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HABITAT AND MOVEMENTS OF BREEDING YELLOW RAILS

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ABSTRACT.—Four pairs of Yellow Rails (*Coturnicops noveboracensis*) were radiotracked (1039 locations) in May–August 1980 at Seney National Wildlife Refuge, Michigan, to identify characteristics of breeding habitat and its use by Yellow Rails. Vegetation at nesting sites was dominated by *Carex lasiocarpa* (>90% of basal stems) in wet sedge meadows, which comprised nearly 90% of the 30-ha study area. Water depth in the meadows was 20–30 cm in spring, but standing water was absent by mid-July. Male activity areas overlapped and averaged 7.8 ha (range = 5.8–10.5) during preincubation and incubation; areas used by females averaged 1.2 ha (range = 1.0–1.7) during preincubation but declined to 0.3 ha during incubation. *Received 21 Oct. 1986, accepted 9 Feb. 1987.*

The Yellow Rail (*Coturnicops noveboracensis*) is difficult to observe because of its secretive habits, reluctance to fly, and preference for remote areas. This rail is widely distributed in northern North America and is highly sought after by bird watchers, but little is known about its habitat, nesting requirements, breeding population densities, or behavior on the breeding grounds (Anderson 1977). Objectives of our study were to ascertain characteristics of breeding habitat and its use by Yellow Rails.

STUDY AREA

The study was done in May–August 1980 at the Seney National Wildlife Refuge (NWR), Schoolcraft County, in the Upper Peninsula of Michigan (46°15′N, 86°00′W). The principal study site was 0.4 km from the west end of Marsh Creek Pool. The Marsh Creek Pool Study Area (MCPSA) was chosen because in earlier surveys it had the highest concentration of calling Yellow Rails on the NWR. MCPSA was a seasonally flooded wet sedge meadow marsh, with water depths of 30 cm or more in the spring that became moist soil by midsummer.

The physiography of the MCPSA was similar to that of the surrounding area. Sand knolls, apparently extinct dunes (Heinselman 1965), were interspersed within the sedge marsh. The vegetation on the knolls was dominated by red pine (*Pinus resinosa*) and white pine (*P. strobus*). Swamp birch (*Betula pumila*), speckled alder (*Alnus rugosa*), and quaking aspen (*Populus tremuloides*) ringed the edges. Bracken fern (*Pteridium aquilinum*) and blueberries (*Vaccinium* spp.) were the principal ground cover, especially in areas burned in 1976.

The principal marsh plant was a tall, mat-forming sedge (*Carex lasiocarpa*) that dominated the extensive wet sedge meadows throughout the refuge. Small colonies (<0.5 ha) of bluejoint grass (*Calamagrostis canadensis*) and rushes (*Juncus* spp.) were in slightly elevated or depressed areas, respectively. Willows (*Salix* spp.), about 1 m in height, dotted the marsh portion of the entire study area, and higher densities occurred on the drier sites.

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METHODS

The 30.25-ha MCPSA was gridded into 121 50 × 50-m sections. Stem density was determined by randomly locating 100 0.05-m^2 plots, each 10 × 50 cm. Height of vegetation and of the senescent sedge layer (from previous growing seasons) from the substrate was measured to the nearest centimeter. Stems were counted and classified as *C. lasiocarpa, Carex* spp. (other than *lasiocarpa*), *Juncus* spp., *Calamagrostis canadensis*, Gramineae (other than *C. canadensis*), herbaceous species, *Salix* spp., and other woody species. Four 50 × 50-m stem-density sample plots were centered around locations of calling males south of the MCPSA. Within each plot 10 random locations were chosen, and at each location all stems within 0.5-m^2 (2 plots) or 0.25-m^2 (2 plots) plots were counted and assigned to the same classes as described above.

Male Yellow Rails were attracted at night (22:00–04:00 h) by striking two small stones together to imitate the territorial call of the male. This caused males to approach an area illuminated by flashlights closely enough to be captured with a hand net. A pointing dog was used to locate all female rails and males that did not respond to the imitation call; these birds were captured with hand nets.

Radiotransmitters with doubler or tripler circuits (Model MP1145LD, Wildlife Materials, Inc., Carbondale, IL) were attached to the birds with sutures, harness, or cyanoacrylate adhesive (Stenzel 1982:14–16) to monitor movements. Permanent locations for obtaining bearings on transmitter signals were established in the MCPSA to facilitate plotting of locations and to minimize disturbance to birds and habitat. A plotted location was derived from 2 to 4 bearings taken ≤20 minutes apart; details for determining the location point were given by Stenzel (1982:16–18). The area of activity was derived by connecting the outermost points to construct a minimum-area polygon (Mohr 1947).

