 0030-0950/85/0004-0164 $2.00/0

THE ICHTHYOPLANKTON OF THE SCIOTO RIVER NEAR OMEGA, OHIO[1]

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ABSTRACT. A comprehensive survey of the ichthyoplankton of the Scioto River near Omega, Ohio, was undertaken during the spring, summer and early fall of 1981. Twenty-six taxa of fish larvae and young of year were collected. Dominant taxa included catostomid larvae, common carp larvae, channel catfish young of year, *Notropis* larvae and other unidentified cyprinid larvae. Although most of the sampling effort was at night, comparisons between temporally-comparable day and night collections were made and some differences in species composition and/or abundance were noted.

OHIO J. SCI. 85 (4): 164-174, 1985

INTRODUCTION

Several investigations of adult and juvenile fishes of the Scioto River have been undertaken. The most well-known is the classic work of Trautman (1981) who reported 125 species of fish from the Scioto River drainage. The Ohio Department of Natural Resources has undertaken periodic hoop net surveys in the lower portions of the Scioto River from Lucasville (river mile 15) to Yellowbud (river mile 90). Within the last 15 yr, seven such surveys yielded a total of 39 taxa of which channel catfish, river carpsucker, common carp and flathead catfish were the dominant species

[1]Manuscript received 2 October 1984 and in revised form 20 May 1985 (#84-45).

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(Ohio DNR, undated). A systematic survey of the ichthyofauna was also undertaken by Ohio Environmental Protection Agency (EPA) (Yoder et al. 1981). They collected 70 species and five hybrids in their survey of the lower 273.3 km (170.8 miles). In the area upstream and downstream of Omega, the fish community was dominated numerically by catostomids, ictalurids and freshwater drum. None of the aforementioned studies were designed to sample the ichthyoplankton community. Thus, this study is the first to report on the ichthyoplankton of the Scioto River.

THE STUDY AREA

The Scioto River originates in eastern Auglaize County, flows approximately 368 km (230 miles) through east-central Ohio and empties into the Ohio River at Portsmouth, Ohio. The river drains 169,926 km^2 (6,510 sq. miles) and has an average discharge of approximately 189 m^3/s (6,300 cfs). Below Columbus the river is freeflowing, although there are impoundments on several tributary streams.

The study area was located from approximately river mile 45 to 47, near the village of Omega, Ohio (fig. 1). The northern shore of the river is principally farmland separated from the river by mature stands of boxelder, cottonwood, silver maple, sycamore, and white elm. The south shore of the river is principally hilly woodland with the same dominant tree species on the lower slopes. The streambed in this reach is mostly pebble or cobble (>4.0 mm) or very coarse sand (2.0 – 0.5 mm). There is very little silt and clay except along the shorelines. The variety of habitats in the river does not become obvious until the lower flow periods of summer and late fall. During that time, many riffles and sandbars become evident, interspaced between runs and pools.

METHODS AND MATERIALS

The survey period extended from the first week in April to the first week in October 1981. Collections were made each week during the night. Emphasis was placed upon night collection of ichthyoplankton in order to minimize gear avoidance and the negative

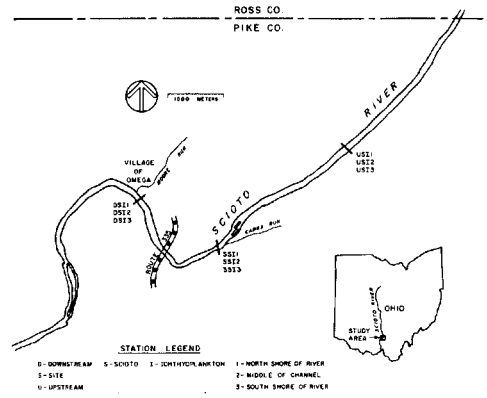

FIGURE 1. Locus map for ichthyoplankton stations in the Scioto River near Omega, Ohio, sampled during 1981.

phototaxic nature of some fish larvae (Clark and Pearson 1980). Once a month (except October), one set of day collections were also taken for comparison with night collections.

