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The Early History and Recent Trends in Iowa Herpetology¹

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Herpetological exploration of Iowa began in 1823 with Long's expedition to the Rocky Mountains. From that time until an 1892 publication by Osborn based on Iowa specimens, herpetological research in the state was minor and incidental. Several significant reports appeared after that date involving analysis of Iowa specimens and from 1938 to 1944 a major base-line collection of the amphibians and reptiles of Iowa was established. Studies after that time have added a few species to Iowa's known herpetofauna but recently have concentrated not only on composition of the fauna and distribution, but emphasized population changes, ecological relationships, and better understanding of life histories.

INDEX DESCRIPTORS: History of Amphibians and Reptiles of Iowa, History of Herpetology of Iowa, History of Zoological Research in Iowa, History of Iowa's Natural History.

Exploratory expeditions and natural history surveys into the western parts of the United States during the nineteenth century began the building of our knowledge of the herpetology of the region. Most explorers gained access to the Great Plains area via the Missouri River valley and thus detoured Iowa, touching only its western border. Apparently the earliest reference to the herpetology of the state is by Thomas Say in 1823, reporting in Long's Expedition to the Rocky Mountains, Vol. I, in which he described four serpents, now known as *Elaphe obsoleta*, the black rat snake, *Thamnophis proximus*, the western ribbon snake, *Thamnophis sirtalis parietalis*, the redbelted garter snake, and *Coluber constrictor flaviventris*, the eastern yellowbelly racer. The rat snake was taken between Isle du Vache and Council Bluffs and the other three were collected from a stone quarry on the west side of the Missouri River, actually in Nebraska across from Pottawattamie County, Iowa. The precise locality, known later as Engineer Cantonment, or Council Bluff, was adjacent to the site of a council of Lewis and Clark with the Otoe and Missouri Indians on 3 August 1804. It lies on the Nebraska shore above the mouth of the Boyer River (Iowa) at a distance of more than 20 miles north of the present Council Bluffs, Iowa. The history and documentation for this locality have been detailed by Shimek (1912). In the journals of Prince Maximilian von Weid recording observations made on a trip up the Missouri River in 1833 and republished by Orr and Porter, eds. (1983), observations were made of *Crotalus tergeminus* from the Iowa side of the Missouri River somewhere between Missouri and the locality then known as Council Bluffs. They also reported this snake near "Council Bluffs." It is probable that both of these refer to massasaugas, now a very rare snake in Iowa. Weid reported seeing blue racers and what was probably a bullsnake from this part of the river as well. Apparently, the first published amphibian record for the state was the original description of *Amblystoma obscurum* Baird (in Cope 1867: 192), since placed in the synonymy of *Amblystoma t. tigrinum*, the eastern tiger salamander.

As the settling of Iowa began, little attention was paid to the abundant amphibians and reptiles. The emphasis was on clearing forests, draining marshes, establishing farms and cities, and building roads. Edward Drinker Cope (1875), for whom the journal *Copeia* is named, produced a checklist which included both amphibians and reptiles from the state. In 1889, his monograph on batrachians (amphibians) listing five species, and in 1900 on reptiles, exclusive of the turtles, including 10 species, reflected the relative dearth of

herpetological activity prior to the twentieth century. No other significant reference appeared until after 1890.

The first attempt at a comprehensive work based on specimens in an Iowa research collection and concerned specifically with the amphibians and reptiles of Iowa, was prepared by Iowa State zoologist Herbert Osborn (1892). After elimination of a few obvious misidentifications and errors, Osborn's list includes 16 valid species of snakes, two lizards, six turtles, two salamanders, and six frogs, a total of 32, or nearly half the number now recognized for the state. The same year, C.C. Nutting (1892) added four species to the list. In 1891, Call described a purportedly new serpent from Iowa, *Tropidoclonion lineatum lowae*, but it has since been placed in synonymy.

