing. This usually occurs with the passage of a strong cold front in that region. Jaegers and Brant appear to utilize fronts to move south but arrive on Lake Ontario sooner than Red-throated Loons implying an earlier departure or faster transit. All these species are reaching Lake Ontario from the north and follow the south shore to some prominent terminal before starting over land.

Those species which have a high probability of movement three to four days after passage of a front have most probably accumulated in the Lake Ontario region and are moving past Hamlin Beach as they leave the lake. Lake Ontario serves as a stop over and the weather conditions provide the incentive to depart. This pattern is identical to that described by Hochbaum (1955).

Wintering Waterbirds

The counts of wintering waterbirds are dependent upon the general weather conditions. In colder winters, (93-95), migration decreased significantly by mid-December and many species are seen in small numbers like Bonaparte's Gull. Usually ice buildup on the shore pushes birds further out, reducing counts. Some birds leave the lake or are not seen like loons. In warmer years, migration remains strong in the first week of January and species like Bonaparte's Gull are seen throughout the winter. Generally, all waterbirds are more numerous.

Table 6 gives a summary of the winter waterfowl data of Bill Symonds form HBSP for the seven year period. All data in Table 6 cover the period of 1 Jan to 15 Mar. Spring migrants begin to appear after 15 Mar for most species. All averages in Table 5 are based on total days observed. All averages apply to approximately 4 hours of observation for a day period. Those entries marked with an asterisk are discussed in their respective summary.

Table 6 Winter Waterfowl Counts (1 Jan - 15 Mar)

Species	Average No / Day	Maximum No Seen	Date of Max Seen	Percent of Days Seen
Red-throated Loon	3	39	22-Feb-98	55
Common Loon	1	8	22-Feb-98	33
Horned Grebe	9	114	1-Feb-98	62
Red-necked Grebe	2	72	4-Feb-99	30
Canada Goose	67	1130	28-Feb-98	46
Am Black Duck	6	175	27-Feb-00	44
Mallard	33	1100	23-Jan-95	72
Northern Pintail	*	327*	7-Mar-98	22
Redhead	*	1350*	18-Jan-97	33
Greater Scaup	243	10000*	2-Jan-95	90
Lesser Scaup	3	39	16-Feb-98	42
Long-tailed Duck	140	2885	10-Feb-99	93
Black Scoter	0.3	10	20-Jan-99	14
Surf Scoter	0.4	20	27-Jan-99	17
White-winged Scoter	285	2260	4-Feb-99	94
Common Goldeneye	58	200	7-Mar-95	100
Bufflehead	5	50	8-Feb-96	83
Common Merganser	29	250	22-Feb-00	93
Red-br. Merganser	76	410	26-Feb-96	100
Bonaparte's Gull	32	1100	1-Feb-98	39

On an average winter morning, approximately 1000 birds are counted. Ring-billed, Herring, and Great Black-backed Gulls are not counted and are common in winter. Seven species have greater than an 80% probability of being found and make up 84% of the birds seen (Greater Scaup, Long-tailed Duck, White-winged Scoter, Common Goldeneye, Bufflehead, Common and Red-breasted Mergansers). Black and Surf Scoters have a 14% and 17 % probability of being found on any day, respectively. Many species are rare and occur with frequencies less than 5%. These include swans, American Wigeon, Gadwall, eiders, Harlequin Duck, and some gull species. Early duck migrants can appear before 15 Mar such as Canvasback, Pintail, and Blue-winged Teal. Species, which are more plentiful in warm years, include loons, Canada Geese, Mallards, and small gulls.

Species Accounts

SPECIES ACCOUNTS

The text describes the status and occurrence of each waterbird species recorded at HBSP during the fall and winter seasons of 1993-1999. The criteria used to describe status were adapted from those defined by the Federation of New York State Bird Clubs (Levine 1998) and are listed below. Relevant weather conditions are discussed for those species that show obvious patterns. Species with a significant presence have a table summarizing the numbers recorded, direction of movement, and aspects of timing distribution. Any record with an asterisks (*) is discussed in the text in more detail. In most cases, this refers to a high count recorded during winter. Bar graphs are presented to show abundance through the progression of the season.

Data is omitted in some tables for one of several reasons. Directional percentages were not tabulated for every year usually because of statistically low counts. First dates are not given for those species already present at the onset of the count. Last dates are not given for species still present throughout the winter. Median dates and peak periods are sometimes omitted due to insignificant numbers recorded during a season or a significant winter presence that distorts any obvious fall migration period. In the latter case, an attempt has been made to provide this information covering the entire study period when appropriate.

Status Criteria

FREQUENCY OF OCCURRENCE

Annual - recorded every year.
Irregular - recorded less often than every year, but more often than one year in four, on average.
Occasional - recorded between one year in every four and one year in every nine, on average.
Sporadic - recorded between one year in every ten and one year in every twenty, on average.
Casual - recorded less often than once in twenty years, on average.
Accidental - recorded, but because of its range not expected to occur again.

ABUNDANCE

Occurring in such numbers that a competent observer at the proper time and place might see:

Abundant	- 500 or more in a single day.
Very common	- 100 to 500 in a single day.
Common	- 25 to 100 in a single day.
Fairly common	- 5 to 25 in a single day.
Uncommon	- 1 to 5 in a day, and no more than 25 in a season.
Rare	- not more than 5 in a season.
Very Rare	- not more than 1 in a season.

SEASONAL OCCURRENCE

Residents - breeding species; may occur as summer residents or permanent residents.

Migrants - birds of passage which occur in spring and/or fall, but do not breed; may occur as spring migrants or fall migrants.

Visitors - non-breeding birds which occur as temporary visitors; may occur as summer visitors, winter visitors, or vagrant visitors.

COMMON LOON (*Gavia immer*)

Status: Annual, abundant fall migrant and uncommon winter visitor.

Occurrence: Common Loon has a very protracted migration with about 8000 recorded annually. A few individuals are already present in mid-August, but significant numbers arrive the last ten days of September. Migration becomes heavy after mid-October, with the peak occurring the first week of November, and continued heavy flights past mid-November. This peak period covers thirty days, noticeably longer than the twenty-two days for Red-throated Loon. The migration drops off at the beginning of December. Annual migration is very consistent; the median dates for five of the seven years fall in a range of only five days (1 Nov-5 Nov). A notable exception to this was the early flight in 1993, in which the peak period was over by the end of October. This was largely due to the incredible flight of 2,602 on 16 October (38% of the season¹s total).

Small numbers of wintering birds are present (1-4/day) in January, but are usually absent in February unless the weather is warm. In February, 1998, as many as 8 were seen in a single day. Their numbers begin to increase the last few days of March, as spring migration commences, and they become numerous in April.

This species is redominantly a westward migrant (70%), with lesser flights occurring to the east. Movements tend to be concentrated towards one direction or the other on any given day. Flights with a large easterly component typically occur in the latter part of the season and are more infrequent than peak western movements. Eastern flights are further off-shore and at medium altitude. We speculate that these are previously staging birds that are now resuming migration. Remarkably, for a species that is often observed migrating overland, southbound Common Loons have only been recorded once at the lakewatch. This event occurred 15 November 1999, and involved 4 Common Loons and 1 Red-throated Loon acting much like migrating raptors (circling overhead and gaining altitude). Common Loon is a near-shore to off-shore migrant but will sometimes fly overhead. They usually migrate singly or in pairs, at low altitude. On days of heavier movement, small groups (3-5) of loosely associating loons occur, and movement on peak days can seem like a steady stream of passing loons. Small flocks approaching 25 have been known to occur on these days.

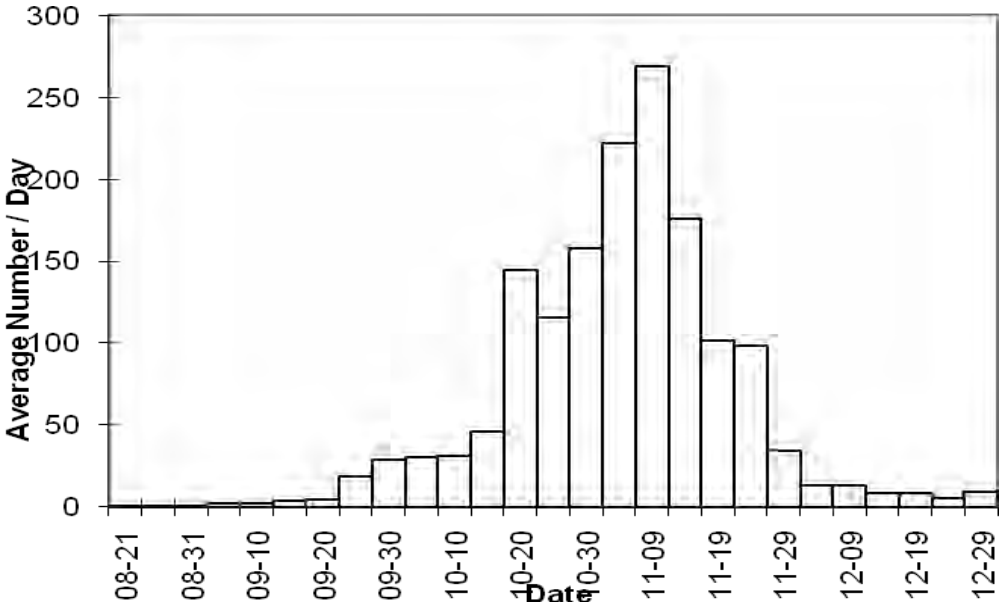
Staging birds are a regular sight at the Lakewatch, and >100 have been seen on numerous occasions. They are usually seen near-shore to off-shore under acceptable conditions, but larger counts have occurred when birds are near shore, usually on rainy days. The largest count of 459 staging birds occurred under these conditions on 17 October 1993.

Weather Factors: Evans et al (1994) and Kerlinger (1982) reported that the predominant migration of Common Loons took place on days of northwest winds at Cayuga Lake (south of Lake Ontario), and at relatively high altitudes. Evans et al (1994) further reported that at the peak of migration, the loon flight was characterized by two pulses, one at daybreak lasting 45 minutes, then a 30 minute lull followed by a second larger pulse migration at high altitude.

AT HBSP, we see no relationship between Common Loon migration and frontal movements, thus no high numbers on day of northwest winds. We have examined the movements throughout the day and do not see the flight broken into two pulses. Also, Common Loons are usually seen at low to medium altitude and we do not see southwest directed migration.

The different results form these studies must be related to the direction and nature of migration. All of the HBSP results are over water and Lake Ontario is a staging area for these birds. We see a net westward migration and the birds are using different weather conditions for the westward migration than those Common Loons leaving Lake Ontario to fly south over Cayuga Lake bound for Chesapeake Bay. It is possible that the westward directed birds are a different group than those going to the Chesapeake and that these Common Loons are likely following the same route taken by Red-throated Loons (see Red-throated Loons).

Common Loon 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	6886	75.4	2602	16-Oct		17-Oct	13 Oct - 26 Oct
94	4293	70.5	506	8-Nov	15-Aug	3-Nov	15 Oct - 12 Nov
95	3934	71.5	245	6-Nov	21-Aug	3-Nov	25 Oct - 23 Nov
96	4386	75.1	555	4-Nov	15-Aug	4-Nov	20 Oct - 16 Nov
97	16846		2982	7-Nov		5-Nov	28 Oct - 16 Nov
98	7671	58.7	1035	11-Nov		12-Nov	30 Oct - 22 Nov
99	9098	71.9	744	2-Nov		1-Nov	16 Oct - 8 Nov
Average	7721	70.0				3-Nov	16 Oct - 14 Nov



RED-THROATED LOON (*Gavia stellata*)

Status: Annual abundant fall migrant, and uncommon winter visitor.

Occurrence: The eastern flyway through Lake Ontario provides an important pathway for Red-throated Loon migration. The seven-year count at HBSP average 9800 per year with a high year count of 19,800. This species exhibits a number of extremes. For a species that has limited winter presence, it is one of the latest fall water bird migrants. It is consistent in time of appearance since its peak period over the past seven years is only 22 days. Only Brant is shorter. Its first date of appearance is almost always between 8 and 16 October.

The annual total count from HBSP shows a distinct change after 1996. This change is caused by the fact that many Red-throated Loon flying at a distance were not being identified and recorded. The species was undercounted in the early years. In our previous work (Sherony, Ewald, and Kelling 2000), we indicated an annual average of 7700. Based on the data for 1997-99, we would estimate an annual average closer to 14,000. This would represent more than 20% of the population counted annually in eastern United States.

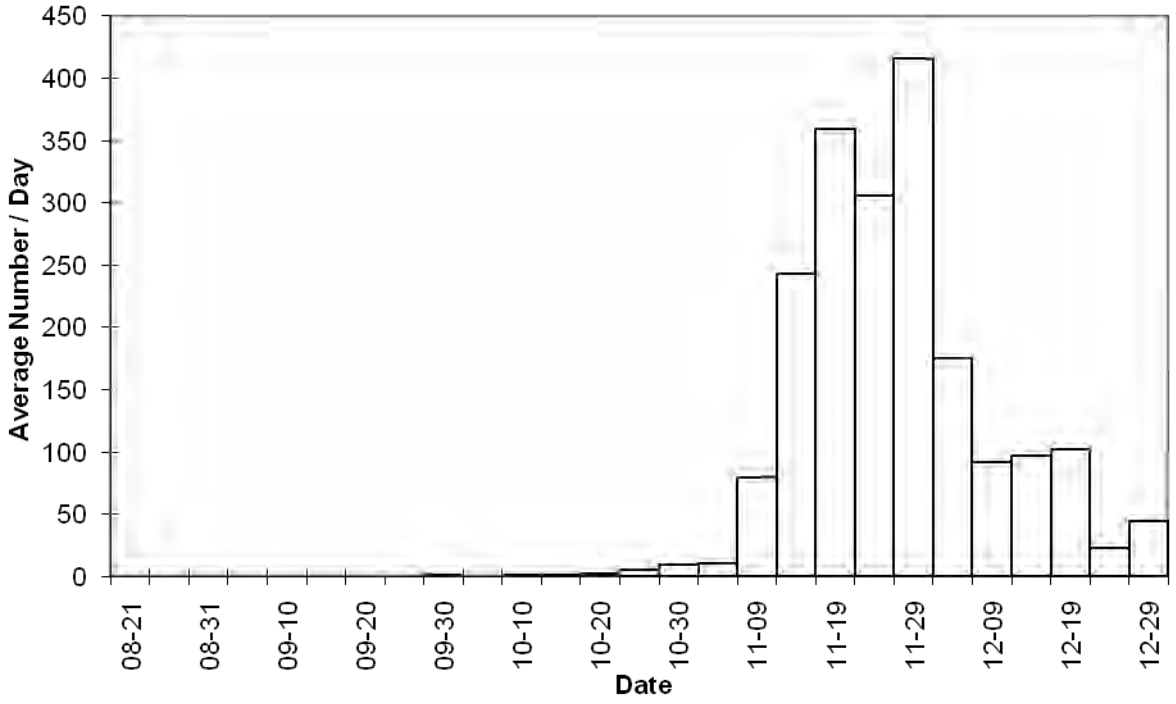
Red-throated Loons usually migrate at a long distance from shore (600 m or more) but some are seen at medium distance (300m). Ninety-five percent of the population moves west. When they begin to occur in large numbers (>200/day), it is normal to have a period of several days of very high numbers (clustering) with at least one day exceeding 1000. These clusters represent the majority of migration. In this period, they fly low over the water and pass continuously as single birds but are sometimes loosely grouped over short time periods.

Red-throated loon migration differs from Common Loon. They go through over a much shorter time period; their median date is later by 21 days; they have a higher percentage moving west; and they do not tend to feed in the shallow waters in large numbers as do Common Loons.

In winter, they are more abundant than Common Loons at Hamlin Beach but still relatively uncommon (see Summary: wintering waterbirds). In 1998 and 1999, daily February counts ranged from 1 to 40 but February highs for the previous three winters did not exceed 5.

Weather Factors: Extensive analysis of the influence of weather on Red-throated loon migration (Sherony, Ewald, and Kelling 2000) indicate that they stage in the Hudson and James Bay region and leave the arctic with the invasion of deep cold conditions usually brought on by large low or high pressure cells. On average, they arrive on Lake Ontario in clustered flights three days after cold conditions occur in the north and migrate west across Lake Ontario. The annual variation in these conditions gives rise to the variations in their appearance. We have presented indirect evidence that they turn south in western Pennsylvania (Sherony, Ewald, and Kelling 2000).

Red-throated Loon 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	6494	85.1	1413	16-Nov	10-Oct	16-Nov	7 Nov - 19 Nov
94	6942	96.5	1944	27-Nov	15-Oct	27-Nov	22 Nov - 6 Dec
95	3928	97.5	958	23-Nov	16-Oct	23-Nov	19 Nov - 3 Dec
96	3289	96.8	433	23-Nov	11-Oct	24-Nov	14 Nov - 3 Dec
97	19841		2777	25-Nov	8-Oct	20-Nov	12 Nov - 25 Nov
98	14131	97.4	1908	25-Nov	25-Sep	26-Nov	11 Nov - 4 Dec
99	10025	90.4	2206	18-Nov	15-Oct	19-Nov	11 Nov - 2 Dec
Average	9841	93.9				24-Nov	9 Nov - 30 Nov



PIED-BILLED GREBE (*Podilymbus podiceps*)

Status: Irregular, rare fall migrant.

Occurrence: Five observed, one in 1993, and two each in 1995 and 1998. For a species with a large breeding range north and west of Lake Ontario, it is not being detected as a fall lake migrant.

Fox (1998) estimates that, at peak of migration, between 5 and 25 Pied-billed Grebes are seen per day on Conesus Lake, south of Rochester, NY.

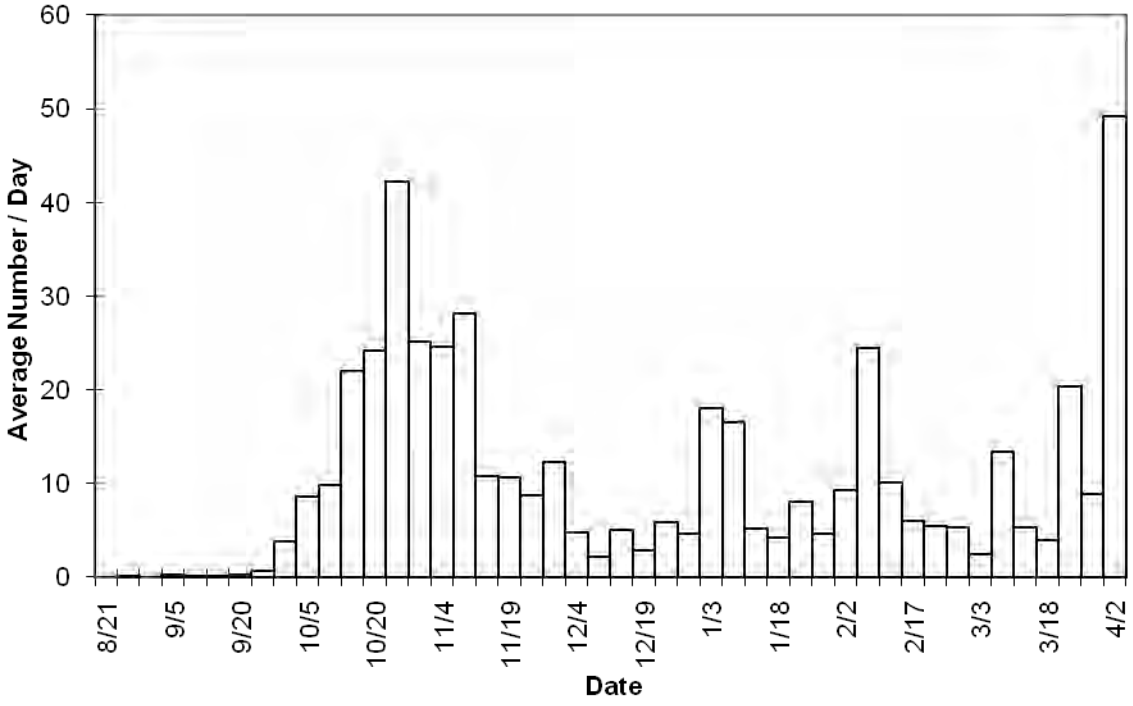
HORNED GREBE (*Podiceps auritus*)

Status: Annual very common fall migrant and fairly common winter visitor.

Occurrence: As with Red-throated Loon, the distant identification of grebes has improved over the years resulting in increased counts. Horned Grebes appear as singles or small flocks, usually flying west. They usually arrive in September but the peak period is 7 Oct to 12 Nov. The migrant population has moved through by the end of November with a median date of 29 Oct. On average, we estimate that the transient population is about 1100 birds.

When migrating, they are the first birds seen in early morning, usually in small flocks of 3 to 10 or as singles. They routinely feed offshore in loosely connected small groups. Present throughout the winter in moderate numbers with an average daily count of 9 but daily totals occasionally in the twenties. We estimate that one to several hundred winter off Hamlin Beach. The highest one-day winter count is 114 (1 Feb 98). Normally in winter, grebes are well out beyond the shore ice and are difficult to see from land.

Horned Grebe 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	377		31	9-Oct	26-Sep	16-Oct	26 Sep - 31 Oct
94	736	78.4	84	22-Oct	23-Sep	2-Nov	22 Oct - 25 Nov
95	978		106	16-Oct	22-Aug	29-Oct	12 Oct - 9 Nov
96	970	83.5	170	27-Oct	15-Aug	27-Oct	16 Oct - 6 Nov
97	1973		222	22-Oct	1-Sep	25-Oct	2 Oct - 10 Nov
98	1467	78.3	159	24-Oct	23-Sep	23-Oct	10 Oct - 12 Nov
99	2215	91.3	347	4-Nov	1-Sep	4-Nov	14 Oct - 7 Nov
Average	1302	84.6				29-Oct	7 Oct - 12 Nov



RED-NECKED GREBE (*Podiceps grisegena*)

Status: Annual fairly common to common fall migrant, and uncommon to common winter visitor.

Occurrence: Annual counts of Red-necked Grebe at Hamlin Beach average 200 to 400 per year with a median date of 16 Nov, over two weeks later than Horned Grebe. Daily counts tend to be low. Like Horned Grebe, they are seen from close to far from shore. They tend to feed far from shore.

