

NESTING OF THE KING RAIL IN THE ARKANSAS  
RICE FIELDS

BY BROOKE MEANLEY

IN view of the paucity of life history information concerning the King Rail (*Rallus elegans*), the writer undertook to obtain additional data on this species in the Grand Prairie region of the Arkansas rice belt during the nesting seasons of 1950, 1951, and 1952.

The Grand Prairie represents the heart of a long narrow rice belt that extends from the Louisiana to the Missouri line and lies in the eastern part of the state of Arkansas. The Grand Prairie surrounds the city of Stuttgart and is roughly bounded on the north by U. S. Highway 70; on the south, by the Arkansas River; on the east, by the White River; and on the west, by Bayou Meto. It is a former natural tall-grass prairie and has become the leading rice producing area in Arkansas. Approximately one-fourth of its 650,000 acres of cultivated land is planted to rice annually, with oats, soybeans, and lespezea as alternate crops in the rotation system.

The writer is grateful to Herbert Friedmann of the U. S. National Museum and to E. R. Kalmbach and Robert E. Stewart of the U. S. Fish and Wildlife Service for reviewing the manuscript; to Johnson A. Neff of the U. S. Fish and Wildlife Service and James Campbell, Director of the University of Arkansas Rice Branch Experiment Station, for furnishing information on several King Rail nests; to Francis M. Uhler of the U. S. Fish and Wildlife Service for the identification of several plants mentioned in this paper; and to Anna G. Meanley for assisting in all phases of the field work.

Much information was obtained about the King Rail in the course of banding nestling Red-wings (*Agelaius phoeniceus*) along drainage ditches, rice field canals, and areas of slash. Observations and collection of a few rail specimens were possible at other seasons as the writer was in the field for an average of ten hours daily throughout a two-year period. Six nests were located while driving along a highway at about 20 miles per hour some two to five miles north of Stuttgart. Other nests were found by systematically covering certain rice fields and by walking ditches in likely nesting habitats. Several nests were located by employees of the University of Arkansas Rice Branch Experiment Station when "roguing" rice fields for coffee bean (*Sesbania macrocarpa*) and indigo (*Aeschynomene virginica*) in mid- and late summer, as well as in their work about experimental rice plots.

The "mud hen," "slash guinea," or "English rail," as the King Rail is known to the rice grower, is a common breeding bird through-

out the rice belt, and finds an optimum habitat in the rice fields. From the time watering begins in early summer until harvest in mid-fall these fields provide nesting, feeding, and escape cover; in winter the rice stubble and aquatic vegetation resulting from rice field irrigation continue to fulfill most ecological requirements.

The King Rail is less numerous here in winter than in the warmer months, but there are a number of records of occurrence for every month of the year. Little is known about the migration of the breeding population, and I have received only one return on a banded bird. On June 7, 1952, I banded a chick, approximately 10 days old, five miles south of Stuttgart. This bird was recovered on December 1, 1952, at Cut Off, Lafourche Parish, Louisiana (about 25 miles south of New Orleans).

#### NESTING PERIOD

The nesting season extends from early March until early September, with the peak of activity occurring between April 15 and July 1. Data for 38 nests are presented in table 1. The earliest indication of breeding at Stuttgart is a pair of King Rails observed copulating along a roadside ditch on March 3 (1952). Also during the month of March, 1952, nearly all King Rails seen were in pairs. A nest containing one egg was found on April 1, 1952; and a dead female found on the road north of Stuttgart on April 3 contained in its oviduct a partly developed egg measuring 18 millimeters in length. Latest evidence of nesting is September 7 (1951), which is the date of the last visit to a nest containing 9 eggs (nest 38).

#### HABITAT AND POPULATION

In the spring nests are built mainly in roadside ditches, canals, canal banks, oat fields, and fallow land. Flash flooding in the narrow ditches, predation, harvesting of oat fields, and cultivation destroys many nests and newly hatched young. While many rails nest in the cultivated rice fields during June, July, and August, it is probable that these represent second nesting attempts following the destruction of the first clutch. Nearly all of the nests located in April were situated either in small old-growth stands of common cat-tail (*Typha latifolia*) or in nearly pure stands of a sedge (*Carex hyalinolepis*), while in May and June most of the nests were found in uniform stands of soft rush (*Juncus effusus*). Most of the earlier nests located in roadside ditches were found in ditches along main highways; these ditches were wider than those along the secondary roads and contained a more extensive and advanced growth of aquatic vegetation than that found in sur-



(*Top*) Roadside ditch (center) and rice field (left), nesting habitats of the King Rail 10 miles north of Stuttgart, Arkansas.

