

## ABUNDANCE OF GULLS AT TAMPA BAY LANDFILLS

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**ABSTRACT.**—I censused Herring, Ring-billed, and Laughing gulls (*Larus argentatus*, *L. delawarensis*, *L. atricilla*) at two landfills near Tampa Bay, Florida, from October 1981 to April 1984. Gulls were most abundant during mid-winter; Herring and Ring-billed gulls were nearly absent from landfills from May through October. At least 90,000 gulls foraged at seven bay-area landfills during January and February. Landfills appear to be an important food resource for all three gull species wintering on the west-central coast of Florida. Changing waste disposal practices from landfilling to incineration are likely to affect them greatly. Received 1 Aug. 1987, accepted 15 Jan. 1988.

Food resources at urban landfills have been implicated in increased abundance of gulls throughout North America and Europe (e.g., Drury and Nisbet 1972, Mudge and Ferns 1982, Patton and Hanners 1984). In some regions, gull populations apparently have reached a maximum, either because of human control measures (Coulson et al. 1982) or because a new carrying capacity has been reached (e.g., Drury and Kadlec 1974). Gull populations inflated artificially by waste disposal practices may threaten human health (e.g., salmonellosis, Butterfield et al. 1983), be a public nuisance (Blokpoel and Tessier 1986) or a hazard to aircraft (Blokpoel 1976). They also are agricultural pests (Blokpoel and Tessier 1986), and threaten other species of birds (Blokpoel and Tessier 1986). The objectives of the present study were to identify the seasonal patterns of occurrence of Herring, Ring-billed, and Laughing gulls (*Larus argentatus*, *L. delawarensis*, *L. atricilla*) at landfills in the Tampa Bay area and to assess the importance of these landfills to gulls. Census results presented in this paper provide a baseline from which the effects of changing waste disposal practices on gull populations in the Tampa Bay area can be assessed.

### STUDY SITES AND METHODS

I censused gulls primarily at two landfills. Toytown landfill, Pinellas County, Florida, was visited regularly from October 1980 until it closed in May 1983. This 116-ha site was 4.5 km west of Tampa Bay and 19 km east of the Gulf of Mexico. The Hillsborough Heights landfill, Hillsborough Co., Florida, was studied from February 1982 to April 1984. This 63-ha site is 17.3 km northwest of Tampa Bay. I also censused all gulls at five other small Tampa Bay area landfills on a less regular basis during this study. Detailed site descriptions can be found in Patton (1986).

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From October 1981 to May 1983, I conducted one or more counts per month ( $\bar{x} = 2.3$ ) of all gulls on the active dumping surface of the Toytown landfill as well as at nearby gull loafing areas. Day-long visits to the landfill during the previous 12 months indicated that few gulls arrived at the landfill after 12:00 h and most gulls did not depart from the landfill or the surrounding loafing areas until after 15:00 h. Therefore, I started all censuses around 12:00 h, each lasting 1–2 h, depending on the number of gulls present. Although I suspect that daily variation existed in the number of gulls foraging at Toytown and Hillsborough Heights (e.g., Schreiber 1968, Kihlman and Larsson 1974), data presented in this paper provide a relative picture of the seasonal patterns of landfill use by each gull species.

For the purposes of this study, I recognized three age classes of Laughing and Ring-billed gulls, and four age classes of Herring Gulls using plumages described by Dwight (1925). The first day in June was chosen as the date when gulls passed to their subsequent age class because it approximates the date of hatching for all three species in North America (Schreiber et al. 1979, Southern et al. 1985); this date also has been used in other studies of gulls (Southern 1974a, b; Moore 1976). I estimated the age class distribution of each gull species at the landfills by recording the age classes of 5–20% of the gulls in each flock. In small flocks (<several hundred birds) I recorded the age classes of 50–100% of the individuals.

