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The Status of Three Uncommon Salamanders (Amphibia: Caudata) in Iowa

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The smallmouth salamander [*Ambystoma texanum* (Matthes)], blue-spotted salamander (*Ambystoma laterale* Hallowell), and central newt [*Notopthalmus viridescens louisianensis* (Wolterstorff)] were studied in Iowa from fall 1982 through summer 1984. All three species have declined in abundance in Iowa. *A. texanum* is more abundant and widespread than was previously suspected, but is declining due to habitat destruction. Apparently, only two populations of *A. laterale* remain in Iowa. *N. v. louisianensis* has also declined due to habitat destruction, with only three populations known. All three species require ponds in or adjacent to forest. *A. texanum* was found primarily in riparian forest. The other two species inhabited both riparian and upland forest. *N. v. louisianensis* was associated with permanent ponds containing aquatic vegetation.

INDEX DESCRIPTORS: *Ambystoma texanum*, *Ambystoma laterale*, *Notopthalmus viridescens*, Iowa, distribution, habitat

Three amphibian species, the blue-spotted salamander (*Ambystoma laterale* Hallowell), smallmouth salamander [*Ambystoma texanum* (Matthes)], and central newt [*Notopthalmus viridescens louisianensis* (Wolterstorff)] occur in Iowa (Menzel and Goellner 1976, Bailey 1943, Miller 1951). Although Conant (1975) shows the ranges of the latter two species to be large in Iowa, more specific reports suggest that these species are declining (Roosa 1977, Christiansen 1981). The blue-spotted salamander was known from only two localities and is listed as endangered (Christiansen 1981).

A survey of museum records for ecological data associated with specimens of the three species housed in the University of Michigan Museum of Zoology, the Iowa State University Collection and the Drake University Research Collection (DURC) indicates that certain similarities exist among the habitats of these salamanders. This study was undertaken to determine the distributional limits of these species in Iowa, to delineate what habitat differences exist between them and to reassess their status.

MATERIALS AND METHODS

Previous collection data, county highway maps, topographic maps, and soil maps were used as aids in finding potential collecting sites. Most specimens were collected by trapping with drift fences, screen wire funnel traps placed in ponds, seines, dip nets, or by searching under logs and rocks in appropriate habitat. Field collected eggs were kept until hatching so that larvae could be identified. Larvae at various stages of development and at transformation were preserved in 10% formalin.

RESULTS AND DISCUSSION

Ambystoma texanum — This species was found in suitable habitat across the southern four tiers of counties in eastern Iowa and two tiers in western Iowa (Fig. 1). Salamanders were found farthest north along the Des Moines, Iowa, and Cedar Rivers in Marion, Johnson, and Muscatine Counties, respectively. This study found *A. texanum* in 23