Very few are seen flying in winter but on calm clear days, they are observed feeding. Present throughout the winter but only seen on 30% of the days covered. It is believed that they winter in the deeper waters in small numbers but the size of the wintering population is not well understood. Highest one-day winter count is 72 (4 Feb 99).

EARED GREBE (*Podiceps nigricollis*)

Status: Irregular, very rare fall migrant.

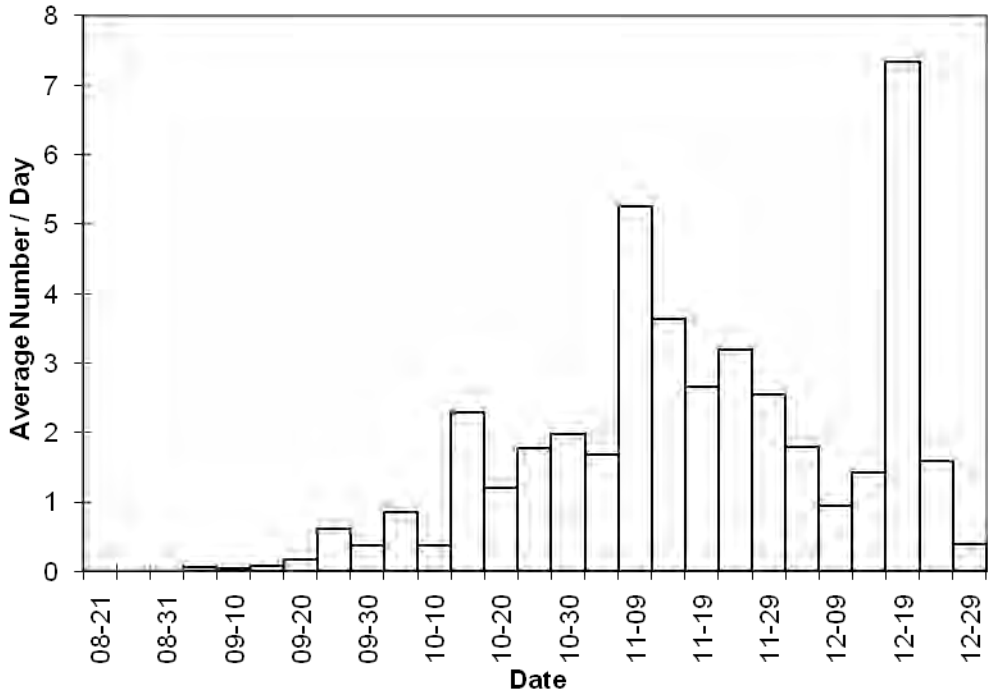
Occurrence: Three observed: 10 Oct 1994, 26 Nov 1977, and 15 Nov 1998. In all cases, these grebes were feeding in the shallow waters in front of the lookout and identified at close range.

WESTERN GREBE (*Aechmophorus occidentalis*)

Status: Casual, very rare fall migrnat.

Occurrence: One observed on 22 Oct 1995 following a cold front and rain the previous day.

Red-necked Grebe 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	25		3	10-Nov	10-Oct		
94	60	70.0	6	8-Nov	10-Sep		
95	72		6	30-Oct	21-Sep		
96	73	71.2	7	14-Dec	21-Sep		
97	403		56	23-Nov	4-Sep	10-Nov	3 Nov - 24 Nov
98	245	74.7	78	19-Dec	28-Sep	29-Nov	13 Nov - 19 Dec
99	425	50.8	24	14-Oct	13-Sep	12-Nov	14 Oct - 1 Dec
Average	211	61.4				16-Nov	5 Nov - 12 Dec



BLACK-CAPPED PETREL (*Petrodroma hasitata*)

Status: Accidental, very rare vagrant.

Occurrence: One record, 23 Sep 1996. This unusual pelagic species was sighted following a large low pressure system caused by Hurricane Fran. At that time, Black-capped Petrels were seen at other locations in western NYS.

NORTHERN GANNET (*Morus bassanus*)

Status: Irregular, rare to uncommon fall migrant.

Occurrence: Northern Gannets are seen in small numbers on Lake Ontario almost annually. All records were juveniles except for two sub-adults. Most are moving west. HBSP recorded a maximum of 10 in 1998, 5 in 1995, 4 in 1994, and one each in 1993, 1996, and 1997. The earliest and latest dates, both recorded in 1998, are 25 Oct and 14 Dec.

GREAT CORMORANT (*Phalacrocorax carbo*)

Status: Irregular, very rare to rare fall migrant.

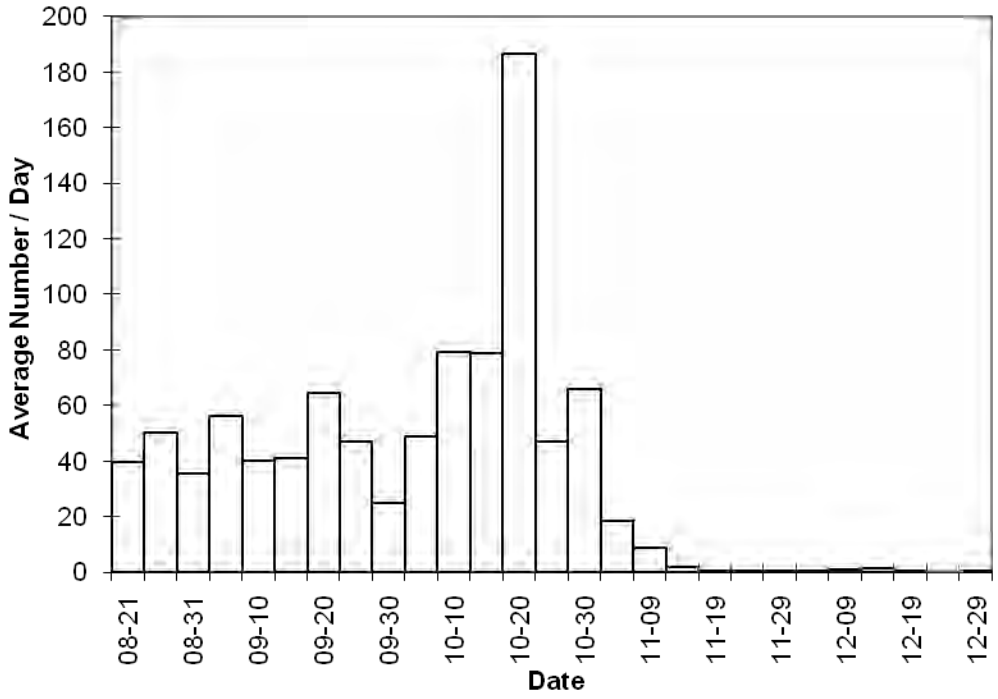
Occurrence: Three records: 5 Nov 1977, and 7 and 19 Oct 1999. All three were seen is small flocks of Double-crested Cormorants.

DOUBLE-CRESTED CORMORANT (*Phalarocorax auritus*)

Status: Annual, abundant fall migrant.

Occurrence: Double-crested Cormorants became increasingly numerous on Lake Ontario in fall, with the migrant population appearing to peak in 1997 and declined in the past two years. They begin to appear at HBSP before the lakewatch begins in August or September. They seem to be present as transients from August until early November. Although their timing distribution shows no obvious peak, the largest flights have always occurred in October. A small fraction of the population is seen migrating south, birds presumed to be coming directly from Canada. On average, 73% move west, and approximately 6% are seen moving south. They usually migrate in flocks, generally high off the water and range from close to distant form shore. Occasionally they fly west over the land. They disappear when conditions turn cold, usually by the end of November but linger into December in warmer years.

Double-crested Cormorant 1993-1999							
Year	**Count**	**Percent West**	**Percent South***	**Single day high count**		**First Date**	**Last Date**
93	637	67.4	5.9	212	19-Oct		3-Dec
94	1561	62.0	18.9	186	15-Oct	15-Aug	12-Nov
95	4020	77.8	9.4	378	10-Oct	15-Aug	29-Nov
96	4098	76.9	1.0	424	21-Oct	15-Aug	7-Dec
97	9088			3985	16-Oct		29-Nov
98	2737	62.1	12.4	330	3-Oct		29-Dec
99	5594	76.9	1.0	577	28-Oct		19-Dec
Average	4696	73.3	6.2				



Year	Tundra Swan	Mute Swan	Snow Goose
1993	22	2	11
1994	12	0	10
1995	4	3	12
1996	7	3	40
1997	7	7	7
1998	66	16	19
1999	23	19	164

TUNDRA SWAN (*Cygnus columbianus)*

Status: Annual, uncommon fall migrant.

Occurrence: Annual counts of Tundra Swan at HBSP, shown above, are low but they usually occur in November and December.

MUTE SWAN (*Cygnus olor*)

Status: Annual, uncommon fall migrant.

Occurrence: Mute Swan gather in bays on the lake and are usually stationary throughout the winter unless ice covers the bays. Numbers seen have been low but show an increasing trend.

SNOW GOOSE (*Chen caerulescens*)

Status: Annual, uncommon fall migrant.

Occurrence: Snow Geese are rare as daytime migrants at HBSP. They are plentiful in fall at Montezuma and Iroquois National Wildlife Refuges and occasionally in agricultural fields south of Lake Ontario. The single largest flock, 101 all blue morph Snow Geese, occurred on 5 Nov 1999. The only other sizable flock recorded at HBS was 37 on 11 Oct 1996. They either cross the lake at night or migrate mostly east and west of Hamlin, NY.

BRANT (*Branta bernicla*)

Status: Annual abundant fall migrant.

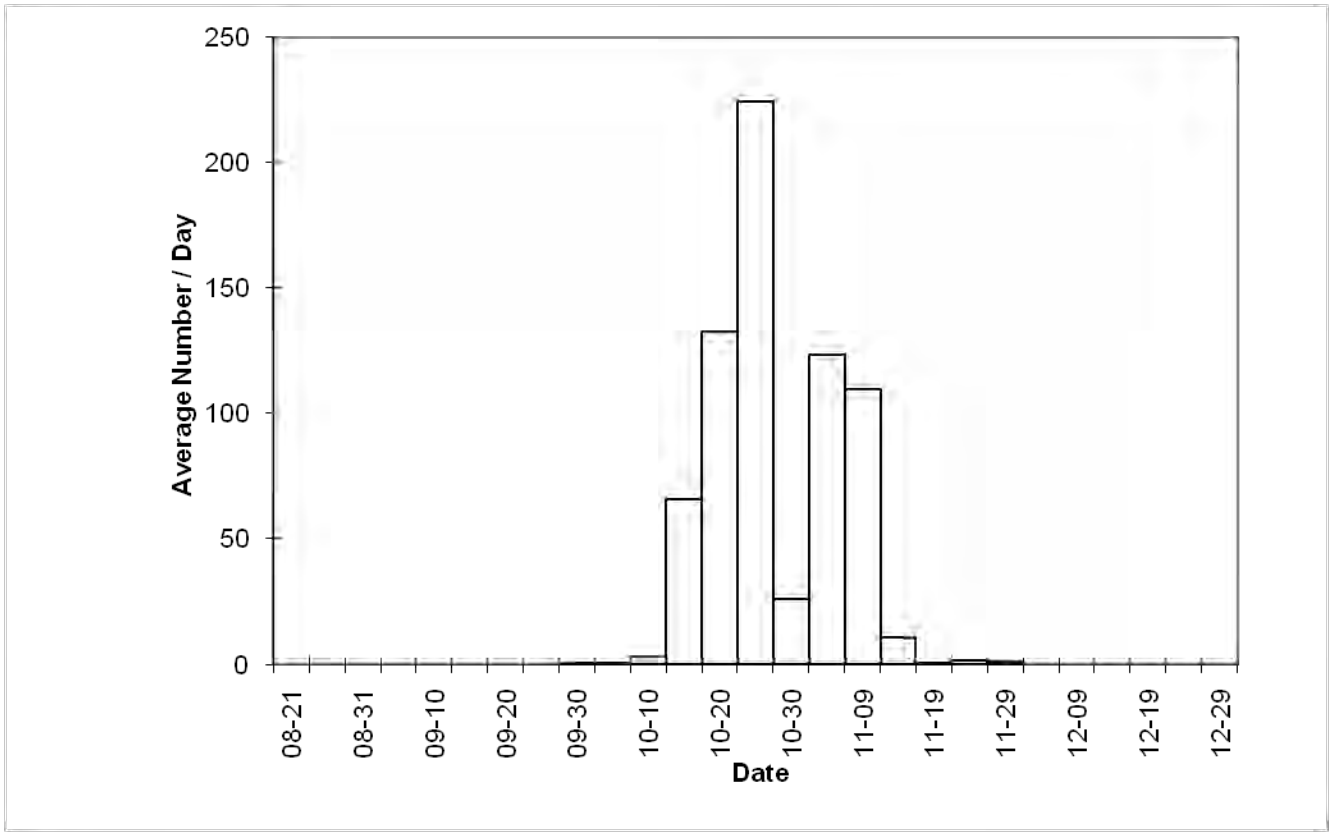
Occurrence: On average, 93% of Brant migrate east on Lake Ontario at HBSP. They leave the lake from the south shore along preferred pathways marked by specific features such as Sodus Bay.

Brant usually appear in homogeneous groups of 30 to 200 approaching from the west and are usually close to shore. On days when they are migrating in good numbers, many groups are seen. When birds are flying west, they are always individuals or very small groups. The one and only exception occurred on Nov 1, 1994 when numerous groups totaling 1400 birds went west with a strong northeast wind. On the following day, the winds changed to west and 1340 Brant were counted going east. These were believed to be the same birds as the day before but had reversed their direction.

Brant are consistent in their dates of migration. Their peak time of migration is a three week period beginning about Oct 15. In any year, the peak period (passage of 70% of the population) averages 8 days and can range from 2 to 17 days. Therefore the population moves through rapidly.

Weather Factors: Thirty-five percent of all Brant seen at HBSP arrive one day after the passage of a cold front. They are long distant migrants from the high arctic. It is possible that they leave after the passage of a cold front and ride this non-stop through Lake Ontario.

Brant 1993-1999								
Year	**Count**	**Percent East**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	1743	98.1	967	31-Oct	29-Sep	31-Oct	24 Oct - 31 Oct	26-Nov
94	3185	55.8*	1606*	1-Nov	9-Oct	1-Nov	1 Nov - 2 Nov	6-Nov
95	574	99.8	294	29-Oct	17-Oct	29-Oct	29 Oct - 4 Nov	8-Nov
96	2473	96.3	1005	5-Nov	11-Oct	6-Nov	5 Nov - 8 Nov	27-Nov
97	2785		916	6-Nov	16-Oct	6-Nov	25 Oct - 7 Nov	8-Nov
98	2969	99.9	2452	22-Oct	5-Oct	22-Oct	22 Oct - 22 Oct	16-Nov
99	10729	100.0	4302	18-Oct	14-Oct	18-Oct	18 Oct - 24 Oct	11-Nov
Ave	3500	92.9				24-Oct	18 Oct - 2 Nov	



CANADA GOOSE (*Branta canadensis*)

Status: Annual, abundant fall migrant and uncommon winter resident.

Occurrence: Canada Geese can be local breeders but first dates of appearance probably represent migrants because they usually occur from 1 to 16 September. Normally, flocks are seen on the lake in September. The earliest record of a significant number is 1 Sep 1994 when 67 were seen. The population builds up rapidly with a peak period for migrants ranging from 16 Sep to 22 Oct. Single day high counts will rarely exceed 1000 with 3511 on 21 Sept 1999 as the highest recorded daily count. More than one-third of Canada Geese seen at HBSP approach from due north.

During winter, they average 10 to 30 per day but generally decrease in January and February depending on the weather. Spring arrivals begin by mid to late February and rapidly buildup in March.

WOOD DUCK (*Aix sponsa*)

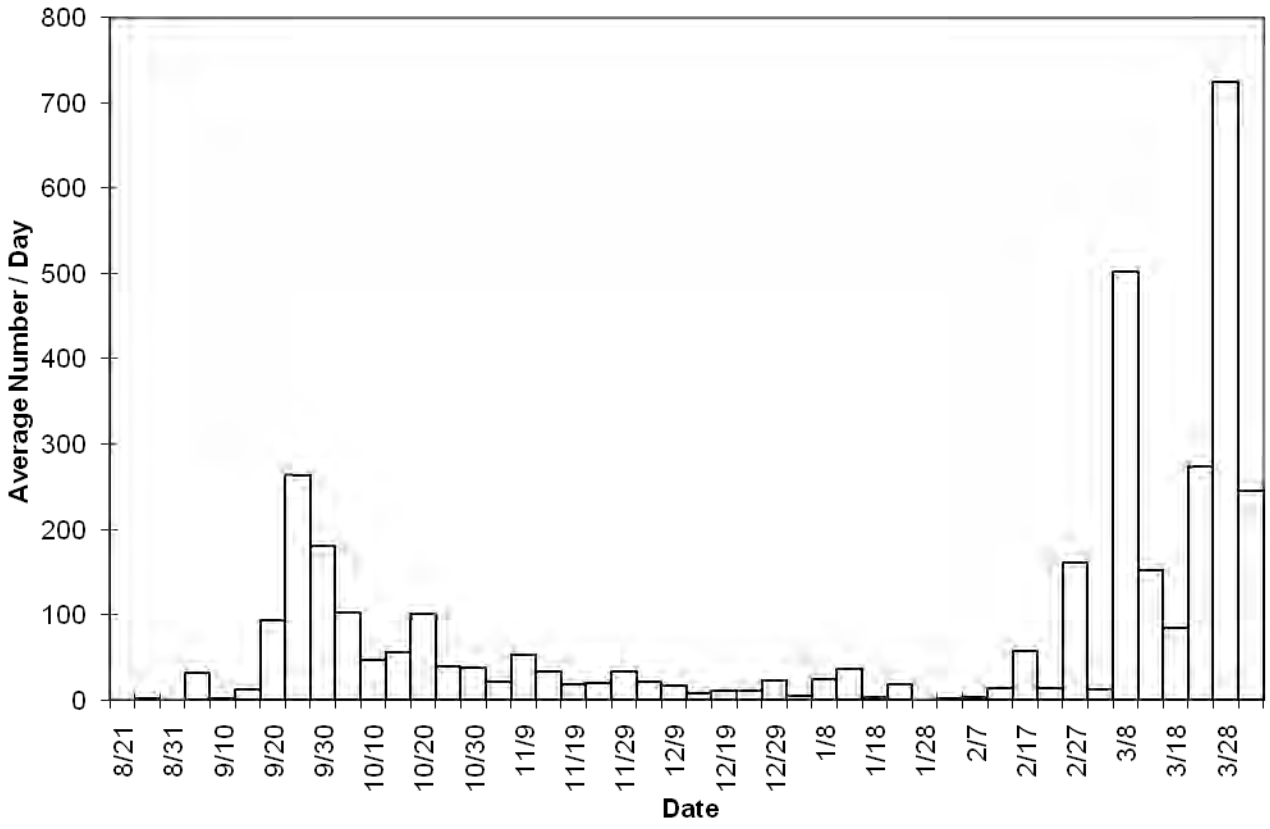
Status: Annual, fairly common fall migrant.

Occurrence: Wood Duck first arrive in early September and the last migrants are usually seen in early November. Although most follow the lakeshore, southward migration has been noted on one occasion. Wood Ducks are more common on the Finger Lakes in fall migration than on Lake Ontario (Fox 1998).

Wood Duck 1993 - 1999

Year	Count	Percent West	Percent South	Single day high count		First Date	Median Date	Peak Period	Last Date
93	7					28-Sep			29-Oct
94	51	5.9	0.0	15	3-Oct	22-Aug			26-Nov
95	42			11	14-Oct	9-Sep			30-Oct
96	39	20.5	0.0	9	18-Oct	17-Aug			1-Nov
97	36			9	19-Sep	17-Sep			22-Nov
98	34	38.2	0.0	10	30-Sep	19-Sep			2-Nov
99	38	18.4	42.1	16	1-Oct	8-Sep			4-Nov
Ave (Aug- Dec)	42						1-Oct	8 Sep - 17 Oct	

Canada Goose 1993 - 1999							
Year	**Count**	**Percent West**	**Percent South***	**Single day high count**	**First Date**	**Median Date**	**Peak Period**
93	2058			501	29-Sep	10-Oct	28 Sep - 23 Oct
94	2611	47.7	28.5	244	14-Oct	15-Aug	13-Oct	1 Sep - 3 Nov
95	8517			2675	29-Sep	10-Sep	30-Sep	28 Sep - 19 Oct
96	4231	38.8	35.6	877	23-Sep	11-Sep	2-Oct	18 Sep - 11 Oct
97	7472			1309	16-Oct	4-Sep	8-Oct	17 Sep - 17 Oct
98	3668	58.0	17.4	303	29-Oct	16-Sep	17-Oct	18 Sep - 9 Nov
99	10521	24.7	46.1	3511	21-Sep	1-Sep	25-Sep	18 Oct - 19 Oct
Ave(Aug-Dec)	6204	36.2	36.8				22-Oct	16 Sep - 22 Oct
Ave(Aug-Mar)	16650							



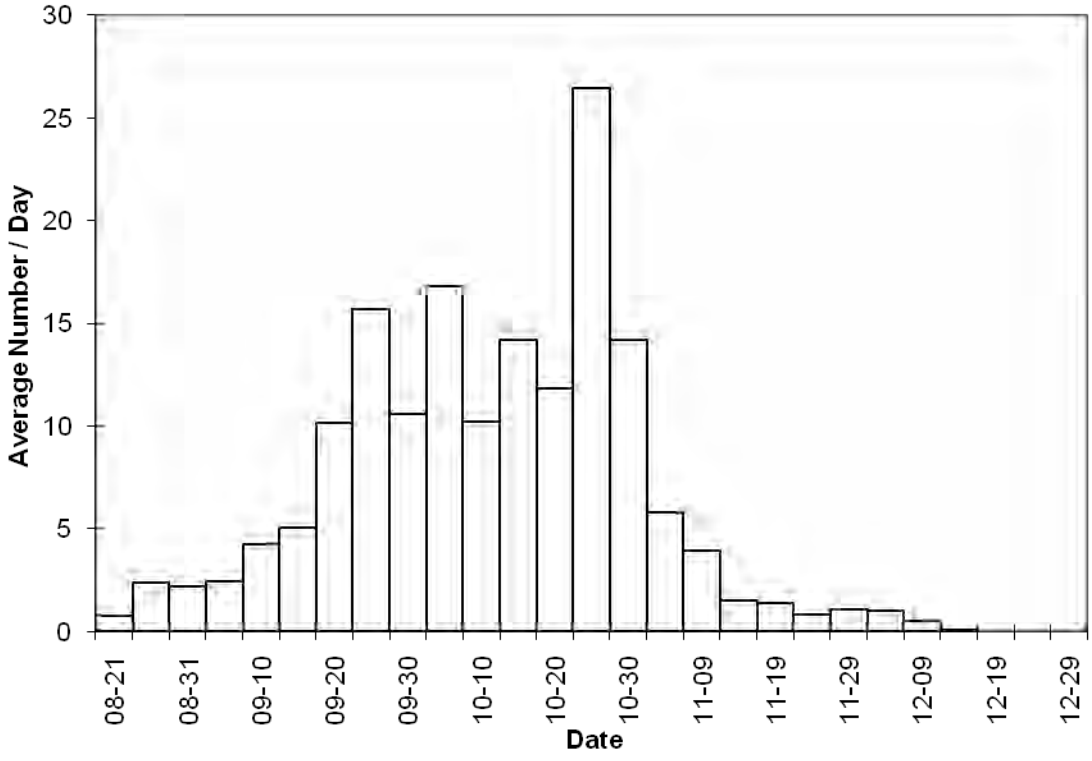
GREEN-WINGED TEAL (*Anas crecca*)

Status: Annual, very common fall migrant.

