DIURNAL AND SEASONAL ACTIVITIES OF A POST-BREEDING POPULATION OF GULLS IN SOUTHEASTERN ONTARIO

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Although the breeding biology of the Herring Gull has been extensively studied, the post-breeding activities are less well understood. The Herring Gull undertakes an explosive post-breeding dispersal with direction influenced to some extent by prevailing winds and by the tendency of the birds to follow waterways or coasts. Gross (1940) noted that few of the gulls banded at Kent Island, New Brunswick moved inland and most moved southward. Poor (1943) reported similar findings from colonies in the Gulf of St. Lawrence. Banding data from gulls breeding around Lake Michigan indicated a predominantly easterly post-breeding movement along the Great Lakes-St. Lawrence system which was attributed to the prevailing winds (Smith, 1959). Young birds tended to disperse more widely than adults. Kadlec and Drury (1968) reported extensive data on the distribution of winter banding recoveries of Herring Gulls in relationship to the areas in which the birds were banded.

Schreiber (1968) carried out a study of gull numbers at Bangor, 35 miles northwest of the Maine coastline. He was able to correlate numbers of birds with cloud cover. Clear days were associated with northwest winds which were thought to drive the gulls towards the coast, while the overcast days usually with little wind allowed numbers to increase as the gulls returned.

In the present study we made daily observations on a flock of gulls which congregate daily on the Kingston (Ontario) City Dump during the fall and early winter. Usually around 95 per cent of this fall flock consisted of Herring Gulls (*Larus argentatus*). During September, however, Ring-billed Gulls (*Larus delawarensis*) comprised up to 40 per cent of the flock but after September, only very small numbers of this species were present. The Great Black-backed Gull (*Larus marinus*), the Glaucous Gull (*Larus hyperboreus*), and the Iceland Gull (*Larus glaucoides*) also occur in extremely small numbers, the last two only late in the fall.

The primary aim of this project was to investigate the factors responsible for the daily fluctuations in flock size and for the eventual disappearance of the flock from the Kingston area in early winter. A study in the Kingston area (see Fig. 1), lying midway between the other major areas where Herring Gulls had been studied, would add to an understanding of the continental dispersion pattern of this species.

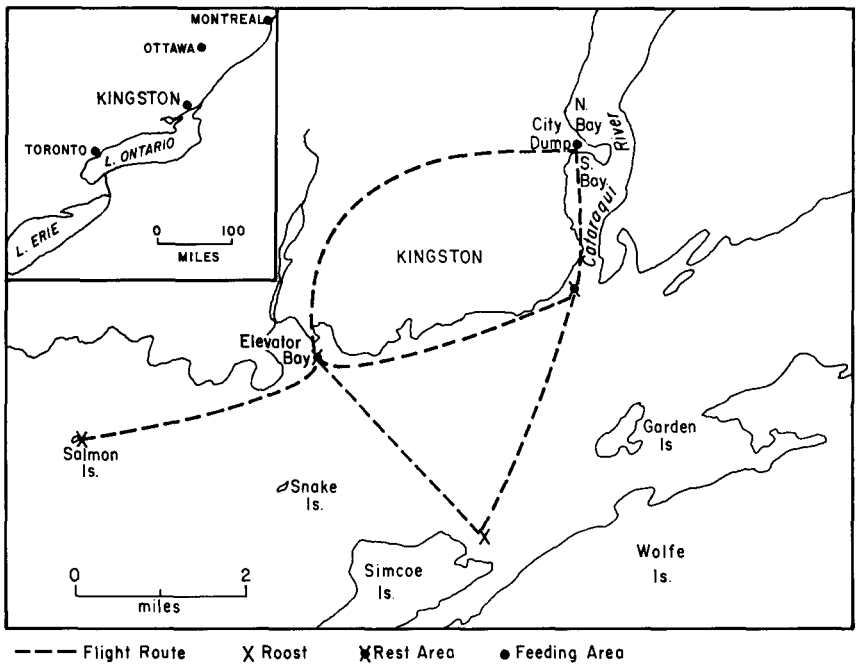

FIG. 1. Map of the Kingston area showing gull flight routes.

