

# Changes in the Molluscan Fauna of the Saint Joseph River, Indiana, between 1959 and 1970

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## Abstract

This report is based on a review of the literature, an examination of museum collections, and a survey of the bottom organisms in the summers of 1959 and 1970.

The populations of large bivalves, Unionidae, have declined from about 20 species to 10, and the size of the living populations of several species has decreased in the past 11 years. Species of Sphaeriidae are common throughout the drainage system. The univalve populations indicate changes similar to the large bivalves but to a lesser degree.

Habitat alterations augmented by significant industrial, domestic, agricultural, and recreational forces are major factors responsible for the changes in the molluscan populations.

## Introduction

Efforts to abate environmental deterioration are frequently stymied by the lack of basic biological data. The paucity of biotic information about the Saint Joseph River Watershed, in particular the portion in Indiana, prompted me to study the bottom organisms. A survey was conducted in the summer of 1959 (4) and again in the same months in 1970 to compare the status of species over an 11-year period.

Clams and snails are at times good indicators of changes in a drainage system. This paper gives the present status of molluscs in the Saint Joseph River Drainage in Indiana, notes population trends, particularly in the last decade, and suggests causes of the changes in populations.

Publications directly related to the molluscan populations in the Saint Joseph River in Indiana are scarce. The pearl button industry, which flourished in the last decade of the 19th century and for several decades of the 20th century, had some influence on the clam populations in the Saint Joseph River Watershed. Several species of commercial value were established in the watershed, but only *Actinonaias carinata* remains in appreciable numbers in the portion of the watershed in Indiana. Call (2, 3) contributed greatly to the early knowledge of Mollusca of Indiana. Wenninger (11) described 15 species of Unionidae which were collected chiefly from the river in the South Bend area. Notes on the biology of the Saint Joseph River by Dolley (5) include basic information on 10 species of clams and several species of snails. Henry van der Schalie (10) summarized the collection data of the naiad fauna of the Saint Joseph River Drainage in Southwestern Michigan. In 1944, Goodrich and van der Schalie (6) published a revision of the Mollusca of Indiana.

Over 50 major collecting sites were studied in 1959. Most of these areas were included in the 1970 survey. Twenty-five areas were in various habitats along the 40 to 50 miles of the Saint Joseph River from the Indiana-Michigan state line north of Bristol, Indiana, to the state line north of South Bend, Indiana. Collections in the major tributaries included the Fawn, Pigeon, Little Elkhart, and Elkhart rivers. Rock, Solomans, Turkey, and Yellow creeks, all tributaries of the Elkhart River, were studied. Also, small creek collecting sites included Judy, Cobus, Christiana, Pine, and Baugo.

The molluscan collections were made by handpicking, short rakes, and the Ekman dredge. Great fluctuations in the water level due to variations in rainfall and control by the use of dams made handpicking possible in the majority of the areas. In deep water a motor boat was used.

#### Bivalves—Unionidae

The mucket, *Actinonaias carinata* (Barnes), and the lady finger, *Elliptio dilatatus* (Rafinesque), are very common in the Saint Joseph River Drainage in Indiana. *Actinonaias carinata* is found in more diverse habitats and in considerably larger numbers than *E. dilatatus*. The mucket is desirable for the manufacturing of pearl buttons and nuclei for cultured pearls (8, 9). The major collecting sites and the changes in the populations of the unionid mussels are listed in Table 1.

Eight unionid mussels were found in widely scattered populations, but never in large numbers of individuals. Alteration of the habitats in small tributaries has decreased the number of slipper shells, *Alasmidonta calceolus* (Lea), and the paper shell, *Anodontooides ferussacianus* (Lea), from 1959 to 1970. Small populations of the elk's toe, *Alasmidonta marginata* (Say), and the fluted shell, *Lasmigona costata* (Rafinesque), are mixed with other species in the stable habitats of the Saint Joseph River and in the larger tributaries. The distribution of the Wabash pigtoe, *Fusconaia flava* (Rafinesque), and the Ohio River pigtoe, *Pleurobema cordatum coccineum* (Conrad), are very similar. However, the populations of *F. flava* are much larger. Three large populations of the squaw's foot, *Strophitus rugosus* (Swainson), were found. A single population of the paper pond shell, *Anodonta imbecillis* Say, was found in July 1970 in a quiet, muddy area near an island upstream from Bristol, Indiana. Goodrich and van der Schalie (6) reported this species as having a sporadic distribution in quiet, muddy waters.

