Call-response and Call-count Wetland Surveys for Nongame Breeding Bird Species

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Wetland bird species are poorly sampled by procedures of the Breeding Bird Survey (BBS). Undersampling primarily results from the relative rarity and patchy distribution of wetland habitats. Other aspects contributing to the paucity of BBS records include: the initiation of breeding prior to the start of BBS counts, the occurrence of peak daily activity outside of the count period, the unimportance of vocalizations in the breeding behavior repertoire and the clumped distribution of colonial nesters. To adequately monitor Ohio wetland bird species, alternative survey methods must be developed.

Using tape-recorded calls, we greatly increased the detection of breeding rail species (Andres and Bart 1989) over simple listening techniques. In addition to rails, call-response techniques could be employed to survey other wetland species. Manci and Rusch (1988) solicited responses from American and least bitterns using intraspecific tape-recorded calls. However, rails and bitterns comprise only a small proportion of wetland breeding bird species. To provide a comprehensive wetland survey, additional species need to be addressed.

Listening counts are often adequate to detect many wetland species. Because we conducted numerous nocturnal surveys (being primarily interested in rail species) in 1988, we only incidently recorded several other wetland species (pied-billed grebes, marsh wrens, and heron spp.). However, preliminary data for these species indicated that the selective surveying of wetlands would be more productive than the random roadside counts of the BBS.

Although greater numbers of rails have been detected between sunset and sunrise (Johnson and Dinsmore 1986a), a comprehensive survey must try to maximize the detection rate for all wetland species. The purpose of this study was to determine: the effectiveness of wetland surveys for monitoring numerous species, the seasonal and daily variation in avian response rate and feasibility of using call-response techniques for detecting bitterns.

STUDY AREA AND METHODS

Marshes in Ohio were selectively surveyed between 6 May and 10 July 1990. Although I originally planned to conclude surveys by the end of June, a high incidence of rainy days in May prolonged the survey season. As in 1989, inclusion of marsh sites was based on information obtained from Ohio's popular birding literature. An effort was made to include varying marsh types from different regions of the state (Figure 1). Surveys were conducted on the periphery of marshes either by foot or by automobile (and in 1 instance, by bicycle) using point-count procedures. Stopping intervals depended on the continuity of the habitat but were never <200 meters. Likewise, the number of stops/marsh depended on the size and accessibility of the marsh. At each stop, survey procedures were the same and involved: 1) listening for 2 minutes, 2) playing a continuous tape of sequential advertisement calls of the five species (least bittern, American bittern, sora, Virginia rail, king rail) for 3 minutes, and 3) listening an additional 2

minutes after the broadcast. Habitat at each stop was classified into one of the Division of Wildlife's Wetland Inventory categories (Table 1). All surveys were conducted between 0530 and 0930 hours. Numbers of bittern and rail species were tallied during pre-broadcast and post-broadcast periods and numbers of all other species were tallied throughout the entire period. The location of each bird was noted to eliminate counting the same individual at more than 1 stop. All individuals, either seen or heard, within a 100-meter radius circle were recorded. Calls from the Borror Bioacoustics Laboratory at Ohio State University and the Cornell Laboratory of Ornithology (1983) were used in making tapes. A single-speaker, 5 watt portable tape player was used to broadcast calls. Acoustic properties of the calls were not determined.

The hypothesis of increased rail response by broadcasting calls was tested against a null hypothesis of no broadcast effect using the binomial test (Hollander and Wolfe 1973). For test, I included only stops where a vocal response was recorded (1989 and 1990). To investigate the effect of time of day on calling rates, the average number of responses was calculated for hourly periods. Rail species were analyzed individually; all other species were analyzed by order. Data from 1989 were also included in the analysis of rail species. One repeat survey was conducted 15 hours after the initial visit (using the same stop locations), to provide further information on time-of-day effects. Weekly average density (birds/stop) was also calculated for each species to determine the optimal period for conducting wetland surveys. Repeat visits to

two marshes were also conducted to provide further information on seasonal response rate. The stop (point count) represented the primary sampling unit in all calculations of means and standard errors.

All common nomenclature follows the A.O.U Checklist 6th edition (1983).

RESULTS AND DISCUSSION

General Abundance

Two-hundred fifty-three point-counts were conducted in 35 marshes throughout the state (Table 2). Eight-hundred twenty individuals of 19 species were recorded (Table 3). Great blue herons, swamp sparrows, willow flycatchers and marsh wrens were recorded most frequently. All species occurred at a higher density (birds/stop) on wetland surveys than on BBS routes (Table 3). Soras, the most common rail species encountered, comprised 61% of the rail responses.

