Distribution of Unionids in Hinkley Creek, Portage County, Ohio[1,2]

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INTRODUCTION

In 1962 the U. S. Army Corps of Engineers began constructic a dam on the West Branch of Mahoning River, Portage County, (The present study was undertaken as part of a program to esta observation stations on some of the tributaries of Mahoning Rive purposes of monitoring changes in stream regimen and unionid f that might result from the impounding of water at the dam site.

Hinkley Creek, located near the center of Portage County (fig is an underfit stream flowing generally in a southern direction ar a tributary of the West Branch of Mahoning River, joining the riv a point aproximately 5 miles east-southeast of the city of Rave Recharge of the creek takes place by rainfall, ground water, an part, by springs that are common to the area.

In January, 1966, three stations were selected for study a Hinkley Creek on the basis of variability of bottom sediment, dep water, velocity of water, areal extent of the stream bottom, and ac bility to the stations. The station locations are as follows:

Station 1 (fig. 2) is on the north side of Newton Falls Road, w Hinkley Creek crosses under the road, .35 miles east of the i section of Esworthy and Newton Falls Roads.

Station 2 (fig. 3) is 75 yards upstream from Station 1.

Station 3 (fig. 4) is 50 yards east of Rock Spring Road, .2 north of the intersection of Rock Spring Road and State Route

These stations were studied for a period of one year (January–Dece 1966) in an effort to draw some general conclusions about the dist tion of *Lampsilis siliquoidea* and *Anodonta grandis* in relation to st morphology.

Prior to the present study, very little has been done to describ distribution of bivalves in Hinkley Creek. Swart's study (1940), o mollusks of the West Branch of Mahoning River included a static Hinkley Creek (Swart's Station #7, which is the same as Wit Station #1) from which he reported *Lampsilis siliquoidea.*

Collections made in 1951 by Dexter and Swart (Dexter, *et al.*, p. 25) showed that *Lampsilis siliquoidea* and *Anodonta grandis* very abundant in the West Branch of Mahoning River. These data found to be the same in July, 1966, by this writer as indicated by pling of the river at the mouth of Hinkley Creek.

The author expresses sincere thanks to Dr. Barry B. Miller,

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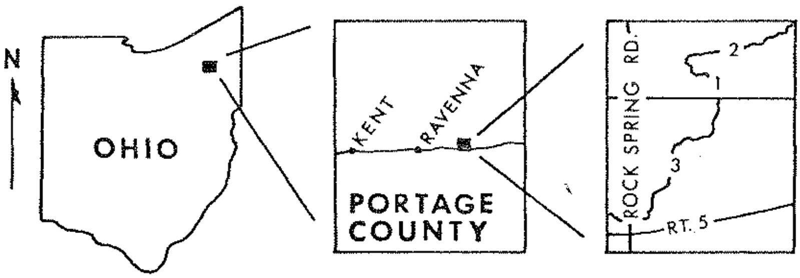

Figure 1.—Location of Hinkley Creek showing the three stations studied over a period of one year.

State University, for his help in initiating and guiding this project, and for taking specimens of *Lampsilis siliquoidea, Anodonta grandis,* and *Lasmigona complanata* to the Museum of Zoology, University of Michigan, to have their identity verified by Dr. Henry Van Der Schalie. Special thanks also go to Dr. Rodney M. Feldmann, Kent State University, for his help with the critical reading of the manuscript.

FIELD PROCEDURE

Three stations were selected along Hinkley Creek which represented three different environments. A topographic map of each station was constructed to facilitate location of points at which observations were made (figs. 2–4).

Each station was visited once in mid-January and mid-December, and at least three times during each of the months of March, May, and

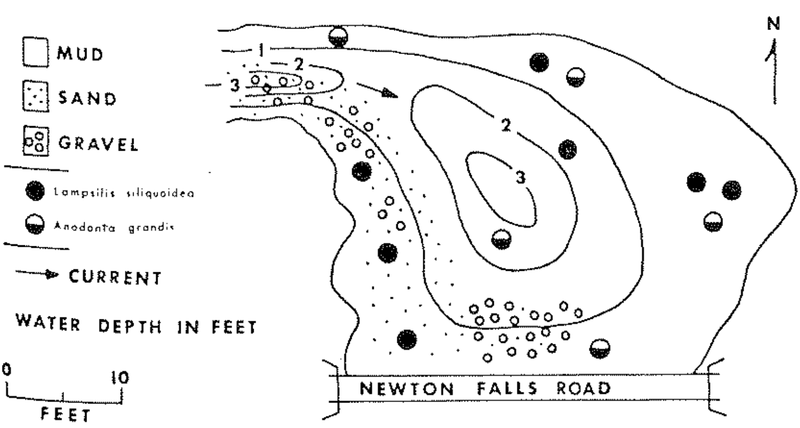

Figure 2.—Station 1 (May 19, 1966), showing the location of clams in relation to depth of water and type of bottom sediment; each large circle represents approximate areal location of eight clams.