Three other species are considered limited to a few adults in isolated habitats and are on the verge of extinction from the Saint Joseph River Drainage in Indiana. A few large shells of each of these species were collected, some of the valves were still attached by the hinge ligament, but no living clams were found. The fat mucket, *Anodonta grandis* Say, is included in older records as common in the Saint Joseph River in Indiana. Goodrich and van der Schalie (6) listed *A. grandis* as one of the most common species in Indiana because

of its ability to live in a wide variety of habitats. In contrast to the delicate shell of *A. grandis* the heavy shell of the purple warty-back, *Cyclonaias tuberculata* (Rafinesque), preserves well when buried. Large numbers of the purple warty-back were uncovered in 1970 during excavations for a new bridge in Bristol, Indiana. Lastly, the pocket-book, *Lampsilis ventricosa* (Barnes), is widely distributed in Indiana as stated by Goodrich and van der Schalie (6). Records indicate that this bivalve was common in the Saint Joseph River and was of commercial value (9).

A few greatly deteriorated shells of eight additional species were found. These species are considered extinct from the Saint Joseph River Drainage in Indiana. Three valves of *Actinonaias ellipsiformis* (Conrad) were taken near Bristol, Indiana. Isolated shells of the three-ridge, *Amblema costata* Rafinesque, were found in the South Bend area of the Saint Joseph River. Dredging in recent years uncovered shells and the specimens in the collections at the University of Notre Dame are listed from South Bend, Indiana, and nearby Bertrand, Michigan. A few shells of *Carunculina glans* (Lea) and *C. parva* (Barnes) were taken from the Little Elkhart River, a small tributary of the Saint Joseph River. Goodrich and van der Schalie (6) listed *C. glans* as common in most of the smaller streams in Indiana and *C. parva* as found in the northern part of the state, but most commonly in the headwaters in streams of southern and central Indiana. The snuffbox, *Dysnomia triquetra* (Rafinesque), was reported from the Saint Joseph River Drainage in Indiana by Goodrich and van der Schalie (6). They also stated that it is seldom in large numbers. Records indicate that the black sand shell, *Ligumia recta latissima* (Rafinesque), was formerly a common inhabitant of the Saint Joseph River in Indiana, particularly in the South Bend area. Shells of the pimple back, *Quadrula pustulosa* (Lea), and the deer's toe, *Truncilla truncata* Rafinesque, were recovered from the dirt among the roots of several large trees which were uprooted recently in the Elkhart, Indiana, area of the Saint Joseph River.

#### Bivalves—Sphaeriidae

Sphaeriids are very common in the Saint Joseph River Drainage in Indiana. Populations are established in diverse habitats which include very stagnant areas. Overhanging banks and dead clam shells in stagnant depressions form excellent microhabitats for sphaeriids. In July 1970 a single clam, *Actinonaias carinata*, with valves attached at the hinge and measuring 6.5 cm in height and 11.0 cm in length, was taken from a muddy depression of the Saint Joseph River north of the toll road bridge, upstream from Bristol, Indiana. The valves of this unionid contained a population of 5564 *Sphaerium transversum* (Say) which could be divided into 4 age groups based on total length: 1-3 mm (4724); 4-7 mm (492); 8-11 mm (258); 12-16 mm (90).

In accordance with the classification established by Herrington (7), several species of *Sphaerium* and *Pisidium* are common in the

Saint Joseph River Drainage in Indiana. *Sphaerium transversum* (Say), *Pisidium casertanum* (Poli), and *P. compressum* Prime have been identified. An intensive taxonomic study has been initiated.

### Univalves

The main stream of the Saint Joseph River Drainage in Indiana has many large populations of *Goniobasis livescens* (Menke) and *Campelema decisum* (Say). *Goniobasis livescens* inhabited a great variety of habitats. The populations in 1970 were as large as in 1959. However, *C. decisum* was more abundant in 1959. Both snails occur in large numbers in most of the shallow, weedy areas of the Saint Joseph River and in the major tributaries.

*Pleurocera acuta* Rafinesque is confined to the Saint Joseph River and the Pigeon River. Populations have been greatly reduced in the last 11 years. Large shells are scarce in recent years.

*Viviparus japonicus* (von Martens), an imported snail, is abundant in two areas of the Elkhart River downstream from Goshen, Indiana.

Small colonies of *Helisoma trivolvis* (Say) inhabited the shallow, stagnant areas of many of the small tributaries of the Saint Joseph River. Most of the colonies were attached to algal coated branches, boards, metal containers and other debris which have accumulated in many of the small streams.