The year 1908 marked the start of an upwelling of interest in the herpetofauna of Iowa. Probably the first and most celebrated Iowa herpetologist was Alexander Grant Ruthven. Appropriately a native of Ruthven, Iowa, Dr. Ruthven spent most of his student days and professional career at the University of Michigan where he was largely instrumental in the development and growth of the University Museums and subsequently served from 1929 to 1951 as president of the university. Early in this century he was interested in the interplay of the fauna of the eastern woodlands and western prairies and plains. He was impressed with the importance of comprehensive lists of local faunas, and was responsible for such contributions for Clay, Dickinson, Palo Alto, Poweshiek, and Woodbury counties (Ruthven, 1910, 1912a, 1919). Ruthven's (1908) classic study of garter snakes included material for three Iowa serpents. He described a new salamander, *Amblystoma stejnegeri* from Iowa (Ruthven 1912b) that was later determined to be *A. macrodactylum*, a species of the northwestern states and Canada. It seems likely that the Davis County specimens on which it was based were introduced with logs shipped by rail from the west. In 1911 M.P. Somes published "Notes on Some Iowa Reptiles," an uncritical compiled list with a partial key.

One of the country's most conscientious workers in herpetology was a student of Ruthven's, Frank N. Blanchard, who later became a distinguished professor at the University of Michigan. Blanchard (1921, 1942) published revisions of the kingsnakes (*Lampropeltis*) and ringneck snakes (*Diadophis*) which made reference to Iowa specimens. In addition, Blanchard (1923) also summarized the herpetofauna of Iowa's "great lakes region."

During the twenties and early thirties J.E. Guthrie, a professor at Iowa State College, produced several works dealing with the herpetofauna of Iowa. "The Snakes of Iowa" (Guthrie, 1926) was a landmark contribution to the knowledge of the herpetofauna of the state and compiled most of the information known at the time about 26 of Iowa's

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snake species. It included some information on the natural history of the species, was well illustrated, and contained the first useful key to the snakes of Iowa, but it provided scanty information about where in Iowa the snakes existed. Guthrie's collection emphasized central Iowa and included a few additional forms living in the eastern and southern parts of the state. Later, Guthrie (1929) added the earth snake (*Virginia valeriae elegans*) from Lee County to the faunal list and recorded color dimorphism in the crayfish snake (*Regina grahami*) (1930).

Other early contributions were made to the herpetology of Iowa between 1929 and 1944. Charles E. Burt published several papers on species or regions overlapping Iowa (Burt 1931, 1932, 1935, and Burt et al, 1934). Edward H. Taylor (1935) examined skinks from Iowa in preparation of his monograph of the genus *Eumeces*. Lawrence Klauber (1936, 1938) began generating information as a forerunner to his monumental work on rattlesnakes as did Howard K. Gloyd (1940). Archie Carr (1938), a leading scholar dedicated to the study of turtles, examined turtles from Iowa. Stull (1940) studied *Pituophis* (bullsnakes). One local worker, Hendrickson (1930), mentioned several herps in his "Notes on Vertebrates of Iowa Prairies," and Scott (1938) called attention to amphibians and reptiles killed on Iowa highways. The brown snakes (*Storeria*) were reviewed by Trapido (1944). The above studies included Iowa specimens.

In 1938, one of us (RMB) joined the staff of the Department of Zoology and Entomology at Iowa State College and initiated a survey of the amphibians and reptiles of Iowa that continued until he left the state in 1944. Collecting activities were pursued with greater or lesser intensity in all 99 counties. In addition to traditional collecting procedures, careful attention was paid to highway mortality of amphibians and reptiles. This effort was enhanced by cooperation of several staff colleagues at Iowa State who, in their travels about the state collected specimens and recorded locality data. In comparing our records, we are impressed by a dramatic reduction in frequency of road kills from the early 1940s to the 1970-1992 period studied by Christiansen (unpublished data). It seems evident that the ongoing mortality of some species, especially large snakes that commonly cross major highways, has reduced populations adjacent to these roads. How important this has been in overall population reduction is unknown but the continuing toll to traffic is clearly one of many causes of decline in Iowa's populations of amphibians and reptiles.

About two dozen species were added to the state herpetofaunal list from 1938 to the present. See Bailey (1939, 1941a, 1941b, 1943); Bailey and Bailey (1941), who also discovered a probable intergeneric hybrid rattlesnake (Bailey 1942), made observations on winter mortality of brown snakes (Bailey 1948), and studied winter temperature tolerance of garter snakes (Bailey 1949). Other contributions came from Klimstra (1948, 1950a, 1950b); Dodge (1950); Miller (1951); Dodge and Miller (1955); Timken (1968); Huggins (1971); Meacham et al (1973); and Menzel and Goellner (1976). Alligator snapping turtles have been reported from Illinois near Iowa by Schroder (1957) and Blanchard and Princen (1976).