Occurrence: Green-winged Teal are seen migrating along the lakeshore in small flocks of 3 to 10 but will also mix with White-winged Scoters, scaup, or other puddle ducks. Migration begins early, in late August or early September, and has a long period of passage. Their peak period is 39 days, longer than any other dabbling duck. On average, their directional bias is 55% west but analysis shows that earlier birds tend to favor east and later birds west. Most puddle ducks migrate earlier in the year, have an easterly directional bias, and a shorter peak period. Green-winged Teal disappear as migrants by the end of November or the first week of December.

Bellrose (1978) describes the migration of Green-winged Teal as a protracted affair with birds appearing in early September and flights continuing until freeze-up in mid-November. This description is consistent with the lakewatch data.

Green-winged Teal 1993 - 1999								
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	224		92	10-Oct		10-Oct	9 Sep- 13 Oct	20-Nov
94	372	52.9	67	14-Oct	2-Sep	14-Oct	10 Oct - 7 Nov	25-Nov
95	780		108	29-Oct	15-Aug	17-Oct	28 Sep - 30 Oct	29-Nov
96	551	64.0	94	30-Sep	22-Aug	30-Sep	31 Aug - 12 Oct	6-Dec
97	1270		159	23-Nov	4-Sep	16-Oct	1 Oct - 24 Oct	4-Dec
98	982	65.9	268	25-Oct		17-Oct	30 Sep - 25 Oct	14-Dec
99	1183	42.6	309	21-Sep		30-Sep	17 Sep - 24 Oct	2-Dec
Ave	818	55.1				10-Oct	17 Sep - 25 Oct	



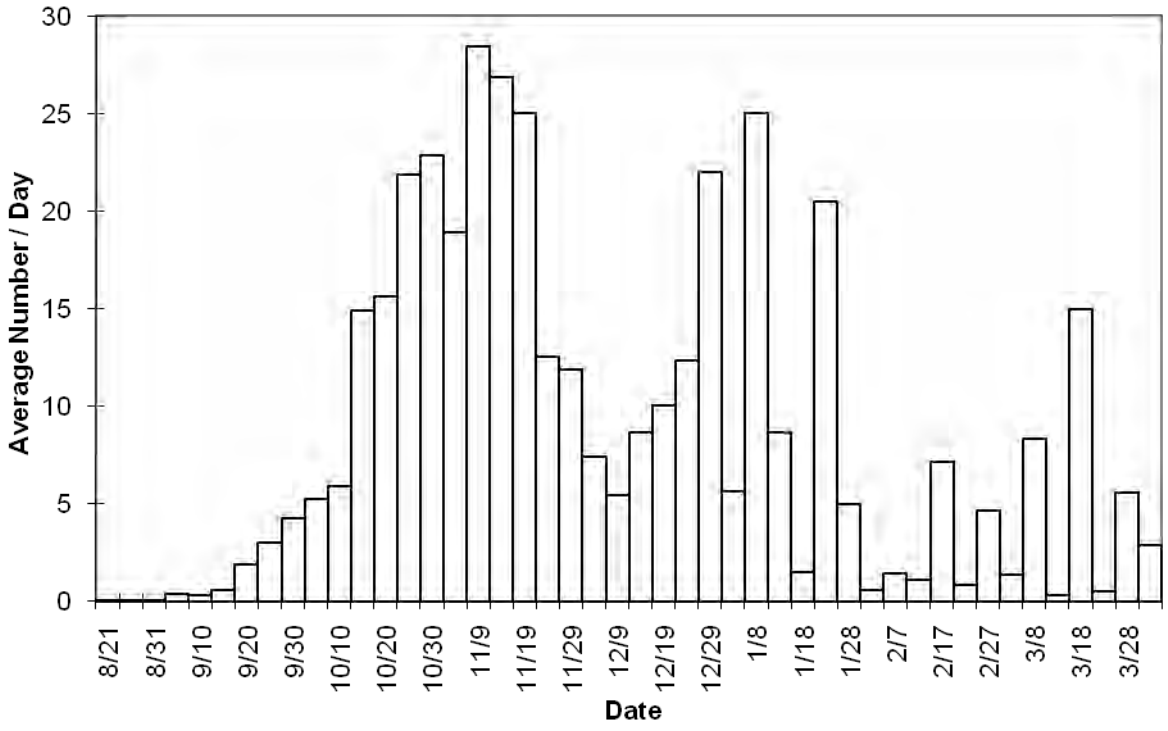
AMERICAN BLACK DUCK (*Anas rubripes*)

Status: Annual, very common fall migrant and uncommon to common winter visitor.

Occurrence: There are many similarities in the timing distribution for American Black Duck and Mallard. Both species arrive early and remain throughout the winter but the frequency of American Black Duck is about 25% that of Mallard. Unlike most dabbling ducks, both species have a westward bias to their directionality. Black Ducks first appear between late August and mid-September and peak of migration occurs in early November. The timing is consistent with existing data (Bellrose 1978).

The timing distribution from HBSP implies two peaks in migration. The second peak (in late December) was caused by the fact that in both 1998 and 1999, there was a large population late in the year but this result was not seen in any of the five previous years. The median date for the period of August to March is 22 Nov but this would be earlier if we had not seen the late spurt in migration the past two years. Winter numbers are quite low, averaging about 6 per day.

American Black Duck 1993-1999						
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**
93	573		93	20-Nov		
94	832	57.6	127	14-Oct	23-Aug	
95	1152		140	19-Oct	14-Sep	
96	1078	80.1	134	3-Nov	17-Aug	
97	2028		117	7-Nov	4-Sep	
98	1932	66.8	264	18-Nov	12-Sep	
99	1283	60.7	135	25-Oct	18-Sep	
Average (Aug-Dec)	1433	61.3				
Average (Aug-Mar)	2000					22-Nov



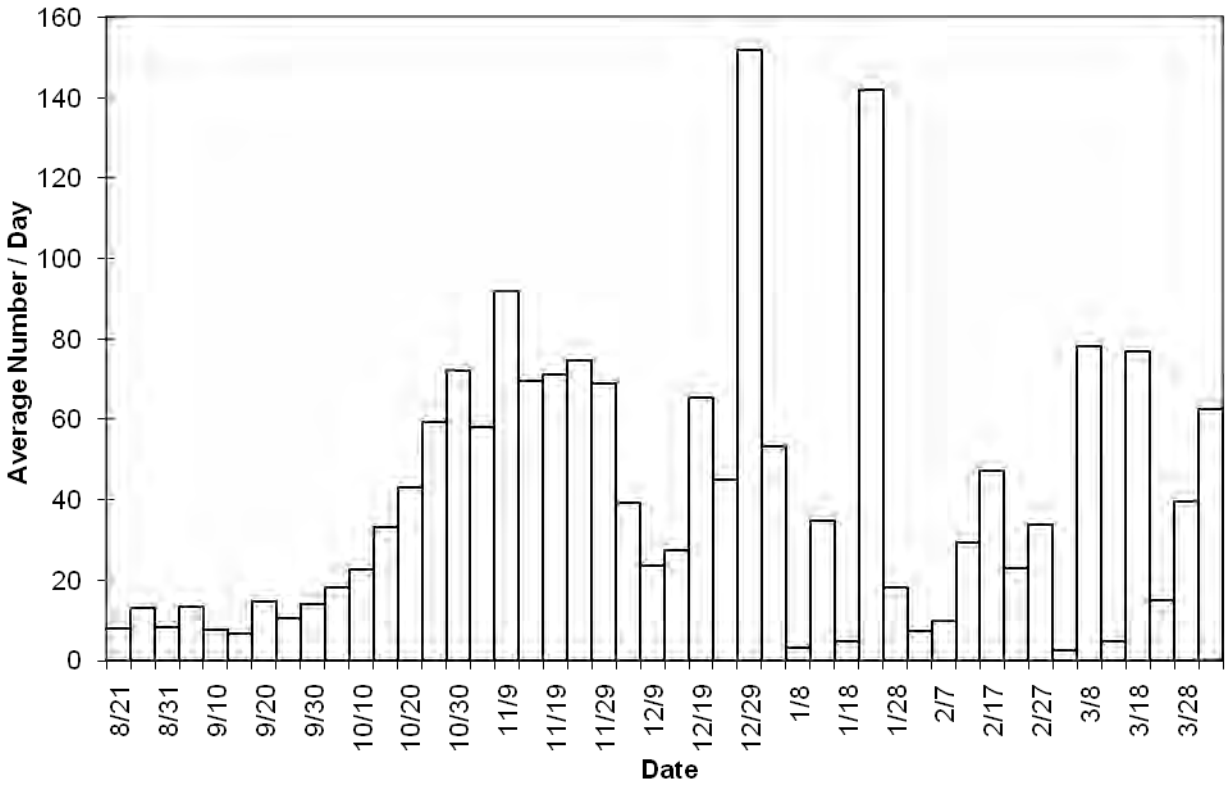
MALLARD (*Anas platyrhynchos*)

Status: Annual, abundant fall migrant and very common to abundant winter visitor.

Occurrence: Mallard are present on Lake Ontario throughout the summer and are always recorded on the first days of the lakewatch. Migrants appear to arrive by the end of September. October and November are prime times for migration. The timing distribution implies that there is a transient migrant group.

Winter brings sporadic but regular movements as demonstrated by the 1100 seen on 23 Jan 1995 (recorded in the summary table as a high count for the 1994-95 season). Days of 100 to 300 are not uncommon in winter but the average daily count after January is 33 compared to an average daily count of 80 during peak period. High-count days in winter usually follow the freeze-up of local ponds.

Mallard 1993 - 1999							
Year	**Count**	**Percent West**	**Percent South***	**Single day high count**		**First Date**	**Median Date**
93	3554			788	20-Nov		
94	3983	60.5	1.3	1100*	23-Jan	15-Aug	
95	4404			423	5-Nov	15-Aug	
96	4432	69.5	1.7	361	23-Nov	15-Aug	
97	4596			758	29-Nov		
98	6394	76.0	0.0	636	29-Nov		
99	4852	57.9	0.9	286	19-Dec		
Average (Aug-Dec)	5660	66.9	0.8				
Average (Aug-Mar)	8780						14-Dec



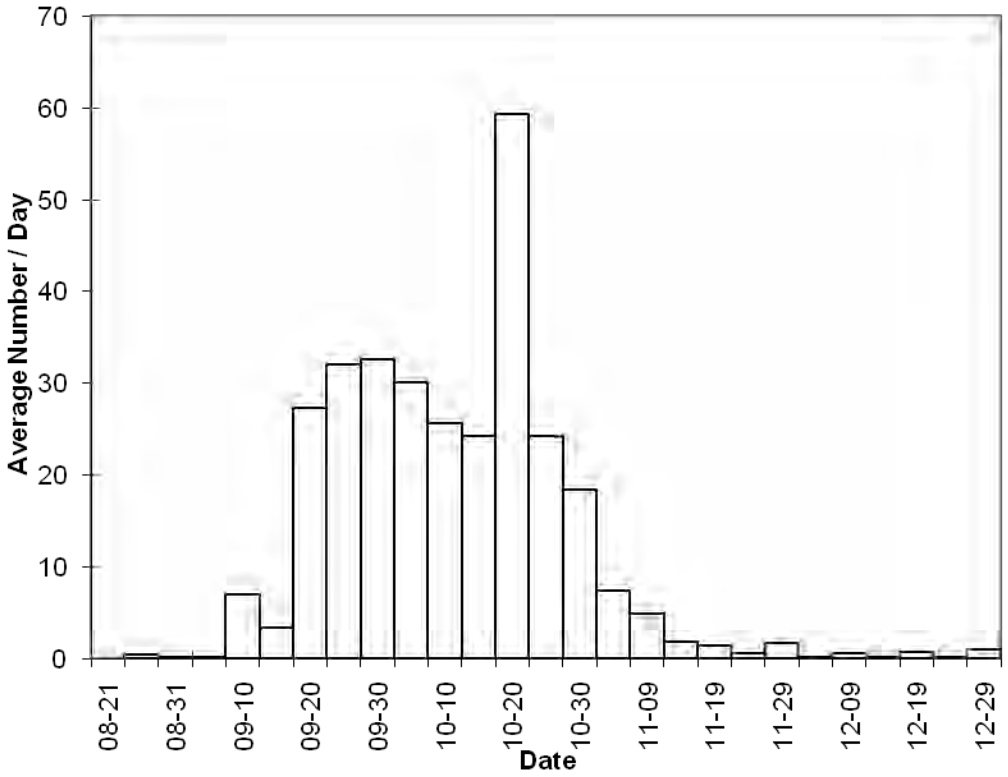
NORTHERN PINTAIL (*Anas acuta*)

Status: Annual, very common fall migrant.

Occurrence: Northern Pintail is an early migrant with a median date of 8 Oct. Among the dabbling ducks, they are the most numerous with an annual average count of 1500 per year. First arrivals are in late August and peak period is 31 days which is average. The timing for Northern Pintails at Hamlin Beach is generally sooner than the average timing for the Great Lakes (Bellrose 1978) where the peak period is late October of early November. The high count in the timing histogram was caused by a single high number of 1041 on 17 Oct 1997. That year a number of duck species set record highs (see discussion under Black Scoter). Winter presence is minimal but spring arrival is usually early. In 1998, spring arrivals began in the last week of February but the first week of March is more typical.

Weather factors: Most Northern Pintail migrate past HBSP when barometric pressure is rising or near peak. Peak movements occur 4 days after lowest barometric pressure. This is consistent with early migrants and puddle duck but unlike the sea, wintering and diving ducks.

Northern Pintail 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	534		74	29-Sep		7-Oct	29 Sep - 13 Oct
94	650	26.9	205	14-Oct	28-Aug	14-Oct	2 Oct - 7 Oct
95	537		117	10-Sep	27-Aug	9-Oct	10 sep - 29 Oct
96	1672	39.7	461	30-Sep	25-Aug	30-Sep	17 Sep - 4 Oct
97	2916		1041	17-Oct		16-Oct	7 Oct - 17 Oct
98	1949	40.9	213	30-Sep		10-Oct	28 Sep - 2 Oct
99	2009	35.0	480	21-Sep		4-Oct	16 Sep - 19 Oct
Average	1531	36.8				8-Oct	17 Sep - 17 Oct



BLUE-WINGED TEAL (*Anas discors*)

Status: Annual, common fall migrant.

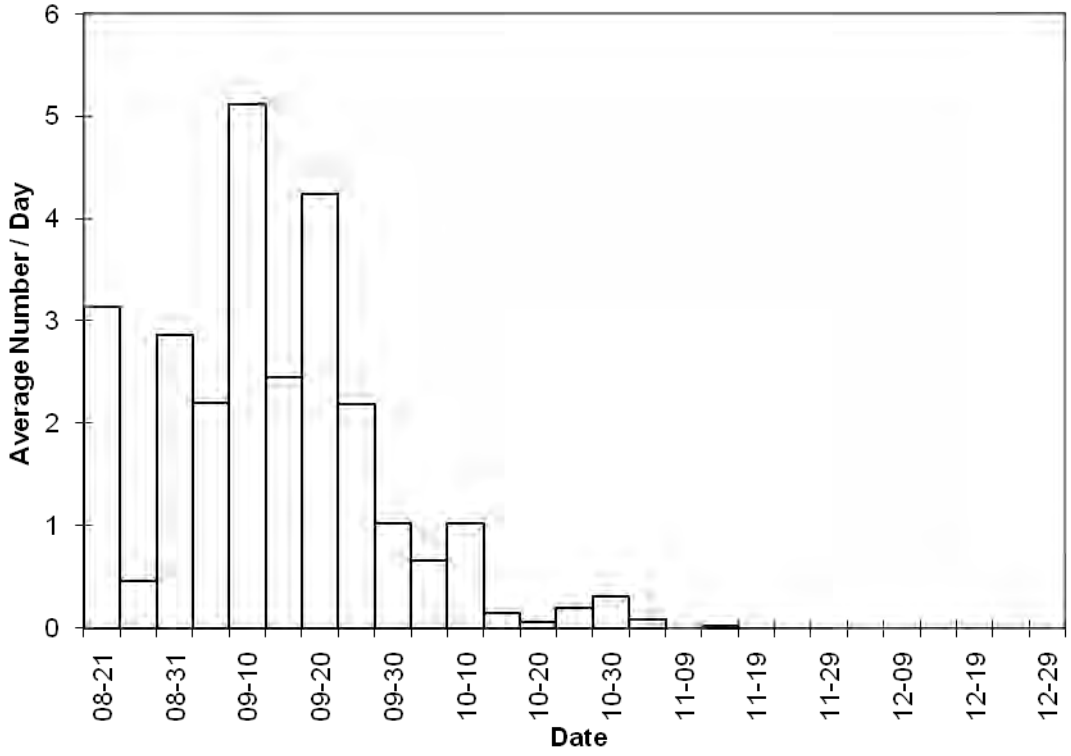
Occurrence: Blue-winged Teal is the earliest migrant duck species. They are seen in small flocks or mixed with Mallards. Migration starts prior to 15 Aug although the lakewatch counts the majority based on the timing distribution. Median date is prior to 10 Sep. Brock (1997) gives 18 Sep as the median date fall migration and 18 Aug as fall arrival at the south end of Lake Michigan. The average number seen per year is only 130 at HBSP. They become rare by mid-October and last date is usually in late October or rarely November. Two-thirds of those seen are migrating east.

NORTHERN SHOVELER (*Anas clypeata*)

Status: Annual, uncommon fall migrant.

Occurrence: The lakewatch has recorded them in 6 of the 7 years with an average annual total count of 16 and a highest year total of 35 in 1997. First birds are seen between 12 - 18 Sep. They are rare after late November with the latest record 19 Dec 1999.

Blue-winged Teal 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	31		19	27-Sep				29-Oct
94	233	38.2	57	19-Sep	16-Aug	17-Sep	21 Aug - 19 Sep	4-Nov
95	43		13	12-Sep	15-Aug			22-Oct
96	129	50.3	24	4-Sep	15-Aug	11-Sep	29 Aug - 11 Sep	4-Nov
97	58		12	7-Oct				27-Oct
98	13	38.4	4	16-Sep				11-Nov
99	112	6.3	35	8-Sep				9-Oct
Ave	131	34				10-Sep	28 Aug - 25 Sep	



GADWALL (*Anas strepera*)

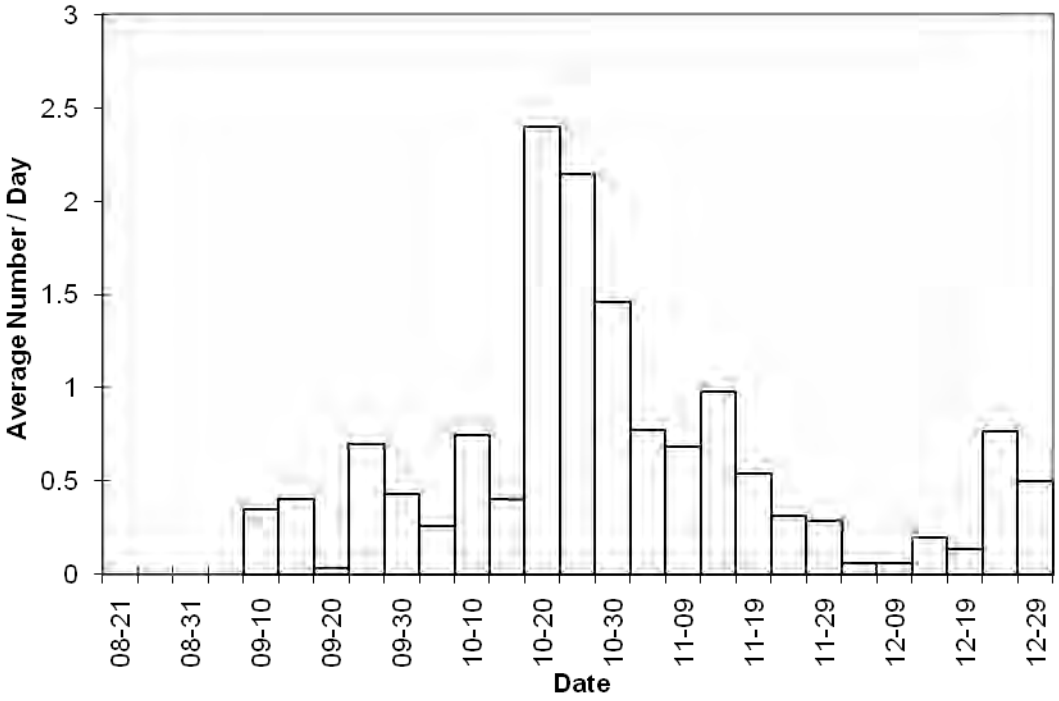
Status: Annual, fairly common fall migrant and uncommon winter visitor.