Effectiveness of Broadcasts

A significantly higher ($p \leq 0.02$) number of vocal responses occurred after broadcasting calls for each rail species (Table 4). Virginia rails and soras responded to intraspecific and interspecific calls. No American bitterns were detected on surveys by either broadcasting calls or listening. However, one bird was encountered between stops at Magee Marsh and a pair nested at

Spring Valley Wildlife Management Area (B. Tobobin pers. comm.). Of 15 least bitterns recorded, only 1 was solicited by broadcasting calls. Manci and Rusch (1988) also recorded low response rates of least bitterns (0.017/stop) and American bitterns (0.023/stop). They also found that broadcasting calls did not greatly enhance bittern detection.

Hourly Response Rate

Responses of rails were fairly consistent throughout the morning until 0830 when responses dropped (Figure 2). Response rates of grebes and coots slightly declined between 0530 and 0900 (Figure 2). Calling activity of other groups did not consistently decrease through the morning (Figure 2). When data from 1989 and 1990 were combined, early morning response rates of rails were as high (and often higher) than nocturnal rates (Figure 3). Additionally, repeat surveys conducted at 0600 hours and 2200 hours at Winous Point Shooting Club yielded no difference in rail response rate (both were 0.4 birds/stop). Robbins (1981), however, noted a gradual decline in detection rate of rails after sunrise in the continental BBS.

Seasonal Response Rate

Soras were found in the highest numbers during the first week of surveying (Figure 4). By the third week, responses had decreased by 75%. Virginia rails initially declined but increased again in June and July. Increases were probably the result of

surveying better Virginia rail habitat. However, similar decreases were apparent in both species on repeat visits to Big Island and Spring Valley Wildlife Management Areas (Figure 5). I also visited Big Island in late July and did not record high numbers of soras. This suggests that high responses rates in early May were not solely caused by visiting high quality habitat. It is most likely that the high numbers of soras encountered in early May were migrants. Manci and Rusch (1988) also noted peak calling rates in early May but made no mention of the contribution of migrants.

Swamp sparrows were present at the start of surveys (May 9). Marsh wrens and willow flycatchers were largely absent until the second and third week (May 16, May 23). High numbers of swamp sparrows recorded in early July were the result of surveys being clustered in northeastern Ohio (Figure 6). Grebes, herons and coots did not show any temporal pattern.

Habitat Associations

Because of the imprecise collection of habitat data (ie. more strict attention to recording the habitat where the bird was calling from rather than from the area immediately surrounding the calling station was needed), I view these data as preliminary. No rigorous statistical analysis was used to determine habitat preferences of wetland species. However, comparisons between species can be made. The majority of rails (53%) occurred in shallow-water marshes dominated by cattails, grasses and sedges (Figure 7). Only half as many birds (27%) were found in deep-water

marshes. Even in predominantly deep-water marshes, rails appeared to occur only where patches of unflooded substrate were available. Thus, marshes with a high density and coverage of cattails (Ottawa, Little Cedar Point NWR and Winous Point) did not necessarily produce high rail numbers. Often, large areas of such marshes were covered by 18 to 36 inches of water. In studies by Pospichal and Marshall (1954) and Johnson and Dinsmore (1986b), rails were most abundant in marshes with cattails (Typha sp.) and other emergent, shoreline vegetation.

Compared to rails, American coots and common moorhens were more evenly distributed in deep-water and shallow-water habitats. Pied-billed grebes were found in predominantly deep-water habitats (Figure 7).

Great blue herons were most common in deep-water marshes while black-crowned night-herons were found in equal numbers in deep-water and shallow-water marshes (Figure 8). The majority of least bitterns were found in deep-water marshes (60%, n=15). Only the green-backed heron was found in a high proportion of shrub/scrub wetlands (47%, n=17).

Swamp sparrows and willow flycatchers were similar in their habitat use occurring in equal proportions (33%) in shallow-water marshes and shrub/scrub wetlands (Figure 9). Marsh wrens were prominent in the dense, flooded cattail stands of deep-water marshes.

Methodology

Surveying selected wetlands is clearly superior to the roadside procedures of the BBS. Selective surveying would substantially produce more information for 14 species of wetland birds; 8 of them inadequately covered by the BBS. Site-specific and technique-specific surveys may need to be incorporated to monitor extremely rare species (e.g. American bittern, terns, double-crested cormorant, prothonotary warbler). Broadcasting calls of soras, king rails and Virginia rails would greatly enhance their detection. Least bitterns appear not to respond to broadcasted calls. Because rail responses are initiated during or immediately after tape playing, a 1 minute listening period following broadcasts would be adequate (95% of all responses occurred during the first minute).

To maximize the number of contacts of all wetland species, surveys should begin an hour before sunrise and be concluded by 3 hours after sunrise. Because responses of American bitterns decline rapidly after sunrise (Robbins 1981), beginning an hour before sunrise should create the greatest possibility of detecting this species. To coordinate surveys with main activity periods of rails and to ensure arrival of passerines, surveys should be conducted from May 15 to June 15. Additionally, interspecific differences in rail vocalizations are more pronounced during the pre-laying stage of breeding (Kaufman 1983). By mid-May most migrant rails have passed through the state (Trautman and Trautman 1968) and wetland passerines have arrived (Peterjohn and Zimmerman

1989).

