

FOOD HABITS OF THE CALIFORNIA GULL IN UTAH

By CLIFTON M. GREENHALGH

The California Gull (*Larus californicus*) is generally revered in Utah for its well known role during pioneer times in helping to save the crops of the first settlers of Great Salt Lake Valley from crickets. Subsequently an interesting social taboo developed whereby the bird was rarely killed (Young, 1928). The famous Seagull Monument, erected on the Temple grounds at Salt Lake City to commemorate the role of the gull, has helped to keep the taboo alive. The first change in local feelings toward the gulls came with complaints against them because of their depredations on cherry crops in Davis County (Cottam, 1935; Sugden, 1937). Similar charges have come from Boxelder and Utah counties.

These birds have long been known to nest on several islands in Great Salt Lake (Behle, 1935, 1949). New colonies of gulls have of recent years been established at three waterfowl refuges on the east side of Great Salt Lake, namely Farmington Bay, Ogden Bay, and the Bear River Refuge. This has brought them in close contact with nesting waterfowl and the gulls are being accused of predations on ducks.

With attention being focused on these new problems, it seemed desirable to make a general study of the food habits of the California Gull. Little specific information was on record. Kalmbach (1914:6) reported on the contents of five stomachs and Cottam and Williams (1939:153) listed the contents of six stomachs of birds taken in the Great Salt Lake region but these were small samples. Accordingly a study was started by the writer in 1940. This was interrupted by the war but was resumed in June of 1946 when arrangements were made with the personnel at Bear River Migratory Bird Refuge to spend the summer working on the refuge and at the laboratory of the research division at the refuge headquarters. In addition to field observations, food items in the stomachs of California Gulls previously collected on the refuge were identified and further samples were taken. The results are presented here supplemented with occasional notes from the literature and interviews with farmers.

Thanks are due William H. Behle of the University of Utah for guidance in this study. I am indebted to several men at the Bear River Migratory Bird Refuge: Cecil Williams and Vanez Wilson were generous in providing facilities for me in 1946; Cecil Williams, Charles Sperry, Hortin Jensen, and Ralph Hervey were helpful in giving advice, collecting, and identifying food items. In my initial collecting around Salt Lake City I was helped by Jack Berryman, Rex Edward, Dan Gardiner, and Nathan Riser to whom I also express my thanks.

MATERIALS AND METHODS

The results herein presented are based mainly on an analysis of 529 stomachs. Of these, 132 were collected at Bear River Refuge in 1939 by the personnel at the refuge. The writer collected 47 in the Salt Lake City area in 1940, and 166 in 1941. These were taken either on Antelope Island in Great Salt Lake or west of Salt Lake City. Ten stomachs were taken each week from March 30 to August 10. By this time most of the gulls had migrated and specimens were difficult to obtain. In 1946, 184 stomachs were collected at the Bear River Refuge. Fifteen gulls were taken each time, again at weekly intervals.

The usual techniques were followed in preserving and handling the stomach contents whereby they were sorted, dried and measured volumetrically in terms of cubic centimeters. First, the entire stomach contents, including debris and gravel, were considered on the basis of 100 per cent. After the gravel and debris had been measured

and removed, the food items were computed on the basis of 100 per cent. All material was measured to the closest 0.1 cc. If there were items mixed to a degree where it was not practical to separate them, an estimate was made of the individual items. No stomachs were eliminated in this study.

DISCUSSION AND EVALUATION OF ITEMS

Gravel.—This made up a bulk of 357.70cc. which was 8.61 per cent of the total. It was found in 427 of the 529 stomachs. Also included in this category were the following items. In one instance a piece of iron was found. Sand was found in many of the stomachs, usually being associated with earthworms and other earth-dwelling animals. Mollusk shells appeared occasionally. They were bleached and there were no signs of associated flesh. In general the stomachs that were gorged with food had little or no gravel, whereas large amounts of gravel were found in the empty or nearly empty stomachs.

