Diatom phytoplankton and periphyton studies of the headwaters of Henrys Fork of the Snake River, Island Park, Idaho

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DIATOM PHYTOPLANKTON AND PERIPHYTON STUDIES
OF THE HEADWATERS OF HENRY'S FORK
OF THE SNAKE RIVER,
ISLAND PARK, IDAHO

A Dissertation
Presented to the
Department of Botany and Range Science
Brigham Young University

In Partial Fulfillment
of the Requirement for the Degree
Doctor of Philosophy

by
Richard L. Clark
April 1975
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Appreciation is expressed to Dr. Samuel R. Rushforth, chairman of my advisory committee, for his help, concern, patience, and encouragement. He has been not only a good advisor but a great teacher and a good friend.

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To Dr. Lorentz C. Pearson special acknowledgement is given. Years ago in a freshman botany class he somehow instilled in me a love for the study of plants and assured me that I too could contribute to botanical science.

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INTRODUCTION

The headwaters of Henrys Fork of the Snake River are located on the western slope of the continental divide adjacent to the Yellowstone Plateau in southeastern Idaho. Most of the headwater streams that join to form this river system originate as springs. Snow melt surface waters contribute significant volume only during the spring runoff. Consequently, the waters of the North Fork are consistently characterized by high dissolved oxygen, low water hardness, and low turbidity (Speth, 1972).

During recent years this upper river drainage basin known as Island Park has experienced increased human impact. U. S. Highway 191, locally known as the Yellowstone Highway, bisects Island Park providing a major route to Yellowstone National Park. As the number of Yellowstone Park visitors has increased, the facilities available inside the park have not met the demand. Consequently, many tourists have opted to stay in the Island Park region. Campgrounds, lodges, and motels in this area have experienced increased visitation especially during July and August.

Island Park waterways are known for their excellent fly fishing. As the fame of the area has spread, the number of fishermen who frequent these choice trout streams...
has increased. The incidence of hikers and campers has also increased in the area, and their impact is noteworthy. Unseemly motorcycle trails are increasingly found. Subdivision of deeded ground and the proliferation of summer homes has accelerated dramatically. This factor is particularly critical since no master plan for sewage disposal or for meeting culinary water demands has been followed in the development of these homes.

Such increased utilization of the Island Park area will undoubtedly affect the waters of the Henrys Fork drainage system. The possibility of cataloging current status in order to monitor future changes in these waters has stimulated this study of the diatom communities of the drainage. Qualitative and quantitative floristic and ecological baseline data have been gathered in order to establish references for future comparisons.

Diatoms are often excellent indicators of water quality (Palmer, 1962). Some species have broad ranges of ecological tolerance while others have very narrow ecological ranges. In addition, algal populations may change dramatically with changes in the ecosystem. Thus, the presence or absence of certain indicators together with population studies can provide rather reliable indications of water quality. Without question, an understanding of algal communities is extremely valuable in the study of changing aquatic systems.

Algae are important in such studies from another
point of view. Since they are photosynthetic, they are primary producers and form the base of many food chains in river systems (Blum, 1956). Algae are not only a source of food for other aquatic organisms but are often an important source of oxygen for the entire ecosystem.

With the above facts in mind, the objectives of this study are: (1), to gather baseline floristic data concerning planktonic and periphytic diatoms of the lentic and lotic waters of the upper Henrys Fork of the Snake River; and (2), to assess diatom community associations and their dynamics in the same water systems.

No comprehensive diatom baseline studies have been made to date in the state of Idaho. However, a number of similar investigations have been completed in adjoining Montana, Wyoming, and Utah.

A study of the periphyton of the West Gallatin River, Montana, was conducted by Gumtow (1955). Quantitative measurements of diatom populations were obtained from samples taken from stone substrates. Twenty-six species in eighteen genera of diatoms were found. The most common genera included Navicula, Diatoma, Cymbella, Cocconeis, Synedra, and Ceratoneis (Hannaea). Two peaks of diatom productivity were noted, one in September and the other in March. The fall bloom was more productive by cell count than the spring bloom. Some correlation between periphyton standing crop and the physical characteristics of the stream, including discharge, turbidity, and ice effects,
Clark (1958) studied the dislodged periphyton as drift phytoplankton of the Logan River, Utah. He saw no diurnal nor seasonal fluctuations in drift samples taken from stations in Logan Canyon. However, he did note seasonal pulses of diatoms along the lower Logan River in Cache Valley. Diatoms were sampled using a plankton net, membrane filtration, and centrifugation. Counts were made on a haemacytometer. The predominant diatoms included *Achnanthes minutissima* Kutz., *Amphora perpusilla* Grun., *Diatoma vulgare* Bory, *Cymbella ventricosa* Kutz., *Cocconeis pediculus* Ehr., *Fragilaria capucina* Rab., and *Navicula cryptocephala* Kutz. Ecological considerations and methods were emphasized in this study at the expense of floristic analysis.

Roeder (1966) surveyed the diatom floras of the Madison and Gardner River drainages of Yellowstone National Park, Montana and Wyoming. By statistical methods he demonstrated that the floras of these two drainages were different, and that the differences seemed to correlate with cation composition and concentration. He also showed that diatom communities in high and low alkalinity areas of the Madison River were different and that greater diatom productivity occurred where the alkalinity and conductivity were high. A total of three hundred eleven taxa of diatoms were reported with one hundred eighty-one taxa found in the Firehole River, one hundred sixty-two in the Gibben River,
one hundred ninety-four in the Madison River, and one hundred eight in the Gardner River.

An extensive taxonomic and ecological study of the diatom communities of Flathead Lake, Montana, was made by Moghadam (1969). She identified three hundred thirty-six taxa and described five new species and two new varieties. Using species diversity indices, comparisons of communities differing in depth, location, and season were made. The most abundant species included *Tabellaria quadrisepta* Knuds., *Fragilaria crotonensis* Kitt., *Asterionella formosa* Hass., *Rhizosolenia eriensis* H. L. Sm., *Cyclotella comta* (Ehr.) Kutz., and *Cyclotella ocellata* Pant.

Bahls (1971) studied the diatom flora above and below the effluent of an abandoned sewage treatment plant on the East Gallatin River, Montana. He was not able to show significant differences in his collections. One hundred thirty-eight taxa of diatoms were reported in this study. An inverse relationship between current and the productivity and diversity of diatoms was proposed. In addition, current was shown to exert some selectivity for certain taxa. *Nitzschia dissipata* (Kutz.) Grun. was the most common diatom encountered with a mean abundance of 35.2 per cent.

Squires et al. (1973) made a quantitative ecological survey of the algae of Huntington Canyon, Utah. Seasonal variations in periphyton, phytoplankton, and drift phyton were recorded as part of an environmental impact study made
prior to the construction of a coal-burning power plant in the canyon. Diatoms were collected with plankton nets and with glass slide artificial substrates. A species list including one hundred seven diatom taxa was produced in this study.

Seasonal and spatial distribution of the diatoms of the Provo River, Utah, was studied by Lawson (1974) in a comprehensive taxonomic treatment of the diatoms of that river. This study was intended to be both a baseline investigation of the diatom flora and an aid for future taxonomic work on diatoms of rivers in the Intermountain area of the United States. Complete descriptions and illustrations are provided for the two hundred five taxa of diatoms observed in the study.

Endsley (1974) completed a comprehensive taxonomic study of the algae of Huntington Canyon, Utah. She reported, described, and commented on the distribution of one hundred twenty-nine taxa of diatoms and one hundred seven taxa of other algae. This study was done in co-operation with Squires et al. (1973) in an attempt to establish an aquatic algal baseline for the canyon. The study includes comments on noted peculiarities in frustule morphology to aid in understanding Intermountain diatom taxonomy.
DESCRIPTION OF THE STUDY AREA

The Henrys Fork watershed basin has an area of four hundred eighty-one square miles with an average annual runoff of four hundred thousand acre feet (WRRI, 1968). This basin is largely formed within a subsidence caldera, eighteen to twenty-three miles in diameter (Ross, 1967). Geologically, the Henrys Fork basin is composed of Pliocene and Pleistocene basaltic and rhyolitic extrusive rocks that originated from a shield volcano that has since collapsed (op. cit.).

Aspen Ridge bounds the caldera on the northwest and Big Bend Ridge bounds it on the south and southwest. The steep bluffs of the Yellowstone Plateau form the northeast and east sides of the basin.

The river draining this watershed was named for Andrew Henry who led a Missouri Fur Company trapping party through the area and established Fort Henry in the valley below near St. Anthony, Idaho in 1810. It is believed this fort was the first American trading post on the Pacific slope of the Continental Divide (Stearn, 1939).

Henrys Fork of the Snake River arises as the outlet of Henrys Lake which is located in the northwest corner of the drainage. Henrys Lake occurs at an elevation of six thousand six hundred feet and has a natural surface area of
Fig. 1.—Map of Henrys Fork study area
about three thousand eight hundred acres. Local Indians relate stories of floating islands of vegetation on Henrys Lake indicating that in the past it was a biologically old lentic system, probably nearing senescence. In 1923 the lake was rejuvenated for future irrigation use by construction of the North Fork Reservoir Dam at its outlet. By construction of this dam, Henrys Lake became a reservoir for irrigation water with a capacity of seventy-nine thousand three hundred fifty acre feet (WRRI, 1968).

Henry's Lake Outlet meanders across Henrys Lake Flat to the southwest forming many oxbow bends and braided streams. The stream banks are heavily covered with willows and occasional open areas support various grasses and herbaceous broadleaf plants.

Approximately twelve miles from Henrys Lake, the outflow stream of Big Springs joins Henrys Lake Outlet. Big Springs issues from spherulitic obsidian and rhyolite of the lower bluffs of the Yellowstone Plateau (Stearn, 1939). The discharge (one hundred eighty-seven second-feet) and temperature (eleven degrees centigrade) of Big Springs are constant summer and winter (op. cit.). The spring outflow flows westward about two miles to its junction with Henrys Lake Outlet.

At Big Springs, Lodgepole Pine (Pinus contorta) forest becomes the principal vegetation along the river. This forest is homogeneous across the basin except on the ridges where Douglas Fir (Pseudotsuga taxifolia) is often
found.

Below the confluence of Big Springs with Henrys Lake Outlet the river flows quietly to the west. However, at Macks Inn, some six miles from the confluence with Big Springs, the river has become more channelized. The flow of the water increases and the river flows more rapidly to form rapids below Coffeepot Campgrounds. The river courses southerly below Macks Inn. At McCraes Bridge, six miles downstream from Macks Inn, the river flows directly south into Island Park Reservoir.

The United States Bureau of Reclamation built the Island Park Dam in 1938. The reservoir formed behind the dam is six thousand three hundred feet in elevation and has a capacity of one hundred thirty-seven thousand five hundred sixty acre feet. Stored water is used primarily for irrigation (WRRI, 1968).

The Buffalo River joins Henrys Fork just below Island Park Dam. This stream arises from numerous small springs some ten miles upstream from the dam and about four to five miles south of Big Springs. Like Henrys Fork, the Buffalo River stream flow is quiet with constant meandering and braided conditions. The banks are covered with lodgepole pine and the stream bed is often cluttered with pine deadfall.

From Island Park Dam, Henrys Fork flows south through Box Canyon and eventually onto the Last Chance flats. The river bed here is composed of exposed igneous
bedrock with very little sand or silt accumulated even along the edges. The river here is broad and shallow, and the flow is rapid.
METHODS AND MATERIALS

Seventeen collection sites were established in April, 1971 to study the diatom flora of the Henrys Fork headwaters. These sites are described in the following paragraphs. In addition, collection sites are shown on Fig. 2.

**Station X, Henrys Lake:** R3E T14S Sec 16 SE1/4

Station X is located at Henrys Lake State Park. Phytoplankton samples were collected here from the end of a dike located near the public boat ramp. Qualitative and quantitative determinations were made of the diatom plankters of this site. Periphyton were studied qualitatively and their abundance was estimated. This station was visited every two weeks from May 1 to November 1, 1971 and May 1 to November 1, 1972.

**Station 1, Henrys Lake Outlet:**

R3E T14S Sec 35 NE1/4

U.S. Highway 191-20 crosses Henrys Lake Outlet about three miles downstream from North Fork Reservoir Dam. Station 1 is located approximately one hundred feet above the highway bridge. Periphyton from this station were studied qualitatively and quantitatively. In addition, standing crop and productivity rates were estimated utilizing glass plate artificial substrates. Station 1
was sampled monthly from September 19, 1971 to May 1, 1973.

**Station 2, South Fork of Big Springs:**
\[R4E \text{T15S Sec 27 SW4}\]

Station 2 is located above the Big Springs Loop Road bridge about fifty feet below the south fork springs. A species list of the diatoms encountered at this collecting site was produced and an estimate of relative abundance was made. This collecting site was sampled irregularly from May 1, 1971 to May 1, 1973. Samples were taken at least quarterly.

**Station 3, North Fork of Big Springs:**
\[R4E \text{T15S Sec 27 SW4}\]

The majority of the total discharge from Big Springs issues from the north fork springs. This collecting station is above the Big Springs Loop Road bridge, extending from the springs proper downstream approximately fifty feet. Seep areas along the banks as well as the springs and stream were sampled. Collections were made and samples were treated identically to those of Station 2.

**Station 4, Big Springs Stream Near Railroad Bridge:**
\[R4E \text{T14S Sec 33 NE4}\]

Station 4 is located immediately upstream from the Union Pacific Railroad bridge which is approximately one-half mile above the confluence of Big Springs with Henrys Lake Outlet. Qualitative and quantitative studies were made on the periphyton of this site together with standing crop and productivity rate studies. Samples were collected
Fig. 2.--Collection sites on Henrys Fork headwaters
Fig. 3.--Station X, Henrys Lake

Fig. 4.--Station X, Henrys Lake
Fig. 5.--Station 1, Henrys Lake Outlet

Fig. 6.--Station 2, south fork of Big Springs
Fig. 7.--Station 3, north fork of Big Springs

Fig. 8.--Station 4, Big Springs stream
Fig. 9.--Station 4, Big Springs stream

Fig. 10.--Station 8, Henrys Fork near Macks Inn
Fig. 11.--Station 8, Henrys Fork near Macks Inn

Fig. 12.--Station 10, Chick Creek Springs
Fig. 13.--Station 11, Buffalo River near Elk Creek

Fig. 14.--Station 12, Buffalo River near Ponds Lodge
Fig. 15.--Station B, Buttermilk Landing on Island Park Reservoir.

Fig. 16.--Station B, Island Park Reservoir
Fig. 17.--Station C, Island Park Dam

Fig. 18.--Station C, Island Park Dam
Fig. 19.--Station D, Henrys Fork at Last Chance

Fig. 20.--Station D, Henrys Fork at Last Chance
monthly.

Station 5, Henrys Lake Outlet Above Confluence:  
R4E T15S Sec 36 SW¼

The Big Springs Loop Road crosses Henrys Lake Outlet nine miles downstream from Henrys Lake dam. Site 5 is located three hundred yards downstream from the bridge. Samples were taken at least quarterly here from May 1, 1971 to May 1, 1973, and diatoms were studied qualitatively.

Station 6, Henrys Fork: R3E T15S Sec 35 NE¼

Four stations were established on Henrys Fork between the confluence of Henrys Lake Outlet with Big Springs and Island Park Reservoir. Station 6 is located one-half mile below the confluence of Moose Creek with Henrys Fork. Diatoms collected here were studied qualitatively. Sampling was done only during the summer months of 1971 and 1972.

Station 7, Henrys Fork: R3E T15S Sec 36 NW¼

U.S. Highway 191-20 crosses Henrys Fork at Macks Inn. Station 7 is located one hundred yards above the bridge. Periphyton samples were collected here at least quarterly from May 1, 1971 to May 1, 1973. Floristic studies of these samples were performed.

Station 8, Henrys Fork: R3E T15S Sec 38 SW¼

Station 8 is located three hundred yards below the highway bridge at Macks Inn. Qualitative and quantitative studies of the samples from this site were conducted in the
same manner as at Station 1. Sampling was done monthly.

**Station 9, Henrys Fork: R3E T15S Sec 38 SW½**

Station 9 is located fifty yards downstream from Upper Coffeepot Campground. Due to the inaccessibility of this locality during winter months, the site was treated in the same manner as Station 6 with no winter collections. Floristic studies of the samples were made.

**Station 10, Headwaters of Buffalo River: R3E T13N Sec 13 SW½**

This collecting site is located one hundred yards below the road at Chick Creek Springs. Sampling was done monthly from June 1, 1971 to October 1, 1971 and June 1, 1972 to October 1, 1972. Qualitative data were recorded regarding the diatom flora of this site.

**Station 11, Buffalo River Near Elk Creek: R3E T13N Sec 23 SW½**

Elk Creek joins the Buffalo River immediately above the Buffalo Campground. Station 11 is located twenty-five yards above the confluence. This station was collected only during the summer months of 1971 and 1972, and qualitative studies were made of the diatoms in the samples.

**Station 12, Buffalo River: R3E T13N Sec 27 W½**

Station 12 is located one hundred yards below the bridge where U.S. Highway 191-20 crosses the Buffalo River. The site was an intensive study station and was treated similarly to Station 1.
Station A, Island Park Reservoir at McCraes Bridge: R3E T13N Sec 8 SE¼

Station A is located just below McCraes Bridge. During periods when the reservoir was full, phytoplankton and periphyton were collected at this station. At other times, only periphyton could be collected. Qualitative data were obtained during the summer months and once during the winter.

Station B, Island Park Reservoir at Buttermilk Landing: R3E T13N Sec 24 SW¼

This collecting site is located off the east pier of the boat ramp at Buttermilk Campground. Diatom phytoplankton studies were conducted here from May 1, 1971 to November 1, 1971 and May 1, 1972 to November 1, 1972. Qualitative as well as quantitative studies were made from these samples.

Station C, Island Park Dam: R3E T13N Sec 28 SW¼

Station C is located on Henrys Fork immediately below the spillway of Island Park Dam. Monthly collections were taken from this locality from May 1, 1971 to May 1, 1973. Qualitative diatom studies were performed on samples from this site.

Station D, Henrys Fork Below Last Chance: R3E T12N Sec 17 S½

Station D is located three hundred yards below the village of Last Chance. Monthly collections were taken here from May 1, 1971 to May 1, 1973, and qualitative
studies were made.

Stations X, A, B, C, and D were sampled for diatom net plankton and nannoplankton. Quantitative data were accumulated only at Station X (Henrys Lake) and Station B (Island Park Reservoir). All stations were sampled for periphyton.

Net Plankton

Net plankton were sampled after Squires et al. (1973). A forty-liter sample was collected by subsampling five randomly selected sections of the site with an eight-liter bucket. These forty liters were filtered through a sixty-seven um mesh plankton net and the net plankton were concentrated in a thirty-milliliter vial attached to the net. Samples were inspected and counted shortly after collection.

A method modified from Weber (1970) was used in counting the net plankton. Following thorough mixing, a one-milliliter aliquot was transferred from the thirty-milliliter sample vial to a Sedgwick-Rafter counting cell. Counting was done at 160 magnifications using a Zeiss photomicroscope. A whipple ocular micrometer was used to establish a width for transects taken on the counting cell.

A minimum of four hundred cells was counted for each sample as suggested by Clark (1956). In order to maintain as sensitive a counting procedure as possible it was often necessary to dilute or to concentrate samples
appropriately. Data were recorded as algae per milliliter.

**Nannoplankton**

Nannoplankton were collected by randomly sub-sampling two liters of the water that passed through the sixty-seven um mesh plankton net. At the laboratory this subsample was suction filtered through a membrane filter with a pore size of 1.2 um. The filter was cleaned with distilled water and the resulting suspension was centrifuged or diluted to a concentration appropriate for counting. Counting of nannoplankton was done using a Palmer nannoplankton counting cell (Palmer and Maloney, 1954). This cell is designed for counting at 400 magnifications. Four hundred organisms were counted for each nannoplankton subsample and data were recorded as algae per milliliter.

**Periphyton**

Though all study sites were sampled for diatom periphyton only stations 1, 4, 8, and 12 were quantified. Qualitative studies were made using methods adapted from Wetzel and Westlake (1969). Natural substrates were sampled proportionately to the type of substrate available at the site. These composite collections were mixed thoroughly. Fresh mounts were prepared, inspected with the microscope, and the species present recorded. Notes were also made on the number and types of living and dead cells. Permanent diatom slides were prepared as
outlined by Patrick (1966). Early collections were mounted in pleurax (Hanna, 1949). However, this medium was abandoned for the more versatile hyrax (Hanna, 1930).

Qualitative studies involved studying the permanent diatom slides and recording the taxa present. The abundance of each taxon was estimated as R - rare, O - occasional, C - common, and A - abundant (See Appendix I).

Quantitative periphyton investigations involved a species proportional analysis as outlined by Weber (1970). Each monthly collection from stations 1, 4, 8, and 12 was cleaned and permanently mounted in hyrax. One thousand cells were counted and percent composition for each taxon observed was recorded. Only the ten most abundant taxa at each of these stations will be reported in this paper.

Monthly periphyton production rates were estimated utilizing a technique similar to that of Castenholz (1960). A number of workers including Newcombe (1949, 1950), Patrick, et al. (1954), Grzenda and Brehmer (1960), Wetzel (1963), King and Ball (1966), and Kevern, et al. (1966) have used artificial substrates to study periphyton productivity, growth, and succession. The use of artificial substrates for these purposes has been reviewed by Cooke (1956) and Sladeckova (1962).

In this study, glass plates one-quarter inch thick, five-centimeters wide, and ten centimeters long were used. Dor (1970) suggested that glass slides were a satisfactory substrate for periphyton but may allow only seventy-six
per cent of the production found on some natural substrates. These plates were attached to bricks with black plastic tape and the bricks were placed in the stream in such a way that the plates were horizontal to the stream bed. Four plates were placed at each station each month as suggested by Newcombe (1949). Production rate studies were conducted only at Stations 1, 4, 8, and 12. Each station was divided into fifty sections by sectioning a one-hundred-foot length of the stream into ten units and partitioning the width of the stream into five channels. A random numbers table was used to select four grids for placement of the plates. The same locations were used throughout the study period. The first plates were placed in the stream on October 2, 1971. The last plates were removed one year later. The plates were removed and replaced monthly since monthly colonization was found to be optimum by Newcombe (1949). Once removed, the plates were cleaned along the sides and bottom. They were then dried in a hot air oven for twenty-four hours and weighed on an analytical balance. The plates were transferred to a muffle furnace and fired at six hundred fifty degrees centigrade for one hour, after which they were again weighed. This ash weight was subtracted from the original dry weight to give the ash-free dry weight which was taken as an approximate measure of the organic weight of the periphyton. Ash-free dry weights were averaged from the four plates collected each month at each station. Data were recorded as milligrams per square meter per day.
Seasonal fluctuations in standing crop were also monitored at Stations 1, 4, 8, and 12. On October 2, 1971 twelve plates, prepared as outlined above, were placed in the stream in each of the four designated grids. Using a random numbers table, one of the twelve plates was removed each month until the last one was removed in October, 1972. Ash-free dry weights were determined for these plates in the same manner as the productivity rate plates. Data obtained from analyzing the four plates were averaged each month at each station. Results were recorded as grams of accumulated accrual per meter square.
RESULTS

A list of diatom species identified in the Henrys Fork drainage system together with their distribution and relative abundance is provided in Appendix I. Description of species and notes on distribution and taxonomy are provided in the taxonomic section of this paper. Illustrations of the described diatoms are presented in Appendix II.

Seasonal fluctuations observed in the planktonic diatom population on Henrys Lake is shown in Fig. 21. All diatom blooms occurred in the early spring and the late fall. *Stephanodiscus invisitatus* began to increase in number while the lake was still covered with ice. The population of this diatom soon decreased dramatically and was followed not long after the lake opened by a bloom of *Asterionella formosa* and *Synedra cyclopum*. Thus, by June 14, 1971 the number of *A. formosa* colonies exceeded eight million per liter in samples collected. *Melosira granulata* replaced *A. formosa* and *S. cyclopum* as the season progressed. The *A. formosa-S. cyclopum* bloom was depressed during the 1972 season. However, diatom plankters did linger through the summer season in 1972 although absent in 1971.

Summer algal blooms on Henrys Lake were principally comprised of species of Cyanophyta. *Gloeotrichia*
echinulata, Anabaena flos-aquae, and Aphanizomenon flos-aquae were the major non-diatom plankters. Various Chlorophyta and Chrysophyta also occurred in the Henrys Lake phytoplankton.

Island Park Reservoir supported similar blooms of S. invisitatus, A. formosa, and M. granulata to those found on Henrys Lake at approximately the same times. However, the centric bloom from under the ice was especially large on the reservoir in the spring. The bloom of M. granulata at Island Park Reservoir was larger in the fall than in the spring. Diatoma tenue var. elongatum was associated with the A. formosa spring blooms and probably first developed under the ice as suggested by collections taken at the spillway. Fragilaria crotonensis maintained a massive bloom through the summer and fall months. Seasonal fluctuations in diatom plankters are shown in Fig. 22.

Non-diatom plankters found on Island Park Reservoir were dominated by Anabaena flos-aquae, Anabaena spiroides var. crassa, and Aphanizomenon flos-aquae. Ceratium hirundinella, Synura uvella, Eudorina elegans, and Staurastrum gracile (along with other Chlorophyta and Chrysophyta) were observed but less frequently and in much lower abundance.

Figures 23 and 24 show percent composition of the ten most abundant periphytic diatom species at Station 1 on Henrys Lake Outlet and their seasonal fluctuations. The
same information for Stations 4, 8, and 12 is recorded in Figs. 25-30 respectively.

The monthly average accrual rate as determined by calculation of the ash-free dry weight of periphyton on glass plates is shown for Stations 1, 4, 8, and 12 in Figs. 31, 33, 35, and 37 respectively. The measure of accumulated accrual which is an indication of the size of the standing crop is shown in Figs. 32, 34, 36, and 38 for the same four stations. These latter measurements were obtained by harvesting each month one plate of twelve placed in the stream at the beginning of the study. Accrual rates were obtained by placing new plates in the stream each month. The high accrual rates and standing crop measurements for the month of March at Station 1 were not due to diatom periphyton alone. The station had an early spring bloom of the crysophyte *Hydrurus foetidus*. 
Fig. 21.—Seasonal distribution of planktonic diatoms on Henry's Lake
Fig. 22.—Seasonal distribution of planktonic diatoms on Island Park Reservoir
Fig. 23.--Per cent composition of dominant periphytic diatoms at Station 1
Fig. 24.--Per cent composition of dominant periphytic diatoms at Station 1
Fig. 25.--Per cent composition of dominant periphytic diatoms at Station 4
Fig. 26. -- Per cent composition of dominant periphytic diatoms at Station 4
Fig. 27.—Per cent composition of dominant periphytic diatoms at Station 8
Fig. 28.--Per cent composition of dominant periphytic diatoms at Station 8
Fig. 29. -- Per cent composition of dominant periphytic diatoms at Station 12
Fig. 30.—Per cent composition of dominant periphytic diatoms at Station 12
Fig. 31.—Monthly accrual rates at Station I

Fig. 32.—Monthly changes in standing crop at Station I
STATION 4
Big Springs

Fig. 33.—Monthly accrual rates at Station 4

Fig. 34.—Monthly changes in standing crop at Station 4
Fig. 35.—Monthly accrual rates at Station 8

Fig. 36.—Monthly changes in standing crop at Station 8
Fig. 37. -- Monthly accrual rates at Station 12

Fig. 38. -- Monthly changes in standing crop at Station 12
TAXONOMIC SECTION

Division CHRYSOPHYTA

Class BACILLARIOPHYCEAE (DIATOMAEAE)

Order RHIZOSOLENIALES

Family COSCINODISCACEAE

Genus MELOSIRA

Melosira distans (Ehr.) Kutz.

Pl. III, Fig. 6

Description.—Frustules cylindrical; valve in valve view round, 5-15 um in diameter, with large scattered punctae; valve in girdle view rectangular; sulcus present, narrow; punctae in longitudinal rows, 12-14 in 10 um; connecting zone spinose; spines, 6-15 um long.

Discussion.—M. distans was collected at all stations. It was particularly abundant in the winter at Big Springs (Stations 2, 3, and 4) and on the Buffalo River (Stations 10, 11, and 12). At Station 12 near Ponds Lodge this diatom had its highest incidence, at times accounting for up to thirty-five per cent of the total diatom population by cell count. Island Park specimens of this taxon agree with those described by Boyer (1929) and
Hustedt (1930), although punctae were occasionally coarser, down to 11-12 in 10 μm.

**Melosira granulata** (Ehr.) Ralfs

Pl. IV, Fig. 2

**Description.**—Frustules cylindrical, slender to robust; valve in valve view round, 5-20 μm in diameter, punctate; valve in girdle view rectangular, punctate; punctae coarse, 7-10 in 10 μm, in transverse oblique longitudinal rows; sulcus present.

**Discussion.**—*M. granulata* was common in the early spring and late fall on both Henrys Lake and Island Park Reservoir. Cells of specimens from these waters were usually quite long and slender. Most lotic samples likewise contained this diatom. The lotic form had cells that were usually more robust than the plankter.

**Melosira teres** Brun.

Pl. IV, Fig. 1

**Description.**—Frustules cylindrical, large, 50-60 μm in diameter, 80-90 μm long, striate; striae diagonal but not apparently punctate; central bands present; sulcus present.

**Discussion.**—*M. teres* was common in collections from Henrys Lake. Its incidence was normally low but because of its large size it was quite conspicuous. Carter
(1971) discussed the taxonomy of this species. Our specimens fit well within the limitations prescribed for this taxon. The huge size of this diatom is its principal distinguishing feature.

**Melosira varians** Ag.

*Pl. III, Fig. 7*

**Description.** Frustules cylindrical, often lacking visible ornamentation, nearly as wide as long, 20-30 μm in diameter, 25-35 μm long, often united in pairs; punctae present, very fine and often not resolvable.

**Discussion.** *M. varians* was common in periphyton samples taken along Henry's Fork below the Big Springs confluence (Stations 6, 7, 8, and 9). It was particularly abundant in the fall bloom of 1971 at Station 8. It was also common in collections taken below Island Park Dam (Stations C and D).

**Genus CYCLOTELLA Kutz.**

**Cyclotella bodanica** var. *lemanensis* O. M.

*Pl. III, Fig. 4*

**Description.** Frustules drum-shaped, with the centers thicker than the edges; valve in valve view round, 16-40 μm in diameter, divided into central and peripheral zones; peripheral zone striate, striae marginal 10-15 in 10 μm; central zone punctate; punctae coarse, central.
Discussion.--C. bodanica var. lemanensis was occasionally collected from Station 1, Henrys Lake Outlet. It was also collected at stations on Henrys Fork as far down as Macks Inn. This diatom can be recognized by its convex valve surface and the central large coarse punctae on the valve face.

**Cyclotella meneghiniana** Kutz.

Pl. III, Fig. 5

**Description.**--Frustules cylindrical, slightly undulate in girdle view; valve in valve view 6-20 um in diameter, with central and peripheral zones; peripheral zone striate; striae marginal, broad; central zone finely punctuate, often appearing non-punctate.

Discussion.--*C. meneghiniana* was found commonly in collections taken from the upper Henrys Fork, in particular near Macks Inn. It was less frequently collected at stations below Island Park Dam. This taxon is recognized by its costa-like marginal striae and its undulate girdle view.

**Cyclotella stelligera** Cl. and Grun.

Pl. III, Fig. 3

**Description.**--Frustules cylindrical, small; valve in valve view round, 7-10 um in diameter, with central and peripheral zones; peripheral zone striate; striae marginal, 14-16 in 10 um; central zone with radiating lines of
unequal length.

Discussion.--C. stelligera was associated with Stephanodiscus invisitatus in an early spring bloom beneath the ice on Island Park Reservoir. Only two specimens were seen. It is easily distinguished from S. invisitatus by the valve ornamentation.

Genus STEPHANODISCUS

Stephanodiscus invisitatus Hohn and Hellerman

Pl. III, Fig. 2

Description.--Valve in valve view round, 8-12 μm in diameter, with central and peripheral zones; peripheral zone striate; striae fine, 14-16 in 10 μm; submarginal spines present, recurved; central area with irregularly spaced punctae.