I have three suggestions for structuring the next stage of our (OCFWRU) wetland work:

1) An additional field season could be used to determine the detection rate of breeding rails when using broadcasted calls. Comparing early May call-response rates with flush counts conducted in early June (particularly of soras) would indicate whether high counts in early May are due to passing migrants or highly active breeding birds. In 1990, sora broods were found at Killbuck Wildlife Management Area as early as June 7 (T. Kerr pers. comm.). This would aid us in establishing a survey season that would truly monitor the breeding population.

2) Another field season could be used to determine the habitat preferences of Ohio breeding rails. The majority of habitat-use studies have occurred in the marshes that differ from those found in Ohio (Johnson and Dinsmore 1986b, Pospichal and Marshall 1954, Manci and Rusch 1988). Further collection of habitat data would provide managers with information on managing for these nongame wetland species.

3) The upcoming winter could be used to develop a thorough survey. Prior to the 1991 breeding season, maps of stop locations and field forms would be made. Wildlife Area and other site personnel would be contacted to participate in the survey. Their input would be important in adding stops I might have over-looked. I would personally meet with these individuals and describe the survey techniques. Decisions governing the recording of fly-overs

would need to be made. High numbers of herons in this study often resulted from fly-over birds. Since BBS procedures include flying individuals, wetland surveys might include such individuals within a certain distance of the observer. An alternative would be to only include birds that were flushed from the calling area. A high quality tape, preferably of calls from Ohio sites, would be distributed to each participant. The tape would include the survey call sequence as well as reference calls. The Unit would receive all data and develop and conduct subsequent analysis. Comparisons from sites surveyed in 1990 would give us some idea of the yearly variation in counts. This would be needed to develop a survey of adequate size.

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Table 1. Wetland Inventory classes used in bird surveys.

Wetland Type	Description
Open Water	Unvegetated standing water
Deep Water Marsh	Cattails dominant
Shallow Water Marsh	Cattails, rushes, grasses, sedges; with standing water
Wet Meadow	Grasses, sedges; no standing water
Wooded Wetland	Large trees; standing water
Scrub/Shrub Wetland	Buttonbush, dogwoods; standing water

Table 2. County location of and effort in Ohio marshes surveyed by call-response/call-count methods 1990.

Marsh Site	County	No. of stops
Irwin Prairie Natural Area	Lucas	3
Little Cedar Point (Ottawa NWR)	Lucas	14
Metzger Marsh WMA	Lucas	2
Ottawa NWR	Lucas	13
Magee Marsh WMA	Ottawa	23
Navarre (Ottawa NWR)	Ottawa	9
Ottawa Shooting Club	Ottawa	7
Little Portage WMA	Ottawa	11
Winous Point Shooting Club (South)	Ottawa	11
Winous Point Shooting Club (North)	Ottawa	24
East Harbor State Park	Ottawa	4
Pickerel Creek WMA	Sandusky	5
Resthaven WMA	Erie	10
Kelly's Island State Park	Erie	3
Willow Point WMA	Erie	7
Mentor Marsh Natural Area	Lake	5
Hotchkiss Pond	Geauga	2
Eagle River Natural Area	Portage	4
Tinker's Creek Natural Area	Portage	6
Grand River WMA	Trumbull	9
Mosquito Creek WMA	Trumbull	7
Shenango Valley WMA	Trumbull	3
Springville Marsh Natural Area	Seneca	4
Killbuck WMA	Wayne	9
Killdeer Plains WMA	Wyandot	10
Big Island WMA	Marion	13
Delaware WMA	Delaware	2
Pickerington Pond Metro Park	Franklin	5
Stillfork Swamp Natural Area	Carroll	3
Ohio Power WMA	Muskingum	7
Stage's Pond Natural Area	Pickaway	2
Circleville Canal WMA	Pickaway	1
Radcliffe Pond	Pickaway	2
Spring Valley WMA	Greene	10
Gilmore Ponds	Butler	3

Table 3. Total number and average density (birds/stop) of birds recorded on wetland surveys and on average density (birds/stop) recorded on Ohio BBS routes.

Species	Total No. of birds	Wetland Survey	Ohio BBS*
Pied-billed Grebe	36	0.142	0.000
Double-crested Cormorant	2	0.008	0.000
Least Bittern	15	0.059	0.000
Great Blue Heron	203	0.802	0.097
Great Egret	52	0.206	0.006
Green-backed Heron	17	0.067	0.004
Black-crowned Night-Heron	28	0.111	0.001
King Rail	3	0.012	0.000
Virginia Rail	39	0.154	0.001
Sora	66	0.261	0.000
Common Moorhen	6	0.024	0.000
American Coot	46	0.182	0.000
Spotted Sandpiper	12	0.047	0.002
Black Tern	1	0.004	0.000
Alder Flycatcher	2	0.008	0.000
Willow Flycatcher	91	0.360	0.051
Marsh Wren	90	0.356	0.001
Prothonotary Warbler	1	0.004	0.000
Swamp Sparrow	110	0.435	0.003

* BBS density for 1986 only.