Several popular works have contributed to knowledge of the Iowa herpetofauna. Iowa's frogs and toads were discussed in volumes 3 and 4 of the Iowa Conservationist and a reprint of these articles was issued separately (Bailey 1944). The entire herpetofauna was reviewed in the Iowa Conservationist in 1950 and 1951 in a series of 14 articles beginning with Volume 9, No. 4 and continuing through Volume 10, No. 5, authored variably by K.D. Carlander and R.B. Moorman (or Moorman and Carlander). A valuable source work for Iowa herpetology is the Field Guide to Reptiles and Amphibians of Eastern and Central North America, now in its third edition (1991) published by Houghton Mifflin Company. The first two editions were authored by Roger Conant; the third by R. Conant and Joseph T. Collins. The largely unpublished distributional data assembled by us for our planned general treatment of the Iowa herpetofauna were made available for use in the preparation of the maps in the above field guides.

The emphasis in Iowa herpetology since the arrival of the other author of this paper (JLC) at Drake University in 1969, has been filling in gaps in the distributional knowledge of the state's less known species, especially the turtles and the more subterranean snakes. This has involved extensive aquatic trapping and hand collecting concentrated in the remnants of Iowa's undamaged habitats. By 1991, the work had generated 26 publications concerning the distribution, reproduction, and parasitology of Iowa's amphibians and reptiles. Among these are several studies of reproduction of turtles in Iowa, for example, Christiansen and Burken (1979), Williams and Christiansen (1981), Christiansen and Gallaway (1984), examination of population trends, Christiansen (1981), and studies of distribution within the state, Christiansen and Mabry (1985) and Christiansen, Gallaway, and Bickham (1990).

As a result of the preceding studies, the composition of the Iowa herpetofauna is probably almost if not completely known, and our still only partially published distributional data give a good estimate of geographical patterns for most species. Meanwhile, an increasing number of workers are adding in-depth information about the life activities, behavioral patterns, population dynamics, physiology, growth, and economic role of herps in the overall scheme of life. Such in-depth studies promise to expand our general understanding of Iowa amphibians and reptiles. Among these efforts, we mention Goldsmith (1945), Bovbjerg and Bovbjerg (1964), Platt (1975), Roosa (1977), Lannoo and Bachmann (1984), McWilliams and Bachmann (1984, 1988), Camper (1988, 1990), Lannoo et al (1990), and Mabry and Christiansen (1991).

The broadening interest in Iowa wildlife including amphibians and reptiles is reflected in the listing of threatened and endangered species by the Iowa Department of Natural Resources (DNR), their continual updating of the list, their funding of research on these animals, and their maintenance of a computerized file of locality records for protected species. In addition, the Iowa DNR has initiated an annual spring frog census in which recordings of frog calls are sent to interested parties who then report calls they have heard on their surveys. The increased concern of the general public with Iowa's amphibians and reptiles is further shown by the addition of courses in herpetology at several institutions, and by the formation of the Iowa Herpetological Society, an organization composed primarily of people interested in promoting education, conservation, and propagation of amphibians and reptiles.

Today, the herpetofauna of Iowa consists of at least 66 species, four of which include two well-defined subspecies within the state. These have recently been listed, illustrated, briefly described, and discussed in a series of publications by the Iowa Department of Natural Resources (Christiansen and Bailey, 1988, 1990, 1991). Included are five species of salamanders, 16 species (17 races) of frogs and toads, five lizards, 13 turtles, and 27 species (30 races) of snakes, four of which are venomous.

With the approach of the last seven years of the century, the focus will be on comparing Bailey's base line data with recent collections to illuminate trends in distribution that have developed in the last 55 years. Much of this will appear in a comprehensive account of Iowa's amphibians and reptiles now in preparation by the authors of this paper. It is hoped that by the year 2,000 this will contribute to a much larger work, now being initiated, that will provide succeeding generations a fairly complete report on the status of all the vertebrates and higher plants in the state.

