DISPERSAL AND POST-FLEDGING SURVIVAL OF FRANKLIN'S GULLS

By JOANNA BURGER

INTRODUCTION

Franklin's Gulls (*Larus pipixcan*) breed in the prairie regions of North America and migrate to the west coast of South America (A. O. U. Check-list, 1957). Juvenile and adult Franklin's Gulls were banded and wing-tagged at Agassiz National Wildlife Refuge in northwestern Minnesota to determine the post-breeding dispersal pattern and the survival rate of young-of-the-year in the dispersal period. I attempted to determine if the young fledged early in the breeding season have a different survival rate than the young fledged later.

METHODS

Franklin's Gulls were banded and marked at Agassiz, Marshall County, Minnesota from 1969 to 1971. Two thousand chicks and 152 adults were wing-tagged and banded with U. S. Fish and Wildlife Service bands. The wing-tags (Southern, 1971) were plastic, two inches in diameter, and fastened around the radius and ulna. Although several colors were used, orange and green were the most visible and were used most often.

Adults were captured in nest traps (Burger, 1971) and in dip nets. Franklin's Gulls follow plows picking up insects and earthworms. A local farmer netted over 200 adults from his tractor by using a smelt dip net with a ten-foot extension.

Chicks were banded and wing-tagged shortly before fledging (30-35 days), when they were strong enough to support the tag and preen it into the secondaries. At this stage, the chicks wander from the nest into open water where they can be pursued by boat and scooped out of the water. Most of these chicks could fly only a few feet if at all. Chicks were released where they were caught to facilitate a safe return to their nests. All chicks tagged in 1971 were weighed and tail length was measured.

In 1971, some chicks were restricted to their nests by six-inch fences around their nest platforms. The tail lengths of these chicks of known age were measured from the base of the tail to the tip with a caliper to determine if tail length could be used as an age indicator. Tail lengths of these chicks were positively correlated with age ($r = +.78$, $P < .001$). Tail length was therefore later used as an estimate of the age of the chick (Fig. 1).

Requests for information on sightings were solicited in newspapers and magazine articles that reached readers in Minnesota, North Dakota, South Dakota, Iowa, and Nebraska. These articles did not contain information on the exact colors or identifying numbers used in order to minimize observer bias.

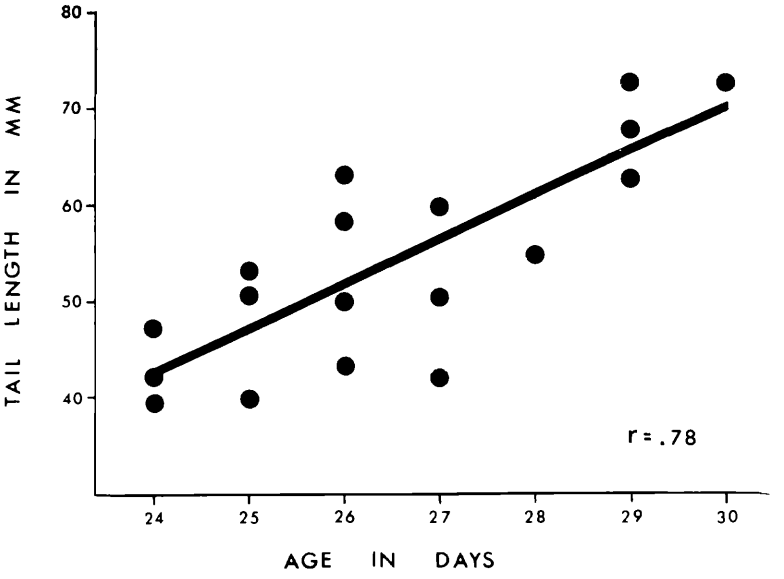

FIGURE 1. Age and tail lengths of juvenile Franklin's Gulls of known age.

RESULTS

Dispersal Pattern. The dispersal pattern of juvenile Franklin's Gulls is shown in Figure 2. Juveniles left the colony area from 5 July to 23 July, although most left the colony area prior to 12 July. Most reports of wing-tagged juveniles came from south of the refuge, although 16 per cent of the sightings in July and 12 per cent of the sightings in August were north of the refuge. The majority of juveniles continued dispersing over western Minnesota, North Dakota, and South Dakota until September, although a few remained until the end of October.

