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A Survey of Larval Caddisflies (Insecta: Trichoptera) from Riffles of Three Streams of the Drake's Creek Drainage, Kentucky, with a Preliminary Investigation of the Adult Trichoptera of the Region

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Beiser,

Michael Charles

1984

A SURVEY OF LARVAL CADDISFLIES (INSECTA: TRICHOPTERA) FROM RIFFLES OF THREE STREAMS OF THE DRAKE'S CREEK DRAINAGE, KENTUCKY, WITH A PRELIMINARY INVESTIGATION OF THE ADULT TRICHOPTERA OF THE REGION

A Thesis

Presented to

the Faculty of the Department of Biology

Western Kentucky University

Bowling Green, Kentucky

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

Michael Charles Beiser

March 1984

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A SURVEY OF LARVAL CADDISFLIES (INSECTA: TRICHOPTERA) FROM RIFFLES OF THREE STREAMS OF THE DRAKE'S CREEK DRAINAGE, KENTUCKY, WITH A PRELIMINARY INVESTIGATION OF THE ADULT TRICHOPTERA OF THE REGION

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Approved April 17, 1984
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A SURVEY OF LARVAL CADDISFLIES (INSECTA: TRICHOPTERA) FROM RIFFLES OF THREE STREAMS OF THE DRAKE'S CREEK DRAINAGE, KENTUCKY, WITH A PRELIMINARY INVESTIGATION OF THE ADULT TRICHOPTERA OF THE REGION

Michael Charles Beiser March 1984 64 pages

Directed by: R. Hoyt, L. Gleason, G. Dillard, and S. Neff

Department of Biology Western Kentucky University

A total of 1665 larval caddisflies, representing four families and eight genera, was collected from seven stations in the Drake's Creek drainage from 1 November, 1982 through 15 October, 1983. The pattern of longitudinal distribution of the larvae, based on feeding relationships, in the West and Middle Forks of the system was consistent with studies by Wiggins and Mackay (1978), Andrews and Minshall (1979), and Ross and Wallace (1982) and the River Continuum Concept (Vannote et al. 1980). The Trammel Fork, a spring fed stream, showed a pattern of distribution contrary to the predictions of the Concept, suggesting that the continuous gradient of physical conditions upon which the Concept was based may not be present in streams where hypogean inflows constitute a major part of the water volume. One larva collected represented a new species record for Kentucky.

Light trap collections of adult caddisflies yielded 28 species representing eight families and 15 genera, suggesting an extremely diverse trichopteran fauna in the

Drake's Creek drainage. In addition, the first reported species records for Trichoptera in Allen and Simpson Counties as well as 21 additional records for Warren County were established. Three of the species of adult Trichoptera reported represented new species records for Kentucky.

INTRODUCTION

Faunal surveys of Kentucky stream insects are rare (Picazo and DeMoss 1980). The caddisflies (Class Insecta, Order Trichoptera) of Kentucky have been thoroughly examined in only a few drainages (Haag and Hill 1983). Resh (1975) stated that the Green River drainage in western Kentucky remains largely unexplored with respect to the trichopterans; this gap must be filled before the distribution of caddisflies within the state can be completely understood. In addition, faunal lists serve as a valuable tool in monitoring changes in environmental quality (Resh and Unzicker 1975). As the expansion of industry continues, the value of such lists will increase.

Resh (1975) listed 175 species of caddisflies reported from Kentucky, but none were reported from Allen and Simpson Counties and only *Hydropsyche depravata* and *Cheumatopsyche oxa* have been reported from Warren County. More recent faunal surveys in Rowan County (Picazo and DeMoss 1980) and Boyd and Henderson Counties (Haag and Hill 1983) have added two and three additional species, respectively, to the known species of the state bringing the total to 180.

The River Continuum Concept (Vannote et al. 1980) proposes that the benthic community adjusts to a continuous gradient of physical conditions that are present from headwaters to mouths of streams, and that predictions of the dominant trophic form in a particular area of a stream can be made using the Concept.

The two objectives of this study were to examine the diversity and relative abundance of larval caddisflies in riffle areas of a stream influenced by municipal and industrial wastes, a stream influenced by agricultural runoff, and a stream influenced by having much of its influent from hypogean inflows and to conduct a preliminary investigation of the adult trichopteran fauna of the region.

MATERIALS AND METHODS

Semimonthly collections were made at all stations except the uppermost station of the Trammel Fork, which was sampled monthly. Collections were taken from 1 November, 1982 to 15 October, 1983, on the first and fifteenth day of each month. A Surber square foot sampler ($0.09\ m^2$) was used to obtain samples; 2 square foot samples were taken at each station per collection. During each collection effort, all stones within the square foot area were examined by hand and all larvae and larval cases removed. The underlying gravel was disturbed to a depth of approximately 10 cm to recover any burrowing forms. Qualitative samples, which utilized the kick-sample technique and a seine of 0.5 mm mesh, were also taken.

Sampled specimens were placed in Kahle's Fluid for two weeks to allow sufficient hardening of the exoskeleton (Wiggins 1977). Specimens were then placed in 70 percent ethanol for permanent storage. Keys by Merritt and Cummins (1978), Pennak (1978), Ross (1944), Schuster and Etnier (1978), and Wiggins (1977) were used to identify the larval trichopterans to the most specific taxon possible.

From July to October, 1983 a black light apparatus similar to that described by Schuster and Etnier (1978) was used to capture night flying adults. Malfunctions in this apparatus resulted in incomplete collections on 15 July and 1 August, 1983. Adults were placed in 70 percent ethanol and prepared for identification by the method of Ross (1944). The insects were identified to species level when possible with the aid of keys by Betten (1934), Blickle (1979), Morse (1975), and Ross (1944). Revisions of the genus Nectopsyche proposed by Flint (1974) were followed.

A Hach Model Al-36WR water chemistry kit was used to determine total hardness, total alkalinity, and pH at each collection. A General Oceanic digital flowmeter was used to determine the rate of water flow, and a YSI Model 54A oxygen meter was used to determine the concentration of dissolved oxygen. The YSI failed to operate on numerous occasions resulting in incomplete data for that parameter. Water depth and temperature were also recorded.

Computations of Shannon's Diversity Index (Shannon 1948) were made for each collection of adult caddisflies. For purposes of analysis, the fall season was considered to be September, October and November; winter--December, January and February; spring--March, April and May; and summer--June, July and August.

STUDY AREA

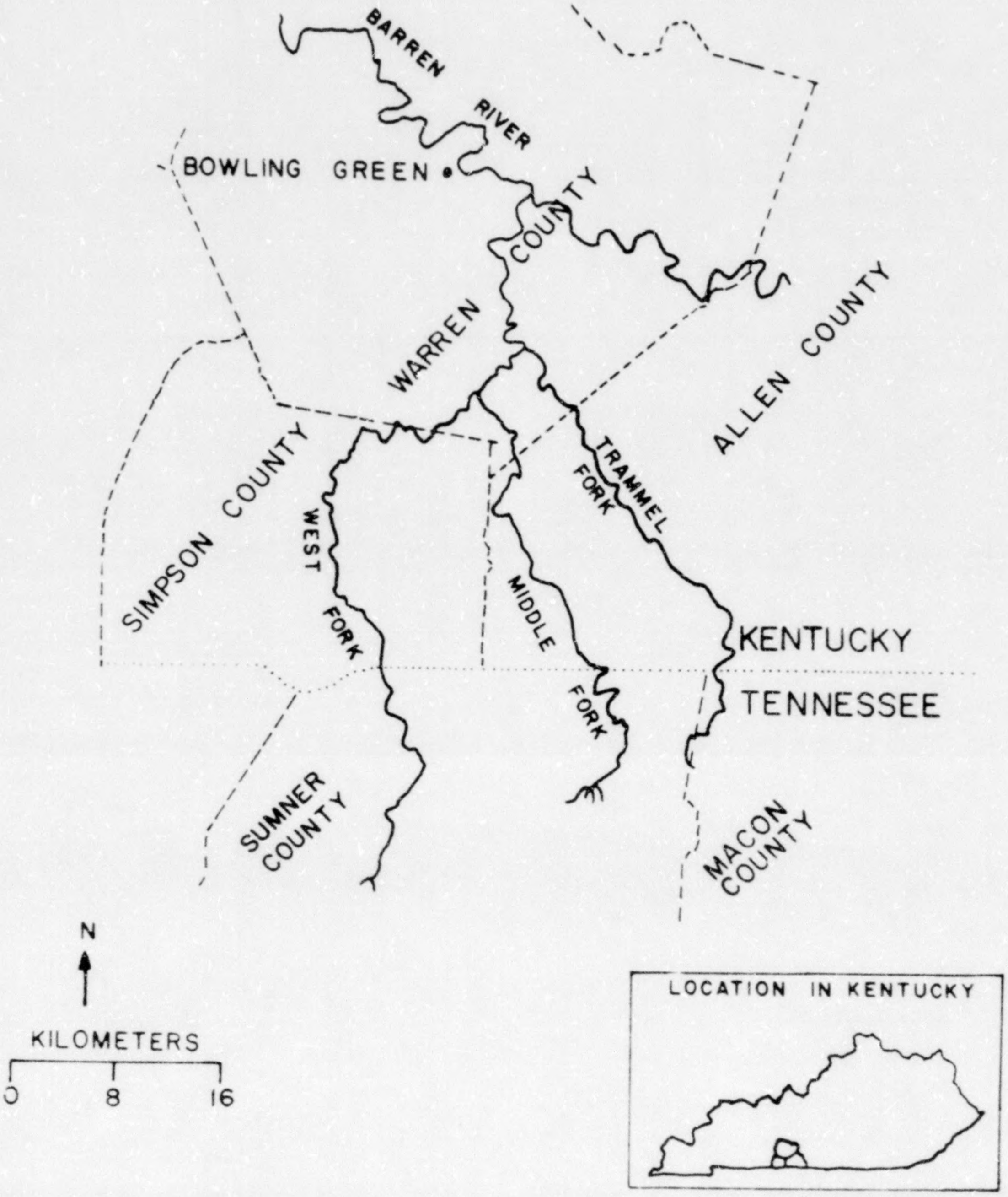
The Drake's Creek drainage includes three major branches, the West Fork, Middle Fork, and Trammel Fork, each having its source in northern Tennessee (Figure 1). The West Fork is a 4th order stream (Horton 1945) and flows through central Simpson County, Kentucky, receiving municipal and industrial wastes from the city of Franklin. It merges with the Middle Fork, a 5th order stream, near Drake, Kentucky in central Warren County, 37.2 km (23 mi) from its confluence with the Barren River near Bowling Green, Kentucky.

The Middle Fork drains areas in extreme eastern Simpson County and western Allen County and southeastern Warren County. Much of the watershed area is used for agricultural purposes, and the karstic feature of leached substrata is common.

The Trammel Fork is a 5th order stream which drains central and western Allen County, receiving much of its input from hypogean inflows due to mature karst development in the region. It merges with the combined West and Middle Forks in Warren County, 27.5 km (17.0 mi) from its confluence with the Barren River.

