



6-30-1971

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### Recommended Citation

Black, Jeffrey Howard and Brunson, Royal Bruce (1971) "Breeding behavior of the boreal toad, *Bufo boreas boreas* (Baird and Girard), in western Montana," *Great Basin Naturalist*: Vol. 31 : No. 2 , Article 13.  
Available at: <https://scholarsarchive.byu.edu/gbn/vol31/iss2/13>

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BREEDING BEHAVIOR OF THE BOREAL TOAD,  
*BUFO BOREAS BOREAS* (BAIRD AND GIRARD),  
IN WESTERN MONTANA

Jeffrey Howard Black<sup>1</sup> and Royal Bruce Brunson<sup>2</sup>

The boreal toad, *Bufo boreas boreas*, is the most frequently observed toad in western Montana and other parts of the Pacific Northwest. Yet little is known of the breeding behavior of this subspecies. The purpose of this paper is to discuss the breeding behavior of the boreal toad as observed in western Montana during 1966 and 1967.

Nine ponds and their breeding populations of the boreal toad were observed during the springs of 1966 and 1967. Three temporary pools filled by underground seepage from the Clark Fork River, 7.7 miles northwest of Missoula, and two spring overflow ponds in the Clark Fork River flood plain 6.7 miles northwest of Missoula, Missoula Co., were observed in both years. Two large ponds 1 miles north of Victor, and two water-filled gravel pits 8 miles southeast of Hamilton along Skalaho Highway 38, Ravalli Co., were observed during the spring of 1967. Practically all breeding sites were dry until the spring runoff.

#### RESULTS

The two gravel pit ponds 8 miles southeast of Hamilton along Skalaho Highway 38 contained the largest populations of breeding toads and their behavior was typical of that observed at other ponds in western Montana. The two gravel pits are about 100 ft apart and one-half acre in size when filled with water (Fig. 1). Vegetation was limited to areas of cattails (*Typha* sp.). Water was clear and 5 ft deep at the middle.

On 11 May 1967, only a few males were present on the shores or hiding in the dry cattails. By 14 May, each pond contained at least 30 waiting males. Most males were in the cattails with only their eyes and front legs above the water surface, while others were in the shallow water near shore with their anterior halves resting on rocks (Fig. 2). All males were spaced at intervals along a single shore and not around the whole pond. There was at least one foot of distance between each male, and all were facing the shore.

Males from one pond were collected and released on the shore of the adjacent pond. As soon as the movement of the new arrivals was noted, the waiting males swam to them and clasping attempts were made with "protest" chirps coming from the clasped male. Males did not stay clasped for any length of time; however, the wrestling of one pair of males attracted all the others until the water was boiling with wrestling males. If a male was clasped behind the forelegs, a "protest" chirping was immediate. This protest chirping attracted other males toward the sound even if the chirping male was on shore and no movements were made. After a few minutes,

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Fig. 1. Pond used for breeding by the boreal toad 8 miles southeast of Hamilton, Ravalli Co., Mont.

the males would start moving apart and again space themselves from each other along the shore. Individual males would frequently give protestlike chirps. On 16 May, at least 40 males were present in each pond and the first pair in amplexus was found in a quiet, hidden area. Eggs had not yet been laid in the ponds. The anal temperature of the waiting males ranged from 17.6 to 18.1 C in water which was 17.6 C. Recorded protest calls from the Victor ponds were brought to these ponds on 18 May. From the nearby highway, the water appeared to be boiling and the protest chirping chorus was loud. This slow chirping chorus could be heard for some distance. Two sets of eggs had been laid, and one pair in amplexus was hidden in the dense grass along shore. The taped calls were played on the shore which attracted some males and clasping attempts were made. Movements of a net or hand in the water with or without the recorded calls attracted numerous males, and at one time 31 males were around the moving aquatic net in the water. The pair in amplexus was taken from their hiding place in the grass and placed in the open water. The pair was immediately attacked by 6 males which the male in amplexus kicked away with his hind legs; the mated pair returned to their hiding place where they were not bothered by the other males.