#### RESULTS

Gulls at the Toytown landfill exhibited seasonal changes in numbers of birds present and species composition (Fig. 1). Peak numbers of gulls present at mid-day in January and February were more than five times greater than the number of gulls present during the same time in May or June (Fig. 1). From May through October, more than 97% of the gulls present at Toytown were Laughing Gulls; less than 200 Herring and Ring-billed gulls were present during these months ( $N = 9$  censuses). November and December marked a transition from the essentially monospecific assemblage of gulls in summer and the peak numbers of all three species observed in January and February. Between November and January, most of the increase in the number of gulls was attributable to an increase in the number of Ring-billed and Herring gulls (Fig. 1).

In January and February, all three species of gulls were at or near peak abundance at Toytown, with Ring-billed Gulls roughly equal in number to Laughing Gulls; the mean ratio of Ring-billed Gulls to Laughing Gulls was 1.0–1.1 ( $\pm 0.2$ , SD) on 11 censuses in January and February of 1982 and 1983. Herring Gulls also reached peak abundance in January and February, but represented less than 18% of the total number of gulls. The number of gulls at Toytown decreased in March and April. By 19 April 1983, only 43, 8, and 18%, respectively, of the Laughing, Ring-billed, and Herring gulls present during the last week of February, remained at Toytown.

Prior to the closing of the Toytown landfill, about 15,000 gulls foraged at the Hillsborough Heights landfill in winter (11 February 1983 census, Table 1). Ring-billed and Laughing gulls were the two most common species (52 and 46%, respectively) and Herring Gulls made up the dif-

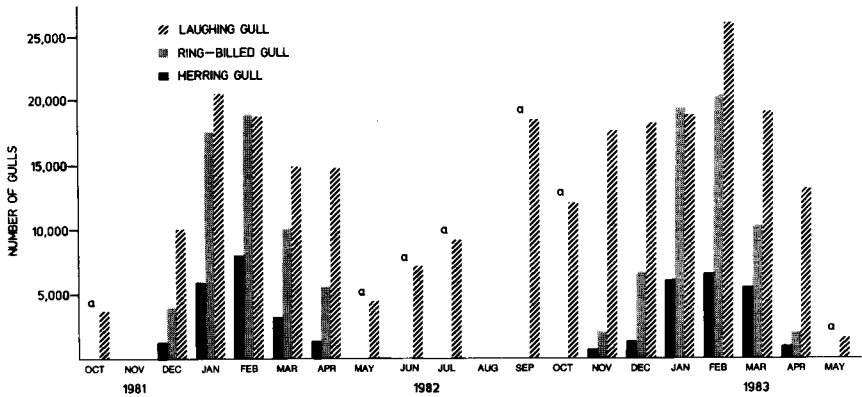


FIG. 1. Monthly censuses of gulls at the Toytown landfill, October 1981–May 1983. Vertical bars represent the average number of each species counted during each month. No censuses were made during November 1981 and August 1982. a—fewer than 200 Herring and Ring-billed gulls present.

ference (2%). After Toytown closed, the Hillsborough Heights landfill was censused regularly from June 1983 to April 1984. Following the closing, gulls at Hillsborough Heights exhibited a threefold increase between winter 1983 and winter 1984 (Table 1). The largest share of this increase was attributable to Laughing Gulls, which nearly quadrupled in number; Herring Gulls increased more than fivefold, but the number of Ring-billed Gulls only doubled. Total numbers of gulls at Hillsborough Heights in April 1984 were larger than in April 1983. Most of this increase resulted from a doubling in the number of Laughing Gulls present at Hillsborough Heights in spring 1984.

Herring Gulls were about 3.5 times more abundant at Toytown in January 1983 than at Hillsborough Heights in January 1984. During February, Herring, Ring-billed, and Laughing gulls were about 2.4, 1.7, and 1.8 times more abundant at Toytown in 1983 than at Hillsborough Heights in 1984. Laughing Gulls were less abundant at Hillsborough Heights during September through November 1983 than during the same months at Toytown in 1982 (Figs. 1 and 2).