Discussion.--S. invisitatus bloomed under the ice in both Henrys Lake and Island Park Reservoir in the spring of 1971 and 1972. The number of cells produced during these blooms was massive. A much smaller bloom was observed in the fall of each of the same two years. Frustules of this taxon were fragile often collapsing during preparation. The small size and the valve ornamentation distinguish this taxon.

Stephanodiscus niagarae Ehr.

Pl. III, Fig. 1
Description.--Frustules disc-shaped; valves round in valve view, 35-50 μm in diameter, elevated centrally, depressed between the center and the margin; striae radiating from the center, with a single row of punctae near the center and two to four rows near the margins; interspaces between striae hyaline; spines prominent, submarginal, opposite every third interspace.

Discussion.--G. niagarae was collected as two specimens only at Station 4, Big Springs near the railroad bridge. This taxon is distinguished by its large size, its submarginal spines, and the pattern of punctae of the radiating striae.

Order FRAGILARIALES

Family FRAGILARIACEAE

Genus TABELLARIA Ehrenberg

Tabellaria fenestrata (Lyngb.) Kutz.

Pl. IV, Fig. 4

Description.--Valve linear, swollen equally at midvalve and poles, 45-90 μm long, 5-8 μm wide; striae parallel, 14-18 in 10 μm; jelly pore present near the center of the median inflation; pseudoraphe narrow, linear; central area absent.

Discussion.--T. fenestrata was collected primarily from the backwaters of the Buffalo River, particularly at
Station 11. It was also seen in samples collected at Station 12. Colonies of this diatom are straight filaments and do not form the zigzag patterns typical of *T. flocculosa*. In addition the apical swellings on the frustule are equal to the central swellings whereas in *T. flocculosa* the central swelling is much larger.

**Tabellaria flocculosa** (Roth) Kutz.

*Pl. IV, Fig. 3*

**Description.**—Valve linear, swollen at midvalve and poles, central swelling greater than apical, 15-30 um long, 5-10 um wide; striae parallel to slightly radiate near midvalve, 14-18 in 10 um; jelly pore present within the central inflated region; pseudoraphe linear, often expanded near midvalve; central area small, elliptical.

**Discussion.**—*T. flocculosa* was found in low abundance throughout the study area. During July and August of 1971 there was a large bloom of this diatom at Big Springs (Station 4) just above the railroad bridge. This taxon is distinguished by the comparative size of the swollen central region and by the zigzag colonies.

**Genus DIATOMA** Bory

**Diatoma anceps** (Ehr.) Kirch.

*Pl. IV, Fig. 5-6*

**Description.**—Valve linear, 17-30 um long, 5-8 um
wide, with capitate apices; margins smooth to irregularly undulate; costae usually extending across entire valve, 3-4 in 10 um; striae parallel, fine, 18-20 in 10 um; pseudoraphe linear, narrow; central area absent.

Discussion.--D. anceps was found in collections from seep areas on the bank of Big Springs north fork (Station 3) only during the spring of 1972. The taxon is distinguished by its linear shape and large capitate apices.

Diatoma hiemale (Roth) Heib.

Pl. V, Fig. 1

Description.--Valve linear to linear-lanceolate, 20-40 um long, 4-6 um wide, with rounded poles; costae irregular, sometimes oblique, 3-4 in 10 um; striae parallel, 16-20 in 10 um; pseudoraphe linear, narrow; central area absent.

Discussion.--D. hiemale was usually collected in low numbers. It was most abundant in the Buffalo River stations. This taxon is distinguished by its valve shape and coarse costa.

Diatoma hiemale var. mesodon (Ehr.) Grun.

Pl. IV, Figs. 8-9

Description.--Valve elliptical to elliptical-lanceolate, 15-30 um long, 8-12 um wide, with rounded poles; costae irregular, 2-3 in 10 um; striae 16-17 in 10
um, parallel; pseudoraphe linear, narrow; central area absent.

**Discussion.**—*D. hiemale* var. *mesodon* was endemic virtually to all study stations. However, it was particularly abundant at Big Springs and Chick Creek Springs (Stations 2 and 3 and 10 respectively). This taxon is distinguished by its valve shape and the reduced number of costae as compared with the nominate variety.

*Diatoma tenue* var. *elongatum* Lyngb.

**Pl. IV, Fig. 7**

**Description.**—Valve linear, 60-100 um long, 2-5 um wide, with swollen capitate apices; costae 6-8 in 10 um, extending across the valve; striae 16-20 in 10 um, parallel; pseudoraphe indistinct; central area absent.

**Discussion.**—*D. tenue* var. *elongatum* was found as an early spring plankter on Island Park Reservoir. It began to increase in number under the ice and persisted until it was found in open water in association with *Asterionella formosa*. The taxon is distinguished by linear shape and swollen capitate ends.

*Diatoma vulgare* Bory

**Pl. V, Fig. 2**

**Description.**—Valve elliptical-lanceolate, 30-55 um long, 10-15 um wide, with broad rounded apices, slightly
constricted adjacent to the poles; costae 5-8 in 10 um, mostly extending across the valve; striae parallel, 16-17 in 10 um; pseudoraphe indistinct; central area absent.

Discussion.--D. vulgare was one of the most dominant diatoms, in terms of both size and numbers, in the Island Park system. It was present at all stations except those located directly at a spring source (2, 3, and 10). The diatom was particularly abundant at Stations 7, 8, (Macks Inn) and C (Island Park Dam). The taxon is distinguished by its size, shape, and costae number. In uncleaned samples D. vulgare is often seen in zig-zag filaments.

Diatoma vulgare var. linearis V. H.
Pl. V, Fig. 3

Description.--Valve linear to linear-lanceolate, 40-60 um long, 8-10 um wide, with broad rounded apices; costae irregular, 5-8 in 10 um, mostly extending across the valve, often obliquely; striae parallel, 16-17 in 10 um; pseudoraphe indistinct; central area absent.

Discussion.--D. vulgare var. linearis was found principally at Station 1, Henrys Lake Outlet. It was most prevalent in periphytic blooms of September, 1971, 1972, and 1973. In all three years it was followed by an increased population of the nominate variety. The taxon is distinguished by the linear shape of the valve and the increased number of costae.
Genus MERIDION Agardh

Meridion circulare (Grev.) Ag.

Pl. V, Fig. 4

Description.--Valve clavate, often slightly constricted near the basal pole, 12-50 um long, 4-8 um wide, with rounded apices; costae 4-6 in 10 um, mostly extending across the valve; striae parallel, 14-17 in 10 um; pseudoraphe usually indistinct; central area absent.

Discussion.--M. circulare was not prevalent in the Island Park system though it was an occasional find at most stations. It was not observed at any of the headwater springs (Stations 2, 3, 4, and 10) though M. circulare var. constrictum was present in rather large numbers at these stations. This diatom is recognized by its valve shape, costae, and the fine striae.

Meridion circulare var. constrictum (Ralfs) V. H.

Pl. V, Fig. 5

Description.--Valve clavate, 20-50 um long, 4-8 um wide, with distinctly capitate poles; apical pole often more strongly capitate; costae 4-6 in 10 um, mostly extending across the valve; striae fine, parallel, 14-17 in 10 um; pseudoraphe usually indistinct; central area absent.

Discussion.--M. circulare var. constrictum was very common in Big Springs and Chick Creek Springs. At times it
reached twenty-five per cent of the total cell count at those sites. It was found infrequently at most other stations in the study area. This taxon is distinguished from the nominate variety by the shape of the apices.

Genus OPEPHORA Petit

*Opephora martyi* Herib.

*Pl.* VII, Figs. 5, 10

**Description.**—Valve clavate to ovate to occasionally nearly rhombic, 10-30 um long, 4-7 um wide; apices rounded; striae broad, cross-lineate, 6-12 in 10 um; pseudoraphe narrow, distinct; central area absent.

**Discussion.**—*O. martyi* was common at all stations except Big Springs and Chick Creek Springs. This diatom was highly variable in valve shape and striae count. However, all forms intergraded so that it was decided to assign all specimens to this taxon. Some specimens approached the form of *Fragilaria pinnata* occasionally making it difficult to distinguish between the two.

Genus FRAGILARIA Lyngb.

*Fragilaria bicapitata* A. Mayer

*Pl.* V, Fig. 8

**Description.**—Valve linear to lanceolate with strongly capitate poles, 10-40 um long, 4-6 um wide; striae mostly parallel, irregularly and often asymmetrically
spaced, 13-15 in 10 um; pseudoraphe present, very narrow; central area absent.

Discussion.—*F. bicapitata* was particularly common at Big Springs near the railroad bridge (Station 4). It was observed infrequently at most other Henrys Fork study stations. Specimens were highly variable in valve shape in Henrys Fork collections. Some of the smaller specimens were only slightly or not capitate.

*Fragilaria brevistrata* Grun.

Pl. V, Fig. 9

Description.—Valve lanceolate with rostrate apices, 10-30 um long, 4-6 um wide; striae marginal, slightly radiate, 13-17 in 10 um; pseudoraphe lanceolate; central area indistinct.

Discussion.—*F. brevistrata* was infrequent among other *Fragilaria* particularly at the upper end of the river system. This diatom was frequent at any station, but was observed most often in samples from Henrys Lake Outlet (Station 1). This taxon is distinguished by its marginal striae and its valve shape.

*Fragilaria capucina* var. *mesolepta* Rabh.

Pl. V, Fig. 10

Description.—Valve linear to linear-lanceolate with rounded apicies, slightly constricted at midvalve and
attenuated at the poles, 30-40 um long, 3-5 um wide; striae parallel, 15-18 in 10 um; pseudoraphe distinct, narrow; central area rectangular, extending to the valve margins.

Discussion.--*F. capucina* var. *mesolepta* was collected in large numbers in the fall of 1971 at Macks Inn (Station 8). It was less frequent at other Henrys Fork stations. This taxon is distinguished by its size, shape, and median valve construction.

*Fragilaria construens* (Ehr.) Grun.

*Pl. V, Fig. 11*

Description.--Valve inflated in the mid-region, with broad capitate apices, at times slightly asymmetrical, 10-25 um long, 5-10 um wide; striae weakly radiate, cross-lineate, 14-18 in 10 um; pseudoraphe distinct, linear-lanceolate; central area absent.

Discussion.--*F. construens* was collected infrequently at most periphyton study stations. It was usually associated with other species of *Fragilaria*. It can be easily confused with *F. leptostauron* but differs in its smaller size and finer striae. This taxon was quite variable in frustule morphology in collections taken from the Henrys Fork system.

*Fragilaria construens* var. *binodis* (Ehr.) Grun.

*Pl. V, Fig. 12*
Description.--Valve constricted in the mid-region with attenuate-rostrate apices, 15-30 um long, 4-8 um wide; striae weakly radiate, may appear cross-lineate, 14-18 in 10 um; pseudoraphe distinct, linear to linear-lanceolate in shape, may be slightly constricted at midvalve; central area indistinct.

Discussion.--F. construens var. binodis was distributed as the nominate variety in approximately the same abundance. This taxon is distinguished from the nominate variety by valve shape.

_Fragilaria construens_ var. _pumila_ Grun.

_Pl. VI, Fig. 1_

Description.--Valve elliptical to lanceolate with rostrate rounded apices, 15-25 um long, 4-6 um wide; striae slightly radiate, 15-17 in 10 um; pseudoraphe distinct, linear to linear-lanceolate; central area indistinct.

Discussion.--F. construens var. _pumila_ was associated with other varieties of _F. construens_ but was less abundant. It was most common in the lower Buffalo River (Stations 11 and 12). The variety is distinguished by the shape of the valve, especially the rostrate poles.

_Fragilaria construens_ var. _venter_ (Ehr.) Grun.

_Pl. VI, Fig. 2_

Description.--Valve rhombic with rounded apices,
6-12 μm long, 3-5 μm wide; striae parallel to slightly radiate, 13-16 in 10 μm; pseudoraphe distinct, usually linear-lanceolate; central area indistinct.

**Discussion.**—*F. construens* var. *venter* was associated with other varieties of *F. construens*. It was nearly as abundant as the nominate variety. It is distinguished by its valve shape and small size.

*Fragilaria construens* var. *venter f. pusilla* Grun.

**Pl. VI, Fig. 3**

**Description.**—Valve ovate to round, 5-7 μm long, 4-6 μm wide; striae radiate, 13-16 in 10 μm; pseudoraphe distinct, elliptical; central area indistinct.

**Discussion.**—*F. construens* var. *venter f. pusilla* was associated with other varieties of *F. construens*. It was more abundant than the other varieties and as well distributed. This taxon is distinguished by the rounded shape of the valve and the small size.

*Fragilaria crotonensis* Kitton

**Pl. VI, Fig. 4**

**Description.**—Valve linear, swollen in the mid-region, 80-120 μm long, 3-5 μm wide; apices capitate; striae parallel, 15-18 in 10 μm; pseudoraphe often indistinct; central area present, with marginal striae.

**Discussion.**—*F. crotonensis* was abundant in the
plankton of Island Park Reservoir during the summer months, particularly July through September. This taxon characteristically forms filaments that remain intact even after cleaning. It is distinguished principally by the inflated mid-region of the frustule.

*Fragilaria leptostauron* (Ehr.) Hust.

**Pl. VI, Figs. 5-6**

**Description.**--Valve strongly swollen in the mid-region, often nearly cruciform, 20-35 um long, 15-30 um wide; striae radiate throughout to becoming parallel near the poles, 5-8 in 10 um; pseudoraphe distinct, linear-lanceolate; central area indistinct.

**Discussion.**--*F. leptostauron* was very common throughout the study area being collected virtually at all periphyton stations. It was particularly abundant near Ponds Lodge on the Buffalo River (Station 12). The colonies of this diatom are zig-zag filaments. This taxon is distinguished by the swollen midvalve, the coarse striae, and the zig-zag colonies.

*Fragilaria pinnata* Ehr.

**Pl. VI, Fig. 7**

**Description.**--Valve linear to elliptical with rounded apices, 5-12 um long, 2-5 um wide; striae slightly radiate, 8-12 in 10 um, at times appearing cross-lineate; pseudoraphe distinct, linear-lanceolate; central area
indistinct.

**Discussion.**--*F. pinnata* was found in moderate numbers at all periphyton study stations. It was at times asymmetrical on the transverse axis and consequently difficult to distinguish from *Opephora martyii*.

**Fragilaria pinnata var. intercedens** (Grun.) Hust.

**Pl. VI, Fig. 8**

**Description.**--Valve linear with rounded ends, 25-35 um long, 4-7 um wide; striae nearly parallel, 9-11 in 10 um; pseudoraphe distinct, linear; central area absent.

**Discussion.**--*F. pinnata var. intercedens* was rare at Henrys Lake Outlet (Station 1) in association with the nominate variety. This taxon is distinguished from the nominate variety by its large size and the shape of the valve.

**Fragilaria pinnata var. lancettula** (Shum.) Hust.

**Pl. VI, Fig. 9**

**Description.**--Valve rhombic, with swollen mid-region and rostrate rounded poles, often asymmetrical on the transverse axis, 6-12 um long, 4-6 um wide; striae radiate, 9-11 in 10 um; pseudoraphe distinct, linear; central area absent.

**Discussion.**--*F. pinnata var. lancettula* was seen rarely at several stations. It was associated with other
varieties of \( F. \) pinnata. This taxon is distinguished by the coarse striae and the swollen mid-section of the valve.

\textit{Fragilaria pinnata} var. \textit{subrhombica} Cleve-Euler

Pl. VI, Figs. 10-11

\textbf{Description.}--Valve rhombic to nearly lanceolate, with rostrate to swollen capitate apices, often asymmetrical on the transverse axis, 15-25 \( \mu \)m long, 3-8 \( \mu \)m wide; striae 10-12 in 10 \( \mu \)m, mostly parallel, often alternating; pseudoraphe distinct, very narrow; central area absent.

\textbf{Discussion.}--\( F. \) pinnata var. \textit{subrhombica} was infrequent at the same stations as the nominate variety. It occurred at spring stations as well as those downstream on both Henrys Fork and the Buffalo River. This taxon is distinguished by the shape of the valve, the narrow pseudoraphe, and the alternating striae.

\textit{Fragilaria vaucheriæ} (Kutz.) Peters.

Pl. VI, Figs. 12-13

\textbf{Description.}--Valve linear to elliptical with rostrate rounded apices, 10-35 \( \mu \)m long, 3-5 \( \mu \)m wide; striae moderately radiate, 11-15 in 10 \( \mu \)m; pseudoraphe distinct, linear to linear-lanceolate; central area swollen, unilateral with parallel striae opposite.

\textbf{Discussion.}--\( F. \) vaucheriæ was one of the most abundant and widely distributed diatoms found in the study.
It was one of the dominant diatoms in Big Springs, it pulsed several times at Henrys Lake Outlet, and was common in collections taken at stations downstream. This taxon is distinguished by its asymmetrical usually rather swollen central area.

Fragilaria vaucheriae var. capitellata (Grun.) Patr.

Pl. VII, Figs. 1, 13

Description.—Valve linear-lanceolate, with swollen capitate poles, 25-35 μm long, 4-6 μm wide; striae parallel, 18-20 in 10 μm; pseudoraphe distinct, narrow; central area on one side only, swollen, with parallel striae opposite.

Discussion.—F. vaucheriae var. capitellata was infrequent at Henrys Lake Outlet. It is distinguished from the nominate variety by its capitate apices and finer striae. Our specimens were much shorter than those described by Patrick and Reimer (1966).

Fragilaria virescens Ralfs.

Pl. VII, Figs. 2-3

Description.—Valve linear, with attenuated rostrate rounded poles, 20-60 μm long, 5-8 μm wide; striae parallel, fine, 15-19 in 10 μm; pseudoraphe distinct, narrow; central area lacking.

Discussion.—F. virescens was associated with other Fragilaria species at most periphyton study stations in the
system. It formed nearly pure stands in a bank sample taken at Big Springs (Station 3) in May of 1973. This taxon is distinguished by valve shape, the fine parallel striae, and absence of a central area.

**Fragilaria virescens** var. capitata Ostr.

*Pl. VII, Fig. 4*

**Description.**—Valve linear, with attenuated capitate apices, 20-40 um long, 4-6 um wide; striae parallel, 16-17 in 10 um; pseudoraphe linear-lanceolate; central area lacking.

**Discussion.**—*F. virescens* var. capitata was observed only at Station 12 where it was fairly common. This taxon is characterized by valve shape, particularly the capitate poles.

Genus HANNAEA Patr.

**Hannaea arcus** (Ehr.) Patr.

*Pl. VII, Fig. 6*

**Description.**—Valve curved, with smooth convex dorsal margin and concave ventral margin, swollen ventrally near midvalve, 80-120 um long, 4-7 um side; apices capitate; striae parallel to slightly radiate, 14-18 in 10 um, usually finer toward the apices; pseudoraphe narrow, distinct; central area on ventral side only, at times lacking.
Discussion.--"H. arcus" was collected at most stations above Island Park Reservoir. It was abundant year round at Big Springs near the railroad bridge (Station A). This diatom varies considerably in frustule morphology but is distinguished by the curved valve and unilateral central area.

Hannaea arcus var. amphioxys (Rabh.) Patr.
Pl. VII, Fig. 7

Description.--Valve curved, with dorsal margin convex and ventral margin triundulate, 25-40 µm long, 4-7 µm wide; striae parallel to slightly radiate, 14-18 in 10 µm, usually finer toward the apices; pseudoraphe distinct, narrow; central area on ventral side only.

Discussion.--"H. arcus" var. amphioxys was found associated with the nominate variety at several Henrys Fork stations. An early spring bloom of this taxon occurred both years just below Island Park Dam. The distinction between this variety and the nominate is often difficult. Size and more particularly the triundulate ventral margin are the characters distinguishing this taxon.

Genus SYNEDRA Ehr.

Synedra acus Kutz.
Pl. VII, Fig. 8

Description.--Valve linear-lanceolate, with capitate
apices, 80-170 um long, 4-6 um wide; striae parallel, 11-14 in 10 um; pseudoraphe distinct, narrow; central area extending to the margin, nearly square.

Discussion.--S. acus was observed in collections from Henrys Lake Outlet. This diatom was often associated with varieties of S. ulna and was often difficult to distinguish. S. acus is characterized by its valve shape, particularly the capitate apices.

**Synedra amphicephala** Kutz.

Pl. VII, Fig. 9

**Description.**--Valve linear to linear-lanceolate with capitate apices, 30-50 um long, 3-4 um wide; striae parallel, alternating, 15-16 in 10 um; pseudoraphe distinct, narrow; central area lacking.

Discussion.--S. amphicephala was observed only once from collections taken at Big Springs near the railroad bridge (Station 4). This taxon is characterized by its linear valve shape, parallel alternating striae, and lack of a central area.

**Synedra capitata** Ehr.

Pl. VII, Fig. 11

**Description.**--Valve linear with abruptly swollen wedge-shaped to nearly rhombic apices, 400-500 um long, 7-9 um wide; striae parallel, slightly radiate near the poles,
8-11 in 10 μm; pseudoraphe distinct, narrow; central area lacking.

**Discussion.**—*S. capitata* was observed only once from a collection taken in Island Park Reservoir. The sample was scraped from rocks at the water line. This taxon is distinguished by the shape of its apices and frustule size.

*Synedra cyclopum* Brutschy

**Pl. VII, Fig. 12**

**Description.**—Valve arched, linear-lanceolate, with often slightly attenuated apices, 70-95 μm long, 3-5 μm wide; striae parallel to slightly radiate, 14-16 in 10 μm, finer towards the poles; pseudoraphe distinct, narrow; central area elliptical, not extending to the valve margins.

**Discussion.**—*S. cyclopum* was an early spring and late fall plankter on Henrys Lake. It was associated with *Asterionella formosa* and *Meloseia granulata*. This taxon is distinguished by its arched valve and elliptical central area.

*Synedra mazamaensis* Sov.

**Pl. VIII, Figs. 1-3**

**Description.**—Valve linear to lanceolate, with attenuate rostrate to distinctly capitate apices, 15-40 μm long, 3-5 μm wide; valve margins at times triundulate;
striae parallel to slightly radiate, 19-24 in 10 μm; pseudoraphe distinct, narrow; central area unilateral, swollen, often traversed by faint striae.

**Discussion.**—*S. mazamaensis* was found in moderate numbers in April collections below Island Park Dam (Station C). This diatom was quite variable in its frustule morphology, although it is distinguished by valve shape and the swollen central area.

*Synedra parasitica* (W. Sm.) Hust.

Pl. VIII, Fig. 4

**Description.**—Valve rhombic with sharply attenuated rostrate apices, 10-20 μm long, 7-11 μm wide; striae fine, arched, radiate, some shorter in the central area, 25-30 in 10 μm; pseudoraphe distinct, narrow; central area elliptical.

**Discussion.**—*S. parasitica* was found attached to other diatoms in collections taken from Big Springs near the railroad bridge (Station 4). Our specimens have finer striae than described by Patrick and Reimer (1966).

*Synedra parasitica f. rhomboidalis* May

Pl. VIII, Fig. 5

**Description.**—Valve rhombic to rhombic-lanceolate, with rostrate to capitate apices, 12-20 μm long, 4-8 μm wide; striae radiate, marginal, 19-20 in 10 μm; pseudoraphe
lanceolate; central area absent.

**Discussion.**—*S. parasitica* f. *rhomboidealis* was found infrequently in the lower Buffalo River. It is distinguished from the nominate variety by valve shape and the marginal striae.

**Synedra parasitica** var. **subconstricta** (Grun.) Hust.

Pl. VIII, Fig. 6

**Description.**—Valve constricted at mid-region, with rostrate apices, 12-20 µm long, 4-8 µm wide; striae radiate, marginal, 19-20 in 10 µm; pseudoraphe constricted, ovate; central area absent.

**Discussion.**—*S. parasitica* var. *subconstricta* was infrequently observed in collections from Big Springs near the railroad bridge (Station 4). It is distinguished from the nominate variety by the constriction of the valve.

**Synedra rumpens** Kutz.

Pl. VIII, Figs. 7-8

**Description.**—Valve linear-lanceolate, attenuated toward the poles, with rounded apices, 30-50 µm long, 2-4 µm wide; striae light, parallel, 18-20 in 10 µm; pseudoraphe narrow; central area rectangular, reaching valve margin, occasionally lacking.

**Discussion.**—*S. rumpens* was common in collections from Big Springs. This diatom was quite variable, often
making it difficult to distinguish from *Fragilaria vaucheriae*. This taxon is characterized by its size, striation, and the absence of a central swelling.

**Synedra rumpens** var. *familiaris* (Kutz.) Hust.

*Pl.* VIII, Fig. 9

**Description.**—Valve linear-lanceolate, attenuated toward the poles, with rounded apices, 50-80 um long, 3-5 um wide; striae parallel, 18-20 in 10 um; pseudoraphe distinct, narrow; central area rectangular, swollen, extending to valve margins.

**Discussion.**—*S. rumpens* var. *familiaris* was collected infrequently immediately above Island Park Reservoir (Stations 7, 8, and 9) and in the Buffalo River. This variety differs from the nominate by its central swelling and its comparatively larger size.

**Synedra rumpens** var. *fragilariodes* Grun.

*Pl.* VIII, Fig. 10

**Description.**—Valve linear-lanceolate, attenuated toward the capitate apices, 30-50 um long, 3-5 um wide; striae parallel, often alternating, 10-14 in 10 um; pseudoraphe distinct, narrow; central area longer than wide, swollen, extending to the valve margins.

**Discussion.**—*S. rumpens* var. *fragilariodes* was observed at Ponds Lodge (Station 12) and Station C below
Island Park Dam. The diatom was rare at both sites. This taxon is distinguished by its central swelling and coarse striae.

_Synedra ulna_ (Nitz.) Ehr.

_Pl. VIII, Fig. 11_

_Pl. IX, Fig. 1_

**Description.**--Valve linear to narrow linear-lanceolate, gradually attenuated to rostrate or slightly capitate poles, 100-150 um long, 7-10 um wide; striae parallel, 9-11 in 10 um; pseudoraphe distinct, narrow; central area usually longer than wide and extending to the valve margins, occasionally not extending to valve margins or absent.

**Discussion.**--_S. ulna_ was extremely common among the periphyton of all study stations. It was particularly abundant at Big Springs near the railroad bridge associated with _Hannaea arcus_. This taxon is distinguished principally by valve shape.

_Synedra ulna var. amphirhynchus_ (Ehr.) Grun.

_Pl. IX, Fig. 2_

**Description.**--Valve linear, with abruptly attenuated capitate apices, 30-60 um long, 3-5 um wide; striae parallel, 12-14 in 10 um; pseudoraphe linear, one-third the width of the valve; central area square, extending to the valve margins.
**Discussion.**—S. ulna var. amphirhynchus was observed only once. It was found in samples taken from Big Springs near the railroad bridge. This taxon is distinguished by its small size, broad pseudoraphe, and linear shape. Patrick and Reimer (1966) reported this diatom as lacking a central area.

**Synedra ulna var. biceps** (Kutz.) V. Schonf.

_pl. IX, fig. 3_

**Description.**—Valve linear, with broad capitate ends, 250-400 um long, 8-10 um wide; striae parallel, 9-11 in 10 um; pseudoraphe distinct, narrow; central area extending to the valve margins, slightly loner than wide.

**Discussion.**—S. ulna var. biceps was associated with the nominate variety in abundance at Macks Inn (Station 8). It was found infrequently at other stations in the systems. The size of the frustule and the shape of the apices characterize this taxon.

**Synedra ulna var. oxyrhynchus** (Kutz.) Hust.

_pl. IX, fig. 4_

**Description.**—Valve linear, with attenuated, rostrate apices, 60-120 um long, 7-9 um wide; striae parallel, 10-12 in 10 um; pseudoraphe distinct, narrow; central area longer than wide, extending to the valve margins, not always abruptly distinguished from the axial area.
Discussion.--*S. ulna* var. *oxyrhynchus* was found throughout the study area below the springs stations. It was most abundant at Henrys Lake Outlet. This taxon is distinguished by valve shape, length to breadth ratio, and the nature of the central area.

*Syedra ulna* var. *oxyrhynchus* f. *mediocontracta* (Forti) Hust.

Pl. IX, Fig. 5

**Description.**--Valve linear, with medial constriction and attenuated rostrate apices, 55-75 µm long, 7-9 µm wide; striae parallel, 11-13 in 10 µm; pseudoraphe distinct, narrow, widening into the central area; central area elliptical, seldom extending to the valve margin.

Discussion.--*S. ulna* var. *oxyrhynchus* f. *mediocontracta* was found associated with *S. ulna* var. *oxyrhynchus* f. *oxyrhynchus*. The distinction between the two is in the median constriction of the valve of the former.

**Genus ASTERIONELLA** Hass.

*Asterionella formosa* Hass.

Pl. V, Fig. 7

**Description.**--Valve linear, slightly attenuated toward the poles, apices unequally capitate, 80-120 µm long, 1-3 µm wide; striae very fine, 24-28 in 10 µm; pseudoraphe very narrow, often indistinct; colonies stellate.

Discussion.--*A. formosa* is an early spring and late
fall plankter on both Henrys Lake and Island Park Reservoir. This diatom bloomed in association with *Syneodra cyclophum* on Henrys Lake and *Diatoma tenue* var. *elongatum* on Island Park Reservoir. This taxon is distinguished by its unequal apices, the fine striation, and stellate colonies.

**Order EUNOTIALES**

**Family EUNOTIACEAE**

**Genus EUNOTIA Ehr.**

*Eunotia curvata* (Kutz.) Lagerst.  
Pl. IX, Fig. 6

**Description.**--Valve arcuate, slightly attenuated toward the poles, apices lightly swollen and rounded, 40-65 um long, 3-5 um wide; margins parallel; terminal nodules near the poles, small; raphe indistinct; striae parallel, 13-15 in 10 um.

**Discussion.**--*E. curvata* was infrequent in samples from most periphyton collecting stations in the Henrys Lake drainage. This taxon is distinguished by its lunate shape and its small terminal nodules.

*Eunotia curvata* var. *falcata* (Breb.) A. Bg.  
Pl. IX, Fig. 7

**Description.**--Valve lunate, with attenuate rounded apices, 15-25 um long, 3-4 um wide; dorsal margin more arched; ventral margin less arched; terminal nodules near
the poles, small; raphe indistinct; striae 14-16 in 10 μm, parallel to slightly radiate.

**Discussion.**—*E. curvata* var. *falcata* was infrequent in samples from Stations 4, 8, and 12. Its abundance was always very low. This variety is distinguished from the nominate by valve shape and size.

*Eunotia incisa* W. Sm. ex Greg.

**Pl. IX, Fig. 8**

**Description.**—Valve with convex dorsal margin and straight ventral margin, 25-35 μm long, 3-5 μm wide; poles acutely rounded, not differentiated from the valve body; terminal nodules often appearing as a notch in the ventral margin, removed from poles; raphe indistinct; striae 13-17 in 10 μm, finer near the poles, parallel to radiate, arched.

**Discussion.**—*E. incisa* was observed at most stations. It was particularly abundant at Stations 1, 4, 8, and 12. This taxon is characterized by its undifferentiated apices, straight ventral margin, and fine striae.

*Eunotia maior* (W. Sm.) Rabh.

**Pl. IX, Fig. 10**

**Description.**—Valve linear, slightly arcuate, 50-150 μm long, 10-18 μm wide; margins parallel; apices broadly capitate, rounded, as broad as valve body; terminal nodules large, near the poles; raphe distinct; striae
parallel at the center, radiate near the apices, 10-14 in 10 um.

**Discussion.**—*E. major* was abundant in collections taken from springfed stations and infrequent in collections taken further downstream. This taxon is distinguished by its large linear shape, striation, and rectangular girdle view.

**Eunotia monodon** Ehr.

*Pl.* IX, *Fig.* 11

**Description.**—Valve arcuate, 35-60 um long, 10-12 um wide; dorsal margin arched; ventral margin less strongly arched; apices rounded to slightly capitate; terminal nodules large, near the valve poles; raphe distinct; striae mostly parallel, 9-11 in 10 um.

**Discussion.**—*E. monodon* was found associated with *E. major* in collections from Big Springs and Chick Creek Springs. This diatom was also collected at downstream stations on the Buffalo River. *E. monodon* is characterized by the size and shape of its frustule. It is differentiated from *E. major* by the absence of distinct capitate apices and the non-parallel valve margins.

