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RESULTS OF THE FIRST ANURAN CALLING SURVEY IN NEBRASKA

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ABSTRACT

In 1997, the Nebraska Game and Parks Commission began an anuran calling survey using routes following those of the upland game bird surveys. At each stop the observer recorded start and stop times, air temperature, cloud cover, precipitation events, wind speed (Beaufort scale), species heard calling, and the frequency of calls heard. An index of calling frequency was standardized on a scale of 1 (no call overlap) to 3 (full chorus). The number of sites occurring within a species' range (n) was determined based upon the number of sites per survey route and species distribution in Nebraska. A mean call index was calculated based upon the value reported for each species. Thirty-eight routes were completed, of which 17 were surveyed during each of the three sample periods. Thirteen routes were sampled twice and eight were surveyed only once. Thirty-two, 21, 18, and 14 routes were surveyed during April, May, June, and July, respectively. All anuran species known to occur in Nebraska except *Gastrophryne olivacea*, the Great Plains Narrow Mouth Toad, were recorded during the survey period. *Hyla chrysocelis*, *Acris crepitans*, and *Pseudacris triseriata* were heard most frequently. *Spea bombifrons*, *Bufo cognatus*, and *Rana caatesbeiana* were heard least frequently (< 5% of total sites within known range). *Bufo americanus* was heard at four sites along two routes.

† † †

The status of amphibian populations worldwide is under debate (Wyman 1990). Though it has been noted that amphibians are becoming more difficult to find, data from long-term, large-scale, multi-taxa census studies are largely unavailable, and reasons for declines are difficult to discern (Pechmann *et al.* 1991). Since the late 1980s, efforts have been made to determine the extent to which amphibian populations are declining

and their causal mechanisms (Blaustein *et al.* 1994; Corn 1996; Pechmann *et al.* 1991; Pechmann and Wilbur 1994).

In 1994 the North American Amphibian Monitoring Program (NAAMP) was initiated to collect reliable data pertaining to the abundance, distribution, physiology, and reproductive status of amphibians. The NAAMP suggests several methods for standardized data collection, including anuran calling surveys, terrestrial salamander surveys, regional amphibian and reptile counts, and aquatic surveys of egg masses and tadpoles. This paper reports the results of the first anuran calling survey conducted in Nebraska and addresses concerns for future programs of this nature in Nebraska.

METHODS

In 1997, the Nebraska Game and Parks Commission (NGPC) initiated an anuran calling survey following NAAMP protocol in an effort to establish base-line census data for detecting long term spatial and temporal changes in anuran populations. Amphibian breeding occurs in Nebraska from March through August, with each species having specific periods during which it can be heard in breeding choruses (Billings 1973; Hudson 1953; Lynch 1985). NGPC biologists were trained to identify calls of individual species and mixed choruses of frogs. Anuran survey routes followed those of the upland game bird surveys (Taylor, J.S., Nebraska Game and Parks Comm., pers. comm.). Routes were 16-48 km, with travel direction assigned randomly. With one exception, each route consisted of 10

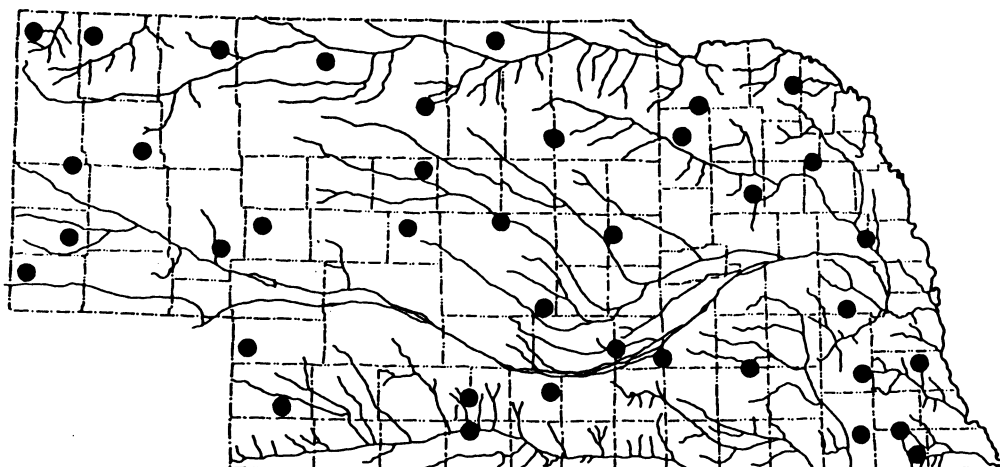


Figure 1. Distribution of Nebraska Game and Parks Commission 1997 calling survey routes across Nebraska.