After the Toytown landfill closed, gulls also increased at five of the six other landfills (Table 2). At the sixth site, the number of gulls present in 1984 was 27% of the total present in 1983 (Table 2). This was correlated with the loss of the primary gull loafing area adjacent to the landfill. In spite of the closing of the Toytown landfill in May 1983, the number of Laughing Gulls at Tampa Bay area landfills in January 1984 increased by about 19%, and that of Ring-billed Gulls increased by about 5% over

**TABLE 1**  
**CENSUS DATA FOR HILLSBOROUGH HEIGHTS BEFORE AND AFTER THE CLOSING OF THE TOYTOWN LANDFILL IN SPRING 1983, AND FOR THE TOYTOWN LANDFILL IN 1983**

	Laughing Gull		Ring-billed Gull		Herring Gull		All species	
	Winter	Spring	Winter	Spring	Winter	Spring	Winter	Spring
<b>Toytown</b>								
1983	24,475	11,500	27,359	1600	7921	1175	59,755	14,275
<b>Hillsborough Heights</b>								
1983	6750	5400	7600	1323	400	15	14,750	7238
1984	26,340	12,150	17,900	1425	2200	29	46,440	13,604
Percent change	>290	>125	>136	>8	>450	>93	>215	>88

Winter: 29 January 1983, Spring: 19 April 1983.  
 Winter: 11 February 1983, Spring: 29 April 1983.  
 Winter: 31 January 1984, Spring: 11 April 1984.

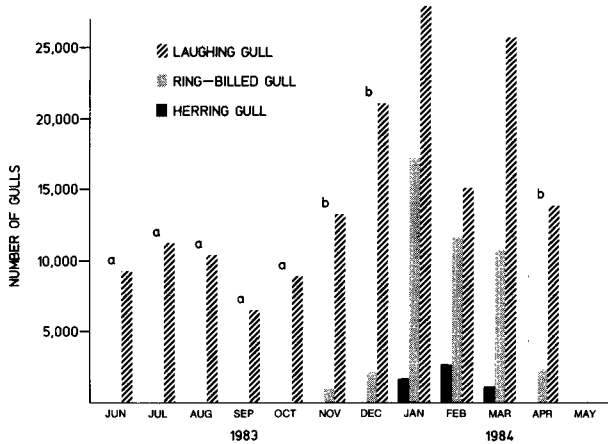


FIG. 2. Monthly censuses of gulls at the Hillsborough Heights landfill, June 1983–April 1984. Vertical bars represent the average number of each species counted during each month. a—fewer than 200 Herring and Ring-billed gulls present; b—fewer than 200 Herring Gulls present.

that recorded in the previous year. Only Herring Gulls showed a decrease (~2000 birds, 29%) between 1983 and 1984. Of the six landfills used by gulls in both years, two showed substantially larger increases in 1984 than the other four. The number of gulls at the Manatee County and Hillsborough Heights landfills increased by fifteenfold and fourfold, respectively. Perhaps not coincidentally, except for the very small Waste Aid landfill in Pasco County, these two landfills were the closest landfills to the Toytown landfill, and both sites were less than 22 km from nighttime roosting sites on Tampa Bay and the Gulf of Mexico.

Censuses of gulls at all Tampa Bay area landfills in January 1983 and February 1984 revealed that at least 90,000 gulls foraged at these sites (Table 2). Ring-billed and Laughing gulls made up 49–51% and 41–46%, respectively, of the total number of gulls counted at these landfills, whereas Herring Gulls accounted for only 5–8% of the total.

Juvenile Laughing Gulls comprised about 1% of the Laughing Gulls present at Toytown in July, but by September had increased to about 17% of the Laughing Gulls present; they remained near that percentage (12–17%) through February (Fig. 3). Numbers of juveniles decreased in April, when they represented only 7% of the total count (Fig. 3). From June to September 1982, the abundance of second-year Laughing Gulls decreased (Fig. 3), probably as a result of gulls passing through second prebasic molt into adult-like second basic plumage. For the remainder of the year, this age-class represented less than 2% of the total Laughing Gull count.