Three transects were established with three stations per transect (fig. 1). The station code is as follows: DS refers to downstream Scioto, SS to site Scioto and US to upstream Scioto; I refers to ichthyoplankton; 1 refers to north shore of the river, 2 to mid-channel and 3 to the south shore of the river. A 505-u mesh, 0.5-m diameter, 3-m long, ichthyoplankton net was employed. Calibrated General Oceanics flowmeters were set off-center in the mouth of each net. Duplicate oblique tows were made at each station. Approximately equal volumes of water were sampled from near bottom, at mid-depth and near surface. Actual depths sampled varied according to the seasonal change of water depth at each station. Sample volumes generally ranged from 80 to 100 m^3. At low river flow, nets were towed for as long as possible or fished stationary. In instances when the net was fished stationary, a low velocity rotor was substituted on the flowmeter. Sample volumes ranged from 10 to 80 m^3 under these low-flow circumstances.

A total of 588 ichthyoplankton samples were collected and analyzed. Samples were rinsed by directing a stream of water from outside of the net and washing the contents into labeled jars containing five percent buffered formalin. A small amount of rose bengal stock solution was added to samples containing large amounts of organic matter. In the laboratory, fish eggs and larvae were removed from samples and placed in three percent buffered formalin. Identifications of fish eggs, yolk-sac larvae (yolk sac still present), post-larvae (yolk sac absorbed but still without all adult characteristics) and young of year (complete set of adult characteristics) were to the lowest taxon practicable. References used to identify larvae and to determine geographic distri-

TABLE 1

Common and scientific names of fish larvae collected by plankton net in the Scioto River near Omega, Ohio during 1981.

Common Name	Scientific Name	Collection Period	
		day	night
Gars	Lepisosteidae		
	Lepisosteus sp.		x
Herrings	Clupeidae	x	x
Gizzard shad	*Dorosoma cepedianum*		x
Mooneyes	Hiodontidae		
Mooneye	*Hiodon tergisus*	x	x
Minnows	Cyprinidae	x	x
Common carp	*Cyprinus carpio*	x	x
Chub	*Hybopsis* spp.		x
Speckled chub	*Hybopsis aestivalis*		x
Shiner	*Notropis* spp.		x
Emerald shiner	*Notropis atherinoides*	x	x
Minnow	*Pimephales* spp.		x
Suckers	Catostomidae	x	x
Buffalofish	*Ictiobus* spp.		x
Catfishes	Ictaluridae		x
Yellow bullhead	*Ictalurus natalis*		x
Channel catfish	*Ictalurus punctatus*		x
Flathead catfish	*Pylodictis olivaris*		x
Sunfishes	Centrarchidae		x
Sunfish	*Lepomis* spp.	x	x
Bluegill	*Lepomis macrochirus*		x
Black bass	*Micropterus* spp.		x
Perches	Percidae	x	x
Johnny darter	*Etheostoma nigrum*		x
Yellow perch	*Perca flavescens*		x
Walleye/Sauger	*Stizostedion* spp.		x
Drums	Sciaenidae		
Freshwater drum	*Aplodinotus grunniens*		x

bution of species were: Connor (1979), Hogue et al. (1976), Lippson and Moran (1974), May and Gasaway (1967), Nelson and Cole (1975), Pflieger (1975), Scott and Crossman (1973), Scotton et al. (1973), Snyder (1979); Stewart (1926), Trautman (1981), Wang and Kernehan (1979), and Wrenn and Grinstead (1968). Whenever the term "larvae" is used in this paper, it refers to both the yolk-sac and post-larvae stages combined. A voucher collection was maintained for all taxa identified. The voucher collection was verified by Darrel E. Snyder of the Colorado State University Larval Fish Laboratory where the collection is currently curated.

RESULTS

A total of 26 taxa of fish larvae and young of year were collected in ichthyoplankton tows in the Scioto River during 1981 (table 1). Table 2 presents a listing of fishes collected by electrofishing, seining and hoop netting in the Scioto River near Omega during a 1981 and 1982 companion study (CPI 1983). Water temperature data were taken concurrently with the ichthyoplankton sampling (fig. 2). Larval abundance in the Scioto River, for all species combined, from night and day collections is presented in tables 3 and 4, respectively. The period of highest ichthyoplankton abundance extended from about 18 June 1981 (mean day density 31.5 larvae/100 m^3) until approximately 9 August 1981 (mean night density 15.1 larvae/100 m^3). Peak densities occurred during the month of July.

