

INTERSPECIFIC RELATIONS OF BREEDING GULLS AT HONEY LAKE, CALIFORNIA

By DAVID W. JOHNSTON and M. E. FOSTER

In the spring of 1940, J. S. Dow reported the first positively known nesting colony of the Ring-billed Gull (*Larus delawarensis*) in California (Moffitt, 1942:105). On May 3 he and James Moffitt visited the colony which was located on a small island in the freshwater Hartson Reservoir at Honey Lake, Lassen County. The colony contained approximately 150 nests, but no completed sets were present on this date. Local residents claimed that gulls, presumably of this species, had bred on this reservoir since the middle 1920's even though Honey Lake itself had been intermittently dry.

The following year on May 14, Moffitt again visited the colony and found the gulls nesting on three separate islands in the reservoir. There were about 75 nests on one island, and he estimated that 250 pairs were nesting on the three islands. Most of the sets on this date were believed to be complete and they contained three eggs on the average. Incubation ranged from just begun to one-fourth completed. Some of the fresh eggs were placed in an incubator, and the incubation period was determined to be 26 to 27 days.

At no time during these years did anyone report the presence of the California Gull (*Larus californicus*) at this colony although this species has long bred 28 miles to the northwest at Eagle Lake, Lassen County, and 45 miles east-southeast at Pyramid Lake, Washoe County, Nevada.

ADDITIONAL OBSERVATIONS

Foster arrived at Honey Lake as refuge manager in 1949 and first noted breeding gulls in 1950. At this time approximately 750 nests were counted on a small duck pond near the refuge headquarters, and, as far as is known, gulls did not nest on the islands in Hartson Reservoir that year. This was probably due to the fact that there was very little water in the reservoir in the early spring—probably not enough for any of the hummocks to be surrounded and form islands. When the nests were counted, it was thought that *L. californicus* was also breeding, partly because of adults observed and partly because of differences in egg sizes. Since 1950, gulls have again utilized the small islands in the reservoir, which has remained full of water.

On July 18 and August 9 and 10, 1952, Johnston visited the Honey Lake Valley. It was too late to observe breeding birds, but numerous *L. delawarensis* (both adults and birds-of-the-year) were noted on various fields, small lakes and streams. An occasional adult *californicus* was seen in these flocks, indicating that perhaps this species also bred in the area.

On May 17, 1953, Johnston and R. D. Taber visited Hartson Reservoir and observed flying gulls of both species. About one-fourth mile offshore on a small flat island a large group of gulls was seen. En route to the island we stopped at two grassy islands where, according to Foster, gulls had nested in previous years, but this year gulls did not occupy them. One was entirely vacant and the other contained about 40 Forster Terns (*Sterna forsteri*) which showed a decided interest in our presence by diving at us. As we neared the island with gulls, more and more gulls flew around us calling excitedly, and we saw a large number standing and sitting in the short grass. The majority of these were adult *delawarensis*, but we also noted a few adult and fewer subadult *californicus*.

Immediately on our landing, we began to find gull nests. Birds would rise from the short grass in front of us but would return immediately to the nests after we passed. By closely scrutinizing the standing, sitting, and flying gulls, we roughly estimated 10

delawarensis for every *californicus*. Since estimating numbers of moving gulls is exceedingly difficult, especially when more than one species is involved, we decided to make a census of all nests in the colony. Gulls did not nest all over the island but occupied approximately four-fifths (30×200 yards) of it. There was a tendency to nest in the grass, not on the mud, and toward a low ridge which contained a growth of rabbit brush (*Chrysothamnus* sp.) and five-hook bassia (*Bassia hyssopifolia*) two to four feet in height.

Many of the nests were within three feet of each other, but the average distance between nests was probably more than four feet. All the nests of *californicus* were located on the low ridge, being surrounded by and intermixed with nests of *delawarensis*. Since these two species of gulls have eggs which are similar in color and shape, it was necessary to identify nests by relative size of eggs, the eggs of *californicus* being consistently larger. Nests for the most part were completely unprotected from the sun, but a few were located so that the larger plants afforded some shade. Censusing of the entire colony required about one hour and consisted of tabulating nests and contents by crisscrossing through the colony. Only occasionally did we find what appeared to be uncompleted nests, and these could conceivably have belonged to either species although more likely to *californicus*. The result of the nesting census is presented in table 1.