Table 4. Success of broadcasting calls and response rate of call-response counts for rails in Ohio, 1989-1990.

Species	No. of Rails Heard			Total Rail Response Rate (Birds/Stop)	No. of Stops
	Before Tape	After Tape	Signif. level		
Sora	16	63	0.0001	0.21	373
Virginia Rail	3	46	0.0001	0.13	373
King Rail	0	6	0.0156	0.02	373
All Species	19	134	0.0001	0.36	373

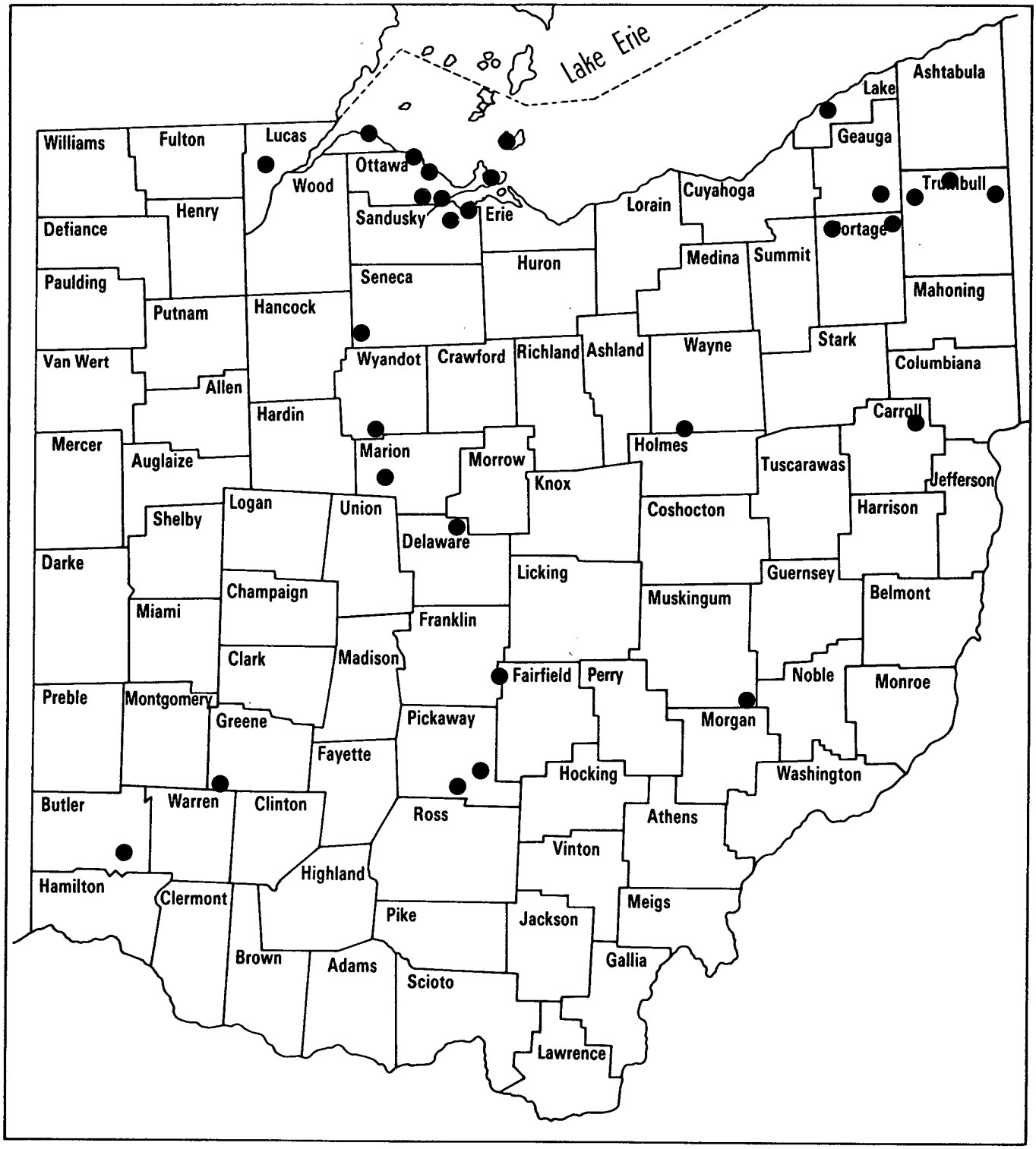

Figure 1. Location of wetlands surveyed in 1990.