TABLE 2

Common and scientific names of fishes collected by electrofishing, seining and hoop netting in the Scioto River near Omega, Ohio, during 1981 and 1982.

Common Name	Scientific Names
Gars	Lepisosteidae
Longnose gar	*Lepisosteus osseus*
Freshwater eels	Anguillidae
American eel	*Anguilla rostrata*
Herrings	Clupeidae
Gizzard shad	*Dorosoma cepedianum*
Mooneyes	Hiodontidae
Mooneye	*Hiodon tergisus*
Minnows	Cyprinidae
Central stoneroller	*Campostoma anomalum*
Common carp	*Cyprinus carpio*
Silverjaw minnow	*Ericymba buccata*
Silver chub	*Hybopsis storeriana*
Gravel chub	*Hybopsis x-punctata*
Emerald shiner	*Notropis atherinoides*
River shiner	*Notropis blennius*
Striped shiner	*Notropis chrysocephalus*
Spotfin shiner	*Notropis spilopterus*
Sand shiner	*Notropis whipplei*
Suckermouth minnow	*Phenacobius mirabilis*
Southern redbelly dace	*Phoxinus erythrogaster*
Bluntnose minnow	*Pimephales notatus*
Bullhead minnow	*Pimephales vigilax*
Blacknose dace	*Rhinichthys atratulus*
Creek chub	*Semotilus atromaculatus*
Suckers	Catostomidae
River carpsucker	*Carpiodes carpio*
Quillback	*Carpiodes cyprinus*
Highfin carpsucker	*Carpiodes velifer*
White sucker	*Catostomus commersoni*
Northern hog sucker	*Hypentelium nigricans*
Smallmouth buffalo	*Ictiobus bubalus*
Silver redhorse	*Moxostoma anisurum*
Golden redhorse	*Moxostoma erythrurum*
Shorthead redhorse	*Moxostoma macrolepidotum*
Catfishes	Ictaluridae
Black bullhead	*Ictalurus melas*
Yellow bullhead	*Ictalurus natalis*
Channel catfish	*Ictalurus punctatus*
Stonecat	*Noturus flavus*
Brindled madtom	*Noturus miurus*
Flathead catfish	*Pylodictis olivaris*
Trout-Perches	Percopsidae
Trout-perch	*Percopsis omiscomaycus*
Silversides	Atherinidae
Brook silverside	*Labidesthes sicculus*
Temperate basses	Percichtyidae
White bass	*Morone chyrsops*
Sunfishes	Centrarchidae
Rock bass	*Ambloplites rupestris*
Green sunfish	*Lepomis cyanellus*
Bluegill	*Lepomis macrochirus*
Longear sunfish	*Lepomis megalotis*
Smallmouth bass	*Micropterus dolomieui*
Spotted bass	*Micropterus punctulatus*
Largemouth bass	*Micropterus salmoides*
White crappie	*Pomoxis annularis*
Black crappie	*Pomoxis nigromaculatus*
Perches	Percidae
Eastern sand darter	*Ammocrypta pellucida*
Rainbow darter	*Etheostoma caeruleum*
Fantail darter	*Etheostoma flabellare*
Johnny darter	*Etheostoma nigrum*
Orangethroat darter	*Etheostoma spectabile*
Banded darter	*Etheostoma zonale*
Logperch	*Percina caprodes*
Blackside darter	*Percina maculata*
River darter	*Percina shumardi*
Sauger	*Stizostedion canadense*
Walleye	*Stizostedion vitreum*
Drums	Sciaenidae
Freshwater drum	*Aplodinotus grunniens*

(Continued)

Fish egg density was relatively low throughout the study. Mean fish egg density for all nine stations exceeded 0.5/100 m^3 on only one date during the entire study. During the night of 14 June 1981, egg density reached a mean 2.2 eggs/100 m^3 across all stations. No attempt was made to identify fish eggs to lower taxonomic levels.

MAJOR TAXA

Several taxa dominated the ichthyoplankton catches in the Scioto River. A summary of findings for these taxa is presented below.