**Eunotia pectinalis** (O. F. Mull.) Rabh.

*Pl.* IX, *Fig.* 12

**Description.**—Valve slightly arcuate, narrowed at
distal end to form rounded attenuate to slightly capitate apices, 20-70 um long, 4-6 um wide; margins nearly parallel; terminal nodules distinct, near the valve poles; striae parallel at midvalve, slightly radiate near the poles, coarser at midvalve, 10-16 in 10 um.

Discussion.--E. pectinalis was quite common at Big Springs near the railroad bridge (Station 4). It was less frequent at sites downstream.

**Eunotia pectinalis** var. **minor** (Kutz.) Rabh.

*Pl. IX, Fig. 13*

Description.--Valve with concave to straight ventral margin and more convex dorsal margin, 18-30 um long, 4-6 um wide; apices attenuate-rostrate, rounded, not set off from the main body of the valve; terminal nodules distinct, near the valve poles; striae parallel in the valve center to slightly radiate near the poles, coarser at the center, 10-18 in 10 um.

Discussion.--E. pectinalis var. minor was found infrequently throughout the Henrys Fork drainage basin. It was often associated with the nominate variety and was occasionally difficult to distinguish. This diatom is characterized by the nature of the apices and the non-parallel margins on the valve.

**Eunotia praerupta** Ehr.

*Pl. IX, Fig. 9*
Description.--Valve slightly arched, 30-40 um long, 8-10 um wide; ventral margin concave at midvalve, straight at the poles; dorsal margin distinctly convex; apices reflexed, rostrate to capitate, truncate; terminal nodules distinct, extending upward at the apices; striae mostly parallel, at times irregular, 8-12 in 10 um.

Discussion.--*E. praerupta* was collected only at Macks Inn (Station 8) where it was rare. This taxon is distinguished by valve shape, especially the reflexed truncate-rostrate to capitate ends.

**Eunotia praerupta** f. *curta* Grun.

*Pl.* X, *Fig.* 2

Description.--Valve with concave ventral margin and inflated dorsal margin, 24 um long, 8 um wide; apices broadly capitate; terminal nodules distinct, extending upward at the apices; striae mostly parallel, 11-12 in 10 um.

Discussion.--*E. praerupta* f. *curta* was found in the lower Buffalo River near Ponds Lodge. Only one specimen was observed. This variety differs from the nominate by the inflated dorsal margin and the broadly capitate apices.

**Eunotia praerupta** var. *bidens* (Ehr.) Grun.

*Pl.* X, *Fig.* 1

Description.--Valve with ventral margin concave in
the center and straight at the poles and dorsal margin inflated but constricted at the center forming two undulations, 34 um long, 5 um wide; apices reflexed to rounded, slightly capitate; terminal nodules distinct, extending upward at the apices; striae parallel at the center, becoming radiate at the poles, coarser at the center, 14-20 in 10 um.

**Discussion.**—*E. praerupta* var. *bidens* was seen only once from a late April collection taken near Ponds Lodge. The taxon is distinguished by the shape of the dorsal margin.

**Eunotia sarekensis** var. *pumila* (Grun.) S. Bg.

Pl. X, Fig. 3

**Description.**—Valve with straight to nearly concave ventral margin and biundulate dorsal margin, 18 um long, 5 um wide; apices round, capitate; terminal nodules distinct, near the valve poles; striae parallel to slightly radiate, 11-12 in 10 um.

**Discussion.**—*E. sarekensis* var. *pumila* was observed as a single specimen in a January collection taken from Big Springs near the railroad bridge. The assignment of the specimen to this taxon was made primarily on the basis of valve shape and size. It differs from Cleve-Euler's (1951) description of the taxon in the more parallel nature of the striae.
Order ACHNANTHALES

Family ACHNANTHACEAE

Genus COCCONEIS

Cocconeis diminuta Pant.

Pl. XIV, Figs. 7-8

Description.--Valve elliptical, 8-18 um long, 6-12 um wide; raphe valve with evident rim adjacent to valve margin; raphe filiform; striae arched and radiate, 20-24 in 10 um; pseudoraphe valve with lanceolate pseudoraphe; striae radiate throughout, 15-17 in 10 um.

Discussion.--C. diminuta was common in samples from the lower station at Big Springs (Station 4). It was less often encountered in samples taken from sites along the Buffalo River. It was occasionally observed at downstream stations on Henrys Fork. The taxon can be confused with C. disculus. This assignment was made on the basis of the relatively fine striae on the pseudoraphe valve and the overall small size of the frustules. However, the raphe valve does have a rim near the valve margin which is in contrast to Hustedt's (1959) description.

Cocconeis pediculus Ehr.

Pl. XV, Figs. 3-4

Description.--Valve elliptical, arched, 20-30 um long, 15-25 um wide; raphe valve with narrow linear axial
area; raphe filiform extending into the central area; central area elliptical; striae curved, radiate, not extending to the valve margin, 16-20 in 10 μm; pseudoraphe valve with a narrow linear pseudoraphe; central area absent; striae arched, radiate, with punctae aligned in longitudinal undulate rows, 15-17 in 10 μm.

**Discussion.** *C. pediculus* was very common at all periphyton stations in the study area. It was particularly abundant at Henrys Lake Outlet in the fall of 1972 where it was epiphytic on a bloom of *Cladophora glomerata* and *Oedogonium* sp. This taxon is distinguished by the hyaline marginal region on the raphe valve and the arched shape of the frustule.

*Cocconeis placentula* var. *eugypta* (Ehr.) Cl.

**Pl. XIV, Figs. 9-10**

**Description.** Valve elliptical to linear-elliptical, 20-40 μm long, 10-30 μm wide; raphe valve with narrow axial area; raphe filiform, with proximal ends close; central area small, elliptical; striae curved, radiate, finely punctate, 20-24 in 10 μm; pseudoraphe valve with narrow linear pseudoraphe; central area absent; striae parallel in the center, radiate toward the ends, 17-20 in 10 μm, formed of dash-shaped punctae that form 3-5 longitudinal rows.

**Discussion.** *C. placentula* var. *eugypta* was infrequently found associated with the variety *C. placentula*
var. lineata. The former taxon is characterized by the reduced number of longitudinal rows of punctae on the pseudoraphe valve. The raphe valve is identical to that of other varieties.

*Cocconeis placentula* var. *lineata* (Ehr.) V. H. Pl. XV, Figs. 1-2

**Description.**—Valve elliptical to linear-elliptical, 20-40 μm long, 10-30 μm wide; raphe valve with narrow axial area; raphe filiform, with proximal ends close; central area small, elliptical; striae curved, radiate, finely punctate, 20-24 in 10 μm; pseudoraphe valve with narrow linear pseudoraphe; central area lacking; striae curved, radiate, with punctae aligned to form about twelve longitudinal rows, 19-21 in 10 μm.

**Discussion.**—*C. placentula* var. *lineata* was one of the most common diatoms both in abundance and distribution throughout the study. Glass plates used in standing crop and productivity studies were colonized first by this diatom. *C. placentula* var. *lineata* was often observed as an epiphyte and was particularly plentiful in collections taken from sites well populated with aquatic vascular plants. This taxon differs from the nominate variety in the number of striae on the pseudoraphe valve and the number of longitudinal rows of punctae.

Genus ACHNANTHES
Achnanthes austriaca Hust.

Pl. X, Figs. 4-5

Description.--Valve linear-elliptical, with broadly rounded slightly truncated ends, 16-20 µm long, 6-7 µm wide; raphe valve with narrow axial area; raphe straight, extending into the central area; central area a broad fascia; raphe valve striae 24-28 in 10 µm, slightly radiate; pseudoraphe valve with narrow pseudoraphe; central area small, asymmetrical; pseudoraphe valve striae 26-30 µm in 10, parallel at midvalve, radiate near the poles.

Discussion.--A. austriaca was collected on the lower Buffalo River (Stations 11 and 12). Only one specimen was identified at each site. Our specimens did not have the rounded central area on the pseudoraphe valve nor was the central area of the raphe valve as indicated by Hustedt (1959). However, the shape of the valve, the convex nature of the valve, and the striation do suggest assignment to this taxon.

Achnanthes clevei Grun.

Pl. X, Figs. 8-9

Description.--Valve elliptical, with rounded rostrate apices, 12-18 µm long, 5-9 µm wide; raphe valve with linear-lanceolate axial area; central area indistinct; raphe valve striae 20-24 in 10 µm, irregularly shortened at midvalve, parallel near midvalve, radiate near the poles;
pseudoraphe valve with narrow pseudoraphe; central area absent; pseudoraphe valve striae 10-13 in 10 um, parallel at midvalve, becoming moderately radiate near the poles.

Discussion.--*A. clevei* was widely distributed throughout the study area. It was never found in large numbers, yet appeared to be endemic to the system throughout the year. This taxon is distinguished by the coarse striae on the pseudoraphe valve and the fine punctae on the raphe valve.

*Achnanthes clevei* var. *rostrata* A. Cl.

*Pl. X, Figs. 10-11*

Description.--Valve elliptical-lanceolate, with protracted rostrate apices, 20-24 um long, 8-10 um wide; raphe valve with linear-lanceolate axial area and indistinct central area; raphe valve striae 20-26 in 10 um, irregularly shortened at midvalve, mostly radiate throughout; pseudoraphe valve with linear-lanceolate pseudoraphe and no central area; pseudoraphe valve striae 10-15 in 10 um, mostly radiate throughout.

Discussion.--*A. clevei* var. *rostrata* was collected only from Henrys Lake. This diatom was larger, had protracted rostrate poles, and more radiate striae than specimens of the nominate variety found at most other sites in the system.

*Achnanthes didyma* Hust.
Pl. X, Figs. 6-7

Description.--Valve elliptical, constricted at midvalve, 7-9 um long, 4-5 um wide; poles broadly rounded; raphe valve with narrow axial area; central area small, square; raphe valve striae 30-32 in 10 um, only slightly radiate; pseudoraphe valve with linear to linear-lanceolate pseudoraphe; central area indistinct; pseudoraphe valve striae 24-26 in 10 um, moderately radiate, irregularly shortened throughout.

Discussion.--

A. didyma was found in low abundance at Big Springs near the railroad bridge (Station 4). One specimen was also collected during the winter from Henrys Fork below Macks Inn. This taxon is distinguished by the shape of the valve and the shape of the pseudoraphe.


t Achnanthes exigua Grun.

Pl. XI, Figs. 1-2

Description.--Valve angular elliptical, with broadly rounded protracted ends, 8-20 um long, 4-8 um wide; raphe valve with narrow axial area; central area extending to valve margin on one side only; raphe valve striae 16-20 in 10 um, mostly radiate; pseudoraphe valve with linear-lanceolate pseudoraphe and asymmetrical central area extending to the valve margin; pseudoraphe valve striae 16-20 um, radiate throughout.

Discussion.--

A. exigua was widely distributed
throughout the study area. It was most abundant in the upper Henrys Fork between Big Springs and Island Park Reservoir. Our specimens had coarser striae and a more square valve shape than those described by Patrick and Reimer (1966). The asymmetrical central area on both the raphe valve and pseudoraphe valve was consistent in specimens from the Island Park area.

**Achnanthes exigua var. heterovalva** Krasske

*Pl. XI, Figs. 3-4*

**Description.**--Valve linear-elliptical, with rostrate rounded apices, 12-20 um long, 4-6 um wide; raphe valve with narrow axial area that flares into the stauros central area; raphe valve striae 30-32 in 10 um, radiate throughout; pseudoraphe valve with linear-lanceolate pseudoraphe and rounded central area; pseudoraphe valve striae 16-20 in 10 um, radiate throughout.

**Discussion.**--*A. exigua var. heterovalva* was found associated with the nominate variety, but was less abundant. This variety differs from the nominate variety by the fine striae on the raphe valve.

**Achnanthes grimmei** Krasske

*Pl. XI, Fig. 5*

**Description.**--Valve lanceolate, with broadly rostrate to slightly capitate ends, 10-12 um long, 3-4 um wide; raphe valve with lanceolate axial area and
asymmetrical central area extending to one margin; raphe valve striae short, 16-24 in 10 μm, moderately radiate; pseudoraphe valve with broad lanceolate pseudoraphe and asymmetrical central area extending to one margin; pseudoraphe valve striae 16-24 in 10 μm. radiate throughout.

Discussion.--*A. grimmei* had a low incidence at Big Springs and near Macks Inn (Stations 4 and 8) but was not collected elsewhere. This taxon is distinguished by its small size, valve shape, and short radiate striae.

*Achnanthes hungarica* Grun.

*Pl. XI, Fig. 6*

**Description.**--Valve lanceolate, with rounded ends, 15-18 μm long, 5-7 μm wide; raphe valve with narrow axial area and stauros central area; raphe valve striae 20-26 in 10 μm, radiate throughout; pseudoraphe valve with linear-lanceolate pseudoraphe and indistinct central area; pseudoraphe valve striae 20-26 in 10 μm, radiate throughout.

Discussion.--*A. hungarica* was observed only at Big Springs near the railroad bridge. Its incidence there was very low. The taxon is distinguished by its valve shape, fine striae, and the stauros central area on the raphe valve.

*Achnanthes kryophila* Boye Pet.

*Pl. X, Fig. 7*
Description.--Valve elliptical, with rounded ends, 12-15 um long, 5-6 um wide; raphe valve with narrow axial area that widens gradually toward the central area; central area rounded; raphe valve striae 23-28 in 10 um, radiate; pseudoraphe with linear pseudoraphe and small central area formed by the shortening of opposing single striae at midvalve; pseudoraphe valve striae 19-23 in 10 um, radiate.

Discussion.--*A. kryophila* was observed only from collections taken from Big Springs near the railroad bridge (Station 4). This taxon is distinguished by its valve shape, the shape of the raphe valve central area, and the linear pseudoraphe.

*Achnanthes lanceolata* (Breb.) Grun.

*Pl. XI, Fig. 9*

Description.--Valve elliptical to lanceolate, with broadly rounded apices, 12-30 um long, 5-8 um wide; raphe valve with narrow axial area and widened rectangular central area; raphe valve striae 11-13 in 10 um, radiate throughout; pseudoraphe valve with narrow pseudoraphe; horseshoe-shaped clear area present on one side of the central area; pseudoraphe valve striae 11-13 in 10 um, radiate throughout.

Discussion.--*A. lanceolata* was widely distributed throughout the entire study area. It was common to abundant at all stations. There was considerable variation in valve shape in our specimens. This taxon is distinguished
by the number of striae present on both valves and by the horseshoe-shaped clear area on the pseudoraphe valve.

**Achnanthes lanceolata var. dubia** Grun.

*Pl. XI, Fig. 10*

**Description.**—Valve elliptical to elliptical-lanceolate, with protracted rounded apices, 10-15 μm long, 4-6 μm wide; raphe and pseudoraphe valves as in the nominate variety; striae on both valves 12-15 in 10 μm, radiate.

**Discussion.**—*A. lanceolata* var. *dubia* was found associated with the nominate variety but was never found in as large numbers. This taxon is distinguished from the nominate variety by valve shape, particularly the protracted apices.

**Achnanthes lanceolata var. elliptica** Cl.

*Pl. XI, Figs. 11-12*

**Description.**—Valve elliptical, with rounded ends, 7-12 μm long, 4-6 μm wide; raphe and pseudoraphe valves as in the nominate variety; striae on both valves 12-15 in 10 μm, radiate.

**Discussion.**—*A. lanceolata* var. *elliptica* was rare in Big Springs and in the lower Buffalo River. It was collected with the nominate variety. This taxon is distinguished from the nominate variety by the shape of the valve.

**Achnanthes lanceolata var. lanceolatoides** (Sov.) Reim.
Description.--Valve elliptical-lanceolate, with apiculate apices, 20-25 um long, 7-9 um wide; raphe valve with large quadrate central area containing isolated punctae; pseudoraphe valve as in the nominate variety; striae on both valves 12-14 in 10 um, radiate.

Discussion.--A. lanceolata var. lanceolatoides was found on the lower Buffalo River. Only a few specimens were observed. This taxon is distinguished by the shape of the valve and the nature of the central area on the raphe valve.

Achnanthes lanceolata var. rostrata Hust.

Description.--Valve elliptical, with rostrate to slightly capitate apices, 15-18 um long, 5-7 um wide; raphe valve with asymmetrical central area extending to one margin only; pseudoraphe valve as in the nominate variety; striae on both valves 12-15 in 10 um, radiate.

Discussion.--A. lanceolata var. rostrata was found throughout the study area in association with the nominate variety but was never as abundant. This taxon is distinguished by its distinct rostrate to capitate poles. There seemed to be no gradation between specimens of this variety and those of A. lanceolata var. dubia so that it was felt justified to recognize both varieties.
**Achnanthes lapponica var. fennica** A. Cl.

*Pl. XII, Figs. 1-2*

**Description.**--Valve elliptical, with protracted rounded ends, 15-20 um long, 6-8 um wide; raphe valve with narrow axial area and rounded central area; pseudoraphe valve with linear pseudoraphe and rounded central area; striae on both valves 22-26 in 10 um.

**Discussion.**--*A. lapponica var. fennica* was found in the upper Henrys Fork and the lower Buffalo River in small numbers. This diatom appeared at times to be bent across the transverse axis as well as the longitudinal axis. This taxon is distinguished by its valve shape, fine striae, and the rounded central areas on both the raphe and pseudoraphe valves.

**Achnanthes laterostrata** Hust.

*Pl. XII, Figs. 5-6*

**Description.**--Valve elliptical, with broad rostrate rounded apices, 12-16 um long, 5-7 um wide; raphe valve with broad linear-lanceolate axial area and irregular central area formed by variously shortened striae; raphe valve striae 14-16 in 10 um, radiate throughout; pseudoraphe valve with linear pseudoraphe and no central area; pseudoraphe valve striae distinctly punctate, 12-14 in 10 um, radiate.

**Discussion.**--*A. laterostrata* was widely distributed
in the study area but never very abundant. It was most frequent in the spring-fed stations. This diatom is distinguished by the punctate striae on the pseudoraphe valve, the irregular central area of the raphe valve, and the valve shape.

**Achnanthes levanderi** Hust.

**Pl. XII, Figs. 9-10**

**Description.**—Valve elliptical, with broadly rounded apices, 8-12 µm long, 4-6 µm wide; raphe valve with narrow axial area and very small, rounded central area; raphe valve striae 18-22 in 10 µm, radiate; pseudoraphe valve with linear to linear-lanceolate pseudoraphe; central area lacking; pseudoraphe valve striae 18-22 in 10 µm, radiate, often irregularly shortened.

**Discussion.**—*A. levanderi* was widely distributed throughout the study area but was always in low abundance. This taxon is distinguished by the shape of the valve, the small central area on the raphe valve, and the large linear to lanceolate pseudoraphe.

**Achnanthes linearis** (W. Sm.) Grun.

**Pl. XII, Fig. 4**

**Description.**—Valve linear-lanceolate, with rounded apices, 12-16 µm long, 3-5 µm wide; raphe valve with narrow axial area and small central area formed by the shortening of one or more striae at midvalve; raphe valve striae 24-28
in 10 um, mostly parallel; pseudoraphe valve with narrow linear pseudoraphe; central area absent; pseudoraphe valve striae 24-28 in 10 um, mostly parallel.

Discussion.--*A. linearis* was widely distributed throughout the study area, but was never abundant. Usually only one or two specimens were observed in collections. Some specimens observed had a rather rostrate apex. This taxon is distinguished by its linear valve shape, parallel striae, and small central area on the raphe valve.

*Achnanthes linearis* var. *pusilla* Grun.

Pl. XIII, Figs. 1-2

Description.--Valve linear, with parallel margins and broad rounded apices that are not set off from the body of the valve, 10-22 um long, 3-5 um wide; raphe and pseudoraphe valve as in the nominate variety; striae on both valves 24-30 in 10 um, parallel, sometimes radiate in smaller specimen.

Discussion.--*A. linearis* var. *pusilla* was collected from the lower station at Big Springs, Macks Inn, and the lower Buffalo River. It was low in abundance at all three locations but was more abundant than the nominate variety at the same locations. This taxon is distinguished from the nominate by the parallel valve margins. Small specimens often appeared elliptical in shape and had radiate striae.

*Achnanthes marginulata* Grun.
Description.--Valve elliptical, with rounded apices, 10-16 μm long, 4-7 μm wide; raphe valve with narrow axial area and rectangular central area; pseudoraphe valve with broad lanceolate pseudoraphe; striae on both valves 24-28 in 10 μm, radiate throughout, irregularly shortened on pseudoraphe valve.

Discussion.--*A. marginulata* was found in low numbers throughout the study area. This taxon is distinguished by valve shape and the transverse rectangular central area on the raphe valve.

*Achnanthes minutissima* Kutz.

Description.--Valve linear-lanceolate, with broadly rostrate to slightly capitate apices, 10-14 μm long, 3-4 μm wide; raphe valve with narrow axial area and small round central area; pseudoraphe valve with narrow linear pseudoraphe and very small, round central area; striae on both valves 32-34 in 10 μm, radiate.

Discussion.--*A. minutissima* was widely distributed throughout the study area. Next to *A. lanceolata* it was the most abundant *Achnanthes* in the study. This diatom is recognized by its small size, linear-lanceolate shape, and small round central areas on both valves.
Achnanthes montana Krasske

Pl. XIII, Fig. 11

**Description.**--Valve rhombic to elliptical, with apiculate ends, 7-9 μm long, 4-6 μm wide; raphe valve with narrow axial area that flares into a transversely rectangular central area; pseudoraphe valve with large elliptic-lanceolate pseudoraphe; striae on both valves 10-12 in 10 μm, parallel at midvalve, radiate near the poles.

**Discussion.**--*A. montana* was seen only once at Stations 1, 8, and 12. The taxon is distinguished by valve shape and the broad pseudoraphe.

Achnanthes nodosa A. Cl.

Pl. X, Fig. 12

**Description.**--Valve linear, with broadly rounded near capitate apices, 12-15 μm long, 4-6 μm wide; raphe valve with narrow axial area and small rectangular central area; pseudoraphe valve with narrow linear pseudoraphe and no central area; striae on both valves 14-17 in 10 μm, radiate throughout on the raphe valve, parallel at midvalve and radiate near the poles on the pseudoraphe valve.

**Discussion.**--*A. nodosa* was observed infrequently at Stations 1, 4, and 8. Most specimens were smaller than those described by Hustedt (1959), but conformed in valve shape and striation.
Achnanthes oestrupii (A. Cl.) Hust.

Pl. XIII, Figs. 9-10

Description.--Valve broadly elliptical, with angular ends, 12-16 μm long, 8-10 μm wide; raphe valve with narrow axial area and rectangular central area; pseudoraphe valve with narrow linear pseudoraphe and a double horseshoe clear area at one side of midvalve; striae on both valves 10-14 in 10 μm, finer on the raphe valve, radiate on both valves but more so on the raphe valve.

Discussion.--A. oestrupii was occasionally collected from Big Springs near the railroad bridge (Station 4) and in the Buffalo River near Ponds Lodge (Station 12.) In addition, it was rare at Stations 5, 8, and A. Patrick and Reimer (1966) indicated that this taxon is confused with A. peragalli. Though some specimens of A. peragalli in the Island Park drainage approached A. oestrupii in shape, the two species were quite distinct. A. oestrupii is larger and has a definite double horseshoe shaped area on the pseudoraphe valve.

Achnanthes peragalli Brun. and Her.

Pl. XIII, Figs. 7-8

Description.--Valve broadly elliptical, with protracted, rostrate to capitate apices, 10-20 μm long, 5-8 μm wide; raphe valve with narrow axial area and rectangular to cross-shaped central area; pseudoraphe valve
narrow linear to broadly lanceolate pseudoraphe and horseshoe shaped clear area at midvalve; striae on both valves 16-18 in 10 um, radiate but more so on the raphe valve.

**Discussion.**—*A. peragalli* was widely distributed throughout the study area. It was particularly common below Coffeepot Campground (Station 9). This taxon is distinguished by the shape of the valve and the nature of the pseudoraphe valve.

*Achnanthes saxonica* Krasske

*Pl. XIV, Figs. 1-2*

**Description.**—Valve elliptical, with broad round ends, 8-10 um long, 3-4 um wide; raphe valve with narrow axial area and small rectangular central area; pseudoraphe valve with narrow linear pseudoraphe; central area absent; striae on both valves 14-16 in 10 um, radiate but more so on raphe valve.

**Discussion.**—*A. saxonica* was observed at Stations 4 and 12 in low abundance. The taxon is distinguished by its small size and narrow pseudoraphe. Island Park specimens had coarser striae on the raphe valve than described by Hustedt (1959).

*Achnanthes sublaevis* var. *crassa* Reim.

*Pl. XIII, Fig. 12*
**Description.**--Valve broadly elliptical, with broad rostrate to nearly capitate apices, 11 μm long, 5 μm wide; raphe valve with narrow axial area and transversely rectangular central area; pseudoraphe valve not observed; striae 24-26 in 10 μm on raphe valve.

**Discussion.**--*A. sublaevis* var. *crassa* was collected as a single specimen during January from Station 4. This taxon is distinguished by valve and central area shape.

*Achnanthes suchlandti* Hust.

Pl. XIV, Figs. 3-4

**Description.**--Valve elliptical, with broad rounded ends, 8-11 μm long, 3-5 μm wide; raphe valve with narrow axial area; central area absent; pseudoraphe valve with narrow linear pseudoraphe; central area absent; striae 18-22 in 10 μm on both valves, slightly radiate, broken on the pseudoraphe valve.

**Discussion.**--*A. suchlandti* was collected only from the lower Buffalo River. Only a few specimens were observed. This taxon can be recognized by valve shape and the broken striae on the pseudoraphe valve.

*Achnanthes sp.*

Pl. XIV, Figs. 5-6

**Discussion.**--This unidentified *Achnanthes* was often observed in collections taken from the lower Buffalo River.
The large capitate apices and the parallel striae on the pseudoraphe valve make the diatom distinctive.

**Genus RHOICOSPHENIA** Grun.

*Rhoicosphenia curvata* (Kutz.) Grun. ex Rabh.

*Pl. XV, Figs. 5-7*

**Description.**—Valve clavate, with broadly rounded poles, 15-40 μm long, 4-8 μm wide; raphe valve with narrow axial area that widens into a small central area; rudimentary raphe valve with linear to linear-lanceolate axial area and no central area; striae on both valves 10-15 in 10 μm, parallel, finer toward the apices.

**Discussion.**—-*R. curvata* was widely distributed throughout the study area. It was not found at those stations located at spring water sources. This taxon is recognized by the rudimentary raphe valve, the bent girdle view, and the clavate shape of the frustule.

**Order NAVICULALES**

**Family NAVICULACEAE**

**Genus AMPHIPLEURA** Kutz.

*Amphipleura pellucida* Kutz.

*Pl. XVI, Fig. 1*

**Description.**—Valve linear-lanceolate, with rounded obtuse ends, 80-120 μm long, 8-10 μm wide; raphe branches
short, 15-20 um long, connected by narrow siliceous rib; striae very fine, 35-40 in 10 um; longitudinal lines indistinct.

Discussion.--A. pellucida was found most abundantly on the lower Buffalo River and in lower incidence at a number of other stations throughout the study area. This taxon is distinguished by the shape of the valve, the very fine striae, and the short raphe branches which are connected by the characteristic siliceous rib.

Genus FRUSTULIA Agardh

Frustulia rhomboides (Ehr.) DeT.

Pl. XVI, Fig. 2

Description.—Valve rhombic-lanceolate, with obtusely rounded ends, 150 um long, 15 um wide; transverse striae parallel, becoming sharply radiate at the apices, 25-30 in 10 um; longitudinal striae 25-30 in 10 um; raphe enclosed in a siliceous rib which is rounded proximally and pointed distally; axial area narrow; central area narrow, hour-glass shaped.

Discussion.—F. rhomboides was observed as a single specimen in a late June collection from Chick Creek Springs. This taxon is distinguished by valve shape and the fine striae.

Frustulia rhomboides var. amphipleuroides (Grun.) Cl.
Pl. XVI, Fig. 3

**Description.**—Valve rhombic-lanceolate, with obtusely rounded ends, 100-120 μm long, 18-21 μm wide; transverse striae parallel, sharply radiate at the apices, 25-30 in 10 μm; longitudinal striae 25-30 in 10 μm; raphe enclosed in eccentric siliceous rib; axial area narrow; central area narrow, elongate.

**Discussion.**—*F. rhomboides* var. *amphipleuroides* was collected once from Station 8 and once at Station 12. This variety differs from the nominate variety in the eccentric siliceous rib and the elongate central area.

*Frustulia rhomboides* var. *capitata* (A. Mayer) Patr.

Pl. XVI, Fig. 4

**Description.**—Valve lanceolate, with rostrate to capitate apices, 40-50 μm long, 10-12 μm wide; transverse striae parallel, becoming sharply radiate at the apices, 26-30 in 10 μm; longitudinal striae 26-30 in 10 μm; raphe enclosed in a siliceous rib that widens toward midvalve; axial area narrow; central area narrow, hour-glass shaped.

**Discussion.**—*F. rhomboides* var. *capitata* was rare in collections from the lower Buffalo River. This diatom differs from the nominate variety in the shape of the apices and the thickened siliceous rib.

*Frustulia rhomboides* var. *saxonica* (Rabh.) DeT.
Pl. XVI, Fig. 6

**Description.**--Valve lanceolate, with attenuated rounded apices, 60 um long, 11 um wide; transverse striae very fine, 36-40 in 10 um; longitudinal striae about 40 in 10 um; raphe enclosed in a siliceous rib as in the nominate variety; axial area very narrow; central area as in the nominate variety.

**Discussion.**--*F. rhomboides* var. *saxonica* was identified as a single specimen from an April collection on the lower Buffalo River. The taxon is distinguished from the nominate variety by its smaller size and finer striae.

*Frustulia vulgaris* (Thwaites) DeT.

Pl. XVI, Fig. 5

**Description.**--Valve linear-lanceolate, with subrostrate to subcapitate rounded apices, 50-60 um long, 11-13 um wide; transverse striae 24-30 in 10 um; longitudinal striae 28-34 in 10 um; raphe enclosed in a siliceous rib; axial area very narrow; central area elliptical.

**Discussion.**--*F. vulgaris* was collected throughout the study area. Its abundance was rather low although it was ubiquitous. This taxon is distinguished by its size and shape and striae count.

Genus *GYROSIGMA* Hass.

*Gyrosigma sciotense* (Sulliv. and Wormley) Cl.
Description.--Valve moderately sigmoid, linear-lanceolate, with obtusely rounded apices, 100-145 um long, 12-20 um wide; transverse striae 16-17 in 10 um; longitudinal striae 17-18 in 10 um; axial area narrow, undulate; central area diagonal.

Discussion.--G. sciotense was found in very low abundance at Stations X, 1, 8, 9, and A. All of these stations are above Island Park Reservoir. This diatom was not present in the stream arising at Big Springs. This taxon is distinguished by the diagonal central area and the undulate axial area.

Genus NEIDIUM Pfitzer

Neidium affine (Ehr.) Pfitz.

Description.--Valve linear-lanceolate, with sub-rostrate rounded apices, 46 um long, 12 um wide; margins parallel to slightly convex; striae parallel at midvalve, becoming convergent at the poles, 22-24 in 10 um; axial area narrow; raphe straight, narrower at the proximal and distal ends not bent proximally; central area transversely elliptical; longitudinal band marginal.

Discussion.--N. affine was collected only from Henrys Lake Outlet as a single specimen. This taxon is
distinguished by the valve and central area shape and striation.

**Neidium binode** (Ehr.) Hust.

Pl. XVII, Fig. 1

**Description.**—Valve linear-lanceolate, constricted at midvalve, with apiculate apices, 18-25 um long, 6-8 um wide; striae radiate throughout, 22-26 in 10 um; axial area narrow; raphe straight, not bent proximally; central area small, rounded; longitudinal band indistinct.

**Discussion.**—N. binode was collected infrequently from Henrys Lake and Henrys Lake Outlet. This diatom is distinguished by its central valve constriction and small size.