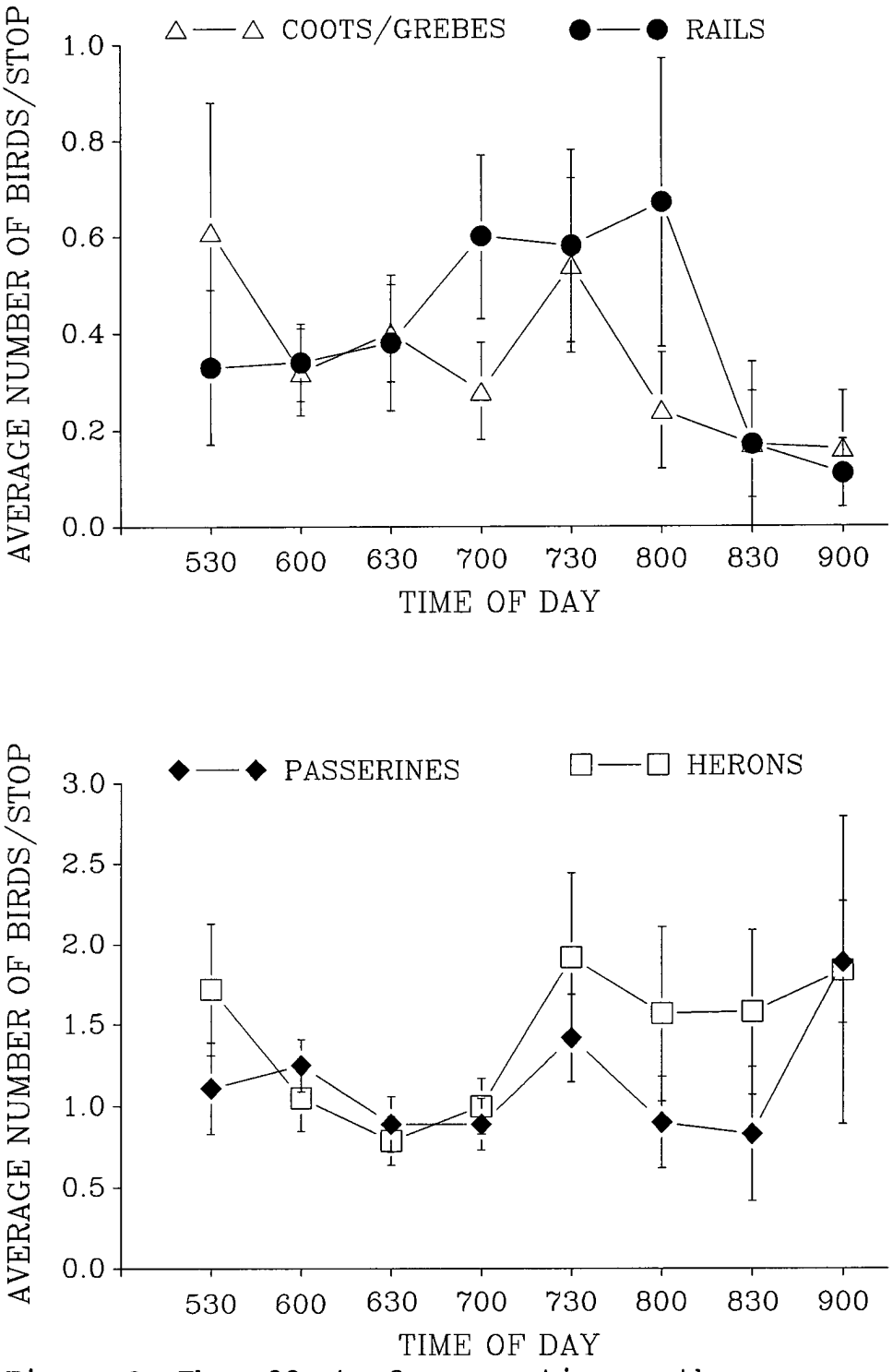

Figure 2. The effect of survey time on the response rate of wetland bird species (vertical lines indicate ± 1 SE).