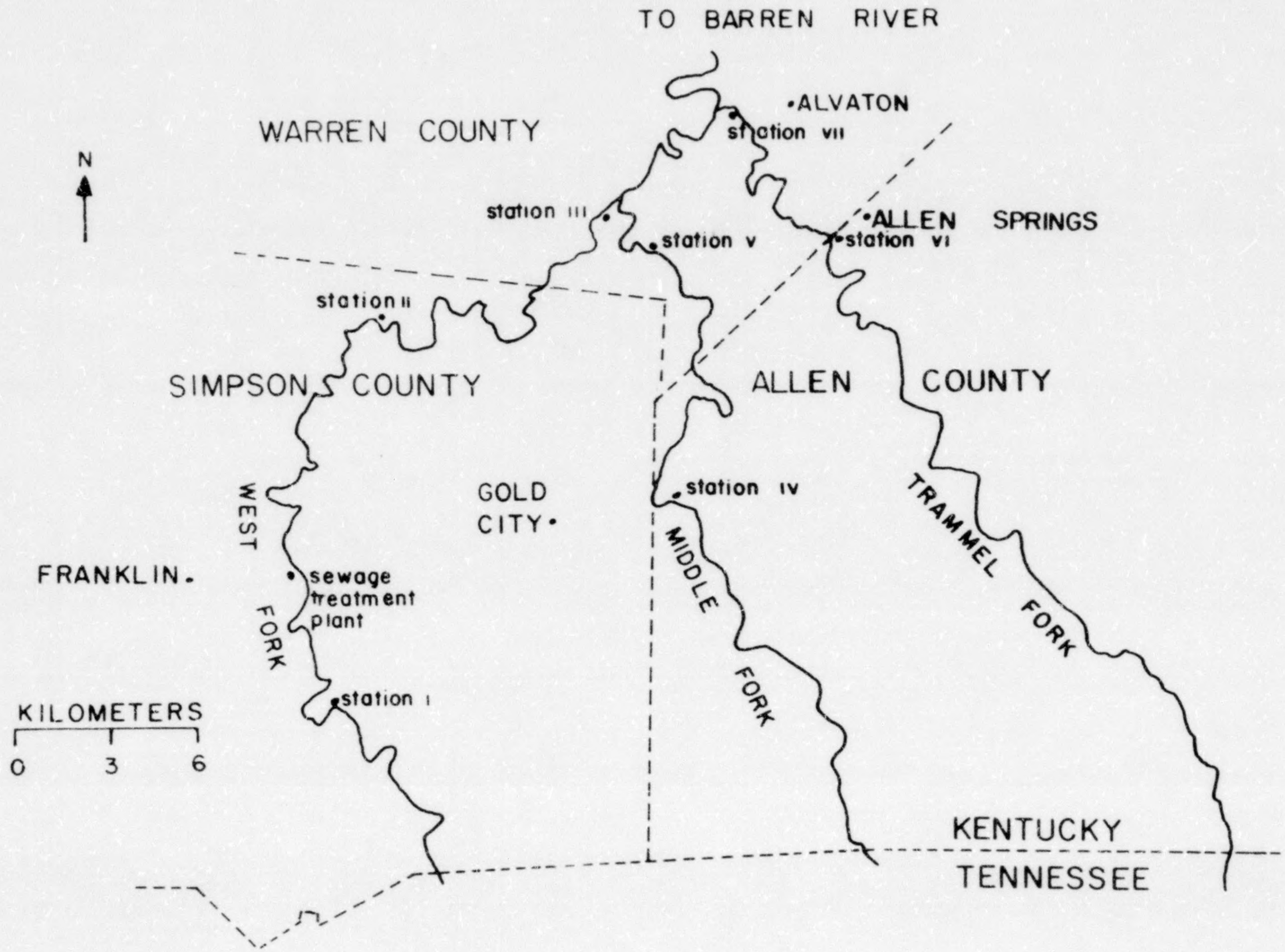
Seven sampling stations were selected throughout the Drake's Creek system (Figure 2). All stations were riffle areas of approximately 50 m^2, with substrates ranging from

Figure 1. Map of the Drake's Creek watershed showing general drainage area and location in Kentucky.



BARREN
RIVER
BOWLING GREEN
WARREN
COUNTY
ALLEN COUNTY
SIMPSON COUNTY
WEST
FORK
MIDDLE
FORK
TRAMMEL
FORK
KENTUCKY
TENNESSEE
SUMNER
COUNTY
MACON
COUNTY
N
KILOMETERS
0
8
16
LOCATION IN KENTUCKY

Figure 2. Map of the Drake's Creek system showing locations of collecting stations.



TO BARREN RIVER
ALVATON
station VII
WARREN COUNTY
N
station III
station V
ALLEN SPRINGS
station VI
station II
SIMPSON COUNTY
ALLEN COUNTY
GOLD CITY
station IV
WEST FORK
MIDDLE FORK
TRAMMEL FORK
FRANKLIN
sewage treatment plant
station I
KILOMETERS
0 3 6
KENTUCKY
TENNESSEE

small to large stones in a bed of fine gravel. Each station was at an elevation of approximately 152 m (500 ft) above mean sea level.

Station I--West Fork (W_1): Located in Simpson County 2.8 km (1.7 mi) from the junction of State Highways 73-100, at Creek Kilometer 31.7 (Mile 19.6), 6.5 km (4 mi) upstream from the Franklin sewage treatment plant. This station received no apparent municipal or agricultural additives and was thus designated as a control station for the West Fork.

Station II--West Fork (W_2): Located 5.6 km (3.5 mi) from the junction of Cedar Ridge Road and U.S. 31W, 0.65 km (0.38 mi) south of the Warren-Simpson County line, at Creek Kilometer 57.2 (Mile 35.5) in Simpson County, 19 km (11.7 mi) downstream from the Franklin sewage treatment plant and 25.5 km (15.8 mi) from Station W_1.

Station III--West Fork (W_3): Located in southern Warren County at the State Highway 240 bridge, at Creek Kilometer 92 (Mile 57.1), 1.75 km (1.1 mi) upstream from the confluence of the West and Middle Forks, and 34.8 km (21.5 mi) downstream from Station W_2.

Station IV--Middle Fork (M_1): Located in Allen County near the Simpson County line 0.8 km (0.5 mi) off State Highway 265, at Creek Kilometer 20.7 (Mile 12.8).

Station V--Middle Fork (M_2): Located in Warren County at Creek Kilometer 36.4 (Mile 22.6) at the ford at Drake, 3.45 km (2.1 mi) above the confluence of the West and Middle Forks and 15.7 km (9.7 mi) downstream from Station M_1.

Station VI--Trammel Fork (T_1): Located near Allen Springs, in Allen County at the State Highway 240 bridge, at Creek Kilometer 32.2 (Mile 19.9).

Station VII--Trammel Fork (T_2): Located 0.3 km upstream (0.19 mi) from the confluence with the West and Middle Forks near Alvaton at the bridge on the Lebanon Church Road, 11.5 km (7.1 mi) downstream from Station T_1 at Creek Kilometer 43.7 (Mile 27).

PHYSICO-CHEMICAL PARAMETERS

The annual trends observed for temperature, oxygen saturation, total alkalinity, total hardness, pH, flow rate, and water depth are given in Figures 3 through 9. Average values for the above physico-chemical parameters are summarized in Table 1.

The lowest average temperature noted during the study occurred at Station W_2, and temperatures were observed to increase in the lowermost reaches of each stream system (Table 1). The mean temperatures of the spring fed Trammel Fork stations were closer (differing by 0.5 C) than were the temperatures of any other stations within the same stream system, except at Stations W_1 and W_2, where little difference was noted.

Oxygen saturation averaged near 100 percent at all stations except M_1 where the lowest mean oxygen saturation value was noted (Table 1). Mean oxygen saturation increased from upstream to downstream within each stream system with the highest mean percent saturation value occurring at Station T_2.

The average total alkalinity was lowest at Station W_1 and highest at M_2 (Table 1). This parameter also increased in the downstream reaches of each stream system. The differences in mean alklainities were less between the Trammel

Figure 3. Water temperatures, in degrees centigrade, for each station during the period 1 November, 1982 through 15 October, 1983.

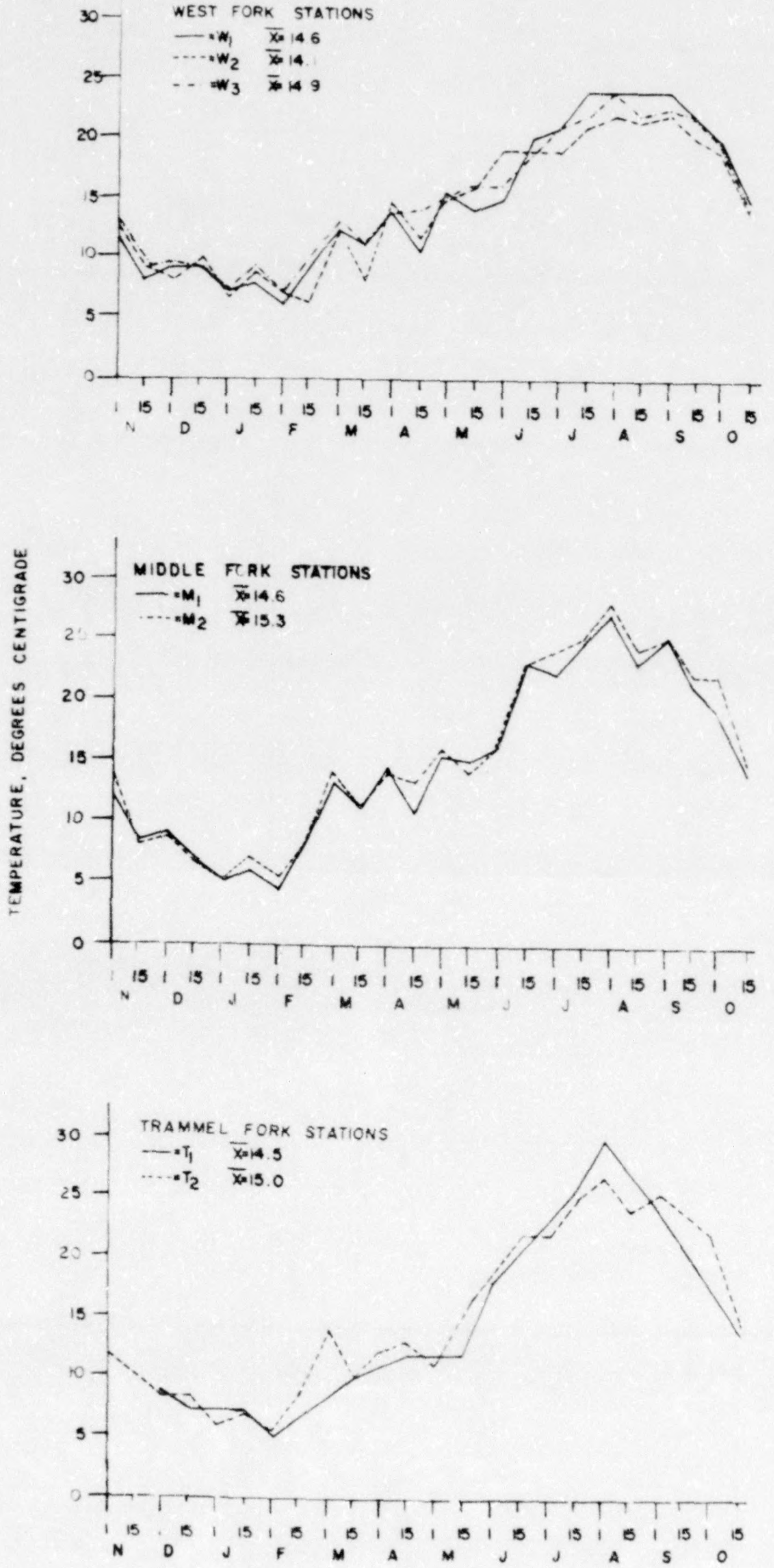

WEST FORK STATIONS
=W1 X̄=14.6
=W2 X̄=14.1
=W3 X̄=14.9
MIDDLE FORK STATIONS
=M1 X̄=14.6
=M2 X̄=15.3
TEMPERATURE, DEGREES CENTIGRADE
TRAMMEL FORK STATIONS
=T1 X̄=14.5
=T2 X̄=15.0
N D J F M A M J J A S O

Figure 4. Percent saturation of dissolved oxygen for each station during the period 1 November, 1982 through 15 October, 1983.