*Gyraulus deflectus* (Say) are common inhabitants of the shallow lily-pad areas of the protected sections of the Saint Joseph River Drainage. This species is widely distributed, but the number of individuals in each population is usually small.

*Physa heterostropha* (Say) was collected in most shallow, protected areas of the Saint Joseph River Drainage. It seems to be absent only in the areas where the current is swift during all or part of the year.

*Aplexa hypnorum* (Linnaeus) inhabited the headwaters of many of the small creeks of the Saint Joseph River Drainage. Some of the populations were large.

Two species, *Valvata tricarinata* Say and *V. sincera* Say, were collected in most of the weedy areas of the Saint Joseph River and the major tributaries.

Species of the genus *Ferrissia* were common in the weedy areas of the river. Many individuals were attached to clam shells in the South Bend area.

Two large populations of *Amnicola lustrica* Pilsbry were found in a weed-bed in the South Bend area of the Saint Joseph River in 1959. A smaller number was recovered from the same area in the summer of 1970.

### Population Trends and Causes

The populations of the large bivalves (Unionidae) in the Saint Joseph River Drainage in Indiana have declined both in number of species and number of individuals. Quantitative records are lacking in the early reports of bivalves. However, insofar as can be ascertained from the literature and preserved collections, approximately 20 species have been listed from the Indiana portion of the Saint Joseph River Drainage. My collections (1959 and 1970) contain records of 10 living species and some indications of 3 additional species in isolated habitats. Only 2 of the 10 species, *Actinonaius carinata* and *Elliptio dilatatus*, are very common. One of the 10, *Anodonta imbecillus*, has not been listed in former records. Thus, the number of species has been reduced by about one-half. Also, a comparison of the 1959 and 1970 collections, which were largely from the same areas, indicates a definite decline in the number of established populations and in the number of individuals in the populations for 5 of the 10 species.

Comparative data on the Sphaeriidae populations are not available. The 1959 and 1970 collections contain several species of the two accepted genera, *Sphaerium* and *Pisidium*. Specimens have been collected from a wide variety of habitats in the Saint Joseph River Drainage. Species of this family may be useful indicators of water quality and habitat conditions when more biological data are known. An intensive taxonomic and habitat study has been started.

Statements of population trends of the univalves in the Saint Joseph River Drainage in Indiana are less definitive than those for the larger bivalves. Quantitative information is not available in the literature. However, my records of *Pleurocera acuta* over the last 11 years show a significant decline in the main populations which inhabit the Saint Joseph River in the areas upstream from Elkhart, Indiana. To a lesser degree, the populations of *Campeloma decisum* and *Amnicola lustrica* have also been reduced. The many populations of *Goniobasis livescens* were larger or equally as large in 1970 as in 1959. The numerous small populations of the other species did not show a change during this same period.

The decline in the molluscan populations, in particular those of many large bivalves, has been caused by several factors. Undoubtedly a major aspect has been alterations in the habitats. The suitable habitats for large bivalves in any river system are restricted by fluctuation in water level due to variable seasonal and annual precipitation. This variable has been augmented by control measures, the power dams. August 1959 was an extremely dry period. The water level on several days was reduced by dam controls to a level where large beds of clams were exposed and desiccated. New bridges, roads, retaining walls, and landfills have destroyed many stable habitats. Many of the small tributaries of the Saint Joseph River have been diverted into ponds and small lakes. These habitats have been changed, the physical characteristics of the water, *i.e.* the temperature, have been altered. Domestic sewage and industrial wastes, in spite of recent abatement

measures, have considerable influence on the molluscan populations. Likewise, sediment from erosion, agricultural practices, and housing developments have had a restricting influence on the Mollusca. Baker (1) and Krumholz *et al.* (8) have reported similar limiting factors of the molluscan populations in other drainage systems.

TABLE 1. Major collecting sites and population trends, from 1959 to 1970, of the unionid mussels in the Saint Joseph River Drainage in Indiana.