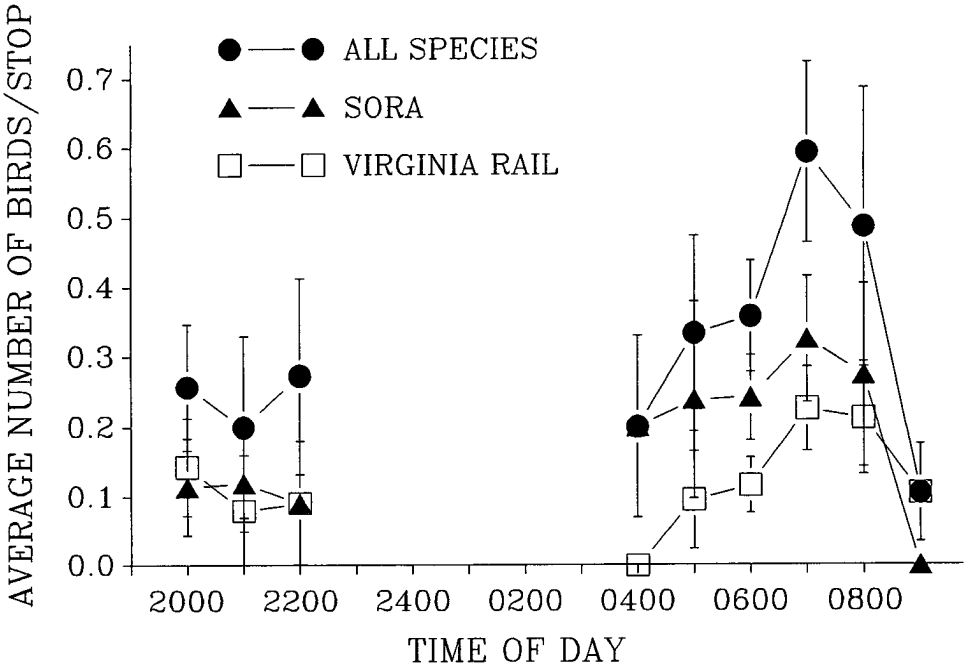

Figure 3. Hourly responses of rails during wetland surveys 1989-1990 (vertical bars indicate ± 1 SE).

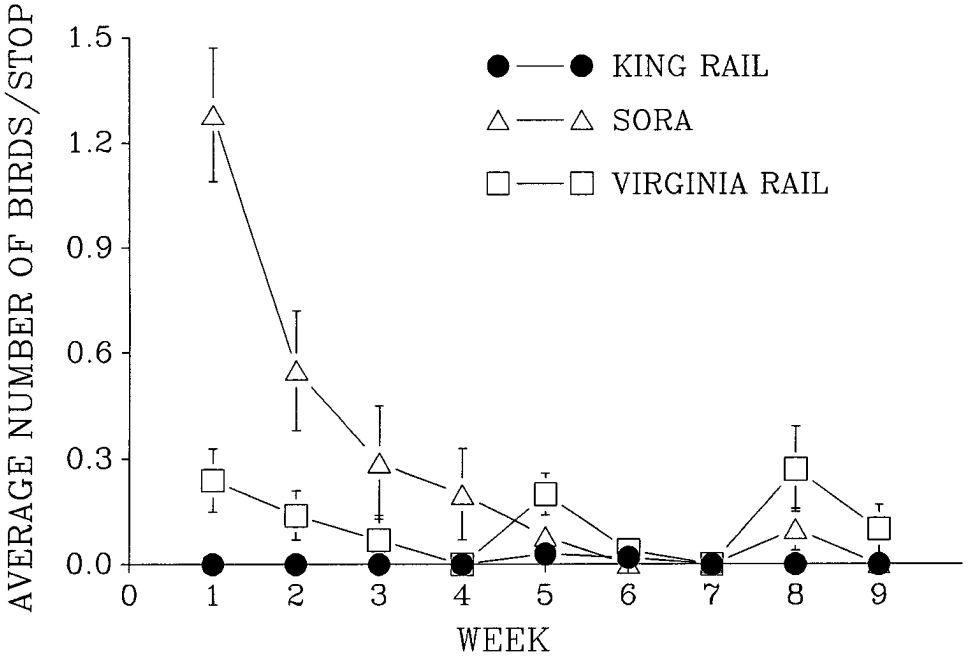

Figure 4. Weekly response rates of rails on wetland surveys (vertical lines indicate ± 1 SE).

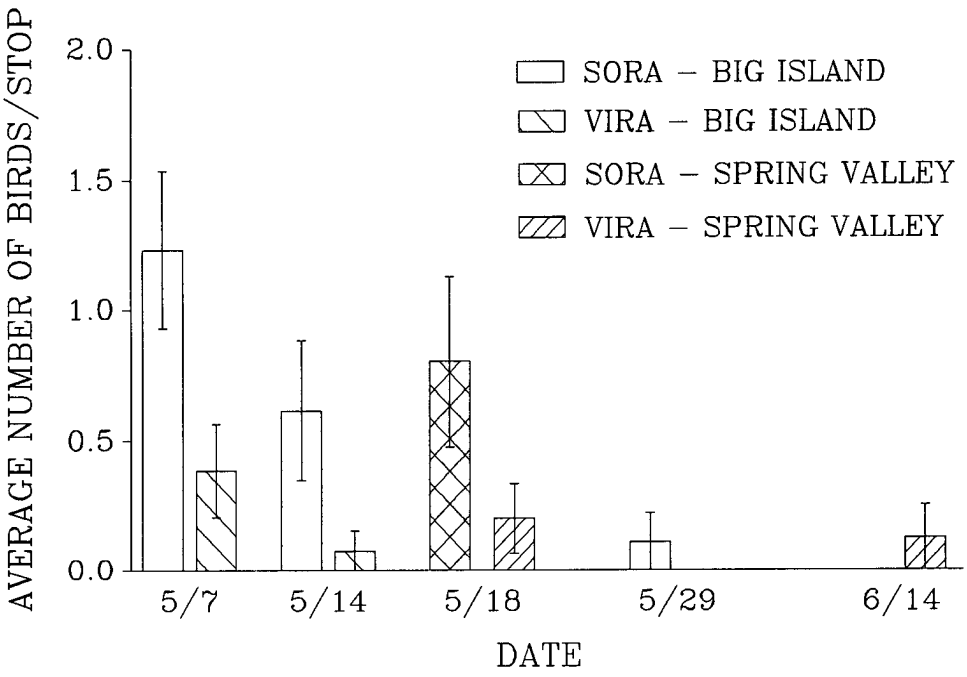

Figure 5. Number of Virginia rails and soras on repeat wetland visits in 1990 (vertical lines indicate ± 1 SE).

