FOOD HABITS OF THE KING RAIL IN THE ARKANSAS RICE FIELDS

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THIS paper on the food habits of the King Rail (*Rallus elegans*) is a continuation of a life history study of this species in the Arkansas rice fields (Meanley, 1953). Specimens and data on feeding behavior were obtained from 1950 to 1955. Most of the stomachs representing the nesting season were taken from dead rails found along local highways; winter specimens were furnished by Carl Kitler, local mink trapper who caught about one a day along his trap line.

I am indebted to U. S. Fish and Wildlife Service co-workers E. R. Kalmbach, Alexander C. Martin, Robert T. Mitchell, and Francis M. Uhler for the identification of several food items found in gizzards; and to Dr. Martin, Johnson A. Neff, Charles C. Sperry, and Robert E. Stewart for reviewing the manuscript.

Feeding Behavior.—During April, May, and early June it is not unusual to see 15 or 20 King Rails in the evening feeding along ditches bordering certain highways leading out of Stuttgart, Arkansas. After the middle of June, the rails move out of the roadside ditches and canals into adjacent rice fields where they are found until harvest. During the winter they are found about the network of rice field canals and natural drainage, spending much of their time along runways beneath matted vegetation.

The most active feeding periods appeared to be in the early morning and the late afternoon or evening, usually till dusk. Rails were also found to feed sporadically throughout the day, tapering off or stopping for short rests during periods of intense heat. I once kept a pair of rails under constant observation for 2 hours while they fed in the vicinity of their nest during the middle of the day. The feeding bird passed back and forth near the nest and often came within a few inches of its incubating mate. On other occasions individuals seen feeding steadily for a half hour or more along a ditch during the heat of midday in June stopped under a tussock of grass and remained motionless for from 5 to 20 minutes before resuming activity.

Rails do most of their feeding in places concealed by plant cover or in relatively open areas where they blend well with their surroundings. Occasionally, however, the birds are very conspicuous, as when feeding on mud flats or in recently flooded fields where rice sprouts are 3 or 4 inches in height. W. Leon Dawson (1903: 443) observed similar rail-feeding activity in open areas in Ohio: "In a region where

they were in little fear of molestation, I have seen them deploy upon an extensive mud flat in broad daylight and go prodding about in company with migrant sandpipers, for the worms which riddle the ooze with their burrows."

The King Rail feeds almost exclusively in rice fields during the summer. About the only time it emerges from this cultivated marsh type is when it moves from one rice field to another or comes to the edge of a gravel road to obtain grit. When a field of nearly mature grain is drained preparatory to harvesting, the rails move over to a field of younger rice, often contiguous to the dry field. Some rice fields have a few low, wet spots which prove attractive to rails even up to harvest time; but the last feeding place in nearly all drying rice fields is along the "borrow" or ditch bordering the levee. King Rails, Virginia Rails (*Rallus limicola*), and Soras (*Porzana carolina*) continue to feed along these ditches while they contain water until the field is harvested.

Generally, King Rails forage in water so shallow that only the bill, or part of it, disappears beneath the surface while food is sought. However, on March 25, 1954, I observed a pair of rails feeding in a roadside ditch where the water varied from 6 to 12 inches in depth. Both of these birds immersed their entire heads and necks in the water, and several times their entire bodies disappeared beneath the surface. In fact, they occasionally fed by "tipping up" like dabbling ducks.

This typical bird of the rice country performs a service to the rice grower by consuming large numbers of crayfish (*Cambarus*) that bore holes in rice field levees. These crustaceans are usually torn apart and eaten in the course of several minutes; in one case the dismantling operation was timed at 7 minutes. On another occasion, within several seconds after a crayfish was caught by a rail and the bird was still holding it in its bill, another rail, presumably its mate, rushed up, grabbed the crayfish and swallowed it whole.

An interesting food habits note was recorded on June 3, 1954. From an observation post, 30 feet from a King Rail nest, I saw the brooding bird pick up a complete egg shell and devour about three-fourths of it. This occurred about 5 minutes after the egg had hatched. This incident may explain the occurrence of King Rail egg-shell fragments as 85 per cent of the contents of a stomach collected at Stuttgart on May 11, 1953.