CATOSTOMIDAE. Catostomidae larvae were numerically dominant, accounting for 75.9% of the larvae in the night collections. Approximately 73% of the larvae were yolk-sac larvae. Catostomid larvae were collected from 28 April at water temperatures of 18 °C (64.4 °F) through 9 August at a water temperature of 24-25 °C (75.2-77.0 °F). The peak mean density occurred on 26 July when the water temperature was 27 °C (80.6 °F). Also, high mean densities were recorded on 13 and 20 July. The Catostomidae in the day collections constituted only 29% of the larvae captured. The peak mean density occurred on 17 July at a water temperature of 24.8-27 °C (76.6-80.6 °F).

TABLE 3

Mean densities of fish larvae (all taxa combined) collected at night in the Scioto River near Omega, Ohio.*

Date	Stations									
	DSI1	DSI2	DSI3	SSI1	SSI2	SSI3	USI1	USI2	USI3	Mean
07 APR 81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
13 APR 81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
20 APR 81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
28 APR 81	0.00	0.45	0.50	0.00	0.00	0.95	0.00	0.00	0.00	0.2
03 MAY 81	0.00	0.50	0.50	0.00	0.00	1.45	0.00	0.00	0.95	0.4
15 MAY 81	0.55	0.90	0.90	4.15	0.45	1.75	3.90	0.90	0.90	1.6
20 MAY 81	0.00	0.50	0.00	0.50	1.00	0.50	0.00	0.00	0.00	0.3
24 MAY 81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.1
31 MAY 81	2.40	2.75	0.00	1.50	1.10	3.75	2.35	1.65	2.55	2.0
07 JUN 81	0.50	4.50	4.95	1.95	4.40	2.35	1.20	5.95	4.50	3.4
14 JUN 81	3.35	3.90	5.00	9.35	2.50	5.90	3.70	1.00	3.55	4.2
22 JUN 81	14.15	9.50	9.30	1.50	9.00	9.90	12.25	6.55	7.10	8.8
29 JUN 81	14.70	25.85	33.95	18.40	23.45	15.40	4.85	11.95	18.90	18.6
06 JUL 81	8.25	6.00	17.55	14.50	9.10	14.55	6.60	25.95	5.00	11.9
13 JUL 81	128.30	104.75	183.45	112.05	66.75	170.55	0.95	3.55	15.50	87.3
20 JUL 81	56.90	79.25	60.35	109.10	58.05	62.65	17.15	34.55	109.80	65.3
26 JUL 81	115.45	268.50	218.75	36.35	74.05	110.00	4.60	95.95	204.30	125.3
03 AUG 81	39.50	47.85	103.65	9.30	46.90	61.10	0.00	31.45	5.95	38.4
09 AUG 81	5.00	4.10	98.75	3.05	2.00	15.95	0.00	3.50	3.30	15.1
17 AUG 81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.75	0.8
23 AUG 81	11.20	9.35	9.50	17.70	4.95	0.00	0.55	0.50	0.00	6.0
31 AUG 81	0.00	1.40	9.95	31.30	0.50	0.50	0.00	0.50	0.00	4.9
10 SEP 81	0.00	2.95	12.95	0.55	0.50	0.50	0.00	0.00	0.00	1.9
14 SEP 81	0.00	0.80	16.70	4.30	3.35	1.10	2.10	4.60	3.90	4.1
21 SEP 81	2.20	3.00	8.70	1.75	1.10	0.55	0.00	0.50	0.00	2.0
28 SEP 81	0.70	0.00	51.00	2.10	0.00	0.00	0.55	0.00	0.00	6.0
05 OCT 81	1.40	0.00	1.75	1.15	0.55	1.20	0.00	0.00	0.00	0.7
Mean	14.98	21.36	31.41	14.09	11.47	17.80	2.25	8.48	14.59	

*Mean number of organisms/100 m^3.

CHANNEL CATFISH. Channel catfish ranked second (six percent) in abundance in the night samples; however, none were collected during day sampling. Nearly all the channel catfish were young of year. No larvae were collected. The rapid development of the anal ray complement even before the yolk sac is absorbed abbreviates the earlier lifestages such as yolk-sac and larval stages. Also, the young remain in the nest for a short period of time. Therefore, it is not unusual to collect only one lifestage of channel catfish over a sampling season. Relatively large concentrations of channel catfish were noted on 6 July (mean density: 9/100 m^3) and 3 August (8/100 m^3) when water temperatures were 24 °C (75.2 °F) and 25 °C (77.0 °F), respectively. Channel catfish were collected throughout the summer of 1981 from the end of June through mid-September.