Debris.—This made up 327.45cc. or 7.89 per cent of the total. Items classified as debris are those that may have been inadvertently taken in while feeding. Such items identified were paper, sawdust, chips of wood, grains, portions of bullrushes, sedges, chara, dandelions, pondweeds, and various plant fibers. Feathers were considered as debris unless skin or flesh was also present in which case the entire unit was considered as food. Special care was taken to prevent feathers of the gull being mixed with stomach contents. Nevertheless gull feathers did show up in stomach contents. This may serve as a clue to the reason for so much debris. The gull has the habit of picking objects at random while resting or feeding and then ingesting them. In March and April when nesting sites were being chosen there was a higher percentage of debris than in the rest of the season.

Food.—All items in the stomach contents other than gravel and debris and which possessed nutritional values were considered as food. This made up 3468.15cc. or 83.50 per cent of the total. The various items were subdivided to expedite handling.

Birds and birds' eggs: 155.60cc. (4.49 per cent). This study indicates that the gulls are commonly predacious on birds and birds' eggs. Both young and adults are taken. Some land birds are preyed on as well as marsh-dwelling birds.

Seven ducklings were found in the stomach contents, for which the measurement was 35.20cc. Three young coots were also found with a volume of 51.40cc. There were two occurrences of passerine birds with a volume of 35.20cc. One of these was a sparrow. In addition, a day-old turkey that had been regurgitated by a young gull was picked up by W. H. Behle at a Farmington Bay colony on June 16, 1945.

Five gull stomachs contained duck feathers and skin of adults. The measurement was 4.40cc. While working during a botulism outbreak at Bear River Refuge, the writer saw many ducks that had been attacked by gulls. The uropygial gland at the base of the tail was the area most often injured. According to Charles C. Sperry, even if these birds were to recover from botulism, they would die in a few weeks from drowning because of the subsequent lack of oil for waterproofing the feathers.

There were no egg remnants in the stomachs of gulls taken before 1946. Of the 184 stomachs collected at the Bear River Refuge in 1946, thirty contained eggs of other species of birds. In twenty-five of these there were twenty-six duck eggs with a volume of 16.50cc. There were also two other eggs measuring only .50cc. that could not be identified as to species since there were only remnants of lining and egg contents present. Avocet eggs were found in two instances; one stomach contained two eggs; the other, one. Whole pheasant eggs have been found in full nests at Farmington Bay during banding operations. Sugden (1947) has recorded some data bearing on these exotic eggs locally and Twomey (1948) elsewhere. There was only one case of pheasant eggs found

in this study, the measurement being 2.80cc. In 1941 the foreman of the ranch on Antelope Island told the writer that gulls were attacking and destroying the eggs of his turkeys. The gulls even prey on eggs of their own kind. Although fragments of only one gull egg were found in one stomach, the destruction of eggs of their own species in disturbed colonies has been observed many times by the writer. As to the predation by California Gulls on the eggs of associated species in the colonies on the islands of Great Salt Lake, if the nesting colonies are disturbed and the incubating adults are frightened from their nests, the gulls will destroy the unprotected eggs of pelicans, herons, cormorants and any other birds present. References to such behavior have been frequently made in the literature (Behle, 1935; Bailey, 1935; Sugden, 1936).

The indications are then, that the California Gull will eat or destroy any egg that may be left unprotected in the vicinity of its nesting sites. For the most part I should say that these eggs are secured in close proximity to the gulls' own nesting sites, but in some instances they are taken far afield.

Carrion and garbage: Together these items totaled 438.77cc. (12.65 per cent). Some clues as to when to consider an item carrion were the presence of carrion beetles, fly larvae, and the odor of advanced decay. If the skin or flesh was in good condition, the item was placed in the previous category of "birds and birds' eggs."

Birds were represented among the carrion by one pintail duck and one sparrow. The total volume for these two items was 71.70cc. Two remnants of mammals which were doubtless also eaten as carrion, proved to be skunk and sheep as indicated by hair and wool. These two items had a volume of 76.00cc. The largest item of carrion, however, was fish. The gulls occasionally dive into the water for food and may fish from the surface, but fish are generally picked up near the shoreline of the rivers and lakes. In many cases therefore, the fish were in an advanced state of decomposition. Where there were no identifiable characteristics, they were grouped under miscellaneous fish carrion. Such remnants were found in fourteen stomachs, and measured 23cc. Fifteen carp were found in eleven stomachs with a volume of 156.45cc. Suckers were found in three stomachs; four individuals measured 18.80cc. There was only one catfish. It had a volume of 0.80cc. Meat fragments of unidentified birds occurred in twenty-two stomachs and measured 71.10cc. Cottam (1945:216) has described California Gulls eating ground squirrels and prairie dogs killed by cars along highways as well as the taking of a crippled chipmunk.

