TRANSACTIONS OF THE KANSAS ACADEMY OF SCIENC
82(1), 1979, pp. 11

Notes on the Freshwater Mussel Fauna of the Verdigris River System in Kansas

GUENTER A. SCHUSTER
State Biological Survey of Kansas, Lawrence, Kansas 66044
East. Ky Univ Dept Biol Sci Richmond, Ky
40475

ABSTRACT

Twenty-eight species of freshwater mussels are reported as presently o curring in the Verdigris River system in Kansas. Many of these species we last reported in the mid-1880's. Five species are thought to have been e tirpated from the system. An old record of *Plethobasus cyphyus* is fou to be in error; it is doubtful that this species has ever been collected Kansas. Trans. Kansas Acad. Sci., vol. 82:1, 1979.

INTRODUCTION

In the past 100 years several comprehensive studies have been mac concerning the freshwater mussel fauna of Kansas (Call, 1885–1887; Scar mon, 1906; Murray and Leonard, 1962). By and large, however, the muss fauna of the Verdigris River system has not been studied well.

The two early studies by Call (1885–1887) and Scammon (1906), althou fairly complete, are not of much use to modern workers for a number reasons. First, there have been many changes in the nomenclature of mu sels over the past fifty years, which makes the works of Call and of Scar mon utterly confusing if one is not aware of current synonymies. Secon and closely correlated to the first, is that the species concepts of Call ar of Scammon were radically different from those of today, and without r course to specimens studied by them it is often difficult to correlate the work with modern studies. Lastly, the work was often ambiguous in tern of locality data. This is especially true with Scammon (1906) who oft wrote in generalities, as, "most abundant in the southern rivers."

The most recent work, that of Murray and Leonard (1962) is the mo complete publication regarding the mussels of Kansas. It is excellent bridging the old nomenclature with the new, even though a number changes have taken place since its publication. It is also extremely usef on a regional basis. It, however, has its shortcomings with regard to t mussel fauna of the Verdigris system. This is evidenced by their stateme (p. 71): "The Verdigris River, especially the lower portion, has not bee carefully investigated."

They treated the Verdigris and Neosho faunas together, since the two rivers join the Arkansas River shortly after crossing into Oklahoma. They considered the faunas essentially identical. Upon examination of their distribution maps, it quickly became apparent more comprehensive work was required on the Verdigris system since the majority of the records indicated on the maps were records by R. E. Call (1885–1887).

This basically is what prompted the writing of this paper; even so this work does not represent a complete study of the Verdigris River system mussel fauna. A great deal still needs to be done, especially in the deep water sections of the system. This paper is intended to fill in some gaps left by Murray and Leonard (1962). It was felt that at this time enough new records and data were available to warrant a "status" report. It is also hoped that this paper will bring into focus for workers in Kansas some of the changes in nomenclature that have taken effect since Murray and Leonard (1962).

All of the specimens referred to in this paper are in the collection of the State Biological Survey of Kansas (SBSK). At the same time, it should also be useful to future students of the mussels of Kansas to point out the disposition of specimens collected by earlier workers.

The collection of Murray and Leonard which consisted of more than 6,000 lots was deposited some years ago with the National Museum of Natural History (NMNH). I have written Dr. Arthur H. Clarke, Jr., Associate Curator of Mollusks at the NMNH and inquired about this collection. He related the following in a letter:

> ". . . we could not accommodate the more than 6000 lots involved, and a decision had to be made. Accordingly we retained 3000 lots (including all types and figured specimens or other material designated as of special interest) and shipped the remainder to six other institutions. These were: Delaware Museum of Natural History (515 lots), Ohio State University (551 lots), National Museum of Canada (547 lots), University of Michigan (552 lots), Field Museum (Chicago) (718 lots) and California Academy (722 lots)."

These included about 100 lots collected by R. E. Scammon.

Murray and Leonard (1962) pointed out that much of the Scammon material was lost; this was prior to its move to the NMNH. It is my understanding that much of the R. E. Call material is deposited at the Putman Museum in Davenport, Iowa.

