

BREEDING AND ANNUAL CYCLE OF LAUGHING GULLS IN TAMPA BAY, FLORIDA

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The Laughing Gull (*Larus atricilla*) is one of the most familiar species of the coasts of the eastern United States. Although the behavior of this gull has been intensively studied (e.g. Beer, 1970a, 1970b; Impeken, 1973), many aspects of the breeding biology are little or poorly known. Our study was designed to gather data on reproduction in this species in Tampa Bay, as well as to provide an outline of the annual cycle in that area. A better understanding of the biology of this species is particularly relevant, in view of man's general encroachment into its breeding areas and of the alarming decline in populations in New England (Nisbet, 1971).

STUDY AREA AND METHODS

Laughing Gulls have been recorded nesting in the Tampa Bay region since the early 1900's (Sprunt, 1954). In recent years they have nested primarily on islands created by dredge and fill operations. We know of colonies in St. Joseph Sound, central Hillsborough Bay, and lower Boca Ciega Bay. In 1972 and 1973 we studied Laughing Gulls nesting on fill owned by the Bayway Development Corporation in lower Boca Ciega Bay, southern Pinellas County, Florida. These fill areas were created about 1960 and consist of small patches of bare ground covered with shells and coarse rubble, interspersed among the dominant saltbush (*Baccharis*), dog fennel (*Eupatorium*), and sand spurs (*Cenchrus*).

Besides Laughing Gulls, Black Skimmers (*Rynchops nigra*), Least Terns (*Sterna albifrons*), a few American Oystercatchers (*Haematopus palliatus*), and a pair of Caspian Terns (*Hydroprogne caspia*) (see Schreiber and Dinsmore, 1972) nest on these fill areas.

In 1972 we marked about 100 nests and followed their progress through hatching. In 1973 we fenced two 10 by 10 m plots with 18-in-high chicken wire (1 in hexagonal mesh); however, we were prevented from obtaining data on fledging success, as vandals ripped off the fencing. We visited the colony at intervals of about a week during each nesting season. Although more frequent visits and a longer-term study would have been desirable, the study area is now under real estate development. Thus, our 1972 and 1973 data on what was then an expanding, relatively undisturbed population probably cannot be duplicated during future nesting seasons. We believe our results provide basic information on the breeding of Laughing Gulls in Florida.

In addition to studies at the nesting colony, each year we raised two gull chicks from hatching and kept notes on their development in captivity. We have also systematically censused by age group and plumage stage the Laughing Gulls throughout the year at several localities in the Tampa Bay region. These censuses and certain other data were gathered from 1969 to 1973.

SIZE OF THE COLONY

In 1972, we estimated the number of nests by the random pairs method used by botanists (Cottam and Curtis, 1956). This method gave an estimate

of 10,000–12,000 nests for the largest nesting area. On other areas where nests were more patchy in distribution, our sample counts indicated several thousand pairs were present. Overall we estimate a minimum of 15,000 pairs in 1972, and we believe that the population was at least as large in 1973.

ANNUAL CYCLE

Based on partial data for 1969–1971 and more detailed information for 1972 and 1973, the outline of the annual plumage and nesting cycle of Laughing Gulls in the Tampa Bay region is as follows:

January.—Most of the Laughing Gulls present are adults in winter plumage, rather than first-year birds. Some adults are just starting to obtain the black hood. On 26 January 1969 only two of 50 adults had full black hoods, the earliest we have observed these.

February.—By the end of February many adults start obtaining hoods. On 12 February 1970, none of 39 adults had hoods; on 9 February 1973, 12 of 25 had hoods, and by 23 February 1973, 61 of 259 gulls had hoods. On 13 February 1970 a few gulls had gathered and were courting on the beach near the nesting colony, the earliest date we have noted this behavior.

March.—By the end of March most adults have hoods, and courtship behavior is common near the nesting colony. On 19 March 1972 hundreds of black-hooded gulls were in the vicinity of the nesting areas, sitting on the water, flying over the colony, calling and courting; nest building had not started. On 4 March 1973, over 1,000 adults, nearly all black-hooded, were in a similar state of courtship activity. As a sample, 34 of 44 gulls on 2 March 1973 had hoods, while 73 of 74 birds had hoods in the same locale on 23 March 1973.

April.—Most gulls are concentrated near the nesting areas, and fewer gulls are evident in roosting or loafing areas used by wintering birds. Virtually all adults have full hoods. On 20–22 April 1972 and 1973 hundreds of gulls were building nests at the Bayway colony. Few nests were completed or contained eggs.