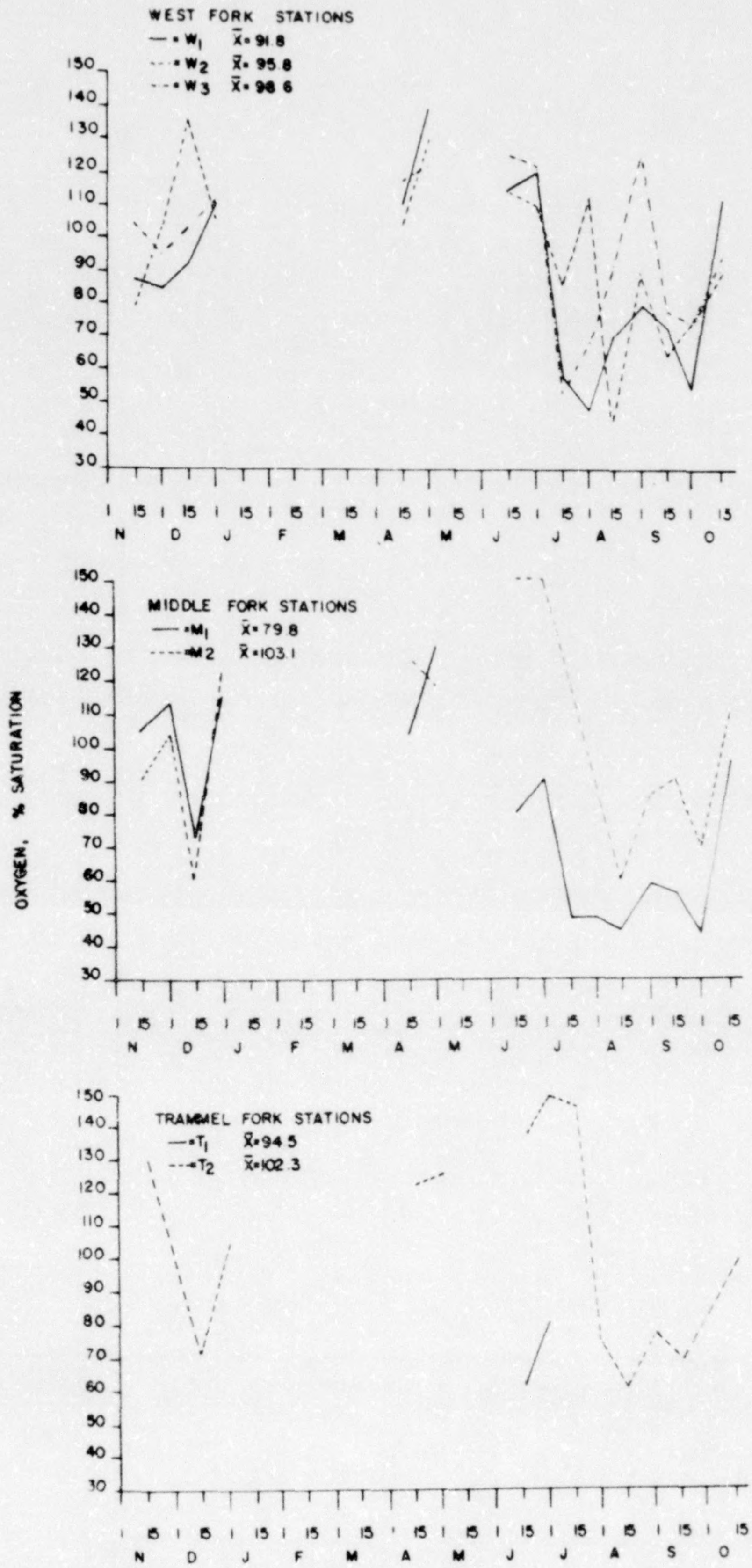
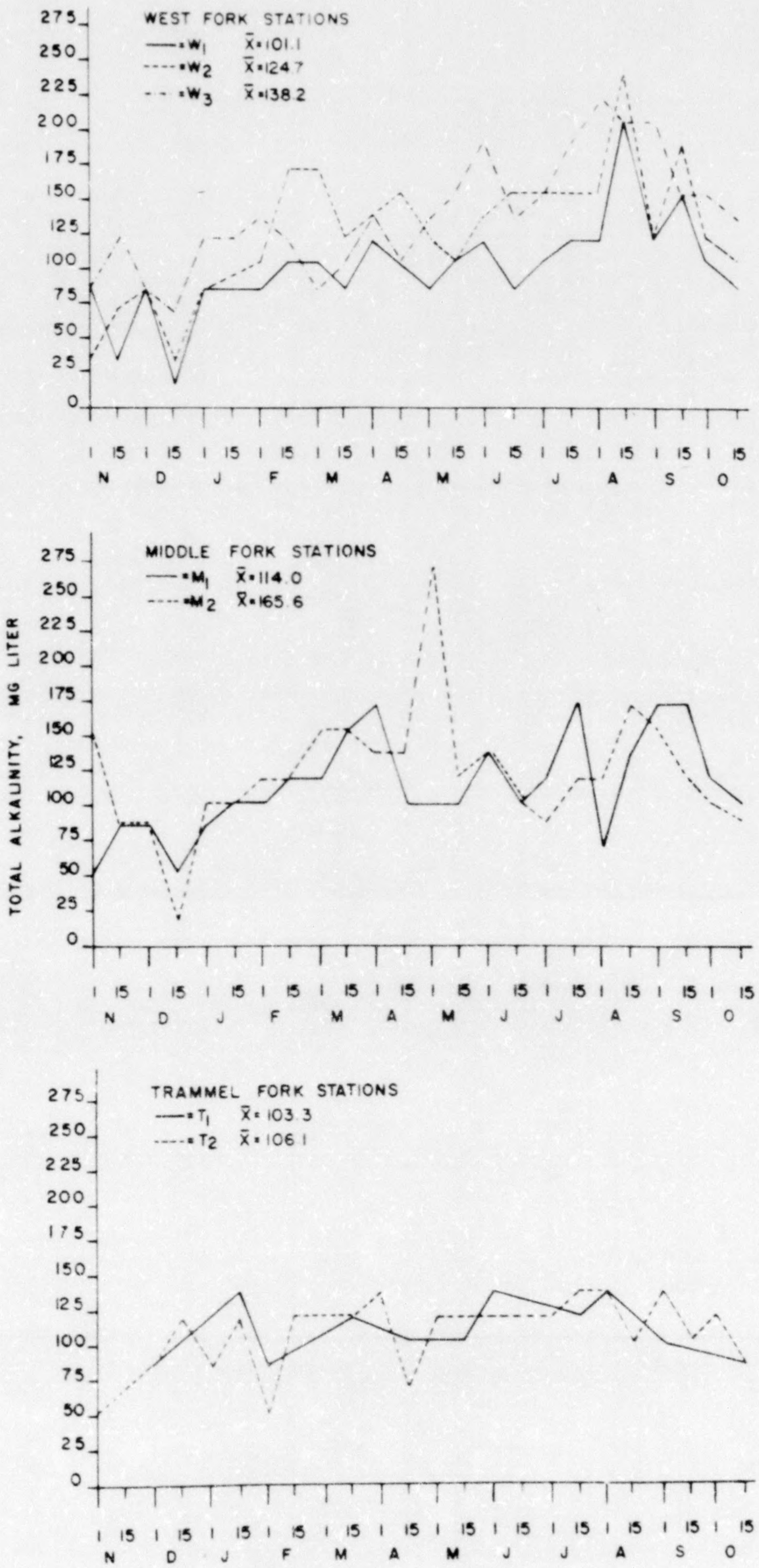

WEST FORK STATIONS
W1 X̄ = 91.8
W2 X̄ = 95.8
W3 X̄ = 98.6
MIDDLE FORK STATIONS
M1 X̄ = 79.8
M2 X̄ = 103.1
TRAMMEL FORK STATIONS
T1 X̄ = 94.5
T2 X̄ = 102.3
OXYGEN, % SATURATION
N D J F M A M J J A S O

Figure 5. Total alkalinity, in milligrams of $CaCO_3$ per liter, for each station during the period 1 November, 1982 through 15 October, 1983.



WEST FORK STATIONS
=W1 X̄=101.1
=W2 X̄=124.7
=W3 X̄=138.2
MIDDLE FORK STATIONS
=M1 X̄=114.0
=M2 X̄=165.6
TRAMMEL FORK STATIONS
=T1 X̄=103.3
=T2 X̄=106.1
TOTAL ALKALINITY, MG LITER
0 25 50 75 100 125 150 175 200 225 250 275
N D J F M A M J J A S O

Figure 6. Total hardness, in milligrams of $CaCO_3$ per liter, for each station during the period 1 November, 1982 through 15 October, 1983.