The dispersal pattern of the adults was similar to that of the juveniles except that no adults were reported north of the refuge (Fig. 3). Some individual adults were observed more than once.

TABLE 1. Sightings by month of adults and juveniles.

Month	Adults		Juveniles	
	Number	Per cent	Number	Per cent
July	23	23.5	177	32.1
August	31	31.6	250	45.4
September	32	32.7	101	18.3
October	12	12.2	23	4.2
Totals	98	100.0	551	100.0

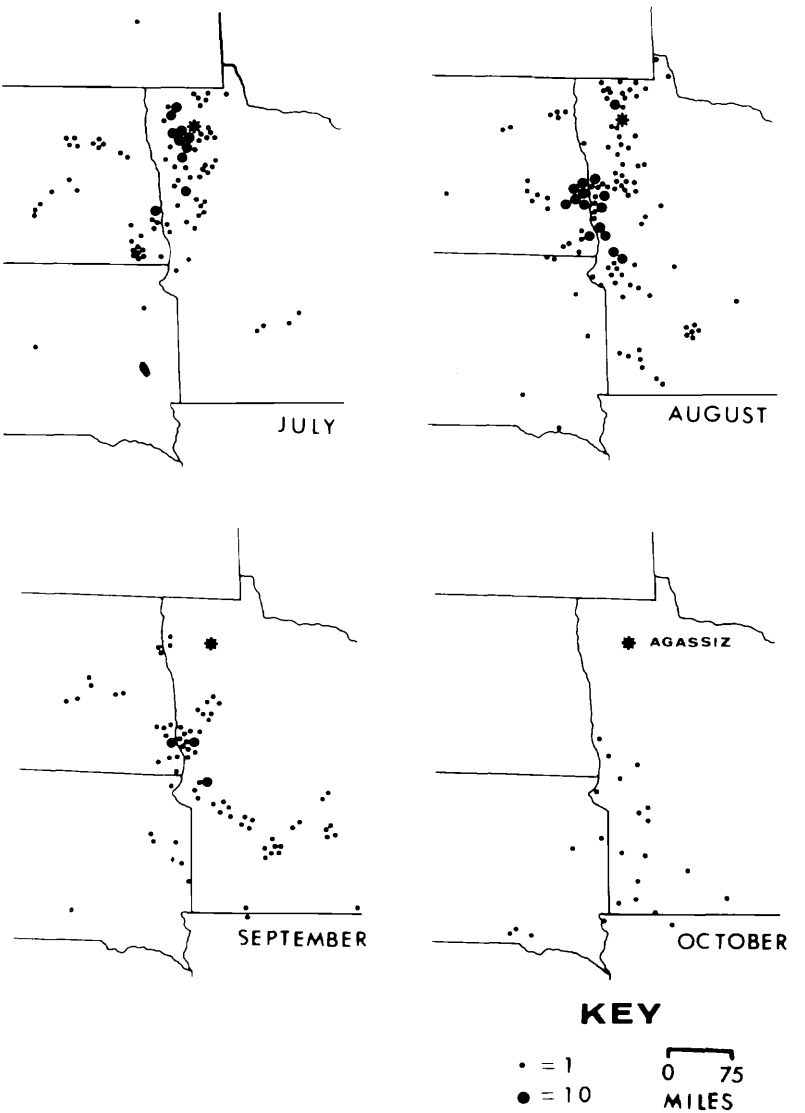

FIGURE 2. Dispersal pattern of juveniles from Agassiz National Wildlife Refuge.

Successive sightings of individuals were useful because they revealed a tendency to disperse south although particular individuals often moved in other directions (Fig. 4). These data suggest that adults tend to remain in Minnesota and the Dakotas later in the fall than juveniles (Table 1). Adults were sighted more often (65%) than juveniles (28%), indicating that adults have a higher survival rate or remain in the reporting area longer.