Garbage is a category devised to include a miscellaneous lot of vegetative matter of no great food value that may have been picked up at random. A considerable part of this consists of fruit debris. For instance, apple peels were found in two stomachs with a measurement of 3.90cc. In one instance a banana peel was present with a measurement of 7.00cc. In addition, there was a miscellaneous amount of fruit peel found in four stomachs with a measurement of 2.00cc. Brown beans were found in one stomach with a volume of 7.00cc. Even tomato sauce occurred with the beans! Bread was found in combination with other miscellaneous items like potato chips and apple peel in eleven stomachs. No separate measurement was taken of these since the items were so mixed that it was not practical to separate them. The measurement of this mixture was 19.20cc. A whole frankfurter was found in one stomach, the volume being 19.20cc. The prevalence of these food items is easily accounted for by the gulls' practice of congregating around schools and parks where lunches are eaten.

Items of carrion and garbage are important as indicating the role of the gulls as scavengers. As such they help to clear away debris and organic matter which otherwise might be a source of pollution.

Cherries: These totaled 182.95cc., or 5.28 per cent. Forty-one stomachs contained 311 cherries. At the nesting sites stones were frequently found in piles of twenty to forty adjacent to each nest.

At Brigham City, Utah, the writer interviewed fifteen farmers, inquiring as to the damage that the gulls were doing to the cherry crop. The majority gave the answer that about one-fourth of the early cherries were eaten or destroyed by the gulls. Some stated that each year the attacks on the orchards were becoming greater and that during the season it was a full time job to patrol the orchards.

A few farmers reported depredations on the late cherry crops. However, it would seem that damage at this time is relatively less serious because there are more late cherries. Consequently the damage is extended over a larger area and the loss is not so great for any one farmer. The writer's data from analysis of stomach contents indicate that cherries are eaten throughout the season. Beck (1947:46) estimated that the quantity of cherries eaten at the Geneva Steel Colony in 1946 by some 8000 birds amounted to 1507 pounds.

The farmers in Boxelder County also reported damage to strawberries. The gulls were reported to fly only into the larger patches, where they would pick at the fruit that showed signs of ripening. The fruit picked at but not ingested subsequently became shrivelled.

Earthworms (Lumbricidae): 70.75cc. or 2.04 per cent. One of the common sights in northern Utah in the spring is that of flocks of California Gulls in the fields following in the wake of the farmers' plows. One might expect, therefore, to find a large proportion of earthworms in the gulls' diet. Instead, earthworms comprise a small amount of the food. There were only seventeen stomachs containing worms. A numerical count was not made because in most instances the worms were in several pieces. There was usually sand in the stomach when earthworms were present.

Arthropods (Arthropoda) (Miscellaneous): 12.50cc. or 0.36 per cent. All arthropods that do not belong to the class Insecta are placed in this group. The group is not important in terms of quantity. There were two stomachs that contained spiders (Arachnida) with only a trace in volume. The measurement of brine shrimps (*Artemia*) was 2.00cc. The eating of brine shrimps has been reported by Behle (1935). There were eighty-one isopods in one stomach, which measured 10.50cc. Most of this group are considered to have been picked up accidentally.

Insects (Insecta) (Miscellaneous): 8.35cc. or 0.24 per cent. All insects that were found in small numbers are grouped together in this category, none being present in great enough volume to be discussed independently. For instance, caddisflies (Trichoptera) were found in only one stomach, where they had a volume equal to one-half of the total of that particular stomach.

