FIGURE 1. Common Tern chick with fish (probably Bluefish) impaled on upper mandible after tail-first swallowing.

trials, 2 of 39 were swallowed tail-first on the fourth and seventh attempts. By contrast, 33 of 62 tail-trials resulted in fish being swallowed head-first. This difference, tested by a Chi Square on a 2×2 contingency table is highly significant ($P < 0.0001$).

Four possible outcomes were considered: head-first presentations swallowed head-first vs. tail-first, and tail-first presentations swallowed head-first vs. tail-first. The mean elapsed time and the number of attempts required for swallowing a fish are given for each of the four response categories. For head-presentations (with only two tail-first swallows and no ties), the Mann-Whitney U test was used and the probabilities associated with the differences were $P < 0.001$ for both attempts and time. For tail-presentations with many ties, the Median Test and Fisher Exact Probability tests were used. The differences between head-first and tail-first swallowing with respect to time ($P < 0.001$) and number of attempts ($P = 0.003$) were again significant.

For all trials there was a total of 246 attempts. Of tail-first attempts 31 of 143 (21.7%) were successful, compared with 70 of 103 head-first attempts (68%). The difference is significant ($\chi^2 = 53$; $P < 0.0001$). However, as mentioned earlier, these trials are not strictly independent, and will be repeated with randomization for each attempt. Additional observations made on chicks of various ages that were fed in a holding pen with other chicks revealed that of 76 head-first swallowing attempts, fish were stolen only twice, compared with five thefts in 21 tail-first attempts ($\chi^2 = 11$; $P < 0.001$).

The results indicate that tail-first swallowing attempts usually failed. Moreover, even when successful, tail-first attempts required more time and effort on the part of the chick and increased the possibility of having a fish stolen by another bird. Thus even if the "accident" shown in figure 1 is evolutionarily trivial, the disadvantages observed in the feeding experiments are adequate to explain the rarity of tail-first swallowing in nature. They also indicate why chicks learn to swallow fish head-first, almost without errors, by the time they are about a week old.

The cues involved in this learing process remain to be determined. Presumably, success associated with head-first attempts condition chicks to repeat the process, while failures would inhibit future tail-first attempts. My initial results suggest that the manner in which the fish is presented plays a role, since the chicks usually seize the fish close to the forceps in experiments and close to the adult bill in nature. Field observations show that adults usually grip the fish just behind the head (pers. observ.). Also, I have noted that chicks will frequently seize a fish near the eye, as if this contrasting spot elicited pecking, much as for Herring Gulls (*Larus argentatus*) (Tinbergen 1960). Both of these factors increase the likelihood that chicks will attempt to swallow a fish head-first (Gochfeld, unpubl. data).

Several people, particularly Joy Grafton, Danielle Ponsolle, and Robert Gochfeld, participated in the field work. Deborah J. Gochfeld assisted with the feeding experiments. C. Lavett Smith and James S. Atz kindly provided a provisional identificaton of the fish in the photograph. Dean Amadon, Eugene Eisenmann, David Ewert, and Leslie Marcus provided valuable advice on preparation of this paper.

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PELAGIC GULLS IN WINTER OFF SOUTHERN CALIFORNIA

BRIAN A. HARRINGTON
Manomet Bird Observatory
Manomet, Massachusetts 02345

The species and age distribution of certain gulls in southern California were reported by Devillers et al. (1971), but few sightings at sea were included. Indeed, except for the work of Sanger (1970, 1973) in the north Pacific, few studies of the movements and ranges of gulls consider pelagic populations (cf. Woodbury and Knight 1951, Kadlec and Drury 1968). This article presents winter observations on age, distribution, density, and species of gulls at sea off southern California.

Most observations were made more than 50 but less than 400 miles offshore, by me or other personnel of the Pacific Ocean Biological Survey Program (POBSP), Smithsonian Institution, during 436 hr of daytime observations, 19 January to 9 April 1967. Observations in pelagic areas between 30°10′ and 35°00′ N and 121°20′ to 126°40′ W, an area of approximately 350 by 300 statute miles (fig. 1), were made from ships usually traveling at about 10 knots.