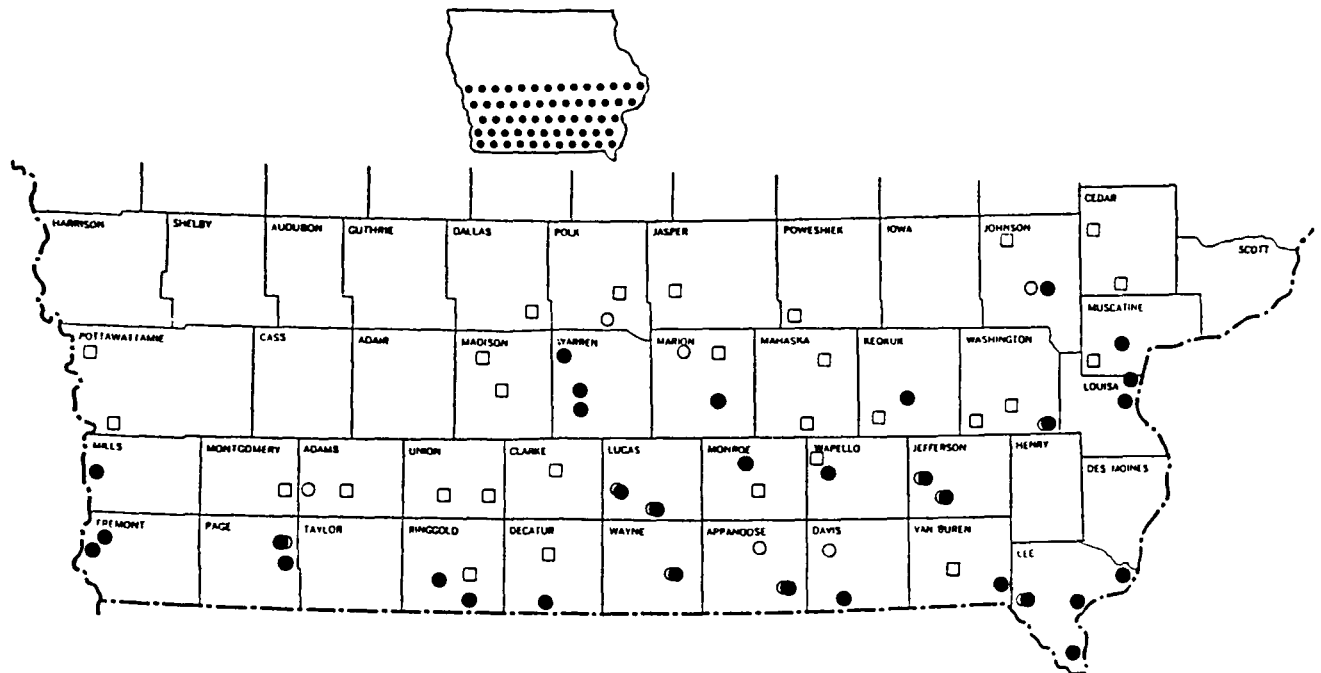


Fig. 1. The distribution of *Ambystoma texanum* in Iowa. Open circles indicate records older than ten years. Open squares indicate localities sampled where no *A. texanum* were found.

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previously unknown localities and discovered that they still occur at 10 of 14 localities established prior to 1969. One of the 14 was not resampled and three that were yielded no *A. texanum*. Suitable habitat existed at one of these localities.

Proximity of woodland to the semipermanent water in which *A. texanum* bred was important (Table 1). While estimates of distance to permanent flowing water were available for all breeding sites, estimates of distance to woodland were lacking for three. Nineteen of 29 (65%) breeding pools were natural and ephemeral. Twenty-six of 29 (89.7%) were in or within 850 m of permanent water. Twenty-five of 26 (96%) were within 850 m of woodland. Bailey (1943) and McWilliams and Bachmann (1988) found *A. texanum* breeding in the same habitat. This species has been found in riparian habitats elsewhere (Anderson 1942, Barbour 1971, Bonn and McCarley 1953, Bragg 1949, Cagle 1942, Mount 1975, Peters 1942, Walker 1963). At only one locality in Iowa was *A. texanum* found in prairie habitat. Five larvae were collected in an artificial pond surrounded by prairie in Ringgold Co. on 5 June 1984. On 8 June an adult was found dead on a road <1 km south of the pond. This species occurs in prairie in Illinois (Smith 1961). Features characteristic of *A. texanum* habitats were lowland forest and vernal ponds. Floodplain tree species like black willow (*Salix nigra*) were good indicator species of *A. texanum* habitat.

Since *A. texanum* was found in 10 of 14 previously established localities and in 23 new localities, it was not as uncommon as previously thought. It was evident from the degree of isolation of most populations that there had been no recent range expansion in Iowa. This is due to habitat destruction. Iowa's forest land has been reduced from 19% at the time of settlement to only 4% currently (see Fig. 1 in Thomson and Hertel 1981).

Ambystoma texanum probably invaded Iowa from the south following the northward advance of floodplain forests along major rivers and spread through the smaller tributaries where suitable forests and breeding habitat existed. Thomson and Hertel (1981) discussed the northward advance of forest into Iowa. This may have occurred since the xerothermal period 5000 to 7000 years ago. If so, smallmouth salamanders might eventually be found farther north along Cedar, North and South Skunk, and Raccoon River drainages in Cedar, Poweshiek, and Dallas Cos., respectively. However, surveys conducted along these rivers in Jasper, Poweshiek, and Dallas Cos. yielded no salamanders (Fig. 1). Perhaps this species has not had sufficient time to spread northward.