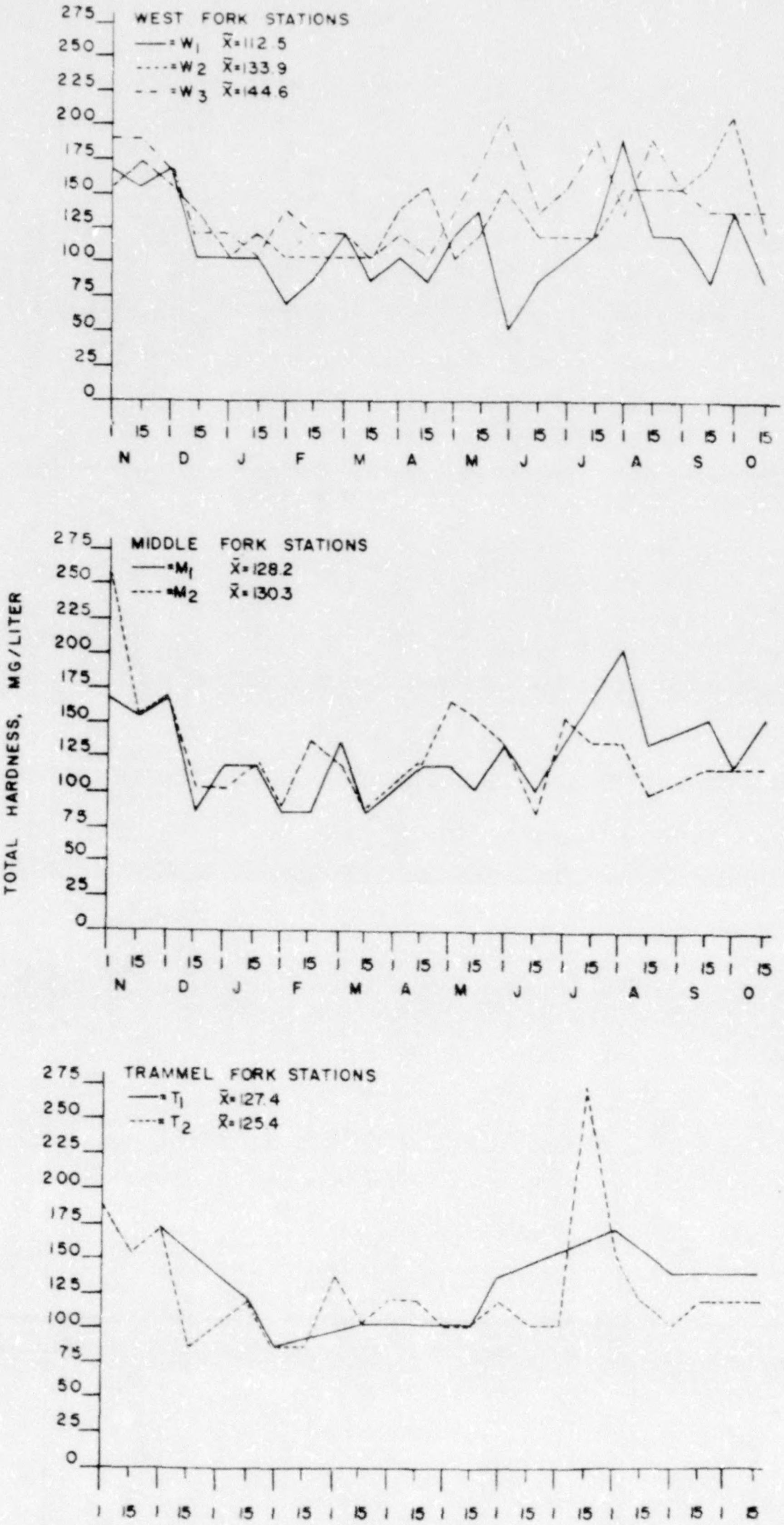

WEST FORK STATIONS
=W1 X̄=112.5
=W2 X̄=133.9
=W3 X̄=144.6
MIDDLE FORK STATIONS
=M1 X̄=128.2
=M2 X̄=130.3
TRAMMEL FORK STATIONS
=T1 X̄=127.4
=T2 X̄=125.4
TOTAL HARDNESS, MG/LITER
275
250
225
200
175
150
125
100
75
50
25
0
N
D
J
F
M
A
M
J
J
A
S
O

Figure 7. Hydrogen ion concentration (pH) for each station during the period 1 November, 1982 through 15 October, 1983.

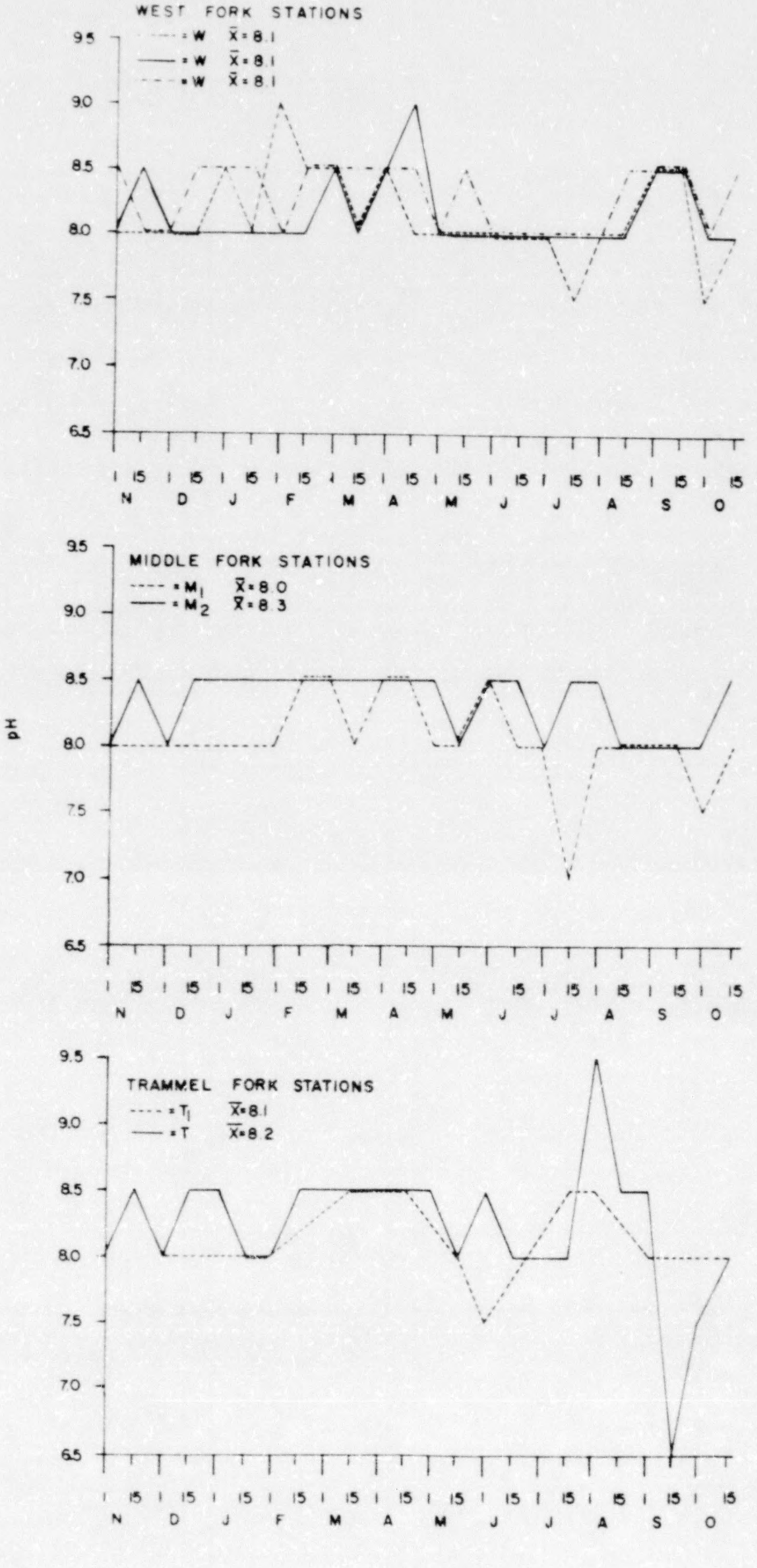

WEST FORK STATIONS
= W X̄ = 8.1
= W X̄ = 8.1
= W X̄ = 8.1
MIDDLE FORK STATIONS
= M1 X̄ = 8.0
= M2 X̄ = 8.3
TRAMMEL FORK STATIONS
= T1 X̄ = 8.1
= T X̄ = 8.2
pH
9.5
9.0
8.5
8.0
7.5
7.0
6.5
N D J F M A M J J A S O

Figure 8. Flow rate, in centimeters per second, for each station during the period 1 November, 1982 through 15 October, 1983.

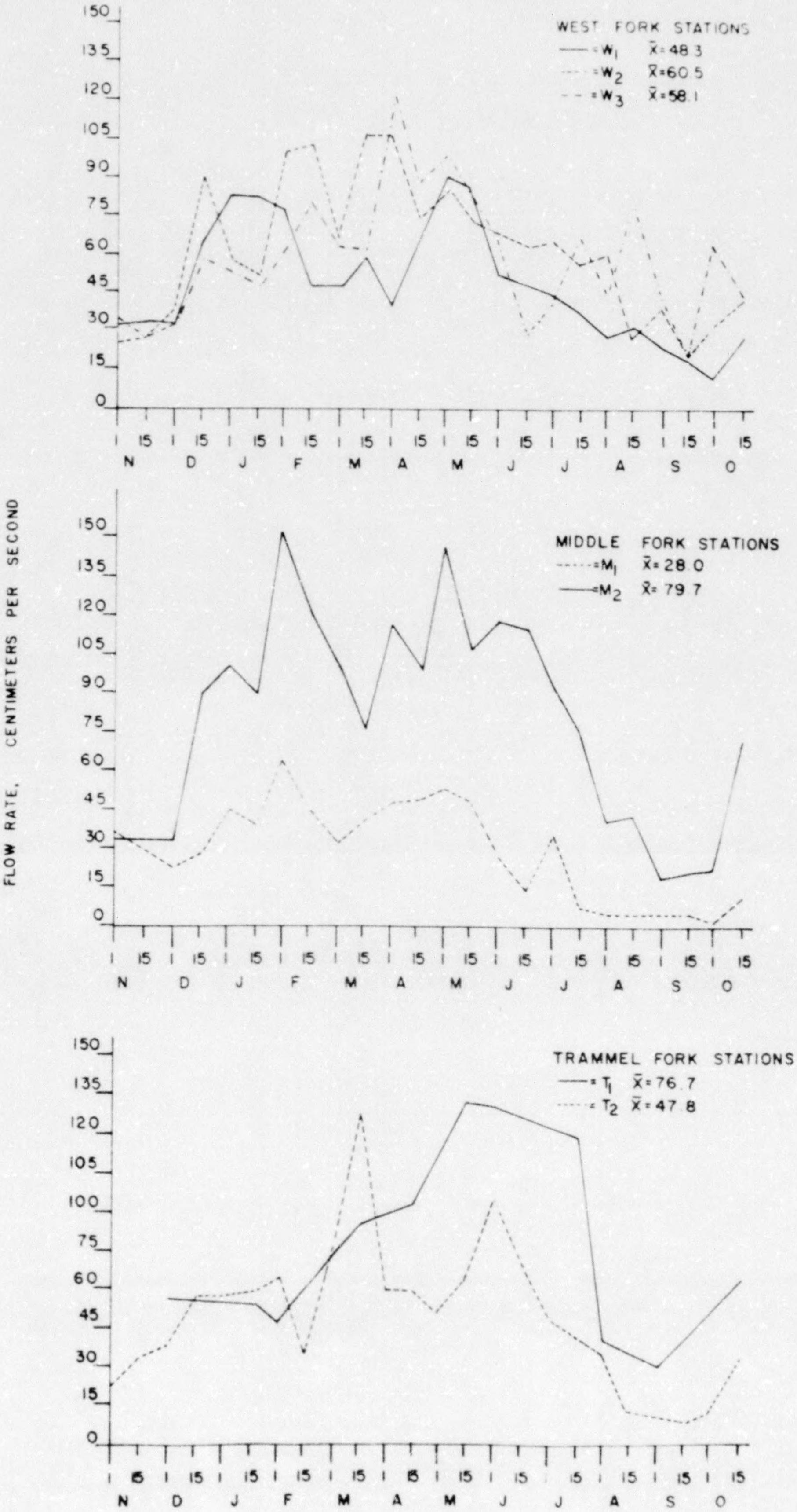
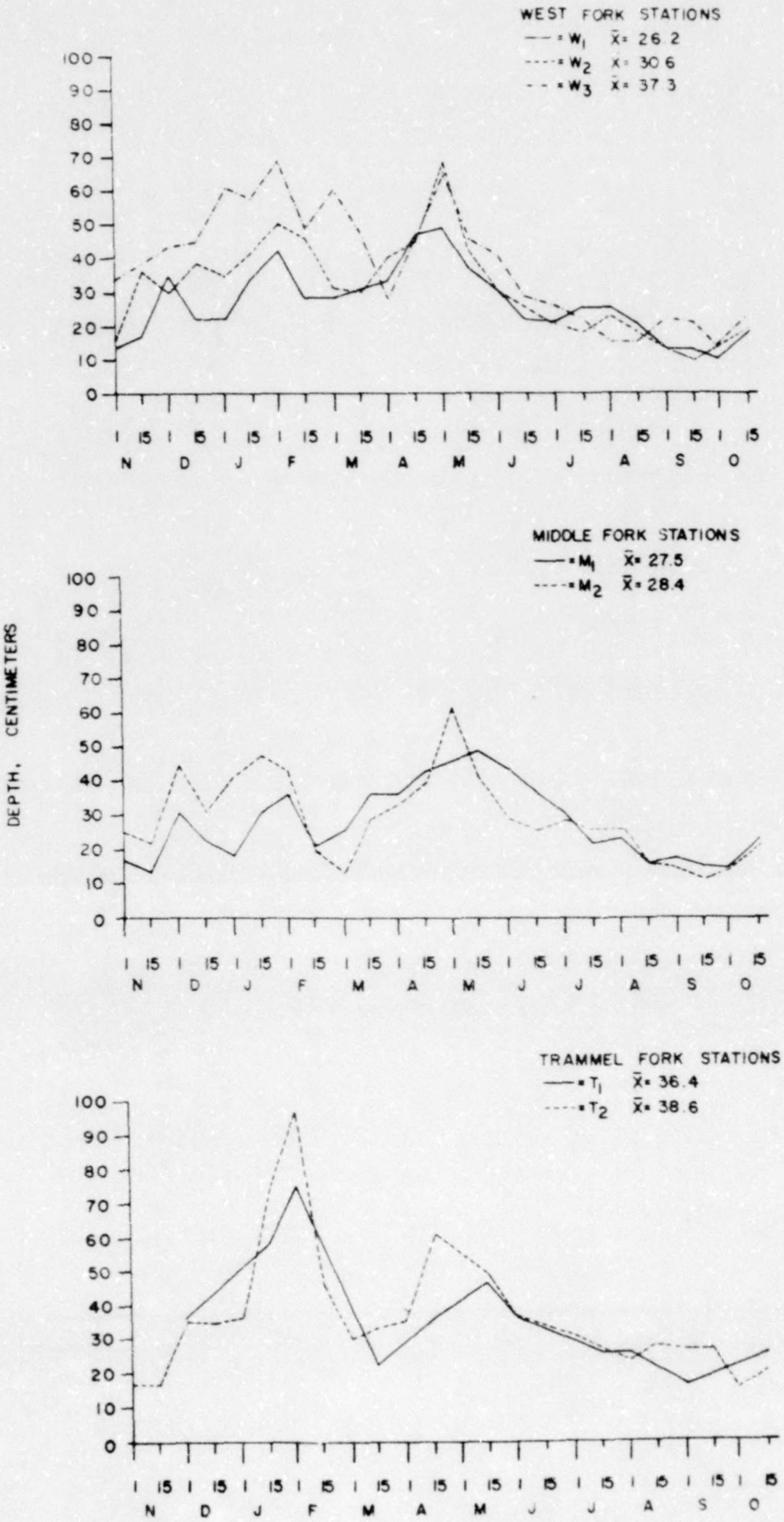