**Neidium bisulcatum** var. *baicalense* (Skv. and Meyer) Reim.

Pl. XVII, Fig. 2

**Description.**—Valve lanceolate, with rounded apices not set off from the valve body, 32 um long, 7 um wide; striae parallel, slightly radiate near midvalve, 22-24 in 10 um; axial area narrow; raphe straight, with proximal ends hooked in opposite directions; central area elliptical; longitudinal band marginal.

**Discussion.**—N. bisulcatum var. *baicalense* was observed at Stations 4 and 5. A single specimen was seen at each station. This taxon is distinguished by its coarse
striae, valve shape, and the marginal longitudinal band.

**Neidium dubium** (Ehr.) Cl.

*Pl. XVII, Fig. 3*

**Description.**—Valve elliptical, with apiculate ends, 35-40 μm long, 14-16 μm wide; striae mostly parallel, 18-20 in 10 μm; axial area narrow; raphe straight, with proximal ends not hooked in opposite directions; central area elliptical; longitudinal band marginal, usually indistinct.

**Discussion.**—*N. dubium* was infrequently collected from Henrys Lake Outlet. This taxon is distinguished by valve and raphe shape.

**Neidium iridis** (Ehr.) Cl.

*Pl. XVII, Fig. 4*

**Description.**—Valve linear-elliptical, with rounded apices not set off from the valve body, 70-120 μm long, 20-35 μm wide; striae parallel to oblique, at times radiate at midvalve and convergent toward the poles, 14-18 in 10 μm; axial area narrow; raphe straight, with distal ends bifurcate and proximal ends hooked in opposite directions; central area transversely elliptical; longitudinal band submarginal to marginal.

**Discussion.**—*N. iridis* was well distributed throughout the study area but was low in abundance. This taxon
is distinguished by its relatively coarse striae, the valve shape, and the hooked proximal raphe ends.

**Neidium iridis var. ampliatum** (Ehr.) Cl.  
**Pl. XVII, Fig. 5**

**Description.**--Valve linear-elliptical, with broadly rostrate apices, 55-65 um long, 11-18 um wide; striae parallel to oblique, at times radiate at midvalve and convergent toward the poles, 14-18 in 10 um; axial area narrow; raphe straight, with distal ends bifurcate and proximal ends hooked in opposite directions; central area transversely elliptical; longitudinal band submarginal to marginal.

**Discussion.**--*N. iridis var. ampliatum* was occasionally found at Macks Inn. It was also rare at Henrys Lake Outlet and on the lower Buffalo River. The variety is distinguished from the nominate variety in the shape of the valve apices.

**Neidium productum** (W. Sm.) Cl.  
**Pl. XVII, Fig. 6**

**Description.**--Valve linear to linear-lanceolate, with rostrate to capitate apices, 60-70 um long, 14-16 um wide; striae parallel to oblique, 16-18 in 10 um; axial area narrower near the central area and at the poles; raphe straight, bifurcate on the distal ends, hooked in opposite directions at the proximal ends; central area
transversely elliptical; longitudinal band submarginal.

Discussion.--N. productum was found at Stations 1, 12, and D in very low abundance. This diatom is recognized by its coarse striae and the shape of the apices.

Genus DIPLONEIS Ehr.

Diploneis finnica (Ehr.) Cl.
Pl. XVII, Fig. 7

Description.--Valve elliptical, 60-70 µm long, 35-40 µm wide; axial area flares into central area; raphe enclosed in a robust siliceous rib, with median ends quite distant; costae 7-8 in 10 µm, with double rows of alveoli between; longitudinal canals broad, about one-third the valve breadth; central area elliptical.

Discussion.--D. finnica was observed in a few collections taken from the lower Buffalo River and once from Henrys Lake and Chick Creek Springs. This taxon is distinguished by its wide longitudinal canals, double row of alveoli, and axial area shape.

Diploneis elliptica (Kutz.) Cl.
Pl. XVII, Fig. 8

Description.--Valve elliptical, 25-65 µm long, 15-35 µm wide; axial area narrow, flaring into the central area; raphe straight; costae 10-14 in 10 µm, radiate, with a single row of alveoli between; longitudinal canals narrow;
central area elliptical.

Discussion.--D. elliptica was well distributed throughout the study area. It was most abundant in the spring fed streams but was also present at some other stations. This taxon is distinguished by its narrow longitudinal canals and the single row of alveoli between the costae.

Genus STAURONEIS Ehr.

Stauroneis acuta W. Sm.

Pl. XVIII, Fig. 1

Description.--Valve rhombic-lanceolate, swollen at midvalve, with obtusely rounded apices, 144 um long, 28 um wide; pseudoseptae present near poles; striae radiate, 12-14 in 10 um; axial area broad; central area a fascia, widening toward the margins; raphe straight, filiform near central area and near poles, otherwise broad.

Discussion.--S. acuta was represented by a single specimen from Henrys Lake Outlet.

Stauroneis anceps Ehr.

Pl. XVII, Fig. 9

Description.--Valve lanceolate to elliptical-lanceolate, with capitate apices, 40-50 um long, 11-13 um wide; striae radiate throughout, 20-22 in 10 um; axial area narrow; raphe straight, filiform near central area and
poles, otherwise broad; central area a broad fascia, widening longitudinally toward the margins.

Discussion.—S. anceps was rare in collections from Stations 1, 4, 8, 9, 12 and C. It was more abundant at Stations 11 and B. This taxon is distinguished by its comparatively small size and fine striae.

Stauroneis anceps f. gracilis Rabh.

Pl. XVII, Fig. 10

Description.—Valve elongate-lanceolate, with attenuate capitate apices, 45-55 μm long, 9-11 μm wide; striae radiate throughout, 20-22 in 10 μm; axial area narrow; raphe straight, filiform near central area and poles, otherwise broad; central area a broad fascia, widening toward the margins.

Discussion.—S. anceps f. gracilis was found in collections taken from Henrys Lake, Macks Inn, and the lower Buffalo River. In all cases the diatom was seen only once or twice. This form differs from the nominate taxon only in valve shape.

Stauroneis kriegeri Patr.

Pl. XVIII, Fig. 2

Description.—Valve broadly linear with parallel margins, 20-22 μm long, 5-6 μm wide; apices capitate; striae radiate, 25-27 in 10 μm; axial area narrow; raphe
filiform throughout; central area stauros.

Discussion.--S. kriegeri was rare in collections from a number of stations above Island Park Reservoir. This taxon is distinguished by its small size and linear shape.

Stauroneis lundii Hust.

Pl. XVIII, Fig. 3

Description.--Valve lanceolate, with slightly rostrate rounded to truncate apices, 17-20 μm long, 4-5 μm wide; striae radiate throughout, 20-22 in 10 μm; axial area narrow; raphe filiform; central area a fascia.

Discussion.--S. lundii was observed rarely at Macks Inn, at Chick Creek Springs, and on the lower Buffalo River.

Stauroneis phoenicenteron (Nitz.) Ehr.

Pl. XVIII, Figs. 4-5

Description.--Valve lanceolate, with attenuate to protracted rounded apices, 100-180 μm long, 20-28 μm wide; striae radiate throughout, 12-15 in 10 μm; axial area 4-5 μm broad, widening into the central area; raphe broad, tapering at the distal and proximal ends; central area a broad fascia, linear to expanding toward the margins.

Discussion.--S. phoenicenteron was found widely distributed throughout the study area. Frustule morphology
varied considerably even within single collections. This diatom lacks pseudoseptae and is further distinguished by valve size and shape.

**Stauroneis smithii** Grun.

Pl. XVIII, Fig. 6

**Description.**—Valve linear-lanceolate, with triundulate margins, 20-30 um long, 7-9 um wide; apices apiculate rostrate; striae radiate at midvalve, convergent at the poles, 26-28 in 10 um; axial area narrow, gradually widening into the central area; raphe filiform; central area narrow, linear; pseudoseptae present at distal ends of the valve.

**Discussion.**—-*S. smithii* was widely distributed throughout the study area. It was seen most often in collections from the lower Buffalo River. This diatom is characterized by the narrow central area, the triundulate margins, and the apiculate apices.

**Genus ANOMOEONEIS** Pfitz.

**Anomoeoneis serians var. apiculata** Boyer.

Pl. XVIII, Fig. 7

**Description.**—Valve elliptical-lanceolate, with attenuate apiculate to capitate apices, 60 um long, 18 um wide; margins slightly undulate; axial area narrow, linear-lanceolate; central area rounded; striae radiate throughout,
crossed by undulating longitudinal lines, 20-25 in 10 um.

**Discussion.**—*A. serians* var. *apiculata* was seen only once from a late June collection below Coffeepot Campground. This diatom differs from the nominate variety in shape of the valve only. This species is distinguished by the size and shape of the valve, and in the nature of the striae.

*Anomoeoneis serians* var. *brachysira* (Breb. and Kutz.) Hust.

**Pl. XVIII, Figs. 8-9**

**Description.**—Valve lanceolate to elliptical-lanceolate, with obtusely rounded to apiculate rostrate apices, 15-30 um long, 3-6 um wide; axial area narrow; central area rounded; striae radiate, becoming parallel toward the poles, crossed by longitudinal lines, 24-26 in 10 um.

**Discussion.**—*A. serians* var. *brachysira* was widely distributed at stations above Island Park Reservoir. Its abundance was always low. This variety is characterized by its comparative small size, fine striae, and variable valve shape.

**Genus NAVICULA** Bory

*Navicula accomoda* Hust.

**Pl. XIX, Fig. 1**

**Description.**—Valve elliptical-lanceolate, with
short attenuated rounded poles, 22-25 um long, 7-9 um wide; striae parallel throughout, 20-25 in 10 um; axial area linear, narrow; raphe straight, filiform; central area absent.

Discussion.--*N. accomoda* was seen once at the Henrys Lake station and once at the upper Henrys Lake Outlet station. This diatom can be recognized by its valve shape and apices and by the parallel or near parallel striae.

**Navicula amphibola** Cl.

Pl. XIX, Fig. 2

Description.--Valve broadly elliptical-lanceolate, with short apiculate apices, 50-60 um long, 22-25 um wide; striae radiate at midvalve, becoming parallel at the poles, punctate, 7-10 in 10 um; axial area narrow; raphe straight, with proximal ends enlarged and distal ends question-mark shaped; central area transversely rectangular.

Discussion.--*N. amphibola* was observed rarely in collections from Henrys Lake Outlet and below Macks Inn. Its abundance was higher in collections taken from Island Park Reservoir. This taxon is distinguished by valve shape and the punctate striae.

**Navicula anglica** Ralfs.

Pl. XIX, Fig. 3
Description.--Valve lanceolate, with apiculate apices, 35-40 μm long, 13-15 μm wide; striae radiate throughout, 10-12 in 10 μm; axial area linear-lanceolate; raphe straight, with proximal nodules just outside central area; central area transversely elliptical.

Discussion.--*Navicula anglica* was found in one collection from Henrys Lake and once at the upper station on Henrys Lake Outlet. This diatom was more frequent in collections taken below Macks Inn. This taxon is recognized by the size and shape of the valve.

*Navicula anglica* var. *lapponica* Cleve-Buler

Pl. XIX, Fig. 4

Description.--Valve elliptical-lanceolate, with short rostrate apices, 20-25 μm long, 8-10 μm wide; striae radiate throughout, 10-12 in 10 μm; axial area linear; raphe straight, with proximal nodules just outside central area; central area small, rounded.

Discussion.--*Navicula anglica* var. *lapponica* was found infrequently at the mouth of Henrys Lake Outlet (Station 1). This variety differs from the nominate variety in valve size and the shape of the central area.

*Navicula arvensis* Hust.

Pl. XIX, Fig. 5

Description.--Valve lanceolate, with slightly
rostrate apices, 11-14 μm long, 4-5 μm wide; striae fine, indistinct; axial area narrow; raphe filiform; central area absent.

Discussion.—*N. arvensis* was widely distributed throughout the study area as occasional specimens. The frustules of this diatom are lightly silicified. This taxon can be recognized by the small size, the light silicification of the frustule, and the fine striae.

*Navicula aurora* Sov.

Pl. XIX, Fig. 6

Description.—Valve linear-lanceolate, with broad slightly rostrate apices, 60-125 μm long, 14-24 μm wide; striae radiate at midvalve, convergent at the poles, 8-10 in 10 μm; axial area linear-lanceolate; raphe straight, with distinct terminal fissures; central area transversely rectangular, formed from irregularly shortened midvalve striae.

Discussion.—*N. aurora* was one of the most conspicuous and common diatoms encountered in the study. Specimens collected varied considerably in size and shape. This taxon is distinguished by the size and shape of the axial and central areas and by striaion.

*Navicula bacillum* Ehr.

Pl. XIX, Fig. 7
Description.--Valve broadly linear, with rounded poles, 30-75 um long, 11-25 um wide; striae radiate at midvalve to parallel near the poles, 14-20 in 10 um; axial area linear; raphe straight, filiform, with siliceous encasement; central area elliptical.

Discussion.--Navicula bicephala Hust. was infrequently observed in collections taken from Big Springs stream near the railroad bridge, Henrys Fork below Macks Inn, and from the lower Buffalo River. This diatom is characterized by its linear shape and silicified encasement about the raphe.

Navicula bicephala Hust.

Pl. XIX, Fig. 8

Description.--Valve linear, with slightly convex margins, with protracted capitate apices, 18-20 um long, 3-4 um wide; striae radiate throughout, 16-20 in 10 um; axial area very narrow, flaring abruptly into the central area; raphe straight, filiform, with distal ends curved in the same direction; central area rounded, formed by irregular shortening of the midvalve striae.

Discussion.--Navicula bicephala was infrequent in collections from the lower Buffalo River. The taxon is distinguished by valve size and shape and the radiate striae.

Navicula brevissima Hust.
Pl. XIX, Fig. 10

**Description.**--Valve linear-elliptical, with broad rounded apices, 14-16 μm long, 4-5 μm wide; striae lightly radiate at midvalve, becoming parallel near the poles, 20-22 in 10 μm; axial area narrow; raphe straight, filiform, with proximal nodules bending in the same direction; central area linear-elliptical.

**Discussion.**--*N. brevissima* was infrequent in collections from the lower Buffalo River. This taxon is distinguished by the shape of the valve, and the nature of the axial area and raphe.

*Navicula capitata* Ehr.

Pl. XIX, Fig. 11

**Description.**--Valve lanceolate, with broad rostrate to subcapitate rounded apices, 20-30 μm long, 5-7 μm wide; striae radiate at midvalve, becoming parallel near the poles, missing at valve apices to form a clear terminal area, 8-10 in 10 μm; axial area narrow, linear; raphe straight, filiform; central area small.

**Discussion.**--*N. capitata* was widely distributed within the study area, but was low in abundance. It was not observed in collections taken from spring sources (Stations 2, 3, 4, or 10). This taxon is characterized by the shape of the valve and the large terminal hyaline area at both poles.
Navicula capitata var. luneburgensis (Grun.) Patr.

Pl. XIX, Fig. 12

Description.--Valve lanceolate, with obtusely rounded ends, 17-18 μm long, 4-5 μm wide; striae radiate throughout, missing at valve apices to form clear terminal areas, 8-10 in 10 μm; axial area narrow, linear; raphe straight, filiform; central area small.

Discussion.--N. capitata var. luneburgensis was observed only once from a collection taken in November from Henry's Lake Outlet. This variety differs from the nominate variety in the shape of the valve and apices.

Navicula cocconeiformis Greg.

Pl. XIX, Fig. 13

Description.--Valve linear-elliptical, with protracted slightly rostrate rounded apices, 12-20 μm long, 6-8 μm wide; striae radiate throughout, fine, 25-30 in 10 μm; axial area linear; raphe straight, filiform; central area indistinct to small.

Discussion.--N. cocconeiformis was observed infrequently in collections from lower Big Springs and the lower Buffalo River (Stations 4 and 12). This diatom is recognized by the shape of the valve, the fine striae, and the indistinct central area.

Navicula constans Hust.
Description.--Valve elliptical, with apiculate rostrate to slightly capitate ends, 25-30 um long, 9-10 um wide; striae radiate throughout, 13-16 in 10 um; axial area linear, narrow; raphe straight, filiform; central area small, transversely rectangular, containing an isolated punctum.

Discussion.--N. constans was observed only once in an April collection taken from the lower Buffalo River. This taxon is distinctive in the shape of the valve and the isolated punctum within the central area.

Navicula cryptocephala Kutz.

Description.--Valve lanceolate, with subrostrate apices, 20-32 um long, 5-7 um wide; striae radiate at midvalve, becoming parallel at the poles, 16-18 in 10 um; axial area linear; raphe straight, filiform; central area transversely rounded to irregular.

Discussion.--N. cryptocephala was widely distributed in the study area, but was infrequent when collected. This taxon is distinguished by the shape and size of the valve, and by the striae count.

Navicula cryptocephala var. veneta (Kutz.) Rabh.

Pl. XX, Fig. 1

Pl. XX, Fig. 3

Pl. XX, Fig. 2
Description.--Valve lanceolate, with acutely rounded to slightly protracted apices, 15-25 um long, 4-7 um wide; striae radiate at midvalve, becoming parallel at the poles, 14-16 in 10 um; axial area linear; raphe straight, filiform; central area small, elliptical to irregular.

Discussion.--N. cryptocephala var. veneta was widely distributed throughout the study area. It was more abundant than the nominate variety. This variety is distinguished from the nominate by the smaller size of the valve, the smaller central area, and the usually less distinctly protracted apices.

Navicula cuspidata (Kutz.) Kutz.

Pl. XX, Figs. 4-5

Description.--Valve lanceolate, with acute to subrostrate apices, 60-90 um long, 18-25 um wide; striae parallel, with punctae forming both longitudinal and transverse rows, 14-17 in 10 um; axial area narrow, linear; raphe straight, filiform; central area absent; internal septum at times evident.

Discussion.--N. cuspidata was low in abundance at a number of sites. It was most common in the upper Henrys Lake Outlet. This taxon can be most easily recognized by its shape, longitudinal and transverse striae, and by the internal septum.
Navicula denestriata Hust.
Pl. XX, Fig. 6

**Description.**—Valve linear-lanceolate, with rounded ends not set off from the valve body, 15-20 μm long, 4-6 μm wide; striae radiate, 28-30 in 10 μm; axial area narrow, linear; raphe straight, filiform; central area broad, rectangular.

**Discussion.**—*N. denestriata* was identified from collections from the lower Big Springs stream and the lower Buffalo River station. This diatom is characterized by valve shape, the broad central area, and the fine striae.

Navicula detenta Hust.
Pl. XX, Fig. 7

**Description.**—Valve linear to linear-lanceolate, with attenuated rostrate to capitate apices, 15-20 μm long, 5-6 μm wide; striae radiate at midvalve becoming convergent at the poles, 30-32 in 10 μm; axial area narrow, linear; raphe straight, filiform; central area absent.

**Discussion.**—*N. detenta* was found widely distributed in the study area but in low abundance. This taxon is distinguished by the size and shape of the valve, the fine striae, and the absence of a central area.

Navicula dicephala (Ehr.?) W. Sm.
Pl. XX, Fig. 8
Description.--Valve linear to linear-lanceolate, with capitate apices, 40-45 um long, 11-12 um wide; striae radiate at midvalve becoming convergent at the poles, 11-12 in 10 um; axial area narrow, linear; raphe straight, filiform; central area transversely elliptical to rectangular.

Discussion.--*N. dicephala* was seen once in collections from the lower Big Springs stream and once below Macks Inn. This diatom is characterized by the size and shape of the valve, the transverse central area, and the coarse striae.

**Navicula elginensis** (Greg.) Grun.

Pl. XX, Fig. 9

Description.--Valve linear-lanceolate, with rostrate to subcapitate apices, 25-30 um long, 7-9 um wide; striae radiate throughout, occasionally becoming parallel at the poles, 10-12 in 10 um; axial area linear-lanceolate; raphe straight, filiform; central area transversely rectangular.

Discussion.--*N. elginensis* was observed in low abundance from samples taken above Island Park Reservoir. The taxon can be recognized by valve shape and the nature of the striae.

**Navicula elginensis** f. *abiskoensis* Hust.

Pl. XXI, Fig. 1
Description.--Valve linear, with attenuated capitate apices, 30 um long, 8 um wide; striae radiate at midvalve becoming parallel at the poles, punctate, 10-12 in 10 um; axial area narrow, flaring abruptly into central area; raphe straight, filiform; central area transversely rectangular.

Discussion.--*N. elginensis* f. *abiskoensis* was collected as a single specimen from the upper Henrys Lake Outlet. This form differs from the nominate form in the shape of the valve, the punctate striae, and the shape of the central and axial areas.

*Navicula elginensis* var. *lata* (M. Perag.) Patr.
Pl. XXI, Fig. 2

Description.--Valve linear-lanceolate, with rostrate apices; 26-28 um long, 7-8 um wide; striae radiate at midvalve becoming parallel at the poles, lineate, 10-12 in 10 um; axial area narrow, linear; raphe straight, filiform; central area large, transversely rectangular to irregular.

Discussion.--*N. elginensis* var. *lata* was observed at Station 12 on the lower Buffalo River as a few specimens in several collections. This variety differs from the nominate in the size and shape of the central area. In addition, the valve is broader and the apices are rostrate.

*Navicula elginensis* var. *neglecta* (Krasske) Patr.
Pl. XXI, Fig. 3
**Description.**--Valve triundulate, lanceolate, with rostrate apices, 27 um long, 8 um wide; striae radiate at midvalve becoming parallel at the poles, cross-lineate, 10-12 in 10 um; axial area narrow, linear; raphe straight, filiform; central area elliptical.

**Discussion.**--*Navicula elginensis* var. *neglecta* was represented by a single specimen collected just below Island Park Dam in May, 1972. The variety differs from the nominate in the triundulate valve margins.

*Navicula elginensis* var. *subcapitata* Grun.

Pl. XXI, Fig. 4

**Description.**--Valve lanceolate, with rostrate to subcapitate ends, 25-30 um long, 6-10 um wide; striae radiate throughout, 10-12 in 10 um; axial area narrow, linear; raphe filiform; central area transversely elliptical.

**Discussion.**--*N. elginensis* var. *subcapitata* was present in low abundance at several stations in the study area. This variety is distinguished from the nominate by valve shape.

*Navicula exigua* var. *capitata* Patr.

Pl. XXI, Fig. 5

**Description.**--Valve linear-lanceolate, with subcapitate to capitate apices, 24-28 um long, 6-8 um wide;
striae radiate at midvalve becoming convergent at the poles, 14-16 in 10 μm; axial area linear-lanceolate; raphe filiform; central area transversely rectangular, with midvalve striae longer, producing an X shape.

Discussion.--*N. exigua* var. *capitata* was widely spread throughout the study area in low to moderate abundance. The X-shaped central area and the valve shape distinguish the taxon.

*Navicula gastrum* var. *exigua* (Greg.) Grun.

Pl. XXI, Fig. 6

Description.--Valve elliptical-lanceolate, with attenuated rostrate apices, 23 μm long, 9 μm wide; striae radiate throughout, 10-12 in 10 μm; axial area linear, narrow; raphe filiform; central area irregularly elliptical.

Discussion.--*N. gastrum* var. *exigua* was represented in the study by a single specimen that was collected in late September, 1972 at Henrys Lake. This taxon is distinguished by valve shape and striation. Care must be used in separating this taxon from *N. elginensis*, *N. placentula*, and *N. anglica*.

*Navicula halophila* (Grun.) Cl.

Pl. XXI, Fig. 7

Description.--Valve lanceolate, with acute slightly protracted apices, 29 μm long, 7 μm wide; striae 20 in
10 um, parallel; axial area narrow, linear; raphe filiform; central area small.

**Discussion.**—*N. halophila* was represented by a single specimen collected on the lower Buffalo River. This taxon is distinguished by the shape of the valve, the size of the frustule, and the parallel to near parallel striae.

**Navicula hustedtii** Krasske

*Pl. XXI, Fig. 8*

**Description.**—Valve linear-lanceolate, with large capitate apices, 13-16 um long, 4-6 um wide; striae slightly radiate throughout, 20-22 in 10 um; axial area narrow, linear; raphe filiform; central area irregularly elliptical.

**Discussion.**—*N. hustedtii* was seen several times in collections taken from the lower Buffalo River. This taxon is distinguished by its shape, size, and distinctive apices. The fine striae appear cross-lineate to punctate.

**Navicula jaernefeltii** Hust.

*Pl. XXII, Fig. 1*

**Description.**—Valve elliptical, with broad rounded ends, 16-20 um long, 8-10 um wide; striae radiate throughout, punctate, occasionally appearing cross-lineate, 16-25 in 10 um; axial area narrow, linear; raphe filiform; central area irregularly small to indistinct.

**Discussion.**—*N. jaernefeltii* was observed in several
collections taken from the lower Buffalo River. It was also identified once from a Big Springs sample. The diatom is characterized by the shape of the valve and the radiate, punctate striae.

**Navicula lanceolata** (Ag.) Kutz.

*Pl. XXII, Fig. 2*

**Description.**—Valve lanceolate, with acute to slightly protracted apices, 30-45 um long, 9-11 um wide; striae radiate at midvalve becoming parallel at the poles, 10-14 in 10 um; axial area narrow, linear; raphe filiform; central area orbicular, formed by regularly shortened midvalve striae.

**Discussion.**—*N. lanceolata* was infrequent in collections from Henrys Lake Outlet, below Macks Inn, and more commonly in the lower Buffalo River. Its abundance was always low. The shape of the valve and the orbicular central area distinguish this taxon.

**Navicula laterostrata** Hust.

*Pl. XXII, Fig. 3*

**Description.**—Valve lanceolate, with broad rostrate to capitate apices, 25-30 um long, 7-9 um wide; striae radiate at midvalve becoming parallel at the poles, cross-lineate, 15-17 in 10 um; axial area linear, narrow, raphe filiform; central area small orbicular.
Discussion.---*Navicula laterostrata* was infrequently observed in collections taken from lower Big Springs stream, below Macks Inn, and from the lower Buffalo River. This taxon is distinguished by the shape of the valve and structure of the central area.

*Navicula menisculus* Schum.

Pl. XXII, Fig. 4

Description.---Valve elliptical-lanceolate with acute rounded apices, 12-25 µm long, 4-9 µm wide; striae radiate throughout, 12-14 in 10 µm; axial area narrow, linear; raphe filiform; central area transversely rectangular, formed by irregular peripheral striae.

Discussion.---*N. menisculus* was moderately abundant throughout the study area. This taxon is distinguished by valve shape and striation.

*Navicula minima* Grun.

Pl. XXII, Fig. 6

Description.---Valve linear-elliptical, with rounded apices, 7-9 µm long, 4-5 µm wide; striae mostly radiate, 24-26 in 10 µm; axial area narrow, linear; raphe filiform; central area small, formed by the shortening of a single pair of midvalve striae.

Discussion.---*N. minima* was found in low abundance throughout the study area. The small size of the frustule,
the shape of the valve, and the small central area distinguish the taxon.

_Navicula minusculoides_ Hust.

Pl. XXII, Fig. 7

**Description.**—Valve lanceolate, with slightly protracted rostrate apices, 12-15 µm long, 4-6 µm wide; striae parallel at midvalve becoming radiate near the apices; axial area narrow, linear, flaring at midvalve; raphe filiform; central area linear, small, longer than wide.

**Discussion.**—_N. minusculoides_ was infrequent in collections from the upper Henrys Lake Outlet. This taxon is distinguished by the shape of the valve and central area.

_Navicula muraliformis_ Hust.

Pl. XXII, Fig. 5

**Description.**—Valve linear-elliptical, with broad rounded apices, 11 µm long, 7 µm wide; striae parallel at midvalve becoming radiate near the poles, 20-22 in 10 µm; axial area narrow, linear; raphe filiform; central area absent.

**Discussion.**—_N. muraliformes_ was represented by a single specimen found in a collection taken from the Buffalo River. The shape of the valve and parallel to radiate striae distinguish this taxon.
Navicula mutica Kutz.
Pl. XXII, Fig. 9

Description.--Valve lanceolate, with rounded to slightly protracted apices, 18-35 um long, 7-13 um wide; striae distinctly punctate, radiate throughout, 14-18 in 10 um; axial area narrow, linear; raphe filiform, with proximal nodules bent unidirectionally; central area transversely elliptical, containing an isolated punctum.

Discussion.--N. mutica was distributed among scattered stations with a low abundance at each. This taxon is distinguished by the shape of the valve and striation.

Navicula mutica var. cohnii (Hilse) Grun.
Pl. XXII, Fig. 10

Description.--Valve linear-elliptical, with broad rounded ends, 10-12 um long, 5-6 um wide; striae distinctly punctate, radiate throughout, 14-18 in 10 um; axial area narrow, linear; raphe filiform, unidirectionally bent within the central area; central area transversely rectangular, containing an isolated punctum.

Discussion.--N. mutica var. cohnii was represented by several specimens from collections on the Buffalo River near the Elk Creek confluence. This variety differs from the nominate in the size and shape of the valve and in the larger central area.
Navicula mutica var. undulata (Hilse) Grun.

Pl. XXII, Fig. 8

Description.--Valve linear-lanceolate, with undulate margins and protracted rounded apices, 17 um long, 6 um wide; striae punctate, radiate throughout, 14-18 in 10 um; axial area narrow, linear; raphe filiform, unidirectionally bent within the central area; central area transversely rectangular, containing an isolated punctum.

Discussion.--N. mutica var. undulata was represented by a single specimen in a collection from Henrys Fork below Coffeepot Campground. This variety is distinguished from the nominate by the shape of the valve with its undulate margins.

Navicula pelliculosa (Breb. ex Kutz.) Hilse

Pl. XXIII, Fig. 1

Description.--Valve elliptical to linear-elliptical, with rounded apices, 6-8 um long, 5-6 um wide; striae very fine, indistinct; axial area linear, constricted at midvalve; raphe in silicious thickening, indistinct; central area absent.

Discussion.--N. pelliculosa was represented by several specimens collected at scattered stations throughout the system. This taxon is distinguished by the small, lightly silicified elliptical frustules and the highly silicified axial area.
Navicula placentula f. rostrata A. Mayer

Pl. XXIII, Fig. 2

**Description.**—Valve elliptical-lanceolate, with attenuated rostrate apices, 35-38 um long, 14-15 um wide; striae moderately radiate throughout, 8-10 in 10 um; axial area linear, narrow; raphe filiform; central area small, rounded.

**Discussion.**—*N. placentula f. rostrata* was represented in the study by single specimens from upper Henrys Lake Outlet and Henrys Fork at McCraes Bridge. The taxon is distinguished by the shape of the valve and striaion.

Navicula pseudoscutiformis Hust.

Pl. XXIII, Fig. 3

**Description.**—Valve orbicular, with apices not differentiated from the valve body, 10-14 um long, 9-11 um wide; striae sharply radiate throughout, punctate, 24-28 in 10 um; axial area narrow, flaring into the midvalve; raphe filiform; central area indistinct.

**Discussion.**—*N. pseudoscutiformis* was found in low abundance at several stations above Island Park Reservoir. The diatom was collected from both Henrys Fork and the Buffalo River. This taxon is distinguished by the round valve and the sharply radiate striae.
Navicula pupula Kutz.
Pl. XXIII, Fig. 5

Description.—Valve linear-lanceolate, with broad rostrate to subcapitate apices, 19-30 μm long, 5-9 μm wide; striae radiate, arcuate, 13-17 in 10 μm; axial area linear; raphe filiform; central area transversely rectangular.

Discussion.—N. pupula was widely distributed in the study area but was low in abundance at all stations. This taxon is distinguished by the shape of the valve and the arcuate striae.

Navicula pupula var. capitata Hust.
Pl. XXIII, Fig. 6

Description.—Valve linear to linear-lanceolate, with broad capitate apices, 22-29 μm long, 6-10 μm wide; striae radiate, arcuate, 13-17 in 10 μm; axial area linear; raphe filiform; central area transversely rectangular.

Discussion.—N. pupula var. capitata was widely distributed in the study area but was low in abundance in all collections. This variety is distinguished from the nominate by the shape of the apices.

Navicula pupula var. minuta V. H.
Pl. XXIII, Fig. 7

Description.—Valve lanceolate, with broad rostrate truncated apices, 18 μm long, 9 μm wide; striae radiate,
arcuate, 13-17 in 10 um; axial area linear; raphe filiform; central area transversely rectangular.