Table 1. Relationship of breeding sites of *Ambystoma texanum* to permanent rivers, creeks, and woodland.

Breeding Sites	Frequency		River/Creek Distance(M)		Woodland Distance(M)	
	No.	(%)	<850M ^a	>850M	<850M	>850M
Oxbow or Swamp	19	(65.5)	17	2	18	0
Roadside Ditch	7	(24.1)	7	0	5	1
Artificial Pond	2	(6.9)	2	0	1	0
Quarry	1	(3.5)	0	1	1	0
Total %	29	(100)	26 (89.7%)	3 (10.3%)	25 (96%)	1 (4%)

^aThis distance was chosen arbitrarily, but seems reasonable in light of the absence of information on migration distances.

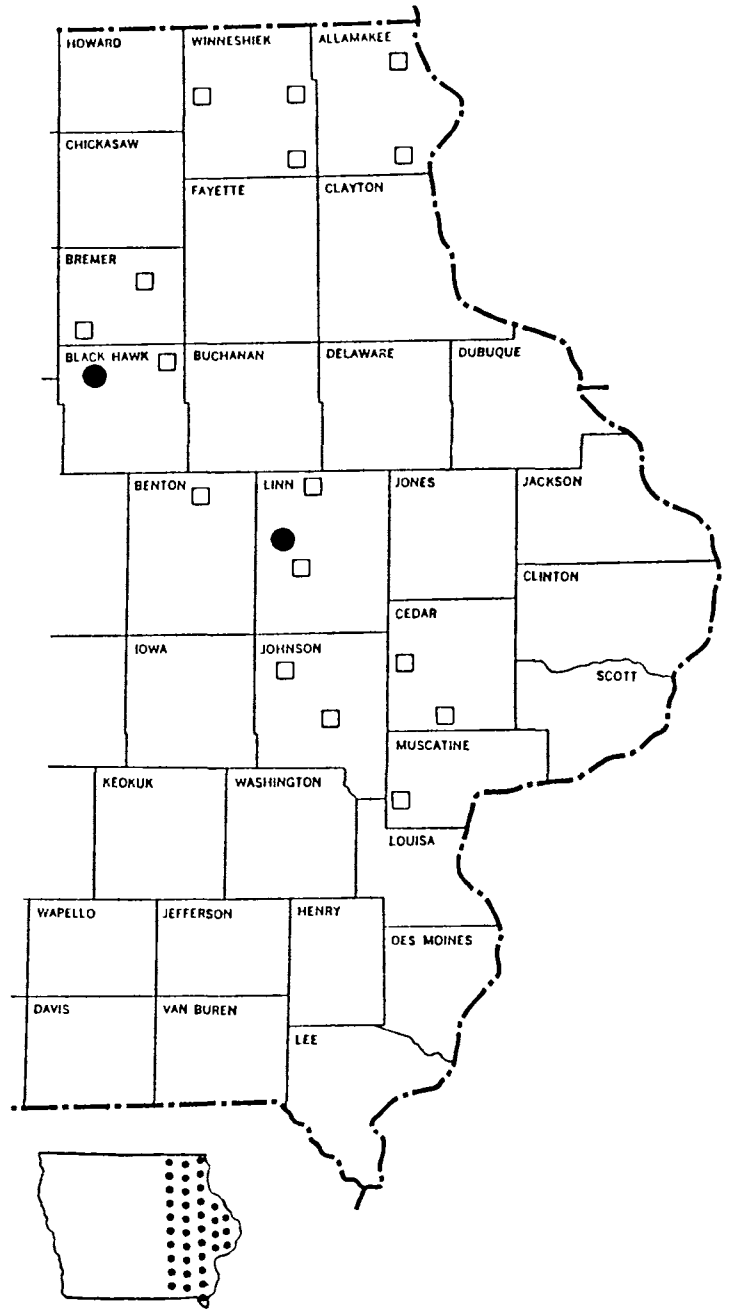


Fig. 2. The distribution of *Ambystoma laterale* in Iowa. Open squares indicate localities that were sampled where no *A. laterale* were found.