(*Bottom*) King Rail approaching nest in rice field. Stuttgart, Arkansas, July 13, 1952.



(Top) King Rail nest in roadside ditch near Stuttgart, Arkansas, May 30, 1952.

(Bottom) Incubating King Rail on nest made of cat-tails in roadside ditch.

TABLE 1  
NESTING DATES, CLUTCH SIZE, AND HABITAT OF KING RAIL NESTS

Nest Number	Date Nest Found	Number Eggs	Complete Clutch Size	Number Hatched	Location	Dominant Vegetation
1	April 1, 1952	1	11	8	Ditch	<i>Typha latifolia</i>
2	April 10, 1952	b	2d	..	Canal	<i>Juncus</i> sp.
3	April 15, 1952	4	12	12	Ditch	<i>Typha latifolia</i>
4	April 16, 1952	11	11	9	Ditch	grass?
5	April 21, 1952	10	10	9	Ditch	<i>Juncus effusus</i>
6	April 21, 1952	14	14	14	Ditch	<i>Carex hyalinolepis</i>
7	April 24, 1952	4	4d	—	Ditch	<i>Carex hyalinolepis</i>
8	May 1, 1952	1	1d	—	Ditch	sedge?
9	May 1, 1952	11	11	11	Ditch	<i>Typha latifolia</i>
10	May 2, 1952	new	d	—	Ditch	<i>Juncus effusus</i>
11	May 2, 1952	11	11	10	Ditch	sedge?
12	May 6, 1952	5	11	9	Ditch	<i>Juncus effusus</i>
13	May 9, 1950	4	5d	—	Rice Field	<i>Oryza sativa</i>
14	May 9, 1951	6	11	—	Ditch	<i>Juncus effusus</i>
15	May 10, 1948	12	12	—	Oat Field	<i>Avena</i> (var.)
16	May 10, 1952	9	9	9	Ditch	<i>Juncus effusus</i>
17	May 10, 1952	11	11	10	Canal Bank	<i>Bromus secalinus</i>
18	May 11, 1952	12	12	10	Ditch	<i>Juncus effusus</i>
19	May 13, 1952	10	10	0	Ditch	<i>Juncus effusus</i>
20	May 26, 1952	2	2d	—	Canal Bank	grass?
21	May 28, 1952	4	8	8	Ditch	<i>Juncus effusus</i>
22	June 4, 1952	eb	—	—	Weedy Field	grass? & sedge?
23	June 9, 1952	10	10	10	Canal Bank	<i>Avena</i> (var.)
24	June 13, 1952	7	—	—	Rice Field	<i>Oryza sativa</i>
25	June 13, 1952	eb	—	—	Pond Edge	<i>Paspalum distichum</i>
26	June 13, 1952	eb	—	—	Pond Edge	<i>Paspalum distichum</i>
27	June 19, 1952	9	9	—	Rice Field	<i>Oryza sativa</i>
28	June 25, 1952	10	10	—	Rice Field	<i>Oryza sativa</i>
29	July 15, 1950	—	—	—	Rice Field	<i>Oryza sativa</i>
30	July 15, 1950	—	—	—	Rice Field	<i>Oryza sativa</i>
31	July 15, 1950	—	—	—	Rice Field	<i>Oryza sativa</i>
32	July 15, 1950	—	—	—	Rice Field	<i>Oryza sativa</i>
33	July 15, 1950	—	—	—	Rice Field	<i>Oryza sativa</i>
34	July 18, 1951	7	9	—	Rice Field	<i>Oryza sativa</i>
35	August 1, 1950	6	8d	—	Rice Field	<i>Oryza sativa</i>
36	August 9, 1951	5	5d	—	Rice Field	<i>Oryza sativa</i>
37	August 10, 1951	6	6d	—	Rice Field	<i>Oryza sativa</i>
38	August 29, 1951	9	9	—	Ditch	<i>Echinochloa</i> sp.

d—deserted b—building eb—eggs broken

rounding areas. Nests found in rice fields during the summer were located in pure stands of rice (*Oryza sativa*), or in weedy rice fields containing barnyard grass (*Echinochloa*) or sedges (*Cyperus strigosus* and *Fimbristylis autumnalis*). The shift to the rice field habitat during the presumed renesting period is fairly evident, and may be based on two conditions. First, most of the roadside ditches dry up and, although the King Rail often nests in dry locations in the spring, it is essentially a damp habitat species. Secondly, a fairly uniform and

not too dense or tall a stand is preferred as a nesting site, but in the summer a rank growth usually develops in the ditches.