May and June.—These months are the height of the breeding season for Laughing Gulls in the Tampa Bay region (Table 1). It is apparent that for the four years for which we have any data, the peak of egg-laying typically occurred in the first week of May; in 1973 it was delayed about one week. Many clutches in the first week of May have only one or two eggs; by the second week of May most have the complete three egg clutch. The earliest date we have seen chicks is 14 May, and the fourth week of May is typically the peak of hatching. By mid-June some young are able to fly short distances, and by late June most spend the day away from their natal territories resting on the beach adjacent to the colony and are capable of flight. The last nests

TABLE 1
CONTENTS OF LAUGHING GULL NESTS ON VARIOUS DATES IN FOUR NESTING SEASONS

Date checked	Nests checked	Percent ¹ of nests containing					
		Eggs				Egg(s) and chick(s)	Chicks only
		1	2	3	4		
1969							
8 May	184	10	22	68	0	0	0
1970							
9 May	66	6	21	73	0	0	0
17 May	106	6	19	75	1	0	0
1972							
1 May	47	26	26	49	0	0	0
2 May	51	18	29	53	0	0	0
7 May	54	9	20	70	0	0	0
10 May	43	0	14	86	0	0	0
14 May	161	6	25	68	0	1	1
18 May	41	2	15	68	0	15	0
21 May	51	0	20	53	0	16	12
23 May	338	5	38	24	0	22	12
30 May	23	0	0	0	0	9	91
1973							
14 April	0	0	0	0	0	0	0
21 April	2	0	0	100	0	0	0
29 April	24	29	50	21	0	0	0
4 May	126	20	34	46	0	0	0
5 May	94	17	29	54	0	0	0
12 May	101	13	39	49	0	0	0
17 May	252	9	38	50	0	2	<1
19 May	144	9	44	38	0	8	1
25 May	148	11	39	18	0	15	18
31 May	84	7	46	12	0	17	18
10 June	32	25	25	3	0	16	31

¹ May not equal 100 percent because of rounding.

with eggs were found on 27 June 1972 and 22 June 1973. In 1973, with delayed nesting, on 22 June no young were capable of flight, although some were gathered on the beach. In late June the post-nuptial molt of adults is underway, as hundreds of feathers lie scattered around the colony.

On 30 May 1973, while nesting was in full swing at the Bayway colony, a count at nearby Tampa revealed 79 adults and 187 one-year-old birds, indicating the presence of some non-breeding birds in the region.

July.—Most young fledge in July. During the day thousands line the beach, most can fly at least a few hundred yards, and a few move some distance

from the colony. Molt in adults continues, and by late July black hoods are mottled with some white feathers on the lores.

August.—The number of birds at the colony decreases rapidly, so that by the end of the month it is virtually deserted. The movement of the birds-of-the-year away from the colony is especially marked, these comprising only 10 percent of 330 gulls counted there on 22 August 1972. Most adults had black and white speckled heads, the only ones with full black hoods being individuals remaining at nest sites. Further data on the exodus of gulls from the colony and the molt of adults comes from a count made in Tampa on 20 August 1973: 124 adults, 10 birds-of-the-year, and 3 one-year-old birds in a sample of 137. Only one of the adults had a full black hood, 88 had lost part or most of the hood, and 35 were in winter plumage. By late August most birds-of-the-year were growing the gray mantle feathers of their first winter plumage.

September.—Both adults and birds-of-the-year continue their molt. By the end of September most adults have the winter head plumage; only three of 349 adults counted on 28 September 1973 still had part of the hood. On that same date 13 of 53 birds-of-the-year still had an appreciable amount of brown on their mantle, and the other 40 had a gray mantle.

October.—The molts are completed essentially in October. Only 10 of 173 gulls near the nesting colony on 14 October 1973 were birds-of-the-year, all with a gray mantle; all adults had winter plumage.

November and December.—Thousands of Laughing Gulls winter in the Tampa Bay region, congregating especially around two dumps 12 miles north of the nesting colony. Virtually all gulls are in the winter plumage. Inexplicably, one adult seen in Tampa on 16 November 1973 had almost a full black hood.

While the total population may not increase in winter in the Tampa Bay region, the species is certainly more widely dispersed throughout the region, being common in parking lots, residential areas, and shopping centers, as well as in its natural saline habitats. In the period March–August gulls are not common in the more urban habitats. The local breeding population probably is augmented by wintering gulls from other areas, but we have no band recovery information to document winter movement. The recovery of some Laughing Gulls from South Carolina in Florida in winter (Forsythe, 1972) indicates one potential source of these birds.