METHODS

We made observations from 22 September 1968 to 22 December 1968 and from 22 September 1969 to 10 December 1969. Less regular observations were made in January 1969. In the first season of study we made daily observations at gull concentration areas in the Kingston area. The major area studied was the Kingston City Dump which is the principal feeding site for the gull population. Numbers at this site remained essentially constant between 10:00 and 14:00 each day and we made daily gull counts during this time interval throughout both seasons. With larger flocks, estimates were made.

Weather records were obtained from the Kingston Weather Office, which is located seven miles southwest of the main study area. Weather conditions at 08:00 were used in the tables. The location of the actual roosts in Lake Ontario were found by spotting from the shore and by aerial survey in the late afternoon.

DAILY MOVEMENTS AND BEHAVIOR

The morning feeding flight.—The first of the gulls' daily movements was the flight from the roosting area on Lake Ontario and the islands to the feeding area, i.e. the Kingston City Dump (see Fig. 1). This started just before sunrise and continued over a period of three to four hours. Incoming birds were constantly visible throughout this period, coming in singly or in

TABLE 1

FREQUENCY OF FEEDING IN SAMPLES OF TWO AGE GROUPS OF HERRING GULLS

Date	Time	Loafing		Feeding	
		1st & 2nd	3rd & Adult	1st & 2nd	3rd & Adult
18 November 1969	13:00	40	245	47	80
16 September 1970	13:00	16	188	18	15
17 September 1970	11:30	11	78	6	12
20 October 1970	13:30	32	453	33	67
Total		99	964	104	174

small groups. During the peak movements which occurred in the middle of the period, these groups increased in size (up to 30–40). The groups were not very cohesive and splitting often occurred. The method of flight depended on wind direction and speed although in all cases it was fairly direct with little circling and chasing of one another. Major directions of flight are shown in Figure 1. The easterly route between the Simcoe Island roost and the City Dump was the most used.

Arrival in the feeding area.—On arrival in the dump vicinity, the gulls initially congregated south of the feeding area. They were active at this time. After a build-up in numbers to several hundred, the birds began moving onto the actual dumping area. The first sorties often involved a simple circling of the area and a return to the south bay. This was soon followed by actual landing in the dumping area.

Feeding.—Feeding activity varied throughout the day from a complete cessation to a frenzy of hundreds of birds swirling around the garbage piles. Periods of feeding activity could last for up to half an hour after which most of the birds returned to the loafing areas. There was a tendency to move to water after these sessions and drinking was observed. Schreiber (1967) noted a definite requirement for a supply of fresh water near the feeding area.

The age classes of the Herring Gulls were determined following Dwight (1925). On each of four sample counts it was found that there were a significantly higher proportion of first and second year birds in the feeding groups than were found in the loafing groups (see Table 1). A Chi square value of 534.9 ($P < 0.001$) was obtained. The presence of larger numbers of younger birds on the garbage pile suggests that they spend more time feeding than do older birds. This could be due to lack of dominance and youthful inexperience in food procuring. Drury and Smith (1968) found a definite dominance of adults over younger birds. Immature Herring Gulls

were never observed chasing adults with food although the converse was frequently seen. It seems likely that immature birds would have to remain longer on the garbage pits to meet their nutritional requirements and so would tend to be concentrated in this area.

Loafing.—The birds spend much of the time loafing while in the general area of the dump. Loafing gulls stood or sat in groups. Very little preening activity was observed. Regular commuting between feeding and loafing areas occurred. In the early fall loafing groups could be found in the water of the south bay, along its shores, and on the flat open land around the dump. Gulls rarely loafed on the weedy water of the north bay. Later in the year, however, this section was the first frozen and the north bay became the preferred loafing area. Birds loafed both on the ice and in the water near the ice.

Swarm circling.—A flock of gulls often would rise in a compact swarm, circling presumably on a thermal upcurrent. The birds would go almost out of sight (around 3000 feet) and then return very quickly in a steep glide, approaching a dive. This is thought to be a defensive mechanism (Tinbergen, 1953) which might confuse or even intimidate an attacking predator. The passage of a low flying helicopter, the explosive launching of a cannon net and appearance of a Rough-legged Hawk all appeared, on occasion, to trigger the circling. At other times, however, the behavior was observed with no visible fright stimulus associated with it.