REFERENCES

- BAILEY, R.M. 1939. *Carphobphis amoena vermis* and *Lampropeltis calligaster* in Iowa. Copeia (4):218-220.
 _____, 1941a. The northern copperhead in Iowa. Iowa State College Jour. Sci. 15(1):1-2.

- _____, 1941b. The occurrence of the wood turtle in Iowa. *Copeia* (4):265.
- _____, 1942. An intergeneric hybrid rattlesnake. *Amer. Nat.* 76:376-385.
- _____, 1943. Four species new to the Iowa herpetofauna, with notes on their natural histories. *Proc. Iowa Acad. Sci.* 50:347-352.
- _____, 1944. Iowa's frogs and toads. *Iowa Conservationist*. Part I, 3(3):17-20. Part II, 3(4):25-30. Reprinted with one additional map, pp. 1-20.
- _____, 1948. Winter mortality in the snake *Storeria dekayi*. *Copeia* (3):215.
- _____, 1949. Temperature toleration of gartersnakes in hibernation. *Ecology* 30(2):238-242.
- _____, and M.K. BAILEY. 1941. The distribution of Iowa toads. *Iowa State Coll. Jour. Sci.* 15(2):169-177.
- BLANCHARD, F.N. 1921. A revision of the king snakes: genus *Lampropeltis*. U.S. Natl. Mus. Bull. 114:v+260.
- _____, 1923. The amphibians and reptiles of Dickinson County, Iowa. *Iowa Univ. Iowa Studies Nat. Hist.* 10(2):19-26.
- _____, 1942. The ring-neck snakes, genus *Diadophis*. *Bull. Chicago Acad. Sci.* 7(1):1-144.
- BLANCHARD, S.E., and L.H. PRINCEN. 1976. Survey on the occurrence of reptiles and amphibians in central Illinois. *Proc. Peoria Acad. Sci.* 9:29-35.
- BOVBJERG, R.V., and A.M. BOVBJERG. 1964. Summer emigrations of the frog *Rana pipiens* in northwestern Iowa. *Proc. Iowa Acad. Sci.* 71:511-518.
- BURT, C.E. 1931. A study of the teiid lizards of the genus *Cnemidophorus* with special reference to their phylogenetic relationships. U.S. Natl. Mus., Bull. 154:viii+286.
- _____, 1932. Records of amphibians from the eastern and central United States (1931). *Amer. Midl. Nat.* 13(2):75-85.
- _____, 1935. Further records of the ecology and distribution of amphibians and reptiles in the middle west. *Amer. Midl. Nat.* 16(3):311-336.
- _____, and W.L. HOYLE. 1934. Additional records of the reptiles of the central prairie region of the United States. *Trans. Kansas Acad. Sci.* 37:193-216.
- CALL, R.E. 1891. On a new serpent from Iowa. *Amer. Jour. Sci.* 41:297-299.
- CAMPER, J.D. 1988. The status of three uncommon salamanders (Amphibia: Caudata) in Iowa. *Jour. Iowa Acad. Sci.* 95:127-130.
- _____, 1990. Mode of reproduction in the smallmouth salamander, *Ambystoma texanum* (Ambystomatidae) in Iowa. *Southwestern Nat.* 35:127-130.
- CARLANDER, K.D., and R.B. MOORMAN. 1950. Pigmy singers of the ponds. *Iowa Conservationist* 9(4):25,30.
- CARR, A. 1938. Notes on the *Pseudemys scripta* complex. *Herpetologica* 1(5):131-135.
- CHRISTIANSEN, J.L. 1981. Population trends among Iowa's amphibians and reptiles. *Proc. Iowa Acad. Sci.* 88(1):24-27.
- _____, and R.M. BAILEY. 1988. The lizards and turtles of Iowa. *Iowa Dept. Nat. Res., Spec. Publ.* 2:1-19.
- _____, and _____ 1990. The snakes of Iowa (second edition). *Iowa Dept. Nat. Res., Nongame Tech. Ser.* (1):1-16.
- _____, and _____ 1991. The salamanders and frogs of Iowa. *Iowa Dept. Nat. Res., Nongame Tech. Ser.* (3):1-24.
- _____, and R.R. BURKEN. 1979. Growth and maturity of the snapping turtle (*Chelydra serpentina*) in Iowa. *Herpetologica* 35(3):261-266.
- _____, and B.J. GALLAWAY. 1984. Raccoon removal, nesting success, and hatchlings of Iowa turtles with special reference to *Kinosternon flavescens*. *Southwestern Nat.* 29(3):343-348.
- _____, B.J. GALLAWAY, and J.W. BICKHAM. 1990. Population estimates and geographic distribution of the yellow mud turtle (*Kinosternon flavescens*) in Iowa. *Jour. Iowa Acad. Sci.* 97(3):105-108.
- _____, and C.M. MABRY. 1985. The amphibians and reptiles of Iowa's loess hills. *Proc. Iowa Acad. Sci.* 92(5):159-163.
- CONANT, R., and J.T. COLLINS. 1991. A field guide to reptiles and amphibians of Eastern and Central North America. Houghton Mifflin Co. xviii+450pp.