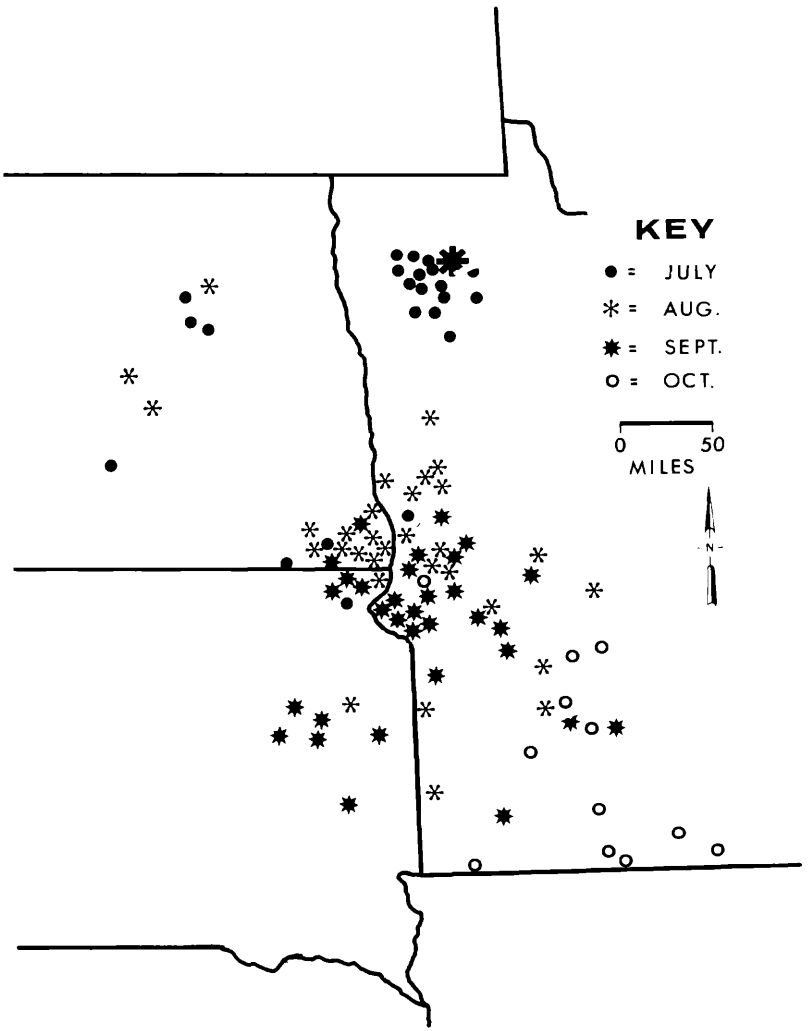

FIGURE 3. Dispersal patterns of adults from Agassiz National Wildlife Refuge.

Survival of Early and Late Fledglings. In several species of gulls late nesters have a lower breeding success than early nesters (Paynter, 1949; Coulson and White, 1958; Brown, 1967; Harris, 1969). The success of young birds following their departure from the colony has been studied only in the Herring Gull (Nisbet and Drury, 1972). Nisbet and Drury found that the earlier hatched chicks from earlier colonies suffered lower post-fledging mortality. They also found that very few chicks hatched after 6 July survived to leave the colony. They believed the failure of late chicks to reach the size of independence might be due to parental neglect.

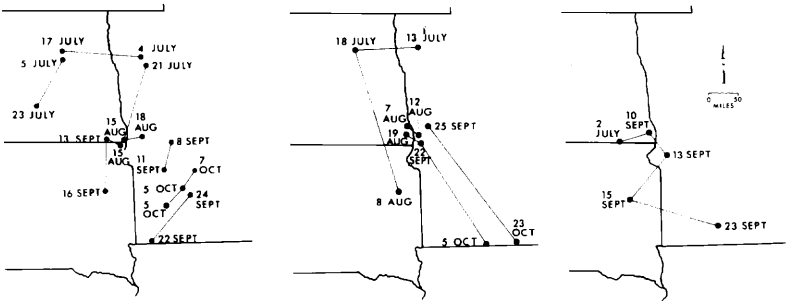

FIGURE 4. Movements of individually marked adult Franklin's Gulls.

Results of a preliminary study of wing-tagged chicks in 1970 indicated a 15 per cent sighting-rate of 150 chicks banded from 4 to 7 July, and no sightings of the 150 chicks banded from 10 to 18 July.

The fledging period in 1971 occurred between 6 and 19 July. I then divided the data into three sample periods, and analyzed them accordingly. The number of birds in the third sample period was small, and the data are thus inconclusive for the very late fledglings. As in 1970, proportionally more sightings were made of birds tagged during the first sample period (18%) than during the second (6%) and third (0%) periods (Table 2). The youngest birds were in the

TABLE 2. Summary of tagging operations in 1971.