Verdigris River System

The Verdigris River system is located in the southeastern sector of Kansas and is composed of three major tributaries; the Verdigris River, Fall River and Elk River. Each of these rivers has its headwaters originating in the

Flint Hills. The vast majority of the drainage lies in the Osage Questa which embrace almost all of eastern Kansas south of the Kansas Riv (Schoewe, 1949). Schoewe (1949) states: "In general (they) consist of series of northeast-southwest irregularly trending east-facing escarpmen between which are flat to gently rolling plains." The vegetation consis primarily of Bluestem Prairie grasses. Portions of the drainage system tr verse the Chautauqua Hills, the vegetation of which is primarily Cross Tir ber.

Collection Sites

The following locality data represent collections of mussels from the ma channels of the Verdigris River system (Verdigris, Elk and Fall River). the discussion of each species, in order to save space, these data are give according to their assigned number, and the reader is referred to this pa for the actual locality information.

1. Verdigris R: Greenwood Co.
   17 Oct 1972
   Coll. Drenner and Cross
2. Verdigris R: Woodson Co.
   Below Toronto Reservoir Spillway
   5 Apr 1974
   Coll. D. G. Huggins
3. Verdigris R: Woodson Co.
   Below Toronto Reservoir Spillway
   12 Mar 1976
   Coll. D. G. Huggins, P. M. Liechti
4. Verdigris R: Lyon-Greenwood Co. line
   16 July 1976
   Coll. S. W. Hamilton
5. Verdigris R: Greenwood Co.
   2.0 mi N of Hilltop
   28 Dec 1976
   Coll. P. M. Liechti, D. G. Huggins
6. Verdigris R: Montgomery Co.
   1.0 mi E, 1.0 mi S of Coffeyville
   27 Dec 1976
   Coll. P. M. Liechti, D. G. Huggins
7. Verdigris R: Wilson Co.
   Above K-39 Hwy Bridge at Be
   edict
   27 Dec 1976
   Coll. P. M. Liechti, D. G. Hu
   gins
8. Verdigris R: Montgomery Co.
   1.0 mi E, 1.0 mi S of Coffeyvil
   22 July 1977
   Coll. S. Roth
9. Verdigris R: Woodson Co.
   ⅛ mi below Toronto Reservo
   Spillway
   5 June 1978
   Coll. G. A. Schuster, S. W
   Hamilton, F. C. Gilbert
10. Verdigris R: Wilson Co.
    Above K-39 Hwy Bridge at Be
    edict
    27 July 1978
    Coll. M. B. DuBois, F. C. Gi
    bert
11. Verdigris R: Montgomery Co.
    3.0 mi E, 3.5 mi S of Indepe
    dence
    7 Sept 1978
    Coll. G. A. Schuster, S. W
    Hamilton

12. Verdigris R: Wilson Co.
    Above K-39 Hwy Bridge at Benedict
    7 Sept 1978
    Coll. G. A. Schuster, S. W. Hamilton
13. Verdigris R: Woodson Co.
    Toronto Reservoir S. Shoreline
    8 Sept 1978
    Coll. G. A. Schuster, S. W. Hamilton
14. Elk R: Elk Co.
    At K-99 Hwy Bridge at Howard
    28 Dec 1976
    Coll. D. G. Huggins, P. M. Liechti
15. Elk R: Elk Co.
    1.0 mi E, 1.0 mi S of Longton
    2 Aug 1977
    Coll. S. W. Hamilton, T. W. Oldham
16. Fall R: Greenwood Co.
    4.4 mi N, 0.3 mi W of Climax
    28 Dec 1976
    Coll. P. M. Liechti, D. G. Huggins
17. Fall R: Wilson Co.
    1.0 mi W, 1.0 mi S of Fredonia at low water Dam
    7 Sept 1978
    Coll. G. A. Schuster, S. W. Hamilton

The Mussel Fauna

The following is a discussion of each species which has been collected in the Verdigris system. For each species I have given the known historical references, and my interpretation of its present status within the Verdigris system. If a species has not been collected since Call's work (mid-1880's) I have assumed that it has been extirpated from the system, and is included in the following section of this paper.

I have also provided the reader with the various names applied to each species in the older literature. This is done especially to help the worker of Kansas with existing nomenclatorial problems, and to give information about the presently accepted names.