- COPE, E.D. 1867. A review of the species of the Amblystomidae. *Proc. Acad. Nat. Sci. Philadelphia* 19:166-211.
- _____, 1875. Check-list of North American Batrachia and Reptilia. U.S. Natl. Mus. Bull. 1:1-104.
- _____, 1889. The Batrachia of North America. U.S. Natl. Mus. Bull. 34:1-525.
- _____, 1900. The crocodylians, lizards, and snakes of North America. Report U.S. Natl. Mus. (1898):153-1270.
- DODGE, C.H. 1956. The musk turtle in Iowa. *Herpetologica* 12:176.
- _____, and L.S. MILLER. 1955. The yellow mud turtle, *Kinosternon flavescens spooneri* Smith, in Iowa. *Nat. Hist. Miscellanea* (Chicago Acad. Sci.) no. 144:1-3.
- GLOYD, H.K. 1940. The rattlesnakes, genera *Sistrurus* and *Crotalus*. A study in zoogeography and evolution. Chicago Acad. Sci. Spec. Publ. 4:vi+270pp.
- GOLDSMITH, W.M. 1945. Notes on the egg laying habits of the soft shell turtles. *Proc. Iowa Acad. Sci.* 51:447-449.
- GUTHRIE, J.E. 1926. The snakes of Iowa. *Agr. Exp. Sta., Iowa State Coll. Agr. Mech. Arts. Bull.* 239:147-192.
- _____, 1930. A color-mutation in Graham's watersnake. *Jour. Heredity* 21(5):237-240.
- HENDRICKSON, G.O. 1930. Notes on vertebrates of Iowa's prairies. *Proc. Iowa Acad. Sci.* 37:398-399.
- HUGGINS, D.G. 1971. *Scaphiopus bombifrons* Cope, a species new to Iowa. *Jour. Herpetology* 5:216.
- KLAUBER, L. 1936. A key to the rattlesnakes with summary of characteristics. *Trans. San Diego Soc. Nat. Hist.* 8(20):185-276.
- _____, 1938. Notes from a herpetological diary, I. *Copeia* (4):191-197.
- KLIMSTRA, W.D. 1948. An Iowa record of the keeled green snake. *Copeia* (2):138.
- _____, 1950a. Notes on some amphibians and reptiles from Davis County, Iowa. *Iowa State Coll. Jour. Sci.* 24(4):429-431.
- _____, 1950b. Narrow-mouthed toad taken in Iowa. *Copeia* (1):60.
- LANNOO, M.J., and M.D. BACHMANN. 1984. Aspects of cannibalistic morphs in a population of *Ambystoma t. tigrinum* larvae. *Amer. Midl. Nat.* 112:103-109.
- _____, M.P. SWEET, N.M. LADEHOF, E.S. EANGMAN, and W.B. COLLINS. 1990. Time to metamorphosis as a function of larval size in a population of *Ambystoma tigrinum* salamanders consisting of cannibal and typical morph phenotypes. *Jour. Iowa Acad. Sci.* 97(4):121-126.
- MABRY, C.M., and J.L. CHRISTIANSEN. 1991. The activity and breeding cycle of *Scaphiopus bombifrons* in Iowa. *Jour. Herpetology* 25:116-119.
- MCWILLIAMS, S.R., and M.D. BACHMANN. 1984. Aspects of cannibalistic morphs in a population of *Ambystoma t. tigrinum* larvae. *Amer. Midl. Nat.* 112:103-109.
- _____, and _____ 1988. Using life history and ecology as tools to manage a threatened salamander species. *Jour. Iowa Acad. Sci.* 95:66-71.
- MECHAM, J.S., M.J. LITTLEJOHN, R.S. OLDHAM, L.E. BROWN, and J.R. BROWN. 1973. A new species of leopard frog (*Rana pipiens* complex) from the plains of the central United States. *Occ. Papers Mus. Texas Tech. Univ. No.* 18:1-11.
- MENZEL, B.W., and K.E. GOELLNER. 1976. Occurrence of the blue-spotted salamander, *Ambystoma laterale*, in Iowa. *Proc. Iowa Acad. Sci.* 82(3-4):182-186.
- MILLER, L.S. 1951. The occurrence of the Louisiana newt in Iowa. *Copeia* (2):176.
- MOORMAN, R.B., and K.D. CARLANDER. 1951. Iowa's poisonous snakes. *Iowa Conservationist* 10(1):97, 103-104.
- NUTTING, C.C. 1892. Report of the Committee on State Fauna. *Proc. Iowa Acad. Sci.* 1(3):39-42.
- ORR, W.J., and J.C. PORTER (Eds.). 1983. A journey through the Nebraska region in 1833 and 1834: from the diaries of Prince Maximilian of Weid. *Nebraska History and Record of Pioneer Days. Nebraska St. Hist. Soc.* 84:325-354.
- OSBORN, H. 1892. A partial catalogue of the animals of Iowa, represented in the collections of the Department of Zoology and Entomology of the Iowa Agricultural College (1891) Ames: pp. 1-39.
- PLATT, W.S. 1975. The vertebrate fauna of the Cayler Prairie Preserve, Dickinson County, Iowa. *Proc. Iowa Acad. Sci.* 82:106-108.
- ROOSA, D.M. 1977. Endangered Iowa Amphibians and Reptiles. *Iowa Conservation Comm., State Preserves Board. Special Report No.* 2:1-23.