FLOW RATE, CENTIMETERS PER SECOND
WEST FORK STATIONS
=W1 X̄=48.3
=W2 X̄=60.5
=W3 X̄=58.1
MIDDLE FORK STATIONS
=M1 X̄=28.0
=M2 X̄=79.7
TRAMMEL FORK STATIONS
=T1 X̄=76.7
=T2 X̄=47.8
N D J F M A M J J A S O

Figure 9. Water depth, in centimeters, for each station during the period 1 November, 1982 through 15 October, 1983.



WEST FORK STATIONS
W_1 $\bar{x}$= 26.2
W_2 x= 30.6
W_3 $\bar{x}$= 37.3
MIDDLE FORK STATIONS
M_1 $\bar{x}$= 27.5
M_2 $\bar{x}$= 28.4
TRAMMEL FORK STATIONS
T_1 $\bar{x}$= 36.4
T_2 $\bar{x}$= 38.6
DEPTH, CENTIMETERS
N D J F M A M J J A S O

TABLE 1: Means and Ranges of Physico-Chemical Parameters on the Drake's Creek System November, 1982 - October, 1983. Ranges are enclosed within parentheses

STATION	W_1	W_2	W_3	M_1	M_2	T_1	T_2
Temp. (C)	14.6 (6-24)	14.1 (6-22)	14.9 (7-24)	14.6 (4-26)	15.3 (5-27)	14.5 (5-30)	15.0 (5.5-30)
Oxygen (% Sat.)	91.8 (48-139)	95.8 (45-135)	98.6 (53-125)	79.8 (44-130)	103.1 (60-150)	94.5 (62-115)	102.3 (60-151)
Total Alkalinity (mg/l $CaCO_3$)	101.1 (17-205	124.7 (34-239)	138.2 (68-222)	114 (51-205)	165.6 (86-274)	103.3 (86-137)	106.1 (51-137)
Total Hardness (mg/l $CaCO_3$)	112.5 (51-171)	133.9 (103-205)	144.6 (103-205)	128.2 (86-222)	130.3 (86-257)	127.4 (86-171)	125.4 (86-274)
pH	8.1 (7.5-9.0)	8.1 (8.0-9.0)	8.1 (8.0-8.5)	8.0 (7.0-8.5)	8.3 (8.0-8.5)	8.1 (7.5-8.5)	8.2 (6.5-9.5)
Flow (cm/sec)	48.3 (13-91)	60.5 (21-107.6)	58.1 (27-121)	28 (2-64)	79.7 (18-152)	76.7 (11-128)	47.8 (31-131)
Depth (cm)	26.2 (10-36.2)	30.6 (10-68.6)	37.3 (14-68.3)	27.5 (13-48)	28.4 (11.5-61)	36.4 (16-75)	38.6 (14-102)

Fork stations than at stations of the West and Middle Forks. Average total hardness followed a similar pattern (Table 1).

Mean flow rate was least at Station M_1 and greatest at M_2 (Table 1). Within the West and Middle Fork systems, flow rate was greatest at the downstream stations; however, this pattern was reversed at the Trammel Fork stations. Average water depth also increased at the downstream sites on all three stream systems (Table 1), with the least mean depth at Station W_1 and the greatest at T_2.

RESULTS

A total of 1665 larval trichoptera, representing four families and eight genera, was collected during the study (Table 2). The families represented were Rhyacophilidae, Hydropsychidae, Limnephilidae, and Brachycentridae.

Rhyacophilidae--This family was third in overall abundance but was not present in large numbers at any of the sampling sites. It was represented by a single species, Rhyacophila fenestra (Ross). Three specimens were taken at Stations W_2 and W_3 and two at M_1. The greatest number of larvae of this species, four, was taken at M_2.

Hydropsychidae--This was the most abundant family observed during the study and was represented by three genera, Cheumatopsyche, Hydropsyche, and Symphitopsyche. Cheumatopsyche was the most abundant hydropsychid collected in this study with 608 individuals representing 36.5 percent of the total larvae collected. Members of this genus were taken at all seven stations and dominated the collections at Stations W_2 (145 specimens); W_3 (119); M_1 (62); and M_2 (190) (Table 2). Cheumatopsyche was second in abundance at all other stations.

Members of the genus Hydropsyche, like Cheumatopsyche, were collected at all stations. In the West and Middle Fork systems, Hydropsyche were in greatest abundance at the most

TABLE 2: Collections of larval Trichoptera from three streams of the Drake's Creek system, Kentucky, November, 1982 - October, 1983

Taxon	W_1	W_2	W_3	M_1	M_2	T_1	T_2	Total of this taxon	Percent of total collection
RHYACOPHILIDAE									
Rhyacophila fenestra	0	3	2	2	4	0	0	11	0.661
HYDROPSYCHIDAE									
Cheumatopsyche	24	145	119	62	190	35	33	608	36.52
*Hydropsyche**	5	46	67	1	20	6	6	151	9.07
Symphitopsyche	0	0	38	8	27	1	1	75	4.50
LIMNEPHILIDAE									
Neophylax concinnus	581	0	2	9	3	47	174	816	49.00
Pycnopsyche	0	0	0	0	1	0	1	2	0.1201
BRACHYCENTRIDAE									
Brachycentrus	0	0	0	0	0	0	1	1	0.001
Micrasema	0	0	0	0	1	0	0	1	0.001
PERCENT OF TOTAL COLLECTION AT THIS STATION	36.64	11.65	13.69	4.92	14.77	5.35	12.97	100.0	

*Includes *H. depravata*, *H. frisoni*, and unidentifiable early instars downstream stations; however, equal numbers were taken at both Trammel Fork stations (Table 2). Members of this genus were most abundant at Station W_3 where 67 larvae were collected (Table 2). These comprised 29.3 percent of the total fauna sampled at this station.

Key characters were sufficiently well-developed in all except 47 of the *Hydropsyche* larvae to allow species determination. The collections included two species, *Hydropsyche depravata* (Hagen) and *H. Frisoni* (Ross). *Hydropsyche depravata* was taken at all stations except M_1 but occurred in greatest numbers in the two downstream stations of the West Fork where 87 percent of all *H. depravata* were collected (Table 3).

Hydropsyche frisoni was less numerous and not as widely distributed as *H. depravata*. Over one-half of the individuals of *H. frisoni* occurred at Station M_2, an area where few *H. depravata* were collected (Table 3). The station where the second largest number of *H. frisoni* were collected was W_3, where the largest number of *H. depravata* were collected. *Hydropsyche frisoni* was not collected from Stations W_1 and M_1 and was represented by single specimens at Stations W_2 and T_1 (Table 4).

Symphitopsyche was the least abundant hydropsychid genus taken and was less cosmopolitan in its distribution than *Cheumatopsyche* and *Hydropsyche*, being absent from the collections at Stations W_1 and W_2. *Symphitopsyche* was represented by single specimens at both Trammel Fork stations

TABLE 3: Longitudinal and seasonal occurrence of larval <u>Hydropsyche</u> <u>depravata</u> (Hagen) in the Drake's Creek system, November, 1982 - October, 1983.

	W_1	W_2	W_3	M_1	M_2	T_1	T_2	Total	Percent
Fall (Sep,Oct,Nov)	1	18	25	0	1	2	1	48	60.76
Winter (Dec,Jan,Feb)	1	0	0	0	0	0	0	1	1.27
Spring (Mar,Apr,May)	3	2	0	0	0	0	0	5	6.33
Summer (Jun,Jul,Aug)	0	0	24	0	1	0	0	25	31.65
TOTAL	5	20	49	0	2	2	1	79	100
PERCENT	6.33	25.32	32.03	0	2.53	2.53	1.27	100	

TABLE 4: Longitudinal and seasonal occurrence of larval *Hydropsyche frisoni* (Ross) in the Drake's Creek system, November, 1982 - October, 1983

	W_1	W_2	W_3	M_1	M_2	T_1	T_2	Total	Percent
Fall (Sep,Oct,Nov)	0	1	4	0	0	0	0	5	20.0
Winter (Dec,Jan,Feb)	0	0	0	0	0	0	0	0	0.00
Spring (Mar,Apr,May)	0	0	1	0	9	1	1	12	48.0
Summer (Jun,Jul,Aug)	0	0	3	0	4	0	1	8	32.0
TOTAL	0	1	8	0	13	1	2	25	100
PERCENT	0	4.0	32.0	0	52.0	4.0	8.0	100	

(Table 2). The pattern of longitudinal distribution exhibited by *Symphitopsyche* was similar to that of the other hydropsychid genera with the greatest numbers of individuals being taken in the most downstream collecting sites on the West and Middle Forks but with similar numbers at both Trammel Fork stations.