Occurrence: The lack of directional preference (50% west) and the small numbers seen in fall implies that there is not a significant population migrating through this great lake. There are not significant breeding grounds for Gadwall north of Lake Ontario. Another possible reason for the low number of Gadwall is the fact that they migrate at night (Bellrose 1978). Fox (1998) reports Gadwall are more common in fall on Conesus Lake in the Finger Lakes than on Lake Ontario.

Among dabbling ducks, the population seen at HBSP is late (median date 29 Oct). The timing at Hamlin Beach, however, is about the same as that seen on Lake Michigan. Brock (1997) gives 2 Nov as the median date.

Occasionally seen in winter as single birds.

Gadwall 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	21		4	10-Nov	9-Oct		
94	34	20.5	8	24-Nov	8-Sep		
95	48		8	23-Oct	6-Sep		
96	44	40.9	9	20-Oct	15-Aug		
97	75		12	15-Sep	15-Sep		
98	138	71.7	31	21-Oct	22-Sep	21-Oct	1 Oct - 31 Oct
99	104	34.6	15	19-Oct	6-Sep	26-Oct	19 Oct - 13 Nov
Average	73	50				29-Oct	17 Oct - 12 Nov



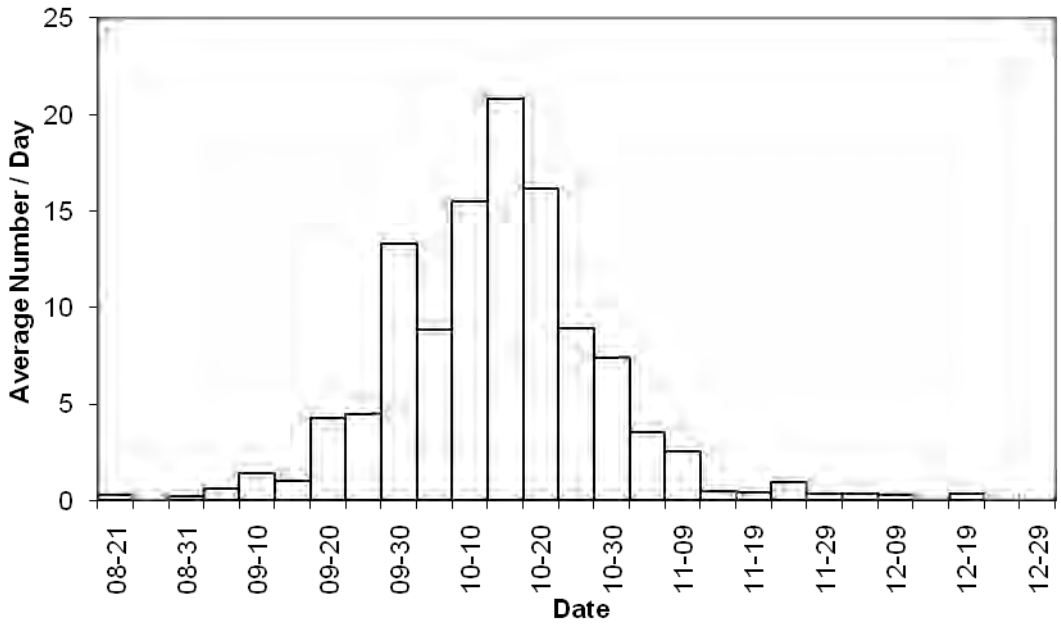
AMERICAN WIGEON (*Anas americana*)

Status: Annual, very common fall migrant.

Occurrence: Migration pattern similar to other dabbling ducks. An early fall migrant with two-thirds of the population moving east past HBSP. Wigeon are normally seen in groups of 10 to 20 any distance from shore, but flying high off the water and sometimes associate with Mallards or Northern Pintail.

According to Bellrose (1978), the major pathways for American Wigeon are the Mississippi and Central flyways. Nevertheless, there is a significant number moving from Ontario, Canada to Long Island shore, which is a prime wintering area. The NYS Waterfowl Count recorded as many as 1700 there (Sabin 1995). We only see a small hint of the migration on Lake Ontario.

American Wigeon 1993-1999								
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	228		29	10-Oct		10-Oct	29 Sep - 14 Oct	26-Nov
94	588	16.0	294	14-Oct	20-Aug	14-Oct	14 Oct - 30 Oct	15-Nov
95	320		35	20-Oct	20-Aug	18-Oct	5 Oct - 30 Oct	22-Nov
96	497	68.4	196	30-Sep	1-Sep	3-Oct	29 Sep - 20 Oct	23-Nov
97	1034		153	7-Oct		11-Oct	6 Oct - 25 Oct	30-Nov
98	641	39.8	207	10-Oct		10-Oct	9 Oct - 2 Nov	6-Dec
99	554	31.4	78	18-Oct		13-Oct	29 Sep - 29 Oct	27-Nov
Average	566	37.9				12-Oct	28 Sep - 24 Oct	



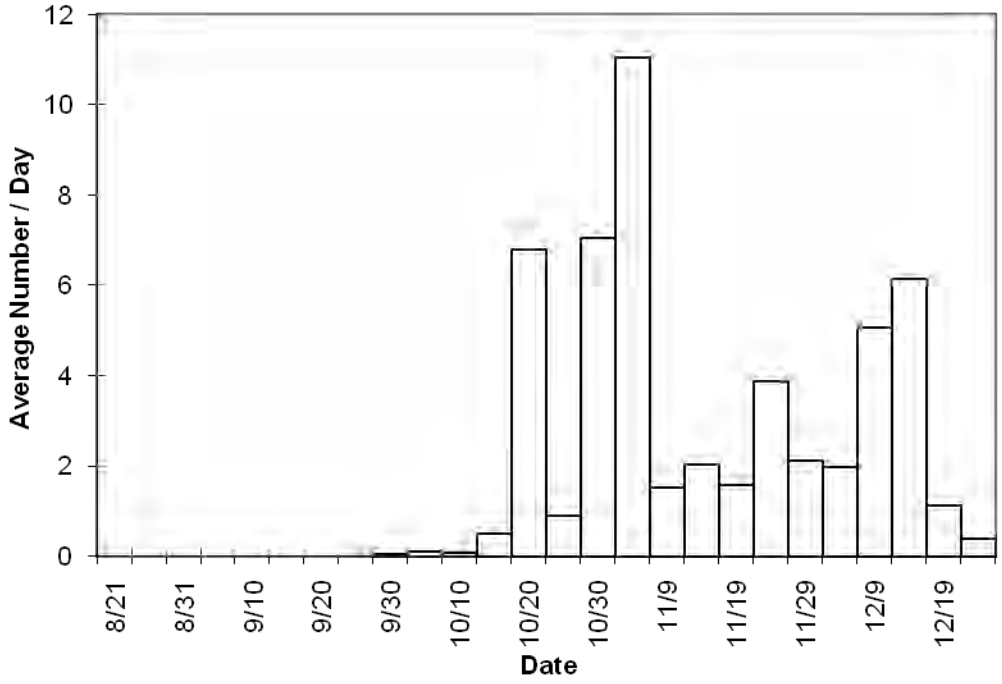
CANVASBACK (*Aythya valisineria*)

Status: Annual common to very common fall migrant and uncommon winter resident.

Occurrence: Our data shows erratic timing of Canvasbacks at HBSP. Overall, they have a much earlier median date (9 Nov) than Redhead (15 Jan) which they often associate with in the spring. As with later migrants, the population seen at HBSP is mostly directed west. They occur as homogeneous flocks of 10 to 20 but occasionally up to 100. Annually, we average about 250 but the peak year was 676. Winter records are usually single birds.

Bellrose (1978) reported that Canvasback migrate through Lake Ontario in late October and are present through November and December based on research done in the late 1950's. Even thought we count a very small number of Canvasbacks, the lakewatch timing distribution is consistent with that work.

Canvasback 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	36		26	22-Oct	3-Oct		
94	49	83.6	19	23-Oct	22-Oct		
95	39		12	19-Nov	10-Oct		
96	162	90.7	50	14-Dec	19-Oct	7-Nov	3 Nov - 15 Dec
97	448		184	9-Nov	22-Oct	9-Nov	8 Nov - 25 Nov
98	676	82.9	100	1-Nov	19-Oct	24-Nov	1 Nov - 15 Dec
99	307	98.4	107	31-Oct	23-Oct	7-Nov	23 Oct - 7 Nov
Average	262	87.9				9-Nov	21 Oct - 3 Dec



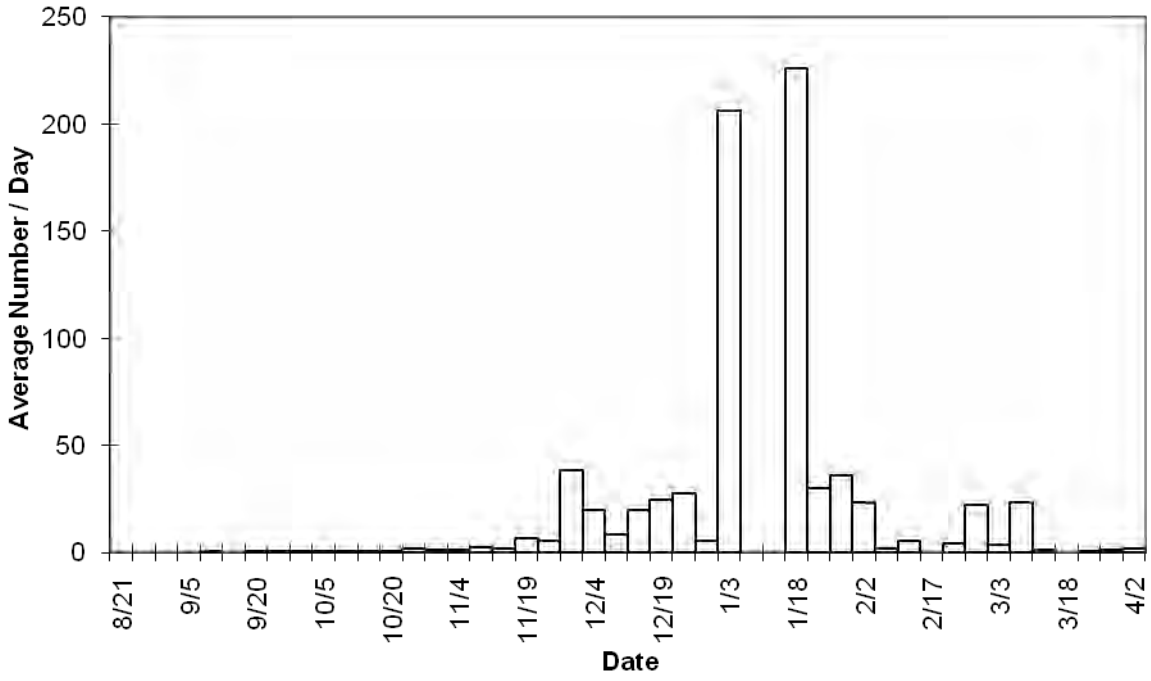
REDHEAD (*Aythya americana*)

Status: Very common to abundant fall migrant and common winter visitor.

Occurrence: Redhead are the latest annual migrants. Because we have limited winter data, we can only make a rough estimate of timing. The period of occurrence ranges from Nov to Mar with peak timing expected to be mid Dec to mid Jan. Most Redhead are in flocks of 20 to 50 birds and fly west. They often occur in small numbers mixed with Greater Scaup.

Bellrose (1978) reported that the principal migration corridor for Redhead is through the mid-west. Peak migration is mid-October and they are gone by late November. Brock (1997) gives 4 Nov as the median date of migration at the south end of Lake Michigan. Only a small fraction of the population migrates east through Lake Ontario. But the data from HBSP, with a median date of 15 Jan, indicates very late passage compared to what Bellrose and Brock reported. Data from HBSP are also in agreement with New York State January waterfowl counts, which consistently show high concentrations of Redhead in January (Sabin 1995, 1996)

Redhead 1993 - 1999						
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**
93	37		50*	15-Feb		
94	77	87.0	28	20-Nov	20-Sep	
95	123		30	5-Dec	11-Oct	
96	104	75.0	1350*	18-Jan	29-Sep	
97	410		183	3-Dec	22-Oct	
98	2573	99.0	1178	28-Nov	19-Oct	
99	1540	89.6	931*	1-Jan	10-Sep	
Average (Aug-Dec)	838	94.8				
Average (Aug-Mar)	3760					15-Jan

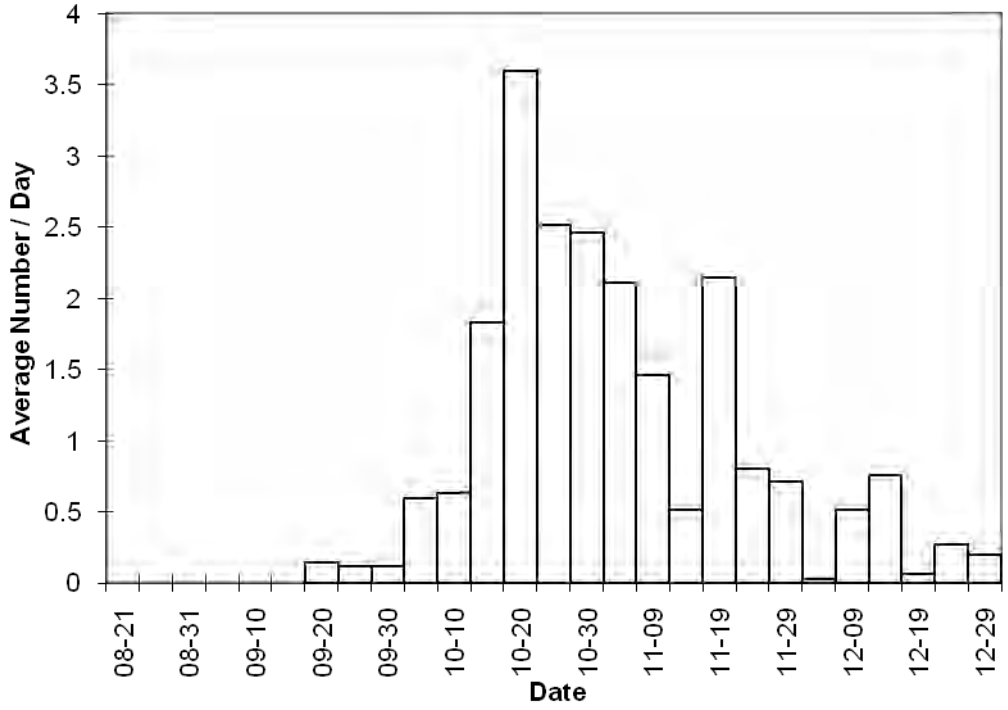


RING-NECKED DUCK (*Aythya collaris*)

Status: Annual fairly common to common fall migrant.

Occurrence: Regular in its timing, about 100 are seen annually at Hamlin Beach. They have an early median date for a diving duck, 26 Oct. Bellrose (1978) reported peak numbers in mid-October in the major flyway, consistent with the timing from HBSP. Often seen in flocks of Greater Scaup.

Ring-necked Duck 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	5						
94	39	97.4	10	4-Nov	25-Oct		
95	119		35	12-Oct	19-Sep	17-Oct	12 Oct - 30 Oct
96	63	95.2	41	26-Oct	3-Oct		
97	174		49	16-Oct	24-Sep	17-Oct	15 Oct - 30 Oct
98	137	29.9	25	1-Nov	12-Oct	1-Nov	19 Oct - 11 Nov
99	199	74.8	34	15-Nov	18-Sep	5-Nov	6 Oct - 15 Nov
Average	108	65.7				26-Oct	13 Oct - 15 Nov



GREATER SCAUP (*Aythya marila*)

Status: Annual, fall migrant and abundant winter visitor.

Occurrence: Greater Scaup is the second most numerous species in fall at HBSP. They begin to arrive early but their median date is 12 Dec. The timing distribution implies two peaks but this is erroneous. The decrease in numbers in January is simply due to lack of data. We believe that the true timing distribution is a simple bell curve peaking in December or early January. Given the percentage west and the annual count, we estimate that we see about 60,000 on an annual basis. Our data does not cover a long enough time span to show any temporal trends.

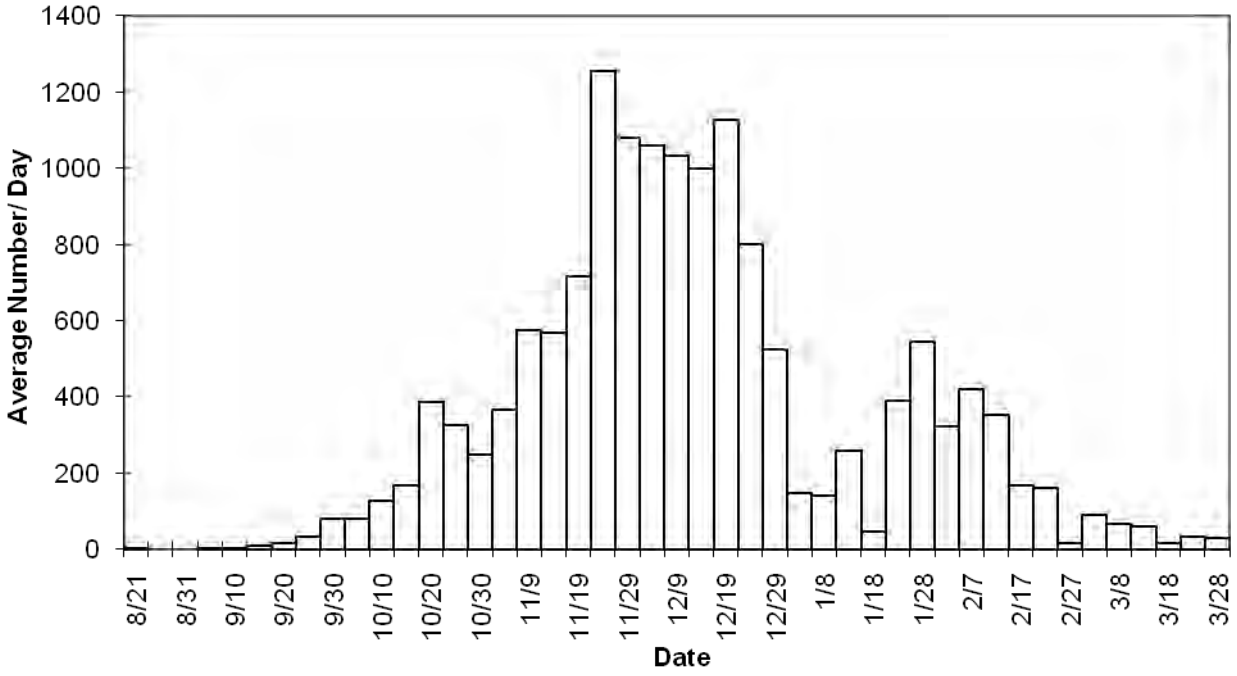
The timing distribution is lacking two data points. A total of 10,000 were seen on 2 Jan 95 and 8000 on 2 Jan 98. If we add in these two data points, it distorts the axes and one looses perspective of the shape of the distribution. The peak number for the 1994 season is this high count on 2 Jan 95 and the high for the 1994 season is the count in the winter of 2 Jan 1995. These high counts indicate that Greater Scaup continue to be abundant in January and even in February. They gather in large rafts on the lake and these rafts remain in the same location for some time. Rafts are especially common off the Rochester area. When rafts move, either because it has become too cold, too rough, or they want a new feeding area, the high winter count days occur at Hamlin Beach.

The timing distribution implies that the species is always transient. They never form a truly stationary winter presence. They migrate to the area of Hamlin Beach in high numbers beginning in early fall but continue to leave to the west throughout the winter. They either move to other locations on Lake Ontario or they leave the lake. Since we see so many, there are always some present. It is possible that the majority continue to move west and leave the lake at the west end, possibly continuing on to Lake Erie. They do not form a buildup in spring as do other species. Similar timing data from the area of Hamilton, Ontario would be beneficial to understanding their movements.

They are seen as large flocks, flying west at medium to high altitude. They range from close to far from shore.

Weather Factors: Greater Scaup follow the general pattern of diving ducks. Peak numbers are seen two days after the passage of a cold front.

Greater Scaup 1993-1999						
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	23482	66.2	2766	26-Nov			
94	37416	83.1	10000*	2-Jan	1-Sep		
95	23447	75.2	2800*	9-Feb	22-Aug		
96	23705	79.9	3037	12-Dec	15-Aug		
97	44167		8000*	2-Jan			
98	88328	89.1	10543	28-Nov			
99	76003	83.7	3568	8-Dec			
Ave (Aug-Dec)	54900	82.8					
Ave (Aug-Mar)	74000					12-Dec	15 Oct - 27 Feb



LESSER SCAUP (*Aythya affinis*)

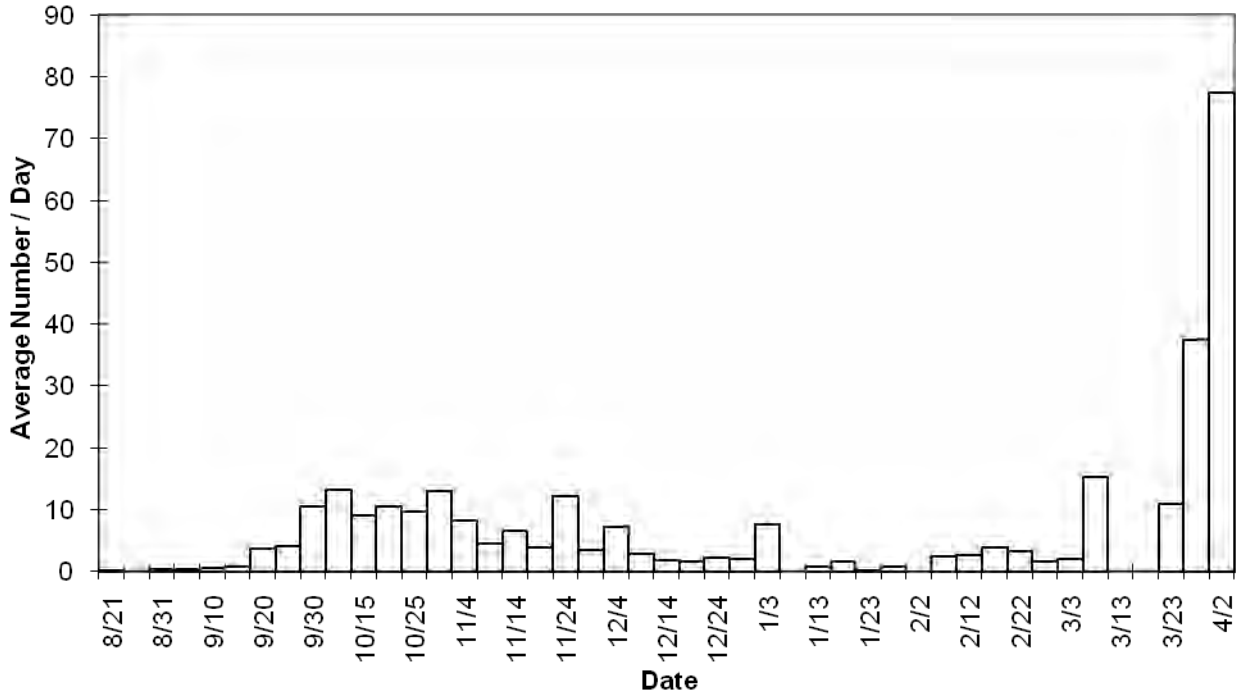
Status: Annual, common to uncommon fall migrant and fairly common to uncommon winter visitor.