RESULTS AND DISCUSSION

Habitat characteristics.—The MCPSA was dominated by a sedge, *C. lasiocarpa*. Sand knolls and slightly elevated areas dominated by bluejoint grass represented less than 12% of the study area. Small stands of cattail (*Typha angustifolia*) (total area <350 m^2, N = 2), *Juncus* spp. (total area <270 m^2, N = 2), and swamp birch (total area <700 m^2, N = 3) comprised less than 1% of the area. Standing water and soil moisture generally declined with distance from Marsh Creek Pool, but isolated wetter areas containing concentrations of *C. lasiocarpa* occurred north and northwest of sand knolls, which served as natural impoundments to the southeasterly flow of water (Bart et al. 1984).

Stem density of plants in the sample plots was higher at the MCPSA than at other sites examined (Table 1). All sites sampled were comprised of >90% *C. lasiocarpa*. This sedge occurs widely throughout Michigan and is characterized by its well developed rhizome system that forms extensive mats under black spruce (*Picea mariana*), tamarack (*Larix laricina*), and northern white cedar (*Thuja occidentalis*) (Voss 1972).

Water depths on the MCPSA in April–May 1980 varied from 20 to 30 cm and diminished to 5–8 cm by mid-June; by early July standing water was not present, but the soil remained saturated throughout the field

TABLE 1
STEM DENSITIES IN BREEDING YELLOW RAIL HABITAT, MARSH CREEK POOL STUDY AREA, SENEY NWR, MICHIGAN, 1979–80

Sample site	Plot size (m^2)	N	Vegetation	Stems/plot ± SE	Calculated stems/m^2
Marsh Creek Pool study area	0.05	100	*C. lasiocarpa*	63.2 ± 2.7	1265
			Juncus, Carex, and Gramineae spp.	4.5 ± 0.8	90
			Forbs and woody spp.	2.2 ± 0.4	43
			All vegetation	70.0 ± 2.4	1398
Calling male sites 1, 2	0.50	20	*C. lasiocarpa*	368.9 ± 24.6	738
			Other	33.8 ± 1.6	67
			All vegetation		805
Calling male sites 4, 5	0.25	20	*C. lasiocarpa*	160.4 ± 13.2	641
			Other	7.6 ± 3.1	30
			All vegetation		672
Both male sites			All vegetation		739

season. In 1979 snowfall was deep and late in melting, resulting in high spring water levels. Standing water was present throughout the 1979 season in all areas where Yellow Rails were found and averaged 6.5 ± 2.8 cm [SD] (N = 40, 10 samples in each of 4 plots) between 1 and 15 August on the sample plots examined south of Marsh Creek Pool. The greatest water depth we recorded at a Yellow Rail calling site was 46 cm on 4 June 1979, which was higher than the 37-cm spring marsh depth recorded by Stahlheim (1974). Water depths recorded at Yellow Rail nest sites have varied from 5 to 10 cm (Elliot and Morrison 1979, Peabody 1922) to 2 to 4 cm at Seney NWR in 1979 (2 nests) to moist soil (Devitt 1939, Walkinshaw 1939, Terrill 1943, MCPSA in 1980 [5 nests]).

The senescent vegetation formed a permanent canopy that averaged 16 cm above the substrate at the MCPSA. A canopy layer of procumbent *C. lasiocarpa* was present at the seven Yellow Rail nesting sites that we found.

Rail movements.—Ten rails (4 breeding pairs, 1 breeding male, 1 juvenile) were monitored during the 1980 season. We recorded 345 locations for the males, 649 for the females, and 178 for the juvenile. Here we discuss the movements of the 4 mated pairs.

Within one week of their arrival at Seney NWR in 1980 (first male heard calling on 6 May), males established activity areas that did not vary

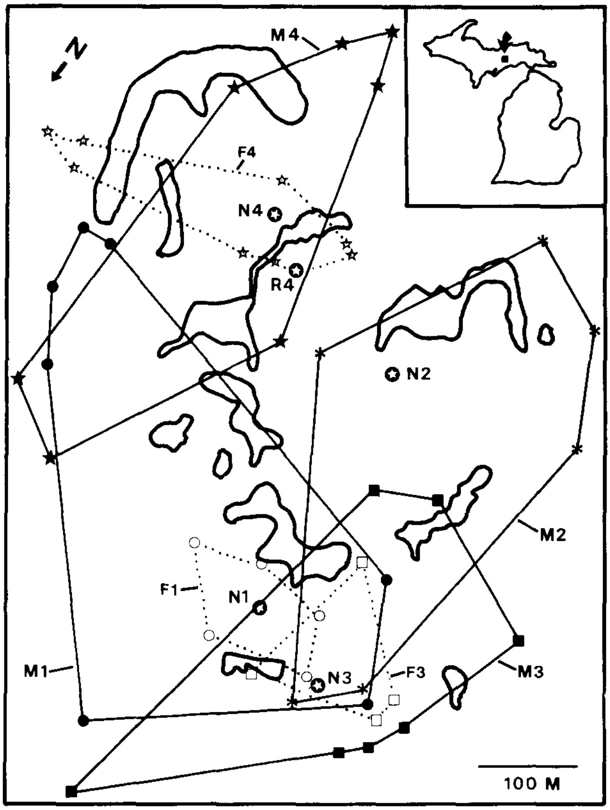

FIG. 1. Movement areas of breeding Yellow Rails during preincubation (males and females) and incubation (males), Seney NWR, Michigan, May–August 1980. Solid symbols connected by lines are male areas; open symbols connected by dotted lines are female areas; symbols of mated pairs are identical. N = nest, R = renest. Irregular areas are sand knolls.