TABLE 2  
CENSUS DATA FOR SEVEN LANDFILLS BEFORE AND AFTER CLOSURE OF THE TOYTOWN LANDFILL

	Laughing Gull		Ring-billed Gull		Herring Gull		All species	
	Before	After	Before	After	Before	After	Before	After
Toytown	19,500	—	22,450	—	5800	—	47,800	—
Hillsborough County	6750	26,340	7600	17,900	400	2200	14,750	46,440
Manatee County	1200	9700	550	14,600	100	2000	1850	26,300
Sarasota County, North	6450	10,100	3950	7950	300	600	10,700	18,650
Sarasota County, South	1500	1000	1250	3000	175	200	2925	4200
Pasco County	0	0	650	3800	0	200	650	4000
Pasco County, Waste Aid	3000	300	11,500	3150	600	0	15,100	3450
Total	38,450	47,440	47,950	50,400	7375	5200	93,775	103,040

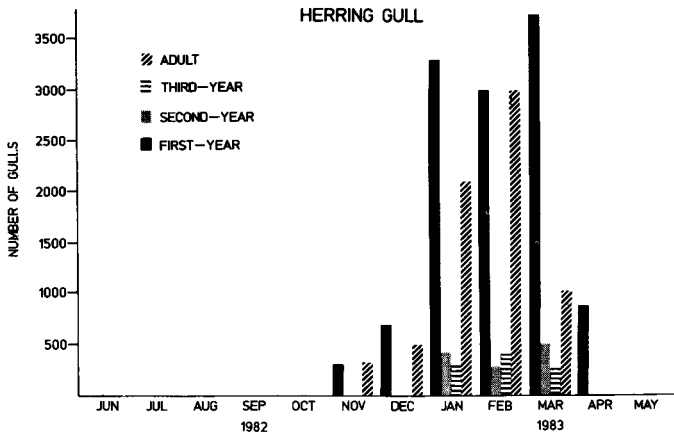
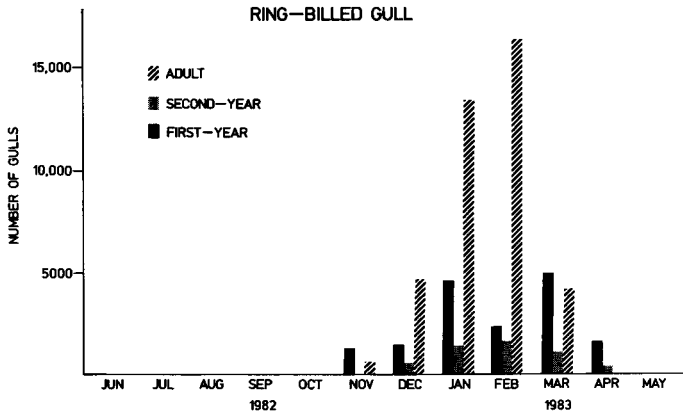
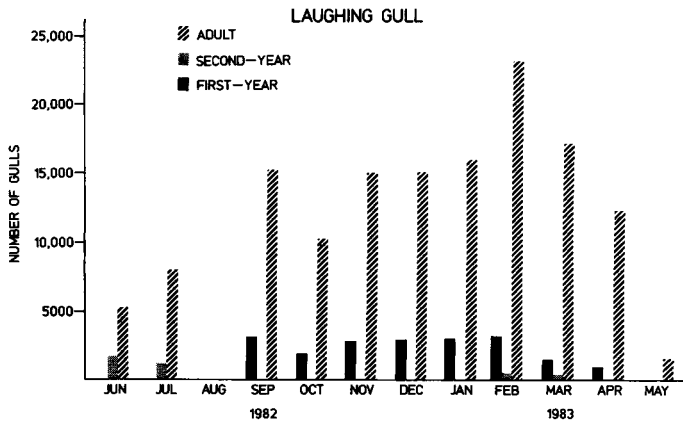


FIG. 3. Age class distributions of Herring, Ring-billed and Laughing gulls at the Toytown landfill, June 1982–May 1983. Vertical bars represent the average number of each age class estimated during each month. No census was taken during August 1982.