Ambystoma laterale — Extensive sampling for this species in eastern Iowa did not reveal any more populations. However, specimens were collected (and released) in both the Black Hawk and Linn Co. localities reported by Menzel and Goellner (1976), see Fig. 2. Seemingly suitable habitat was found along the Cedar River in Benton, Bremer, Cedar, and Muscatine Cos. as well as along the Wapsipicon River in Black Hawk, Linn, and Clinton Counties. The range of this species appears to be restricted to the Cedar River drainage and is isolated from the closest known populations in southwestern Wisconsin (Vogt 1981).

Blue-spotted salamanders were found in one open and four wood-

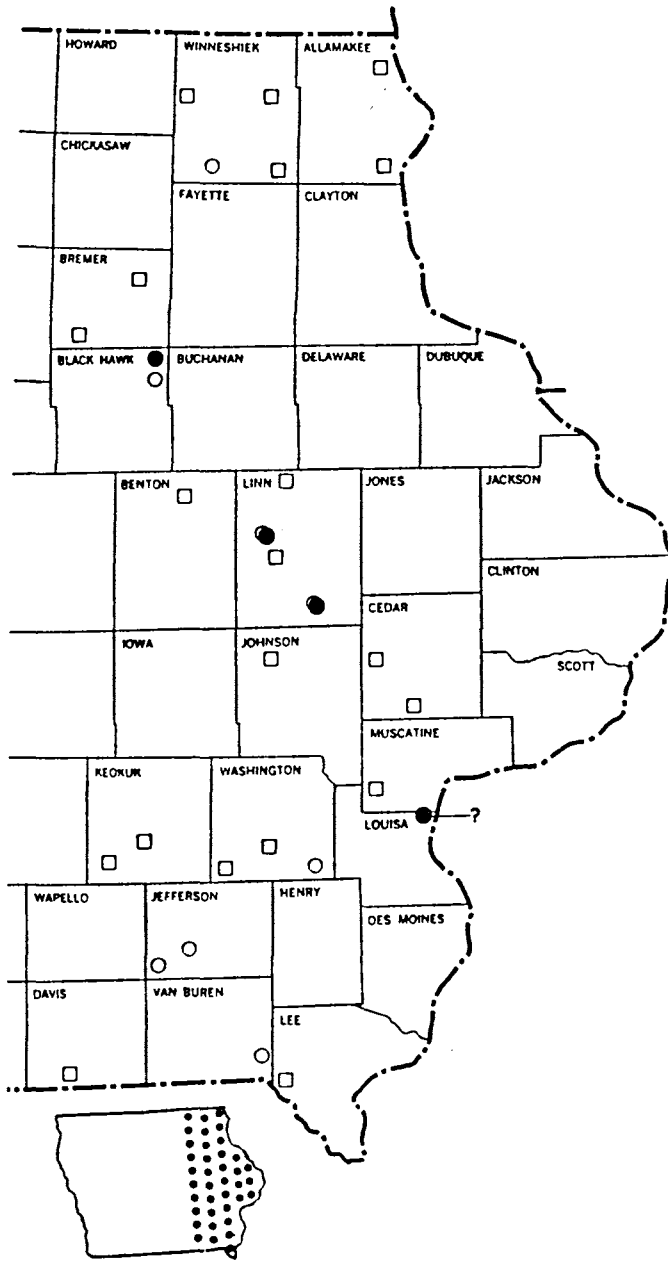


Fig. 3. The distribution of *Notophthalmus viridescens* in Iowa. Open circles indicate records older than ten years. Open squares indicate localities that were sampled where no *N. viridescens* were found.

land ponds in Linn and Black Hawk Counties. The three Linn Co. ponds, known as Behrens Ponds, are presently owned and protected by the Iowa chapter of the Nature Conservancy. One pond was surrounded by open fields, one by brushy oak savanna, and one by mature hardwood forest. All ponds were close to mature upland deciduous forest. Menzel and Goellner (1976) also described the area. All ponds dried during drought years. From 14-30 March 1983 *A. laterale* was found eight times. Salamander species which may compete with *A. laterale* were *N. viridescens*, which was caught six times and tiger salamanders (*Ambystoma tigrinum*), which were caught 34 times in the same ponds during the same time period.

The two Black Hawk Co. ponds were located in forest, in the 455 acre George Wyth Memorial State Park along the Cedar River

adjacent to the Cedar Falls-Waterloo metropolitan area. One pond yielded two *A. laterale* in funnel traps on 4 April 1984 and the other yielded 11 in funnel traps on 7 April 1984.