wetland areas, > 500 m apart to prevent site-to-site call overlap (one route in Gage County had four additional wetland areas). Data were collected for each route at least once during each of three periods (1–28 April, 7 May–4 June, and 13 June–10 July).

For safety and reliability, no survey was conducted during heavy rain or wind > 24 km/hr. Surveys were conducted < 30 minutes of sunset following periods of rain or high humidity. At each stop the observer recorded start and stop times, air temperature, cloud cover, precipitation events, wind speed (Beaufort scale), species heard calling, and the frequency of calls heard. Approximately five minutes were spent at each wetland area during the auditory survey. Two minutes were assigned to wait time, allowing calling to resume, and three minutes for recording observations. An index of calling frequency was standardized on a scale of 1 (no call overlap) to 3 (full chorus).

The number of sites occurring within a species' range (n) was determined based upon the number of sites per survey route and species distribution in Nebraska (Lynch 1985). If a route was surveyed more than once in a given month, the route was counted only once and each site at which anurans were heard was counted only one time. A mean call index was calculated based upon the value reported for each species. For the purpose of calculating the mean call index, sites visited more than once a month were treated independently so the mean call intensity could be calculated for each month.

RESULTS

Thirty-eight routes were completed (Fig. 1), of which 17 were surveyed during each of the three sample periods. Thirteen routes were sampled twice and eight were surveyed only once. Thirty-two, 21, 18, and 14 routes were surveyed during April, May, June, and July, respectively. All anuran species known to occur in Nebraska (Lynch 1985) except *Gastrophryne olivacea*, the Great Plains Narrow Mouth Toad, were recorded during the survey period (Table 1). *Hyla chrysocelis*, *Acris crepitans*, and *Pseudacris triseriata* were heard most frequently. *Spea bombifrons*, *Bufo cognatus*, and *Rana caatesbeiana* were heard least frequently (< 5% of total sites within known range). *Bufo americanus* was heard at four sites along two routes.

DISCUSSION

Of the 11 anurans known to occur in Nebraska, *Gastrophryne olivacea* and *Bufo americanus* have extremely limited ranges, whereas most other species have nearly statewide distributions (Lynch 1985). Other taxa included in Nebraska's herpetofaunal composition include *Acris crepitans*, *Bufo cognatus*, *Bufo woodhousii*, *Hyla chrysocelis*, *Pseudacris triseriata*, *Rana blairi*, *Rana catesbeiana*, *Rana pipiens* and *Spea bombifrons*.

Gastrophryne olivacea is known from only two counties in south central Nebraska (Lynch, J.D., unpublished), only one of which (Gage County) was surveyed. Thus, due to its scarcity, it is not surprising that this species was not recorded. *Pseudacris triseriata* occurs commonly throughout the state and we expected it to be recorded at more sites. This species is likely the

Table 1. Anuran calling survey results by period for Nebraska, 1997. Mean call indices were calculated based upon values from sites at which the species was found. The total number of sites within the species' (*n*) reflects distributions presented by Lynch (1985). Species codes are as follows: *Hyla chrysocelis* (196), *Acris crepitans* (191), *Pseudacris triseriata* (214), *Bufo americanus* (172), *Bufo woodhousii* (188), *Bufo cognatus* (175), *Rana blairi* (224), *Rana catesbeiana* (228), *Rana pipiens* (239), *Spea bombifrons* (142), *Gastrophryne olivacea* (218).