Amblema plicata (Say)

This genus and species has had perhaps the most confounding and muddled nomenclature of any unionid species. Valentine and Stansbery (1971) pointed out that at least eight species names have appeared in the literature with numerous combinations of subspecies or forms (depending on the author). This is not to mention that at least four different generic names have been utilized.

The following names have appeared in the literature concerning the presence of this species in Kansas: *Unio plicatus* (Call, 1885e, 1886), *Unio undulatus* (Call, 1885e, 1886), *Quadrula plicata* (Scammon, 1906), *Crenodonta peruviana peruviana* (Murray and Leonard, 1962), *Amblema plicata* (in Liechti and Huggins, 1977). Until a thorough and comprehensive revision of this (these?) species can be made I will take the conservative point of

view by using the oldest available name, and follow Valentine and Stansbe (1971).

Amblema plicata was reported from the Verdigris river system by C (1885e, 1886) and Murray and Leonard (1962). It has been collected at most every site sampled, and is undoubtedly the most common mussel this river system.

Anodonta grandis Say

This species is the most widely distributed species in Kansas, and it found throughout the Verdigris river system. Typically, it has been collect in smaller headwater streams, ponds, reservoirs and quiet backwater are of the larger rivers. Within the Verdigris River and its major tributaries t SBSK has specimens from collection sites 5, 13 and 14.

Anodonta imbecilis Say

In recent years of extensive collecting, the staff of the SBSK has fou *A. imbecilis* to be widespread throughout the eastern one-half of Kansa Its habitat preference is quiet pools, small streams, oxbow lakes and pond which generally excludes it from the main channel of larger rivers. Neve theless, Call (1885e) reported it from the Verdigris River at Coffeyville, a Murray and Leonard (1962) indicated two localities on the Fall River. N recent main channel collections of *A. imbecilis* have been made, but it h been collected from small tributaries and ponds in the vicinity.

Carunculina parva (Barnes)

Carunculina parva according to Baker (1928) prefers small streams havi sluggish current and mud bottom, and Murray and Leonard (1962) report finding it near the shallow banks of larger streams. In part, because of t apparent habitat preference *C. parva* had previously not been reported fro the main channels of the Verdigris system. We possess a single specim from site 1 in the Verdigris River near its headwaters.

Ellipsaria lineolata (Rafinesque)

This genus was in recent years best known under the name *Plagiola,* a Murray and Leonard (1962) treated this species under that name. Bak (1964) pointed out the rationale involved in this name change. However, t problem is not as easily resolved as one would think because Johnson (197 recently resurrected the name *Plagiola*. Johnson's use of the name is wi regard to species formerly classified under the generic name *Dysnomia.* the literature dealing with species from Kansas this results in another nam change. The species reported by Murray and Leonard (1962) as *Dysnom triquetra* is now known by the name *Plagiola triquetra.*

This species was previously known from the Fall River from a sing

record reported by Call (1887) as *Unio securis*. Murray and Leonard (1962) were unable to find specimens of it during the course of their work. I collected two relic valves from station 11 in the Verdigris River.

It is not known for certain that *Ellipsaria lineolata* still populates this river system. Since two old, worn and weathered valves were found, it is optimistically interpreted that *Ellipsaria* remains viable in this river.

Fusconaia flava (Rafinesque)

Call (1886) reported this species as *Unio rubiginosus* from the Fall River at Eureka and Neodesha and the Verdigris River at Neodesha. Scammon (1906) relegated it as a "common species in all Kansas river systems." Murray and Leonard (1962) reported it from two sites; one in the upper Verdigris, the second in the upper Elk. Current collections of this species are from sites Nos. 7, 10, 11, 12 and 17.

Call (1886) also reports *Unio trigonus* from the Fall River at Neodesha. In current literature it is considered a synonym of the *undata* form of *F. flava*. Scammon (1906) also reports this form as common in the larger rivers in the southern part of the state. The only specimens of *Fusconaia* that I have seen which approach the *undata* form in appearance have been from the lower Neosho River, but I am even skeptical of these.

Lampsilis ovata ventricosa (Barnes)

This is one of the more common species in the drainage and has been collected from sites 7, 8, 11, 12, 14, 15, 16 and 17. Previously it was reported from the Elk River by Murray and Leonard (1962) and the Fall and Verdigris Rivers by Call (1885e, 1886 and 1887) as *Unio occidens* and *U. satur*.