Occurrence: Experienced observers separate Lesser Scaup from Greater Scaup in flight by size and the extent of white in the wings. This technique is mastered with practice. The timing distribution data for Lesser Scaup is considerably different from Greater Scaup.

They form a clear transient migrant wave with a median date of 25 Oct and a peak period of 29 Sep to 19 Nov. Their migration is earlier than Greater Scaup. Annually about 700 are counted with a peak year of 2097 in 1999 and an average of about 15 per day in the peak period. By the end of October, they are seen as singles mixed in flocks of Greater Scaup.

During winter, they are always present in small numbers. They tend to collect on bays and remain stationary unless weather conditions force them out. On bays, they can be more numerous than Greater Scaup. In spring, they stage on Lake Ontario, building up to larger numbers in late March and early April. This pattern of migration is the most common one observed.

Lesser Scaup 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	298		50	22-Oct	26-Sep	22-Oct	29 Sep - 30 Oct
94	519	90.9	167	30-Sep	5-Sep	1-Oct	20 Sep - 14 Oct
95	401		76	16-Oct	2-Sep	16-Oct	28 Sep - 30 Oct
96	253	72.7	31	18-Sep	16-Aug	9-Oct	18 Sep - 22 Oct
97	576		55	1-Oct	15-Sep	7-Oct	19 Sep - 23 Oct
98	387	94.5	78	21-Oct	10-Sep	21-Oct	28 Sep - 22 Oct
99	2097	88.6	207	16-Nov	1-Sep	6-Nov	5 Oct - 17 Nov
Ave (Aug-Dec)	709	88.4				25-Oct	29 Sep - 19 Nov



KING EIDER (*Somateria spectabilis*)

Status: Annual uncommon fall migrant and irregular rare winter visitor.

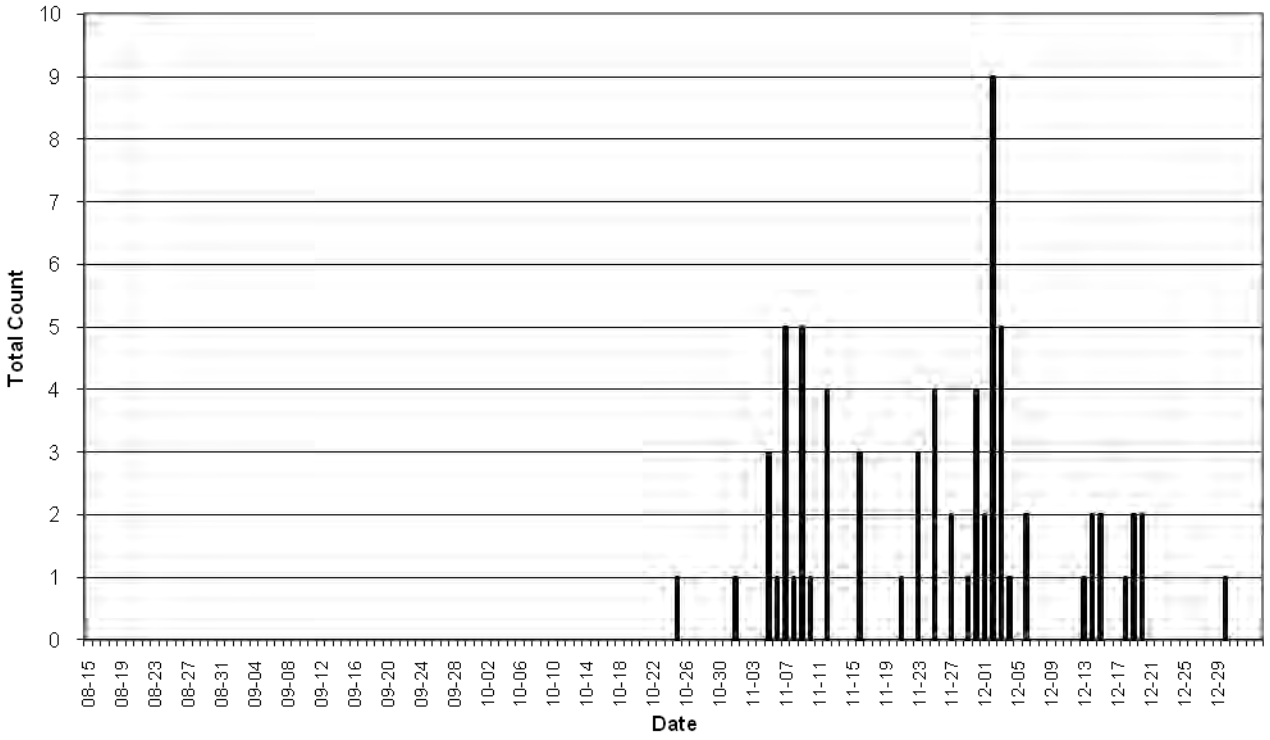
Occurrence: Seen annually in fall since 1997 at HBSP. Often seen migrating west low off the water on days when water bird migration is very active. Most records are immatures or females; adult males have been seen once or twice. Most are seen in November, usually solitary but sometimes in strings of White-winged Scoters. Eiders are believed to be more common on Lake Ontario in more recent years because of the food source created by Zebra Mussels.

COMMON EIDER (*Somateria mollissima*)

Status: Irregular, rare fall migrant.

Occurrence: Common Eider was recorded three of the last seven years with a high number of 16 in 1997 but only 2 in 1998 and 1 in 1994. Earliest record is 26 Oct 98 and latest is 24 Nov 1997 with a highest single day count of 5 on 7 Nov 97. The ratio of King to Common Eiders at HBSP is 5 to 1. Although the timing of the two eider species overlap, on average, Common Eider is earlier than King Eider. As with King Eider, most birds seen are immatures and fly west.

King Eider 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**	**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	0						
94	0						
95	0						
96	0						
97	40		5	17-Nov	6-Nov		19-Dec
98	10		3	12-Nov	25-Oct		20-Dec
99	20		9	2-Dec	4-Nov		30-Dec
Average							



HARLEQUIN DUCK (*Histrionicus histrionicus*)

Status: Irregular, rare fall migrant.

Occurrence: Casual migrant. A rare duck usually seen flying west, normally in November or December. Eight records of single birds: 1993 - 27 Oct, 22 Nov, 15 Dec; 1997- 20 Nov, 12 Dec; 1998 - 7 Nov, 9 Dec.

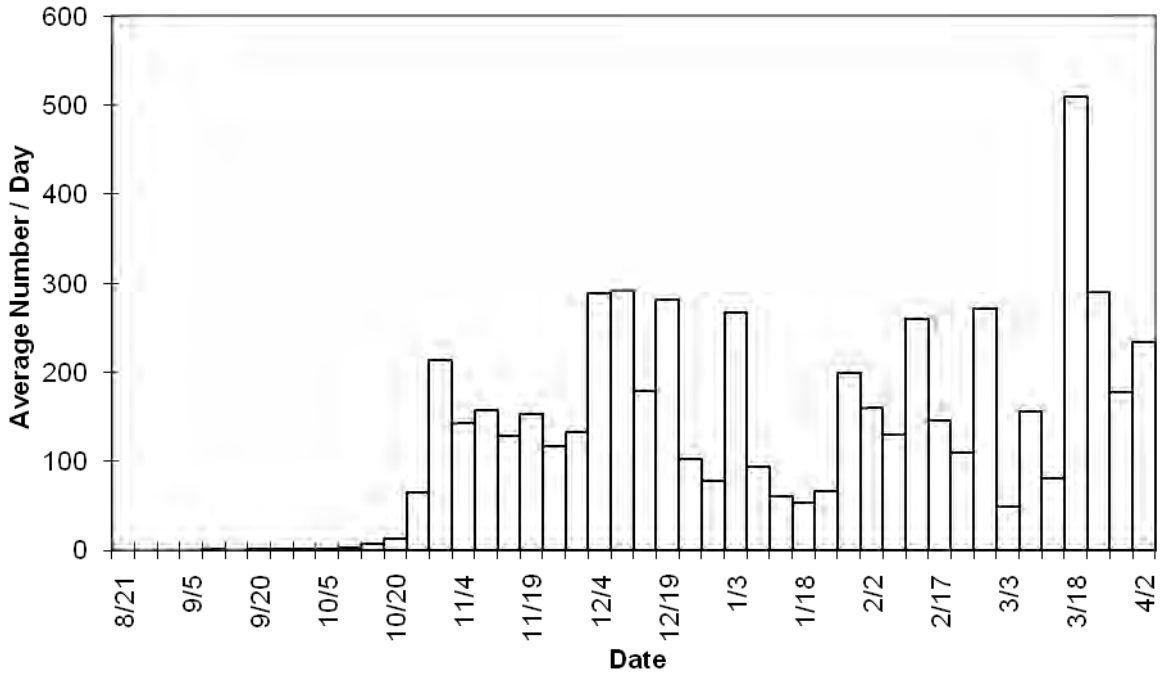
LONG-TAILED DUCK (OLDSQUAW) (*Clangula hyemalis*)

Status: Annual, abundant fall migrant and winter visitor.

Occurrence: Although most Long-tailed Ducks winter off the coasts and feed in salt water, a considerable number winter on Lake Ontario after arriving in late September. The average timing distribution indicates a stationary presence. We see no indication of transient migrants. We believe that the birds arriving on Lake Ontario remain throughout the winter. We do not see a spring buildup so the lake does not serve as a staging area for coastal migrants moving north. These conclusions are based on the fact that we see a flat timing distribution with no strong directional bias. Based on highest winter counts, there must be one to several thousand in the Hamlin Beach area throughout the winter.

Weather Factors: This species shows that most movement occurs one or two days after the passage of a cold front.

Long-tailed Duck (Oldsquaw) 1993 - 1999						
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**
93	7404		1422	7-Dec	25-Sep	
94	4699	59.4	1200*	23-Mar	5-Oct	
95	5889		1477*	26-Feb	3-Sep	
96	4740	72.9	755	4-Nov	10-Sep	
97	20420		4582	2-Nov	23-Sep	
98	16189	49.4	2885*	10-Feb	17-Sep	
99	13790	49.5	1323	7-Dec	3-Oct	
Average (Aug-Dec)	12213	53.4				
Average (Aug-Mar)	28300					



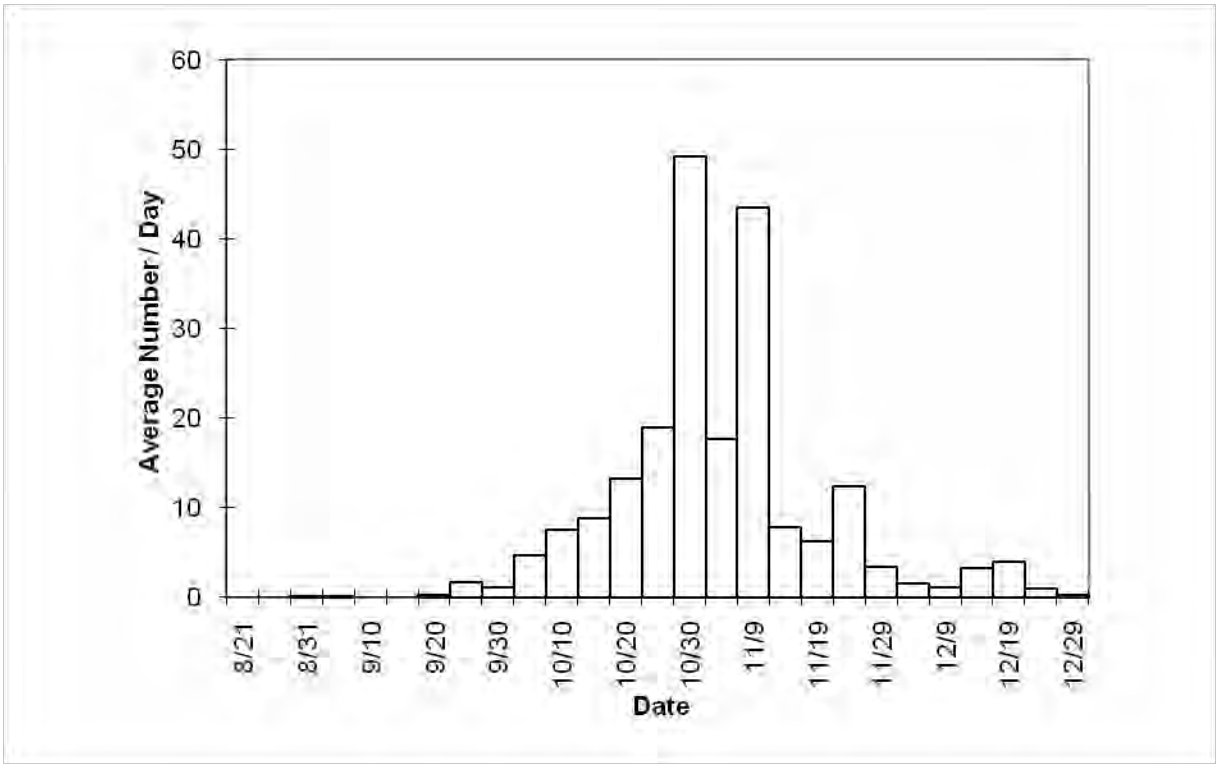
BLACK SCOTER (*Melanitta nigra*)

Status: Annual, common to very common fall migrant and uncommon winter visitor.

Occurrence: Black and Surf Scoters are very similar in their pattern of migration and very unlike White-winged Scoter. Black Scoters arrive by the end of September and have a median date of 30 Oct and a peak period of 15 Oct to 9 Nov. Both Black and Surf tend to migrate east in small groups. Normally, Black Scoters are seen as small flocks or as individuals, or mixed with White-winged Scoters. They have occurred in very large numbers on several occasions. These flights have occurred as single day events near the end of October or early November. Experience has found this species is more common around Sodus Bay. Alerstam (1990) indicates that Black Scoters will migrate at night. It is possible that they do so over Lake Ontario. In winter, Black Scoter is present in very small numbers (see summary, Wintering Water Birds).

In 1997, a number of duck and both loon species were recorded in record numbers. An unusual event was the flight of 11,635 Black Scoters on 7 Nov 1997. This single group is not included in the total count for the 1997 year in the summary table because it would misrepresent the average values. These birds came in waves, many close to shore, and were photographed from the lookout. All of these birds were flying east. The flight started early in the morning, peaked between 10:00 and 11:00 am, and was complete by 1:00 pm (see Surf Scoter).

Black Scoter 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	1804		1029	6-Nov	27-Sep	6-Nov	6 Nov - 20 Nov
94	558	31.0	91	15-Oct	30-Sep	26-Oct	15 Oct - 2 Nov
95	921		588	30-Oct	24-Sep	30-Oct	30 Oct - 1 Nov
96	331	61.0	48	20-Oct	31-Aug	27-Oct	11 Oct - 5 Nov
97	1345*		11635*	7-Nov	24-Sep	28-Oct	22 Oct 16 Nov
98	1496	28.0	499	26-Oct	17-Sep	26-Oct	20 Oct - 1 Nov
99	682	59.6	52	11-Nov	5-Sep	26-Oct	14 Oct - 12 Nov
Average	1036*	39.1				30-Oct	15 Oct - 9 Nov

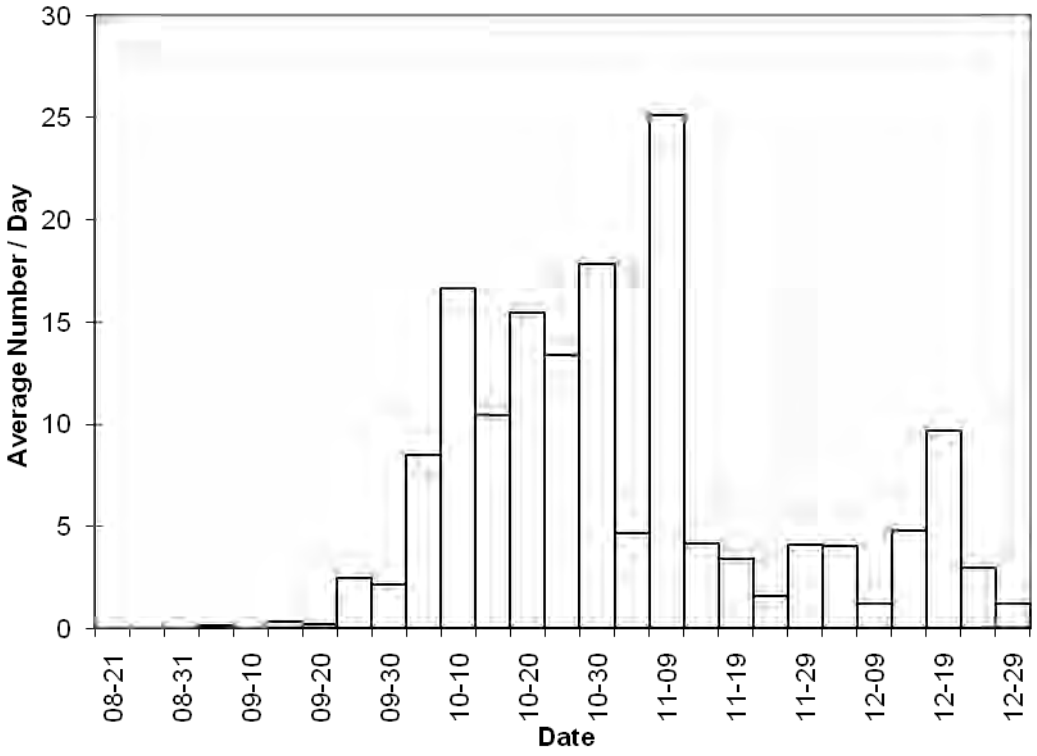


SURF SCOTER (*Melanitta perspicillata*)

Status: Annual, common fall migrant and uncommon winter visitor.

Occurrence: In many respects, Surf Scoter's migration is very similar to Black Scoter. Counts for the two species are about equal and timing is very close. Their flight direction has a slight easterly bias. On 7 Nov 97, the highest single count of 699 occurred and these birds were all flying east, as part of a large movement of Black Scoters. This is the only large movement recorded for this species. The Surf Scoter migration might be more protracted since the peak period is 41 days compared to 36 days for Black Scoter. Surf Scoters are usually present throughout the winter in small numbers.

Surf Scoter 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	274		55	10-Oct	26-Sep	31-Oct	6 Oct - 12 Nov
94	464	43.5	85	16-Oct	20-Sep	23-Oct	15 Oct - 8 Nov
95	311		53	30-Oct	20-Sep	25-Oct	5 Oct - 2 Nov
96	396	55.5	72	12-Oct	14-Sep	21-Oct	6 Oct - 30 Oct
97	1391		699	7-Nov	1-Oct	7-Nov	25 Oct - 9 N0v
98	1205	37.0	141	7-Oct	11-Sep	20-Oct	2 Oct - 27 Oct
99	1043	61.9	60	3-Oct	5-Sep	19-Oct	27 Sep - 9 Oct
Average	770	48.7				27-Oct	2 Oct - 11 Nov



WHITE-WINGED SCOTER (*Melanitta fusca*)

Status: Annual, abundant fall migrant and winter visitor.

Occurrence: White-winged Scoter is the most common migrant recorded at HBSP, with a seasonal average of 60,600. Although they are present as early as mid-August, they arrive in significant numbers the last ten days of September. This is about two weeks earlier than the other scoter species. There are two peaks to their migration. The first is 1 Oct to 5 Nov, and the second, larger peak, is from 4 Dec to 4 Jan. In some years, the two peak effect is more noticeable (1993, 1994) than in others (1998). The first peak corresponds closely to the peak periods for Black and Surf Scoters. Also, Brock (1997) reports the median date for Lake Michigan is within the first peak seen at HBSP. We speculate that these separated peaks may represent two transient groups and may be different populations. The late median date for the fall flight (11 December) is due largely to the magnitude of the second peak period. The migration tapers off in January, but they remain numerous, and the number seen remains constant until the end of February, averaging about 300 per day in winter. In March, numbers decrease, indicating northward migration with no influx of coastal spring migrants.