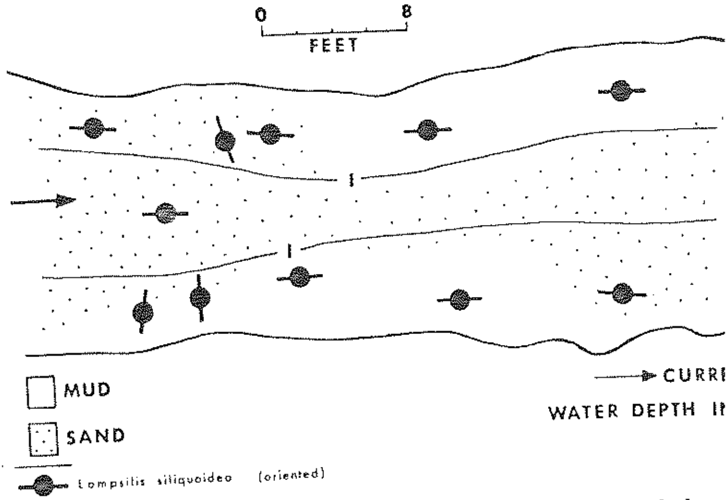

Figure 3.—Station 2 (May 25, 1966), showing the location of clams
tion to depth of water and type of bottom sediment; ea
circle represents approximate areal location of five clams.

August. Various measurements were made at the time of each v
these data were then averaged out (where possible) to single fi
each month (tabs. 1–3). The pH was measured using a Beck
meter; water velocity (bottom 3 inches of the stream) was de
using a Gurley Pygmy Current Meter; O_2 and CO_2 was obtai
the use of a Hach Water Analysis Kit. The depth of water
erally shallow, and almost always very clear which made the
counting, and identifying of the clams very easy.

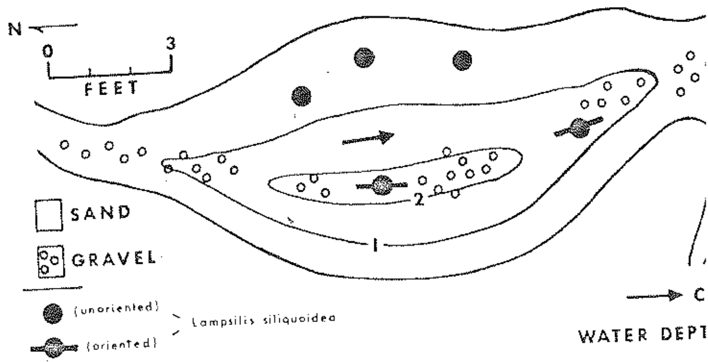

Figure 4.—Station 3 (May 4, 1966), showing the location of clam
to depth of water and type of bottom sediment; each
represents approximate areal location of five clams.

TABLE 1.—Data from Station 1; all information represents average values for each month; L.S. = *Lampsilis siliquoidea*; A.G. = *Anodonta grandis.*

	March	May	August
Type of bottom	10% sand 90% mud	20% sand 80% mud	20% sand 80% mud
Stream bottom area	900 sq. ft.	900 sq. ft.	900 sq. ft.
Max. water depth	4 feet	4 feet	3.5 feet
Species & number of clams	L.S. 20 A.G. 15	L.S. 55 A.G. 35	L.S. 14 A.G. 6
Location of clams & water depth in feet	L.S. mud > 1.5 A.G. mud > 1.5	L.S. sand .5–1 A.G. mud .5–3	L.S. sand .5–1 A.G. mud .5–3
Clam orientation	none	none	none
O_2 in p.p.m.	7	9	7
CO_2 in p.p.m.	160	55	110
pH	7.9	7.5	7.8
Temp. of bottom °C.	9	23	28
Water vel. in f.p.s.	<1	<1	<1

TABLE 2.—Data from Station 2; all information represents average values for each month; O_2, CO_2, pH, and temperature measurements were not made for the month of August; L.S. = *Lampsilis siliquoidea.*