NOTROPIS AND CYPRINIDAE (EXCLUDING COMMON CARP). Taxonomic information on larvae of the family Cyprinidae is scanty, thus limiting the level of identification. Cyprinidae (those minnow larvae identified only to family) comprised a small (less than two percent) but similar percent composition in both the night and day collections. Larvae were found over an extended period of time from May to September in both the day and night collections. Approximately five percent of the total larvae in the night collections were *Notropis* spp.,

TABLE 4

Mean densities of fish larvae (all taxa combined) collected during the day in Scioto River near Omega, Ohio.*

Date	Stations									
	DSI1	DSI2	DSI3	SSI1	SSI2	SSI3	USI1	USI2	USI3	Mean
26 APR 81	0.45	1.45	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.3
20 MAY 81	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.1
18 JUN 81	14.60	29.45	32.75	35.80	16.10	49.55	28.00	24.40	52.80	31.5
17 JUL 81	35.85	6.50	7.70	3.10	8.55	6.50	9.50	13.70	10.80	11.4
28 AUG 81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
24 SEP 81	0.00	1.30	0.00	0.00	0.00	0.55	0.50	1.05	0.00	0.4
Mean	8.57	6.53	6.74	6.48	4.11	9.51	6.33	6.52	10.60	

*Mean number of organisms/100 m^3.

whereas none were collected during the day. Nearly all the larvae were collected at Station DSI3, a shoal area. *Notropis* spp. were present in non-consecutive samples in early June through September indicating that more than one species is represented in the taxon *Notropis* spp. A few emerald shiner and speckled chub were the only young-of-year identified to species in the ichthyoplankton collections.

COMMON CARP. Common carp were infrequently captured at night (less than 1.5% of the total catch); however, they were the most abundant larvae collected during the day (64% of the total catch). Larvae were most commonly found at Stations SSI3 and USI3. The June day collection yielded the greatest density of carp larvae (28/100 m^3) at a water temperature of 24 °C (75.2 °F). The remaining larvae were collected 20 May (less than 1/100 m^3).

DAY-NIGHT COMPARISONS

Species composition and relative abundance differed between day and night sampling efforts. Fig. 3 is a graphical presentation of density data over time for each transect sampled both day and night within the same week only. The night data for which there was no corresponding day collection was not graphed. It is apparent that relatively little difference existed for the months of April, May and September because the catch was relatively low in those

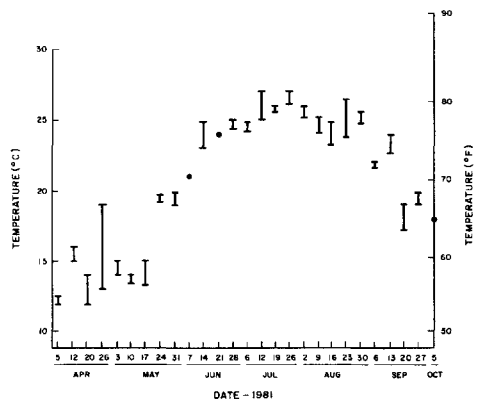

FIGURE 2. Ranges of weekly water temperatures measured in the Scioto River in 1981 near Omega, Ohio.

months obscuring minor differences in availability or catchability. Table 5 presents density data for the June, July and August collection period which allows for a closer examination of species contributions to abundance peaks shown on fig. 3.

During June, a high percentage (89%) of the day ichthyoplankton densities were attributable to large collections of carp yolk-sac larvae and post-larvae. Carp were also the major component of the night collections (57%) but densities were more than 10 times lower than those found during the day. Proportionally, more catostomids were collected at night in June than during the day (28% and eight percent, respectively).