Beetles (Coleoptera): 162.90 cc. or 4.70 per cent. Ground beetles (Carabidae) were the most common beetles found. There were 1160 individuals found in 175 stomachs, with a measurement of 65.90cc. Tiger beetles (Cicindelidae) constitute another important group that are predacious on other insects. In forty-two stomachs, there were 538 individuals that measured 34.10cc. Water beetles were represented by two families. Members of the Dytiscidae were found in six stomachs with a count of 219 individuals, and a measurement of 2.90cc. Hydrophilids were found in larger numbers; in sixty-one stomachs the measurement was 14.35cc. for 608 beetles. Dermestid beetles (Dermestidae) were found in twelve stomachs, the count being 473 individuals which measured 11.05cc. In seventeen stomachs there were 538 weevils (Curculionidae) that measured 17.55cc. The scarab beetles (Scarabaeidae) were found in smaller amounts. There were

108 beetles of this type in twenty-two stomachs; the volume was 11.60cc. There were other coleopterans found, but they were in very small amounts. The families represented are click beetles (Elateridae), rove beetles (Staphylinidae), and darkling beetles (Tenebrionidae). There were only seventeen specimens of beetles that were not identified because of the lack of determining parts.

Flies (Diptera): 187.45cc. or 5.40 per cent. Groups like the robber flies (Asilidae), long-legged flies (Dolichopodidae), house flies (Muscidae), and horse and deer flies (Tabanidae) were eaten in minute amounts, whereas the midges (Chironomidae) and brine flies (Ephydriidae) are well represented. There were eighty-seven stomachs that contained 18,418 chironomids. The volume of this group was 132.50cc. Cottam (1945) has reported observing gulls eating chironomids. Examples of the family Ephydriidae were found in twenty-one stomachs with 3249 individuals present having a measurement of 26.30cc. Behle (1935) has described how the gulls capture these flies while the latter swarm in large numbers. Crane flies (Tipulidae) were represented by 4765 individuals in five stomachs. These flies measured 22.3cc.

Cicadas, etc. (Homoptera): 89.90cc. or 2.59 per cent. In the collections of 1941 there were five stomachs that contained eighty-two specimens of the family Cicadidae. This is the only family represented in the order, and the measurement was 89.90cc.

Dragonflies and damselflies (Odonata): 313.20cc. or 9.03 per cent. They are apparently an important item in the diet of gulls. Dragonflies (Anisoptera) were noted in one instance, but damselflies (Zygoptera) were found in forty-nine stomachs. The total measurement for the latter was 313.20cc.

Grasshoppers and crickets (Orthoptera): 1845.80cc. or 53.22 per cent. Only one individual cricket of the family Gryllidae was found. All the rest of the orthopterans belong to the family Locustidae (grasshoppers and migratory locusts). In 198 stomachs there were 2839 grasshoppers with a volume of 1845.80cc. This is the greatest volume of any one group of animal food found in the study. The greatest number of grasshoppers was eaten in the latter part of June and the month of July. Some stomachs seemed to be filled to utmost capacity. When grasshoppers were found, there was very little else—although gravel was found in a few instances in small amounts.

The finding of but one cricket is misleading as to the role of the California Gulls in controlling this type of insect in the Great Salt Lake region. Knowlton (1941) has observed gulls eating Mormon crickets in recent years. He thinks the gulls are as important today in this respect as they were in pioneer times. Sorenson and Thornley (1938:70) have described the congregation of the gulls at an area of cricket infestation in Tooele and Juab counties.

In contrast, the role of gulls in controlling grasshoppers is not as effective as might be supposed from the figures. When the young gulls are able to fly, they begin a migration to the west coast about mid-July (Woodbury, Behle and Sugden, 1946). Some of the adults seem to migrate at the same time as the young. After July 15 it is difficult to collect gulls because the numbers have been so reduced. The gulls have migrated, therefore, when the locusts are becoming a real menace. In the case of the Mormon Cricket, it is a different story, for the eggs are laid in the fall and hatch early in the spring.

According to the quantitative data for volume and per cent, it would appear that 50 per cent of the food eaten by gulls consists of grasshoppers. This, however, is misleading, for the size of the insect, and the numbers taken at one time must be considered. When the gull eats grasshoppers, the tendency is to engorge them in such great numbers that the stomach becomes distended and the volume is five to ten times the amount found in the average stomach.