relative to each other for the duration of the breeding season (Fig. 1). Data for male movements during preincubation were combined with those during incubation because Stahlheim (1974) found that calling and patrolling behavior observed during preincubation continued through the incubation period.

Activity areas of mated males averaged 7.8 ha (5.8–10.5), but the distribution of plotted locations within activity areas indicated that the area of frequent use was smaller (Stenzel 1982:44–47). Boundaries of activity areas overlapped, consistent with the suggestion of Bart et al. (1984) that nesting Yellow Rails are slightly gregarious. The pattern of plotted locations of calling males showed the birds were sedentary at night and

TABLE 2
AREA OF MOVEMENT OF FEMALE YELLOW RAILS BEFORE AND DURING INCUBATION, SENEY NWR, MICHIGAN, MAY–JULY 1980

	Preincubation			Incubation		
Female	Date	Area (ha)	No. locations	Date	Area (ha)	No. locations
1	29 May–10 June	1.1	34	11 June–23 June	0.5	145
2				17 June–20 June	0.1	89
3	25 June–29 June	1.0	13	30 June–10 July	0.3	65
4	12 June–5 July	1.7	55	6 July–24 July	0.2	90

mobile during the day. For example, between 06:12 and 20:48 h on 30 May, prior to initiation of incubation, male 1 was near the nest in early evening and early morning, but in the intervening time the total linear distance he moved between plotted points was 983 m, and his greatest straight-line distance from the nest was 375 m. Observations of his calling location on several nights indicated he was near the nest.

The behavior of females during the preincubation period was not readily determined because capturing them at that time was difficult. Females 1, 3, and 4 were captured during egg laying on 28 May, 25 June, and 11 June, respectively (female 2 was captured on 17 June, after she had begun incubating). Female 4 ceased incubation but renested successfully, and her movement patterns were not inconsistent with those of the other two females. During preincubation females were more closely associated with the nest site than were males. Females 1 and 3 stayed within the activity areas of their mates, but female 4 did not (Fig. 1). The average size of the area used by females prior to the onset of incubation was 1.2 ha (Table 2).

Once incubation began, females were closely associated with the nest and incubated through the night. The average detectable distances females 4, 1, and 3 moved from the nest were 21.5, 27.6, and 35.6 m, respectively (SD = 22.6, range = 68.2). Females used an average of 0.3 ha during incubation (Table 2).

Only male 4 retained his transmitter after the eggs hatched, and his movements were more centralized than before hatching. He was in the same location as female 4 (5 plotted locations/bird) on 1 August (16:22 h) to 2 August (19:15 h), a period of more than 23 h. During that time young were heard peeping in the same location; thus male, female, and young were together (we also monitored male 2 at or near the nest of female 2 during hatching and an unmarked male associated with a brood

TABLE 3

MOVEMENTS OF FEMALE YELLOW RAILS DURING POSTHATCH, <8 DAYS (181 H) AFTER LAST YOUNG HATCHED, SENEY NWR, MICHIGAN, 1980

Female	Date and time	No. of plotted locations	Mean distance (m) ± SE from active nest	Area used (ha)
2	20 Jun (13:30 h)–23 Jun (14:54 h)	21	23.6 ± 2.9	0.2
4	24 Jul (13:41 h)–1 Aug (06:17 h)	33	29.7 ± 2.3	0.2

on 27 June [Stenzel 1982:83–85]). Stahlheim (1974) found no association of male and female after incubation began. Males ceased calling on 15 August, and at about that time the bills of males began to darken, suggesting they no longer were in breeding condition (Stahlheim 1974). The area of movement of male 4 after calling ceased was 1.9 ha (45 plotted locations), compared to 6.8 ha he used while males were still calling after eggs hatched (92 locations), suggesting a general decline of encounters with neighboring males as the breeding season waned.

Females 2 and 4 were monitored during hatching of the eggs. Less than 15 h after the last egg hatched, the female led the brood from the nest but remained near the nest for the next few days (Table 3). Female 2 lost her transmitter after 23 June; the only female with young to retain her transmitter more than 5 days after hatch was female 4. During August she moved at intervals of about 1 week between two areas (ca 1.0 and 1.7 ha) separated by a sand knoll in the western portion of her use area (Fig. 1).

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