Feeding Activity of Young.—Laboratory analysis revealed food in the stomachs of several King Rail chicks less than one day old. Nests of newly hatched King Rails were examined for clues to the source of this food. In several such nests small regurgitated pellets

about one-half inch in diameter were found. These pellets usually were composed of finely ground fragments of crayfish and aquatic insects similar to material found in the young rails' stomachs. I believe that young rails one day or less old feed upon these small regurgitated pellets. This type of feeding behavior has been recorded for young Little Blue Herons (*Florida caerulea*) less than three days of age, which fed upon pellets regurgitated by their parents (Meanley, 1955).

A pair of King Rails may remain with their brood for more than a month after hatching. I have collected young rails three-fourths grown that were still traveling with an adult pair in early August. In several instances a pair of rails with their two-weeks-old brood were observed feeding within 50 feet of their nest. Once I came upon a brood of young King Rails approximately three weeks old that was traveling with three adult birds.

Food.—Animal life comprised 79 per cent of the King Rail's year-round diet. It constituted 90 per cent or more in spring and summer; then dropped to 74 per cent in the fall (the fact that the bulk of the

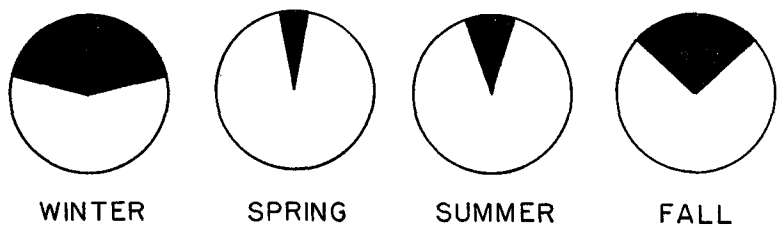

FIGURE 1. Seasonal variations in proportion of plant (black) and animal (white) food of the King Rail in Arkansas rice fields.

fall series of stomachs was collected in November may have made this figure lower than if there had been better representation of the early part of this season); and was still lower (58 per cent) in winter.

The shifts in feeding grounds (from roadside ditches in the spring to rice fields in summer and early fall, and finally back to natural drainage ditches and small marshes of cattail, *Typha latifolia*, in winter) may account for some of the seasonal variations in food. However, natural seasonal fluctuation in abundance of aquatic animal life is apparently the basic explanation for most of these differences in diet.

The crayfish is an outstanding food of the King Rail, constituting 23 per cent (by volume) of the diet on an annual basis. In spring it forms 61 per cent; in summer, 22 per cent; in fall, 3 per cent; and

in winter, 7 per cent. Crayfish are available the year round and constitute a staple food of this rail. It appears probable that consumption of this crustacean is influenced as much by the availability of other favorite foods as by the abundance of crayfish. Possibly seasonal variation in the size of the crayfish, its agility and/or palatability according to age may also be factors bearing upon its extent of seasonal use by the rail.

Another staple food available at all seasons is fish. It amounts to 26 per cent (by volume) of the King Rail's food in the fall when many fish have become impounded in the shallow borrow pits of drained rice fields and are easy prey for the foraging birds.

Aquatic insects are important foods, especially certain aquatic beetles and water bugs which are available the year-round. Dytiscids furnished 19 per cent of the winter diet. They are more abundant in rail habitat at all seasons than hydrophilids.

Land beetles, chiefly ground beetles (Carabidae), scarabs (Scarabaeidae), and snout beetles (Curculionidae) made up 6 per cent of the rail's food, and grasshoppers (Orthoptera) constituted 7 per cent.

A wide variety of other insects was taken in small quantities. During the summer and fall this formed 8 per cent and 5 per cent, respectively, of the rail's food. Among these insects were dragonfly (Odonata) nymphs, back-swimmers (Notonectidae), horsefly (Tabanidae) larvae, fall army worms (*Laphygma frugiperda*), rice water weevils (*Lissorhoptrus simplex*), and rice stinkbugs (*Solubea pugnax*).

Frogs accounted for about 4 per cent of the food. Unusual animal food items (listed in Table 1 as "Miscellaneous") found in King Rail stomachs were skunk (*Mephitis*) hair, feathers and vertebrae of a female Redwing (*Agelaius phoeniceus*), King Rail egg shell fragments, a small water snake (*Natrix*), and a shrew (*Sorex*).