Limnephilidae--This family was represented by two taxa, *Neophylax concinnus* (McLachlan) and *Pycnopsyche* sp. *Neophylax concinnus* was the most abundant taxon collected in the study being represented by 816 individuals or 49 percent of all specimens taken. *Neophylax concinnus* was numerically dominant at Station W_1 with 581 (71.2%) of the total number of specimens collected. This genus was poorly represented at the remaining stations on the West Fork with none collected at Station W_2 and only two individuals collected at Station W_3 (Table 2). Likewise *N. concinnus* was poorly represented at both stations on the Middle Fork with nine specimens collected at Station M_1 and three at M_2. Forty-seven (5.75% of all *N. concinnus*) were collected at Station T_1 and 174 (21.3% of all *N. concinnus*) at Station T_2 (Table 2). The other limnephilid genus collected in this study, *Pycnopsyche*, was not abundant. One individual was collected at Stations M_2 and T_2 on different dates (Table 2).

Brachycentridae--This family was the most poorly represented family during the study period. Two genera, *Brachycentrus* and *Micrasema*, each represented by a single specimen, were taken at Station M_2 (*Micrasema*) and T_2 (*Brachycentrus*).

Station distribution--Eight of the nine identifiable larval taxa (except Brachycentrus) were collected at Station M_2. Seven taxa (except R. fenestra and Micrasema) were collected at Station T_2, and six taxa (except Pycnopsyche, Brachycentrus, and Micrasema) were taken at Station W_3. Station T_1 had five taxa present in the samples (except R. fenestra, Pycnopsyche, Brachycentrus and Micrasema). Four taxa were collected at Stations W_2 (except Symphitopsyche, N. concinnus, Pycnopsyche, Brachycentrus, and Micrasema) and M_1 (except H. depravata, H. frisoni, Pycnopsyche, Brachycentrus, and Micrasema). The least diversity of taxa was at Station W_1 which had only Cheumatopsyche, H. depravata, and N. concinnus present in the samples.

Seasonal Occurrence

Rhyacophilidae--Only Rhyacophila fenestra pupae were collected and these occurred in the April and May samples.

Hydropsychidae--The majority of Cheumatopsyche larvae were takne during the fall and winter but they were also present in the samples taken during the other seasons (Table 5). The majority of identifiable Hydropsyche larvae taken in the fall were H. depravata (Table 3), while H. frisoni was collected primarily in the spring and summer (Table 4). Symphitopsyche showed a seasonal pattern similar to Cheumatopsyche (Table 6).

Limnephilidae--Neophylax concinnus larvae were most abundant in the spring and summer (Table 7) when 96 percent of all representatives of this species were collected. Pupae

TABLE 5: Seasonal occurrence of larval <u>Cheumatopsyche</u>, November, 1982 - October, 1983.

	W_1	W_2	W_3	M_1	M_2	T_1	T_2	Total	Percent
Fall (Sep,Oct,Nov)	11	89	20	34	42	18	12	226	37.54
Winter (Dec,Jan,Feb)	12	12	38	21	76	9	4	172	28.28
Spring (Mar,Apr,May)	1	19	30	6	48	8	5	117	19.24
Summer (Jun,Jul,Aug)	0	25	31	1	24	0	12	93	15.29
TOTAL	24	145	119	62	190	35	33	608	100
PERCENT	3.95	23.85	19.57	10.20	31.25	5.76	5.42	100	

TABLE 6: Seasonal occurrence of larval *Symphitopsyche*, November, 1982 - October, 1983.

	W_1	W_2	W_3	M_1	M_2	T_1	T_2	Total	Percent
Fall (Sep,Oct,Nov)	0	0	18	4	1	0	0	23	30.67
Winter (Dec,Jan,Feb)	0	0	7	3	11	1	0	22	29.33
Spring (Mar,Apr,May)	0	0	6	1	11	0	0	18	24.0
Summer (Jun,Jul,Aug)	0	0	7	0	4	0	1	12	16.0
TOTAL	0	0	38	8	27	1	1	75	100
PERCENT	0	0	50.67	10.67	36.0	1.33	1.33	100	

TABLE 7: Seasonal occurrence of larval *Neophylax concinnus* (McLachlan), November, 1982 - October, 1983.

	W_1	W_2	W_3	M_1	M_2	T_1	T_2	Total	Percent
Fall (Sep,Oct,Nov)	21	0	0	0	0	1	5	27	3.30
Winter (Dec,Jan,Feb)	4	0	0	0	0	0	1	5	0.61
Spring (Mar,Apr,May)	329	0	0	9	3	25	24	390	47.49
Summer (Jun,Jul,Aug)	227	0	2	0	0	21	144	394	48.28
TOTAL	581	0	2	9	3	47	174	816	100
PERCENT	71.2	0	0.24	1.1	0.36	5.75	21.3	100	

were taken only in the collection of 15 October. No pupae of Pycnopsyche were collected, and low numbers of this genus prevented the determination of any seasonal pattern.

Brachycentridae--Like Pycnopsyche, both representative genera of this family (Brachycentrus and Micrasema) were obtained in such low numbers that no seasonal pattern could be determined. No pupae of either genus were collected.

Light Trap Collections

Light trap collections yielded a total of 867 adult caddisflies representing eight families, 15 genera, and 28 species (Table 8). The families represented in the adult samples were Glossosomatidae, Philopotamidae, Polycentropidae, Hydropsychidae, Hydroptilidae, Phryganeidae, Limnephilidae, and Leptoceridae. However, 95 percent of all adult caddisflies collected belonged to either the Hydropsychidae or the Leptoceridae.

The family Glossosomatidae was represented by three species, Glossosoma intermedium, Protoptila maculata, and P. palina; however, none were abundant (Table 8). All were restricted in their distribution to Station W_1 (G. intermedium) and the Trammel Fork stations (Protoptila species). Glossosoma intermedium was collected only in July while P. maculata and P. palina were observed in the collections from late August and early September.

The family Philopotamidae was poorly represented in the collections and restricted in its distribution to Station M_2 (Table 8). Only a single specimen of Chimarra obscura was taken.

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Table 3. Seasonal abundance and distribution of caddisfly adults from the Drake's Creek system, Kentucky for the period 15 July, 1983-15 October, 1983.

TAXON	15 JUL	1 AUG	15 AUG	1 SEP	15 SEP	1 OCT	15 OCT	TOTAL
GLOSSOSOMATIDAE								
Glossosoma intermedium (Klapalek)	W_1 1M							1M
Protoptila maculata (Hagen)				T_2 1F				1F
P. palina (Ross)				T_2 1F				1F
Protoptila sp			T_2 2F					2F
PHILOPOTAMIDAE								
Chimarra obscura (Walker)			M_2 1M					1M
POLYCENTROPIDAE								
Neuroclipsis nr *crepuscularis*			W_3 2F	W_1 2F				4F
HYDROPSYCHIDAE								
Cheumatopsyche campyla (Ross)	W_1 4M	M_2 1M	W_1 12M	W_1 9M 1F	W_1 9M 1F	W_2 4M		
	W_3 6M	T_1 5M 16F	W_2 21M 7F	W_2 21M 1F	W_2 14M 5F			
		T_2 1M	W_3 14M 5F	W_3 4M 3F				139M
			M_2 2M	M_2 2F				105F
			T_1 5M 12F	T_1 4M	26F			
			T_2 2M 2F	T_2 1M 22F				
C. oxa (Ross)	W_2 2M		W_2 5M		W_2 2M			10M
			T_1 9F		W_3 1M			9F
Cheumatopsyche sp		T_1 3F	W_3 2F	M_2 2F				
			M_2 1F	T_1 3F				31F
			T_1 20F					
Hydropsyche depravata (Hagen)	W_1 1M	M_2 2M 1F	W_1 4M 6F	W_1 3M 5F	W_1 29M 3F	W_3 1M		
	W_2 2M 6F	T_1 3F	W_3 2M 3F	W_2 2F	W_3 3M			
	M_1 2F	T_2 2F	M_2 4M	M_1 1F	T_2 3F			51M
				M_2 5F				44F
				T_2 2F				
H. orris (Ross)	W_1 18M	M_2 7M	W_3 4M	M_2 1M 2F	W_1 1M			
	W_3 2M	T_1 4M	T_1 2M	T_2 49M 3F	W_2 1M 4F			122M
		T_2 4M	T_2 29M					9F
H. scalaris (Hagen)**					T_2 2M			2M
H. simulans (Ross)				T_2 1M				1M
Hydropsyche spp	W_1 2F	M_2 11F	W_1 4F	W_3 5F	T_2 1F	W_2 1F		
			W_3 4F	M_1 2F				44F
			T_2 5F	M_2 6F				
				T_2 3F				
Symphitopsyche chelionis (Ross)		T_1 1M		W_3 1F	T_2 1M			2M 1F
S. slossonae (Banks)**			T_1 1M					1M

TABLE 8. CONTINUED

TAXON	15 JUL	1 AUG	15 AUG	1 SEP	15 SEP	1 OCT	15 OCT	TOTAL
HYDROPTILIDAE								
Hydroptila nr angusta (Ross)			W_3 1F					1F
H. virgata (Ross)				T_2 1F				1F
H. nr waskesia (Ross)**			T_1 1F					1F
Hydroptila sp				T_2 6F				6F
PHRYGANEIDAE								
Phryganea sayi (Milne)			M_2 1F	M_2 1F				2F
LIMNEPHILIDAE								
Pycnopsyche indiana (Ross)						W_1 2M W_2 1M W_3 6M T_2 3M	W_1 3M W_2 4M W_3 1M 1F M_1 1M M_2 1M T_2 1M	23M 1F
LEPTOCERIDAE								
Ceraclea ancylus (Vorhies)	W_1 7M	T_2 1M	T_1 1M					9M
C. maculata (Banks)		T_1 3M		T_2 3M				6M
C. protonepha (Morse and Ross)**	W_1 3M							3M
C. resurgens (Walker)			T_1 1M					1M
C. transversa (Hagen)	W_1 4M 1F		T_1 7M	T_1 3M 1F				14M 2F
Ceraclea sp		T_1 9F	T_2 2F					11F
Mystacides sepulchralis (Walker)				W_1 1M	W_1 1M	W_2 1M	W_3 1M	4M
Nectopsyche exquisita (Walker)	W_1 1M M_1 1M	T_1 5M 6F T_2 4M	T_2 1M	T_1 1M 63F T_2 6M 5F				19M 74F
N. pavida (Hagen)	W_1 1F	T_2 2M	T_2 3M 1F	T_2 3M				8M 2F
Nectopsyche sp		M_2 1M						1M
Oecetis cinerescens (Hagen)	W_1 25M	M_2 5M T_1 7M T_2 1M 2F	T_2 1M	T_1 1M 1F				40M 3F
O. inconspicua (Walker)	W_2 2M	M_2 3M 1F	W_3 1M 1F T_1 10M 3F T_2 7M	T_1 1F T_2 4M	W_2 1M			28M 6F
O. persimilis (Banks)	W_2 1F							1F
Oecetis sp		T_1 5F	W_1 2F	W_1 1F				8F
Triaenodes ignitus (Walker)	W_1 1M	T_1 3M		T_1 2M				6M
T. nr ignitus				T_1 1M				1M
T. tardus (Milne)	W_1 1F W_2 2F				W_1 1F			4F

** Denotes new species record for Kentucky.

nr = nearest to that published description

The family Polycentropidae was poorly represented. Neuroclipsis was the only genus represented, and all specimens were morphologically nearest to the description of N. crepuscularis and were collected in late August and early September.