- RUTHVEN, A.G. 1908. Variations and genetic relationships of the garter-snakes. U.S. Natl. Mus. Bull. 61:xii-201.
- _____, 1910. Contributions to the herpetology of Iowa, Proc. Iowa Acad. Sci. 17:198-209.
- _____, 1912a. Contributions to the herpetology of Iowa, II. Proc. Iowa Acad. Sci. 19:207.
- _____, 1912b. Description of a new salamander from Iowa, Proc. U.S. Natl. Mus. 41(1874):517-519.
- _____, 1919. Contributions to the herpetology of Iowa, III. Occ. Papers Mus. Zool., Univ. Michigan No. 66:1-3.
- SCHRODER, R.C. 1957. Range extension of *Macrochelys temminckii* [sic]. *Copeia* (3):234.
- SCOTT, T.G. 1938. Wildlife mortality on Iowa highways. Amer. Midl. Nat. 20(3):527-539.
- SHIMEK, B. 1912. Early Iowa locality records. Proc. Iowa Acad. Sci. 19:253-257.
- SOMES, M.P. 1911. Notes on some Iowa reptiles. Proc. Iowa Acad. Sci. 18:149-154.
- STULL, O.G. 1940. Variations and relationships in the snakes of the genus *Pituophis*. U.S. Natl. Mus. Bull. 175:vi + 225pp.
- TAYLOR, E.H. 1935. A taxonomic study of the cosmopolitan scincoid lizards of the genus *Eumeces* with an account of the distribution and relationships of its species. Univ. Kansas Sci. Bull. 23:1-643.
- TIMKEN, R.L. 1968. *Graptemys pseudogeographica* in the upper Missouri River of the north central United States. Jour. Herpetology 1(1-4):76-82.
- TRAPIDO, H. 1944. The snakes of the genus *Storeria*. Amer. Midl. Nat. 31:1-84.
- WILLIAMS, T.A., and J.L. CHRISTIANSEN. 1981. The niches of two sympatric softshell turtles, *Trionyx muticus* and *T. spiniferus*, in Iowa. Jour. Herpetology 15(3):303-308.