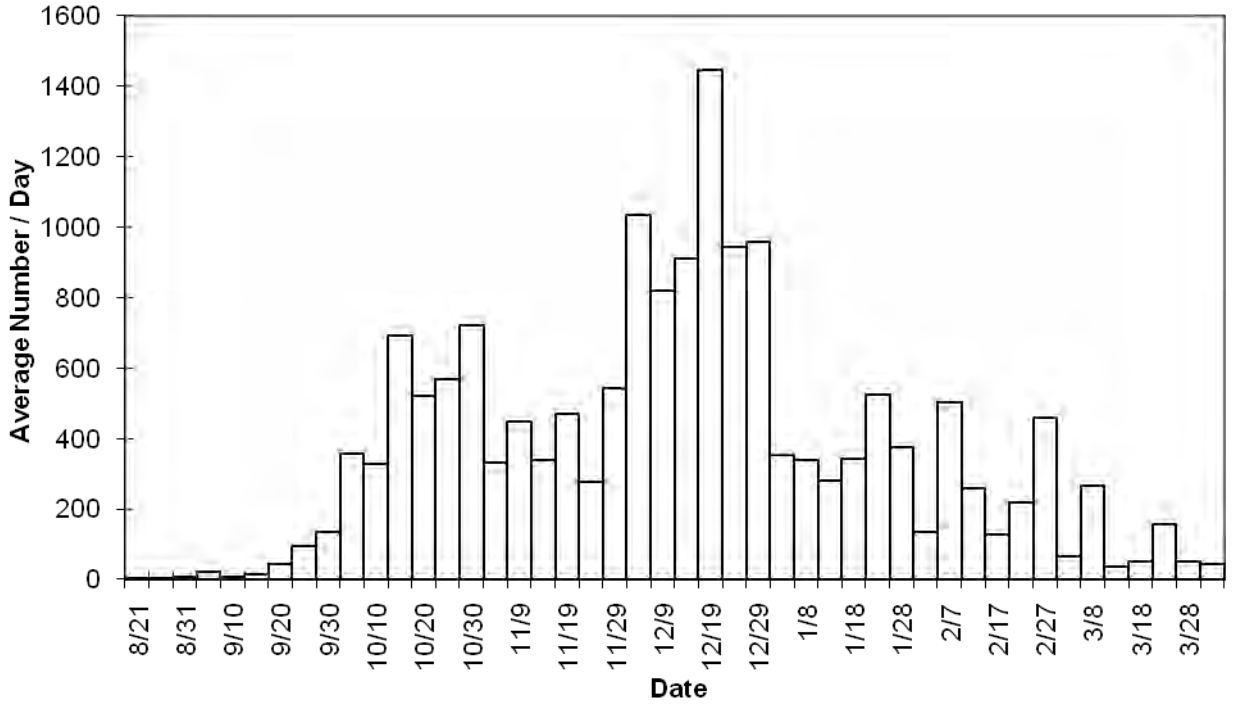
Flight Characteristics: White-winged Scoter has a predominantly westward migration (61.8%). There is less eastward movement on a daily basis, but large easterly flights (>1,000) have occurred. These usually takes place after days of significant westerly movement, and would seem to indicate that there is an incursion of White-winged Scoters onto the lake and subsequent movement along the south shore to staging areas or a continuation of migration.

This species is a distant migrant, with flocks seldom closer than 1/4 mile from shore. Flock size is moderate to large, with flocks in excess of 300 occurring during peak movements. This species is an early morning migrant, with the peak movement occurring during the first two hours of daylight. There is an immediate push after first light and a tapering off afterward, with almost no movements taking place during the middle of the day. Limited movement takes place the last couple hours of daylight on days of heavy migration.

Resting and feeding White-winged Scoters can be observed on calm days with negligible distortion, and sometimes stretch almost the length of the visible horizon, with numbers exceeding 1,000. They form scattered groups, unlike the concentrated rafts formed by Greater Scaup.

Weather Factors: Approximately 35% of all White-winged Scoters are seen 2 to 3 days after the passage of a cold front, thus showing a weak but measurable influence of weather. Since they are low altitude and distant migrants, fog, heat shimmer, and precipitation play a role in undercounting.

White-winged Scoter 1993-1999						
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	31265	63.9	2024	26-Oct			
94	32239	48.8	3285	15-Oct	15-Aug		
95	21420	55.9	1690	26-Feb	20-Aug		
96	19833	53.4	1405	26-Oct	15-Aug		
97	76704		8631	9-Dec			
98	85797	62.2	7324	14-Dec			
99	75574	70.2	5523	1-Dec			
Ave (Aug-Dec)	60600	61.8					
Ave (Aug-Mar)	82900					11-Dec	30 Sep - 27 Feb

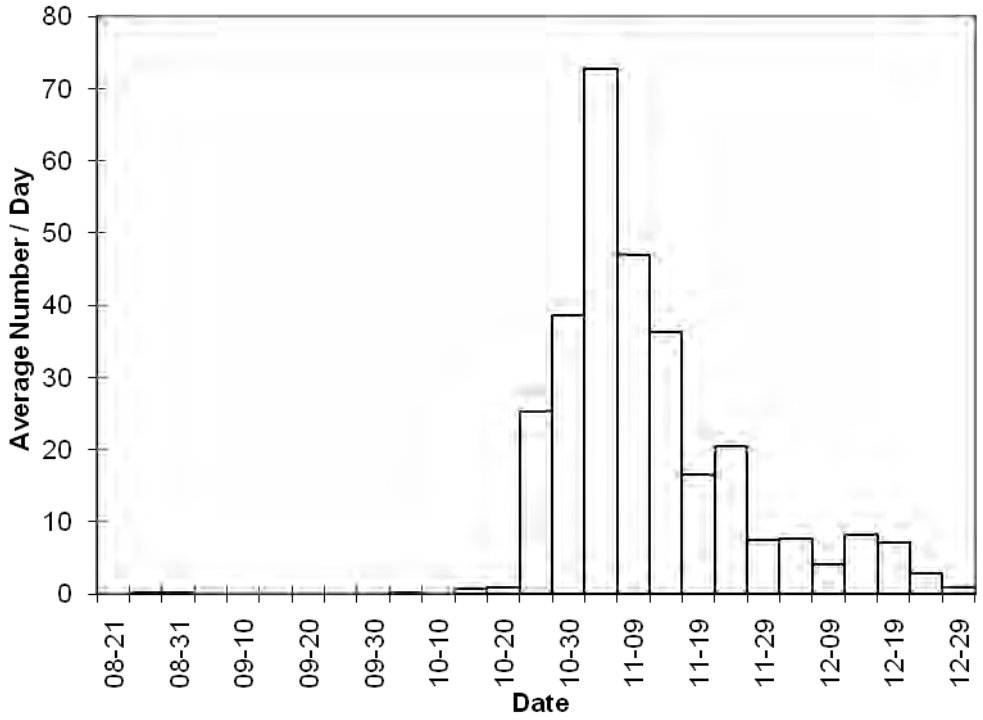


BUFFLEHEAD (*Bucephala albeola*)

Status: Annual, very common fall migrant and uncommon to common winter visitor.

Occurrence: Bufflehead has a very precise timing distribution with a rapid buildup and a slower decrease. The transient population totals about 1000 birds with a median date of 7 Nov and a short peak period of 19 days. They are present throughout the winter in very small numbers. A few usually winter at Hamlin Beach, feeding amid the jetties. Brock (1997) reports Bufflehead is a common wintering duck on Lake Michigan.

Bufflehead 1993-1999						
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	785		169	31-Oct	10-Oct	2-Nov	23 Oct - 11 Nov
94	1588	66.8	292	1-Nov	28-Sep	8-Nov	31 Oct - 16 Nov
95	1242		198	1-Nov	16-Oct	5-Nov	26 Oct - 10 Nov
96	855	74.7	206	3-Nov	24-Aug	4-Nov	27 Oct - 13 Nov
97	1590		172	8-Nov	2-Oct	9-Nov	24 Oct - 13 Nov
98	1435	72.6	180	13-Nov	21-Oct	14-Nov	28 Oct - 6 Dec
99	2603	82.6	639	4-Nov	12-Oct	5-Nov	25 Oct - 8 Nov
Average	1490	75.5				7-Nov	24 Oct - 11 Nov

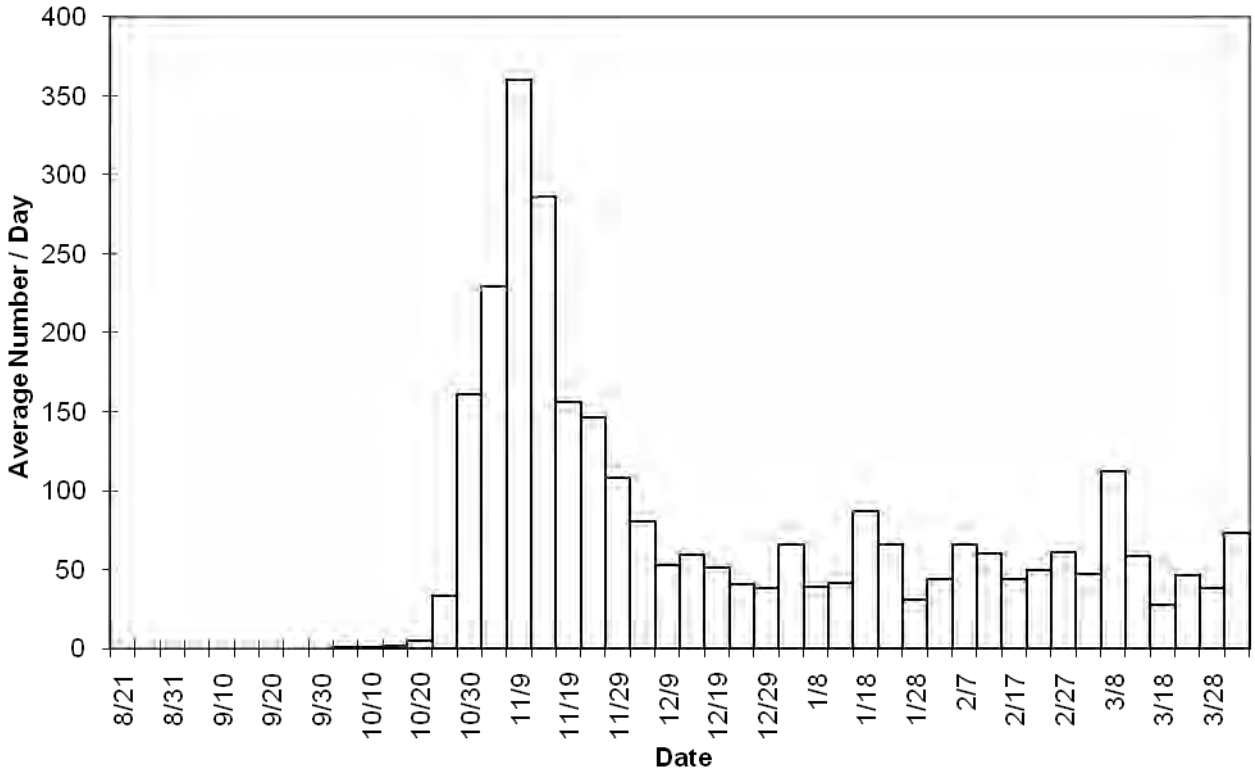


COMMON GOLDENEYE (*Bucephala clangula*)

Status: Annual abundant fall migrant and common to very common winter resident.

Occurrence: Common Goldeneye show a classic timing distribution with a transient migrant group passing through between 29 Oct and 24 Nov and a distinct wintering population of about 60 birds seen per day. The transient population would average about 7000 birds. They arrive about the first week of October. Overall, their timing is similar to that of Red-breasted Merganser. Usually seen in small groups any distance from shore, and are found feeding relatively close to shore throughout the fall and winter. During winter they feed in loosely connected small groups. There is no influx of spring migrants.

Common Goldeneye 1993-1999						
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date***	**Peak Period**
93	4410	68.1	334	21-Nov	5-Oct		
94	9609	75.7	1047	12-Nov	15-Oct		
95	7626	85.3	819	9-Nov	12-Oct		
96	5589	84.2	580	3-Nov	7-Oct		
97	10877		1156	7-Nov	5-Oct		
98	12082	71.5	946	13-Nov	12-Oct		
99	9854	78.2	508	6-Nov	7-Oct		
Ave (Aug-Dec)	9203	76.7				14-Nov	Oct 29 - 24 Nov
Ave (Aug-Mar)	14000					25-Nov	

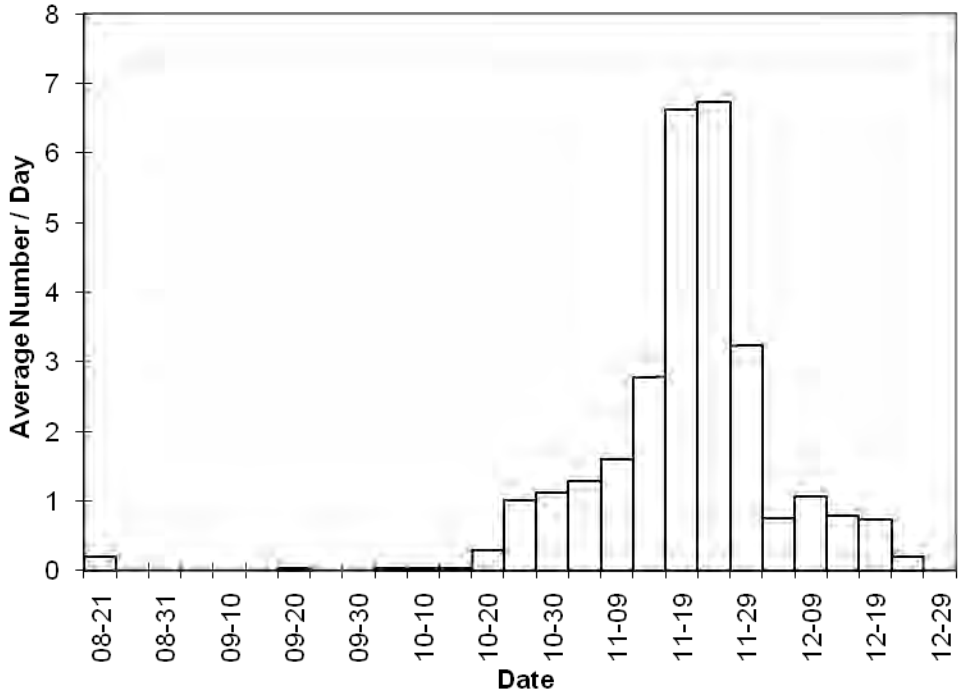


HOODED MERGANSER (*Lophodytes cucullatus*)

Status: Annual, fairly common to common fall migrants.

Occurrence: Very few Hooded Mergansers are seen on Lake Ontario in the fall. For a species with a very extensive breeding range north of this great lake, this is a surprising outcome. The main migration is either flying over the lake, going around the lake, or migrates at night. They tend to concentrate in fall in large numbers on the Finger Lakes (Fox 1998). Those that do occur show consistent timing with a median date of 19 Nov and a peak period from 8 Nov to 27 Nov. They tend to occur in flocks of 10 to 30, near shore, and high off the water.

Hooded Merganser 1993-1999								
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	75		41	21-Nov	10-Oct	21-Nov	21 Nov - 26 Nov	9-Dec
94	72	52.8	17	27-Nov	13-Oct	1-Oct	20 Sep - 14 Oct	10-Dec
95	161		82	23-Nov	20-Aug	23-Nov	12 Nov - 23 Nov	6-Dec
96	66	62.1	19	14-Nov	18-Aug	14-Nov	3 Nov - 17 Nov	29-Nov
97	350		72	18-Nov	19-Oct	19-Nov	18 Nov - 26 nov	12-Nov
98	174	62.1	20	18-Nov	17-Sep	18-Nov	24 Octr - 25 Nov	20-Dec
99	77	63.6	15	4-Nov	24-Oct	11-Nov	24 Oct - 2 Dec	31-Dec
Average	143	61.7				19-Nov	8 Nov - 27 Nov	



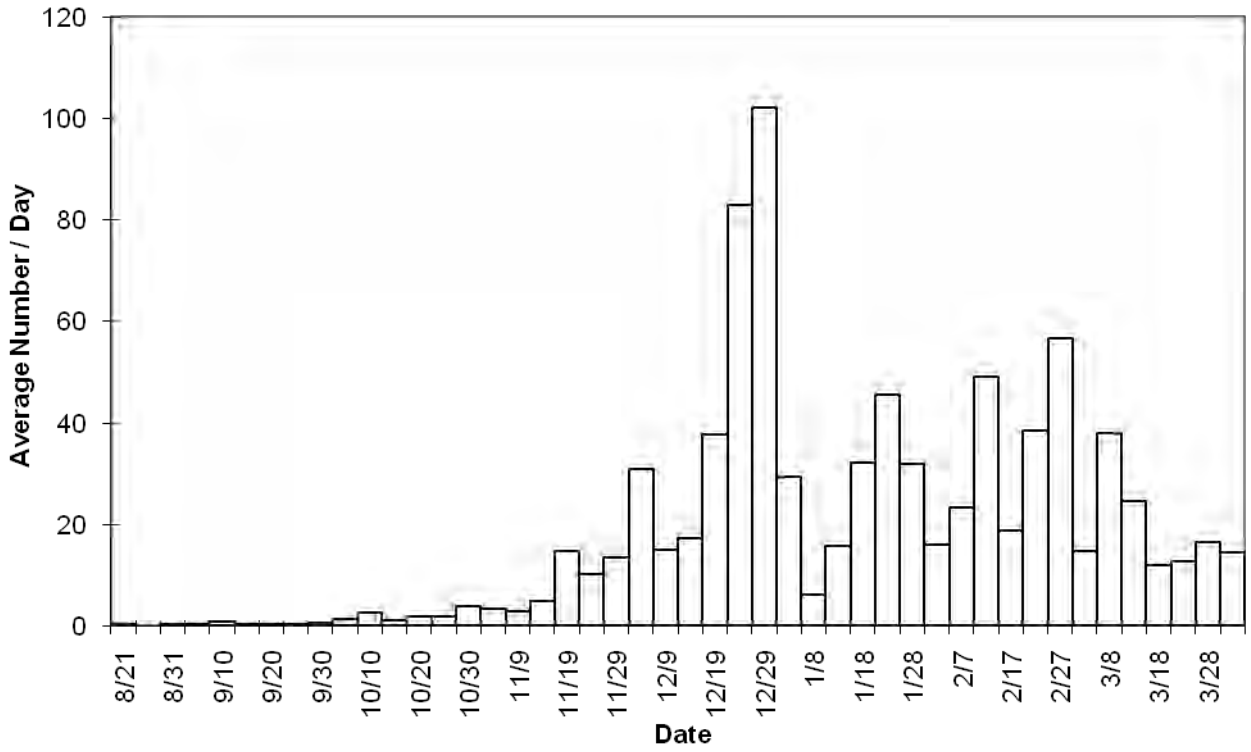
COMMON MERGANSER (*Mergus merganser*)

Status: Annual, very common to abundant fall migrant and very common winter visitor.

Occurrence: As a migrant species on Lake Ontario, the occurrence of Common Merganser is similar to Greater Scaup. There is a clear buildup in fall but they continue to move past Hamlin Beach in a regular pattern throughout the fall and winter. The population does not form a truly stationary winter presence. They are predominately westward migrants and move with favorable weather. We believe that they will linger if weather remains mild but move with cold conditions. The timing distribution implies this effect.

They are a near shore migrant and fly high off the water in homogeneous flocks, but occasionally mix with Red-breasted Mergansers. Known to be more numerous at certain places along the lakeshore, such as Ontario Beach Park in Monroe Co.

Common Merganser 1993-1999						
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**
93	297		33	13-Dec			
94	278	59.3	36	24-Nov	5-Sep		
95	1564		699	30-Nov	18-Aug		
96	762	57.6	128	29-Nov	14-Sep		
97	1380		126	12-Dec	9-Sep		
98	1071	85.7	391	27-Dec	14-Sep		
99	1443	76.2	310	24-Dec	16-Sep		
Ave (Aug-Dec)	1823	73.7					
Ave (Aug-Mar)	4170					16-Jan	



RED-BREASTED MERGANSER (*Mergus serrator*)

Status: Annual, abundant fall migrant and common to very common winter visitor

Occurrence: First fall birds arrive in August but the major part of migration begins early October. The transient population averages about 16,000 with a median date of 14 Nov and an average peak period of about one month. Usually seen in homogeneous flocks of 20 to 100 flying west and low off the water, primarily near shore.

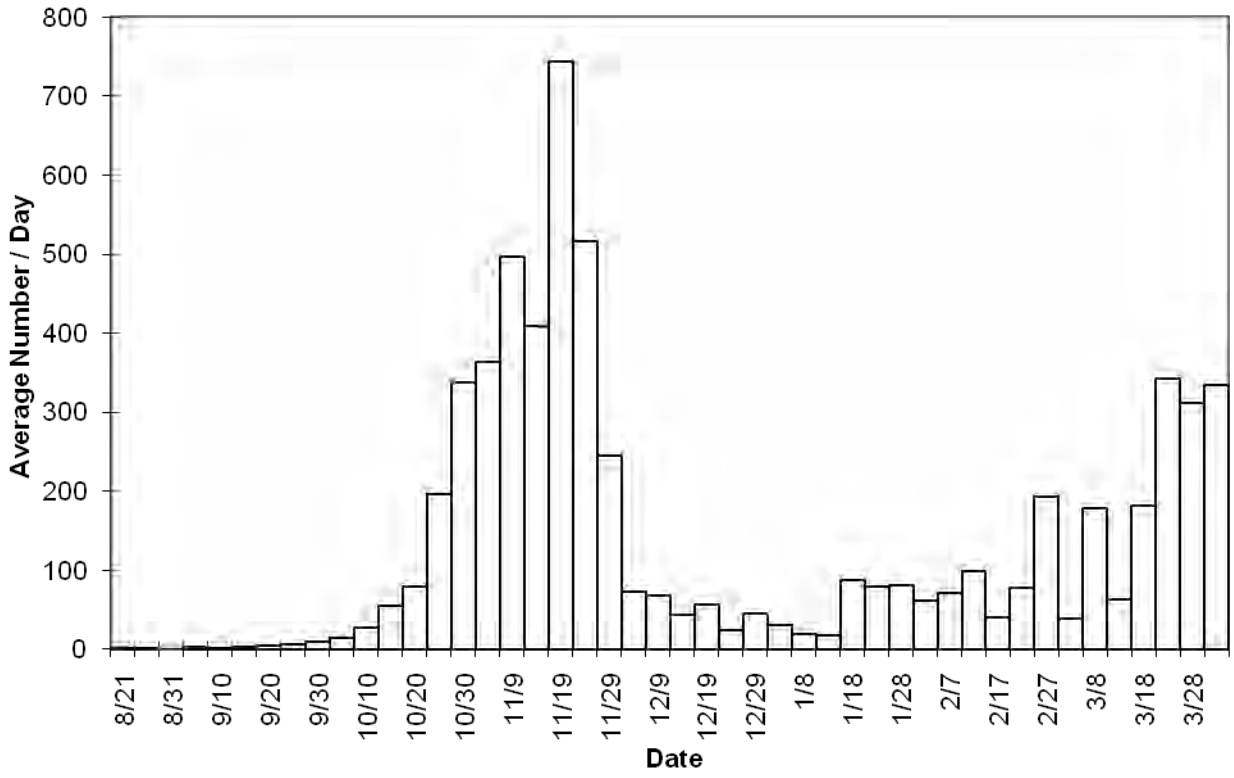
Present throughout the winter, with daily counts averaging about 75. Usually seen as small groups and routinely feeds all along the Lake Ontario shore. In spring, they return to Lake Ontario beginning in late February; numbers build during March.