Discussion.—-*N. pupula* var. *minuta* was represented by a single specimen collected from the upper Henrys Lake Outlet (Station 1). This variety differs from the nominate in its smaller size and truncate apices.

Navicula pupula var. mutata (Krasske) Hust.

Pl. XXIII, Fig. 8

Description.—Valve elliptical-lanceolate, with attenuated rostrate apices, 25 um long, 8 um wide; striae radiate, arcuate, 13-17 in 10 um; axial area linear; raphe filiform; central area transversely rectangular.

Discussion.—*N. pupula* var. *mutata* was collected as single specimens from Henrys Lake and Henrys Lake Outlet. This variety differs from the nominate in the shape of the apices and in its smaller size.

Navicula pupula var. rectangularis (Greg.) Grun.

Pl. XXIII, Fig. 4

Description.—Valve linear, with broad rounded apices, 40-47 um long, 9-11 um wide; striae radiate, arcuate, 13-17 in 10 um; axial area linear; raphe filiform; central area broad, transverse.

Discussion.—*N. pupula* var. *rectangularis* was found in low abundance at several stations throughout the study
area. This variety differs from the nominate in the linear valve shape, the wide transverse central area, and the larger size of the frustule.

**Navicula pygmaea** Kutz.

Pl. XXV, Fig. 1

**Description.**—Valve linear-elliptical, with broadly rounded apices, 21–23 μm long, 11–12 μm wide; lateral areas prominent, curving into midvalve and poles; striae radiate, 22–24 in 10 μm; axial area narrow, linear; raphe filiform; central area merging with lateral areas.

**Discussion.**—*N. pygmaea* was represented by a few specimens collected from upper Henrys Lake Outlet. This taxon is distinguished by the shape of the valve and the presence of the curved lateral areas.

**Navicula radiosa** Kutz.

Pl. XXIII, Fig. 9

**Description.**—Valve linear-lanceolate, with acute rounded apices, 40–35 μm long, 9–12 μm wide; striae radiate at midvalve becoming convergent at the poles, 10–12 in 10 μm; axial area narrow, linear; raphe filiform; central area orbicular to irregular.

**Discussion.**—*N. radiosa* was moderately abundant throughout the study area. This diatom was not found in collections taken from the upper Henrys Lake Outlet nor
from any of the source springs. This taxon is characterized by the size and shape of the valve.

*Navicula radiosa* var. *parva* Wallace

Pl. XXIII, Fig. 10

**Description.**--Valve linear-lanceolate, with acute rounded apices, 40-42 µm long, 6-7 µm wide; striae radiate at midvalve becoming convergent at the poles, 13-14 in 10 µm; axial area narrow, linear; raphe filiform; central area orbicular to rectangular.

**Discussion.**--*N. radiosa* var. *parva* was represented by a few specimens collected from the lower Buffalo River. This variety differs from the nominate in its smaller size and finer striae.

*Navicula radiosa* var. *tenella* (Breb. ex Kutz.) Grun.

Pl. XXIII, Fig. 11

**Description.**--Valve linear-lanceolate, with acute rounded apices, 20-28 µm long, 5-6 µm wide; striae radiate at midvalve becoming parallel to convergent at the poles, 15-16 in 10 µm; axial area narrow, linear; raphe filiform; central area small, irregularly rectangular, usually with longer midvalve striae.

**Discussion.**--*N. radiosa* var. *tenella* was observed in collections taken from scattered stations located above Island Park Reservoir, including the Buffalo River. This
variety is distinguished by its very fine striae and small size of the frustule.

**Navicula recondita** Hust.

Pl. XXIV, Fig. 1

**Description.**--Valve linear-elliptical, with broad rounded apices, 10-11 μm long, 5-6 μm wide; striae radiate throughout, 14-15 in 10 μm; axial area lanceolate; raphe filiform; central area small, formed by one or two shortened striae.

**Discussion.**--*N. recondita* was moderately abundant on the lower Big Springs stream (Station 4). This diatom was not found at other stations. This taxon is distinguished by the shape of the valve, the small size of the frustule, and the short striae that form the lanceolate-shaped axial area.

**Navicula rhynchocephala** Kutz.

Pl. XXIV, Fig. 2

**Description.**--Valve lanceolate, with attenuated rostrate to subcapitate apices, 50-55 μm long, 10-11 μm wide; striae radiate at midvalve becoming convergent near the poles, 8-12 in 10 μm; axial area narrow, linear; raphe filiform; central area orbicular to irregularly rectangular.

**Discussion.**--*N. rhynchocephala* was low to moderate in abundance in collections from most spring streams
(Stations 2, 3, 4, and 10). This taxon is distinguished by the size and shape of the valve.

**Navicula rhynchocephala** var. **amphiceros** (Kutz.) V. H.

*Pl. XXIV, Fig. 3*

**Description.**—Valve broadly lanceolate, with rostrate apices, 37-54 um long, 10-12 um wide; striae radiate at midvalve becoming convergent near the poles, 8-12 in 10 um; axial area narrow, linear; raphe filiform; central area irregularly to regularly orbicular.

**Discussion.**—*N. rhynchocephala* var. **amphiceros** was widely distributed throughout the study area. It was more common than the nominate variety. This variety differs from the nominate in the broader valve and the less attenuate poles.

**Navicula rhynchocephala** var. **elongata** May

*Pl. XXIV, Fig. 4*

**Description.**—Valve lanceolate, with long protracted rostrate to capitate apices, 50-54 um long, 11-12 um wide; striae radiate at midvalve becoming convergent near the poles, 8-12 in 10 um; axial area linear; raphe filiform; central area irregularly orbicular.

**Discussion.**—*N. rhynchocephala* var. **elongata** was represented by two specimens collected on the lower Buffalo River. This variety differs from the nominate in valve
shape and the protracted poles.

Navicula rhynchocephala var. grunowii A. Cl.

Pl. XXIV, Fig. 5

Description.—Valve lanceolate, nearly rhombic, with acute, slightly protracted apices, 58 μm long, 14 μm wide; striae mostly radiate throughout, 8-12 in 10 μm; axial area gradually widening toward midvalve; raphe filiform; central area elliptical.

Discussion.—Navicula rhynchocephala var. grunowii was observed as a single specimen collected from Island Park Reservoir. This variety differs from the nominate in the shape of the valve and in the shape of the axial and central areas.

Navicula rotaeana (Rabh.) Grun.

Pl. XXIV, Fig. 6

Description.—Valve linear-elliptical, with broad rounded apices not set off from valve body, 18-20 μm long, 8-9 μm wide; striae oblique, radiate to the raphe, 26-30 in 10 μm; axial area narrow, linear, oblique; raphe filiform; central area transversely rectangular.

Discussion.—N. rotaeana was observed at scattered sites from Henrys Lake to McCraes Bridge. Only one or two specimens were observed in the collections at each site. This diatom is characterized by the oblique axial area and
the shape of the valve. Specimens were not assigned to *Navicula vanheurckii* Patr. since the raphe was not sigmoid as described by Patrick and Reimer (1966).

**Navicula salinarum** var. *intermedia* (Grun.) Cl.

Pl. XXIV, Fig. 8

Description.--Valve lanceolate, with attenuated rostrate to capitate apices, 30-35 um long, 8-9 um wide; striae radiate at midvalve becoming convergent at the poles, 14-16 in 10 um; axial area narrow to very narrow; raphe filiform; central area irregular in shape.

Discussion.--*Navicula salinarum* var. *intermedia* was very common in collections taken throughout the study area. It was particularly abundant in Henrys Lake Outlet. The size and shape of the frustule and the irregular central area distinguish the taxon.

**Navicula scutelloides** W. Sm.

Pl. XXIV, Fig. 7

Description.--Valve elliptical, with rounded apices not set off from valve body, 15-25 um long, 11-13 um wide; striae strongly radiate, punctate, irregularly shortened about the central area, 7-11 in 10 um; axial area narrow, linear; raphe filiform; central area irregular to indistinct.

Discussion.--*Navicula scutelloides* was collected exclusively from Henrys Lake Outlet in moderate abundance. This
taxon is distinguished by the shape of the valve and the punctate striae.

**Navicula secreta var. apiculata** Patr.

*Pl. XXIV, Fig. 9*

**Description.**—Valve lanceolate, with rostrate apices, 23-29 µm long, 5-8 µm wide; striae mostly parallel, slightly radiate at midvalve, slightly convergent near the poles, 15-17 in 10 µm; axial area narrow, linear; raphe filiform; central area irregular to elliptical.

**Discussion.**—*N. secreta var. apiculata* was common in Henrys Fork from Macks Inn downstream to Last Chance. This taxon is distinguished by the shape and size of the valve and the nearly parallel striae.

**Navicula semen** Ehr.

*Pl. XXIV, Fig. 10*

**Description.**—Valve linear to linear-elliptical, with broad subrostrate apices, 58-72 µm long, 21-24 µm wide; striae punctate, arcuate, radiate throughout most of the valve, becoming sharply convergent near the apices, 8-12 in 10 µm; axial area linear, narrow; raphe undulate; central area orbicular, often with isolated punctae.

**Discussion.**—*N. semen* was infrequently observed in collections from a number of scattered sites throughout the study area. This taxon is distinguished by the size and
shape of the valve, the punctate striae, and the orbicular central area often with isolated punctae.

**Navicula seminuloides** Hust.

*Pl.* XXV, *Fig.* 2

**Description.**--Valve linear-elliptical, with rounded apices not set off from the valve body, 7-11 um long, 3-5 um wide; striae radiate throughout, 15-17 in 10 um; axial area linear, narrow; raphe filiform; central area irregularly elliptical.

**Discussion.**--*N.* seminuloides was moderately abundant throughout the study area. This taxon is distinguished by its small size, valve shape, and radiate striae.

**Navicula seminulum** Grun.

*Pl.* XXV, *Fig.* 3

**Description.**--Valve elliptical to rhombic, with rounded truncate apices, 7-9 um long, 3-4 um wide; striae slightly radiate, 20-22 in 10 um; axial area linear, narrow; raphe filiform; central area small, rounded.

**Discussion.**--*N.* seminulum was moderately abundant in collections from stations throughout the study area. This taxon is distinguished by its small size, valve shape, and slightly radiate striae.

**Navicula stromii** Hust.

*Pl.* XXV, *Fig.* 4
Description.--Valve linear to linear-lanceolate, with broad subcapitate apices nearly forming triundulate margins, 17 um long, 6 um wide; striae radiate throughout, 22-25 in 10 um; axial area linear, narrow; raphe filiform; central area transversely elliptical.

Discussion.--N. stromii was represented by a single specimen collected below Macks Inn on Henrys Fork. This taxon is distinguished by valve shape and striaion.

Navicula tripunctata (O. F. Mull.) Bory
Pl. XXV, Fig. 5

Description.--Valve linear-lanceolate, with obtuse to slightly protracted rounded apices, 37-52 um long, 8-9 um wide; striae slightly radiate at midvalve becoming slightly convergent at the poles, 11-12 in 10 um; axial area linear, narrow; raphe filiform; central area transversely rectangular, formed by three (occasionally two) shortened striae.

Discussion.--N. tripunctata was low to moderate in abundance at most study sites throughout the Henrys Fork drainage. This diatom was not found at the source springs (Stations 2, 3, and 10). This taxon is distinguished by the shape of the valve, the large rectangular central area, and the nearly parallel striae.

Navicula variostriata Krasske
Pl. XIX, Fig. 9
Description.--Valve linear-elliptical, with rounded apices not set off from the valve body, 36 um long, 10 um wide; striae punctate, radiate and arcuate throughout, about 20 in 10 um at midvalve, to 28 in 10 um at the valve poles; axial area linear; raphe filiform; central area elliptical, with median stria longer.

Discussion.--N. variostriata was represented by a single specimen collected from the lower Big Springs stream. This taxon is distinguished by the shape of the valve, the radiate, arcuate striae, and the shape of the central area.

Navicula viridula (Kutz.) Kutz.
Pl. XXV, Fig. 6

Description.--Valve linear-lanceolate, narrowing to obtuse, rostrate rounded apices, 52-76 um long, 13-16 um wide; striae radiate throughout, becoming convergent directly at the poles, 8-10 in 10 um; axial area narrow, linear; raphe filiform; central area large, elliptical.

Discussion.--N. viridula was widely distributed throughout the study area, but was generally in low abundance in most collections. It was not found at source springs (Station 2, 3, 4, and 10). This taxon is distinguished by the shape of the valve and the coarse striae.

Genus CALONEIS Cl.

Caloneis bacillaris (Greg.) Cl.
**Description.**—Valve linear, with broad rounded poles, 12 μm long, 5 μm wide; striae radiate throughout, 20–24 in 10 μm; axial area linear-lanceolate; raphe filiform, bent proximally; central area rectangular.

**Discussion.**—*C. bacillaris* was represented by a single specimen collected from upper Henrys Lake Outlet. This taxon is distinguished by the shape and size of the valve, the fine striae, and the shape of the central area.

*Culoeis bacillum* (Grun.) Cl.

**Description.**—Valve linear, with rounded apices, 36 μm long, 6 μm wide; striae radiate at midvalve becoming slightly convergent at the poles, 24–26 in 10 μm; axial area linear, narrow; raphe filiform, bent proximally; central area a transverse fascia.

**Discussion.**—*C. bacillum* was represented by a single specimen collected on the lower Buffalo River (Station 12). This taxon is distinguished by the linear valve shape and the transverse fascia.

*Culoeis bacillum* var. *fontinalis* Hust.

**Description.**—Valve linear to linear-elliptical, with broad apices, 11 μm long, 4–5 μm wide; striae radiate
throughout, 24-26 in 10 um; axial area linear; raphe filiform; central area a transverse fascia.

**Discussion.** — *C. bacillum* var. *fontinalis* was represented by single specimens collected from lower Big Springs (Station 4) and the lower Buffalo River (Station 12). This variety differs from the nominate in the size of the valve.

**Caloneis lewesii** Patr.

Pl. XXV, Fig. 8

**Description.** — Valve strongly triundulate, with cuneate-rounded apices, 35 um long, 13 um wide; striae mostly parallel, radiate about the central area, 18-20 in 10 um; axial area biconstricted; raphe filiform, bent proximally; central area follows expansion of the midvalve, with lunate markings on either side of the valve.

**Discussion.** — *C. lewesii* was represented by a single specimen collected from McCraes Bridge (Station A). This taxon is distinguished by the shape of the valve, the short striae about the axial and central areas, and the central lunate markings.

**Caloneis ventricosa** (Ehr.) Meist.

Pl. XXVI, Fig. 1

**Description.** — Valve linear, biconstricted, with swollen midvalve and broad rounded apices, 85-95 um long,
14-16 um wide; striae mostly parallel throughout, radiate at the poles, 16-20 in 10 um, crossed by two marginal longitudinal lines; axial area linear, biconstricted; raphe filiform; central area indistinct from axial area.

**Discussion.**—*C. ventricosa* was represented by single specimens collected from lower Big Springs (Station 4), the lower Buffalo River (Station 12), and McCraes Bridge (Station A). The shape of the valve and the structure of the axial area distinguish this taxon.

**Caloneis ventricosa var. subundulata** (Grun.) Patr.

*Pl. XXVI, Fig. 2*

**Description.**—Valve linear, biconstricted, with swollen midvalve and broad cuneate-rounded apices, 54 um long, 11 um wide; striae mostly parallel becoming radiate at the poles, 16-20 in 10 um; axial area linear, flaring at midvalve; raphe filiform; central area a narrow transverse fascia.

**Discussion.**—*C. ventricosa var. subundulata* was represented by a single specimen collected at Station 11 on the Buffalo River near the Elk Creek confluence. This variety differs from the nominate by the transverse fascia at the central area.

**Genus PINNULARIA Ehr.**

**Pinnularia abajensis var. rostrata** Patr.
Description.--Valve linear, with broadly rostrate apices, 63 µm long, 9 µm wide; striae radiate at midvalve becoming convergent at the poles, 8-10 in 10 µm; axial area linear, broad, one-fourth to one-third valve width; raphe broad with question-mark shaped terminal fissures; central area elliptical.

Discussion.--P. abaujensis var. rostrata was represented by a single specimen collected from the lower Big Springs stream (Station 4). This taxon is distinguished by the size and shape of the valve, the structure of the central area, and striaion.

Pinnularia abaujensis var. subundulata (A. M. ex Hust.) Patr.

Description.--Valve linear, with triundulate margins and attenuated rounded apices, 65 µm long, 13 µm wide; striae radiate at midvalve becoming convergent at the poles, 8-10 in 10 µm; axial area linear, flaring at midvalve; raphe filamentous; terminal fissures not readily apparent; central area a broad transverse fascia.

Discussion.--P. abaujensis var. subundulata was represented by a single specimen collected at Station 8 on Henrys Fork below Macks Inn. This variety is distinguished from the nominate by the shape of the valve and the broad transverse fascia.
**Pinnularia acrosphaeria** (Breb.) W. Sm.

Pl. XXVI, Figs. 5-6

**Description.**—Valve linear, with swollen midvalve, and broad rounded to swollen apices, 60-130 μm long, 11-23 μm wide; striae mostly parallel at midvalve, radiate at the poles, 8-10 in 10 μm; axial area broad, about one-third the valve width, sometimes roughened; raphe broad; central area not differentiated from axial area.

**Discussion.**—*P. acrosphaeria* was represented by a few specimens collected from lower Big Springs (Station 4) and the lower Buffalo River (Station 12). This taxon is distinguished by valve shape and the broad axial area.

**Pinnularia acuminata** W. Sm.

Pl. XXVI, Fig. 7

**Description.**—Valve linear, with cuneate rounded apices, 44-48 μm long, 10-11 μm wide; striae parallel through most of the valve, becoming radiate at the poles, 9-11 in 10 μm; axial area broad, about one-third the valve width; raphe broad; central area a narrow fascia.

**Discussion.**—*P. acuminata* was represented by a few specimens collected from the Buffalo River at Elk Creek confluence. This taxon is distinguished by the shape of the valve and the structure of the axial and central areas. The short parallel striae are also characteristic.
Pinnularia appendiculata (Ag.) Cl.

Pl. XXVI, Fig. 8

Description.--Valve linear, with tapering cuneate rounded apices, 35 um long, 5.5 um wide; striae radiate at midvalve, convergent near the poles, 15-18 in 10 um; axial area linear, narrow; raphe filiform; central area a broad fascia.

Discussion.--P. appendiculata was represented by a single specimen collected on Henrys Fork below Macks Inn. This taxon is distinguished by its small size and comparatively fine striae.

Pinnularia biceps Greg.

Pl. XXVI, Fig. 9

Description.--Valve linear, with slightly attenuated capitate apices, 40-46 um long, 10-11 um wide; striae radiate at midvalve becoming convergent at the poles, 10-12 in 10 um; axial area linear, flaring at midvalve; raphe filamentous; central area a broad fascia.

Discussion.--P. biceps was observed in low abundance in collections from upper Henrys Lake Outlet, Macks Inn, and the lower Buffalo River. The shape of the valve with its capitate apices and the angle and number of striae distinguish this taxon.

Pinnularia borealis Ehr.
Description.--Valve linear, with rounded apices, 28-43 μm long, 9-11 μm wide; striae parallel throughout to slightly radiate at midvalve and slightly convergent at the poles, 5-6 in 10 μm; axial area broad, linear; raphe broad, often bent unilaterally; central area usually indistinct from the axial area.

Discussion.--*P. borealis* was infrequent in collections from scattered sites throughout the study area. This taxon is distinguished by shape and the broad parallel striae. The shape and size of the valve was quite variable in our specimens.

*Pinnularia brandelii* Cl.

Description.--Valve linear, with rounded to slightly swollen poles, 68 μm long, 12 μm wide; striae radiate directly at midvalve becoming convergent very soon, 10-12 in 10 μm; axial area broad, about one-third the valve width, flaring into the midvalve; raphe broad; central area a broad transverse fascia.

Discussion.--*P. brandelii* was represented by a single specimen collected from Henrys Fork below Macks Inn. This taxon is distinguished by the size and shape of the valve, the structure of the axial and central areas, and striation.
Pinnularia brebissonii (Kutz.) Cl.

Pl. XXVII, Figs. 2-3

**Description.**—Valve linear to linear-lanceolate, with rounded to slightly cuneate apices, 32-44 μm long, 9-15 μm wide; striae radiate at midvalve becoming convergent at the poles, 10-12 in 10 μm; axial area linear, expanding gradually or flaring abruptly toward midvalve; raphe filamentous; central area a broad fascia.

**Discussion.**—*P. brebissonii* was collected infrequently at a number of stations in the Henrys Fork drainage. This taxon is distinguished by the size and shape of the valve and the structure of the axial and central areas.

Pinnularia brebissonii var. diminuta (Grun.) Cl.

Pl. XXVII, Fig. 4

**Description.**—Valve linear, with rostrate rounded apices, 23 μm long, 5 μm wide; striae radiate throughout, 10-12 in 10 μm; axial area linear, expanding gradually toward midvalve; raphe filamentous; central area a broad fascia.

**Discussion.**—*P. brebissonii* var. diminuta was represented in the study by a single specimen collected on the lower Buffalo River. This variety is distinguished from the nominate by the size of the valve and the shape of the apices.
**Pinnularia crucifera var. subrostrata** A. Cl.

Pl. XXVII, Fig. 5

Description.--Valve linear, with midvalve slightly swollen and apices slightly protracted, 106 um long, 15 um wide; striae slightly radiate at midvalve becoming convergent at the poles, 9-11 in 10 um; axial area broad, one-third the valve width; raphe broad; central area a narrow fascia with one stria.

Discussion.--**P. crucifera** var. subrostrata was represented in the study by a single specimen collected on the lower Big Springs stream. This taxon is distinguished by the size and shape of the valve and by the "cross" formed by the axial area and the central area.

**Pinnularia dactylus** Ehr.

Pl. XXVII, Fig. 6

Description.--Valve broad, linear to linear-lanceolate, with rounded to cuneate-rounded apices, 175-300 um long, 30-58 um wide; striae nearly parallel throughout to slightly radiate at midvalve and slightly convergent at the poles, crossed by a broad band, 4-5 in 10 um; axial area one-fourth to more than one-third valve width; raphe broad, undulate; central area small, rounded.

Discussion.--**P. dactylus** was the largest diatom observed in the study. Specimens were observed infrequently at a number of sites throughout the drainage. This
taxon is distinguished by its large size, broad axial area, and striation.

**Pinnularia flexuosa Cl.**

Pl. XXVII, Fig. 9

**Description.**--Valve linear, with broad rounded apices, 239 um long, 42 um wide; striae radiate at midvalve becoming convergent at the poles, crossed by a broad band, 4-5 in 10 um; axial area one-fourth the valve width; raphe broad, complex; central area rounded, asymmetrical.

**Discussion.**--*P. flexuosa* was represented by a single specimen collected from lower Big Springs stream. This taxon is distinguished by the relatively narrow axial area, the complex raphe, and the large frustule size.

**Pinnularia hemiptera var. bielawski Her. and Per.**

Pl. XXVII, Fig. 7

**Description.**--Valve linear-lanceolate, with slightly cuneate rounded apices, 44-48 um long, 7-8 um wide; striae radiate and more distant at midvalve becoming convergent at the poles, 8-11 in 10 um; axial area linear-lanceolate; raphe broad; central area transversely elliptical.

**Discussion.**--*P. hemiptera var. bielawski* was moderately abundant in collections taken directly at the source of Big Springs. This taxon is distinguished by the shape and size of the valve, the broad axial area, and the
distant median striae.

**Pinnularia inflata var. major** A. Cl.

*Pl. XXVII, Fig. 8*

**Description.**--Valve linear-lanceolate, with protracted slightly rostrate apices, 41 μm long, 11 μm wide; striae radiate at midvalve becoming convergent at the poles, 13-14 in 10 μm; axial area linear, narrow; raphe filiform; central area elliptical.

**Discussion.**--*P. inflata var. major* was represented by a single specimen collected from Henrys Fork below Macks Inn. This taxon is distinguished by the fine striae, the narrow axial area, and the shape and size of the frustule.

**Pinnularia intermedia** (Lagst.) Cl.

*Pl. XXVII, Figs. 11-12*

**Description.**--Valve linear with, rounded to cuneate-rounded apices, 14-35 μm long, 6-7 μm wide; striae radiate at midvalve becoming convergent at the poles, 7-10 in 10 μm; axial area linear to expanding toward midvalve; raphe filiform; central area a broad fascia.

**Discussion.**--*P. intermedia* was moderately abundant at scattered stations throughout the study area. This taxon is distinguished by the shape and size of the valve and the broad fascia.

**Pinnularia isostauron** (Ehr., Grun.) Cl.
Description.—Valve linear, with broad rounded apices, 44-55 μm long, 8-13 μm wide; striae slightly radiate at midvalve becoming slightly convergent at the poles, 9-11 in 10 μm; axial area about one-third the valve width; raphe filiform; central area a broad fascia.

Discussion.—P. isostauron was represented by a few specimens collected at Station 12 on the lower Buffalo River. This taxon is distinguished by the size and shape of the frustule and the broad fascia.

Pinnularia lata var. pachyptera (Ehr.) Meist.

Description.—Valve linear, with slightly swollen midvalve and rounded apices, 135 μm long, 34 μm wide; striae radiate at midvalve becoming convergent at the poles, 3-4 in 10 μm; axial area broad, less than one-third the valve width; raphe broad; central area elongate elliptic.

Discussion.—P. lata var. pachyptera was represented by a single specimen collected on Henrys Fork below Coffeepot Campground. This taxon is characterized by the linear shape of the valve, the large coarse striae, and the broad axial area.

Pinnularia legumen Ehr.
Description.--Valve linear to linear-lanceolate, usually with triundulate margins, with protracted rostrate apices, 78-83 um long, 16-18 um wide; striae radiate at midvalve, becoming convergent at the poles, 8-10 in 10 um; axial area linear, one-fourth the valve width; raphe broad; central area rounded or a broad fascia.

Discussion.--P. legumen was infrequently collected from several widely scattered sites in the study area. This taxon is distinguished by the triundulate margins and the shape and size of the valve. Patrick and Reimer (1966) did not mention that this taxon may include specimens with a broad fascia. Some of the Henrys Fork specimens did have a definite fascia.

Pinnularia maior (Kutz.) Cl.

Description.--Valve linear, swollen at midvalve, with rounded apices, 170-207 um long, 29-33 um wide; striae radiate at midvalve becoming convergent at the poles, 5-7 in 10 um; axial area one-fifth the valve width; raphe broad; central area elliptical, asymmetrical.

Discussion.--P. maior was infrequently observed in collections taken from a number of stations located above Island Park Reservoir, including the Buffalo River. This taxon is distinguished by its distinct axial area and by
the size and shape of the frustule.

**Pinnularia maior var. transversa** (A. S.) Cl.

*Pl. XXVIII, Fig. 5*

**Description.**—Valve linear, slightly swollen at midvalve and at the ends, with rounded apices, 160–170 μm long, 16–17 μm wide; striae radiate at midvalve becoming convergent at the poles, crossed by submarginal longitudinal lines, 8–9 in 10 μm; axial area up to one-third the valve width; raphe broad; central area unilateral, semielliptical.

**Discussion.**—*P. maior var. transversa* was represented by a single specimen collected at lower Big Springs stream, lower Buffalo River, and McCraes Bridge. This variety differs from the nominate by having finer striae and a greater length to width ratio.

**Pinnularia mesogongyia** Cl.

*Pl. XXVIII, Fig. 6*

**Description.**—Valve lanceolate, gibbous in the center, with capitate apices, 65–75 μm long, 14–16 μm wide; striae radiate at midvalve becoming convergent near the apices, 11–12 in 10 μm; axial area about one-third the valve width; raphe broad; central area large orbicular.

**Discussion.**—*P. mesogongyia* was infrequent in collections from Big Springs in the seepage area on
the bank. This taxon is distinguished largely on the shape of the valve.

**Pinnularia mesolepta** (Ehr.) W. Sm.

Pl. XXVIII, Fig. 8

**Description.**—Valve linear, with triundulate margins and capitate apices, 51 μm long, 11 μm wide; striae radiate at midvalve becoming convergent at the apices, 10-12 in 10 μm; axial area about one-third the width of the valve, lanceolate; raphe broad; central area a very broad fascia.

**Discussion.**—**P. mesolepta** was represented by a single specimen collected from McCraes Bridge (Station A). This taxon is distinguished by the large capitate apices, the broad central fascia, and the triundulate margins.

**Pinnularia mesolepta var. turbulenta** Cleve-Euler

Pl. XXVIII, Fig. 7

**Description.**—Valve linear, with triundulate margins and rostrate apices, 36 μm long, 5 μm wide; striae radiate at midvalve becoming convergent at the apices, 10-12 in 10 μm; axial area about one-fourth the width of the valve; raphe undulate; central area a broad fascia.

**Discussion.**—**P. mesolepta** var. **turbulenta** was represented by a single specimen collected below Macks Inn on Henrys Fork. This variety differs from the nominate by
the rostrate apices, the smaller size of the frustule, and the narrower axial area.

**Pinnularia microstauron** (Ehr.) Cl.

*Pl. XXVIII, Fig. 9*

**Description.**--Valve linear, with broad subrostrate apices, 32-61 um long, 6-9 um wide; striae radiate at midvalve becoming convergent near the apices, 10-12 in 10 um; axial area about one-third valve width, widening toward midvalve; raphe filiform; central area a fascia.

**Discussion.**--*P. microstauron* was observed infrequently in collections from stations scattered throughout the study area. This taxon is distinguished by the size and shape of the valve and the central fascia.

**Pinnularia microstauron** var. *biundulata* O. Mull.

*Pl. XXIX, Fig. 1*

**Description.**--Valve linear, with biundulate margins and round rostrate apices, 46-50 um long, 8-9 um wide; striae radiate at midvalve becoming convergent at the poles, 10-12 in 10 um; axial area one-fourth to one-third valve width, expanding toward the central area; raphe broad; central area a broad fascia.

**Discussion.**--*P. microstauron* var. *biundulata* was collected infrequently from Henrys Fork below Macks Inn and the lower Buffalo River (Station 12). This variety is
distinguished from the nominate by its biundulate margins.

**Pinnularia nobilis** Ehr.

*Pl. XXIX, Fig. 2*

**Description.**—Valve linear, slightly gibbous at midvalve, with broad rounded apices, 200-210 um long, 34-35 um wide; striae radiate at midvalve becoming convergent at the poles, crossed by a wide band, 4-5 in 10 um; axial area one-fourth to one-third the valve width; raphe broad, complex; central area elliptical, scarcely distinct from the axial area.

**Discussion.**—*P. nobilis* was represented by single specimens collected from the Buffalo River near Elk Creek confluence and Island Park Reservoir. This taxon is distinguished by its coarse striae and the length to breadth ratio.

**Pinnularia nodosa** Ehr.

*Pl. XXIX, Fig. 3*

**Description.**—Valve linear to linear-lanceolate, with triundulate margins and with sharply capitate apices, 50-55 um long, 8-9 um wide; striae radiate at midvalve becoming convergent at the poles, 8-10 in 10 um; axial area about one-third the valve width; raphe broad; central area a broad fascia.

**Discussion.**—*P. nodosa* was represented by single specimens collected at Station 5 on Henry's Lake Outlet and
at Station 12 on the lower Buffalo River. This taxon is distinguished by the shape of the valve and the transverse fascia.

**Pinnularia nodosa var. pseudogracillima** (May) A. Cl.

*Pl. XXIX, Fig. 4*

**Description.** Valve linear to linear-lanceolate, with triundulate margins and sharply capitate apices, 50 um long, 9 um wide; striae radiate at midvalve becoming convergent at the poles, 8-10 in 10 um; axial area about one-third the valve width; raphe broad; central area longitudinally elliptical, not a fascia.

**Discussion.** *P. nodosa var. pseudogracillima* was represented by a single specimen collected from Henrys Fork below Coffeepot Campground. This variety differs from the nominate in the structure of the central area.

**Pinnularia parallela** A. Cl.

*Pl. XXIX, Fig. 5*

**Description.** Valve linear, with cuneate rounded apices, 142 um long, 23 um wide; striae mostly parallel, slightly radiate at midvalve, slightly convergent at the poles, 8-10 in 10 um; axial area about one-third valve width; raphe broad, undulate; central area elliptical.