	4 - 6 July	7 - 10 July	13 - 19 July
Tagged			
Total	211	257	25
Post-fledging sightings			
Number	37	15	0
Per cent	18	6	0
Weights (grams)			
$\bar{X}_1 \pm$ SD	272 ± 21	297 ± 30	269 ± 13
$\bar{X}_2 \pm$ SD	280 ± 18	294 ± 28	—
Tail lengths (mm)			
$\bar{X}_1 \pm$ SD	62 ± 8	67 ± 6	78 ± 9
$\bar{X}_2 \pm$ SD	64 ± 7	66 ± 5	—
Colony composition	Entire colony present, both adults and young.	Many adults had left the colony site, young just starting to leave area.	No adults present, most young gone from area.

$\bar{X}_1$ = mean value for entire sample tagged during the time period.
$\bar{X}_2$ = mean value for birds sighted later and tagged during the time period.

first sample period, as estimated by tail length. The mean weight of the middle group was approximately 25 grams heavier than that of the other two groups.

DISCUSSION

The migration and dispersal patterns of several species of gulls have been studied (Table 3). Some of the populations are relatively sedentary (Western Gull, Glaucous-winged Gull, Woodbury and Knight, 1951; Great Black-backed Gull, Harris, 1962b; and Herring Gull, Harris, 1964), whereas others migrate a maximum of 1,000 miles from the hatching site (Western Gull, Ferris, 1940; California Gull, Behle and Woodbury, 1952; Lesser Black-backed Gull, Harris, 1962a; Black-headed Gull, Roggeman, 1970). The species studied usually migrate along waterways. Franklin's Gulls, however, migrate through the prairie region feeding over sloughs and in the farm fields.

The number of sightings in this study represents a minimum survival rate since all birds reported are alive. Presumably the actual survival rate is much higher. Two assumptions were made in this analysis: (1) the same proportion of sightings to live birds occurs for all sample groups and (2) the sightings are not biased in favor of early or late fledglings. It seems unlikely that the sightings are biased since approximately 43 per cent of the recoveries from each of the four recovery months were from the early fledged birds. Late sightings in October were recorded of birds from the early and middle fledging group. I have no reason to assume that birds from the two fledging groups dispersed in a different manner.

The data presented here indicate a higher survival rate for the early fledglings. The middle group was the heaviest, and averaged older than the first group, but did not have the highest survival rate. At the time of the wing-tagging I might have predicted that the middle group would have the highest survival rate because they were older and heavier. Since this was not the case, some additional factor must be involved. I believe this to be differential parental care. The birds in the early sample group were probably cared for and fed by their parents into the second sample period. Most of those tagged during the second period were probably not fed after that date since many adults left the colony during the previous tagging period. No adults were present in the colony during the third tagging period, thus suggesting that chicks had already been deserted by their parents. This accounts for their being lighter in weight despite their age. It thus appears that the early group had two advantages: (1) they were fed for a longer period of time, and (2) they were able to leave the colony site with adults. This association with adults might ease the problems associated with finding suitable foraging areas (farm fields) as well as facilitate learning of feeding techniques.

TABLE 3. Migration patterns of Gulls (*Larus*).

Species	Common name	Colony site	General pattern	Reference
L. argentatus	Herring Gull	England Michigan	Spread out within 1000 miles. Follows waterways, most remain within 500 miles until December. After December, most recoveries still in Great Lakes region.	Harris, 1964 Smith, 1959
L. californicus	California Gull	Utah	Migrate to the Pacific coast, then spread over the coast.	Behle and Woodbury, 1952
L. delawarensis	Ring-billed Gull	Michigan	Disperse over Michigan, migrate south in September.	Southern, 1967
L. fuscus	Lesser Black-backed Gull	England	Generally south for two months. Some migrate to Africa, but most remain on coast of Europe.	Harris, 1962a
L. glaucescens	Glaucous-winged Gull	British Columbia and Washington	Sedentary, remain within 250 miles.	Woodbury and Knight, 1951
L. marinus	Great Black-backed Gull	England	Sedentary, remain within 100 miles.	Harris, 1962b
L. occidentalis	Western Gull	Oregon	In Washington and Oregon in the fall, spread out on Pacific coast in winter.	Ferris, 1940
L. o. occidentalis		Oregon	Most remained within 300 miles.	Woodbury and Knight, 1951
L. o. wymani		California	Most remained within 150 miles.	
L. ridibundus	Black-headed Gull	Belgium	Move toward coastal areas of Europe. A few migrate as far as 1200 miles.	Roggeman, 1970

SUMMARY

Two thousand juvenile and 152 adult Franklin's Gulls were wing-tagged at Agassiz National Wildlife Refuge in northwestern Minnesota from 1969 to 1971. A general dispersal occurs over Minnesota, North Dakota, and South Dakota until October. Adults remained in this area longer than juveniles, and individual adults were often observed more than once. A higher proportion of tagged adults than juveniles was observed, suggesting either a higher adult survival rate, a longer dispersal time, or both.