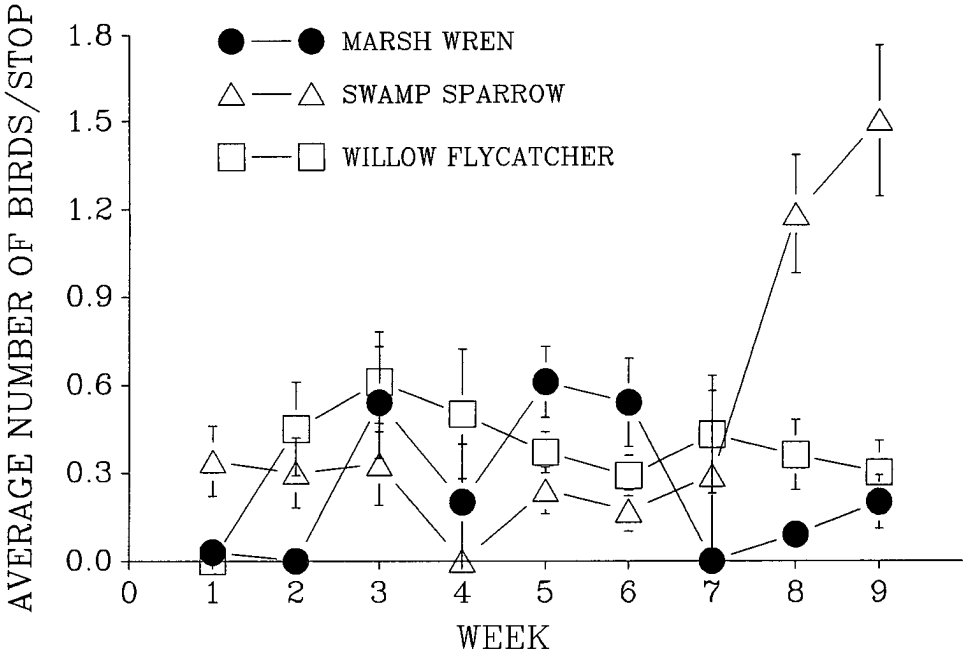

Figure 6. Weekly response of passerines on wetland surveys (vertical lines indicate ± 1 SE).

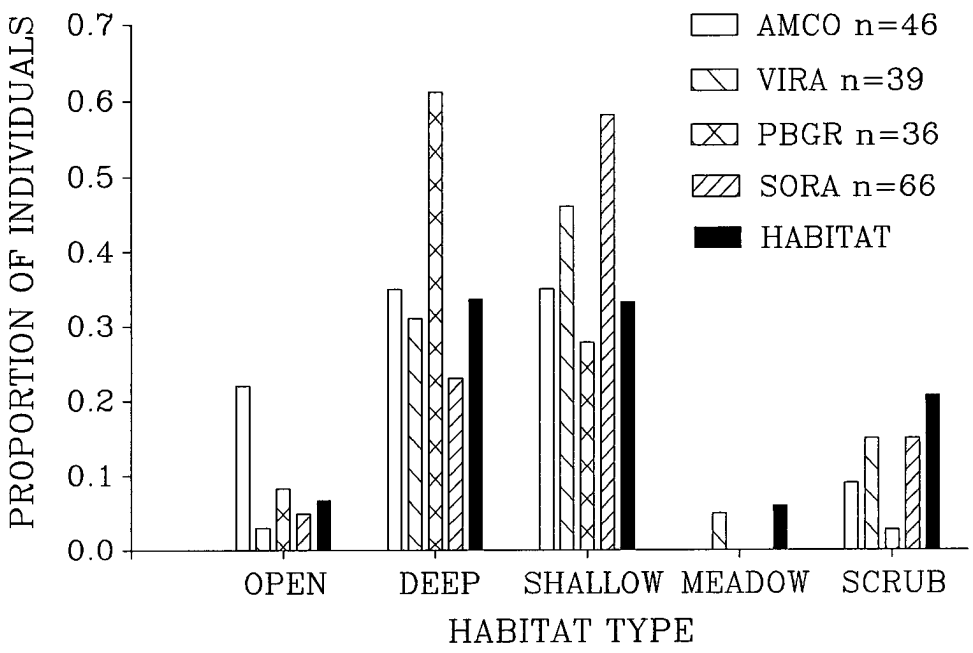

Figure 7. Habitat use (ODNR Wetland Inventory classes) by American coots (AMCO), Virginia rails, soras and pied-billed grebes (PBGR). Proportions of habitat types are based on 253 stops.