Other birds frequently associating with the King Rail in these habitats included the Red-wing, Dickcissel (*Spiza americana*), and Short-billed Marsh Wren (*Cistothorus platensis*).

To obtain an idea of breeding density, a count of occupied rail nests was made in the two major nesting types, the roadside ditch and the rice field. In the ditch bordering a paved road four miles north of Stuttgart, five nests were located along a 300-yard strip on May 6, 1952. The width of the ditch averaged 35 feet. On July 15, 1950, at the University of Arkansas Rice Branch Experiment Station, five nests were located in a 70-acre pure-stand rice field.

#### NEST SITE AND CONSTRUCTION

Most King Rail nests on the Grand Prairie are placed in a fairly uniform stand of vegetation, whether it is rice, oats, sedges, cat-tails, or rushes. The nest may be placed in a tussock or clump of some plant or between several small clumps, parts of which are used in fashioning the canopy and sides of the nest. The platform (including the cup and rim) is constructed usually of the dead stems of the dominant plant type in the vicinity of the nest. In the spring along the roadside ditches, the nest canopies appear as conspicuous mounds in the uniform tracts of vegetation. In one case the entire base of the nest was made of dried mud and was  $2\frac{1}{4}$  inches in depth. The height of the nest depends upon whether it is placed over water and upon the depth of the water. Nests found in dry locations, such as an oat field, canal bank, or dried ditch, are only occasionally elevated, and the eggs may rest within an inch or two of, or actually on, the ground. Nests placed above two or three inches of water may be elevated as much as a foot during a heavy rain or when a rice field is being flooded. On April 12, 1952, following a heavy rain, an incubating rail was observed working feverishly to build up its cat-tail-constructed nest above the rising water in the roadside ditch. It reached out all around the nest to pick up materials (mostly cat-tail leaf fragments), which it tucked beneath the eggs. Most of the canopy was also used in this building process. The bird managed to keep the eggs about two inches above the rising water. The ditch was nearly dry prior to the rain, and the eggs were then five inches from the ground. At flood peak the water was 21 inches deep in the ditch. On another occasion, a nest was found in a rice field that had been temporarily drained. At the time of its discovery, the eggs were 2.5 inches from the ground. The next day water was placed in the

field to a depth of 5 inches, and the eggs were then 7 inches from the ground. As the water continued to rise the incubating bird elevated the eggs by bending over and tucking the rice leaves under them.

The nest may not always be completed before the laying of the first egg. While driving along a paved road south of Stuttgart at 5:30 p. m. in May, I heard two rails uttering their characteristic *jupe-jupe-jupe-jupe-jupe* call. One of the birds was standing in a nearby ditch. After about three minutes of watching, I saw the grass move on the bank opposite the rail in view. As the grass continued to move in the same place it was evident to me that the mate was building a nest. Actually the bird was pulling in the grass to form sides and a canopy for the nest. After watching it for a few minutes I departed. The next morning I found that construction was in the initial stage, but two eggs had already been laid. The eggs were lying on the bare ground and were surrounded by just a few dead plant fragments.

Male and female have been observed together and separately constructing the nest. In one case a pair was discovered building a nest on a small island in a rice field canal. One of the pair sat in the cup as it fashioned the canopy, while its mate stood on the outside bending a blade of grass over the nest. On another occasion I came upon a bird building a nest on a canal bank. I had been watching the process only a minute or so before its mate came to continue the work, at which time the bird that had been at the nest left to feed in a nearby ditch. I watched the second bird for about three minutes, and then collected it. Upon dissection it proved to be the male.

The average measurements, in inches (with extremes in parenthesis), of eleven nests found near Stuttgart were as follows: height from ground to canopy, 17.0 (30.0 and 14.0); height from ground to rim, 7.6 (19.5 and 2.0); exterior diameter, 11.0 (14.5 and 8.5).