Chicks about to fledge were caught in the water and tagged in three consecutive sample periods. Birds tagged in the first sample period were slightly younger, intermediate in weight, and had a higher reporting rate relative to birds in the two later groups. Juveniles fledging in the middle tagging sample were the heaviest, were intermediate in age, and had a lower reporting rate than the first group. The last juveniles marked were the oldest and weighed less then either of the other groups. No sightings were obtained from the last group.

ACKNOWLEDGMENTS

I wish to thank H. B. Tordoff, K. W. Corbin, and W. E. Southern for help in the preparation of this manuscript and for suggestions during the research. I am grateful to the following people for helping to wing-tag gulls: R. Brownstein, J. Kotok, L. Kotok, M. Hamas, and M. Howe. This research was part of a three-year study of the Franklin's Gull conducted at Agassiz National Wildlife Refuge as a cooperative project with the U. S. Department of the Interior, Fish and Wildlife Service. I gratefully acknowledge financial support from the Frank M. Chapman Memorial Fund of the American Museum of Natural History, the Society of the Sigma Xi, and the Josephine Herz Fellowship of the Lake Itasca Forestry and Biological Station of the University of Minnesota.

LITERATURE CITED

American Ornithologists' Union. 1957. Check-list of North American birds, fifth ed. Baltimore, Amer. Ornithol. Union.

Behle, W. H., and A. M. Woodbury, 1952. Results of banding California Gulls (*Larus californicus*) at Farmington Bay, Utah. *Proc. Utah Acad. Sciences, Arts and Letters,* **29:** 24-29.

Brown, R. G. B. 1967. Breeding success and population growth in a colony of Herring and Lesser Black-backed Gulls *Larus argentatus* and *L. fuscus. Ibis,* **109:** 502-515.

Burger, J. 1971. A method for marsh-trapping breeding Franklin's Gulls. *Bird-Banding,* **42:** 123-124.

Coulson, J. C., and E. White. 1958. Observations on the breeding of the Kittiwake. *Bird Study,* **5:** 74-83.

Ferris, R. W. 1940. Eight years of banding Western Gulls. *Condor,* **42:** 189-197.

HARRIS, M. P. 1962a. Migration of the Lesser Black-backed Gull as shown by ringing data. *Bird Study*, **9**: 174-182.

—— 1962b. Recoveries of ringed Great Black-backed Gulls. *Bird Study*, **9**: 192-197.

—— 1964. Recoveries of ringed Herring Gulls. *Bird Study*, **11**: 183-191.

—— 1969. Effect of laying date on chick production in Oystercatchers and Herring Gulls. *Brit. Birds*, **62**: 70-75.

NISBET, I. C. T., and W. H. DRURY. 1972. Post-fledging survival in Herring Gulls in relation to brood-size and date of hatching. *Bird-Banding*, **43**: 161-173.

PAYNTER, R. A., JR. 1949. Clutch-size and the egg and chick mortality of Kent Island Herring Gulls. *Ecology*, **30**: 146-166.

ROGGEMAN, W. 1970. The migration of *Larus ridibundus* ringed as chick in the north of Belgium. *De Giervalk*, **60**: 301-321.

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

SOUTHERN, W. E. 1967. Dispersal and migration of Ring-billed Gulls from a Michigan population. *Jack-Pine Warbler*, **45**: 102-111.

—— 1971. Evaluation of a plastic wing-marker for gull studies. *Bird-Banding*, **42**: 88-91.

WOODBURY, A. W., and H. KNIGHT. 1951. Results of the Pacific gull color-banding project. *Condor*, **53**: 57-77.

Department of Ecology and Behavioral Biology, J. F. Bell Museum of Natural History, University of Minnesota, Minneapolis, Minn. 55455. (*Present address: Institute of Animal Behavior, Rutgers University, Newark, N. J.* 07102).

Received 24 July 1972, accepted 23 September 1972.