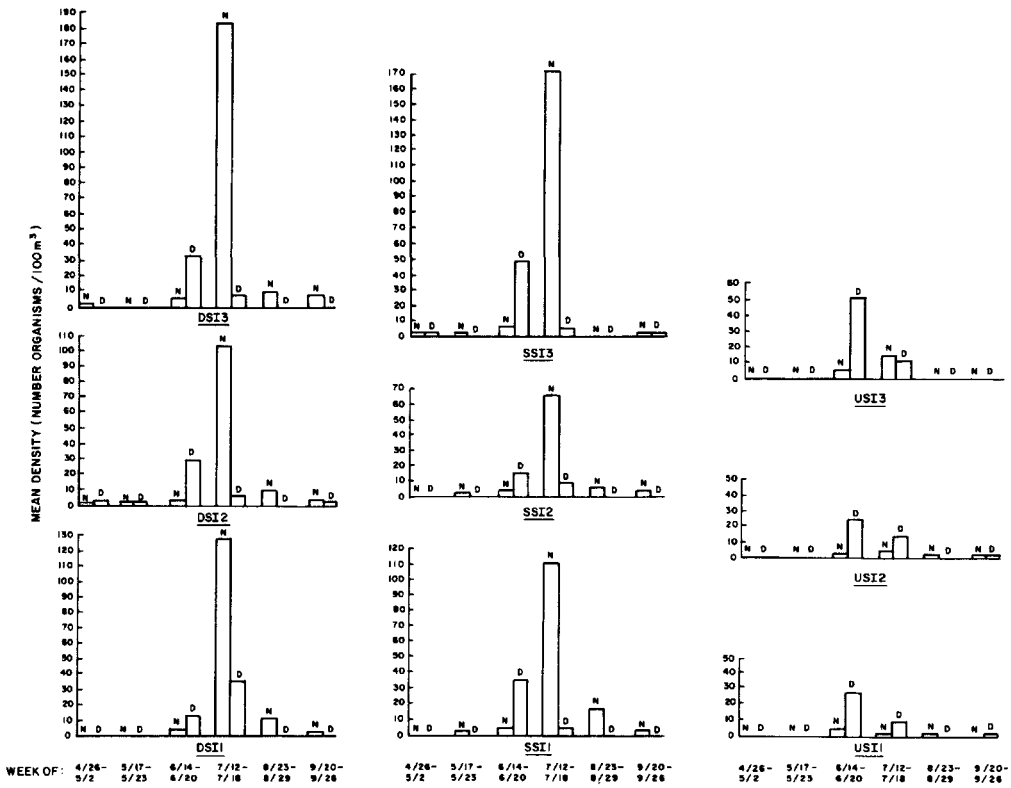

FIGURE 3. Mean densities of fish larvae collected day (D) and night (N) within the same week in 1981 in the Scioto River near Omega, Ohio.

In July, catostomids dominated both the day and night collections (89 and 91%, respectively). Catostomid densities were almost eight times greater at night than during the day. A few channel catfish were collected at night. Carp densities dropped dramatically from June levels.

By August, species composition had changed again. Channel catfish young of year dominated the catch (71%). A number of small cyprinid young of year were collected, but densities were low. The daytime collections contained no ichthyoplankton.

DISCUSSION

During this survey of the ichthyoplankton of the Scioto River, a total of 26 taxa of fish larvae and young of year were collected (table 1). A companion study of the adult fish fauna from the Scioto River and several tributaries near Omega, Ohio, yielded 58 species (table 2). Differences in the number of taxa reported in these studies are due to two factors: (1) the lack of adequate taxonomic descriptions of early life stages of many species results in the lumping of more than one species into higher taxonomic categories, and (2) a number of Scioto River species spawn in tributaries, in backwaters, in depressions and nests, or in and around vegetation, rocks, and similar structure where the spawn may reside for some time prior to assuming a more open water existence and consequently becoming vulnerable to collection gear.

Carrying the comparison of the ichthyoplankton and adult fish communities one step further, it becomes apparent that the

ichthyoplankton and adult fish sampling programs did not inherently sample the same segment of the overall fish community in terms of relative abundance. For example, gizzard shad and emerald shiner were very abundant numerically in electrofishing collections in the river; however, neither species, nor the clupeid or cyprinid groups were particularly abundant in the ichthyoplankton. Some species such as carp, however, were abundant both as adults (electrofishing collections) and as larvae (in day ichthyoplankton collections).

It is apparent that trends in ichthyoplankton abundance in the Scioto River varied from month to month, from day to night and even from station to station.