Table 1

Census of Gull Nests on an Island in Hartson Reservoir, Honey Lake, on May 17, 1953

Nest contents	Number of nests	
	<i>Larus delawarensis</i>	<i>Larus californicus</i>
1 egg	29	2
2 eggs	129	17
3 eggs	490	7
4 eggs	20	
5 eggs	17	
6 eggs	8	
2 eggs, 1 young	10	
1 egg, 2 young	6	
1 egg, 1 young	6	
2 young	2	
Totals	717	26

From the presence of nestlings a day or two old and the presence of pipping eggs in nests of *delawarensis*, we began to suspect that the eggs of this species were further advanced than were the eggs of *californicus*. In order to test this supposition, more than a dozen eggs of both species from random nests were broken open, with the result that all the eggs of *delawarensis* were found to have been incubated two or more weeks whereas the eggs belonging to *californicus* were found to be either fresh or incubated up to an estimated four days' maximum.

From table 1 it is readily apparent that the median number of eggs in the clutches of *delawarensis* was about three. The significance of clutches with only one egg is not fully understood, but it is probable that these sets were complete since developing embryos were contained in the few that were broken. (A completed clutch of only one egg was found to be not infrequent in nests of *californicus* at Mono Lake, California, by Johnston.) Possibly some of the single eggs were infertile or had been deserted. No individuals of *delawarensis* were collected to ascertain internal conditions of reproductive physiology.

The small number of nests of *californicus* posed further problems. At such an early

stage of incubation, it would seem as though *californicus* was not yet through laying, and such might have been true for some individuals in the colony. All the available evidence, however, indicates that they had just finished laying. In the first place, two adult females collected both exhibited well developed incubation patches and ovulated follicles. Neither showed any follicles ready to be ovulated or eggs anywhere in the oviduct. In the second place, other observations at other colonies (Pyramid Lake, Marshall and Giles, 1953:113; Mono Lake, Johnston, MS) indicate that the mean number of eggs for this species is about two.

From the number of nests counted it becomes apparent that there were more than 1400 *delawarensis* and at least 55 *californicus* (including three subadults) present at this colony.

DISCUSSION

Comparison of dates of nesting in different years.—It will be recalled that Dow and Moffitt found only incomplete sets of *delawarensis* on May 3, 1940. Assuming that full clutches were attained within the next two or three days, by adding 26 or 27 days (the incubation period as determined by Moffitt), one might suppose that the eggs would have hatched at least by June 1 of that year, and perhaps earlier. In 1953, although some hatching had already commenced by May 17, many of the eggs which we broke open were only about one-half incubated. Thus, these, too, would have hatched out by June 1. These interpretations of the existing data would indicate a similarity in the time of nesting in these two years at this colony, although there is some indication that the nesting in 1953 was slightly more advanced than in 1940.

Increase in Ring-billed Gulls.—By examination of total counts and estimates made of the nesting gulls in this colony for several years, it is definite that *delawarensis* has increased in numbers at least since 1940. Counts and estimates of breeding pairs are as follows: 1940, 150±; 1941, 250±; 1950, 700±; 1953, 717.

Colonization of California Gulls.—Just exactly when *californicus* first nested in Honey Lake Valley is not known, but from the data at hand it was probably between 1941 and 1950. It would seem that one condition to be fulfilled in order for numbers of these gulls to occupy new breeding grounds would be that of considerable population pressure in the closer, established colonies. One might speculate that the "invading" birds came from either Eagle Lake or Pyramid Lake, the closest breeding colonies. Another possible source would be migrants which did not reach other colonies to the north (for example, Tule Lake and Klamath Lake). Since the Eagle Lake population has always been small—something on the order of four pairs (see Grinnell, Dixon, and Linsdale, 1930:226-227)—and since the Pyramid Lake population has been increasing into the thousands according to Marshall and Giles (1953:115), it is more probable that *californicus* came from Pyramid Lake. Sooner or later it might be possible to prove this point, for rather extensive banding has been undertaken at Pyramid Lake, and, if any birds did move over to Honey Lake, they would be detectable by the presence of bands. Such an instance would be of considerable interest because there seems to be a general tendency for *californicus* to return to its natal grounds for breeding (see, for example, Woodbury, Behle, and Sugden, 1946:13).

Competition and ecologic separation.—As far as food habits are concerned, there is no evidence that the two species differ to any great extent, although we have not examined any large number of stomachs critically. From observations of wintering gulls in the San Francisco Bay area, it is known that *delawarensis* and *californicus* fare better together than do either or both of them with their larger congeners. In this connection it should be indicated that *californicus* is only slightly larger than *delawarensis*. The two species frequently feed together in wintering flocks, and also in the Honey Lake Valley

in the open fields and along water courses. They are to be found together in migrating flocks. So it seems that the two species occupy similar food niches; at least their niches are as close as has been observed in the various species of gulls.