From June to September 1982, the only Ring-billed Gulls present at Toytown had just entered their second year. The first increase of adult- and juvenal-plumaged Ring-billed Gulls occurred in the Tampa Bay area during October, when they represented less than 1% of the total number of gulls. In November and December, the number of Ring-billed Gulls increased rapidly, with juveniles comprising a greater portion of this increase in November, and adults increasing more rapidly in December (Fig. 3). Both age classes approximately tripled in abundance between December and January. Ring-billed Gulls were at peak abundance in January and February with adults representing up to 86% (22 February 1983 census) of the gulls present. In spring 1983, their numbers decreased rapidly, from 14,200 on 29 March to 2500 on 12 April. The proportion of adults present at Toytown decreased during spring, compared to an increase in the proportion of first- and second-year birds. These results indicate that adult Ring-billed Gulls departed earlier than did first- and second-year gulls. By mid-April, adult Ring-billed Gulls were nearly absent from Toytown (<20 adults present) compared to more than 1400 first-year and 150 second-year gulls.

From May through October 1982, Herring Gulls were essentially absent from Toytown (Fig. 3). In October, the first juvenal-, subadult-, and adult-plumaged Herring Gulls arrived at Toytown, but they numbered fewer than 100. The number of Herring Gulls increased from about 350 on 19 October to 1150 on 12 November, but did not reach peak abundance until January. First-year Herring Gulls outnumbered adult Herring Gulls during every month but November from October 1982 through May 1983.

Adults reached peak abundance in January and February, when they represented 34% and 44%, respectively, of the total number of Herring Gulls. As was true with Ring-billed Gulls, the proportion of first-year Herring Gulls increased in spring (67% in March, 86% in April), compared with a decrease shown by adults (19% in March, 1% in April). The relative abundance of second-year gulls remained the same in April as in March (9%), but this percentage was higher than for the winter season (6%). By May, fewer than 25 Herring Gulls remained at the landfill; most of those present (87%) were in their first year. Third-year Herring Gulls were uncommon during all months of the year, representing less than 6% of the total number of Herring Gulls at Toytown from November through April.

#### DISCUSSION

*Migration patterns.*—Banding data from Herring Gulls on the Great Lakes and northeast Atlantic coast indicate that Herring Gull migratory movements are initiated in November and December, and the southern



extremes of their winter range are occupied in January and February (Drury and Nisbet 1972, Moore 1976). Moore (1976) found that <1% of adult Great Lakes Herring Gulls winter as far south as the south Atlantic and Gulf coasts of the United States, but juveniles and subadults migrate farther than adults and winter on these coasts. Return migration northward is initiated in late February (Moore 1976, Southern 1980) with juveniles and subadults lingering at southerly latitudes into March and April.

Banding studies of Ring-billed Gulls on the Great Lakes have shown that fall dispersal from the breeding colonies begins in late July and August, with the major push towards southern localities occurring during November and December (Southern 1974a, b). Juvenile and subadult Ring-billed Gulls begin to arrive on the Florida Gulf coast earlier in fall and depart later in spring than adults (Southern 1974b). Peak numbers of Ring-billed Gulls occur in Florida during January and February (Southern 1974b, 1980). Most adult Ring-billed Gulls migrate back to their Great Lakes colony sites during March and April (Southern 1974a, 1980). These results parallel the pattern of Ring-billed Gull abundance I recorded at landfills.

Little is known about the seasonal distribution pattern of Laughing Gulls on the Florida Gulf coast. Banding data indicate that a substantial proportion of Laughing Gulls wintering in the Tampa Bay area are summer residents, but that wintering birds also come from breeding colonies located farther north on the Atlantic and Gulf coasts (Southern 1980, Patton, unpubl. data). First-year Laughing Gulls tend to migrate farther south than adults in winter (Patton, unpubl. data). This tendency may explain the drop in the relative abundance of first-year Laughing Gulls at Toytown between February and March. Also contributing to this reduction is the lower annual survivorship of first-year gulls compared with that experienced by adults (Ludwig 1967, Kadlec and Drury 1968).