RUDDY DUCK (*Oxyura jamaicensis*)

Status: Annual, rare to uncommon fall migrant.

Occurrence:. Ruddy Duck does not appear to be a regular migrant on Lake Ontario in fall with one to three seen annually. In 1997, 22 were seen, 13 in one flock. This was an unusually high annual count but the species is difficult to detect.

Red-breasted Merganser 1993-1999						
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date***	**Peak Period**
93	10527	82.9	1083	31-Oct		31-Oct	20 Oct - 8 Nov
94	11171	74.3	637	13-Nov	4-Sep	8-Nov	24 Oct - 23 Nov
95	18982	82.0	1259	9-Nov	15-Aug	10-Nov	2 Nov - 24 Nov
96	16152	88.7	1201	16-Nov	16-Aug	6-Nov	26 Oct - 16 Nov
97	31111		7885	19-Nov		19-Nov	4 Nov - 24 Nov
98	17062	89.6	1711	18-Nov		8-Nov	9 Nov - 30 Nov
99	25389	88.0	3584	22-Nov		15-Nov	2 Nov - 23 Nov
Ave (Aug-Dec)	19058	85.2				14-Nov	29 Oct - 24 Nov
Ave (Aug-Mar)	28940						



JAEGERS

Jaegers migration shows significant challenge. There is substantial variation in numbers from year to year. In addition, they pose identification problems in terms of separating the species. At HBP, 39 % of jaegers remain unidentified. This is due to plumage and behavioral similarities and the distance of observation. Observer experience also plays a large role in the ability to identify these species.

Jaegers can be any distance from shore and have very rarely landed on the beach in front of the lookout. They usually tend to migrate low over the water and will frequently chase Ring-billed Gulls but chases are of very short duration and are most likely unsuccessful. In some cases, they will remain in the area of HBSP for several hours. Occasionally, they are found on the water in the early morning. But statistical analysis of their time of appearance at HBSP shows that it is uniformly random with respect to time of day.

Total Jaeger Count					
Year	**Long-Tailed**	**Parasitic**	**Pomarine**	**Unidentified**	**Total**
1993		8	2	4	14
1994		14		1	15
1995		5		1	6
1996		126	34	77	237
1997		30	14	60	104
1998		9	2	14	25
1999	2	85	23	67	177

POMARINE JAEGER (*Stercorarius pomarinus*)

Status: Irregular, uncommon fall migrant.

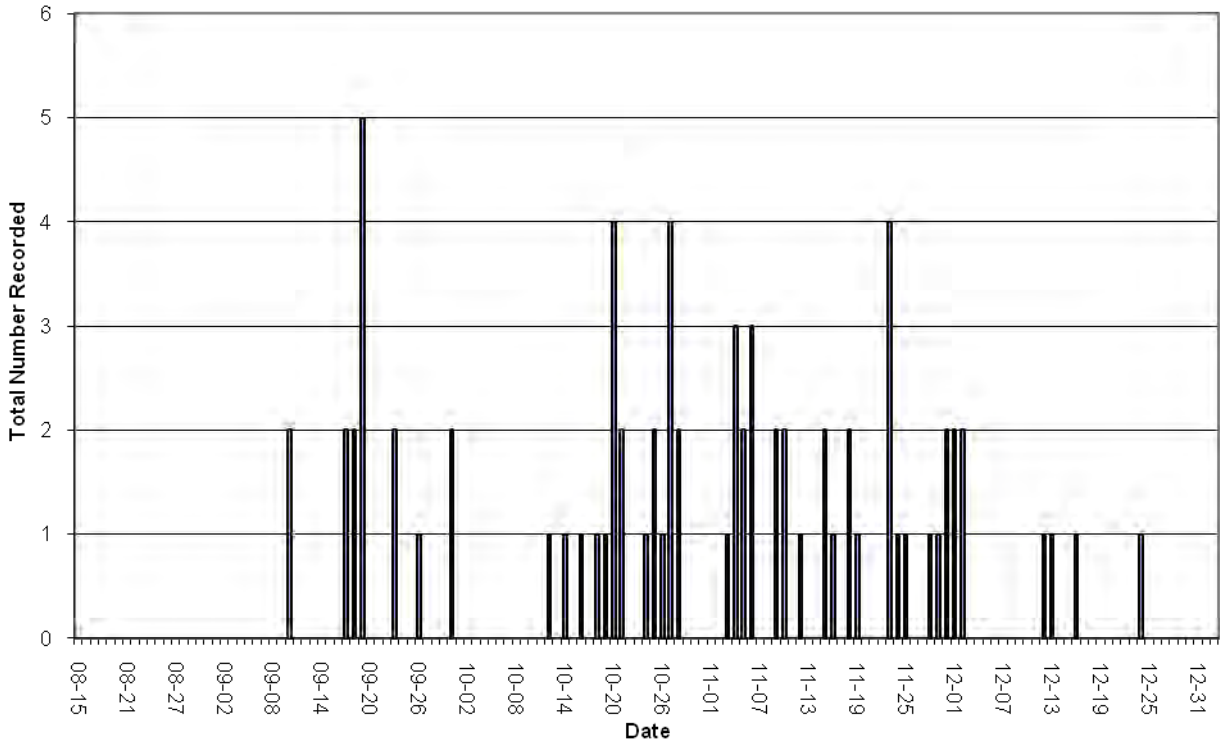
Occurrence: A total of 75 records over the past 7 years have a median date of 28 Oct and a peak period of 12 Oct to 2 Dec. Brock (1997) gives a median date of 2 Nov for Lake Michigan. These dates are considerably later than the previous estimated median date of 13 Oct (Sherony 1999). There are several possible reasons for this change: observers have become more cautious about identifying Pomarine Jaegers, the jaeger flight in 1999 was late, and finally, the population is too small to give precise estimates. There are 16 September records. This small group is separated from those seen during the peak period. Almost all individuals seen are juveniles. Most often, Pomarine Jaegers fly straight through. They have a very high westward directional bias. The data form HBSP indicates that during the peak period of 12 Oct to 2 Dec, there is a 10% chance of seeing one pass on any single day.

LONG-TAILED JAEGER (*Stercorarius longicaudus*)

Status: Casual fall migrant.

Occurrence: Two documented records: 18 Aug 99, 29 Aug 99. These records are prior to the start of the lakewatch. Another record occurred prior to the lakewatch, on 30 Aug 84. All were juveniles, all seen flying east. The bird of 18 Aug 99 landed in the water off the lookout. The bird of 29 Aug 99 spiraled up out of sight.

Pomarine Jaeger 1993-1999							
Year	**Count**	**Percent West**	**Single day high count**	**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	2			10-Oct			15-Nov
94	0						
95	0						
96	34		5 19-Sep	10-Sep			2-Dec
97	14		2 28-Oct	23-Sep			16-Dec
98	2		2 28-Oct	28-Oct			28-Oct
99	23		3 27-Oct	18-Oct			24-Dec
Average	12				28-Oct	12 Oct - 2 Dec	



PARASITIC JAEGER (*Stercorarius parasiticus*)

Status: Annual, fairly common to uncommon fall migrant.

Occurrence: Although we have had an average of 43 per year, the annual total ranges for 5 to 126. Annual numbers are consistently cyclic. Two possible causes are either years of low fledgling success or the migration drifts across the Great Lakes region and they are more common in some other more distant region. There is supporting evidence for this later explanation (Sherony and Brock 1997).

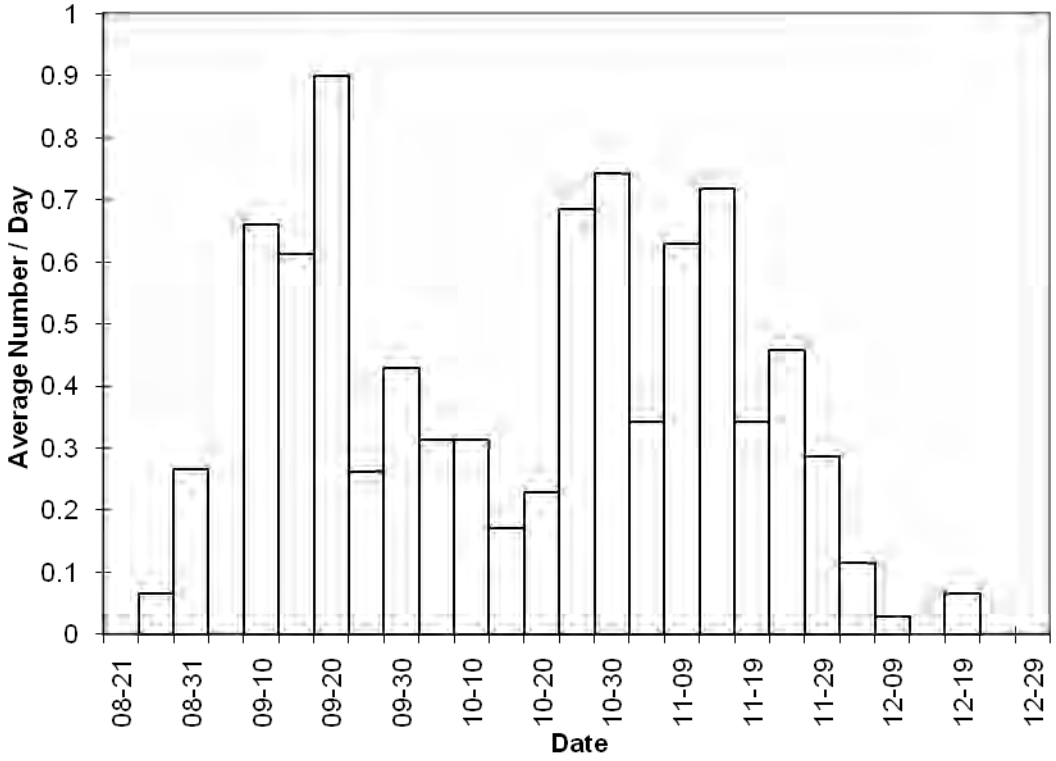
The population data implies two peaks for the past seven years. This was caused by the fact that jaegers had a large late flight in 1999. If we include the 1999 data, the median date is 22 Oct. With the 1999 data excluded, the median date is 2 Oct. This second estimate compares very favorably with a previously published result of 3 Oct which was an average of 20 years of data throughout Lake Ontario (Sherony 1999). The 1999 year, which was a warm year, had a median date of 6 Nov. Brock (1997) gives a median date of 14 Oct for Lake Michigan migrants.

In an average year, the peak period is 22 Sep to 27 Oct (Sherony 1999). The expansion of the peak period for this analysis was caused by the late jaeger push in 1999. The probability of seeing a Parasitic Jaeger at HBSP during the normal peak period is 21% assuming four hours of observation on any given day. This probability is enhanced by selecting the appropriate day with respect to frontal passage but it is degraded in years when jaegers are generally scarce.

Parasitic Jaegers typically arrive one to two days after a cold front passes through. Most birds seen are juveniles. Early in the season, Parasitic Jaegers tend to move east and later birds are much more likely to head west but on average, 70% are seen going west. They usually pursue Ring-billed Gulls but there is one observation of a Parasitic Jaeger chasing a Bonaparte's Gull. There are two records of a Parasitic Jaeger seen overland south of HBSP and one sighting of a jaeger circling upward over the lake and leaving the lookout area by heading south.

.

Parasitic Jaeger 1993-1999								
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	8		3	5-Oct	5-Oct			24-Nov
94	14	100.0	13	10-Sep	27-Aug			27-Oct
95	5		2	3-Oct	3-Oct			26-Oct
96	126	57.9	11	22-Nov	25-Aug	30-Sep	10 Sep - 4 Nov	5-Dec
97	30		4	22-Oct	15-Sep			18-Dec
98	9	77.0			22-Sep			13-Nov
99	85	77.6	9	25-Nov	11-Sep	6-Nov	24 Oct - 16 Nov	25-Nov
Average	43	69.2				22-Oct	10 Sep - 7 Nov	



FRANKLIN'S GULL: (*Larus pipixcan*)

Status: Irregular, rare fall migrant.

Occurrence: Three records: 14 Oct 1995, 13 and 14 Nov 1998. The later two records are coincident with the November, 1998 incursion of Franklin's Gulls in the northeast due to severe winds the previous week.

LITTLE GULL: (*Larus minutus*)

Status: Annual, uncommon to fairly common fall migrant.

Occurrence: About 30 Little Gulls are counted annually at HBSP. They appear with migrating Bonaparte's Gulls. Their peak period is within the peak timing for Bonaparte's gulls but their median date of occurrence, 20 Nov, is earlier by 12 days. They do not normally linger into winter. A very high percentage are seen flying west (95%), usually at medium distance from the lookout. They usually appear singly; annually, several occur on the same day.

Dates of first appearance at HBSP are usually between the last week of October and the first week of November. However, they are usually found at Ontario Beach Park in Monroe County, about 25 miles east of HBSP, in August and September. Apparently, Little Gulls move into Lake Ontario and remain stationary as long as weather conditions and food availability are adequate. The birds seen at HBSP are those that have initiated migration west. In warmer years, they frequently stage at Ontario Beach Park and off Durand Eastman Park and can remain into January.

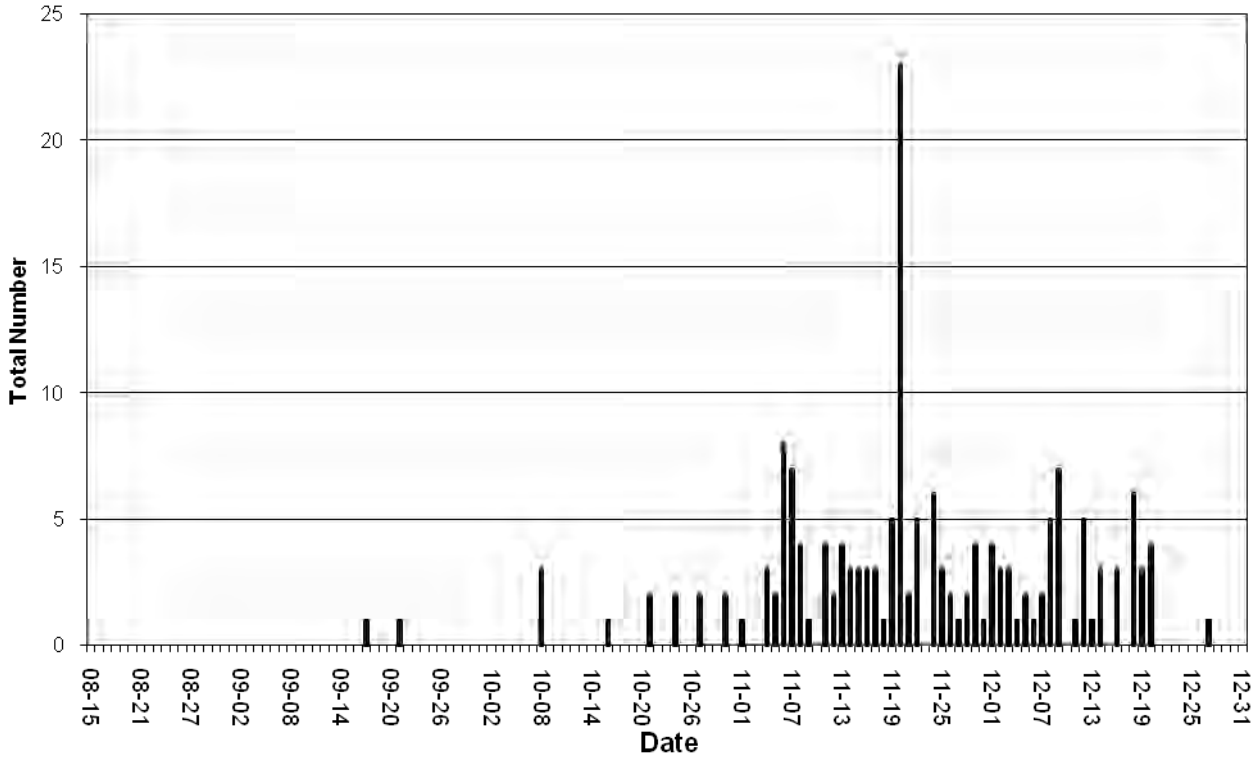
Weather Factors: The weather factors influencing their migration are similar to those for Bonaparte's Gull. However, with Little Gull, there is an additional late peak in their movements with respect to fronts, yielding a pattern also similar to Pintail shown in Figure 9.

BLACK-HEADED GULL (*Larus ridibundus*)

Status: Irregular, rare fall migrant.

Occurrence: There have been 11 records of Black-headed Gull: 1997- 4 Sep, 21 Sep, 9 Oct, 1 Nov, 29 Nov, and 2 on 14 Dec; 1998 - 8 Oct and 25 Nov; 1999 - 12 Oct and 19 Oct. A rare gull, all birds seen flying west. Usually seen on days when Bonaparte's Gulls are migrating.

Little Gull 1993-1999								
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	2							
94	2				21-Oct			
95	9				7-Nov			7-Dec
96	18	100.0	5	24-Nov	4-Nov			14-Dec
97	83		22	20-Nov	17-Sep			20-Dec
98	23	86.9	3	13-Nov	21-Oct			27-Dec
99	35	97.1	8	6-Nov	24-Oct			18-Dec
Average	28					20-Nov	16 Nov - 9 Dec	



BONAPARTE'S GULL (*Larus philadelphia*)

Status: Annual fall migrant and fairly common to abundant winter visitor.

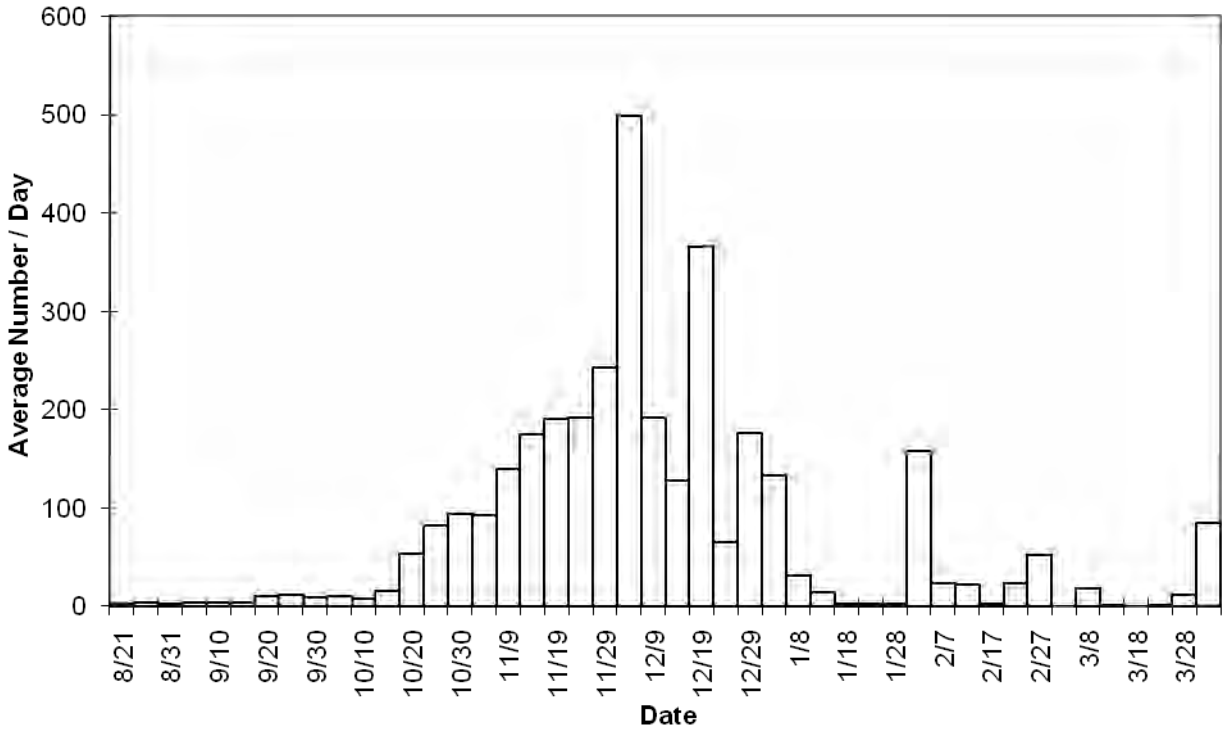
Occurrence: On average, the annual transient population is about 13,000 but could be as high as 20,000 due to undercounting in earlier years. Since they migrate west, it is believed that they reach the Niagara River. This population would make up about 10% to 20% of the Bonaparte's Gulls seen on the river (Levine 1998). The median date over the last seven years is 2 Dec, one of the later migrants on Lake Ontario. Experience has shown that they will delay migration if weather conditions remain warm in the lake region as shown in their timing histogram by the winter movements. Annually, we have peak days of 1000 to 5000.

Brock (1997) found two peaks for Bonaparte's Gull on Lake Michigan. The first was a small population occurring on 12 Aug and the bulk of migration had a median date of 4 Nov. This is considerably earlier than the experience at HBSP.

They migrate in loosely connected flocks, flying low to medium altitude above the water. They can occur from close to moderate distance from the lookout. Often they fly along the shoreline. Occasionally, they feed off Hamlin Beach. Normally, highest counts are in the early morning.

Weather factors: During their main period of migration Bonaparte’s Gulls are seen daily but 62% of the population occur one, two or three days after the passage of a front. They are seen migrating west into west winds but days when highest counts are recorded usually have a southwest or southeast wind.