The King Rail apparently is more of a vegetarian than its salt marsh relative, the Clapper Rail (*Rallus longirostris*). Of the former, Audubon (1835: 29) states that, "When grown they feed on a variety of substances, and it has appeared to me that they eat a much greater proportion of seeds and other vegetable matter than the Salt-water Marsh-hens." John Oney (1954), in his study of the fall food of the Clapper Rail along the Georgia Coast found that plant materials constituted only trace items of the Clapper's diet at that season. Martin, Zim, and Nelson (1951: 82) found the volume of plant food in the Clapper's diet to be as follows: winter, 11 per cent; spring, 1 per cent; summer, 0 per cent; and fall, 3 per cent. In the Arkansas area vegetable matter in the diet of the King Rail made up the following volumetric percentages during the 4 seasons: winter (33 stomachs)

TABLE 1

PRINCIPAL FOODS OF THE KING RAIL IN THE ARKANSAS RICE FIELDS

	Winter (December–February)		*Spring (March–May)*		*Summer (June–August)*		*Fall (September–November)*		*Annual*
	33 stomachs		*48 stomachs*		*16 stomachs*		*21 stomachs*		*118 stomachs*
	per cent by volume	*per cent by occurrence*	*per cent by volume*	*per cent by occurrence*	*per cent by volume*	*per cent by occurrence*	*per cent by volume*	*per cent by occurrence*	*per cent by volume*
ANIMAL	58	249	95	252	90	412	74	300	79
Invertebrate:									
Crayfish	7	18	61	81	22	25	3	5	23
Aquatic beetles	20	76	7	21	19	31	10	48	14
Land beetles	1	13	8	56	11	87	4	38	6
Grasshoppers	5	24	3	8	6	63	14	57	7
Aquatic bugs	5	24	1	15	10	44	6	29	6
Other insects	tr.	21	2	17	8	75	5	38	4
Spiders	tr.	3	tr.	2	tr.	13	1	10	tr.
Snails	3	12	2	8	tr.	6	tr.	10	1
Vertebrate:									
Fish	7	30	1	21	8	19	26	43	11
Frogs	5	21	4	15	5	50	4	24	5
Miscellaneous	5	7	6	8	—	—	—	—	3
PLANT	42	109	5	25	10	87	26	76	21
Rice	30	52	4	19	10	31	21	29	16
Rice field weed seeds	tr.	36	tr.	4	tr.	56	2	38	1
Woody plant seeds	—	—	1	2	—	—	3	10	1
Tubers	12	21	—	—	—	—	—	—	3

42 per cent; spring (48 stomachs) 5 per cent; summer (16 stomachs) 10 per cent; and fall (21 stomachs) 26 per cent.

Cultivated rice (*Oryza sativa*) seed is taken in larger quantities than any other plant food. It formed 16 per cent of the annual diet. Increased rail consumption of rice seed during fall and winter no doubt is due to the abundance of waste grain left in the stubble. Kalmbach (1937) in his study of the food of the Gulf Coast Redwing (*Agelaius phoeniceus littoralis*) suggests that the hard siliceous hulls of rice seed may be used for grinding purposes.

Rice field weeds, abundant in all rail habitats, furnished some food to rails throughout the year. Seeds of jungle-rice (*Echinochloa colonum*), wild millet (*Echinochloa crus-galli*), bullgrass (*Paspalum boscianum*), rice cutgrass (*Leersia oryzoides*), beakrush (*Rhynchospora*), and smartweeds (*Polygonum*) were found as traces in many stomachs, in each season except fall when they composed 2 per cent of the contents.

The following seeds of woody plants were found in individual stomachs: blackberry (*Rubus*), snowbell (*Styrax americana*), blackgum (*Nyssa sylvatica*), and oak (*Quercus*). Tubers of marsh plants (probably sedge) were found in several stomachs, and one rail had eaten tubers of an arrowhead (*Sagittaria*).

SUMMARY

A study of the food habits of the King Rail in Arkansas rice fields has been based on analysis of 118 gizzards and numerous field observations from 1950 to 1955.

During the cooler months, rails fed mostly about the network of rice-field canals and natural drainage, while in summer the feeding was largely in rice fields. The periods of most active feeding appeared to be early morning and late afternoon or evening.

Animal life comprised 79 per cent (by volume) of the King Rail's food. Crayfish were the principal item, constituting 23 per cent of the annual diet. In the fall, fish impounded in pools of drying rice fields became readily available and furnished 26 per cent of the fall season's food. Dytiscids were important in the winter diet, amounting to 19 per cent of it, while various beetles, grasshoppers, and numerous other insects provided most of the remainder of food used.

Of the 21 per cent of plant food taken, cultivated rice seeds were the dominant item. Seeds of rice-field weeds were eaten frequently but generally constituted traces in the total bulk of food.

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U. S. Fish and Wildlife Service, P. O. Box 1365, Alexandria, Louisiana, April 12, 1955.