The roosting flight.—Roughly three hours before sunset, a large flock developed beside the dump, usually on water, and feeding activity decreased. After a period of "nervousness" involving chasing, preening, and quick circling, also noted by Schreiber (1967), the birds left singly or in small groups, retracing the morning route to the roosts.

Most birds roosted on the sheltered water northeast of Simcoe Island although some also roosted on Salmon Island. As the estimates of roosting gull numbers were consistently less than the total daily numbers, it is presumed that other roosts existed.

DAILY NUMBERS OF GULLS AND ENVIRONMENTAL CONDITIONS

Food supply.—The Kingston City Dump is operated as a sanitary landfill operation, with food refuse being covered with earth soon after it is dumped. Dumping is carried out daily from Monday to Saturday with no significant variations in amounts trucked in from day to day. On Sundays, however, there is no dumping and little edible material remains on the surface from the previous day, and considerably fewer birds visit the feeding area. The average of 19 Sunday counts was 678 and for 137 week-day counts was 1382. The Sunday average is 49 per cent of the week-day average. The

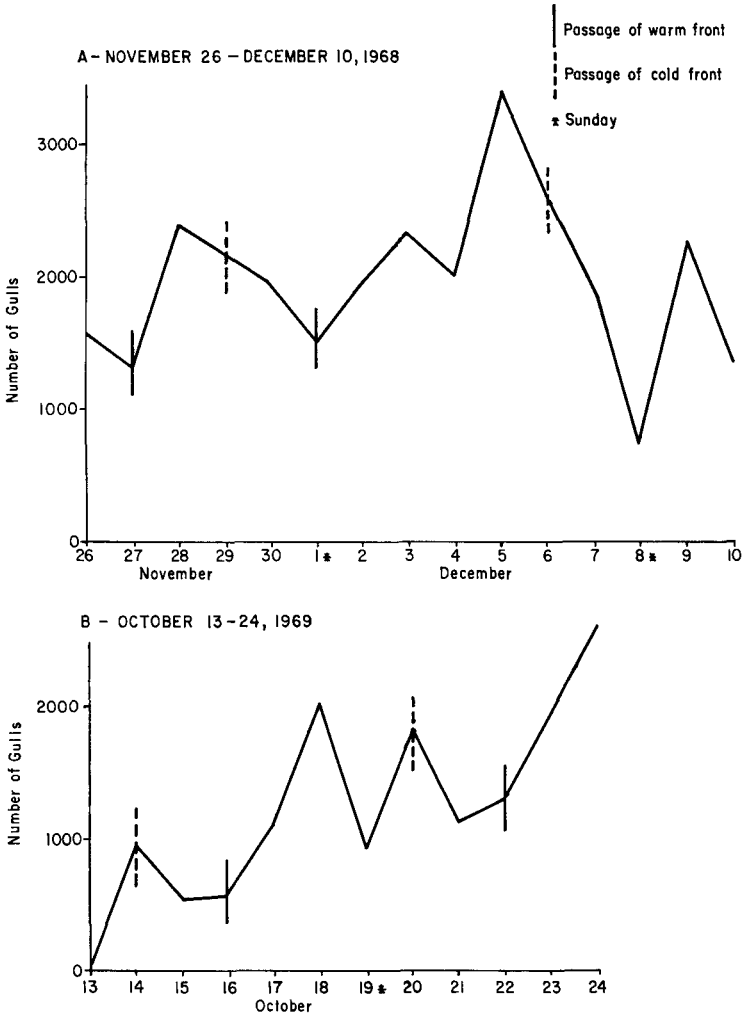

FIG. 2. Relationship between weather fronts and daily number of gulls.

counts were made around noon. On Sundays, the birds arrived as normal in the morning but left the feeding area, some to the loafing areas and others away from the vicinity of the dump altogether. We suspect that the whole flock initially came but dispersed on finding no food.