	Species code	196	191	214	172	188	175	224	228	239	142	218
	<i>n</i>	90	244	384	0	384	384	384	384	254	321	13
1-28 April	Mean Call Index	0.00	2.00	2.33	0.00	0.00	1.00	1.38	1.00	1.73	0.00	0.00
	No. Routes	0	2	25	0	0	1	11	1	6	0	0
	No. Sites	0	3	228	0	0	3	21	1	22	0	0
	% of Total	0.00	1.23	59.38	0.00	0.00	0.78	10.55	0.26	8.66	0.00	0.00
7 May- 4 Jun	Mean Call Index	1.86	1.88	2.56	0.00	1.70	1.70	1.27	1.70	1.26	2.00	0.00
	No. Routes	6	12	28	0	18	6	8	5	7	4	0
	No. Sites	35	40	162	0	71	10	11	10	19	12	0
	% of Total	38.89	9.02	42.19	0.00	18.49	2.60	2.86	2.60	5.92	3.74	0.00
13 Jun- 10 Jul	Mean Call Index	2.14	2.30	2.09	2.00	1.68	2.50	2.05	1.18	0.00	1.56	0.00
	No. Routes	6	12	19	2	13	3	9	7	0	4	0
	No. Sites	29	37	85	4	37	4	19	17	0	18	0
	% of Total	32.22	15.16	22.14	4.00	9.64	1.04	4.95	4.43	0.00	5.61	0.00

most commonly encountered frog in the state and is known to begin calling as early as March and continue through August (Lynch 1985). *Spea bombifrons* and *Bufo cognatus* have statewide distributions and appear at breeding sites after heavy rains during late spring and early summer. We believe these species may have been under-represented due to the limited time they occur at breeding sites, or because wetlands along survey routes were not the ephemeral pond types used by these organisms. *Rana catesbeiana* was also heard infrequently (< 5% of sites within the species' range). *Rana catesbeiana* occurs only in permanent bodies of water and therefore, depending on the types of habitat present along survey routes, may simply have not been encountered. *Bufo americanus* is known from only two localities in Nebraska (Burt and Sarpy counties) and appears to be restricted to hardwood forest habitats along the Missouri River (Lynch, J.D., pers. comm.). The presence of *B. americanus* was reported from one route in both Dodge and Saunders counties. It is known that *B. americanus* and *B. woodhousii* interbreed and their calls can be easily confused or misidentified. It is also possible that *B. americanus* has extended its range in Nebraska. Further work is required to verify these species.

Calling surveys, such as this one, are limited to those amphibian choruses that can be heard at the time the route is driven. It is possible that the frogs and toads in the area may not be calling for a variety of reasons, ranging from predators being in the vicinity, to poor environmental conditions, to the presence of the observer. Problems may also exist in interpreting the size of a chorus due to external noise pollution (e.g. irrigation motors, passing vehicles, and overhead

powerline noise). Further, observer bias may contribute to misidentification of calls if, for example, certain species are expected at a site or within a particular geographic range. No verification procedure was in place to validate the calls reported and therefore the extent of misidentification is unknown. For example, *Rana pipiens*, occurring north of the Platte River, was recorded on a route well outside its range (in Pawnee County) and may have been mistaken for *R. blairi*, which occurs south of the Platte.

Calling surveys do not measure reproductive success. For example, *Hyla chrysocelis* was heard frequently during this survey (32.8–38.9% of total sites within its range), yet in a concurrent study no larval sample of *H. chrysocelis* was taken from sites within this species' range during the same time period (McLeod 1999). Therefore we recommend concurrent larval sampling at sites where calling surveys are conducted to determine whether breeding had in fact occurred. In addition, a verification procedure should be established to ensure the accuracy of field data collected if it is to be useful in the future for determining the status of Nebraska's amphibian populations. A possible solution is to have observers work in pairs, experienced with beginner. This would ensure better-trained observers for future studies. Last, we recommend surveys be conducted three times each month from April through July to establish a more complete record of anuran distribution.

Long-term monitoring programs are essential to accurately evaluate the status of amphibian populations. The 1997 anuran calling survey is a first step in establishing such a database in Nebraska.

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