Since this study was made, Beck (1947:46) estimated that on June 17, 1947, the

gulls at the Geneva Steel Colony numbering 8000 consumed 154,472 grasshoppers which would weigh about 305 pounds.

SUMMARY AND CONCLUSIONS

This study of the food habits of the California Gull (*Larus californicus*) in Utah was based on an evaluation of 529 stomachs collected in four years in the vicinity of Salt Lake City and the Bear River Migratory Bird Refuge. In the analysis of stomachs,

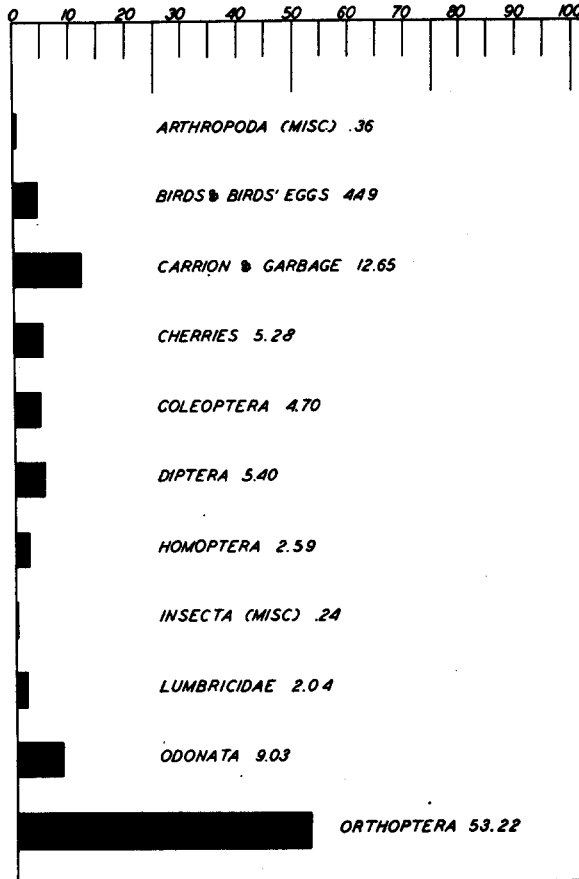


Fig. 1. Percentages of the larger categories of food items in 529 stomachs of the California Gull.

the contents were divided into three main categories (gravel, debris, and food), and their percentage representation computed with results as follows: gravel 8.61, debris 7.89, and food 83.50. The food items consisted of the following, their abundance being expressed as portions of 100 per cent: birds and birds' eggs, 4.49; carrion and garbage, 12.65; cherries, 5.28; Lumbricidae, 2.04; Arthropoda (miscellaneous), 0.36; Insecta (miscellaneous), 0.24; Coleoptera, 4.70; Diptera, 5.40; Homoptera, 2.59; Odonata, 9.03; and Orthoptera, 53.22.

These data indicate that California Gulls have an omnivorous diet. The presence of much carrion and garbage suggests that this gull is in large part a scavenger. Animal food predominates but changing food habits of recent years have caused gulls to do

some damage to the cherry crops of northern Utah. The greatest damage is to the early crops, but cherry flesh appears regularly in their crops until July. Grasshoppers (Orthoptera) are the most abundant food items eaten.

The finding of bird remnants and birds' eggs opens up the problem of the effect of the gulls' nesting on waterfowl refuges. Many of the gull stomachs collected on the Bear River Refuge contained birds or eggs. Comparison of the data from the stomachs of the gulls in the vicinity of Salt Lake City, which birds presumably nested on the islands in Great Salt Lake, with those from gulls definitely nesting on the Bear River Refuge, indicated the former to be less detrimental to waterfowl in this respect.

When the gulls were restricted to their natural island nesting sites and had to forage widely over the entire area, they constituted no particular problem. In recent years they have become concentrated on man-made refuges close to nesting waterfowl and also near extensive orchards, many of which have been planted in recent years. They have adjusted themselves to a food supply somewhat different from that formerly utilized, provided by man himself, and accordingly locally they do serious damage.

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