Relatively few specimens were collected in April and May (mean monthly flows of 522 m^3/s (17,402 cfs) and 411 m^3/s (13,703 cfs), respectively; CPI 1983). By June, larval densities began to increase (mean monthly flow of 467 m^3/s (15,577 cfs)). Larval densities peaked in July while river discharge dropped dramatically (mean monthly flow of 83 m^3/s (2,769 cfs)). Comparing the June to April-May densities, it is apparent that more larvae were in the river in June than earlier in the season. While it seems likely that even more larvae were in the river in July, the peak densities recorded in July may have been influenced, in part, by reduced river discharge in light of the following area-volume consideration: (1) area–sampling at high flow periods decreases the relative sampling area of the fixed open area plankton net to the larger cross-sectional area of the transect, and (2) volume–simple dilution affects any density calculations linearly, i.e., the same absolute number of larvae will seem half as abundant, in terms of density, if the flow volume of the river or stream is doubled.

Relative to day/night comparisons, early season (April and May) catostomid larvae (*Moxostoma?*) were similarly low in abundance in both day and night collections. In June, as catostomid densities began to rise, more larvae were caught during the day than at night. By July when catostomids dominated the catch, day-night susceptibility changed dramatically. Many more catostomids (*Ictiobus?* and *Carpiodes?*) were caught at night.

Sampling location greatly influences ichthyoplankton catch. On the Scioto River, stations along the DSI transect were located about 180-240 m (600-800 ft) below the largest riffle area in the study area. High production and good sampling efficiency were anticipated and were realized. Stations along the SSI transect were located downstream of an island with attendant backwater area and a tributary, Carrs Run. Relatively high abundance extending over several weeks, as noted at the DSI stations, was recorded. Stations along the USI transect were located in a pool about 540 m (1800 ft) below a moderately-sized riffle area. Relative to the other two transects, catch was fairly low with only one peak in abundance observed on 26 July. Numerous catostomid yolk-sac larvae were collected, possibly *Carpiodes carpio,* which may have spawned in the pool above the transect.

This study demonstrated that ichthyoplankton in the Scioto River were abundant over a relatively short period of time from late June through early August; however, some species were collected as early as late April, and their abundance may be greater than measured by the collection gear. Day-night differences were noted for some species. Lastly, collecting station location can appreciably influence the results of a sampling program. As was done in this study, a variety of habitats should be sampled.

ACKNOWLEDGMENTS. The study was funded by Cooperative Power, Inc., Columbus, Ohio. The authors wish to acknowledge Messrs. Steven P. Dupont, Rodney Pierce and Gregory Grunzel of Applied Biology, Inc. for their field and laboratory expertise. The manuscript was reviewed by Dr. David L. Thomas and Mr. Ralph N. Shaver of the Planning and Scientific Services Division of Chas. T. Main, Inc. Figures and typing, respectively, were done by Mr. Stephen VandeWater and Ms. Donna Molino of Chas. T. Main, Inc.