Bonaparte's Gull 1993-1999								
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	1064		64	1-Dec				
94	2747	84.0	258	2-Dec	15-Aug			
95	3809		472	24-Nov	17-Aug			19-Jan
96	5361	89.2	970	4-Nov	15-Aug			15-Dec
97	32018		5750	2-Dec				10-Jan
98	18131	98.3	1956	13-Nov				
99	20349	86.6	3308	1-Dec				6-Feb
Ave (Aug-Dec)	14438	90.8						
Ave (Aug-Mar)	16300					2-Dec		



THAYER'S GULL (*Larus thayeri*)

Status: Irregular, rare fall migrant.

Occurrence: Occasional fall visitor. Three records, all observed at close range, some seen standing on the beach in front of the lookout: 9 Nov 97, 16 Dec 97, 17 Nov 99.

ICELAND GULL (*Larus glaucoides*)

Status: Irregular, rare fall migrant.

Occurrence: Rare fall migrant, annual since 1997. Seen four of the last seven years but tending to become more common in recent years. Total of 16 recorded; highest count of 9 in 1997; earliest record is 4 Nov 97 and latest is 16 Dec 97.

LESSER BLACK-BACKED GULL (*Larus fuscus*)

Status: Irregular, rare fall migrant.

Occurrence: Five records: 8 Dec 95, 14 Dec 97, 8 Oct 99, 9 Oct 99, and 25 Oct 99.

GLAUCOUS GULL (*Larus hyperboreus*)

Status: Irregular, rare fall migrant.

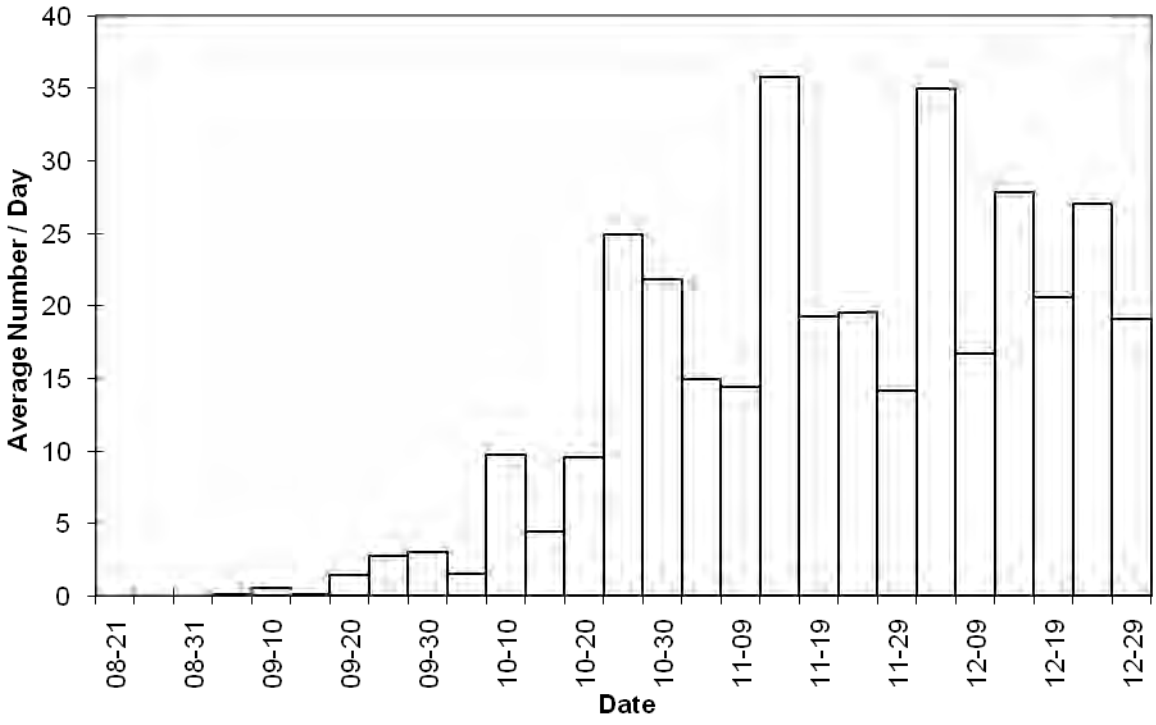
Occurrence: Seen annually since 1995, total of 16 records. Peak number was 7 in 1998. Earliest date: 9 Oct 97, latest date: 30 Dec 99.

GREAT BLACK-BACKED GULL (*Larus marinus*)

Status: Annual, common to very common fall migrant and winter visitor.

Occurrence: Counts of Great Black-backed Gull started in 1997. Although our data is sparse, we see an average of about 1700 between late September and 31 December. However, they continue to move past during winter. Almost all seen are moving west.

Great Black-backed Gull 1997-1999						
Year	**Count**	**Percent West**	**Single day high count**	**First Date**	**Median Date**	**Peak Period**
93						
94						
95						
96						
97	939		239	1-Dec		
98	2498		170	24-Oct	28-Sep	
99	1408	88.4	101	27-Dec	5-Sep	
Average	1738					



BLACK-LEGGED KITTIWAKE (*Rissa tridactyla*)

Status: Irregular, uncommon to fairly common fall migrant.

Occurrence: Seen almost annually, immature Black-Legged Kittiwakes are observed with Bonaparte's Gulls. There are very few observations of adults. Annual timing of migration is almost identical to that of Little Gull, thus median date earlier than that of Bonaparte's Gull but our sample size is too small to draw firm conclusions. Annually about 20 seen but numbers are very cyclic with none seen in some years. Highest single count day was 18 on 9 Nov 1997. Usually observed at close to medium distance from shore, occasionally they will follow the shoreline. Usually seen flying low above the water, riding the wave troughs.

During the peak period of migration from 8 Nov to 24 Nov, there is a 21 % chance of seeing one on any given day based on the lakewatch records. These chances are improved by selecting the three-day period beginning on the passage of a strong cold front.

Weather Factors: Thirty-five percent of all records occur two days after the passage of a front. Species is unusual in that they occur more than expected on the day of frontal passage. Most birds seen on windy days (wind speed at 20 mph or more). Usually occur on northwest winds but can occur on southwest or northeast winds.

ROSS'S GULL (*Rhodostethia rosea*)

Status: Casual very rare vagrant.

Occurrence: One record. Immature observed on 9 Nov 97, seen following two Black-Legged Kittiwakes. Another sighting believed to be the same bird observed on 20 Nov 97. On this second appearance, the bird spent the entire afternoon in front of the lookout feeding and resting on the lake. It was not seen again after that.

SABINE'S GULL (*Xena sabini*)

Status: Casual very rare migrant.

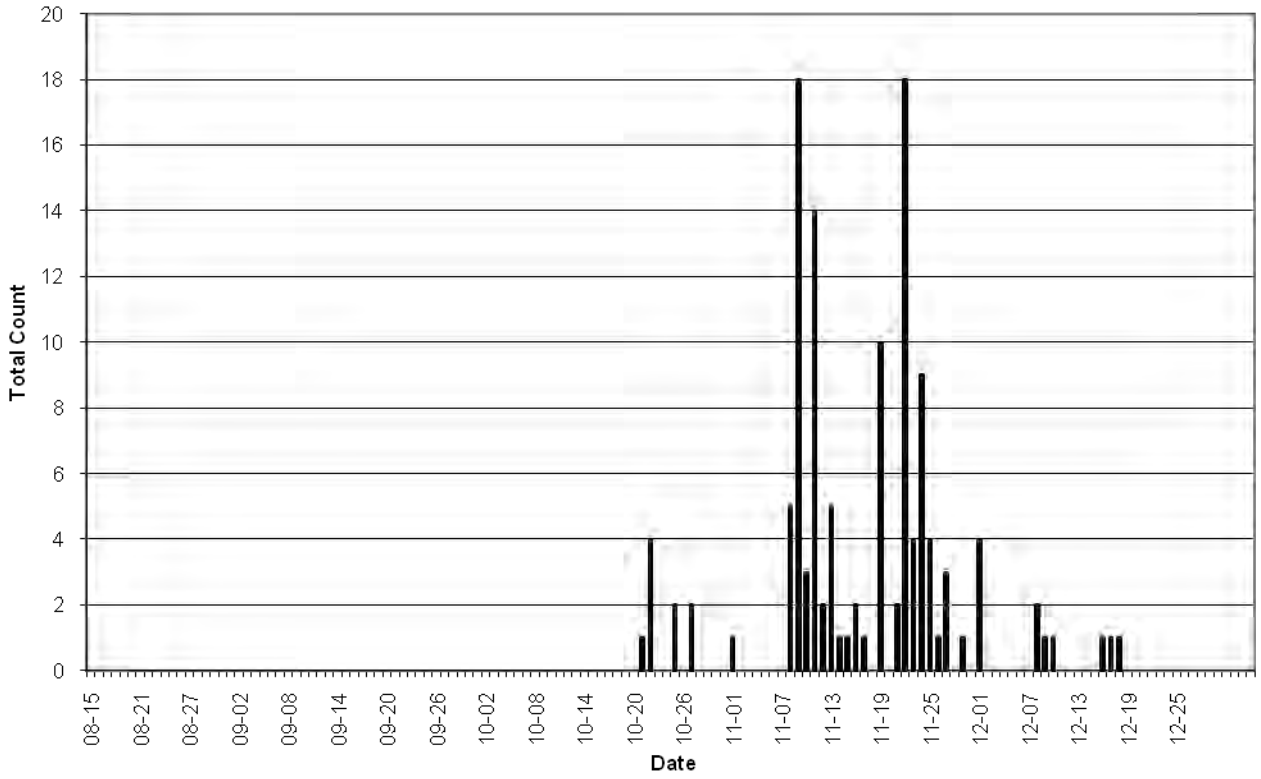
Occurrence: Three records. All first year birds observed on 14 Oct 93, 15 Sep 97, and 24 Nov 97. Seen more frequently on the Niagara River than at Hamlin Beach State Park. Observations suggest that they migrate far from shore and most go by unseen.

IVORY GULL (*Pagophila eburnea*)

Status: Casual very rare vagrant.

Occurrence: One record, 31 Dec 1999.

Black-legged Kittiwake 1993-1999								
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	0							
94	0							
95	13		10	19-Nov	19-Nov			26-Nov
96	27	96.2	16	22-Nov	10-Nov			8-Dec
97	66		18	9-Nov	21-Oct			16-Dec
98	11	100.0	5	13-Nov	1-Nov			28-Nov
99	8	87.5	2	27-Oct	27-Oct			18-Dec
Average	19	95.6				19-Nov	8 Nov - 24 Nov	



92

COMMON TERN (*Sterna hirundo*)

Status: Annual fairly common to common fall migrants.

Occurrence: Common Terns migrate later than Caspian Terns although their arrival is prior to 15 Aug. From our data, which is incomplete, we would estimate a peak period of 21 Aug to 10 Sep and latest dates between the end of October and early November.

ARCTIC TERN (*Sterna paradisaea*)

Status: Casual, very rare fall migrant.

Occurrence: Two records: 14 Oct 93, 5 Oct 99.

FORSTER'S TERN (*Sterna forsteri*)

Status: Annual, uncommon fall migrant.

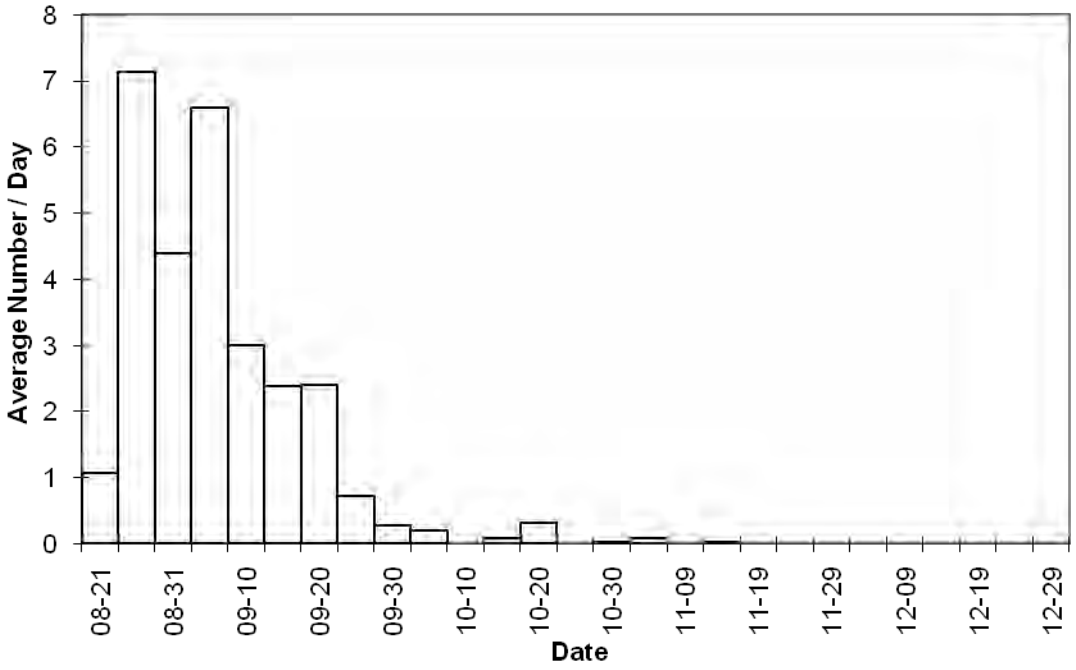
Occurrence: Seen every year at HBSP except 1993. Normally 1 to 10 recorded annually but 65 seen in 1996 was exceptional. Earliest and latest dates were 25 Aug 95 and 4 Nov 99. Peak period of migration is 9 Sep to 19 Sep.

LEAST TERN (*Sterna antillarum*)

Status: Casual, very rare fall migrant.

Occurrence: One record on 25 Oct 95 of an immature seen following the passage of a warm front the previous day.

Common Tern 1993-1999								
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Peak Period**	**Last Date**
93	4							
94	97		30	30-Aug	15-Aug	30-Aug	15 Aug - 31 Aug	18-Sep
95	83		34	22-Aug	15-Aug	27-Aug	22 Aug - 16 Sep	18-Oct
96	177		23	26-Aug	15-Aug	31-Aug	22 Aug - 10 Sep	27-Oct
97	166		47	1-Sep		1-Sep	1 Sep - 16 Sep	12-Nov
98	2							20-Sep
99	45		14	12-Sep				3-Nov
Average	144					1-Sep	21 Aug - 10 Sep	



CASPIAN TERN (*Sterna caspia*)

Occurrence: Most terns begin migrating west prior the beginning of the lakewatch. For Caspian Tern, we are only seeing the end of its season. Caspian Tern begins migration in July and latest dates on Lake Ontario are usually in the last two weeks of October.

SOOTY TERN (*Sterna fuscata*)

Status: Accidental, very rare fall vagrant.

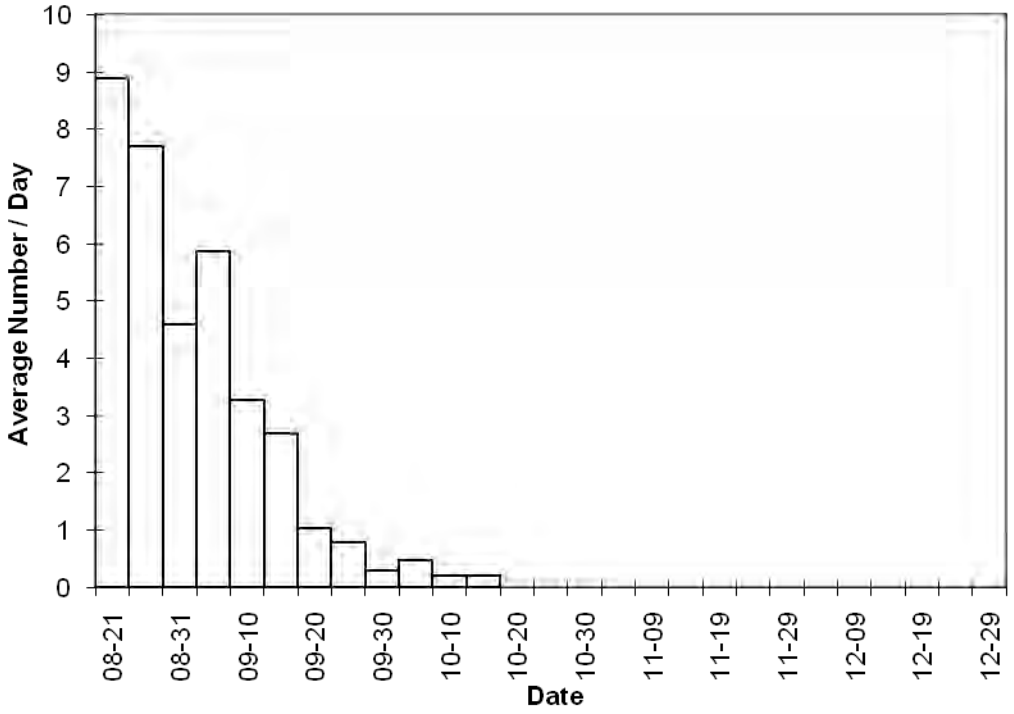
Occurrence: One record on 10 Sep 96, three days after the passage of Hurricane Fran.

ANCIENT MURRELET (*Synthliboramphus antiquus*)

Status: Accidental, very rare vagrant.

Occurrence: One record on 8 Nov 1994 flying west, believed to be the same bird seen off the mouth of the Genesee River, Monroe Co., 31 Oct 1994 (Levine 1998).

Caspian Tern 1994-1999							
Year	**Count**	**Percent West**	**Single day high count**		**First Date**	**Median Date**	**Last Date**
93							
94	107	66.4	26	1-Sep			2-Oct
95	232		48	15-Aug			29-Sep
96	151		23	18-Aug			30-Sep
97	12						1-Oct
98	20						15-Oct
99	31	45.2					11-Oct
Average	131						



ACKNOWLEDGEMENTS

The time and energy expended on a project like the Lakewatch are tremendous. We cannot say enough to thank the many principal observers and assistants for their dedication and professionalism (see Methods - Table 2). William Symonds and John Bounds deserve special recognition for their companionship, commitment and flexibility in helping to cover the watch. William Symonds continues to provide valuable information year-round on the movements past Hamlin Beach. There were a number of people instrumental in establishing Hamlin Beach as a premier site, including Mike Davids, Allen Kemnitzer, Walt Listman, Chip Perrigo, and Steve Taylor. Many other local birders also deserve thanks for providing companionship and assistance throughout the course of the seasons, including: Gary Chapin, Julie Claffey, Anne Clarridge, Kathleen Dalton, Tom Griswold, Bob Grolling, Jack Hartwig, Tom Kretchmer, John Lehr, Bill McGuire, Richard O'hara, Art Tanghe, Bob Voss, Ann Watson, and many more. We also thank Mike Tetlow for reviewing the manuscript and Madison Lee for computer assistance.

We thank Kowa Optimed Inc. for the generous contribution of a TSN-822 spotting scope to the project. Kowa's high quality optics have been a major factor in the increased number of sightings and identifications. Special recognition goes to the Hamlin Beach State Park, the Park Manager, James Slusarcyzk, the park police, and Charlie and Diane for cooperation and assistance in the execution of the watch.

We thank the many supporters of the Lakewatch, without whose efforts and contributions this project would not have been possible. Extremely generous donations were received from individuals who realize the importance of understanding the wildlife in their own area. We thank the local birding and nature organizations for their continued support. The results and information gleaned from these observations may have a far-reaching impact on our "shrinking" natural world.

Most of all, I (BME) would like to thank my wife, Sheryl Ewald, for her unlimited support, understanding, and patience throughout the hours and years of the Lakewatch.

REFERENCES

Able, K. P., ed. 1999. Gatherings of angels: migrating birds and their ecology. Comstock Books. Ithace, NY. 193 pp.

Ahrens, C. D. 1993. Essentials of Meteorology. West Publishing, Minneapolis Saint Paul, Minn. p. 205.

Alerstam, T. 1990. Bird Migration, Cambridge University Press, Cambridge England, 420 pp.

Bellrose, F. C. 1978. Ducks, Geese & Swans of North America, 2nd ed. Stackpole Books, Harrisburg, Pa. 540 pp..

Bent, A. C.1963. Life History of North American Diving Birds. Dover, New York, NY. 239 pp.

Brock, K. J. 1997. Birds of the Indiana Dunes, 2nd ed, Shirley Hazen Environmental Fund, Gary, In. 251 pp.

Evans, B. B. Meade, T. Nix, and S. Kelling. 1994 The fall flight of Common Loons over Cayuga Lake. Kingbird 44:164-169.

Fox, K.A. 1998. The birds of Livingston County, New York. Proc. Of the Roc. Acad. Of Sci., 18: no.4, November 98.

Hochbaum, H. A. 1955. Travels and traditions of waterfowl. Charles T. Branford Co., Newton, Mass. 301 pp.

Kerlinger, P. 1982. The migration of Common Loons through eastern New York. Condor 84:97-100.

_____. 1995. How birds migrate. Stackpole Books, Mechanicsburg, Penn. 228 pp.

Levine, E. ed. 1998. Bull's Birds of New York State. Comstock Pub., Ithaca, NY. 622 pp.

Sabin, W. B. 1995. New York State waterfowl count, January 1995. Kingbird 45:162-167.

_____. 1996. New York State waterfowl count, January 1996. Kingbird 46:193-199.

Sherony, D. F., B. M. Ewald, S. Kelling. Inland fall migration of Red-throated Loons. J. of Field Ornithology. 71:310-320.

Sherony, D. 1999. The fall migration of jaegers on Lake Ontario. J. of Field Ornithology. 70: 33-41.

Sherony, D. F., K. J. Brock 1997. Jaeger Migration on the Great Lakes. Birding 29:372-385

Upton, G. J. G. 1985. Accounting for visible migration. in Lecture Notes in Statistics, No. 29, Statistics In Ornithology, ed. B. J. T. Morgan and P. M. North, Springer-Verlag, Berlin. p. 85-89.

Weidensaul, S. 1999. Living on the wing: across the hemisphere with migratory birds. North Point Press, New York, NY. 420 pp.