	March	May	August
Type of bottom	40% sand 60% mud	60% sand 40% mud	60% sand 40% mud
Stream bottom area	600 sq. ft.	600 sq. ft.	600 sq. ft.
Max. water depth	1.5 feet	1.5 feet	1 foot
Species & number of clams	L.S. 3	L.S. 57	L.S. 40
Location of clams & water depth in feet	mud 1.5	sand .5	sand .5
Clam orientation	parallel to direction of current		
O_2 in p.p.m.	6	11	?
CO_2 in p.p.m.	48	135	?
pH	7.8	7.8	?
Temp. of bottom °C.	6	22	?
Water vel. in f.p.s.	<1	<1	<1

TABLE 3.—Data from Station 3; all information represents average for each month; O_2, CO_2, and pH measurements were not made for the of August; L.S. = *Lampsilis siliquoidea.*

	March	May	August
Type of bottom	sand to cobble	sand to cobble	gravel & cob
Stream bottom area	200 sq. ft.	200 sq. ft.	40 sq. ft.
Max. water depth	2.5 feet	2.5 feet	.5 feet
Species & number of clams	L.S. 20	L.S. 24	L.S. 6
Location of clams & water depth in feet	sand 2.5	sand .5–2.5	gravel .5
Clam orientation	parallel to current		none
O_2 in p.p.m.	6	10	?
CO_2 in p.p.m.	180	150	?
pH	7.3	7.9	?
Temp. of bottom °C.	8	20	31
Water vel. in f.p.s.	>1–3	>1–3	none

STATION OBSERVATIONS

January

Station 1.—*Lampsilis siliquoidea* and *Anodonta grandis* w cated in the deepest segment of the stream, and were for the mc unoriented. Evidence of movement in the form of short trails (inches in length) was noted. It was also noted that the majority clams observed were almost wholly buried in areas of mud bottoı partially buried in areas of sand to gravel bottoms. No measu were made during this month except depth of water and areal e stream bottom.

Station 2.—No clams were observed at this station during J

Station 3.—*Lampsilis siliquoidea* was observed in the dee ment of the stream, and the activities of this species was much tl as at Station 1.

March

Station 1.—An average figure of 35 clams is given in Tab this month. These bivalves were near shore and only partially in the bottom. Raking the deeper portions of the area disclo fact that many clams were almost wholly buried in the substr therefore quite hard to observe; hence, the exact number of cl not known for this month at this station.

Station 2.—Three specimens of *Lampsilis siliquoidea,* parallel to the current, were found at Station 2, and whether the into the area from another portion of the stream, or were mostly buried in the bottom and not noticed in January is unknown. The station was carefully checked at this time and no other clams were observed.

Station 3.—At Station 3, the clams were more active than in January, but were, for the most part in deeper portions of the stream. They did, however, assume an orientation parallel to the current, which they lacked during January.

May

Station 1.—During the month of May the majority of *Lampsilis siliquoidea* had moved to a sandy bottom and were for the most part in water 1 foot or less in depth. *Anodonta grandis* was found in all depths of water, but restricted to a mud bottom.

Station 2.—Although a large number of clams had moved into Station 2 (fig. 3) by May, they were all the same species, *Lampsilis siliquoidea.* Whether they had moved into this station from up or downstream is not known. Prior to the occurrence of *Lampsilis siliquoidea* at Station 2, both *Lampsilis siliquoidea* and *Anodonta grandis* were noted in quantity above and below this station. One possible reason for the absence of *Anodonta grandis* at this station may be the effect of the sandy to gravelly bottom found directly above and below this station which essentially acts as a barrier for this species.

Station 3.—Table 3 indicates that the location of *Lampsilis siliquoidea* is variable in regards to selection of depth of water. In general, however, more were found in the sandy shallows rather than the coarser bottom in the deeper water. During mid-May, seven specimens of *Lampsilis siliquoidea* were observed partly buried in sand, unoriented, and in water one foot or less in depth. They were all females, and it is believed that they were spawning. As the depth of water in which the clams were found increased, their orientation was more regular. This was, however, a reflection of an increase in velocity, and not depth, as indicated by velocity readings in the shallow versus the deeper portion of the channel.

August

Station 1.—Toward the end of the month of May, all of the clams were removed from Station 1 as part of an experiment to determine the rate of repopulation. It was interesting to note that by early August at least 20 clams had migrated into Station 1. Assuming that the sandy to gravelly segments of the stream are hostile to *Anodonta grandis*, it would seem logical to assume that the *Anodonta grandis* found at Station 1 moved into the area from downstream, since, based on bottom sediment distribution, this route would appear to have been most propitious. On the other hand, *Lampsilis siliquoidea* could have moved into the area from either direction.