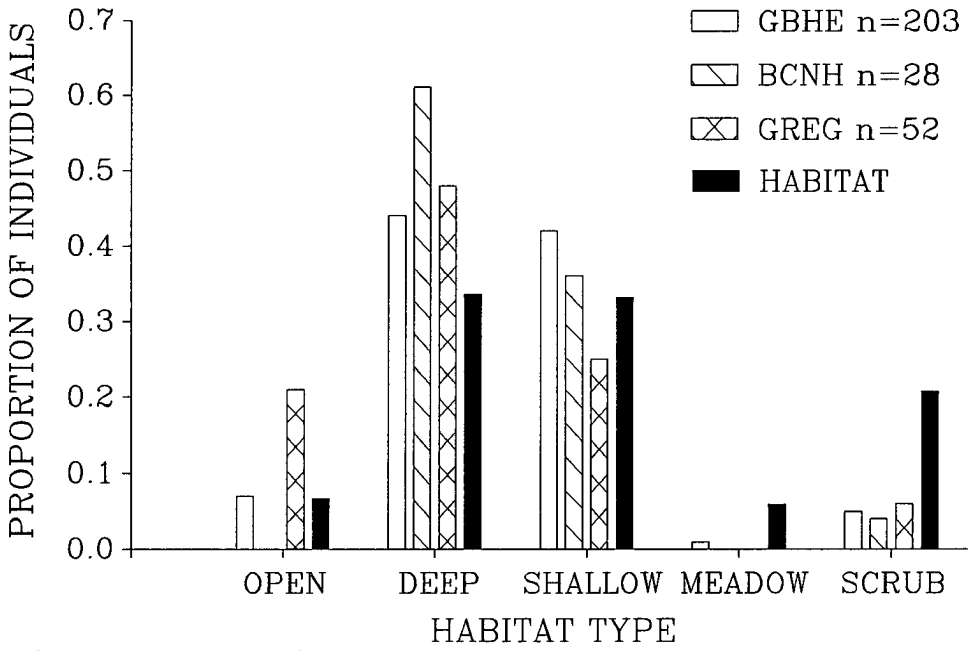

Figure 8. Habitat use (ODNR Wetland Inventory classes) by great blue herons (GBHE), great egrets (GREG), and black-crowned night-herons (BCNH). Proportions of habitats are based on 253 stops.

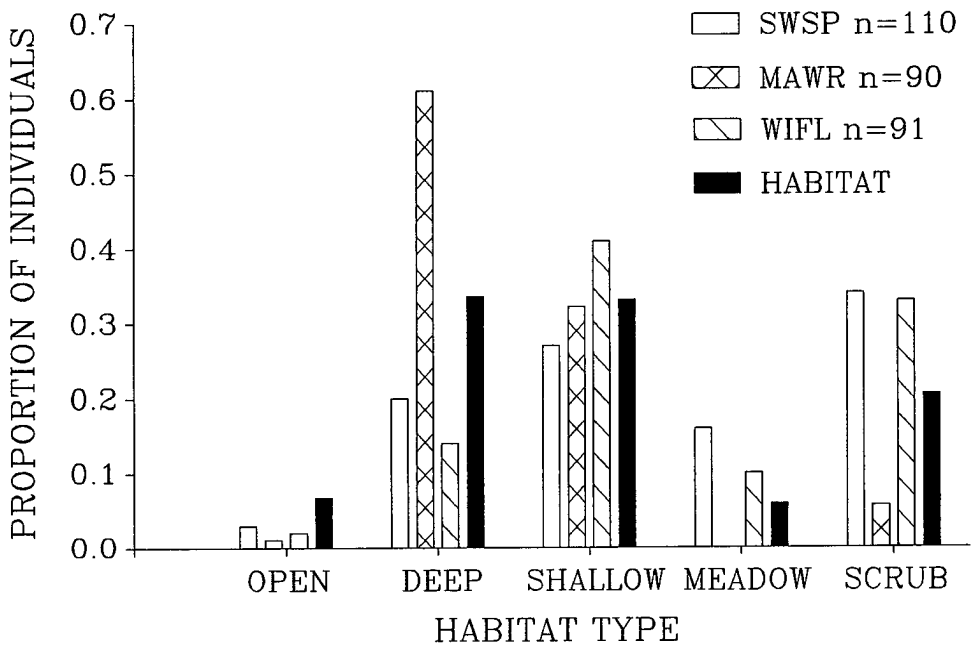

Figure 9. Habitat use (ODNR Wetland Inventory classes) by swamp sparrows (SWSP), willow flycatchers (WIFL) and marsh wrens (MAWR). Proportions of habitat are calculated from 253 stops.