Weather conditions.—During the week, when there was adequate food on the dump, the numbers still fluctuated. A decrease in temperature and an increase in barometric pressure both tended to signal a decrease in gull numbers,

TABLE 2

RELATIONSHIP BETWEEN GULL NUMBERS AND WEATHER FRONTS

	Final Day of Warm Front Interval		Final Day of Cold Front Interval	
	Date	Count	Date	Count
1968	26 September	715	27 September	640
	8 October	1010	10 October	1352
	18 October	1643	21 October	1081
	23 October	2011	26 October	1439
	28 October	1266	1 November	1177
	2 November	1606	4 November	1640
	15 November	2325	16 November	2150
	22 November	3784	26 November	1658
	28 November	2395	30 November	1950
	5 December	3429	10 December	1321
	12 December	2710	16 December	324
	18 December	2296	20 December	35
1969	18 October	2030	21 October	1146
	24 October	2674	29 October	1183
	31 October	2338	4 November	2370
	6 November	1495	12 November	800
	18 November	1945	20 November	1222
	22 November	2320	26 November	1865
	28 November	1915	1 December	700
	3 December	1400	5 December	1350

and so an attempt was made to correlate the numbers and the passage of warm and cold fronts. Figure 2 provides examples of two sample periods. Generally the numbers increased during the period between the passage of a warm front and the arrival of the associated cold front (hereafter, warm front interval). Conversely, numbers decreased after the cold front and before the next warm front (hereafter, cold front interval). Table 2 presents the counts on the final day of both the warm and cold front intervals throughout the two seasons of observation. The final-day counts were chosen as they demonstrated the maximum effect of that weather interval. Using the Wilcoxon matched-pairs signed ranks test (Siegel, 1956), we found that the decrease of gull numbers at the end of the cold front interval as compared to the previous warm front interval count was significant at the 0.02 level. Sunday counts were omitted.

Although trends of changes in population size are evident, the absolute numbers of gulls cannot be accurately predicted from this knowledge of weather conditions. The actual effect of these conditions on the gulls is still

TABLE 3

MEAN WEEKLY COUNTS OF GULLS IN 1968 AND 1969

1968		1969	
Week Ending	Mean Count	Week Ending	Mean Count
28 September	496	27 September	542
5 October	1320	4 October	402
12 October	971	11 October	592
19 October	1210	18 October	1059
26 October	1377	25 October	1632
2 November	1354	1 November	1741
9 November	1457	8 November	1439
16 November	1919	15 November	1099
23 November	2844	22 November	1608
30 November	1809	29 November	1834
7 December	2399	6 December	1060
14 December	2154	13 December	210
21 December	823		
28 December	155		

unexplained. Associated with those periods after warm fronts are increased temperatures, decreased barometric pressure and a veering of the wind to the southwest. After a cold front comes decreased temperature, increased pressure and a wind change to the north. All these parameters not only correlate with the gull numbers but also correlate with one another and so it is impossible to analyze which, if any, of the individual factors affects the birds. It seems likely, however, that wind direction and speed play a major role. Southwest winds reach Kingston from Lake Ontario and might aid flight of birds to Kingston from other urban areas around the lake.

Fright stimulus.—A cannon net was discharged within a large loafing flock on 30 September 1969 catching 65 gulls. Although 1000 gulls were present on that day, only 190 were seen the next day and not until eight days later were numbers back to their previous level. Since the passage of weather systems was not involved, it is felt that the fright stimulus of the trapping activities was sufficiently strong to deter many birds from returning for some time.

WEEKLY AND SEASONAL VARIATION IN FLOCK SIZE

There was a progressive rise in numbers as the season proceeeded (Table 3). The initial rise was found highly significant in both years ($P = 0.00011$ in 1968 and $P = 0.0046$ in 1969, Kendall rank correlation test). In both years, the rise ended in late November or early December. Numbers then

decreased and great fluctuations occurred. As Lake Ontario began to freeze around Kingston, gulls were no longer seen daily on the dump and only periodical appearances, correlated with the passage of warm fronts, were made. Freeze-up took place during the first week of January in the two years, and by the middle of the month, gulls were seen only sporadically in very small numbers. This relative absence of gulls may have been caused by the lack of drinking water in the vicinity of the garbage dump. The nearest open water area was 2½ miles from the feeding area.