Station 2.—Between the months of May and August, the population of unionids decreased at Station 2. This drop in number could represent some or all of the *Lampsilis siliquoidea* that had repopulated Station 1. Migration out of Station 2 into Station 1 may be linked to the fact that the deepest water is only, at this time, 1 foot at Station 2. Raccoon tracks and piles of broken clam shells along the banks of Stati suggests that the decrease in number, in part, is attributable to predа Orientation of the clams during the month of August at Station 2 very good, with most of the *Lampsilis siliquoidea* oriented parall the current.

Station 3.—At Station 3 the drop of the water level was 2 compared to only ½ foot at Stations 1 and 2. The explanation for t enigmatic and is perhaps related to a lower water table or po differences in stream bottom materials. The drastic drop in water co with the decrease of bottom area resulted in death for all but six o clams. Dead shells were found within a part of Station 3 which had isolated from the rest of the stream by a dry zone, indicating pe that the clams were trapped and unable to move out.

December

Each station was visited once in December. The water level was up to what it had been in the first half of the year, and, at Stati things were much as they had been in January. Station 2 was vo clams, as in January, and Station 3 had only seven clams in it, refle no repopulation after August.

DISCUSSION

Two specimens of *Lasmigona complanata* (identification ve by Van Der Schalie) were collected from Station 1 in mid-May. were living on a mud bottom, half buried, in three feet of water. these were the only two specimens collected from the three st during the entire time of the study, they have been excluded fro tables and the text on station observations. Collections made by (1940) and Dexter (1963) do not record *Lasmigona complana* Hinkley Creek or the West Branch of Mahoning River. La Roc compilation of data (1967, p. 188) on *Lasmigona complanata* it to be absent from the northeast quarter of Ohio. It therefore ap that this would be the first recorded occurrence of this species in east Ohio. La Rocque goes on to say (p. 191) that *Lasmigona planata* is found exclusively in quiet waters with muddy bottoms, corresponds to the present author's findings.

By far, the most common unionid in Hinkley Creek is *Lan siliquoidea*. The majority of this species observed preferred a bottom, and selected, as a whole, stretches of the creek having a ve of less than 1 foot per second. During the winter months, *Lan siliquoidea* is quite restrictive in location and movement, being fou both muddy and sandy bottoms in the deeper waters. Swart (1 suggests that the optimum environment of *Lampsilis siliquoidea* sandy to gravelly bottom and a swift current, which is certainly no of Hinkley Creek. Swart's work (p. 33) also shows *Lampsilis siliqu* to be the second most common unionid in his study, with 92 spec counted versus 93 specimens of *Anodontoides ferussacianus* count the West Branch of Mahoning River. La Rocque (p. 226) ind *Lampsilis siliquoidea* as preferring quiet waters with a sandy to m bottom, which is more in accord with my findings. La Rocque (p.

also indicates *Lampsilis siliquoidea* to be well distributed throughout Ohio.

Anodonta grandis was collected from Hinkley Creek (Wittine's Station #1) in 1966, but was not mentioned by Swart (1940) as being present at this same locality (Swart's Station #7), or in the West Branch of Mahoning River when he did his research. However, its occurrence was noted (Dexter, 1963) in the West Branch of Mahoning River in 1951. La Rocque (p. 181) shows *Anodonta grandis* to be widely distributed over much of the state of Ohio, including Portage County. La Rocque says (p. 185) that *Anodonta grandis* is a quiet water inhabitant, preferring muddy to sandy bottoms. The present work on Hinkley Creek indicates it to be exclusively a muddy bottom inhabitant.

CONCLUSIONS

1. *Anodonta grandis* was found only in a mud bottom environment, which is necessarily associated with sections of the stream having velocities of less than 1 foot per second.
2. *Lampsilis siliquoidea* is found in both muddy and sandy to gravelly bottoms, but prefers the sandy bottom and seems to select a lower velocity (less than 1 foot per second) over a nearby higher velocity stretch of the stream. This differs from Swart's optimum environment (1940, p. 36) for *Lampsilis siliquoidea* which was defined as a gravel bottom and a swift current.
3. An increase in velocity of water causes the clams to become well oriented (long axis of the shell parallel to the current); whereas an increase in depth of water in itself does not influence clam orientation.
4. Based on the repopulation of Station 1 from May to August, and based on the number of clams that occupied Station 2 from May to late August, then moving out into deeper waters for the winter months, it would be safe to say that *Lampsilis siliquoidea* migrates to shallow sandy bars (in this case a migratory distance of at least 25 yards) during the summer months and retreats to deeper water for the winter months.
5. During the winter months (post-August to pre-May) *Lampsilis siliquoidea* and *Anodonta grandis* prefer the deeper segments of the stream and are restrictive in movement.
6. *Lasmigona complanata* was collected at Station 1 and represents the first record of this species in northeast Ohio.

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