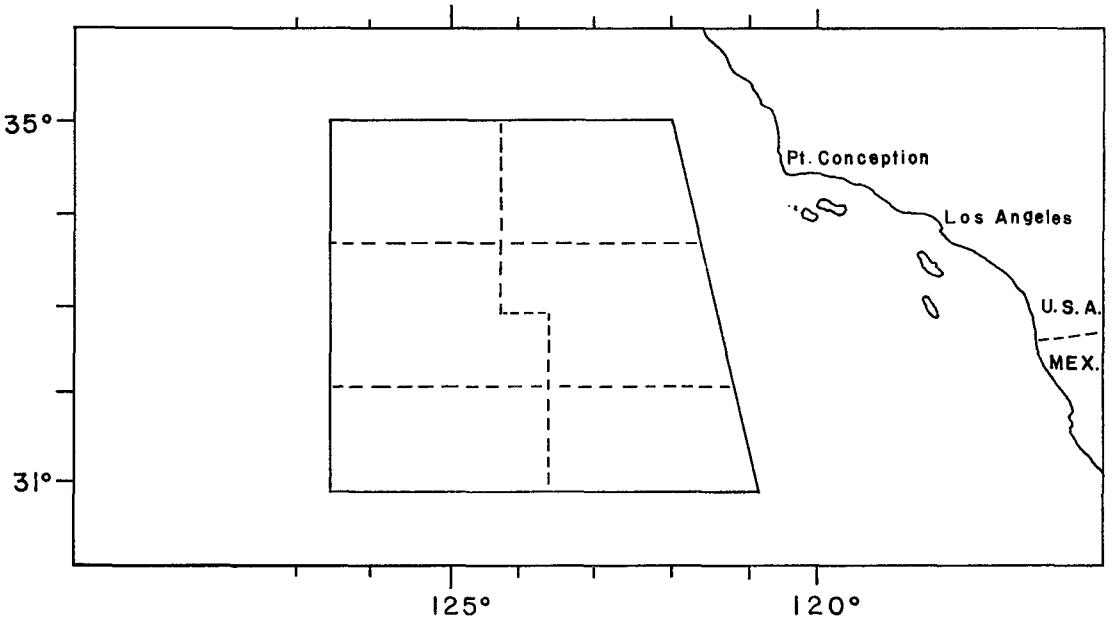

FIGURE 1. Pelagic survey area off southern California, including boundaries used in analysis of north to south and east to west gull distribution.

Observations from comparable latitudes but further at sea were reported by Yocom (1947), and observations off San Francisco were reported by Sanger (1973).

Additional sightings reported here come from 80 hr of observations over 750 linear miles traveled between the pelagic survey area and ports on the southern California coast. Because these observations were not in the primary survey area, flocks were not approached; consequently, only about a quarter of the gulls near the coast were identified. Those species identified and the numbers of each are presented in appendix 1. However, these figures probably do not represent relative species abundance accurately because some gulls are more easily identified than others. For example, species pairs such as immature Western (*Larus occidentalis*) and immature Herring (*L. argentatus*) gulls, or California (*L. californicus*) and Ring-billed (*L. delawarensis*) gulls, are difficult to separate at a distance. Consequently, a high percentage of each of these species is listed in the appendix as unidentified, whereas high percentages of the distinctive Heermann's Gull (*L. heermanni*) and Black-legged Kittiwake (*Rissa tridactyla*) were identified. These observations still show which species were present regularly within 50 miles of the coast and provide a crude estimate of their relative abundance.

For purposes of presentation and discussion, the pelagic survey area is divided north to south into three parts of nearly equal size, and east to west into two approximately equal parts (fig. 1). Daytime observations were made over 4100 statute miles within this survey area.

All large gulls in the pelagic survey area, except Kittiwakes, habitually followed the survey ship. The

TABLE 1. Numbers, distributions, ages and densities of three species of gull seen on five surveys of a pelagic area off southern California in 1967.

Species	Sector of survey area	19–26 January			7–15 February			22 Feb.–2 March			12–22 March			1–9 April		
		X[a]	Y[b]	Z[c]	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
Glaucous-winged Gull	North	5	0.014	100	4	0.009	100	3	0.002	100	3	0.006	100	0	—	—
	Central	7	0.012	100	4	0.008	100	6	0.012	100	1	0.002	100	1	0.002	100
	South	4	0.009	100	6	0.012	100	8	0.013	100	0	—	—	0	—	—
Herring Gull	North	45	0.122	36	87	0.180	17	92	0.151	10	107	0.217	17	19	0.034	?
	Central	76	0.132	35	87	0.165	17	71	0.145	20	12	0.019	9	2	0.004	?
	South	32	0.071	28	44	0.088	33	47	0.079	35	0	—	—	2	0.003	?
Black-legged Kittiwake	North	211	0.581	76	68	0.141	18	125	0.205	33	29	0.059	9	0	—	—
	Central	69	0.120	93	47	0.089	57	46	0.094	77	0	—	—	0	—	—
	South	20	0.057	100	26	0.052	58	18	0.030	75	0	—	—	—	—	—

[a] = Number of birds seen.
[b] = Density (birds/square mile).
[c] = Immatures (percent of total).

daily totals given for these ship-following species are the highest numbers counted at any one time on a given day. Undoubtedly, this led to some underestimation of numbers of large gulls, as some individuals probably followed the survey ship only at times other than when maximum counts were made.