The initial, gradual rise of numbers in the fall can be explained if the general Herring Gull population of Lake Ontario increased during that time. This could be due to Herring Gulls moving east from the western Great Lakes as reported by Smith (1959) and Hofslund (1959). In the fall of 1968, J. B. Steeves (pers. comm.) also found an increase in Herring Gull numbers in Montreal which peaked a week after the counts in Kingston. This may indicate that gulls, after initially increasing in numbers in eastern Lake Ontario, move down the St. Lawrence River to Montreal. Gross (1940) found little post breeding movement up the St. Lawrence River. Similarly, Poor (1943) showed that Herring Gulls breeding in the Gulf of St. Lawrence almost never moved towards Montreal, and instead dispersed to the Atlantic. This, therefore, leaves the Great Lakes and Upper St. Lawrence region with its large gull population as the most likely contributor of gulls to the Montreal flock.

SUMMARY

The activities of a flock of gulls, which congregated daily to feed on the Kingston City Dump were studied in order to investigate the factors leading to the daily and seasonal fluctuations in flock size.

The daily numbers of gulls on the dump were found to be influenced by food supply, severe fright stimulus, availability of water, and weather. The period after a warm front was associated with an increase in numbers while that after a cold front was usually associated with a decrease.

First and second year gulls were found to spend considerable more time feeding than the adult and third year birds.

The mean weekly numbers were found to increase gradually to a peak in late November or early December. This is thought to be due to the influx of Herring Gulls from the western Great Lakes. The final disappearance of gulls from the Kingston area came just after the local freezing of Lake Ontario and it is postulated that the lack of drinking water near the dump triggered the departure.

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LITERATURE CITED

DRURY, W. H., JR., AND W. J. SMITH. 1968. Defense of feeding areas by adult Herring Gulls and intrusion by young. Evolution, 22:193–201.

DWIGHT, J. 1925. The gulls (Laridae) of the world; their plumages, moults, variations, relationships and distribution. Bull. Amer. Mus. Nat. Hist., 52:63–402.

GROSS, A. O. 1940. The migration of Kent Island Herring Gulls. Bird-Banding, 11: 129–155.

HOFSLUND, P. B. 1959. Fall migration of Herring Gulls from Knife Island, Minnesota. Bird-Banding, 30:104–113.

KADLEC, J. A. AND W. H. DRURY, JR. 1968. Structure of the New England Herring Gull population. Ecology 99:644–675.

POOR, H. H. 1943. Color-banded immature Herring Gulls in the New York region. Bird-Banding, 14:101–115.

SCHREIBER, R. W. 1967. Roosting behavior of the Herring Gulls in central Maine. Wilson Bull., 79:421–443.

SCHREIBER, R. W. 1968. Seasonal population fluctuations of Herring Gulls in central Maine. Bird-Banding, 39:81–106.

SIEGEL, S. 1956. Nonparametric statistics for the behavioral sciences. McGraw-Hill Book Co., New York.

SMITH, W. J. 1959. Movements of Michigan Herring Gulls. Bird-Banding, 30:69–104.

TINBERGEN, N. 1953. The Herring Gull's world. Collins, London.

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PUBLICATION NOTES AND NOTICES

RARE OR ENDANGERED FISH AND WILDLIFE OF NEW JERSEY. Edited by Donald S. Heintzelman. Science Notes No. 4, New Jersey State Museum, Trenton, N.J., 1971: 8½ × 11 in., paper covered, mimeographed, 23 pp. Free. Request from the Science Bureau, New Jersey State Museum, 205 West State Street, Trenton, N.J. 08625.

The last natural history survey in New Jersey was conducted more than 60 years ago. Since then, enormous environmental changes have taken place, resulting in declines of many species of vertebrates. The present report lists animals which are considered rare or endangered, or whose status is unknown. It is sobering to find that there are 37 rare species (including 14 birds), 18 endangered species (6 birds), and 22 species (6 birds) of undetermined status. The modest format of this report belies its importance as a conservation document. The report calls attention to the urgent need for surveys of the current status of wildlife resources in New Jersey, and for measures to protect vanishing animals.—P.S.