TABLE 5

Mean densities of fish larvae** collected both day and night near Omega, Ohio.*

Taxa	DSI1	DSI2	DSI3	SSI1	SSI2	SSI3	USI1	USI2	USI3	Total Mean Density
	Stations									
	Day (Night)	Day (Night)	Day (Night)	Day (Night)	Day (Night)	Day (Night)	Day (Night)	Day (Night)	Day (Night)	Day (Night)
	14 & 18 June 1981									
Clupeidae	—***	0.45	—	—	—	—	—	—	—	0.05
	(—)	(0.50)	(—)	(0.50)	(—)	(—)	(—)	(—)	(—)	(0.10)
Cyprinidae	—	—	—	—	0.45	—	0.45	—	—	0.10
	(—)	(—)	(—)	(—)	(0.50)	(—)	(1.05)	(—)	(—)	(0.15)
Catostomidae	2.15	—	5.00	2.50	1.35	3.85	2.75	—	3.90	2.40
	(0.95)	(2.45)	(1.55)	(2.70)	(—)	(1.45)	(1.60)	(—)	(—)	(1.20)
Percidae	—	—	—	—	—	0.50	—	0.45	—	0.10
	(—)	(—)	(—)	(—)	(—)	(—)	(—)	(—)	(—)	(—)
Lepomis sp.	—	—	—	—	—	0.50	—	—	—	0.05
	(—)	(—)	(—)	(—)	(—)	(—)	(—)	(—)	(—)	(—)
Stizostedion sp.	—	—	—	—	—	—	—	—	—	—
	(—)	(—)	(—)	(0.55)	(—)	(—)	(—)	(—)	(—)	(0.05)
Carp	11.90	29.00	27.75	33.30	12.90	44.70	22.95	20.70	48.90	28.00
	(2.40)	(0.95)	(3.45)	(5.10)	(2.00)	(2.50)	(1.05)	(1.00)	(2.95)	(2.40)
Undetermined	0.55	—	—	—	1.40	—	1.85	3.25	—	0.80
	(—)	(—)	(—)	(0.50)	(—)	(1.95)	(—)	(—)	(0.60)	(0.35)
Total Mean Larval Density	14.60	29.45	32.75	35.80	16.10	49.55	28.00	24.40	52.80	31.50
	(3.35)	(3.90)	(5.00)	(9.35)	(2.50)	(5.90)	(3.70)	(1.00)	(3.55)	(4.25)
	13 & 17 July 1981									
Clupeidae	—	—	—	—	—	—	—	—	—	—
	(—)	(—)	(0.70)	(—)	(—)	(—)	(—)	(—)	(—)	(0.10)
Cyprinidae	0.60	—	—	0.50	—	0.50	1.50	1.00	—	0.45
	(—)	(—)	(1.40)	(—)	(—)	(—)	(—)	(—)	(—)	(0.15)

Catostomidae	29.70 (118.95)	6.50 (92.50)	7.70 (169.95)	2.60 (98.35)	8.05 (58.60)	6.00 (153.60)	7.05 (0.95)	12.70 (3.05)	10.80 (15.50)	10.10 (79.05)
Lepisosteus sp.	— (—)	— (—)	— (0.70)	— (0.50)	— (—)	— (—)	— (—)	— (—)	— (—)	— (0.15)
Notropis sp.	— (—)	— (—)	— (0.70)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (0.10)
Carp	— (2.50)	— (—)	— (1.40)	— (—)	— (—)	— (—)	— (—)	— (0.50)	— (—)	— (0.50)
Channel Catfish	— (3.10)	— (1.95)	— (1.40)	— (0.50)	— (1.55)	— (3.90)	— (—)	— (—)	— (—)	— (1.40)
Undetermined	5.55 (3.75)	— (10.30)	— (7.20)	— (12.70)	0.50 (6.60)	— (13.05)	0.95 (—)	— (—)	— (—)	0.80 (5.95)
Total Mean Larval Density	35.85 (128.30)	6.50 (104.75)	7.70 (183.45)	3.10 (112.05)	8.55 (66.75)	6.50 (170.55)	9.50 (0.95)	13.70 (3.55)	10.80 (15.50)	11.40 (87.30)
				23 & 28 August 1981						
Cyprinidae	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (0.55)	— (—)	— (—)	— (0.05)
Notropis sp.	— (—)	— (—)	— (0.70)	— (7.75)	— (—)	— (—)	— (—)	— (—)	— (—)	— (0.95)
Pimephales sp.	— (—)	— (—)	— (—)	— (1.10)	— (—)	— (—)	— (—)	— (—)	— (—)	— (0.10)
Ictiobus sp.	— (—)	— (—)	— (1.45)	— (1.10)	— (0.55)	— (—)	— (—)	— (—)	— (—)	— (0.35)
Emerald Shiner	— (—)	— (—)	— (1.45)	— (—)	— (—)	— (—)	— (—)	— (—)	— (—)	— (0.15)
Speckled Chub	— (—)	— (—)	— (—)	— (0.55)	— (—)	— (—)	— (—)	— (—)	— (—)	— (0.05)
Channel Catfish	— (11.20)	— (9.35)	— (5.90)	— (7.20)	— (4.40)	— (—)	— (—)	— (0.50)	— (—)	— (4.30)
Total Mean Larval Density	0.00 (11.20)	0.00 (9.35)	0.00 (9.50)	0.00 (17.70)	0.00 (4.95)	0.00 (0.00)	0.00 (0.55)	0.00 (0.50)	0.00 (0.00)	0.00 (5.95)

*Rounded to the nearest 0.05 larvae/100 m^3
**Includes yolk-sac, post-larvae and young of year
***No larvae collected

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