The small number of Laughing Gulls present at Toytown in May (<5000 in 1982 and 1983) may be attributed to their presence at several colony sites in Tampa Bay. Laughing Gulls establish nesting territories and begin to lay eggs in mid- to late April; the peak of egg laying occurs during early to mid-May (Schreiber et al. 1979, Hanners, pers. comm.). During this period, both members of the pair remain near their territories (Hanners, pers. comm.), explaining their absence as loafers at the landfills.

*Interspecific comparisons.*—Although the timing of arrival and departure of Herring and Ring-billed gulls in the Tampa Bay area was similar, these species were markedly different with respect to the relative abundance of age classes in Florida. Whereas adult Ring-billed Gulls present at Toytown during January and February greatly outnumbered juveniles,

juvenile Herring Gulls were more abundant than adults during every month of the year except November. In contrast to Herring and Ring-billed gulls, more than 80% of the Laughing Gulls present at Toytown were adults during every month of the year.

A pattern that emerges from these results is that first-year gulls are proportionately more abundant in the southern extent of a particular species' range. Tampa Bay is near the southern limit of the Herring Gull's primary winter range in North America and near the center of the winter range for Ring-billed Gulls. By contrast, Laughing Gulls range widely through coastal Central and northern South America. Differences in the relative abundances of age-classes among these species reflect interspecific differences in the winter ranges of these species.

Closure of the Toytown landfill altered the distribution of gulls wintering in the Tampa Bay area. Laughing Gulls increased at three of five remaining bay-area landfills in 1984 following the closure of Toytown, and their total numbers increased by more than 9000 (23%). This overall increase at the landfills probably was attributable in part to their continued increase in number as a summer resident in the bay-area (Patton and Hanners 1984).

Ring-billed Gulls increased in number (5%) at five of six bay-area landfills in 1984 following the closure of Toytown; their increase was small compared with that shown by Laughing Gulls. Daily or weekly fluctuations in numbers of gulls present at landfills probably can account for most of this increase. Population size on their breeding range in the Great Lakes has been difficult to assess in recent years because record high water levels have caused major shifts in the distribution of gulls, and many gulls may have been unable to obtain sites for nesting (W. E. Southern, pers. comm.).

Only Herring Gulls decreased in number (29%) at bay-area landfills following the closure of the Toytown landfill. Records from Christmas Bird Counts suggest that Herring Gulls occur south of Tampa Bay in small numbers, and seldom fly far inland.

At least 90,000 gulls, primarily Laughing and Ring-billed, foraged at Tampa Bay area landfills in January 1983 and February 1984; more than 50,000 were at Toytown alone. Since this study was initiated, three waste-to-energy refuse plants have been built in Hillsborough and Pinellas counties. Similar waste management practices are being proposed in some of the adjoining counties. The amount of garbage being landfilled in the Tampa Bay area already has been reduced significantly, and further major reductions are anticipated during the next five years in spite of expected growth of the human population.

Burning urban waste greatly diminishes the need for landfills and, con-

sequently, two bay-area landfills have closed (Toytown, Hillsborough Heights). Those landfills that service areas with waste-to-energy plants bury primarily ashes produced by refuse incineration. Monaghan et al. (1986) demonstrated that partially incinerated waste was less attractive to Herring Gulls than garbage that had not been incinerated. My observations of landfills that bury completely incinerated garbage suggest that this material is unusable by gulls.

Changes in waste management practices in the Tampa Bay area are likely to have major consequences on the abundance and distribution of gulls on the west-central coast of Florida. The closure of the Toytown landfill in Pinellas Co., Florida, resulted in substantial increases in the number of gulls at neighboring landfills during the following year. As more landfills close and the amount of refuse that is landfilled without burning dwindles, gulls in west-central Florida will be forced to winter elsewhere or find alternative food resources. Ultimately, these changes may result in lower overwinter survival of all three species. The long-term consequences of changes in waste management practices that are taking place in the Tampa Bay area as well as in urban centers throughout North America may be significant declines in abundance of species whose populations previously were inflated by this abundant food resource.

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