NESTS AND NEST PLACEMENT

Bongiorno (1970) discussed in detail nest site placement in Laughing Gulls. In the Bayway colony the gulls nest on dry land, both in open areas with scattered vegetation and in areas with thick vegetation. Nests are notice-

ably more clumped in areas with some vegetative cover than in areas of only low ground cover. Two to four pairs often nest within centimeters of each other, if each of the nests is backed by a clump of *Baccharis* or *Eupatorium*. Apparently the plants visually isolate the birds (Burger, 1972). Such clumping never occurs on areas with only low ground cover. Based on 62 measurements made in 1972, the average distance between nests is 195 cm.

The nest itself is a low cup-shaped structure made of plant material, much of it from dead annuals from the previous year's growth. Outside diameters of 13 nests average 28 cm and inside diameters 16 cm. The nests rapidly disintegrate after the eggs hatch, so that by late July little of them is evident in the colony. In 1973 in particular, thick vegetation covered the nesting areas by late July. As July and August are months of heavy rainfall in the Tampa Bay region, it seems likely that this precipitation and the abundant supply of nutrients from the guano trigger the heavy growth.

CLUTCH SIZE

Our best information on clutch size comes from 94 clutches that we marked and followed closely in 1972. Seventy-eight of the clutches had three eggs and 16 had two, for an average of 2.8. Additional eggs may have been laid and lost from two egg clutches without our knowledge. Adults have three brood patches and we suspect that three eggs is the optimal usual clutch of this species. Of 17 nests marked in 1973, 13 had three eggs and four had two, for an average of 2.8.

EGG SIZE AND FLOTATION

On 7 May 1972 we obtained the following measurements from 49 eggs:
length: \bar{x} 52.6 mm, S.D. 2.4, range 47.1–58.9;
width: \bar{x} 37.8 mm, S.D. 1.1, range 34.8–40.3.

Bent (1921) gives similar results from 69 eggs: mean length 53.3 mm, range 48.5–62.0; mean width 38.5 mm, range 30.5–42.0.

Schreiber (1970) and Hays and LeCroy (1971) have described the flotation characteristics of three species of larid eggs. We were able to establish an aging scale for Laughing Gull eggs using this technique (Table 2).

HATCHING SUCCESS

In 1972 we obtained information on the hatching success of 154 eggs in 55 nests (Table 3). All eggs listed as not hatching were added or remained in nests at least 7 days after the expected hatching date. Eggs that disappeared at about the time they were expected to hatch were placed in a questionable category. Many may have hatched, with the chicks simply leaving before we revisited the nest. As we were mainly interested in the number of added

TABLE 2
FLOTATION CHARACTERISTICS OF LAUGHING GULL EGGS

Age of egg (days)	Floating characteristics
Day of laying	Long axis horizontal and egg resting on bottom of container.
Day 1-2	Large end of egg raised slightly with long axis of egg tilted upward at angle of 5-20°.
Day 4-5	Angle of long axis of egg about 45°.
Day 7-10	Angle of long axis of egg about 80-90°.
Day 11	Egg floats vertically free from bottom of container.
Day 16-18	Egg floats on surface of water with area less than 5 mm in diameter exposed, egg bobs deeply when released.
Day 19-21	Over 5 mm diameter area exposed; as greater area exposed, the long axis of egg approaches 20-30° from horizontal.
Day 22	Most eggs cracked or pipped with a few hatched by this date.
Day 23-24	Most eggs hatched.
Day 25	All eggs hatched.

or infertile eggs, we included all eggs that were cracked or pipped in the hatched category. As can be seen, only six percent of the eggs definitely did not hatch, and a minimum of 76 percent of the eggs did hatch. Although a somewhat higher percentage of eggs in two egg clutches were known to have hatched, this may be due to our method of collecting the data rather than there being a real difference.

GROWTH AND DEVELOPMENT

Table 4 summarizes the major growth and development parameters of four Laughing Gull chicks raised in captivity in 1972 and 1973. These chicks were taken from the nest while still damp or in pipped eggs. They were fed a diet consisting primarily of fish, shrimp, table scraps, and Purina Dog Chow. We were unable to compare our diet with the natural Laughing Gull diet, and we do not have a good series of measurements of known-aged wild

TABLE 3
HATCHING SUCCESS OF LAUGHING GULL EGGS IN 1972

Clutch size	No. nests	No. eggs	No. hatched	No. not hatched	Questionable
2	11	22	19 (86%)	1 (5%)	2 (9%)
3	44	132	98 (74%)	8 (6%)	26 (20%)
Totals	55	154	117 (76%)	9 (6%)	28 (18%)

TABLE 4
SUMMARY OF THE MAJOR GROWTH AND DEVELOPMENT PARAMETERS OF FOUR LAUGHING
GULLS RAISED IN CAPTIVITY¹

	Hatching	Asymptote	Age asymptote reached	Adults ²
Culmen	14-15 mm	33-34 mm	42-44 days	35-43 mm
Tarsus	27-28 mm	55-56 mm	26-28 days	47-60 mm
Wing (chord)	18-20 mm	310-315 mm	55± days	300-327 mm
Weight	30-33 g	310 g	25± days	182-360 g

¹ Egg tooth gone at 6-7 days, young begin major loss of down at 20 days.