Whenever possible, gulls were designated adult or immature. Aging of some species, especially those following ships, was easy. Ages of others, for example Kittiwakes at a distance, were not determined. In this report, total numbers of adults and immatures (table 1) were calculated for each species by adding to the numbers of adults and immatures identified the equivalent proportion of birds whose ages were not determined. In estimating densities I assumed that all gulls within one mile of the survey ship were visible.

All specimens collected during the surveys are in collections of the National Museum of Natural History, Smithsonian Institution.

SPECIES ACCOUNTS

Larus hyperboreus. Glaucous Gull. Uncommon or rare in the survey area. We saw only four, all immatures, and all in January and February. We collected an immature *L. h. barrovianus* at 31°31′ N; 123°19′ W on 13 February.

L. glaucescens. Glaucous-winged Gull. Uncommon, but with regular distribution throughout the survey area (table 1). From 19 January through 9 April we saw at least 52 individuals; all were immature. During the same period, we regularly saw adults near the coast off Los Angeles, and Devillers et al. (1971) noted that adults occur regularly near San Diego. Yocom (1947) reported four immature Glaucous-winged Gulls near 34° N, 131°31′ W in February–March 1945, and Sanger (1973) noted adults near the coast off northern California, but scarce further offshore. Immatures, however, had a more seaward distribution in his study. We collected several immatures in our survey area.

L. occidentalis. Western Gull. We saw none in the pelagic survey area until 21 April when four adults (one collected) were sighted in the northeast sector. Neither Sanger (1970) nor Yocom (1947) reported Western Gulls in pelagic areas of their West Coast surveys.

Along the southern California coast, we regularly saw Western Gulls (appendix), occasionally as far as 50 miles west of Point Conception and 60 miles SW of San Clemente Island.

L. argentatus. Herring Gull. The most common gull in the survey area, with occasionally as many as 30 following the ship at one time. Between 19 January and 9 April, the overall average density was greatest in the northern sector of the pelagic survey area and lowest in the southern sector. This contrasts with Sanger's (1973) observation of uniform latitudinal distribution off northern California. In our pelagic surveys, the distribution by age (table 1) shows that when immature birds were present, they were evenly distributed over all three north-to-south sectors, the average densities being 0.029, 0.027, and 0.026 birds per square mile (bpm^2), respectively. In contrast, adults were not evenly distributed, the densities from north to south being 0.139, 0.088, and and 0.053 bpm^2. Thus, the decrease in overall density of the species from north to south reflects changes in densities of adults but not immatures. On an east-west basis, however, frequencies of adults and immatures were not significantly different ($P > 0.05$).

We saw twice as many Herring Gulls in the eastern half of the pelagic survey area as in the western half, indicating a tendency for this species not to go far out to sea. However, Yocom (1947) designated adult and immature Herring Gulls common 575 miles off San Francisco. Sanger (1973) noted that both adult and immature Herring Gulls are most common 50–100 miles off northern California, and that they also are common nearer shore or as far as 300 miles offshore, but that they are absent farther than 300 miles out. In contrast, we repeatedly noted a decline in numbers of Herring Gulls within about 25 miles of the coast and often saw individuals up to 400 miles offshore.

The seasonal pattern of abundance of Herring Gulls off southern California is one of increasing numbers through early or mid-February, followed by rapid decrease from mid-March to mid-April (table 1). Gonads of adults showed little evidence of recrudescence until late February, with noticeable enlargement beginning in March. By early April they were quite large and appeared to be nearly in breeding condition.

L. californicus and *L. delawarensis.* California and Ring-billed Gulls. Although these birds were common near the coast during the surveys (appendix 1), we did not see a single individual of either species in the pelagic survey area. We occasionally saw California Gulls as far as 90 miles SW of San Clemente Island, but the majority was seen between the mainland and the Channel Islands. In this area we estimated that California Gulls outnumbered all other species combined by about ten to one.

L. canus. Mew Gull. We collected one individual in the northeast portion of the survey area on 20 April.

L. heermanni. Heermann's Gull. Although regular near the coast during portions of these surveys (appendix 1), none was seen seaward of the Channel Islands.