In the wintering flocks of gulls in the San Francisco Bay area, where one finds large numbers of the Herring Gull (*Larus argentatus*), there will almost always be considerable numbers of the Glaucous-winged Gull (*L. glaucescens*) and perhaps the Western Gull (*L. occidentalis*). Large flocks of wintering gulls at garbage dumps are essentially devoid of the smaller *californicus* and *delawarensis* due to their inability to compete with the larger species. These two situations indicate a correlation between size of the bird and food niche.

There are several localities in North America where *californicus* and *delawarensis* have been known to nest on the same lake for years. In these instances, the two species may either occupy the same or different breeding sites. Gabrielson and Jewett (1940: 292) state that the two species nest in separate and distinct areas, with *californicus* usually entirely surrounding *delawarensis*. At Malheur Lake, Oregon, Willett (1919: 196) reported that the nests of the two species did not overlap, and in this instance there were 500 pairs of *delawarensis* and 60 pairs of *californicus*. Bent (1947:126) records nesting of the two species in Saskatchewan on the same island where apparently their numbers were equal: "The nests of the ring-billed gulls were chiefly on the higher portions of the island, while those of the California gulls were mostly around the shores and on a bare, flat point, though both species were somewhat intermingled when the two colonies came together." At Honey Lake there was only a slight tendency toward spatial segregation, and this was not entirely conclusive. Probably the proximity and intermingling of nests at this colony were due to the small size of the island on which the gulls nested.

The most interesting single fact resulting from our study was the ecologic separation of the two species in reference to the timing of their nesting cycles. It will be recalled that all the nests of *delawarensis* contained eggs at least one-half incubated whereas the eggs of *californicus* were relatively fresh. This would mean, of course, a difference in time when the young of the two species would hatch and therefore would tend to stagger the greater demands on the available food supply. As a possible exception to a phenological difference in these two species is the situation reported by Willett (*loc. cit.*) in which *californicus* began to lay on June 7 whereas *delawarensis* began on June 5. These dates, however, seem to be exceedingly late for both species to begin laying in Oregon, and one might suspect that there was a tendency toward overlap of nesting due to a late season locally.

In conjunction with our findings, the reader is referred to a comprehensive investigation of the breeding biology of two sympatric colonial species of European gulls. Paludan (1951:table 6, 40; 46) found that *L. argentatus* occupied the colony before *L. fuscus*, attributing this phenomenon to the fact that *fuscus* migrates much farther to the south. Furthermore *argentatus* reaches the height of its egg-laying period during the last third of April but *fuscus* not until the middle of May. Here, then, is another example of closely related sympatric species being somewhat ecologically separated by a difference in breeding times.

In addition to the phenological difference pointed out and the obvious morphological difference between *californicus* and *delawarensis*, there are probably also differences in voice, flight, reproductive physiology, and behavior patterns which we have not observed.

LITERATURE CITED

- Bent, A. C.
1947. Life histories of North American gulls and terns. Dodd, Mead & Co., New York. 333 pp.
- Gabrielson, I. N., and Jewett, S.
1940. Birds of Oregon. Ore. State Monog., Studies in Zoology, No. 2. 650 pp.
- Grinnell, J., Dixon, J., and Linsdale, J. M.
1930. Vertebrate natural history of a section of northern California through the Lassen Park region. Univ. Calif. Press, Berkeley. 594 pp.
- Marshall, D. B., and Giles, L. W.
1953. Recent observation on the birds of Anaho Island, Pyramid Lake, Nevada. Condor, 55:113-115.
- Moffitt, J.
1942. A nesting colony of ring-billed gulls in California. Condor, 44:105-107.
- Paludan, K.
1951. Contributions to the breeding biology of *Larus argentatus* and *Larus fuscus*. Vidensk. Medd. fra Dansk naturh. Foren., 114:1-128.
- Willett, G.
1919. Bird notes from southeastern Oregon and northeastern California. Condor, 21:196.
- Woodbury, A. M., Behle, W. H., and Sugden, J. W.
1946. Color-banding California gulls at Great Salt Lake, Utah. Bull. Univ. Utah, Biol. Ser. 10, 37:1-15.
- Museum of Vertebrate Zoology, Berkeley, California, and California Department of Fish and Game Refuge, Wendel, California, July 10, 1953.*