Ambystoma laterale breeding sites were ponds in or close to mature deciduous forest in Iowa. This has a significant effect on its distribution in the state. Ponds in both areas were in or close to open fields. This has been reported elsewhere for *A. laterale* (Anderson and Giacosis 1967, Minton 1954, Weller et al. 1978).

Blue-spotted salamanders were clearly the least abundant and least widespread of the salamanders studied. Beyond the two localities reported by Menzel and Goellner (1976), this species was not found despite searching in seemingly ideal nearby habitats (Fig. 2). Vegetation changes may have caused some areas to become forested that were not originally suitable *A. laterale* habitat. Failure to locate *A. laterale* reaffirmed the rare and endangered status of this species in Iowa. The discovery of two disjunct populations of *A. laterale* about 47 km apart in the Cedar River valley indicated that these may be relicts of a larger population that existed there prior to the xerothermal period. Menzel and Goellner (1976) postulated that Iowa *A. laterale* are relicts from Wisconsin glacial times.

Notophthalmus viridescens louisianensis — Extensive sampling for newts in eastern Iowa resulted in the discovery of only one previously unknown population in Black Hawk County. Sampling at old localities in Black Hawk, Jefferson, Louisa, Van Buren, Washington, and Winnesheik Cos. failed to yield specimens even though suitable habitat with ample woodland was present (Fig. 3). Iowa's newt populations have drastically declined and are clearly in danger of extinction. Tiger salamanders, whose larvae prey on newt larvae (Morin 1983) were found at both Linn Co. sites. Bullfrogs (*Rana catesbeiana*), which prey on adult newts and efts (Hurlbert 1970), were found at the Black Hawk Co. locality and many old localities where newts appeared absent. Behrens and Troy Ponds lacked bullfrogs and fish. The Louisa Co. record is based on a partially decomposed specimen of questionable identity.

Troy pond is adjacent to the entrance of Palisades Kepler State Park approximately 9.6 km east-southeast of Cedar Rapids, Linn Co., along the Cedar River. It is an ephemeral upland pond of less than one acre. Newts were collected 30 times from 30 March to 15 April at Troy Pond. The first efts and terrestrial adults were obtained here on 21 October 1983 when the pond was dry.

The Black Hawk Co. population was discovered by Dr. R.W. Howe, and utilized at least three ponds in mature bottomland forest along the Wapsipinicon River adjacent to Bruggeman County Park. The ponds were surrounded by forest and appeared fairly deep and permanent. Five newts were collected there in funnel traps on 7 April 1984. All had granular skin characteristic of terrestrial adults.

All newt ponds were adjacent to or surrounded by mature hardwood forest. Submergent macrophytes were found in all ponds inhabited by newts except Troy Pond which contained many emergent forms. This appears typical (Ashton 1976, Bellis 1968, Brophy 1980, Gates and Thompson 1982). Newts inhabited more permanent ponds than those utilized by *Ambystoma*.

The western edge of the range of *N. viridescens* roughly coincides with that of the eastern deciduous forest biome (Odum 1983). The central newt reaches the western edge of its range in Iowa (Mecham 1967) and was probably restricted to the eastern forested portions of the state. The disjunct populations presently known indicate that newts may have been more abundant in eastern Iowa at one time (Fig. 3). The decline in abundance indicated by sampling of Bailey's 1939-1946 localities appear due to habitat destruction as shown by Thomson and Hertel (1981).

Precipitation and available water may be the most important factor limiting the distribution of amphibians. *Ambystoma texanum* seems to be limited in the west by the 30 inch precipitation line as shown by Olson (1970). Precipitation may limit the ranges of *A. laterale* and *N.*

viridescens indirectly, by limiting suitable habitat. If Iowa served as a refugium for *A. laterale* during Wisconsin glaciation (Menzel and Goellner 1976), this species was probably present in Iowa during the xerothermal period. The low precipitation levels at that time may have been responsible for eliminating most *A. laterale* populations in Iowa. *N. viridescens* probably invaded Iowa following the xerothermal period when eastern forests began advancing westward.

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