Species	Collecting Sites	Population Trends
<b>Very Common, Many Populations</b>		
<i>Actinonaias carinata</i>	Saint Joseph; all major streams	No change
<i>Elliptio dilatatus</i>	Saint Joseph; Pigeon; Elkhart	Declined greatly
<b>Common, Scattered Populations</b>		
<i>Alasmidonta calcicolus</i>	Most small streams	Declined
<i>Alasmidonta marginata</i>	Saint Joseph; Pigeon	No change
<i>Anodonta imbecillis</i>	Saint Joseph; one area	Not found 1959
<i>Anodontoïdes ferussacianus</i>	Most small streams	Declined greatly
<i>Fusconaia flava</i>	Saint Joseph; Pigeon; Elkhart	Declined
<i>Lasmigona costata</i>	Saint Joseph; Pigeon; Elkhart	Declined
<i>Pleurobema cordatum</i>	Saint Joseph; Elkhart	No change
<i>Strophitus rugosus</i>	Saint Joseph; Pigeon	No change
<b>Few, Shells Only</b>		
<i>Anodonta grandis</i>	Saint Joseph, South Bend area	No change
<i>Cyclonaias tuberculata</i>	Saint Joseph, Bristol area	No change
<i>Lampsilis ventricosa</i>	Saint Joseph; Pigeon; Elkhart	No change
<b>Rare, Deteriorated Shells Only</b>		
<i>Actinonaias ellipsiformis</i>	Saint Joseph, Bristol area	Not found 1959
<i>Amblera costata</i>	Saint Joseph, South Bend area	No change
<i>Carunculina glans</i>	Little Elkhart	No change
<i>Carunculina parva</i>	Little Elkhart	No change
<i>Dysnomia triquetra</i>	Saint Joseph, Bristol area	Not found 1959
<i>Ligumia recta</i>	Saint Joseph, South Bend area	Declined
<i>Quadrula pustulosa</i>	Saint Joseph, Elkhart area	Not found 1959
<i>Truncilla truncata</i>	Saint Joseph, Elkhart area	Not found 1959

High-speed motor boats and water skiing disturb microhabitats of bottom organisms. The shallow areas of the river and shoreline region are particularly affected by these activities. The principal harm done is the mixing of bottom sediments into the water.

In conclusion, the Saint Joseph River Drainage in Indiana has been changing gradually from "free-flowing" bodies of water toward controlled, restricted channels and ditches. Many small floodplain areas have been eliminated. The habitat alterations augmented by significant industrial, domestic, and agricultural influence on the water supply have destroyed some species of Mollusca and greatly reduced the population of others.

The Asiatic clam, *Corbicula fluminea* Muller, has not been found in this drainage, but is abundant in the Wabash and White rivers, and the cultured pearl industry as reported by Krumholz *et al.* (8) has not affected the Saint Joseph River population of Mollusca.

It is very difficult to examine all of the numerous small tributaries of the Saint Joseph River and the isolated habitats within the river. Other species may be found in future studies. Some species not reported for the Saint Joseph River Drainage in Indiana have wide geographic distributions and are recorded for adjacent drainage systems.

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### Literature Cited

1. BAKER, F. C. 1922. The molluscan fauna of the Big Vermillion River, Illinois, with special reference to its modification as a result of pollution by sewage and manufacturing wastes. Ill. Biol. Monogr. 7:105-224.
2. CALL, R. E. 1895. On a small collection of mollusks from Northern Indiana. Proc. Indiana Acad. Sci. 246-250.
3. ———— 1900. A descriptive illustrated catalogue of the Mollusca of Indiana. 24th Annu. Rep. Indiana Dep. Geol. and Nature Resources. 1899:335-535.
4. DINEEN, C. F. 1960. Bottom types and bottom organisms of the Saint Joseph River. Fish. Res. Rep., Statewide Fish. Invest., Indiana Dep. Conserv. 3(2):2-27.
5. DOLLEY, JOHN S. 1933. Preliminary notes on the biology of the Saint Joseph River. Amer. Midland Natur. 14:193-227.
6. GOODRICH, C., and H. VAN DER SCHALIE. 1944. A revision of the Mollusca of Indiana. Amer. Midland Natur. 32(2):257-326.
7. HERRINGTON, H. B. 1962. A revision of the Sphaeriidae of North America (Mollusca: Pelecypoda). Misc. Pub. No. 118. Mus. of Zool. Univ. of Mich.
8. KRUMHOLZ, L. A., R. L. BINGHAM, and E. R. MEYERS. 1970. A survey of the commercially valuable mussels of the Wabash and White Rivers of Indiana. Proc. Indiana Acad. Sci. 79:205-226.
9. VAN DER SCHALIE, H. 1930. The clamming industry of the Saint Joseph River. Rep. No. 38, Nov. 3, 1930. Inst. Fish. Res., Univ. Mus., Univ. Mich., Ann Arbor, Mich. 12 p. (unpublished report).
10. ———— 1936. The naiad fauna of the Saint Joseph River Drainage in Southwestern Michigan. Amer. Midland Natur. 17:523-527.
11. WENNINGER, F. 1921. A preliminary report on the Unionidae of the Saint Joseph River. Amer. Midland Natur. 7:1-28.