² Based on 16 collected in the Tampa Bay region (specimens now at the University of South Florida and University of Tampa).

pulli for comparison. Based on our field observations, we believe that the asymptotic measurements and the age at which they are attained reflect the natural growth pattern of wild Laughing Gulls. The tarsi of the young are slightly longer than those of most museum specimens of adults, probably reflecting their fleshy and fluid-filled condition prior to fledging. The basic pattern of growth illustrated here for the Laughing Gull is very similar to that found in other gull species (e.g., Schreiber, 1970; Smith and Diem, 1972; Ricklefs, 1973).

MOLT

By mid-June in both 1972 and 1973 the molted feathers of adults littered the nesting area. On each of our visits to the colony in June, July, and August, we gathered all the freshly molted primaries in one portion of the colony. We compared the molted feathers with a known set of primaries to determine the primary number of each molted feather. These data are presented in Table 5, along with the weighted average molt for each date. These show a regular procession of molt from the inner to outer primary. The scarcity of outer primaries in our sample probably indicates that these are shed late in the season, after the gulls no longer frequent the colony. The timing of the molt for early 1973 is somewhat behind 1972, but by early August the two are similar.

FUTURE OF THE TAMPA BAY POPULATION

Currently, the Tampa Bay and especially the Bayway populations of Laughing Gulls appear to be thriving. The gulls have adapted well to a man-made situation by feeding in dumps and nesting on fill areas. On the other hand, automobiles and electric power lines annually kill many birds-of-the-year along the edge of the colony, and other parts of the colony are

TABLE 5
MOLT OF THE PRIMARIES BY LAUGHING GULLS AS DETERMINED BY MOLTED FEATHERS

Date	Total feathers	Primary number										Weighted average
		1	2	3	4	5	6	7	8	9	10	
1972												
30 June	137	23 ¹	18	10	8	21	15	4	-	1	-	3.58
23 July	130	7	9	24	29	12	3	12	4	1	-	4.08
3 August	105	1	-	12	32	21	24	6	3	1	-	4.77
1973												
15 June	47	70	23	-	-	4	2	-	-	-	-	1.51
22 June	30	53	33	7	-	3	3	-	-	-	-	1.77
12 July	202	19	32	32	12	4	-	-	4	-	-	2.51
14 July	161	29	36	23	6	5	-	1	1	-	-	2.38
5 August	45	-	-	4	31	29	24	11	-	-	-	5.07
12 August	46	-	-	-	22	37	26	11	2	2	-	5.41
19 August	36	3	3	3	8	25	31	28	-	-	-	5.53

¹ Percentage of each indicated primary found on that date; may not total 100 percent because of rounding.

extensively disturbed by motorcyclists, picnickers, and other forms of human intrusion. Portions of the Bayway colony already have been bulldozed and the rest is threatened by development in the near future. Other planned development threatens virtually all suitable nesting sites in the Bayway area. Obviously, to assure the gull's continued survival in the region, a few suitable isolated areas, preferably islands, free of human disturbance from March through August, must be established. Increased human population and recreational activity in the region will make such sites rarer in the future. It will be especially interesting to see if the gulls continue to attempt to nest on traditional nesting sites, even after they are developed for such uses as golf courses.

SUMMARY

The breeding biology and annual cycle of Laughing Gulls in the Tampa Bay region are outlined. Wintering adults begin obtaining their black hood in February, and by March the gulls begin occupying the breeding areas. Courtship and nest building occur in April, and by early May the first eggs are laid. The usual clutch is three eggs, and incubation usually takes 23-24 days. A flotation technique was used to determine the incubation stage of eggs. About 75 percent of the eggs hatch, and fledging success appears high—judging from the thousands of birds-of-the-year present in late June. Adults begin their post-nuptial molt in June, and the molted feathers are present in the colony through July and August. Dispersal from the colony starts in July, and by mid-August most adults and birds of the year have left the breeding sites. Adults begin molting their hood in July, and by September virtually all are in winter plumage. In August and September birds-of-

the-year rapidly molt from the basically brown juvenal plumage into their first winter plumage. Large numbers of Laughing Gulls remain in the region during the winter. Nesting populations are thriving, but are threatened by development.

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