The largest family sampled, in terms of numbers of individuals, was the Hydropsychidae. It included 571 specimens (66% of the total number collected) representing three genera and eight species (Table 8). Cheumatopsyche campyla was the most frequently collected species with 243 individuals (42.5% of all hydropsychids and 28% of the total collection). This species was widely distributed having been collected at every station except M_1 (Table 8). Its peak abundance was during late August and early September when 77 and 94 individuals, respectively, were taken in the light traps. These comprised 70.4 percent of all C. campyla taken. The only other species of this genus identified, C. oxa, was more restricted in its distribution and less abundant than C. campyla.

Four species of Hydropsyche (H. depravata, H. orris, H. scalaris, and H. simulans) were collected during the study. Hydropsyche depravata and H. orris comprised 82.7 percent of the total of all Hydropsyche collected (Table 8).

Hydropsyche depravata, represented by 95 specimens (11% of the total number of individuals collected during the study), was most abundant in late September when 38 individuals were taken. It was present in the collections from July through 1 October. Hydropsyche orris occurred at all stations except M_1, and was absent only in the October collections. One hundred and thirty-one specimens, making up 15 percent of the total number of individuals collected, were taken in the light traps. This species was collected in greatest abundance during late August and early September.

The other species of this genus, *H. scalaris* and *H. simulans*, were not collected in great numbers (Table 8). Both of these species were restricted to Station T_2. The two species of *Symphitopsyche*, *S. cheilonis* and *S. slossonae*, taken in the light traps were not abundant (Table 8).

The family Hydroptilidae was represented by nine individuals (Table 8). Only one specimen of this family could be identified to species (*Hydroptila virgata*), and two other individuals were morphologically similar to other published descriptions. These insects were most abundant in late August and early September.

The least abundant family sampled was the Phryganeidae. It included a single species, *Phryganea sayi*, which was represented by single specimens in the 15 August and 1 September collections at Station M_2 (Table 8).

Although represented solely by *Pycnopsyche indiana*, the family Limnephilidae was third in overall abundance. The 24 individuals of this species made up 2.8 percent of the total number of individuals collected during the study. This species occurred at all stations except T_1 and was taken only in the October sampling periods, when it was the dominant species (Table 8).

The family Leptoceridae was second in overall abundance with 248 individuals (28.7% of the total number). This family showed the greatest diversity with 13 species representing five genera. The genus *Ceraclea*, represented by five species, was the most diverse collected during the study. All individuals of this genus were taken at Stations W_1, T_1, or T_2 (Table 8). *Ceraclea transversa*, with 16 individuals, was the most abundant species. *Ceraclea ancylus* was the most widespread species being taken at all of the above mentioned stations. *Ceraclea protonepha* and *C. resurgens* seemed to be the most restricted and were taken only at Stations W_1 and T_1, respectively. This genus occurred in the collections from 15 July to 1 September (Table 8). *Mystacides sepulchralis* occurred only at the West Fork stations from 1 September to 15 October when single individuals were taken on each occasion (Table 8).

The leptocerid genus represented by the greatest number of individuals was *Nectopsyche*, which included *N. exquisita* and *N. pavida* (Table 8). Ninety-two of the 102 specimens collected were *N. exquisita* and, except for the capture of single individuals at M_1 and W_1, were collected only at the Trammel Fork stations. It was most abundant at T_1 and was taken from 15 July to 1 September (Table 8). *N. pavida* exhibited a similar pattern of seasonality and distribution (Table 8).

The genus *Oecetis* was represented in this study by three species, *O. cinerescens*, *O. inconspicua* and *O. persimilis* (Table 8). *Oecetis cinerescens* and *O. inconspicua* were most abundant in the Trammel Fork collections and were also taken at M_2. Oecetis cinerescens was numerous at W_1 while O. inconspicua was collected at W_2. Oecetis persimilis was restricted to Station W_2 (Table 8). Oecetis cinerescens attained maximum abundance in the 15 July sample and O. inconspicua was taken in greatest abundance one month later (Table 8).

Triaenodes ignitus and T. tardus were present in low numbers in the samples (Table 8). Except for the collection of a single individual of T. ignitus at Station M_2, all species of this genus were collected at stations W_1 and T_1 (Table 8).

The total of 299 individuals collected on 1 September from all seven collecting sites was the greatest number of specimens taken during any sampling effort (Table 9). The most individuals collected at one station (111 at T_2) also occurred at this time (Table 9). The total of nineteen species taken on 15 August was the most taken on any sampling trip (Table 10). After 1 September the number of specimens collected declined rapidly (Table 9). Concurrently, the number of taxa represented declined sharply with only two species being present in the 15 October samples (Table 10).

Maximum Shannon Diversity values at three of the seven stations were attained at either the 15 August or 1 September sampling times (Table 11). Maximum diversity values for Stations W_1, W_2 and M_1 occurred during the 15 July collections, and for T_1 on 1 August (Table 11). The decline in Shannon Diversity followed a very similar pattern to the decline in numbers of individuals and species by decreasing substantially in the collections taken after 1 September (Table 11).

TABLE 9: Number of caddisfly adults collected throughout the Drake's Creek system 15 July - 15 October, 1983

Station	15 Jul	1 Aug	15 Aug	1 Sept	15 Sept	1 Oct	15 Oct
W_1	72	NC	28	22	45	2	3
W_2	15	NC	33	24	27	7	4
W_3	8	NC	39	13	4	7	3
M_1	3	NC	NC	3	0	0	1
M_2	NC	32	9	19	0	0	1
T_1	NC	72	72	107	NC	NC	0
T_2	NC	15	55	111	7	3	1
TOTAL	98	119	236	299	83	19	13

NC = No collection made.

TABLE 10: Number of taxa of caddisfly adults collected throughout the Drake's Creek system 15 July - 15 October, 1983.

Station	15 Jul	1 Aug	15 Aug	1 Sept	15 Sept	1 Oct	15 Oct	Total
W_1	12	NC	2	4	5	1	1	14
W_2	5	NC	2	2	4	3	1	9
W_3	2	NC	6	2	2	2	2	10
M_1	2	NC	NC	1	0	0	1	3
M_2	NC	5	4	4	0	0	1	8
T_1	NC	9	9	6	NC	NC	0	16
T_2	NC	6	7	11	3	1	1	16
TOTAL	15	11	19	18	9	4	2	

NC = No collection made.

TABLE 11: Shannon Diversity values for collections of caddisfly adults throughout the Drake's Creek system, 15 July - 15 October, 1983.

Station	15 Jul	1 Aug	15 Aug	1 Sept	15 Sept	1 Oct	15 Oct
W_1	2.685	NC	1.727	1.829	1.174	0.00[a]	0.00[a]
W_2	1.664	NC	0.613	0.413	1.261	1.664	0.00[a]
W_3	0.811	NC	2.005	1.295	0.811	0.591	0.918
M_1	0.918	NC	NC	0.918	0.00[a]	0.00[a]	0.00[a]
M_2	NC	2.306	1.378	2.359	0.00[b]	0.00[b]	0.00[a]
T_1	NC	3.126	2.696	2.359	NC	NC	0.00[b]
T_2	NC	2.118	2.287	2.487	1.370	0.00[a]	0.00[a]

NC = No collection made

[a]Only 1 species was taken, therefore Shannon Diversity was zero.

[b]No adults were collected.

DISCUSSION

A classification based on the trophic relationships of the genera of aquatic insects was originally proposed by Cummins (1973), and a summary of this trophic classification for nearctic aquatic insects has been given by Merritt and Cummins (1978). This scheme separated aquatic insects into shredders, collectors, scrapers (grazers), engulfers (predators), and parasites. According to this scheme several of the larval taxa encountered in this study can be categorized as to their trophic roles. *Rhyacophila fenestra* is considered a predator, the hydropsychid genera collectors, *Neophylax concinnus* a scraper, *Pycnopsyche* a shredder, *Brachycentrus* a collector, and *Micrasema* a shredder. The River Continuum Concept (Vannote et al. 1980) further proposes that the structure and function of stream communities adjust to the changes in physical conditions from the headwaters to the mouth of streams. Consequently, zonation predictions of dominant trophic groups can be made based upon the Concept.

Rhyacophila fenestra was collected in such low numbers that determination of a distribution pattern was impossible. However, this species appeared rather uniformly, though in small numbers, throughout the stream system. Vannote et al. (1980) alluded to the predatory component of streams (i.e., *R. fenestra*) as being rather constant throughout. One noteworthy exception to this was observed in the Trammel Fork where no R. fenestra were collected.

The feeding behavior represented by the greatest number of individuals in this study was that of collector. Cheumatopsyche and Hydropsyche have been cited as collectors by Merritt and Cummins (1978). However, Symphitopsyche, recently segregated from the Hydropsyche by Ross and Unzicker (1977), was not mentioned. Because of the close relationship of the two genera, Symphitopsyche was also considered to be a collector in this study. The increasing abundance of the collectors in the downstream areas, noted in the West and Middle Forks of Drake's Creek, was consistent with the findings of Wiggins and Mackay (1978), Andrews and Minshall (1979) and Ross and Wallace (1982). This pattern of distribution was also consistent with the predictions of the River Continuum Concept of Vannote et al. (1980). However, the distribution of collectors in the Trammel Fork,with equal numbers of collectors in both the upstream and downstream stations, did not follow the pattern predicted by the Continuum Concept. These data suggested that a continuous gradient of physical conditions may not be the case in streams where hypogean inflows add a major part of the water volume.

Of the collectors, Cheumatopsyche appeared to exhibit the broadest tolerance limits by being present in the samples at every collecting site. Hydropsyche and Symphitopsyche selected for regions having the highest stream flow and greatest diversity of microhabitat. Edington (1968) reported Hydropsyche larvae to be able to exist in areas where flow exceeded 100 cm/sec. The noticeable absence of H. depravata from Station M_2 and its presence at W_2, to the exclusion of H. frisoni and Symphitopsyche, indicated some degree of habitat partitioning. The basis of this observation could not be explained. The suggestion of Edington (1968) that there is probably an upper limit of flow that larva can tolerate could not be reasoned to explain the pattern of distribution of these three taxa.

The scraper in the study, Neophylax concinnus, was most abundant at the uppermost station on the West Fork and at both stations on the spring fed Trammel Fork. The occurrence of scrapers (i.e., N. concinnus) in this region of the West Fork was consistent with the data of Wiggins and Mackay (1978) and supported the predictions of the River Continuum Concept (Vannote et al. 1980). Again, the pattern of longitudinal distribution noted in the Trammel Fork, with respect to the scrapers, was contrary to that predicted by the Concept.

The low abundance of Pycnopsyche in this study was to be expected since this genus usually occurs in slow portions of streams (Wiggins 1977) and this study was concerned solely with riffle areas.

The Brachycentridae (Brachycentrus and Micrasema) were collected in such low numbers that it was impossible to make statements regarding their distribution within the Drake's Creek system.