Rissa tridactyla. Black-legged Kittiwake. Common in January and February, uncommon in mid-March, and absent in April. The average density was highest in the northern and lowest in the southern sector of the pelagic survey area. Kittiwakes were present on four of the five surveys considered in this report, but on only three were they present in all three north-south sectors (table 1). On each of these three surveys the percentage of immatures was lower in northern than in central and southern sectors, but the percentage changed dramatically from one survey to the next (table 1). These fluctuations apparently were caused mostly by changes in numbers of immature birds rather than by changes in numbers of adults. For example, during the three surveys in question, the adult : immature ratios were 56 : 244 in January, 87 : 54 in the second week of February, and 99 : 90 in late February–early March. In terms of birds per square mile for the whole survey area, the extremes for adults were 0.149 (19–26 January, table 1) and 0.176 (7–15 February); for immatures they were 0.106 (7–15 February) and 0.608 (19–26 January).

The east and west densities of Kittiwakes within the pelagic survey area were almost identical, with no significant difference found between distributions of adults and immatures.

Between the survey area and land, we frequently saw Kittiwakes, especially SW of San Clemente Island from mid-February to early March. On 2 March we counted 40 flocks totaling 1109 birds. Counts of

over half the birds in these flocks suggested that most flocks contained more than 90% immature birds. However, one flock of 30 was comprised entirely of adults.

Inside the Channel Islands we saw Kittiwakes less commonly (see appendix), more often near Point Conception than further south. In the Santa Barbara Channel, 37 of 39 Kittiwakes we saw in February were adults.

Xema sabini. Sabine's Gull. The first ones seen in the pelagic study area were 21 sighted the third week of May.

DISCUSSION

The distribution of certain gulls along the California coast has been well studied (e.g., Woodbury and Knight 1951, Johnston 1955, Devillers et al. 1971), but aside from Yocom (1947) and Sanger (1973) few studies incorporating pelagic studies of species occurrence and abundance at sea have been published. The occurrence of gull species within 50 miles of the southern California coast is quite different from that at equivalent latitudes offshore. This study shows that some gulls seen regularly near the coast are rare or absent far at sea (Western, California, Ring-billed, Heermann's, and Bonaparte's). Other species occur regularly both near the coast and at sea (Herring and Glaucous-winged), and one is predominantly pelagic (Kittiwake). The Herring Gull is especially interesting because, according to our observations, it is most common between 50 and 150 miles at sea. In the Atlantic, however, Herring Gulls apparently are more common near land than offshore, with the exception that large numbers can be found regularly with the international fishing fleet on major banks off the northeast coast (W. H. Drury, pers. comm.).

The pelagic Herring Gulls off California rarely were seen feeding on natural food but habitually followed ships, apparently to feed on sporadically available offal. Some distinctively marked individuals followed our ship for more than 8 hr. In contrast, the Herring Gulls seen near land tended to feed with other gulls in mixed species flocks and normally did not follow ships.

The densities of immature Glaucous-winged and immature Herring gulls in our pelagic survey area were relatively uniform from north to south and from east to west. In contrast, adult Herring Gulls were concentrated in northern parts of the pelagic survey area. Thus age-related differences in Herring Gull distribution occur at sea as well as near land as described for Atlantic populations by Gross (1940), Drury (1963), and Kadlec and Drury (1968). Unfortunately, we have insufficient data to compare latitudinal variation of coastal and pelagic age ratios for Herring Gulls, but in Glaucous-winged Gulls a difference appears to exist. We frequently saw adults near land but never far at sea. Sanger (1973) showed that the distribution of immature Glaucous-winged Gulls off northern California tends to be pelagic rather than coastal. However, he did find adults in pelagic areas.

As with the larger gulls, percentages of immatures among Black-legged Kittiwakes sighted off southern California increased from north to south. Coulson (1966), by analyzing band recoveries, showed that immature Kittiwakes in Europe travel further south than adults. Unlike the larger gulls off California, numbers of adult Kittiwakes at sea were relatively stable between mid-January and early March, but at the same time numbers of immatures fluctuated widely.

The results of these surveys support Sanger's (1973) observation that the pelagic occurrence of Herring and Glaucous-winged gulls off California is not simply casual but instead represents active movement away from land. The limits of active versus accidental seaward movement for these species are not yet clear. While both species often appear during winter in the Hawaiian Islands, their occurrence apparently results from wind-drifting (Sibley and McFarlane 1968). At Kure Atoll (28°25′ N; 70°10′ W), northernmost of the Hawaiian Islands, immatures of both species occur in winter but not regularly from year to year (Woodward 1972).