The eleven nests were constructed of the following materials: rushes, 6; sedges, 2; cat-tails, 2; and rice, 1.

#### COPULATION AND EGG-LAYING

Copulation usually takes place near the nest. On April 1, 1952, the following observations were made at nest No. 1. At 5:15 p. m., the male came to within 20 feet of the nest and called. The female returned the call from the nest, then left the nest slowly and walked toward the male. Copulation took place. On two other occasions birds were observed copulating within 30 feet of the nest.

Five nests were under observation during the egg-laying period. When discovered, two nests contained one egg; two nests, four; and one nest, five. An additional egg was deposited in each nest daily until the clutch was complete.

## INCUBATION AND CLUTCH SIZE

Bent (U. S. Natl. Mus. Bull. 135: 260-266, 1926) does not give the incubation period of the King Rail. Roberts (*The Birds of Minnesota*, p. 440, 1936) quotes A. M. Bailey as stating that the incubation period of the King Rail is about 21 days. The writer has found the incubation period to average a little more than 22 days.

One nest was under daily observation from the time the first egg was laid on April 1, until the last egg hatched on May 4. There were 11 eggs in the complete clutch, and incubation started with the laying of the tenth egg on April 10. Thus the incubation period was 24 days. At another nest, incubation began on April 22 or 23, while the eggs hatched on May 13 and 14, giving an incubation period of 22 or 23 days. At two other nests the incubation period was found to be 21 and 22 days, respectively.

Both sexes incubate. To prove this, one night between 9 and 10 p. m., white paint was placed in a small can at the end of a long stick and poured on the incubating birds at two nests. On subsequent visits to the nests, unmarked birds were often seen incubating. An exchange by both sexes during the incubation period was observed at nest number 1 on April 20. At 5:18 p. m. the incubating bird called from the nest; immediately its mate came from the cat-tails across the road to a point about 20 yards from the nest, and began walking toward the nest until it was within five feet. The incubating bird then left the nest and was replaced by its mate, which remained on the nest for 17 minutes, when an exchange again took place.

The average number of eggs per clutch based on complete sets in 16 nests was 10.7, with extremes in clutch size of 8 and 14.

*Size of Eggs.*—Bent (*op. cit.*) gives the average measurement of 56 eggs as 41 by 30 millimeters with the four extremes as 44 by 32 and 38.5 by 28 millimeters. The writer measured 20 eggs, two from each of 10 nests. Average measurement was 40.8 by 30.4 millimeters, with the four extremes as 42.0 by 32.0 and 39.5 by 29.5.

*Belligerence at Hatching Time.*—Incubating birds seldom flush until the intruder is right at the nest. As the hatching date approaches they exhibit an even more striking tenacity. On several occasions it has been possible to band the incubating bird, but not without considerable resistance from the bird. On one occasion when I approached a nest at hatching time, the bird flew from the nest and struck me in the chest. On other occasions the birds have struck at my legs; or have run out to my feet and just stood there with wings outstretched. They nearly always feign injury by spreading the wings and fluttering through the vegetation.



## NESTING SUCCESS

Sixteen nests containing eggs were under observation during the spring of 1952. One or more eggs hatched in 12 (or 75 per cent) of the nests. The average number of eggs hatched per nest (in 12) was 9.9 (92.5 per cent) out of a potential 10.7. Of 147 eggs found in 16 nests, 119 (80.9 per cent) eggs hatched. A complete clutch of eggs hatched in 5 (31 per cent) of 16 nests. Several nests were found broken up after periods of heavy rain and consequent flooding of ditches and canals.

What is believed to be a valid index of survival is based on the number of young over two weeks old observed in single broods. Such data are difficult to obtain as the complete brood is not always seen. The writer has observed what he believes were full complements in 10 broods. In each case the parent birds were unaware of the observer's presence as the family was seen crossing a road or feeding in a rice field or some other comparatively open spot. The number of young in 10 broods ranged from 2 to 9 with an average of 5. If average hatching success is 9.9 (based on the 12 study nests), then survival rate, after two weeks, is about 50 per cent.