Lampsilis radiata siloquoidea (Barnes)

This species was recorded by Murray and Leonard (1962) from the upper Verdigris River and the Elk River. It was also recorded from the Fall River by Call (1886). For some unknown reason it has not been collected in recent years from the Verdigris system. It is not known whether this reflects extirpation of the species from the drainage or bad collecting techniques. I hope that it reflects the latter.

Lampsilis teres (Rafinesque)

This is another example of a mussel species being muddled by nomenclature. In previous years, and perhaps still at present, it has best been known under the names *Lampsilis anodontoides anodontoides* and *L. a. fallaciosa*. The name *fallaciosa* refers to a rayed ecophenotype of this species. It has been clearly pointed out by Johnson (1972) that *teres* is the name which has priority and should be used. In the Kansas literature both Call (1885 and

1886) and Scammon (1906) used the name *anodontoides*, while Murray an Leonard (1962) used both *L. a. anodontoides* and *L. a. fallaciosa.*

Lampsilis teres is widespread in the eastern one-fourth of the state. I was recorded from the Verdigris system by Call (1885e and 1886) and Mur ray and Leonard (1962). In recent years it has been collected from sites 4 5, 6, 7, 8, 10, 11, 12, 13, 14, 15 and 17. It is one of the most common musse species in this drainage.

Lasmigona complanata (Barnes)

Call (1886) reported this species from both the Fall and Verdigris River under the generic name *Margaritana*. Murray and Leonard (1962) gave onl a single recent record of *Lasmigona complanata* from the upper reaches o the Verdigris River. The SBSK has specimens of this species from th following collections: 7, 8, 11, 13, 14, 16 and 17.

Collection number 14 represents the first collection of *L. complanata* i the Elk River. *Lasmigona complanata* is a relatively common species i the Verdigris River system as it is in the Marais des Cygnes and Neosh Rivers.

Leptodea fragilis (Rafinesque)

This species was referred to as *Unio gracilis* by Call (1885e and 1886) an *Lampsilis gracilis* by Scammon (1906). It was reported from the Verdigri and Fall Rivers by Call (1885e and 1886). Murray and Leonard also reporte it from the Elk River as well as from two sites on the Verdigris River.

The staff of the SBSK in recent years has collected *Leptodea fragili* from sites 5, 6, 7, 8, 10, 11, 12, 13, 15, 16 and 17. It is one of the mos common clam species in the Verdigris River system.

Ligumia recta (Lamarck)

Call (1885e and 1886) reported *L. recta* from the Verdigris and Fall Rivers and Murray and Leonard (1962) recorded it from two localities in this sys tem. It has not been collected from there since Murray and Leonard's work It is not known if this species has been extirpated from the system. M collecting experience in Kansas has led me to conclude that it is a rar species throughout its range in the state. Murray and Leonard (1962) indi cated that its decline in Kansas since the work of Scammon (1906) may i part be due to increased turbidity.

Ligumia subrostrata (Say)

Ligumia subrostrata is one of the most common species of mussel know to Kansas. It is typically known from headwater streams and pond-lik situations. No old records (Call or Scammon) of this species are know

from the Verdigris system. Murray and Leonard (1962) indicated by their distribution map that *L. subrostrata* is common in the upper reaches of the drainage. The SBSK has records from collecting sites 1, 4, 12 and 14.

Megalonaias gigantea (Barnes)

Scammon (1906), who treated this species under the name of *Quadrula heros* Say, wrote that it had been reported from all the drainage systems in Kansas. He did not specifically name the Verdigris river system so it can only be speculated whether or not he had actual records from there. Call in his work did not name this species as occurring in Kansas, and Murray and Leonard (1962) also did not have any substantiated records of it. They listed it as being known only from the Marais des Cygnes and Neosho Rivers.

The SBSK has records of this species from sites 7 and 11. These specimens represent the first authenticated records of *M. gigantea* in the Verdigris River. These are also the largest known specimens from Kansas. The specimens from site 7 are very large, the largest of which is 230 mm (approximately 9 inches) long and 140 mm (approximately 5.5 inches) high.