**Discussion.** *P. parallela* was collected from the lower Big Springs stream as a single specimen. This diatom
is characterized by the size and shape of the valve and by the near parallel striae.

**Pinnularia pulchra** Ostr.

Pl. XXIX, Fig. 6

**Description.**--Valve linear, with triundulate margins and subcapitate apices, 45 um long, 9 um wide; striae radiate at midvalve becoming convergent at the poles, 8-10 in 10 um; axial area linear, less than one-fourth valve width, flaring at midvalve; raphe broad; central area a transverse fascia.

**Discussion.**--*P. pulchra* was represented by a few specimens collected from the Buffalo River near the Elk Creek confluence. This taxon is distinguished by the narrow axial area, the shape and size of the valve, and the central fascia.

**Pinnularia stauroptera** (Grun.) Cl.

Pl. XXIX, Fig. 8

**Description.**--Valve linear to linear-lanceolate, with broad rostrate to subcapitate apices, 79-94 um long, 9-12 um wide; striae radiate at midvalve becoming convergent at the poles, 9-11 in 10 um; axial area less than one-fourth valve width, flaring at midvalve; raphe broad; central area irregularly shaped, usually extending to valve margins.
Discussion.--*P. stauroptera* was moderately abundant at a number of scattered stations above Island Park Reservoir. This taxon is distinguished by the shape of the valve, the narrow axial area, and the irregular central area.

**Pinnularia subcapitata** Greg.

Pl. XXIX, Fig. 7

**Description.**--Valve linear-lanceolate, with subcapitate apices, 33 μm long, 5 μm wide; striae radiate at midvalve, convergent at the poles, 9-11 in 10 μm; raphe filamentous; central area a broad fascia.

Discussion.--*P. subcapitata* was represented by a single specimen collected from the lower Buffalo River. This taxon and its varieties are differentiated by valve shape and presence or absence of a central fascia. The shape of this diatom suggests its assignment to the nominate taxon, although the presence of a central fascia suggests that the diatom is more closely related to *P. subcapitata* var. *lapponica*.

**Pinnularia subcapitata** var. *lapponica* A. Cl.

Pl. XXIX, Fig. 9

**Description.**--Valve linear, with slightly rostrate apices, 37 μm long, 6 μm wide; striae radiate at midvalve, convergent at the poles, 9-11 in 10 μm; raphe filamentous; central area a broad fascia.
Discussion.--*P. subcapitata* var. *lapponica* was represented by a single specimen collected from the lower Buffalo River. This variety differs from the nominate by the shape of the valve and the rostrate apices.

**Pinnularia sudetica** Hilse

Pl. XXIX, Fig. 10

**Description.**--Valve linear-lanceolate, with attenuated rounded to cuneate apices, 64-110 um long, 13-24 um wide; striae radiate at midvalve, convergent at the poles, 14-17 in 10 um; axial area about one-third the valve width; raphe broad; central area elliptical.

Discussion.--*P. sudetica* was collected infrequently from a number of scattered sites above Island Park Reservoir and from the Buffalo River. This taxon is distinguished by the shape of the valve and the fine striae.

**Pinnularia superba** Cleve-Euler

Pl. XXIX, Fig. 11

**Description.**--Valve linear, with gibbous midvalve and poles, 225-270 um long, 28-38 um wide; striae radiate at midvalve, convergent at the poles, 7-8 in 10 um; axial area about one-fourth valve width; raphe broad; central area indistinct from or only slightly expanded from the axial area.

Discussion.--*P. superba* was represented by a few
specimens collected from the lower Big Springs stream (Station 4) and the lower Buffalo River (Station 12). This taxon is distinguished by its length to width ratio and the gibbous midvalve and poles.

**Pinnularia viridis** (Nitzsch.) Ehr.

*Pl. XXX, Fig. 1*

**Description.**—Valve linear-lanceolate, with broad rounded apices, 63-134 um long, 11-34 um wide; striae slightly radiate at midvalve, slightly convergent at the poles, 7-8 in 10 um; axial area about one-fourth the valve width; raphe broad, complex; central area small and unilateral or indistinct from the axial area.

**Discussion.**—*P. viridis* was infrequently collected throughout the study area above Island Park Reservoir and from the Buffalo River. This taxon is distinguished by the narrow axial area and the slightly angled striae.

**Pinnularia viridis** var. *commutata* (Grun.) Cl.

*Pl. XXX, Fig. 2*

**Description.**—Valve linear to linear-lanceolate, with broadly rounded apices, 46-72 um long, 11-14 um wide; striae slightly radiate at midvalve, slightly convergent at the poles, 9-12 in 10 um; axial area lanceolate, about one-fourth the valve width; raphe broad, complex; central area indistinct from the axial area or a narrow fascia.
Discussion.--P. viridis var. commutata was collected associated with the nominate variety and was as abundant. This variety differs from the nominate in the fineness of the striae and the variability of the axial area.

Family CYMBELLACEAE

Genus AMPHORA Ehr.

Amphora ovalis Kutz.

Pl. XXX, Figs. 3-4

Description.--Valve lunate, 28-42 um long, 8-14 um wide; ventral margin concave; dorsal margin convex; axial area narrow, arcuate; raphe filiform, bent dorsally at midvalve; central area extends to ventral margin, rounded to rectangular; ventral striae short, parallel to convergent; dorsal striae parallel at midvalve, becoming radiate at the poles; striae 13-15 in 10 um.

Discussion.--A. ovalis was infrequently observed in collections from most stations throughout the study area. This taxon is distinguished by the size of the frustule, the unilateral central area, and the shape of the valve.

Amphora parallelistriata var. manquini Carter

Pl. XXX, Figs, 6-7; Pl. XXXI, Fig. 1

Description.--Valve arcuate, 22-32 um long, 6-8 um wide; ventral margin slightly gibbous; dorsal margin convex; axial area straight, narrow; raphe filiform; central area
extends to both dorsal and ventral margins or to ventral margin only, often with broken striae; ventral striae short, mostly parallel; dorsal striae mostly parallel; striae 12-13 in 10 μm.

**Discussion.**—*A. parallelistriata* var. *mangunii* was collected infrequently at stations on the lower Buffalo River. This taxon is distinguished by the parallel striae and the central area usually extending to both margins.

**Amphora perpusilla** Grun.

Pl. XXX, Figs. 8-9

**Description.**—Valve arcuate, 8-15 μm long, 3-4 μm wide; ventral margin slightly concave; dorsal margin convex; axial area straight, narrow; raphe filiform; central area extending to both dorsal and ventral margins; ventral striae short, mostly parallel; dorsal striae mostly parallel; striae throughout 16-17 in 10 μm.

**Discussion.**—*A. perpusilla* was collected infrequently from sites throughout the study area. This taxon is distinguished by the small size of the frustule and the fine parallel striae.

**Amphora veneta** Kutz.

Pl. XXX, Fig. 5

**Description.**—Valve semielliptical, with acutely rounded ventrally bent apices, 18 μm long, 4 μm wide;
ventral margin straight; dorsal margin convex; axial area straight, narrow; raphe filiform; central area small, semi-elliptical; ventral striae absent; dorsal striae mostly radiate, punctate, 27-29 in 10 μm.

Discussion.--A. veneta was represented by single specimens collected from the upper Henrys Lake Outlet and from Island Park Reservoir. This taxon is distinguished by its small size and the absence of ventral striae.

Genus CYMBELLA Agardh

**Cymbella affinis** Kutz.  
Pl. XXXI, Fig. 2

Description.--Valve cymbellloid, with rostrate apices, 24-38 μm long, 8-11 wide; ventral margin convex, at times gibbous at midvalve; dorsal margin strongly convex; axial area narrow, arcuate; raphe filiform, arched, bent dorsally at the poles; central area small, elliptical, with ventral isolated punctum; striae parallel at midvalve, radiate at the poles, 12-14 in 10 μm.

Discussion.--C. affinis was a very common diatom throughout the study area. It was particularly abundant in the April bloom at Henrys Lake Outlet. This taxon is distinguished by the shape of the valve and the presence of the ventral isolated punctum.

**Cymbella aspera** (Ehr.) Cl.
Pl. XXXI, Fig. 3

Description.--Valve semilanceolate, with broadly rounded apices, 138-172 um long, 34-40 um wide; ventral margin straight, slightly gibbous at midvalve; dorsal margin convex; axial area broad, enlarging into the central area; raphe filiform, slightly bent dorsally, eccentric; central area widened from axial area; striae radiate throughout, punctate, 7-9 in 10 um.

Discussion.--*C. aspera* was collected infrequently throughout the study area above Island Park Reservoir. This taxon is distinguished by its size, striation, and shape.

*Cymbella cesatii* Grun.

Pl. XXXI, Fig. 4

Description.--Valve nearly lanceolate, with slightly protracted apices, 32-44 um long, 6-8 um wide; ventral margin concave; dorsal margin concave; axial area narrow, straight, gradually widening into the central area; raphe straight, filiform; central area small, elliptical, extending from the axial area; striae parallel at midvalve, radiate at the poles, 18-20 in 10 um.

Discussion.--*C. cesatii* was widely distributed throughout the study area but was found in low abundance at all sites where it was collected. This taxon is distinguished by its lanceolate shape and the fine radiate striae.
**Cymbella cistula** Hempr.

Pl. XXXI, Fig. 5

**Description.**--Valve cymbelloid, with rounded slightly protracted apices, 48-95 um long, 8-22 um wide; ventral margin straight to concave, often with gibbous midvalve; dorsal margin strongly convex; axial area narrow, arcuate; raphe filiform, arched; central area indistinct to orbicular, with two to four isolated ventral punctae; striae radiate throughout, punctate, 7-9 in 10 um.

**Discussion.**--*C. cistula* was collected in low to moderate abundance at sites throughout the study area. This taxon is highly variable in valve size and shape. This diatom is characterized by the isolated ventral punctae in the central area and by the radiate striae.

**Cymbella cistula** var. *maculata* (Kutz.) V. H.

Pl. XXXI, Fig. 6

**Description.**--Valve cymbelloid, with rounded slightly protracted apices, 95 um long, 17 um wide; ventral margin concave, often with gibbous midvalve; dorsal margin strongly convex; axial area narrow, arcuate; raphe broad, arched; central area orbicular, lacking isolated punctae; striae radiate throughout, punctate, 7-9 in 10 um.

**Discussion.**--*C. cistula* var. *maculata* was represented by a single specimen collected on the lower Big Springs stream. This variety differs from the nominate
by the absence of isolated punctae in the central area.

*Cymbella cuspidata* Kutz.

**Pl. XXXI, Fig. 7**

*Description.*—Valve asymmetrically elliptical-lanceolate, with rounded attenuate apices, 45-76 um long, 14-24 um wide; ventral margin convex; dorsal margin convex; axial area narrow, linear; raphe filiform; central area transversely elliptical; striae radiate throughout, 10-12 in 10 um.

*Discussion.*—*C. cuspidata* was infrequently found at scattered stations throughout the study area above Island Park Reservoir. This taxon is distinguished by the shape of the valve and striaion.

*Cymbella cuspidata var. lanceolata* May

**Pl. XXXI, Fig. 8**

*Description.*—Valve nearly lanceolate, with rounded attenuate apices, 85-115 um long, 23-29 um wide; ventral margin convex; dorsal margin convex; axial area narrow, linear; raphe filiform; central area transversely elliptical; striae radiate at midvalve, convergent to parallel at the poles, 10-12 in 10 um.

*Discussion.*—*C. cuspidata var. lanceolata* was collected infrequently from the lower Big Springs stream, below the confluence of Henrys Lake Outlet with Big Springs,
and at McCraes Bridge. This variety differs from the nominate by the shape and size of the valve.

**Cymbella cymbiformis** (Ag.?) Kutz.

*Pl. XXXI, Fig. 9*

**Description.**--Valve cymbelloid, with rounded apices, 81 um long, 23 um wide; ventral margin nearly straight, gibbous at midvalve; dorsal margin convex; axial area narrow, arcuate; raphe filiform, arched; central area orbicular with central isolated punctum; striae radiate throughout, punctate, 8-10 in 10 um.

**Discussion.**--*C. cymbiformis* was represented by a single specimen collected on the lower Buffalo River. This taxon is distinguished by the shape of the valve, the size of the frustule, and the central isolated punctum.

**Cymbella ehrenbergii** Kutz.

*Pl. XXXII, Fig. 1*

**Description.**--Valve asymmetrically elliptical-lanceolate, with slightly rostrate rounded apices, 89 um long, 30 um wide; ventral margin convex; dorsal margin convex; axial area broad, gradually widening into central area; raphe filamentous; central area large, elliptical; striae radiate, punctate, 7-9 in 10 um.

**Discussion.**--*C. ehrenbergii* was represented by a single specimen collected at Station 11 on the Buffalo
River near the confluence of Elk Creek. This taxon is distinguished by the size and shape of the valve, the large axial and central areas, and the radiate, punctate striae.

*Cymbella ehrenbergii* var. *hungarica* Pant.

**Pl. XXXII, Fig. 2**

**Description.**—Valve asymmetrically lanceolate, with rostrate rounded apices, 99 um long, 33 um wide; ventral margin convex; dorsal margin convex; axial area broad, gradually widening into the central area; raphe filiform; central area large elliptical; striae radiate, punctate, 7-9 in 10 um.

**Discussion.**—*C. ehrenbergii* var. *hungarica* was collected once from upper Henrys Lake Outlet and once from McCraes Bridge. This variety differs from the nominate in the size and shape of the valve.

*Cymbella gracilis* (Rabh.) Cl.

**Pl. XXXII, Figs. 3-4**

**Description.**—Valve cymbelloid to semilanceolate, with rounded ventrally directed apices, 35-45 um long, 7-11 um wide; ventral margin straight to concave, often with gibbous midvalve; dorsal margin convex; axial area narrow, arcuate; raphe filiform, arched to straight; central area small to indistinct from axial area; striae parallel to slightly radiate throughout, 10-12 in 10 um.
Discussion.--C. gracilis was collected infrequently throughout the study area. This taxon is distinguished by the shape of the valve and striaion.

**Cymbella heteropleura** Ehr.

Pl. XXXII, Fig. 5

**Description.**--Valve asymmetrically lanceolate, with attenuated rounded apices, 99-140 μm long, 23-37 μm wide; ventral margin convex; dorsal margin convex; axial area broad, up to one-fourth valve width; raphe broad; central area elliptical, continuous with the axial area; striae radiate, punctate, 6-8 in 10 μm.

**Discussion.**--C. heteropleura was represented by a single specimen collected from the upper Henrys Lake Outlet, and by several specimens collected from the lower Big Springs stream and the lower Buffalo River. This diatom is characterized by its size, punctate striae, and wide axial and central areas.

**Cymbella heteropleura** var. minor Cl.

Pl. XXXII, Fig. 6

**Description.**--Valve asymmetrically lanceolate, with attenuated rounded apices, 63 μm long, 15 μm wide; ventral margin convex; dorsal margin convex; axial area narrow, linear; raphe broad; central area elliptical; striae slightly radiate, punctate, 8-10 in 10 μm.
Discussion.--*C. heteropleura* var. *minor* was represented by a single specimen collected from the lower Big Springs stream. This variety differs from the nominate by valve size, the narrow axial area, and the finer striae.

*Cymbella heteropleura* var. *subrostrata* Cl.

Pl. XXXII, Fig. 7

Description.--Valve asymmetrically lanceolate, with attenuated rounded apices, 165-190 um long, 46-54 um wide; ventral margin convex; dorsal margin convex; axial area narrow, linear, expanding near midvalve; raphe broad; central area elliptical; striae radiate, punctate, 8-10 in 10 um.

Discussion.--*C. heteropleura* var. *subrostrata* was represented by a few specimens collected from the lower Big Springs stream and the lower Buffalo River. This variety is characterized by its large size, fine striae, and narrow axial area.

*Cymbella hungarica* var. *grunowii* A. Cl.

Pl. XXXII, Fig. 8

Description.--Valve cymbelloid, with rounded, nearly truncate apices, 39-46 um long, 10-11 um wide; ventral margin concave with gibbous midvalve; dorsal margin convex; axial area linear to lanceolate; raphe broad; central area elliptical; striae radiate throughout, cross-lineate to punctate, 9-10 in 10 um.
Discussion.—C. hungarica var. grunowii was represented by a few specimens collected from the lower Big Springs stream, Henrys Fork below Macks Inn, and the lower Buffalo River. This taxon is distinguished by the shape of the valve, the striaion, and the broad raphe.

*Cymbella mexicana* (Ehr.) A. S.

Pl. XXXIII, Fig. 1

Description.—Valve cymbelloid, with rounded, slightly rostrate apices, 90-130 μm long, 26-33 μm wide; axial area broad, arcuate; raphe filiform, arched; central area elliptical, with central isolated punctum; striae radiate throughout, 5-6 in 10 μm.

Discussion.—*C. mexicana* was widely distributed throughout the study area. It was infrequently collected at stations above Island Park Reservoir and commonly collected at sites below Island Park Dam. This taxon is distinguished by the size and shape of the valve and the central isolated punctum.

*Cymbella microcephala* Grun.

Pl. XXXIII, Fig. 2

Description.—Valve asymmetrically linear-lanceolate, with subcapitate apices, 13-22 μm long, 3-4 μm wide; ventral margin convex; dorsal margin more convex; axial area straight, narrow, linear; raphe filiform; central area small, often unilateral, formed by the regular
shortening of midvalve striae; striae slightly radiate throughout, 25-28 in 10 um.

Discussion.--C. microcephala was collected in low to moderate abundance at scattered stations throughout the study area. This taxon is distinguished by the small size of the frustule, the slightly radiate to near parallel striae, and the small central area.

Cymbella naviculiformis Auersw.

Pl. XXXIII, Fig. 3

Description.--Valve asymmetrically elliptical-lanceolate, with rostrate to subcapitate apices; ventral margin convex; dorsal margin more convex; axial area linear, straight; raphe filiform; central area orbicular; striae radiate throughout, 10-14 in 10 um.

Discussion.--C. naviculiformis was infrequent to common in collections taken throughout the study area. This taxon is distinguished by the shape of the valve and by striation.

Cymbella prostrata (Berk.) Cle.

Pl. XXXIII, Fig. 4

Description.--Valve semielliptical, with broad slightly rostrate apices, 43-60 um long, 19-24 um wide; ventral margin convex; dorsal margin strongly convex; axial area straight, narrow, linear; raphe filiform, straight,
with proximal fissures bent dorsally; central area elliptical to orbicular; striae cross-lineate, radiate throughout, 8-10 in 10 μm.

**Discussion.**—*C. prostrata* was infrequent in collections above Island Park Reservoir and was occasionally observed in samples taken from sites below Island Park Dam. This taxon is distinguished by the size and shape of the frustule.

**Cymbella sinuata** Greg.

*Pl. XXXIII, Fig. 5*

**Description.**—Valve asymmetrically linear, with broadly rounded apices, 11-19 μm long, 3-4 μm wide; ventral margin straight to slightly concave with gibous midvalve; dorsal margin convex; axial area narrow, linear; raphe filiform; central area a broad fascia, with ventral isolated punctum; striae parallel to radiate, 9-11 in 10 μm.

**Discussion.**—*C. sinuata* was infrequently observed throughout the study area. At the upper Henrys Lake Outlet this diatom was common in samples collected. This taxon is distinguished by the shape of the valve, small size of the frustule, and by the large central area with an isolated punctum.

**Cymbella tumida** (Greg.) Cl.

*Pl. XXXIII, Fig. 6*
Pl. XXXIII, Fig. 6

**Description.**—Valve cymbelloid, with rostrate rounded apices, 81 μm long, 21 μm wide; ventral margin concave with gibbous midvalve; dorsal margin convex; axial area linear, arcuate; raphe filiform, arched; central area elliptical with ventral isolated punctum; striae radiate throughout, 8-10 in 10 μm.

**Discussion.**—*C. tumida* was represented by a single specimen collected from the lower Buffalo River. This taxon is distinguished by the shape of the valve and by the ventral isolated punctum.

*Cymbella tumida* (Greg.) Cl.

Pl. XXXIII, Figs. 7-8

**Description.**—Valve semielliptical to semilanceolate, with acute rounded apices, 38-55 μm long, 13-18 μm wide; ventral margin straight with gibbous midvalve; dorsal margin strongly convex; axial area narrow to broad, straight; raphe filiform, with proximal fissures bent dorsally; central area indistinct from axial area; striae radiate throughout, punctate to cross-lineate, 7-9 in 10 μm.

**Discussion.**—*C. turgida* was infrequently collected in the upper Henrys Lake Outlet and in the lower Buffalo River. This diatom was common in collections taken at sites below Island Park Dam. This taxon is distinguished by the size and shape of the valve and by the position and
structure of the axial area.

*Cymbella ventricosa* Kutz.

*Pl. XXXIII, Figs. 9-11*

**Description.**—Valve semieliptical, with acute rounded often ventrally retracted apices, 19-35 um long, 8-11 um wide; ventral margin straight, at times with gibbous midvalve, at times slightly concave; dorsal margin strongly convex; axial area straight, broad; raphe filiform; central area indistinct from axial area; striae radiate throughout, but at times ventrally convergent at the poles, 10-12 in 10 um.

**Discussion.**—*C. ventricosa* was very common at all sites throughout the Henrys Fork drainage system. This taxon is distinguished by the size and shape of the valve.

**Family GOMPHONEMACEAE**

**Genus GOMPHONEIS** Cl.

*Gomphoneis herculeana* (Ehr.) Cl.

*Pl. XXXIV, Fig. 1*

**Description.**—Valve clavate to clavate-lanceolate, often swollen at midvalve, with submarginal longitudinal line, 38-84 um long, 14-23 um wide; apical pole rounded; basal pole attenuate, smaller, containing a small septum; axial area linear to linear-lanceolate; raphe filiform, straight; central area elliptical, with unilateral isolated
punctum; striae composed of two rows of punctae, radiate throughout, 12-14 in 10 μm.

Discussion.--G. herculeana was commonly observed in samples taken both above and below Island Park Reservoir. This taxon is distinguished by the size and shape of the frustule, the isolated punctum, and the double rows of punctae comprising the striae.

Genus GOMPHONEMA Agardh

Gomphonema acuminatum Ehr.

Pl. XXXIV, Fig. 2

Description.--Valve clavate, with swollen midvalve and apical pole, 35-51 μm long, 5-9 μm wide; apical pole cuneate-rostrate; basal pole attenuate, small, septate; axial area linear; raphe filiform, straight; central area small, elliptical with unilateral isolated punctum; striae radiate throughout, 10-13 in 10 μm.

Discussion.--G. acuminatum was infrequently collected at scattered stations throughout the study area. This taxon is distinguished by the shape of the valve, particularly the acuminate apical pole, and by the isolated punctum.

Gomphonema acuminatum var. coronatum (Ehr.) Grun.

Pl. XXXIV, Fig. 3

Description.--Valve clavate, with swollen midvalve
and apical pole, deeply constricted below apical pole, 48-58 um long, 11-13 um wide; apical pole cuneate-acuminate; basal pole attenuate, small, septate; axial area linear; raphe filiform, straight; central area small, elliptical with unilateral punctum; striae radiate throughout, 10-12 in 10 um.

Discussion.--G. acuminatum var. coronatum was infrequently collected from the lower Buffalo River and McCraes Bridge. This variety differs from the nominate by the deep constriction below the apical pole and the shape of the apical pole.

Gomphonema acuminatum var. pusillum (Ehr.) Cl.

Pl. XXXIV, Fig. 4

Description.--Valve clavate, with swollen midvalve and apical pole, 45-52 um long, 6-8 um wide; apical pole rounded acuminate; basal pole attenuate, small, septate; axial area linear; raphe filiform, straight; central area small, elliptical with unilateral isolated punctum; striae radiate throughout, 10-12 in 10 um.

Discussion.--G. acuminatum var. pusillum was represented by a few specimens collected from the lower Buffalo River. This variety differs from the nominate in the shape of the apical pole.

Gomphonema acuminatum var. turris (Ehr.) Cl.

Pl. XXXIV, Fig. 5
Description.--Valve clavate, with swollen midvalve and less swollen apical pole, 50-60 μm long, 11-13 μm wide; apical pole cuneate-attenuate; basal pole attenuate, small, septate; axial area linear; raphe filiform, straight; central area small, elliptical, with unilateral isolated punctum; striae radiate throughout, 10-12 in 10 μm.

Discussion.--G. acuminatum var. turris was infrequently observed in collections from the lower Buffalo River. This variety differs from the nominate in the shape of the apical pole.

Gomphonema angustatum (Kutz.) Rabh.
Pl. XXXIV, Fig. 6

Description.--Valve clavate-lanceolate, 26-38 μm long, 6-9 μm wide; apical pole slightly rostrate; basal pole attenuate; axial area narrow, linear; raphe filiform, straight; central area small, elliptical, with unilateral isolated punctum; striae radiate throughout, 9-11 in 10 μm.

Discussion.--G. angustatum was common at most sites throughout the Henrys Fork drainage. This taxon is distinguished by valve shape and striaion.

Gomphonema angustatum var. productum Grun.
Pl. XXXIV, Fig. 7

Description.--Valve clavate-lanceolate, 21-35 μm long, 5-9 μm wide; apical pole attenuate-rostrate; basal
pole more attenuate-rostrate; axial area narrow, linear; raphe filiform, straight; central area small, elliptical, with unilateral to nearly central isolated punctum; striae radiate throughout, 9-11 in 10 um.

Discussion.--G. angustatum var. productum was collected throughout the study area in moderate abundance. This variety is distinguished from the nominate by the more rostrate apices.

*Comphonema angustatum* var. *undulatum* A. Cl.

Pl. XXXIV, Fig. 8

Description.--Valve clavate-lanceolate, with undulate margins, 40-45 um long, 7-8 um wide; apical pole attenuate; basal pole attenuate; axial area narrow, linear; raphe filiform, straight; central area small, elliptical, with unilateral punctum; striae radiate throughout, arcuate, 7-9 in 10 um.

Discussion.--*G. angustatum* var. *undulatum* was infrequently collected from the Buffalo River near the Elk Creek confluence. This variety differs from the nominate by the undulate margins, the coarser striae, and the shape of the apices.

*Comphonema constrictum* Ehr.

Pl. XXXV, Fig. 1

Description.--Valve clavate, with swollen midvalve,
40-49 um long, 11-12 um wide; apical pole broadly capitate; basal pole attenuate; axial area narrow, linear; raphe straight, filiform; central area irregularly rectangular, with isolated punctum; striae radiate throughout, cross-lineate to punctate, alternating long and short about the central area, 10-12 in 10 um.

Discussion.—*G. constrictum* was infrequently collected from sites throughout the Henrys Lake drainage. This taxon is distinguished by the shape of the valve, the radiate striae, and the alternating long and short striae about the central area.

**Gomphonema constrictum f. clavata** Cleve-Euler

Pl. XXXV, Fig. 3

Description.—Valve clavate, with swollen midvalve, 40 um long, 11 um wide; apical pole broadly rounded; basal pole attenuate; axial area narrow, linear; raphe straight, filiform; central area irregularly rectangular, with isolated punctum; striae radiate throughout, cross-lineate to punctate, alternating long and short about the central area, 10-12 in 10 um.

Discussion.—*G. constrictum f. clavata* was represented by a single specimen collected on the upper Henrys Lake Outlet. This form differs from the nominate in valve shape.

**Gomphonema constrictum var. capitatum** (Ehr.) Cl.
Description.—Valve clavate, with swollen midvalve, 42–62 μm long, 9–14 μm wide; apical pole subcapitate, without subpolar constriction; basal pole attenuate; axial area narrow, linear; raphe straight, broad; central area irregularly rectangular, with isolated punctum; striae radiate throughout, cross-lineate to punctate, alternating long and short about the central area, 10–12 in 10 μm.

Discussion.—G. constrictum var. capitatum was collected once from upper Big Springs and several times from the lower Buffalo River. This variety differs from the nominate by valve shape.

Gomphonema gracile Enr.

Description.—Valve lanceolate-clavate, 30–50 μm long, 7–9 μm wide; apical pole acute, rounded; basal pole acute, rounded; axial area lanceolate; raphe filiform, straight; central area small, rounded with an isolated punctum; striae radiate, cross-lineate, 10–12 in 10 μm.

Discussion.—G. gracile was infrequently collected at sites throughout the study area. This taxon is distinguished by its shape and apices.

Gomphonema instabilis Hohn and Hellerman

Pl. XXXV, Fig. 7
Description.--Valve clavate, 37 um long, 8 um wide; apical pole subrostrate; basal pole attenuate; axial area linear, straight; raphe filiform, straight; central area extending to one margin, with two isolated punctae; striae slightly radiate, punctate, 13-14 in 10 um.

Discussion.--G. instabilis was represented by a single specimen collected at Station 1 on upper Henrys Lake Outlet. This taxon is distinguished by the multiple punctae in the central area, by striation, and by shape.

Gomphonema intricatum Kutz.
Pl. XXXV, Fig. 8

Description.--Valve linear-clavate, with swollen midvalve, 25-45 um long, 6-7 um wide; apical pole rounded; basal pole attenuate, septate; axial area linear, narrow; raphe filiform, straight; central area small, round, with isolated punctum; striae radiate, 10-12 in 10 um.

Discussion.--G. intricatum was infrequently found throughout the study area. This taxon is distinguished by valve shape and striation.

Gomphonema intricatum var. pusillum May
Pl. XXXV, Fig. 9

Description.--Valve linear-clavate, with swollen midvalve, 20-25 um long, 4-5 um wide; apical pole rounded; basal pole attenuate, septate; axial area linear, narrow;
raphe filiform, straight; central area small, round, with isolated punctum; striae radiate, 10-12 in 10 μm.

**Discussion.**—*G. intritatum* var. *pusillum* was infrequently collected from Henrys Fork below Macks Inn and from McCraes Bridge. This variety differs from the nominate by its small size.

**Comphonema lanceolatum** Ehr.

*Pl. XXXV, Fig. 10*

**Description.**—Valve clavate-lanceolate, 38-45 μm long, 7-8 μm wide; apical pole broadly rounded; basal pole attenuate-acute; axial area lanceolate; raphe filiform, straight; central area small, round with isolated punctum; striae slightly radiate, 9-11 in 10 μm.

**Discussion.**—*G. lanceolatum* was infrequently collected from a number of scattered stations throughout the study area. This taxon is distinguished primarily by valve shape.

**Comphonema lanceolatum** var. *affine* (Kutz.) A. Cl.

*Pl. XXXV, Fig. 11*

**Description.**—Valve clavate-lanceolate, 48 μm long, 9 μm wide; apical pole acute, rounded; basal pole attenuate-acute; axial area linear-lanceolate; raphe filiform, straight; central area small, round with isolated punctum; striae radiate, cross-lineate, 9-11 in 10 μm.
Discussion.--*G. lanceolatum* var. *affine* was represented by a single specimen collected from the lower Buffalo River. This variety differs from the nominate by the more acute apical pole.

*Comphonema montanum* var. *medium* Grun.

Pl. XXXVI, Fig. 1

**Description.**--Valve clavate-lanceolate, 32 um long, 5 um wide; apical pole cuneate, rounded; basal pole attenuate; axial area narrow, linear; raphe filiform to slightly undulate; central area rounded, small, with isolated punctum; striae radiate throughout, 10-12 in 10 um.

Discussion.--*G. montanum* var. *medium* was represented by a single specimen collected from the lower Buffalo River. This taxon is distinguished by the shape of the apical pole.

*Comphonema olivaceum* (Lyngb.) Kutz.

Pl. XXXVI, Fig. 3

**Description.**--Valve ovate-clavate, 15-30 um long, 6-7 um wide; apical pole broad, rounded; basal pole acute, rounded; axial area narrow, linear; raphe filiform, straight; central area transversely rectangular, with no punctum; striae radiate throughout, 10-14 in 10 um.

Discussion.--*G. olivaceum* was common in collections taken from most sites in the Henrys Fork drainage. It was
not collected in the source springs. This diatom has a characteristic bend in the girdle view and is further distinguished by its comparative small size and absence of an isolated punctum.

_Gomphonema olivaceum_ var. _calcareum_ Cl.