## MORTALITY

*Adult Birds.*—The automobile is one of the important hazards to adult birds. Over a three-month period (March 1–June 1), 24 adult rails were found dead along a 10-mile stretch of paved road north of Stuttgart. A few rails are caught in steel traps during the winter fur season: One trapper with a line of 20 traps reported catching one or two a week. A small number are shot by hunters, particularly during the winter quail season.

*Eggs and Young.*—In addition to flash flooding, predatory animals are also responsible for breaking up many rail nests. Complete or partial clutches of eggs disappear from nests prior to the hatching date. Two nests found along the edge of a pond were broken up by racoons (*Procyon lotor*) as evidenced by the numerous tracks leading from the nest to a point in the open where the eggs had been taken and destroyed. In the ditches and rice fields the cottonmouth moccasin (*Agkistrodon piscivorus*), various snakes of the *Natrix* group, and certain land snakes are very abundant and probably take many eggs and small young.

## WEIGHTS OF EGGS, YOUNG, AND ADULTS

Three eggs were marked on the day they were laid, and weighed on that date and on every seventh day afterward. The average weight

loss during the first week was 0.47 grams; during the second week, 0.83 grams; and during the third week, 1.0 gram. The average total loss from date laid to date hatched was 2.30 grams.

The weights of five young were as follows: 14.3, 14.7, and 15.3 grams (30 minutes after hatching); 12.5 grams (1½ hours after hatching); 12.5 grams (4 hours after hatching). Two 19-day-old young weighed 62.2 and 67.5 grams.

The weights of eggs and of four adult King Rails are given in table 2.

TABLE 2  
WEIGHTS OF EGGS AND ADULT KING RAILS

Num- ber	<i>Weights of Eggs (grams)</i>					<i>Day of Hatching</i>
	<i>First Day</i>	<i>7th Day</i>	<i>14th Day</i>	<i>21st Day</i>		
1	18.9	18.7	17.8	16.7		?
2	20.3	19.5	18.8	17.9		17.9
3	18.8	18.4	17.5	*		—

  

<i>Sex</i>	<i>Weights of Adult Birds</i>	
	<i>Date</i>	<i>Weight (grams)</i>
Male†	May 18, 1952	339.9
Female‡	April 30, 1952	364.5
Female‡	May 28, 1952	325.0
Female‡	June 15, 1952	305.0

\* Clutch destroyed      † Alive      ‡ Dead

### SUMMARY

Thirty-eight nests of the King Rail were found in the vicinity of Stuttgart, Arkansas, during three nesting seasons (1950, 1951, 1952). Most of these were located in roadside ditches in the spring and in rice fields in the summer. Nests are usually placed in a fairly uniform stand, whether it is rice, sedges, cat-tails, or some other vegetation type. Nests are generally placed over water but in some cases are found in dry locations. When water is turned into a ditch or rice field, nests located there are built up above the water level by the incubating bird.

An idea of breeding population density was obtained when five nests were found in a 70-acre rice field, and the same number in a roadside ditch 300 yards long and 35 feet wide.

Egg laying may begin before the nest is completed. Male and female together and separately have been observed building the nest. Eggs are laid daily until the clutch is complete. Average clutch size in the Arkansas rice fields was 10.7 eggs. Eleven eggs were most frequently found. The average size of 20 eggs measured was 40.8 by 30.4 millimeters.

The incubation period was found to average approximately 22 days. Both sexes incubate. One or more eggs were hatched in 12 of 16 nests under observation in the spring of 1952. The number of nests in which a complete clutch hatched was 5, or 31.2 per cent. Average number of eggs hatched per nest (in 12) was 9.9 out of a possible 10.7. Of a total of 147 eggs found in 16 nests, 119, or 80.9 per cent, hatched.

Survival rate of young after two weeks was about 50 per cent. The most important cause of death to adult birds appears to be the automobile. There is little hunting pressure in the Stuttgart area. Nest and eggs are destroyed by floods and various predators, such as snakes and racoons.

Eggs were marked and then weighed every seventh day. Average total loss in weight from date laid to date hatched was 2.30 grams. Average weight of downy young on first day was 13.86 grams. Average weight of two 19-day-old young was 64.85 grams. Average weight of 3 adult females was 331.5 grams; one male weighed 339.9 grams.

*U. S. Department of the Interior, Fish and Wildlife Service, Stuttgart, Arkansas, October 20, 1952.*