Obliquaria reflexa Rafinesque

This species was reported by Call (1886 and 1887) as *Unio cornutus* from the Fall and Verdigris Rivers. Murray and Leonard (1962) did not collect it from the Verdigris River basin during the course of their work. We have in recent years collected *O. reflexa* from collecting sites 7, 11, 13 and 17. It appears to be a fairly common species in the Verdigris and Fall Rivers, and is also doing well in the backwaters of Toronto Reservoir.

Plethobasus cyphyus (Rafinesque)

This species bears special note since it was reported first by Scammon (1906) on the basis of three specimens from the lower Verdigris River. Of these three specimens only one valve remains, which was pictured in Murray and Leonard (1962). Upon close examination of the photograph it appeared to me that the specimen was in actuality an old and worn *Quadrula quadrula*. The specimen is now housed in the National Museum of Natural History (No. 743141). Dr. Arthur H. Clarke, Jr., who kindly examined it for me, agreed with my observations.

The only other record of this species for Kansas is that of Branson (1966b). He reported it from the Spring River in Cherokee County. I have collected the Spring River at Branson's localities on several occasions, and have not been able to obtain any specimens of *P. cyphyus*. Unfortunately, Branson's specimens were not available for study. It is my opinion, that at best, the present and past status of *P. cyphyus* in Kansas is dubious. Undoubtedly, the situation needs more careful study.

Pleurobema cordatum Rafinesque

In the literature dealing with the mussels of Kansas this species has bee known by a number of names including several subspecific names. Th situation with this species is very similar to that of other species such a *Amblema plicata* and *Quadrula pustuolosa*. That is, *P. cordatum* exhibit a large amount of conchological variation, much of it stemming directl from stream size (Goodrich and van der Schalie, 1944). The names in th literature certainly do not conform to presently accepted theories on sub species (Mayr, 1969). Until the problem has been studied in greater depth I prefer to take the conservative approach and lump all of the morphologic variants under the *P. cordatum*.

As stated above, several names have appeared in the literature. The include: *Unio coccineus* (Call 1885e, 1886 and 1887); *Unio solidus* (Call 1886); *Quadrula coccinea, Q. solida, Q. plena* and *Q. pyramidata* (Scam mon, 1906); *Pleurobema cordatum coccineum, P. c. catillus* and *P. c. pyr amidatum* (Murray and Leonard, 1962). All of the above workers reporte *Pleurobema cordatum* from the Verdigris river system. In recent years th SBSK staff has collected *P. cordatum* only from sites 7 and 11. It appear to be presently restricted to the lower section of the Verdigris River wher it is found in moderate numbers.

Proptera alata (Say)

Murray and Leonard (1962) pointed out that Scammon's (1906) report o *P. alata* from the Fall River was the last and only record of the pink heel splitter in the Verdigris drainage. Since those writings, a single specimen c it has been collected from site 2 below Toronto Reservoir spillway by Mr Don Huggins. This specimen re-established *P. alata* in the Verdigris drain age, but it is undoubtedly very rare. The specimen has been catalogued i the SBSK collection.

Proptera purpurata (Lamarck)

Proptera purpurata is one of the commonest mussel species in Kansas It was reported from the Verdigris by Call (1885e and 1886) and the Fall b Murray and Leonard (1962). Call's records represent the last substantiate records of this species from the Verdigris drainage.

We have collected it in recent years from all three rivers; the Elk, Fa and Verdigris. The SBSK collection contains specimens from sites 5, 6, 7 8, 9, 10, 11, 12, 13, 14, 16 and 17. It is one of the most common species i the drainage system, and it is not known why Murray and Leonard (1962 failed to collect specimens of it during their work. It possibly may hav been a clerical oversight, rather than an absence of the species in the syster at that time.