_Pl. XXXVI, Fig. 2_

**Description.**—Valve lanceolate-clavate, with swollen midvalve, 35-42 µm long, 8-9 µm wide; apical pole rounded; basal pole attenuate; axial area narrow, linear; raphe filiform, straight; central area transversely elliptical, with no punctum; striae radiate throughout, 10-14 in 10 µm.

**Discussion.**—_G. olivaceum_ var. _calcareum_ was infrequently collected in the lower Henrys Lake Outlet and in Henrys Fork below Island Park Dam. This variety differs from the nominate in the size and shape of the valve.

_Gomphonema parvulum_ Kutz.

_Pl. XXXIV, Fig. 9_

**Description.**—Valve clavate-lanceolate, 20-30 µm long, 7-8 µm wide; apical pole short, rostrate; basal pole attenuate-rostrate; axial area lanceolate; raphe filiform, straight; central area asymmetrically rectangular, often extending to margin, with isolated punctum; striae slightly radiate, 10-14 in 10 µm.
Discussion.--*G. parvulum* was a common diatom at scattered stations throughout the study area. This taxon is distinguished by valve shape, striation, and the isolated punctum.

*Gomphonema parvulum* var. *micropus* (Kutz.) Cl.  
Pl. XXXIV, Fig. 10

**Description.**--Valve clavate, 18-30 μm long, 5-7 μm wide; apical pole rounded; basal pole attenuate; axial area linear, narrow; raphe filiform, straight; central area asymmetrically rectangular, often extending to margin, with isolated punctum; striae slightly radiate, almost parallel at the apical pole, 11-15 in 10 μm.

Discussion.--*G. parvulum* var. *micropus* was a common diatom at scattered stations throughout the study area. This variety differs from the nominate by shape and size.

*Gomphonema rhombicum* Fricke  
Pl. XXXV, Figs. 4-5

**Description.**--Valve clavate, 23-37 μm long, 5-8 μm wide; apical pole rounded; basal pole attenuate, rounded, septate; axial area broad, linear-clavate; raphe rather broad, straight; central area expanded from axial area, with isolated punctum; striae parallel to slightly radiate, 10-12 in 10 μm.

Discussion.--*G. rhombicum* was common in collections
taken just below Island Park Dam. It was infrequently observed in collections taken from the upper Henrys Lake Outlet. This taxon is distinguished by the wide axial area, the short striae, and the shape of the valve.

Order EPITHEMIALES

Family EPITHEMIACEAE

Genus DENTICULA Kutz.

Denticula tenuis Kutz.

Pl. XXXVI, Fig. 4

Description.—Valve linear-lanceolate, with acute, rounded poles, 22-25 um long, 5 um wide; transverse costae distinct, 5-6 in 10 um; striae distinctly punctate, alternating in rows of two to four with costae, 22-25 in 10 um; punctae forming parallel longitudinal lines.

Discussion.—D. tenuis was represented by single specimens collected from Henrys Fork below Macks Inn and from the lower Buffalo River. This taxon is distinguished by valve shape and the costae and striaion.

Genus EPITHEMIA Breb.

Epithemia argus Kutz.

Pl. XXXVI, Figs. 5-6

Description.—Valves semielliptical, 40-77 um long, 10-12 um wide; ventral margins straight to slightly concave;
dorsal margins strongly convex; apices rounded to attenuate-rounded; keel on ventral margin at poles, extending toward dorsal margin at midvalve to form a moderately deep V-shaped extension; costae radiate, 1-2 in 10 um, alternating with 6-8 rows of striae; striae 10-12 in 10 um.

**Discussion.**--*E. argus* was collected infrequently at scattered sites throughout the study area. This taxon is distinguished by the shape of the valve, the number of striae between the costae, and the depth of the V-shaped extension.

**Epithemia sorex** Kutz.

Pl. XXXVI, Fig. 7

**Description.**--Valve semielliptical, 28-35 um long, 9-11 um wide; ventral margin slightly concave; dorsal margin strongly convex; apices rostrate to capitate, recurved; keel ventrally submarginal at poles, forming a deep V-shaped dorsal extension at midvalve; costae radiate, 4-5 in 10 um, alternating with 2-4 rows of striae; striae 12-14 in 10 um.

**Discussion.**--*E. sorex* was common in the lower Buffalo River and in Henrys Fork below Island Park Dam. This diatom was prevalent particularly during the late summer and early fall. This taxon is distinguished by the shape of the valve, the limited number of striae between the costae, and the relatively deep V-shaped extension.
**Epithemia turgida** (Ehr.) Kutz.

*Pl. XXXVI, Figs. 8-9*

**Description.**—Valve arcuate, 45-102 um long, 20-25 um wide; ventral margin slightly concave; dorsal margin strongly convex; apices attenuate-rostrate; keel ventrally marginal for much of valve length, forming a shallow V-shaped extension at midvalve; costae radiate, 3-4 in 10 um, alternating with 2-3 rows of striae; striae punctate, 9-10 in 10 um.

**Discussion.**—E. *turgida* was collected throughout the study area. It was common at scattered downstream stations. This taxon is distinguished by the size and shape of the valve, the punctate striae, and the marginal keel forming a shallow V-shaped extension.

**Epithemia zebra** (Ehr.) Kutz.

*Pl. XXXVI, Fig. 10*

**Description.**—Valves lanceolate to semilanceolate, 42-47 um long, 10-11 um wide; ventral margin straight to slightly concave; dorsal margin slightly convex; apices rounded; keel marginal at the poles, forming a moderately deep V-shape at midvalve; costae radiate, 2-4 in 10 um, alternating with 4-8 rows of striae; striae 12-14 in 10 um.

**Discussion.**—E. *zebra* was infrequently found at scattered stations throughout the study area. This taxon is characterized by its shape and by its striation.
Genus RHOPALODIA Mueller

Rhopalodia gibba (Ehr.) O. Mull.

Pl. XXXVII, Figs. 2-3

Description.--Valves broadly linear-elliptical in girdle view, with swollen and notched midvalve and broad rounded apices, 66-104 um long, 10-23 um wide; costae distinct, parallel at midvalve, radiate toward the poles, 5-8 in 10 um; striae fine, 12-14 in 10 um.

Discussion.--R. gibba was collected throughout the study area, but was most common at sites below Island Park Reservoir. This taxon is distinguished by its fine costae and the shape and size of the frustule.

Rhopalodia gibberula (Ehr.) O. Mull.

Pl. XXXVII, Fig. 1

Description.--Valve arcuate, with acute apices, 25-32 um long, 6-8 um wide; ventral margin concave; dorsal margin convex; costae radiate, 3-4 in 10 um; striae radiate, 16-17 in 10 um.

Discussion.--R. gibberula was frequently collected from several stations above Island Park Reservoir. This taxon is distinguished by its fine striaation and the size and shape of the frustule.

Order NITZSCHIALES
Family NITZSCHIACEAE

Genus HANTZSCHIA Grun.

Hantzschia amphioxyx (Ehr.) Grun.

Pl. XXXVII, Fig. 6

Description.--Valve linear, constricted on the keel margin, with rostrate to subcapitate apices, 25-35 um long, 6-7 um wide; raphe marginal, enclosed in a keel; keel punctate; keel punctae irregularly spaced, missing at midvalve, 8-10 in 10 um; striae parallel at midvalve, often radiate near the poles, 16-18 in 10 um.

Discussion.--H. amphioxyx was infrequently collected at a number of sites throughout the Henrys Fork drainage. This taxon is distinguished by the size and shape of the valve.

Hantzschia amphioxyx var. capitata O. Mull.

Pl. XXXVII, Fig. 7

Description.--Valve linear, broadly constricted on the keel margin, with distinctly capitate apices, 65 um long, 9 um wide; raphe marginal, enclosed in a keel; keel punctate; keel punctae irregularly spaced, 8-10 in 10 um; striae parallel at midvalve, often radiate near the poles, 16-18 in 10 um.

Discussion.--H. amphioxyx var. capitata was represented by a single specimen collected from the lower
Big Springs stream. This variety differs from the nominate in its larger size and distinct capitate apices.

**Hantzschia amphioxys** var. *intermedia* Grun.

*Fig. 8*

**Description.**—Valve linear, with keel margin nearly straight and dorsal margin moderately convex, 93 μm long, 10 μm wide; apices attenuated, distinctly capitate; raphe marginal, enclosed in a keel; keel punctate; keel punctae irregularly spaced, 8-10 in 10 μm; striae parallel at midvalve, often radiate near the poles, 18-24 in 10 μm.

**Discussion.**—*H. amphioxys* var. *intermedia* was represented by a single specimen collected from the lower Buffalo River. This variety differs from the nominate in its larger size and in valve shape.

**Hantzschia amphioxys** var. *leptocephala* Ostr.

*Fig. 10*

**Description.**—Valve arcuate, with keel margin concave and dorsal margin convex, 54-81 μm long, 10-12 μm wide; apices attenuated, subcapitate; raphe marginal, enclosed in a keel; keel punctate; keel punctae irregularly spaced, 8-10 in 10 μm; striae parallel at midvalve, often radiate near the poles, 16-18 in 10 μm.

**Discussion.**—*H. amphioxys* var. *leptocephala* was infrequently collected from scattered sites above Island
Park Reservoir. This variety differs from the nominate in size and shape of the frustule.

Genus CYMBELLONITZSCHIA Hust.

Cymbellonitzschia diluviana Hust.

Pl. XXXVII, Fig. 5

Description.--Valve semielliptical, with straight keel margin and strongly convex dorsal margin, 12-17 um long, 3-4 um wide; apices acute, rounded; keel marginal; keel punctae 7-8 in 10 um; striae parallel, 28-34 in 10 um.

Discussion.--C. diluviana was infrequent to common in collections from stations along Henrys Fork directly above and below Island Park Reservoir. This diatom was also plentiful in the lower Buffalo River. This taxon is distinguished by its small size and cymbelloid shape.

Genus NITZSCHIA Hassall

Nitzschia acicularis W. Sm.

Pl. XXXVII, Fig. 4

Description.--Valve linear, spindle-shaped, with long thin attenuated apices, 50-75 um long, 4-5 um wide; keel punctae small, 17-18 in 10 um; striae indistinguishable.

Discussion.--N. acicularis was infrequent to moderate in collections at most sites in the study area.
This taxon is distinguished by its shape and very fine striae.

*Nitzschia amphibia* Grun.

Pl. XXXVII, Figs. 11-12

**Description.** Valve linear, with rostrate apices, 17-44 μm long, 4-5 μm wide; keel marginal; keel punctae irregularly spaced, 6-13 in 10 μm; striae distinctly punctate, irregular, oblique to parallel, 14-16 in 10 μm.

**Discussion.** *N. amphibia* was infrequently collected at scattered sites throughout the study area. It was most often encountered in collections taken below Island Park Reservoir. This taxon is distinguished by the valve shape and the punctate striae.

*Nitzschia angustata* W. Sm.

Pl. XXXVII, Fig. 9

**Description.** Valve linear, with rostrate apices, 37-44 μm long, 5-7 μm wide; keel marginal; keel punctae indistinct; striae punctate, 14-18 in 10 μm.

**Discussion.** *N. angustata* was represented by a few specimens collected from the lower Buffalo River. This taxon is distinguished by the size and shape of the frustule and by the indistinct keel punctae.

*Nitzschia dissipata* (Kutz.) Grun.

Pl. XXXVIII, Fig. 1
Description.--Valve lanceolate, with subcapitate to capitate apices, 25-32 µm long, 3-4 µm wide; keel eccentric; keel punctae 8-10 in 10 µm; striae unresolved.

Discussion.--N. dissipata was widely distributed throughout the study area. This diatom was particularly abundant just below Island Park Reservoir. This taxon is distinguished by the very fine striae and eccentric keel.

*Nitzschia fonticola* Grun.

Pl. XXXVIII, Fig. 2

Description.--Valve lanceolate, with apiculate rounded apices, 13-21 µm long, 3-5 µm wide; keel marginal; keel punctae 12-14 in 10 µm; striae parallel, 28-30 in 10 µm.

Discussion.--N. fonticola was infrequent in collections taken from scattered sites throughout the study area. This taxon is distinguished by the lanceolate shape of the valve and the striaation.

*Nitzschia frustulum* Kutz.

Pl. XXXVIII, Fig. 3

Description.--Valve linear to linear-lanceolate, with rostrate to subcapitate apices, 41-47 µm long, 3-4 µm wide; keel marginal; keel punctae 9-12 in 10 µm; striae parallel, 22-24 in 10 µm.

Discussion.--N. frustulum was infrequently collected
from the lower Buffalo River, McCraes Bridge, and below Island Park Dam. This taxon is distinguished by the shape of the valve and the striation.

**Nitzschia hantzschiana** Rabh.

*Pl. XXXVIII, Fig. 4*

**Description.**—Valve linear, often constricted slightly at midvalve, with rostrate apices, 14-35 μm long, 3-5 μm wide; keel marginal; keel punctae 7-10 in 10 μm; striae parallel, 22-24 in 10 μm.

**Discussion.**—*N. hantzschiana* was infrequently collected at scattered sites above Island Park Reservoir. This taxon is distinguished by the shape of the valve and the striation.

**Nitzschia ignorata** Krasske

*Pl. XXXVIII, Fig. 6*

**Description.**—Valve sigmoid in girdle view, with rounded ends, 52 μm long, 4 μm wide; keel eccentric; keel punctae 8-10 in 10 μm; striae indistinct.

**Discussion.**—*N. ignorata* was represented by a single specimen collected from the lower Big Springs stream. This taxon was seen only in girdle view. The assignment to this taxon was based on the sigmoid shape of the frustule and the size of the valve.

**Nitzschia innominata** Sov.
Pl. XXXVIII, Fig. 5

**Description.**—Valve linear-lanceolate, with obtuse rostrate apices, 6-14 μm long, 2-3 μm wide; keel marginal; keel punctae 10-11 in 10 μm; striae parallel, 26-28 in 10 μm.

**Discussion.**—*N. innominata* was observed in low abundance in collections from lower Big Springs and from Henrys Fork below Macks Inn. This taxon is distinguished by the small size and shape of the frustule and the fine striae.

_Nitzschia linearis* W. Sm.

Pl. XXXVIII, Fig. 7

**Description.**—Valve linear, with acute rounded apices, often slightly constricted at midvalve, 80-130 μm long, 4-9 μm wide; keel marginal; keel punctae 8-13 in 10 μm, absent at midvalve; striae parallel, 28-30 in 10 μm.

**Discussion.**—*N. linearis* was widely distributed throughout the Henrys Fork drainage, but was always in low abundance. This taxon is distinguished by the linear shape of the valve, the size of the frustule, and the missing keel punctae at midvalve.

_Nitzschia oregana* sov.

Pl. XXXVIII, Fig. 8

**Description.**—Valve lanceolate to linear-lanceolate,
with rostrate rounded apices, 16-25 um long, 3-4 um wide; keel marginal; keel punctae 9-12 in 10 um; striae parallel, 23-25 in 10 um.

Discussion.--N. oregana was infrequently observed in collections from the lower Buffalo River and from Henrys Fork below Island Park Dam. This taxon is distinguished by the shape of the valve and the striaion.

*Nitzschia palea* (Kutz.) W. Sm.

Pl. XXXVIII, Fig. 9

Description.--Valve lanceolate to linear-lanceolate, with subcapitate to capitate apices, 25-35 um long, 3-4 um wide; keel marginal; keel punctae 10-15 in 10 um; striae unresolved.

Discussion.--*N. palea* was common at many stations throughout the study area. This diatom was particularly common in Henrys Fork below the confluence of Big Springs with Henrys Lake Outlet. This taxon is distinguished by the shape of the frustule and the very fine striae.

*Nitzschia recta* Hantzsch.

Pl. XXXVIII, Fig. 10

Description.--Valve linear, with attenuated acute apices, not constricted at midvalve, 81 um long, 9 um wide; keel marginal; keel punctae 5-9 in 10 um; striae unresolved.

Discussion.--*N. recta* was represented by a single
specimen collected from Henrys Lake. This taxon is distinguished by its large size, its parallel margins, and its very fine striae.

**Nitzschia romana** Grun.

**Pl. XXXVIII, Fig. 11**

**Description.**--Valve lanceolate, with attenuated capitate apices, 25-35 um long, 3-5 um wide; keel marginal; keel punctae 11-12 in 10 um; striae 23-25 in 10 um.

**Discussion.**--*N. romana* was infrequently collected from upper Henrys Lake Outlet, Henrys Fork below Macks Inn, and just below Island Park Dam. The taxon is distinguished by the shape of the valve, the striaion, and the shape of the apices.

**Nitzschia sigma** (Kutz.) W. Sm.

**Pl. XXXIX, Fig. 1**

**Description.**--Valve sigmoid, with attenuated apiculate to subcapitate apices, 57-99 um long, 3-6 um wide; keel marginal; keel punctae 7-11 in 10 um; striae parallel, 25-30 in 10 um.

**Discussion.**--*N. sigma* was infrequently collected from the upper Henrys Lake Outlet and from the lower Buffalo River. This taxon is distinguished by the shape and size of the valve and the fine striaion.
**Nitzschia sigmoidea** (Ehr.) W. Sm.

Pl. XXXIX, Fig. 2

**Description.**—Valve in girdle view sigmoid, with rounded poles, 150-400 um long, 10-20 um wide; keel marginal; keel punctae 5-7 in 10 um; striae unresolved.

**Discussion.**—*N. sigmoidea* was infrequently collected at Henrys Lake, Island Park Reservoir, and station just below both. This taxon is distinguished by its very large size, sigmoid shape in girdle view, and fine striation.

**Nitzschia sinuata var. tabellaria** Grun.

Pl. XXXIX, Fig. 3

**Description.**—Valve rhombic, with swollen midvalve and protracted subcapitate apices, 18-22 um long, 7-8 um wide; keel marginal, costate; costae extending one-half valve width, 7-8 in 10 um; striae mostly parallel, distinctly punctate, 16-20 in 10 um, extending one-half valve width.

**Discussion.**—*N. sinuata var. tabellaria* was represented by a few specimens collected from upper Henrys Lake Outlet and Henrys Fork at Last Chance. This taxon is distinguished by the shape of the valve, the keel costae, and the punctate striae.
**Nitzschia sublinearis** Hust.

*Pl. XXXIX, Fig. 4*

**Description.**—Valve linear to linear-lanceolate, with attenuate to attenuate-capitate apices, 43-67 um long, 3-5 um wide; keel marginal, keel punctae small, 18-22 in 10 um, striae fine, parallel, 30-40 in 10 um.

**Discussion.**—*N. sublinearis* was infrequent in collections from a few scattered stations throughout the study area. This taxon is distinguished by the shape of the valve and the fine keel punctae and striaion.

**Nitzschia vitrea** Norman

*Pl. XXXIX, Fig. 5*

**Description.**—Valve linear, with asymmetrically rostrate apices, 211 um long, 13 um wide; keel marginal, not constricted at midvalve; keel punctae large, 4-7 in 10 um; striae 22-25 in 10.

**Discussion.**—*N. vitrea* was represented by a single specimen collected from upper Henrys Lake Outlet. This taxon is distinguished by the shape and size of the valve, the large keel punctae, and presence of keel punctae at midvalve.

**Order SURIRELLALES**

**Family SURIRELLACEAE**
Genus CYMATOPLEURA W. Sm.

Cymatopleura elliptica (Breb.) W. Sm.
Pl. XXXIX, Fig. 8

Description.--Valve broadly elliptical, with rounded to cuneate-rounded poles, 121-135 μm long, 40-68 μm wide; costae marginal, 3 in 10 μm; transverse folds distinct on valve surface, parallel at midvalve, radiate near the poles.

Discussion.--C. elliptica was infrequently collected at a few scattered stations throughout the study area. This taxon is distinguished by the shape of the valve and by the presence of transverse folds on the valve surface.

Cymatopleura solea (Breb.) W. Sm.
Pl. XXXIX, Figs. 6-7

Description.--Valve linear, with variably constricted midvalve and rounded to cuneate-rounded often truncated apices, 70-130 μm long, 32-34 μm wide; costae marginal, 7-8 in 10 μm; transverse folds present, variable.

Discussion.--C. solea was infrequently collected at scattered stations throughout the study area. It was not collected from the source springs. This taxon is distinguished by the constricted shape of the valve and by the variable transverse folds.

Genus STENOPTEROBIA Breb.
Stenopterobia intermedia Lewis

Pl. XL, Fig. 1

**Description.**—Valve sigmoid, linear, with rounded apices, 190-250 um long, 12-14 um wide; costae short, 4-5 in 10 um; striae parallel, 20-22 in 10 um; pseudoraphe present on the transapical axis.

**Discussion.**—*S. intermedia* was collected very infrequently at stations on the lower Buffalo River. This taxon is distinguished by the shape of the valve and the marginal costae.

Genus SURIRELLA Turpin

**Surirella angustata** Kutz.

**Description.**—Valve linear, with cuneate truncated apices, 29-40 um long, 7-9 um wide; pseudoraphe linear, narrow; costae extend to pseudoraphe, 6-7 in 10 um; striae fine, parallel throughout most of valve length, becoming radiate at the poles, 16-18 in 10 um.

**Discussion.**—*S. angustata* was infrequently collected at most sites throughout the study area but was absent in collections taken from the source springs. It was most common in collections from upper Henrys Lake Outlet. This taxon is distinguished by valve shape and size and by the costae extending to the pseudoraphe.
**Surirella biseriata** Breb.

*Pl.* **XL., Fig. 3**

**Description.**—Valve linear, with cuneate-rounded apices, 200-270 μm long, 70-81 μm wide; pseudoraphe linear, narrow; costae broad, extending two-thirds to entirely to the pseudoraphe, 1.5 in 10 μm.

**Discussion.**—*S. biseriata* was infrequent in collections from lower Big Springs stream, Henrys Fork below Macks Inn, Chick Creek Springs, and lower Buffalo River. This taxon is distinguished by valve shape and the large broad costae.

**Surirella biseriata var. bifrons** (Ehr.) Hust.

*Pl.* **XL., Fig. 4**

**Description.**—Valve elliptical-lanceolate, with acute-rounded apices, 86-130 μm long, 40-48 μm wide; pseudoraphe linear, narrow; costae broad, extending into the pseudoraphe, 1.5 in 10 μm.

**Discussion.**—*S. biseriata var. bifrons* was infrequently collected at a few scattered sites throughout the study area. This variety differs from the nominate in the shape and size of the valve.

**Surirella biseriata var. subacuminata** Grun.

*Pl.* **XL., Fig. 5**
Description.--Valve lanceolate, with acute apices, 153 um long, 41 um wide; pseudoraphe linear, narrow; costae broad, extending into the pseudoraphe, 1.5 in 10 um.

Discussion.--S. biseriata var. subacuminata was represented by a single specimen collected at McCraes Bridge. This variety differs from the nominate in the shape and size of the valve.

**Surirella bohemica** Maly

Pl. XL, Fig. 6

Description.--Valve linear-ovate, heteropolar, with one broadly rounded pole and one cuneate rounded pole, 57-61 um long, 18-20 um wide; pseudoraphe linear, narrow; costae extending to the pseudoraphe, 4-5 in 10 um.

Discussion.--S. bohemica was collected once from the upper Henrys Lake Outlet and once from McCraes Bridge. This taxon is distinguished by the size and shape of the valve and the fineness of the costae.

**Surirella didyma** Kutz.

Pl. XL, Fig. 7

Description.--Valve linear, constricted at midvalve, with broadly rounded apices, 50 um long, 14 um wide; pseudoraphe linear, narrow; costae short, 3-4 in 10 um.
Discussion.--*S. didyma* was represented by a single specimen collected at McCraes Bridge. This taxon is characterized by the constricted valve, costation, and the broad axial area.

*Surirella elegans* var. *norwegica* (Eulenst.) Brun.

Pl. XLI, Figs. 1-2, 5

Description.--Valve ovate, heteropolar, with one pole broadly rounded and the other acute, 180-245 um long, 58-75 um wide; pseudoraphe linear, narrow; costae not extending to the pseudoraphe.

Discussion.--*S. elegans* var. *norwegica* was infrequently collected at a number of stations throughout the study area. This taxon is distinguished by the large valve size, the lanceolate median area, and the shape of the frustule.

*Surirella linearis* W. Sm.

Pl. XLI, Figs. 3-4

Description.--Valve linear, with cuneate-rounded apices, 50-94 um long, 20-22 um wide; pseudoraphe linear, narrow; costae extending to the pseudoraphe, 2-3 in 10 um.

Discussion.--*S. linearis* was infrequently collected at scattered stations throughout the study area. This taxon is distinguished by the shape of the valve and the very narrow median area.
Surirella ovata Kutz.

Pl. XLI, Fig. 6

Description.—Valve ovate, heteropolar, with one broadly rounded and one acutely rounded pole. 13-28 um long, 9-11 um wide; pseudoraphe linear, narrow; costae extending to pseudoraphe, 6-7 in 10 um; striae parallel at midvalve, radiate near the poles, 20-24 in 10 um.

Discussion.—S. ovata was infrequently collected at a number of stations throughout the Henrys Fork drainage. This diatom was quite common at Station 1 on the upper Henrys Lake Outlet. This taxon is distinguished by the shape of the valve, the costae that extend to the pseudoraphe, and the striaion.

Surirella ovata var. pinnata (W. Sm.) Hust.

Pl. XLI, Figs. 7-8

Description.—Valve ovate, heteropolar, with one broadly rounded pole and one rounded but narrower pole, 25-33 um long, 9-12 um wide; pseudoraphe linear, narrow; costae extending to pseudoraphe, 6-7 in 10 um; striae parallel at midvalve, radiate near the poles, 20-24 in 10 um.

Discussion.—S. ovata var. pinnata was infrequently collected at a number of stations throughout the Henrys Fork drainage. It was most common at Station 1 on the
upper Henrys Lake Outlet. It was often associated with the nominate variety. This variety differs from the nominate in the shape of the valve.

**Surirella robusta** Ehr.

*Pl. XLII, Fig. 1*

**Description.**—Valve ovate, heteropolar, with one broadly rounded pole and one acute rounded pole, 112-200 um long, 38-58 um wide; pseudoraphe broad, costae broad, 1-2 in 10 um, often alternating.

**Discussion.**—*S. robusta* was infrequently collected at stations below the confluence of Big Springs with Henrys Lake Outlet. This taxon is distinguished by its large size and broad pseudoraphe.

**Genus CAMPYLODISCUS** Ehr.

**Camphyldiscus hibernicus** Ehr.

*Pl. XLII, Fig. 2*

**Description.**—Valve irregularly circular, saddle-shaped, bent in valve view, 79-84 um in diameter; raphe marginal; costae converging toward center, radiate, 2-3 in 10 um.

**Discussion.**—*C. hibernicus* was infrequently collected at a few scattered stations in the Henrys Lake drainage, downstream from source springs. This taxon is distinguished by costation and the circular, saddle-shaped valve.
CONCLUSIONS

A total of three hundred thirty-three taxa of diatoms were identified in this study. Thirty-nine genera were represented containing a total of two hundred forty-four species. Eighty-two varieties and seven forms were additionally placed in these genera.

The diatom plankters on Henrys Lake and Island Park Reservoir bloomed primarily in the early spring (May and June) and late fall (October and November). Included in these plankters were Cyclotella stelligera, Stephanodiscus invisitatus, Melosira granulata, Diatoma tenue var. elongatum, Synedra cyclopum, and Asterionella formosa. Fragilaria crotonensis bloomed on Island Park Reservoir during the summer and early fall months. S. cyclopum was confined to Henrys Lake and C. stelligera, D. tenue var. elongatum, and F. crotonensis were collected only from Island Park Reservoir.

Periphyton studies indicate that seven relatively distinct diatom communities exist in the Henrys Lake drainage basin. These include: (1), Henrys Lake Outlet; (2), Big Springs and Chick Creek Springs; (3), Henrys Fork above Island Park Reservoir; (4), McCraes Bridge; (5), Island Park Reservoir; (6), lower Buffalo River; and (7), below Island Park Dam.
The Henrys Lake Outlet community was dominated by *Cymbella affinis*, *Cymbella ventricosa*, *Navicula salinarum* var. *intermedia*, *Synedra ulna*, *Fragilaria vaucheriodes*, *Cocconeis placentula* var. *lineata*, and *Achnanthes minutissima*. In addition, *Cocconeis pediculus* was more abundant in this community than in any other and *Diatoma vulgare* became a dominant in the late fall.

Stations 2, 3, and 4 on Big Springs and Station 10 on Chick Creek Springs shared many common diatom taxa. Abundant diatoms at these stations included *Diatoma hiemale* var. *mesodon*, *Meridion circulare* var. *constrictum*, *Fragilaria vaucheriodes*, *Eunotia maior*, and *Hannaea arcus*. The diversity of taxa was lower in these headwater springs than in collections taken at sites further downstream. Stations 2, 3, and 10 each had less than 50 taxa observed. Station 4, which is just above the confluence of Big Springs stream with Henrys Lake Outlet about 1 mile below the source springs, had a very high diversity of one hundred forty-nine taxa observed. A comparison of Stations 2 and 3 with Station 4 reveals an interesting change in per cent composition. The abundance of *Diatoma hiemale* var. *mesodon* and *Meridion circulare* var. *constrictum* decreased downstream while the abundance of *Hannaea arcus* and *Synedra ulna* increased.

Henrys Fork proper from the confluence of Big Springs with Henrys Lake Outlet down to Island Park Reservoir was distinctive from the rest of the system.
The diatom community of this area was dominated by *Diatoma vulgare*. Some collections taken at Station 7, above Macks Inn were almost unialgal assemblages of this diatom. *Gomphoneis herculeana, Fragilaria construens, Fragilaria capucina var. mesolepta, Synedra ulna, Achnanthes lanceolata, Achnanthes minutissima,* and several *Naviculas* including *Navicula aurora* were commonly associated in this *D. vulgare* community.

Station A at McCraes Bridge was unique in structure of the diatom community found there. Several taxa were found only at this site, including *Galoneis lewesii, Pinnularia mesolepta,* and *Surirella didyma*. There appeared to be no dominant species at this site. The community had a high species diversity with low individual species abundance.

The periphyton community of Island Park Reservoir contained especially *Gomphonema constrictum, Gomphonema acuminatum,* and *Navicula radiosoa* associated with *Diatoma vulgare*. *Synedra capitata* was collected only in this community.

The lower Buffalo River contained the highest diversity in the study area. Two hundred eighteen taxa were recorded from Station 12 below Ponds Lodge. *Amphipleura pellucida* was common here associated with various species of *Fragilaria, Navicula,* and *Melosira. Fragilaria leptostauron, F. construens,* and *Melosira distans* were among the most abundant diatoms in this
Diatoma vulgare was the dominant diatom in the system below Island Park Dam. However, a number of unique associations were evident here. Cymbella prostrata, Cymbella turgida, and Hannaea arcus var. amphioxys were commonly associated with D. vulgare in collections from these downstream sites. Gomphoneis herculeana was equally abundant in this lower section of the river as above Island Park Reservoir.

Artificial substrate data suggested low periphyton productivity at Station 12 on the lower Buffalo River. It is interesting to note that the same station produced the greatest number of different diatoms. Station 8 below Macks Inn had the greatest productivity as measured by accrual on glass plates. The diversity at this station was also high with one hundred eighty-four taxa identified.
LITERATURE CITED


Keever, N. R., J. L. Wilhm, and G. M. Van Dyne. 1966. Use of


TAXONOMIC LITERATURE CONSULTED


Hedwigia, 22(1,2): 267-369.


United States Dept. of the Interior, Federal Water Pollution Control Administration, Water Pollution Surveillance

APPENDIX I
TABLE 1.--DISTRIBUTION AND ESTIMATED ABUNDANCE OF DIATOMS IN HENRY'S FORK STUDY, 1971-73

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EXPLANATION FOR PLATE I

Major Plankters

Figure 1.—Aphanizomenon flos-aquae (L.) Ralfs.

Figure 2.—Anabaena spiroides var. crassa Lemmermann.

Figure 3.—Gloeotrichia echinulata (J. E. Smith) P. Richter.

Figure 4.—Anabaena flos-aquae (Lyngb.) De Brebisson.

Figure 5.—Eudorina elegans Ehrenberg.

Figure 6.—Trachelomonas crebea (Kellicott) Deflandre.

