

from a specimen collected in Kansas by Dr. Hammond, (Proceed. Phila. Acad. Nat. Sci., 1856, p. 246,) and afterward named as distinct by Prof. Cope (Proc. Ph. Ac. Nat. Sc., 1860, p. 77). Mr. Garman, of the Cambridge Museum of Comparative Zoology, "in his excellent account of the *Ophidia* of North America, "North American Reptiles, Part I," reduces it to a variety under *T. gracilis*. As it does not appear that any of the allusions to this species have been based upon more than one or two specimens, it seems necessary to await the accession of further material before the specific identity of *Hallowelli* with *gracilis* can be either asserted or denied.

***Sistrurus catenatus*, Raf. (Massasauga).**—Taken in Ford county by the writer. It is recorded from the Verdigris River [Kansas?] in Dr. Yarrow's Check-list.

This is the *Caudisoma tergemina* (erroneously printed "tergermina") of my Preliminary Catalogue. Mr. Garman's substitution of a fourth generic name in the stead of either of the three to which the plated-headed rattlesnakes had previously been referred, seems to have been the proper and indeed the only logical remedy for the confusion that existed, inasmuch as no new genus, nor even sub-genus, had previously been created for those forms, the generic names previously used for them being preoccupied and long used with a very different signification.

***Amblystoma microstoma*, Cope. (Small-mouthed Salamander).**—A specimen of this salamander occurs in Col. N. S. Goss' contribution. Its locality is, not quite certainly, but probably, Neosho Falls.

***Necturus maculatus*, Raf. (Water Puppy).**—Several specimens from Neosho Falls in the collection submitted by Col. Goss, are the first Kansas specimens that I have seen. The species was previously reported to me in letter by Prof. F. H. Snow, who stated that it had been taken in Allen county, near Iola, by Mr. Bert Casmire, a student of the State University.

[NOTE: This article and the article following, substantially as here given, but combined in a single paper, will appear in the ninth volume of the *Transactions of the Kansas Academy of Science*.]

## The Faunal Relations of Kansas.

BY F. W. CRAGIN, SC. B.

The remarks following are a revision and extension of notes originally drawn up in the winter of 1880-81 to accompany my "Preliminary Catalogue of Kansas Reptiles and Batrachians,"\* but finally withheld in order that the conclusions set forth in them might be made both more accurate and fuller. They make, even now, no claim to completeness. Lack of time prevents me from entering upon a full discussion of the details

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\*Transactions Kan. Acad. Sci., Vol. VII, p. 114.

upon which these conclusions are based; but this I hope soon to be able to do in another paper.

In problems of faunal relations we can direct our attention to no department of zoology more profitably than to that of herpetology, the intimate relations of reptiles and batrachians to their climatic and topographical surroundings (partly dependent on the fact that they do not migrate) rendering them exceptionally important factors in all such problems.

This fact has constantly been kept in mind in my studies of the reptilian fauna of Kansas, and the conclusions primarily derived from the study of that fauna have been frequently reviewed in the light of observations made in the course of my studies upon other groups of Kansas vertebrates and invertebrates, and further tested by the published writings of the various naturalists who have studied portions of the Kansas fauna.

Kansas is approached by four great faunal regions: the Central, the Eastern, the Austroriparian, and the Sonoran. While it embraces features of all of these, no part of its territory is the exclusive property of one.

Faunal regions are rarely sharply defined. They cast their shadows beyond them, and beyond each shadow is spread a penumbra. To a mingling of faunal shadow and penumbra from the regions above mentioned, this area owes the heterogeneous aspect of its fauna.

In its flora, too, we see mingled with the dominant vegetation of the Central and Eastern regions varying shades of the Austroriparian, and a few faint flecks of the Sonoran.

Of reptiles and batrachians whose distribution corresponds nearly with a single one of the four regions concerned, or with a part of such region, we find in Kansas, of the Austroriparian 14, Central 11, Eastern 10, and Sonoran 3. This observation might seem to point to the Austroriparian as the dominant factor, but it by no means represents the true faunal relations of the State. It plainly asserts that the fauna of Kansas is deeply shaded with Austroriparian. But when we consider the ratio of each of the above numbers to the entire number of species peculiar to the corresponding region, and take into account species common to two or more regions, we see at once that the herpetological aspect of Kansas is mainly Central and Eastern.

Two or three, only, of the many reptiles characteristic of the Sonoran region, together with a few which that region shares with the Central on one hand or with the Austroriparian on the other, extending into Kansas, show its distant Sonoran relationship.

The above observations pertain to the Kansas fauna as a whole, all Kansas species being viewed as common to the entire State. But comparatively few species range over the entire area of Kansas in upland and valley alike, and to gain an adequate conception of the Kansas fauna, even in its relations to natural faunæ, we must consider its intra-limital relations, and take into account other groups than those of reptiles and batrachians.

Full details of distribution have as yet been made out for but few species of Kansas animals; but enough has been done to warrant the following conclusions as to the special relations of the Kansas fauna:

1. That Kansas cannot, as a whole, be included in any single faunal region of the four that enter or approach its borders.

2. That it possesses some faunal features in common with each of these regions.

3. That the only faunal region that contributes a considerable majority of its characteristic species to any portion of Kansas is the Central.

4. That the plains of Kansas west of the ninety-seventh meridian possess a large majority—in reptiles and batrachians perhaps all—of the characteristic species of the Central region, and that while the Central fauna cannot be regarded as extending in full force, except locally, over the plains east of that meridian, many of its characteristic forms occur abundantly further east, some of them ranging to the Missouri River.

5. That even in the purest portions of the Central fauna in Kansas appear slight manifestations of Sonoran and others of Eastern and Austroriparian affinities.

6. That the prairie fauna of Kansas east of the ninety-seventh meridian is a heterogeneous assemblage of Central, Eastern and Austroriparian forms, among which the Central predominate.

7. That it is on the "bottoms" and wooded bluffs and their immediate vicinity that the constituency of the Eastern fauna in Kansas is mainly expressed, and that this constituency includes comparatively little that is really characteristic of the aquatic phase of that fauna, while representing fairly well the terrestrial aspect of the same.

8. That the lacking elements of the Eastern fauna in these low and wooded tracts are largely replaced in valleys of the Missouri drainage by Central, and in those of the Arkansas drainage by Austroriparian and Central elements.

9. That the constituency of the Eastern fauna in Kansas diminishes westward and is nearly or quite lost in the Central ere it reaches our western border.

10. That the Kansas constituency of the <sup>at</sup>Austroriparian fauna lacks numerous characteristic forms of that fauna and is constantly intermingled with Eastern and Central elements.

11. That this constituency is fullest in the valleys of the lower Arkansas drainage,—notably of the Spring, Neosho, Verdigris, and Fall Rivers,—and represents only the Louisianian and Texan districts.

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## Preliminary List of Kansas Fishes.

BY F. W. CRAGIN, SC. B.

In the list below given, the writer has brought together the names, so far as known to him, of the various species of fish thus far recognized as belonging to the State, together with such records of localities as will serve to show what (and alas! how little) is known of the distribution, abundance, etc., of the respective species.

The names in parenthesis following localities, are those of the authors on whose authority the localities are recorded. Where no authority is given, the record is based upon the collections of the Washburn Biological