In contrast to the active pelagic occurrence of Kittiwakes and Herring and Glaucous-winged gulls, our observations near the coast show that most other gull species only rarely or never occur more than a hundred miles offshore. Unfortunately, we do not know the precise status of Herring and Glaucous-winged gulls in the coastal zone. Our impression is that they are uncommon there, but additional studies should be made.

SUMMARY

Seabird surveys off southern California between January and April show the seasonal occurrence of gulls within 50 miles of the coast and in pelagic areas more than 50 miles offshore. Nine species occur regularly near the coast. Three are common farther offshore. Immatures of two of the latter, Herring Gulls and Black-legged Kittiwakes, tend to occur farther south than adults. In the third species, the Glaucous-winged Gull, immatures, but not adults, tend to occur in pelagic areas.

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APPENDIX 1. Numbers of gulls identified off the southern California coast, 18 January–10 April 1967.

Species	No. between the Channel Islands and the mainland	No. between the Channel Islands and the pelagic survey area
Larus glaucescens	17	21
L. occidentalis	129	25
L. argentatus	56	65
L. californicus	230	12
L. delawarensis	17	0
L. heermanni	19	0
L. philadelphia	165	0
Rissa tridactyla	227	1333[a]
unidentified	2533[b]	213

[a] Most were seen in one day, see species account.
[b] Most were probably Western, Herring and California gulls.

DIFFERENT HEAD-SCRATCHING ATTEMPTS IN A ONE-LEGGED GULL AND PARROT

ROBERT B. WAIDE

AND

JACK P. HAILMAN

Department of Zoology
The University of Wisconsin
Madison, Wisconsin 53706

Independently, we have observed rather different head-scratching attempts in one-legged individuals of two different species. J. P. H. watched a winter "club" of Ring-billed Gulls (*Larus delawarensis*) on 20 March 1960 in a large field in Norfolk, Virginia. One gull was missing its right leg, yet engaged in behavior that appeared strikingly similar to head-scratching. While preening, the bird lowered its head and turned it to the right side, in the exact posture used by gulls scratching with the right foot. It resumed a normal standing posture with head forward and then repeated the head-scratching posture. After returning to normal posture, the gull repeated a third time the head-down posture, which appeared identical with that shown by other nearby birds that actually were head-scratching.

In contrast, a caged White-fronted Parrot (*Amazona albifrons*) was able to scratch the right side of its head despite a missing left leg. In March 1973, R. B. W. was attracted to a captive individual that was whistling from the doorway of its owner's house in Chetumal, Quintana Roo, Mexico. Pausing in its performance, the parrot hooked its upper mandible through one of the bars of the top of its bell-shaped wire cage and lifted itself from the perch. While hanging vertically, the bird arched its back, brought up its right foot, and scratched the right side of its head. Parrots are perhaps better adapted for such behavior than other birds since they often use their beaks for climbing in the wild.

In sum, the gull appeared to persist in unsuccessful head-scratching attempts with a missing leg, whereas the parrot showed an ingenious solution to scratching one side of its head despite a missing limb. These attempts to solve the unique problems presented by missing limbs reinforce the suggestion that head-scratching is functionally important behavior.

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PERCH-SITE PREFERENCES OF FOUR DIURNAL RAPTORS IN NORTHEASTERN COLORADO

WAYNE R. MARION[1]

AND

RONALD A. RYDER

Department of Fishery and Wildlife Biology
Colorado State University
Fort Collins, Colorado 80521

Reports on the perch-site preferences of larger diurnal raptors are rare and generally involve only one species or several closely related species. Errington and Breckenridge (1938) stated that, in the north-central United States, buteos prefer dead trees, telephone poles, and fenceposts as perch sites. Most of the eagles observed during a winter aerial census in southeastern Colorado were perched on the ground or on fenceposts (Enderson et al. 1970). Perch-site preferences of sympatric species in an area have rarely been compared. Winter censusing of larger diurnal raptors provided an opportunity to determine perch-site preferences of sympatric species on the shortgrass prairie in northeastern Colorado.

MATERIALS AND METHODS

Thirteen semi-monthly censuses of larger diurnal raptors using hawk winter censusing methods (Craighead and Craighead 1956) were conducted between October 1969 and March 1970 on a 145-km^2 study area in Weld County, Colorado. This area is on the shortgrass prairie approximately 56 km NE of Fort Collins, Colorado.

[1] Present address: Wildlife Ecology Program, School of Forest Resources and Conservation, University of Florida, Gainesville, Fla. 32611.