Each scale represents 10 um unless otherwise indicated.
EXPLANATION FOR PLATE II

Major Plankters

Figure 1.--*Ceratium hirundinella* (O. F. Muell.) Dujardin.

Figure 2.--*Phacotus lenticularis* (Ehrenb.) Stein.

Figure 3.--*Synura uvella* Ehrenberg.

Figure 4.--*Staurastrum gracile* Ralfs.

Figure 5.--*Asterionella formosa* Hass.

Figure 6.--*Fragilaria crotonensis* Kitton.

Figure 7.--*Synedra cyclopum* Brutschy.

Each scale represents 10 um unless otherwise indicated.
EXPLANATION FOR PLATE III

Figure 1.--*Stephanodiscus niagarae* Ehr.

Figure 2.--*Stephanodiscus invisitatus* Hohn and Hellerman.

Figure 3.--*Cyclotella stelligera* Cleve and Grun.

Figure 4.--*Cyclotella bodanica* var. *lemanensis* O. M.

Figure 5.--*Cyclotella menigiahiana* Kutz.

Figure 6.--*Melosira distans* (Ehr.) Kutz.

Figure 7.--*Melosira varians* Ag.

Each scale represents 10 um unless otherwise indicated. All figures are valve views except Figures 6 and 7 which are girdle views.
EXPLANATION FOR PLATE IV

Figure 1.--Melosira teres Brun.
Figure 2.--Melosira granulata (Ehr.) Ralfs.
Figure 3.--Tabellaria flocculosa (Roth) Kutz.
Figure 4.--Tabellaria fenestrata (Lyngb.) Kutz.
Figure 5.--Diatoma anceps (Ehr.) Kirch.
Figure 6.--Diatoma anceps (Ehr.) Kirch.
Figure 7.--Diatoma tenue var. elongatum Lyngb.
Figure 8.--Diatoma hiemale var. mesodon (Ehr.) Grun.
Figure 9.--Diatoma hiemale var. mesodon (Ehr.) Grun.

Each scale represents 10 um unless otherwise indicated. All figures are valve views except Figures 1 and 2 which are girdle views.
EXPLANATION FOR PLATE V

Figure 1.--Diatoma hiemale (Roth) Heib.

Figure 2.--Diatoma vulgare Bory.

Figure 3.--Diatoma vulgare var. linearis V. H.

Figure 4.--Meridion circulare (Grev.) Ag.

Figure 5.--Meridion circulare var. constrictum (Ralfs) V. H.

Figure 6.--Meridion circulare var. constrictum (Ralfs) V. H.

Figure 7.--Asterionella formosa Hass.

Figure 8.--Fragilaria bicapitata A. Mayer.

Figure 9.--Fragilaria brevistrata Grun.

Figure 10.--Fragilaria capucina var. mesolepta Rabh.

Figure 11.--Fragilaria construens (Ehr.) Grun.

Figure 12.--Fragilaria construens var. binodis (Ehr.) Grun.

Each scale represents 10 μm unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE VI

Figure 1.—Fragilaria construens var. pumila Grun.

Figure 2.—Fragilaria construens var. venter (Ehr.) Grun.

Figure 3.—Fragilaria construens var. venter f. pusilla
(Ehr.) Grun.

Figure 4.—Fragilaria crotonensis Kitton.

Figure 5.—Fragilaria leptostauron (Ehr.) Hust.

Figure 6.—Fragilaria leptostauron (Ehr.) Hust.

Figure 7.—Fragilaria pinnata Ehr.

Figure 8.—Fragilaria pinnata var. intercedens (Grun.)
Hust.

Figure 9.—Fragilaria pinnata var. lancettula (Schum.)
Hust.

Figure 10.—Fragilaria pinnata var. subrhombica Cleve-Euler.

Figure 11.—Fragilaria pinnata var. subrhombica Cleve-Euler.

Figure 12.—Fragilaria vaucheria (Kutz.) Peters.

Figure 13.—Fragilaria vaucheria (Kutz.) Peters.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE VII

Figure 1.---*Fragilaria vaucheria var. capitellata* (Grun.) Patr.

Figure 2.---*Fragilaria virescens* Ralfs.

Figure 3.---*Fragilaria virescens* Ralfs.

Figure 4.---*Fragilaria virescens* var. *capitata* Ostr.

Figure 5.---*Opephora martyi* Herib.

Figure 6.---*Hannaea arcus* (Ehr.) Patr.

Figure 7.---*Hannaea arcus* var. *amphioxys* (Rabh.) Patr.

Figure 8.---*Synedra acus* Kutz.

Figure 9.---*Synedra amphicephala* Kutz.

Figure 10.---*Opephora martyi* Herib.

Figure 11.---*Synedra capitata* Ehr.

Figure 12.---*Synedra cyclopum* Brutschy.

Figure 13.---*Fragilaria vaucheria var. capitellata* Ostr.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE VIII

Figure 1.--*Synedra mazamaensis* Sov.
Figure 2.--*Synedra mazamaensis* Sov.
Figure 3.--*Synedra mazamaensis* Sov.
Figure 4.--*Synedra parasitica* (W. Sm.) Hust.
Figure 5.--*Synedra parasitica* f. *rhomboidalis* May.
Figure 6.--*Synedra parasitica* var. *subconstricta* (Grun.) Hust.
Figure 7.--*Synedra rumpens* Kutz.
Figure 8.--*Synedra rumpens* Kutz.
Figure 9.--*Synedra rumpens* var. *familiaris* (Kutz.) Hust.
Figure 10.--*Synedra rumpens* var. *fragilariodes* Grun.
Figure 11.--*Synedra ulna* (Nitz.) Ehr.

Each scale represents 10 μm unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE IX

Figure 1.—*Synedra ulna* (Nitz.) Ehr.

Figure 2.—*Synedra ulna* var. *amphirhynchus* (Ehr.) Grun.

Figure 3.—*Synedra ulna* var. *biceps* (Kutz.) v. Schonf.

Figure 4.—*Synedra ulna* var. *oxyrhynchus* (Kutz.) Hust.

Figure 5.—*Synedra ulna* var. *oxyrhynchus f. mediocontracta* (Forti) Hust.

Figure 6.—*Eunotia curvata* (Kutz.) Lagerst.

Figure 7.—*Eunotia curvata* var. *falcata* (Breb.) A. Bg.

Figure 8.—*Eunotia incisa* W. Sm. ex Greg.

Figure 9.—*Eunotia praerupta* Ehr.

Figure 10.—*Eunotia maior* (W. Sm.) Rabh.

Figure 11.—*Eunotia monodon* Ehr.

Figure 12.—*Eunotia pectinalis* (O. F. Mull.?) Rabh.

Figure 13.—*Eunotia pectinalis* var. *minor* (Kutz.) Rabh.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE X

Figure 1.--Eunotia praerupta var. bidens (Ehr.) Grun.
Figure 2.--Eunotia praerupta f. curta Grun.
Figure 3.--Eunotia sarekensis var. pumila (Grun.) A. Bg..
Figure 4.--Achnanthes austriaca Hust.
Figure 5.--Achnanthes austriaca Hust.
Figure 6.--Achnanthes didyma Hust.
Figure 7.--Achnanthes didyma Hust.
Figure 8.--Achnanthes clevei Grun.
Figure 9.--Achnanthes clevei Grun.
Figure 10.--Achnanthes clevei var. rostrata A. Cl.
Figure 11.--Achnanthes clevei var. rostrata A. Cl.
Figure 12.--Achnanthes nodosa A. Cl.

Each scale represents 10 um unless otherwise indicated. Figures 1, 2, and 3 are valve views. Figures 4, 6, 8, 10, and 12 are raphe valve views. Figures 5, 7, 9, and 11 are pseudoraphe valve views.
EXPLANATION FOR PLATE XI

Figure 1.—*Achnanthes exigua* Grun.

Figure 2.—*Achnanthes exigua* Grun.

Figure 3.—*Achnanthes exigua* var. *heterovalva* Krasske.

Figure 4.—*Achnanthes exigua* var. *heterovalva* Krasske.

Figure 5.—*Achnanthes grimmei* Krasske.

Figure 6.—*Achnanthes hungarica* Grun.

Figure 7.—*Achnanthes kryophila* Boye Pet.

Figure 8.—*Achnanthes kryophila* Boye Pet.

Figure 9.—*Achnanthes lanceolata* (Breb.) Grun.

Figure 10.—*Achnanthes lanceolata* var. *dubia* Grun.

Figure 11.—*Achnanthes lanceolata* var. *elliptica* Schulz

Figure 12.—*Achnanthes lanceolata* var. *elliptica* Schulz

Each scale represents 10 μm unless otherwise indicated. Figures 1, 3, 5, 7, 9, and 11 are raphe valve views. Figures 2, 4, 8, 10, and 12 are pseudoraphe valve views.
EXPLANATION FOR PLATE XII

Figure 1.---*Achnanthes lapponica* var. *fennica* A. Cl.

Figure 2.---*Achnanthes lapponica* var. *fennica* A. Cl.

Figure 3.---*Achnanthes lanceolata* var. *lanceolatoides* (Sov.) Reim.

Figure 4.---*Achnanthes linearis* (W. Sm.) Grun.

Figure 5.---*Achnanthes laterostrata* Hust.

Figure 6.---*Achnanthes laterostrata* Hust.

Figure 7.---*Achnanthes lanceolata* var. *rostrata* Hust.

Figure 8.---*Achnanthes lanceolata* var. *rostrata* Hust.

Figure 9.---*Achnanthes levanderi* Hust.

Figure 10.---*Achnanthes levanderi* Hust.

Each scale represents 10 um unless otherwise indicated. Figures 1, 3, 4, 5, 7, and 9 are raphe valve views. Figures 2, 6, 8, and 10 are pseudoraphe valve views.
EXPLANATION FOR PLATE XIII

Figure 1.---Achnanthes linearis var. pusilla Grun.

Figure 2.---Achnanthes linearis var. pusilla Grun.

Figure 3.---Achnanthes marginulata Grun.

Figure 4.---Achnanthes marginulata Grun.

Figure 5.---Achnanthes minutissima Kutz.

Figure 6.---Achnanthes minitissima Kutz.

Figure 7.---Achnanthes peragalli Brun. and Her.

Figure 8.---Achnanthes peragalli Brun. and Her.

Figure 9.---Achnanthes oestrupii (A. Cl.) Hust.

Figure 10.---Achnanthes oestrupii (A. Cl.) Hust.

Figure 11.---Achnanthes montana Krasske.

Figure 12.---Achnanthes sublaevis var. crassa Reim.

Each scale represents 10 um unless otherwise indicated. Figures 1, 3, 5, 7, 9, and 12 are raphe valve views. Figures 2, 4, 6, 8, 10, and 11 are pseudoraphe valve views.
EXPLANATION FOR PLATE XIV

Figure 1.--Achnanthes saxonica Krasske.
Figure 2.--Achnanthes saxonica Krasske.
Figure 3.--Achnanthes suchlandti Hust.
Figure 4.--Achnanthes suchlandti Hust.
Figure 5.--Achnanthes sp.
Figure 6.--Achnanthes sp.
Figure 7.--Cocconeis diminuta Pant.
Figure 8.--Cocconeis diminuta Pant.
Figure 9.--Cocconeis placentula var. eugypta (Ehr.) Cl.
Figure 10.--Cocconeis placentula var. eugypta (Ehr.) Cl.

Each scale represents 10 um unless otherwise indicated. Figures 1, 3, 5, and 7 are raphe valve views. Figures 2, 4, 6, 8, 9, and 10 are pseudoraphe valve views.
EXPLANATION FOR PLATE XV

Figure 1.—*Cocconeis placentula* var. *lineata* (Ehr.) V. H.

Figure 2.—*Cocconeis placentula* var. *lineata* (Ehr.) V. H.

Figure 3.—*Cocconeis pediculus* Ehr.

Figure 4.—*Cocconeis pediculus* Ehr.

Figure 5.—*Rhoicosphenia curvata* (Kutz.) Grun. ex Rabh.

Figure 6.—*Rhoicosphenia curvata* (Kutz.) Grun. ex Rabh.

Figure 7.—*Rhoicosphenia curvata* (Kutz.) Grun. ex Rabh.

Each scale represents 10 um unless otherwise indicated. Figures 1, 3, and 5 are raphe valve views. Figures 2, 4, and 6 are pseudoraphe valve views. Figure 7 is a girdle view.
EXPLANATION FOR PLATE XVI

Figure 1.--**Amphipleura pellucida** Kutz.

Figure 2.--**Frustulia rhomboides** (Ehr.) DeT.

Figure 3.--**Frustulia rhomboides** var. **amphipleuroides** (Grun.) Cl.

Figure 4.--**Frustulia rhomboides** var. **capitata** (A. Mayer) Patr.

Figure 5.--**Frustulia vulgaris** (Thwaites) DeT.

Figure 6.--**Frustulia rhomboides** var. **saxonica** (Rabh.) DeT.

Figure 7.--**Gyrosigma sciotense** (Sulliv. and Wormley) Cl.

Figure 8.--**Neidium affine** (Ehr.) Pfitz.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XVII

Figure 1.--*Neidium binode* (Ehr.) Hust.

Figure 2.--*Neidium bisulcatum* var. *baicalense* (Skv. and Meyer) Reim.

Figure 3.--*Neidium dubium* (Ehr.) Cl.

Figure 4.--*Neidium iridis* (Ehr.) Cl.

Figure 5.--*Neidium iridis* var. *ampliatum* (Ehr.) Cl.

Figure 6.--*Neidium productum* (W. Sm.) Cl.

Figure 7.--*Diploneis finnica* (Ehr.) Cl.

Figure 8.--*Diploneis elliptica* (Kutz.) Cl.

Figure 9.--*Stauroneis anceps* Ehr.

Figure 10.--*Stauroneis anceps* f. *gracilis* Rabh.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XVIII

Figure 1.--Stauroneis acuta W. Sm.

Figure 2.--Stauroneis kriegeri Patr.

Figure 3.--Stauroneis lundii Hust.

Figure 4.--Stauroneis phoenicenteron (Nitz.) Ehr.

Figure 5.--Stauroneis phoenicenteron (Nitz.) Ehr.

Figure 6.--Stauroneis smithii Grun.

Figure 7.--Anomoeoneis serians var. apiculata Boyer.

Figure 8.--Anomoeoneis serians var. brachysira (Breb and Kutz.) Hust.

Figure 9.--Anomoeoneis serians var. brachysira (Breb and Kutz.) Hust.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XIX

Figure 1.--Navicula accomoda Hust.
Figure 2.--Navicula amphibola Cl.
Figure 3.--Navicula anglica Ralfs.
Figure 4.--Navicula anglica var. lapponica Cleve-Euler.
Figure 5.--Navicula arvensis Hust.
Figure 6.--Navicula aurora Sov.
Figure 7.--Navicula bacillum Ehr.
Figure 8.--Navicula bicephala Hust.
Figure 9.--Navicula variostriata Krasske.
Figure 10.--Navicula brevissima Hust.
Figure 11.--Navicula capitata Ehr.
Figure 12.--Navicula capitata var. luneburgensis (Grun.) Patr.

Figure 13.--Navicula cocconeiformis Greg.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XX

Figure 1.—Navicula constans Hust.

Figure 2.—Navicula cryptocephala var. veneta (Kutz.) Rabh.

Figure 3.—Navicula cryptocephala Kutz.

Figure 4.—Navicula cuspidata (Kutz.) Kutz.

Figure 5.—Navicula cuspidata (internal septum) (Kutz.) Kutz.

Figure 6.—Navicula densestriata Hust.

Figure 7.—Navicula detenta Hust.

Figure 8.—Navicula dicephala (Ehr.? ) W. Sm.

Figure 9.—Navicula elginensis (Greg.) Grun.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXI

Figure 1.---Navicula elginensis (Greg.) Grun. f. abiskoensis Hust.

Figure 2.---Navicula elginensis var. lata (M. Perag.) Patr.

Figure 3.---Navicula elginensis var. neglecta (Krasske) Patr.

Figure 4.---Navicula elginensis (Greg.) Grun. var. subcapitata Grun.

Figure 5.---Navicula exigua var. capitata Patr.

Figure 6.---Navicula gastrum var. exigua (Greg.) Grun.

Figure 7.---Navicula halophila (Grun.) Cl.

Figure 8.---Navicula hustedtii Krasske.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXII

Figure 1.---Navicula jarnefeltii Hust.
Figure 2.---Navicula lanceolata (Ag.) Kutz.
Figure 3.---Navicula laterostrata Hust.
Figure 4.---Navicula menisculus Schum.
Figure 5.---Navicula muraliformis Hust.
Figure 6.---Navicula minima Grun.
Figure 7.---Navicula minusculoides Hust.
Figure 8.---Navicula mutica var. undulata (Hilse) Grun.
Figure 9.---Navicula mutica Kutz.
Figure 10.---Navicula mutica var. cohnii (Hilse) Grun.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXIII

Figure 1.--Navicula pelliculosa (Breb. ex Kutz.) Hilse.
Figure 2.--Navicula placentula f. rostrata A. Mayer.
Figure 3.--Navicula pseudoscutiformis Hust.
Figure 4.--Navicula pupula var. rectangularis (Greg.) Grun.
Figure 5.--Navicula pupula Kutz.
Figure 6.--Navicula pupula var. capitata Hust.
Figure 7.--Navicula pupula var. minuta V. H.
Figure 8.--Navicula pupula var. mutata (Krasske) Hust.
Figure 9.--Navicula radiosa Kutz.
Figure 10.--Navicula radiosa var. parva Wallace.
Figure 11.--Navicula radiosa var. tenella (Breb. ex Kutz.) Grun.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXIV

Figure 1.—*Navicula recondita* Hust.

Figure 2.—*Navicula rhynchocephala* Kutz.

Figure 3.—*Navicula rhynchocephala* var. *amphiceros* (Kutz.) V. H.

Figure 4.—*Navicula rhynchocephala* var. *elongata* May.

Figure 5.—*Navicula rhynchocephala* var. *grunowii* A. Cl.

Figure 6.—*Navicula rotaeana* (Rabh.) Grun.

Figure 7.—*Navicula scutelloides* W. Sm.

Figure 8.—*Navicula salinarum* var. *intermedia* (Grun.) Cl.

Figure 9.—*Navicula secreta* var. *apiculata* Patr.

Figure 10.—*Navicula semen* Ehr.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXV

Figure 1.--Navicula pygmaea Kutz.
Figure 2.--Navicula seminuloides Hust.
Figure 3.--Navicula seminulum Grun.
Figure 4.--Navicula stromii Hust.
Figure 5.--Navicula tripunctata (O. F. Mull.) Bory.
Figure 6.--Navicula viridula (Kutz.) Kutz. emend. V. H.
Figure 7.--Caloneis bacillum (Grun.) Cl.
Figure 8.--Caloneis lewesii Patr.
Figure 9.--Caloneis bacillum var. fontinalis Hust.
Figure 10.--Caloneis bacillaris (Greg.) Cl.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXVI

Figure 1.---*Caloneis ventricosa* (Ehr.) Meist.

Figure 2.---*Caloneis ventricosa* var. *subundulata* (Grun.) Patr.

Figure 3.---*Pinnularia abaujensis* var. *rostrata* Patr.

Figure 4.---*Pinnularia abaujensis* var. *subundulata* (A. Mayer ex Hust.) Patr.

Figure 5.---*Pinnularia acrosphaeria* (Breb.) W. Sm.

Figure 6.---*Pinnularia acrosphaeria* (Breb.) W. Sm.

Figure 7.---*Pinnularia acuminata* W. Sm.

Figure 8.---*Pinnularia appendiculata* (Ag.) Cl.

Figure 9.---*Pinnularia biceps* Greg.

Figure 10.---*Pinnularia borealis* Ehr.

Figure 11.---*Pinnularia borealis* Ehr.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXVII

Figure 1.--Pinnularia brandelii Cl.

Figure 2.--Pinnularia brebissonii (Kutz.) Cl.

Figure 3.--Pinnularia brebissonii (Kutz.) Cl.

Figure 4.--Pinnularia brebissonii var. diminuta (Grun.) Cl.

Figure 5.--Pinnularia crucifera var. subrostrata A. Cl.

Figure 6.--Pinnularia dactylus Ehr.

Figure 7.--Pinnularia hemiptera var. bielawski Her. and Per.

Figure 8.--Pinnularia inflata var. major A. Cl.

Figure 9.--Pinnularia flexuosa Cl.

Figure 10.--Pinnularia isostauron (Ehr.? , Grun.) Cl.

Figure 11.--Pinnularia intermedia (Lagst.) Cl.

Figure 12.--Pinnularia intermedia (Lagst.) Cl.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXVIII

Figure 1. — *Pinnularia lata* var. *pachyptera* (Ehr.) Meist.

Figure 2. — *Pinnularia legumen* Ehr.

Figure 3. — *Pinnularia legumen* Ehr.

Figure 4. — *Pinnularia maior* (Kutz.) Cl.

Figure 5. — *Pinnularia maior* var. *transversa* (A. S.) Cl.

Figure 6. — *Pinnularia mesogongyila* Cl.

Figure 7. — *Pinnularia mesolypta* var. *turbulenta* Cleve-Euler.

Figure 8. — *Pinnularia mesolepta* (Ehr.) W. Sm.

Figure 9. — *Pinnularia microstauron* (Ehr.) Cl.

Each scale represents 10 μm unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXIX

Figure 1.—\textit{Pinnularia microstauron} var. \textit{biundulata} O. Mull.

Figure 2.—\textit{Pinnularia nobilis} Ehr.

Figure 3.—\textit{Pinnularia nodosa} Ehr.

Figure 4.—\textit{Pinnularia nodosa} var. \textit{pseudogracillima} (May.) A. Cl.

Figure 5.—\textit{Pinnularia parallela} A. Cl.

Figure 6.—\textit{Pinnularia pulchra} Ostr.

Figure 7.—\textit{Pinnularia subcapitata} Greg.

Figure 8.—\textit{Pinnularia stauroptera} (Grun.) Cl.

Figure 9.—\textit{Pinnularia subcapitata} var. \textit{lapponica} A. Cl.

Figure 10.—\textit{Pinnularia sudetica} Hilse.

Figure 11.—\textit{Pinnularia superba} Cleve-Euler.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXX

Figure 1.---*Pinnularia viridis* (Nitzsch.) Ehr.
Figure 2.---*Pinnularia viridis* var. *commutata* (Grun.) Cl.
Figure 3.---*Amphora ovalis* Kutz.
Figure 4.---*Amphora ovalis* Kutz.
Figure 5.---*Amphora veneta* Kutz.
Figure 6.---*Amphora parallelisliata* var. *manquinii* Carter.
Figure 7.---*Amphora parallelisliata* var. *manquinii* Carter.
Figure 8.---*Amphora perpusilla* Grun.
Figure 9.---*Amphora perpusilla* Grun.

Each scale represents 10 um unless otherwise indicated. All figures are valve views except Figures 4, 7, and 9 which are girdle views.
EXPLANATION FOR PLATE XXXI

Figure 1.---Amphora parallelistriata var. manquini Carter.

Figure 2.---Cymbella affinis Kutz.

Figure 3.---Cymbella aspera (Ehr.) Cl.

Figure 4.---Cymbella cesatii Grun.

Figure 5.---Cymbella cistula Hempr.

Figure 6.---Cymbella cistula var. maculata (Kutz.) V. H.

Figure 7.---Cymbella cuspidata Kutz.

Figure 8.---Cymbella cuspidata var. landeolata May.

Figure 9.---Cymbella cymbiformis (Ag?) Kutz.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXXII

Figure 1.—*Cymbella ehrenbergii* Kutz.

Figure 2.—*Cymbella ehrenbergii* var. *hungarica* Pant.

Figure 3.—*Cymbella gracilis* (Rabh.) Cl.

Figure 4.—*Cymbella gracilis* (Rabh.) Cl.

Figure 5.—*Cymbella heteropleura* Ehr.

Figure 6.—*Cymbella heteropleura* var. *minor* Cl.

Figure 7.—*Cymbella heteropleura* var. *subrostrata* Cl.

Figure 8.—*Cymbella hungarica* var. *grunowii* A. Cl.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXXIII

Figure 1.--Cymbella mexicana (Ehr.) A. S.
Figure 2.--Cymbella microcephala Grun.
Figure 3.--Cymbella naviculiformis Auersw.
Figure 4.--Cymbella prostrata (Berk.) Cl.
Figure 5.--Cymbella sinuata Greg.
Figure 6.--Cymbella tumida (Breb.) V. H.
Figure 7.--Cymbella turgida (Greg.) Cl.
Figure 8.--Cymbella turgida (Greg.) Cl.
Figure 9.--Cymbella ventricosa Kutz.
Figure 10.--Cymbella ventricosa Kutz.
Figure 11.--Cymbella ventricosa Kutz.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXXIV

Figure 1.--*Gomphoneis herculeana* (Ehr.) Cl.

Figure 2.--*Gomphonema acuminatum* Ehr.

Figure 3.--*Gomphonema acuminatum* var. *coronatum* (Ehr.) Grun.

Figure 4.--*Gomphonema acuminatum* var. *pusillum* Grun.

Figure 5.--*Gomphonema acuminatum* var. *turris* (Ehr.) Cl.

Figure 6.--*Gomphonema angustatum* (Kutz.) Rabh.

Figure 7.--*Gomphonema angustatum* var. *productum* Grun.

Figure 8.--*Gomphonema angustatum* var. *undulatum* A. Cl.

Figure 9.--*Gomphonema parvulum* Kutz.

Figure 10.--*Gomphonema parvulum* var. *micropus* (Kutz.) Cl.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXXV

Figure 1.--Gomphonema constrictum Ehr.

Figure 2.--Gomphonema constrictum var. capitatum (Ehr.) Cl.

Figure 3.--Gomphonema constrictum f. clavata Cleve-Euler.

Figure 4.--Gomphonema rhombicum Fricke.

Figure 5.--Gomphonema rhombicum Fricke.

Figure 6.--Gomphonema gracile Ehr.

Figure 7.--Gomphonema instabilis Hohn and Hellerman.

Figure 8.--Gomphonema intricatum Kutz.

Figure 9.--Gomphonema intricatum var. pusillum May.

Figure 10.--Gomphonema lanceolatum Ehr.

Figure 11.--Gomphonema lanceolatum var. affine (Kutz.)

A. Cl.

Each scale represents 10 μm unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXXVI

Figure 1.--*Gomphonema montanum* var. *medium* Grun.

Figure 2.--*Gomphonema olivaceum* var. *calcareum* Cl.

Figure 3.--*Gomphonema olivaceum* (Lyngb.) Kutz.

Figure 4.--*Denticula tenuis* Kutz.

Figure 5.--*Epithemia argus* Kutz.

Figure 6.--*Epithemia argus* Kutz.

Figure 7.--*Epithemia sorex* Kutz.

Figure 8.--*Epithemia turgida* (Ehr.) Kutz.

Figure 9.--*Epithemia turgida* (Ehr.) Kutz.

Figure 10.--*Epithemia zebra* (Ehr.) Kutz.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXXVII

Figure 1.--Rhopalodia gibberula (Ehr.) O. Mull.
Figure 2.--Rhopalodia gibba (Ehr.) O. Mull.
Figure 3.--Rhopalodia gibba (Ehr.) O. Mull.
Figure 4.--Nitzschia acicularis W. Sm.
Figure 5.--Cymbellonitzschia diluviana Hust.
Figure 6.--Hantzschia amphioxyx (Ehr.) Grun.
Figure 7.--Hantzschia amphioxyx var. capitata O. Mull.
Figure 8.--Hantzschia amphioxyx var. intermedia Grun.
Figure 9.--Nitzschia angustata W. Sm.
Figure 10.--Hantzschia amphioxyx var. leptocephala Ostr.
Figure 11.--Nitzschia amphibia Grun.
Figure 12.--Nitzschia amphibia Grun.

Each scale represents 10 um unless otherwise indicated. All figures are valve views except Figure 3 which is a girdle view.
EXPLANATION OF PLATE XXXVIII

Figure 1.--Nitzschia dissipata (Kutz.) Grun.
Figure 2.--Nitzschia fonticola Grun.
Figure 3.--Nitzschia frustulum Kutz.
Figure 4.--Nitzschia hantzschiiana Rabh.
Figure 5.--Nitzschia innominata Sov.
Figure 6.--Nitzschia ignorata Krasske.
Figure 7.--Nitzschia linearis W. Sm.
Figure 8.--Nitzschia oregana Sov.
Figure 9.--Nitzschia palea (Kutz.) W. Sm.
Figure 10.--Nitzschia recta Hantzsch.
Figure 11.--Nitzschia romana Grun.

Each scale represents 10 μm unless otherwise indicated. All figures are valve views.
EXPLANATION FOR PLATE XXXIX

Figure 1.--Nitzschia sigma (Kutz.) W. Sm.

Figure 2.--Nitzschia sigmoidea (Ehr.) W. Sm.

Figure 3.--Nitzschia sinuata var. tabellaria Grun.

Figure 4.--Nitzschia sublinearis Hust.

Figure 5.--Nitzschia vitrea Norman.

Figure 6.--Cymatopleura solea (Breb.) W. Sm.

Figure 7.--Cymatopleura solea (Breb.) W. Sm.

Figure 8.--Cymatopleura elliptica (Breb.) W. Sm.

Each scale represents 10 μm unless otherwise indicated. All figures are valve views.
EXPLANATION OF PLATE XL

Figure 1.--Stenopterobia intermedia Lewis.
Figure 2.--Surirella angustata Kutz.
Figure 3.--Surirella biseriata Breb.
Figure 4.--Surirella biseriata var. bifrons (Ehr.) Hust.
Figure 5.--Surirella biseriata var. subacuminata Grun.
Figure 6.--Surirella bohemica Maly.
Figure 7.--Surirella didyma Kutz.

Each scale represents 10 um unless otherwise indicated. All figures are valve views.
EXPLANATION OF PLATE XLI

Figure 1.--Surirella elegans var. norwegica (Eulenst.) Brun.

Figure 2.--Surirella elegans var. norwegica (Eulenst.) Brun.

Figure 3.--Surirella linearis W. Sm.

Figure 4.--Surirella linearis W. Sm.

Figure 5.--Surirella elegans var. norwegica (Eulenst.) Brun.

Figure 6.--Surirella ovata Kutz.

Figure 7.--Surirella ovata var. pinnata (W. Sm.) Hust.

Figure 8.--Surirella ovata var. pinnata (W. Sm.) Hust.

Each scale represents 10 um unless otherwise indicated. All figures are valve views, except figure 4 which is a girdle view.
EXPLANATION FOR PLATE XLII

Figure 1.--*Surirella robusta* Ehr.

Figure 2.--*Camphylococcus hibernicus* Ehr.

Each scale represents 10 um unless otherwise indicated. Both figures are valve views.
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  didyma 89
  exigua 90
  exigua var.
    heterovalva 91
  grimmii 91
  hungarica 92
  Kryophila 92
  lanceolata 93
  lanceolata var. dubia 94
  lanceolata var.
    elliptica 94
  lanceolata var.
    lanceolatoides 94
  lanceolata var.
    rostrata 95
  lapponica var. fennica 96
  laterostrata 96
  levanderi 97
  linearis 97
  linearis var. pusilla 98
  marginulata 98
  minutissima 99
  montana 100
  nodosa 100
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DIATOM PHYTOPLANKTON AND PERIPHYTON STUDIES

OF THE HEADWATERS OF HENRYS FORK

OF THE SNAKE RIVER,

ISLAND PARK, IDAHO

Richard L. Clark

Department of Botany and Range Science

Ph.D. Degree, April 1975

ABSTRACT

An ecological baseline study of the diatom flora was conducted on the headwaters of Henrys Fork of the Snake River, Idaho.

The diatom flora of this spring fed drainage basin consisted of both phytoplankton and periphyton. Thirty-nine genera, two hundred forty-four species, eighty-two additional varieties, and seven additional forms were identified from these waters. Species of *Melosira*, *Stephanodiscus*, *Fragilaria*, *Synedra*, and *Asterionella* were found in the plankton of Henrys Lake and Island Park Reservoir. *Diatoma*, *Fragilaria*, *Synedra*, *Eunotia*, *Achnanthes*, *Navicula*, *Pinnularia*, *Gomphonema*, *Cymbella*, *Nitzschia*, and *Surirella* were the important genera present in the periphyton.