Determinations of seasonal occurrences of larvae were hampered by heavy rains which precluded effective specimen sampling during the winter and spring. The presence of pupae of

R. fenestra during the spring period in this study was consistent with the seasonal data of Ross (1944).

Distributional data compiled by Resh (1975) reported adult *Cheumatopsyche* from early spring to late summer. This seasonal pattern was supported in this study by the lower numbers of *Cheumatopsyche* larvae collected during these periods. Low numbers of *H. depravata*, *H. orris* and *Symphitopsyche* made it impossible to determine seasonality for these taxa.

The presence of *N. concinnus* pupae during the 15 October collection suggested that emergence occurred in late October or early November. Thus, few larvae would be expected in the fall and winter seasons, as this is the growth period for the larvae (Wiggins 1977). Later instars of this genus fasten themselves to rocks to pupate in the spring and summer (Wiggins 1977), and the well-known scouring effect of high water and rapid flow did not seem to manifest itself with respect to *Neophylax* during the spring collecting period. Wiggins (1977) stated that *Neophylax* clusters when pupating, a possible explanation for the large numbers captured during the spring and summer collecting periods.

Many caddisfly larvae do not seem to possess characters that allow for determination of species (Ross 1944, Wiggins 1977, Merritt and Cummins 1978, Schuster and Etnier 1978). However, in this study over 55 percent of the larval individuals were identified to the species level. *Rhyacophila fenestra* represented new species records for Warren and Simpson Counties. *Hydropsyche depravata* had previously been reported in Warren County by Resh (1975), but these collections provide new speceis records for Allen and Simpson Counties. *H. frisoni* was not cited by Resh (1975) in his survey of Kentucky Trichoptera, or in more recent faunal surveys (Picazo and DeMoss 1980, Haag and Hill 1983), and constituted a new species recrod for the state. It had been previously reported by Ross (1944) from Illinois and Michigan, and by Etnier and Schuster (1979) from Cumberland County, Tennessee, Alabama, and Minnesota.

In the Drake's Creek system, *H. frisoni* was most abundant at Stations W_3 and M_2. The habitat description given by Schuster and Etnier (1978) was similar to the conditions at the above mentioned stations.

The *Symphitopsyche* collected during this study all had a prominent "checkerboard" pattern on the head. According to Schuster and Etnier (1978), this larva cannot be separated from *S. bifidia* (Banks), *S. cheilonis* (Ross), *S. recurvata* (Banks), *S. walkeri* (Betten and Moseley), or the central form of *S. bronta* (Ross).

Neophylax concinnus represented species records for Warren, Simpson, and Allen Counties. It had been previously reported in Kentucky only from Spencer and Oldham Counties (Resh 1975).

Although the technique of light trapping is limited to those species that are attracted to light, it is a useful tool for collecting insects that are active nocturnally (Resh et al. 1975). While light trap collections are subject to sampling bias due to a variety of biological and phyical factors (i.e., mating behavior, temperature, wind), Resh et al. (1975) stated that this technique provides meaningful samples of the overall community.

Because the benthic sampling of the Drake's Creek system took place solely in the riffles, little correlation was expected between larval and adult collections. The greater number of taxa taken in the light trap collections was attributed to the fact that the light attracted species emerging from adjacent pool habitats. The occurrence of such genera as Pycnopsyche, Protoptila, Mystacides, Nectopsyche, and Triaenodes in the light trap collections supported the above contention since these genera are cited by Wiggins (1977) as occupying the slower portions of streams as larvae.

Like species in the families Glossosomatidae, Philopotamidae and Polycentropidae, many other species (i.e., the hydropsychids Cheumatopscyhe oxa, Hydropsyche scalaris, H. simulans, Symphiotpsyche cheilonis, S. slossonae, all species of Hydroptilidae, Phryganeidae, and the leptocerid genera Ceraclea and Triaenodes) occurred in such low abundance that statements regarding their seasonality were unwarranted. Resh (1975) reported the caputre of Protoptila maculata from April-September,and Ross (1944) stated that this species commonly occurs with P. palina. The taking of both of these species in this study supported both of the above reports. In addition, P. palina has been reported in Kentucky only from Bell County, and the record provided herein represented a significant westward extension of its known range within the state.

The family Hydropsychidae is an extremely diverse and widespread group of insects (Ross 1944, Wiggins 1977), and the large numbers of individuals and species taken in this study were to be expected. This family was also the most abundant in the study of Haag and Hill (1983), and Resh (1975) reported 30 species from the state. The widespread distribution of *Cheumatopsyche campyla* in Kentucky (Resh 1975) was corroborated in the Drake's Creek study. The occurrence of this species in the present study was consistent with the seasonal patterns noted by Resh (1975). The species observations made in this study represent county records for Warren, Simpson and Allen Counties.

Hydropsyche depravata and *H. orris* were both abundant and widespread in this study. Resh (1975) reported *H. depravata* from Warren County. The taking of this species on 1 October is the latest reported collection of this species in Kentucky. *H. depravata* was collected in greatest numbers at a time different from the maximum abundance of *H. orris*, suggesting a possible partitioning of resources based on seasonality. *H. orris* is well known from Kentucky, but the records provided by this study are the first from the Green River drainage area.

Hydropsyche scalaris and *Symphitopsyche slossonae* have not been previously cited in any of the faunal surveys of Kentucky Trichoptera (Resh 1975, Picazo and DeMoss 1980, Haag and Hill 1983) and consituted new species records for the state. *H. scalaris* has been previously reported from Illinois (Ross 1944) and by Etnier and Schuster (1979) from eastern and central Tennessee. *Symphitopsyche slossonae* is known from Illinois (Ross 1944) and from Tennessee, North Carolina and Minnesota (Schuster and Etnier 1978).

More species of the family Hydroptilidae, 35, are reported from Kentucky than any other family of caddisflies (Resh 1975). Many of these records, however, are from the Salt River--a streamtermed by Resh et al. (1975) as "not typical of many North American streams." Of the three species identified in this study, two do not exactly conform to the descriptions of Blickle (1979) and must therefore be regarded as questionable identifications. One specimen, however, was identified as *Hydroptila virgata* and this record extends the known range of this species in Kentucky from Breathitt County (its only reported location within the state) westward.

According to Crichton (1971), limnephilid caddisflies have been the dominant family in several light trap studies; however, Resh et al. (1975) collected only one representative in 87,000 light trapped specimens on the Salt River. Resh (1975) stated that the small number of caddisflies in this family from Kentucky was unusual. Reports by Resh (1975), Picazo and DeMoss (1980), and Haag and Hill (1983) have established a total of 16 species from Kentucky. The lone limnephilid collected in this study, *Pycnopsyche indiana*, had only recently been reported from Boyd County, Kentucky by Haag and Hill (1983). Thus the records herein extend the range of this species within the state a considerable distance westward. *Pycnopsyche indiana* showed an extremely well-defined pattern of seasonality, being present only in the October collections when it was the most abundant species throughout the system.

It was felt that because of the observation of pupal N. concinnus in the late October benthic samples, had the light trapping continued into November this species would have almost surely been taken at the stations where the larvae were collected in such large numbers.

The genus Ceraclea was restricted to Stations W_1, T_1, and T_2. Lehmkuhl (1970) and Resh and Unzicker (1975) stated that since larvae of some species of this genus (C. resurgens and C. transversa) depend upon freshwater sponges as a food source, the larvae occur within a narrow range of habitat. Freshwater sponges are reported by Jewell (1935) to be very sensitive to organic pollution and the collection of adult C. resurgens and C. transversa, as well as two other species, at the three stations which received no apparent external contaminants lend support to this claim. Of the species of Ceraclea collected in this study, only C. protonepha has not been previously reported from Kentucky. Within the Drake's Creek system, this species was collected only at Station W_1. Etnier and Schuster (1979) have reported it from eastern Tennessee.

Mystacides sepulchralis seemed to be restricted to the West Fork of the Drake's Creek system. Previously reported in the state only from Wayne County (Resh 1975), the records from this study provided both an extension of its range into the Green River drainage area and its seasonal occurrence into September.

With the exception of single specimens collected at M_2 and W_1, Nectopsyche exquisita was restricted to the Trammel Fork. Its peak abundance was noted at the 1 September collection. This species is widely distributed throughout the eastern United States (Ross 1944) and is well known in Kentucky (Resh 1975) and Tennessee (Etnier and Schuster 1979). Nectopsyche pavida had only been previously reported in Kentucky from the eastern counties of Bell and Rockcastle (Resh 1975).

Both Oecetis cinerescens and O. inconspicua are widely distributed throughout Kentucky and in the current study showed different patterns of seasonal abundance. The occurrence of O. inconspicua in the collections two weeks after O. cinerescens was no longer taken was consistent with the records of Ross (1944) and Resh (1975).

Flannagan and Lawler (1972), Anderson and Wold (1972), Resh et al. (1975), and Haag and Hill (1983) reported that females of most species of caddisflies predominated in light trap collections. However, in this study the opposite seemed to be the case. Studies have revealed that a greater proportion of females become active just after sunset (Harris 1971). Although the light trapping in this study began shortly after sunset, the considerable distance between several of the stations dictated that some collections were not made until several hours after the first. This is a plausible explanation for the greater abundance of males in many of the species collected. Resh et al. (1975) stated that Ceraclea species showed a pattern opposite to the above-mentioned phenomenon. The data collected during this study with respect to *Ceraclea* supported that observation.

Crichton (1960) considered caddisflies to be either summer or autumn species. A summer species is defined as "captured in maximum numbers from May to August." Most of the species collected in this study coincided closely to Crichton's (1960) definition of a summer species. However, *Neophylax concinnus* (collected as pupae during late October), *Pycnopsyche indiana*, and *Mystacides sepulchralis*, did not fit this definition and were considered autumn species. While emergence and collection patterns reported by Ross (1944) and Resh (1975) supported the defining of *N. concinnus* and *P. indiana* as autumn species, *M. sepulchralis* is usually regarded as a summer species. However, in this study *M. sepulchralis* was not taken in the collections until 1 September and continued to be present until the end of the sampling period.

The decline in number of individuals, number of species, and Shannon Diversity after the 1 September collection represented largely the effect of the paucity of autumn species of caddisflies within the Drake's Creek system. The Shannon Diversity values of zero for the October collections reflected the dominance of one species, *P. indiana*, in the collections.

Resh (1975) stated that the Kentucky caddisfly fauna was extremely diverse. The 31 species collected in this study supported Resh's conclusion. Twenty-one of these species were records for Warren County and represented the most diverse assemblage of species noted for any of the counties included in this study. The total number of ciddisfly species reported from Warren County is now 23 including *Hydropsyche frisoni* and *H. scalaris*, which represent state species records. This study has established the first reports of caddisflies from Allen and Simpson Counties. Eighteen species are reported from Allen County. These include *H. frisoni* and *Symphitopsyche slossonae* which represent state species records. Simpson County had 20 species reported during this study, including state records of *H. frisoni* and *Ceraclea protonepha*. Only seven Kentucky counties have more species reported than Warren, and eight counties have a greater number of species reported than Simpson. Allen County was found to have a more diverse assemblage of caddisfly species than all but eleven Kentucky counties. This is not intended to imply that the trichopteran fauna of many Kentucky counties is low, but rather that the fauna is largely unknown in most of them. Spencer County has the greatest number of species reported (57) and this is largely due to the fact that this county has been extensively studied since 1967 (Neff and Krumholz 1973). The Drake's Creek system is an extensive one with much habitat diversity. Continuing studies on this system and on other aquatic habitats within the counties examined will undoubtedly yield additional species of caddisflies for this region.

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