Ptychobranchus occidentalis (Conrad)

There has been considerable confusion surrounding the nomenclature of the species of *Ptychobranchus* known from Kansas. There are at least four specific names in the literature: *occidentalis, clintonensis, fasciolaris* and *phaseolus*. Valentine and Stansbery (1971, p. 23) attempted to straighten the problem:

> "*Ptychobranchus fasciolaris* occurs east of the Mississippi River and crosses into Missouri while *P. occidentalis* is recorded from Louisiana, Arkansas, Oklahoma, Missouri and Kansas. Some of the records for Kansas (Murray and Leonard, 1962, Branson, 1966a, 1967) are under the name *fasciolaris* but the illustrations and descriptions mention the fine continuous lines characteristic of *occidentalis*. Call's (1885) record of *fasciolaris* (as *Unio phaseolus*) falls in the same category. He says (p. 43) 'The specimens seen from Indian Territory and Kansas are beautifully ornamented with numerous green capillary rays.'"

In any case, Murray and Leonard (1962) suggested that *Ptychobranchus* was extirpated from Kansas since it had not been collected subsequent to 1890. Branson (1966a) re-established the species for the state giving records of specimens collected from the Spring River in the very southeastern corner of the state.

Since that time I have been fortunate to collect several beautiful, recently dead specimens from site 11 on the Verdigris River. A relic specimen was also collected from site 12, which is several miles above site 11. These specimens represent the first collection of this species from the Verdigris drainage since Call (1886) who reported it from both the Fall and Verdigris Rivers.

Quadrula metanevra Rafinesque

Call (1887) reported *Q. metanevra* from the Fall River in Wilson County, and Scammon (1906) did likewise. Murray and Leonard (1962) did not give any recent records of this species from the Verdigris system. *Quadrula metanevra* has been found in the following collections: 7, 11, 12 and 17. These include the first specimens of *Q. metanevra* from the Verdigris River proper, and the first collections of it from the Fall River since the turn of the century. It is the most common species in parts of the Neosho River, but it was not found in large numbers at any of the sites in the Verdigris river system. In fact it could be classified as being uncommon to rare in this drainage.

Quadrula nodulata Rafinesque

Call (1885e, 1886 and 1887) reported this species as *Unio pustulatus* Lea from the Verdigris River at Coffeyville and Neodesha and from the Fall

River in Wilson County. Scammon (1906) said it was "found only in th Verdigris River and the Neosho, in the southern drainage." Murray an Leonard (1962) showed no recent records from the Verdigris river system I have been able to collect only a single recently dead specimen from localit no. 11 in the lower Verdigris River.

Murray and Leonard (1962) pointed out that this species occurs onl rarely, and since that time the prognosis for this species has not changed It is still extremely rare, and only a handful of specimens has been col lected from the Neosho River by the SBSK. It was recently put on th Kansas Endangered Species list by the Kansas Fish and Game Agency. T say the least, the status of *Q. nodulata* is uncertain and warrants furthe study.

Quadrula pustulosa (Lea)

Murray and Leonard (1962) listed *Unio dorfeuillianus* Lea, a name use by Call (1885b), as a synonym of *Quadrula pustulosa*. In his six paper serie on the unionid mussels of Kansas, Call used several other names that ar synonyms of *Q. pustulosa* which Murray and Leonard failed to include i their list of synonymy. These names are *Unio sphaericus* Lea (Call, 188 and 1887), *Unio petrinus* Gould (Call, 1886) and *Unio schoolcraftii* Le (Call, 1887). All of these names were used by Call for specimens collecte in the Verdigris river system. *Quadrula pustulosa* is one of the most plasti species of mussels in North America, and it is quite easy to understand hov it has obtained so many names.

The only recent record of *Q. pustulosa* in the Verdigris River system i one given by Murray and Leonard (1962) from the lower Verdigris River Based on my own collecting and specimens in the SBSK this species i much more common than the above single record would indicate. It i known from the following SBSK collections: 5, 7, 8, 10, 11, 14 and 17.

Quadrula quadrula Rafinesque

Call (1885e and 1886) reported this species from the Verdigris River (a *Unio asperrimus* and *U. lachrymosus*) and Call (1887) discussed its occur rence in the Fall River. Murray and Leonard (1962) on their distributio map showed only one recent record of *Q. quadrula* in the Verdigris rive system, and that is from the Elk River.

The SBSK has in its collection specimens from the following sites: 5, 6 7, 10, 11, 12, 13, 14, 15. In the Verdigris and Elk rivers the species is no found in large numbers; however, it is not uncommon. It has not bee collected from the Fall River since 1887.