Fig. 2. Male boreal toad in the breeding pond 8 miles southeast of Hamilton. Typical waiting position of the male in shallow water along shore.

The ponds were visited at night on 18 May, with the recorded protest chirps. At night the males were extremely hard to find; most were floating in the deeper water and only a few were close to shore. The recorded protest calls did attract several males; however, few attempts at clasping were noted. It appeared that practically all breeding activities ceased at night. Even though water temperatures were not taken at night, they were not much lower than the daytime temperatures.

Observations at the breeding ponds in Missoula County and the other ponds in Ravalli County showed similar breeding behavior. Males arrived in early April, and breeding lasted until July, with most breeding activity occurring in May.

Seven males were discovered in a temporary pool on the Clark Fork River on 5 May 1966, when their calling was heard about one-fourth mile away. Males were separated from each other by at least one foot and were along the edge of the pond in clumps of grass, beside logs, or with their front feet on the shore. When approached they ceased calling and swam to the bottom of the pond and remained motionless for a short time, then returned to their calling and watching stations. Their chorus sounded identical to that described above from the breeding sites near Hamilton.

Males in the ponds north of Victor were very bold and also came toward any movement in the water. Individual males were observed giving the protest chirps from stations in clumps of *Typha*, and wrestling groups of male were common.

#### DISCUSSION

The breeding behavior of the boreal toad in Montana was similar in many respects to that reported for other *Bufo* and *B. b. boreas* in other localities. Males greatly outnumbered the females at all breeding sites in Montana and started arriving about five days before the females and spaced themselves along the pond's edge. All males faced in the same direction, usually toward a gently sloping shore.

Karlstrom (1962) reported that male *B. canorus* were in a highly excited state during the height of their chorus at midday and early afternoon. Competition for the few females was intense. *B. b. boreas* males in Montana were also in a highly excited state during the day; however, breeding activity all but ceased at night. There was also intense competition among males for the females, and this was probably the cause of toads in amplexus being hidden and secretive during the day when the height of the male breeding activity existed. Any movement on the shore or at the edge of the water stimulated all males to move toward it, and attempts to clasp other males or dislodge a male in amplexus with a female were common.

Males of the *B. boreas* group lack an enlarged resonating vocal pouch; therefore, the voice is weakly developed. The call of *B. boreas* is a soft chuckle or a birdlike chirp according to Pickwell (1947), Wright and Wright (1949), and Stebbins (1951). Baxter (1952) described the call of *B. boreas* in southeastern Wyoming as a short chirp, repeated at regular intervals. Notes from individual toads were similar to the warning chirps uttered by the male when clasped, jostled by other toads or when handled. Karlstrom (1962) described the weakly developed call of *B. boreas* as consisting of short chirps, five to ten rapidly developed notes in a series. Mullally (1956) reported that male *B. boreas* vocalized only when other males grasped them as if to assume the position of amplexus. Most authors imply that separate and untouched males do not call or form breeding congresses.

Calls of male *B. b. boreas* at the Hamilton and Victor breeding ponds were recorded during 1967. Audiospectograms of these were made in 1969 by Dr. Kenneth R. Porter, University of Denver. He reported that the calls recorded were "protest" or "release" calls which had been described by Karlstrom (1962). Porter suggested that these calls should not be confused with true mating calls and that their function in attracting other males and/or females is doubtful, but should be tested.

In Montana such calls were most frequently emitted by males when they were clasped by another male and hence were true "release" or "protest" calls. However, at the breeding ponds along the Clark Fork River and at the Victor and Hamilton sites, calls were

being given by single males in an excited state which were not being amplexed by other males. These calls could be heard one-fourth mile away. Recorded protest calls also attracted other males. These observations in Montana indicate that slow chirps uttered by males when clasped or by individual males do serve as an attractant for other males and probably also for attracting females to the breeding sites and the waiting males.

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