Strophitus undulatus (Say)

This species has been known in the Kansas literature by a number o names: *Anodonta arkansensis* (Call, 1886), *Anodonta edentula* (Call, 1886)

Strophitus edentulus (Scammon, 1906), and *Strophitus rugosus* (Murray and Leonard, 1962).

This species has been recorded from the Verdigris and Fall Rivers by Call (1886), and Murray and Leonard (1962) reported a collection from the Elk River as well. The SBSK has specimens from collecting sites 7, 11, 16 and 17.

Tritogonia verrucosa (Say)

Call (1885e and 1886) reported this species from both the Fall and Verdigris Rivers under the name *Unio tuberculatus*. Scammon (1906) remarked that *T. verrucosa* has a general distribution in Kansas. Murray and Leonard (1962) gave records from the Elk and Fall Rivers. It has in recent years been collected by the SBSK staff from sites 4, 5, 7, 9, 10, 11, 12, 14 and 17. *Tritogonia verrucosa* appears to be one of the most common and successful mussel species in the Verdigris system. It is often encountered in large numbers.

Truncilla donaciformis (Lea)

Neither Call nor Murray and Leonard recorded *T. donaciformis* from the Verdigris River system. Scammon (1906) described this species as being "common to all the Kansas drainage systems and abundant in all of them"; however, he does not mention the Verdigris River basin in particular. So it is not known whether he actually was aware of specimens from this system.

The collections from sites 11 and 17 represent the first documented specimens from the Verdigris and Fall Rivers. It appeared to be abundant at the two localities it was collected from, but it is not known why it has not been collected elsewhere in the system. In all probability, it reflects on the shortcomings of our collecting techniques.

Truncilla truncata Rafinesque

This species in the old literature was known by the names *Unio elegans*, (Call, 1886 and 1887) and *Plagiola elegans* (Scammon, 1906). It was recorded by Call (1886 and 1887) from the Verdigris and Fall Rivers respectively. Murray and Leonard (1962) had only a single record of it from the upper Verdigris River. The SBSK staff has collected it from sites 5 and 11. It appears that *T. truncata* is presently living only in the Verdigris River proper.

Uniomerus tetralasmus (Say)

This species is one of the most tolerant of mussel species, and is typically found living in ponds and small headwater streams. The SBSK staff has collected it on one occasion from the main channel of the Verdigris River at site 3. This represents the first record of this species from the main

channel. Previously it has been collected from small streams and pond throughout the Verdigris River basin.

Probable Extirpated Species

Over the past 100 years the character of the Verdigris River drainage ha been greatly changed by the construction of major reservoirs on all thre rivers in the system: Elk River (Elk City Reservoir), Fall River (Fall Rive Reservoir), Verdigris River (Toronto Reservoir). In addition to these, man low water dams have been constructed throughout the system, and bridg and road construction also have had an effect on it. This is in addition t changes in water quality (turbidity, insecticide and pesticide pollution, etc due to advanced agrarian techniques. It is little wonder that some specie of freshwater mussels have been eliminated. In optimistic terms, it is indee fortunate that only five species known to have occurred in the Verdigri drainage have succumbed. These species include *Quadrula cylindrica, E liptio dilatatus, Cyprogenia aberti, Actinonaias carinata, Proptera laevis sima.* None of these species have been collected from the Verdigris syste since R. E. Call's work in the mid- and late 1880's.

Summary

Call (1885–1887), Scammon (1906) and Murray and Leonard (1962) a have studied the freshwater mussle fauna of Kansas; however, even thoug these works were fairly comprehensive, the Verdigris system was neve well studied. In recent years the staff of the Biological Survey of Kansa has collected clams from this system, and some interesting and importar records were found.

It has been found that twenty-eight species are presently known to exis in the Verdigris. Many of these species have not been reported from th Verdigris system since the mid-1880's. Five species, *Quadrula cylindrica Elliptio dilatatus, Cyprogenia aberti, Actinonaias carinata, Proptera lae vissima* are thought to have been extirpated from the system. One species *Plethobasus cyphyus,* was previously reported by Scammon (1906), bu upon examination of the figure and specimen it was found that this recor was actually based on a misshapened specimen of *Quadrula quadrula Plethobasus cyphyus* was reported by Branson (1966b) from the Spring Riv er in southeastern Kansas, but the specimens were not available for study Therefore, it is somewhat doubtful if this species has ever resided in Kansas

Acknowledgments

I wish to thank the staff of the SBSK, both present and past, who hav contributed in making the collections of mussels in the Verdigris River sys tem. I wish to thank Mr. Mark DuBois and Mr. Steve Hamilton for thei tireless assistance in the field. I also want to thank Mr. Mark DuBois an

Mr. Donald Huggins for reading the manuscript and giving needed criticism of it.

REFERENCES

Baker, F. C. 1928. The fresh-water Mollusca of Wisconsin. Part II. Pelecypoda. Bull. Wisconsin Geol. Nat. Hist. Surv. 70(2):i–vi + 1–495, pls. 29–105.

Baker, H. B. 1964. Some of Rafinesque's unionid names. Nautilus 77:140–142.

Branson, B. A. 1966a. *Alasmidonta marginata* and *Ptychobranchus fasciolaris* in Kansas. Nautilus 80(1):21–24.

Branson, B. A. 1966b. A partial biological survey of the Spring River drainage in Kansas, Oklahoma and Missouri. Part I. Collecting sites, basic limnological data, and mollusks. Trans. Kansas Acad. Sci. 69:242–293.

Call, R. E. 1885a. Description of a new species of Unio from Kansas. Bull. Washburn Lab. Nat. Hist. 1(2):48–49 (pl. 2, figs. 1–4).

Call, R. E. 1885b. Contributions to a knowledge of the fresh-water mollusca of Kansas. I. Fresh-water bivalves. Bull. Washburn Lab. Nat. Hist. 1(2):49–51.

Call, R. E. 1885c. Contributions to a knowledge of the fresh-water mollusca of Kansas. II. Fresh-water univalves. Bull. Washburn Lab. Nat. Hist. 1(2):51–56.

Call, R. E. 1885d. Contributions to a knowledge of the fresh-water mollusca of Kansas. Bull. Washburn Lab. Nat. Hist. 1(3):93–97.

Call, R. E. 1885e. Contributions to a knowledge of the fresh-water mollusca of Kansas. IV. Bull. Washburn Lab. Nat. Hist. 1(4):115–124.

Call, R. E. 1886. Fifth contribution to a knowledge of the fresh-water mollusca of Kansas. Bull. Washburn Lab. Nat. Hist. 1(6):177–184.

Call, R. E. 1887. Sixth contribution to a knowledge of the fresh-water and land mollusca of Kansas. Bull. Washburn Lab. Nat. Hist. 2(8):11–25.

Goodrich, C., and H. van der Schalie. 1944. A revision of the mollusca of Indiana. Amer. Midl. Nat. 32:257–326.

Johnson, R. I. 1972b. The Unionidae (Mollusca: Bivalvia) of Peninsular Florida. Bull. Florida St. Mus. Biol. Sci. 16:181–249.

Johnson, R. I. 1978. Systematics and zoogeography of *Plagiola* (=*Dysnomia* =*Epioblasma*), an almost extinct genus of freshwater mussels (Bivalvia: Unionidae) from Middle North America. Bull. Mus. Comp. Zool. Harvard Univ. 148:239–321.

Mayr, E. 1969. Principles of systematic zoology. McGraw-Hill, New York. 428 pp.

Murray, H. D., and A. B. Leonard. 1962. Handbook of unionid mussels in Kansas. Univ. Kansas Mus. Nat. Hist., Misc. Publ. (28):1–84, pls. 1–45.

Scammon, R. E. 1906. The Unionidae of Kansas, Part I. An illustrated catalogue of the Kansas Unionidae. Kansas Univ. Sci. Bull. 3(9):279–373, plus plates.

Schwoewe, W. H. 1949. The geography of Kansas. Trans. Kansas Acad. Sci. 52:261–333.

Valentine, B. D., and D. H. Stansbery. 1971. An introduction to the naiads of the lake Texoma Region, Oklahoma with notes on the Red River fauna. Sterkiana 42:1–40.