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CADDISFLY DIVERSITY, ABUNDANCE, AND LARVAL GROWTH IN SPLIT ROCK BROOK OF PECUMSAUGAN CREEK AND BLACKBALL MINE STATE NATURE PRESERVE

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ABSTRACT

Species richness, abundance, and larval growth of the caddisfly community was monitored at Split Rock Brook of the Pecumsaugan Creek – Blackball Mine State Nature Preserve near Utica, Illinois. Five species of caddisflies were taken with quantitative sampling in a limited reach of the springbrook. Three species, *Diplectrona modesta* Ross, *Lepidostoma libum* Ross, and *Neophylax concinnus* MacLachlan were abundant enough to evaluate density changes and growth. Abundance peaked in winter for all caddisflies combined and for most individually, coinciding with an increase in food availability due to leaf fall. The three species all had univoltine (one year) life cycles. *Neophylax concinnus* exhibited a lengthy 2-3 mo. prepupal diapause and emergence in October. Historical samples indicated that 13 species inhabited the brook in 1941, and that all of them still are likely to occur now. A combination of water chemistry, tests for metals and pesticide contamination, evaluation of bacterial content of the local groundwater, and the presence of sensitive caddisfly species indicates this bluff stream to be of the highest quality available in Illinois. It is worthy of the highest protection available. Additional study of the extent of any bacterial and pesticide contamination on both temporal and longitudinal scales would inform the Nature Preserves Commission of Illinois of the magnitude of threats to this system. Possibly community outreach and restoration projects are needed in the headwaters of this stream to ensure its biotic integrity in perpetuity.

INTRODUCTION

Split Rock Brook (SRB) drains a small, heavily wooded ravine on the south facing bluff of the Illinois River. It is located approximately 3.5 km west of Utica in the Pecumsaugan Creek and Blackball Mine State Nature Preserve. The name derives from a local bedrock seam that once jutted south from the bluff toward the Illinois River floodplain. Construction of the Illinois and Michigan Canal, and later the adjacent railroad bed, split that seam of rock.

Ross (1944) documented SRB's unique caddisfly (Insecta: Trichoptera) fauna during 1941. It was from this site that the species *Ochrotrichia riesi* Ross was described – it is the species' type locality. At least one other caddisfly species from SRB has not been reported from any other Illinois location. Webb et al. (1998) reported that other species mentioned by Ross could be found in only a relatively few springbrooks from widely scattered locations across the state. Some additional records have also been uncovered in unpublished data found in specimen databases of the Illinois Natural History Survey (INHS) insect collection.

Recent sampling efforts at SRB demonstrated that unique and rarely encountered fauna still inhabit the springbrook. Due to the presence of historical data and the possibility that local communities with unimproved septic systems and agricultural runoff might adversely affect the stream, it seems prudent to gather detailed quantitative data against which to measure probable future changes. The objectives of this study were to quantitatively document the species richness, abundance, community composition, and larval growth of caddisflies inhabiting SRB throughout a year-long period.

Additionally, water chemistry, water temperature, common agricultural pesticides, and bacterial contamination have been investigated to the extent that funding permitted.

PROJECT METHODOLOGY

Site Description: Split Rock Brook (Fig. 1) is approximately 2.2 km long, with its lower 0.9 km reach being heavy wooded and nestled in a ravine lined with dolomite and sandstone. Approximately 0.47 km upstream of the mouth of the brook lies a 3 m waterfall. At 0.5 km above the mouth, the canopy opens and a low-density residential area develops to US HWY 6. Above this point, row crops and livestock pasture become the predominant land uses.

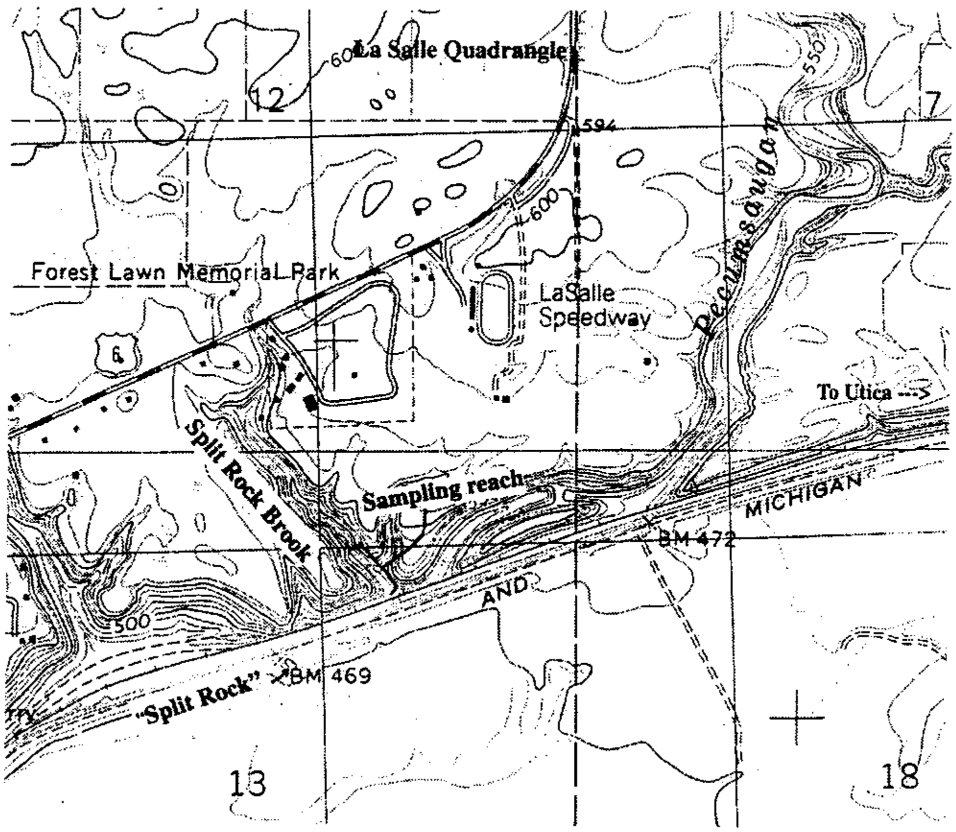

Fig. 1. Location of Split Rock Brook along Illinois and Michigan Canal. Adapted from La Salle 7.5-min. quadrangle, NAD 1983, photorevised 1988.

At least three groundwater upwellings occur along the drainage below the waterfall. Just below the waterfall and north of the preserve boundary, an organic seepage area exists that provides a relatively modest amount of water. Throughout the next 0.3 km are areas of bedrock and cobble that provide a diffuse source of groundwater that increase the volume of the brook dramatically. A major upwelling occurs about 0.1 km upstream of the mouth. Located approximately 6 m off the springbrook is a circular depression carved into the bedrock. Here, approximately 0.26 ft^3/sec of cold groundwater wells up. This location was bored out, probably support a tile for raising a pressure head so that water could be piped downhill to the railroad or canal. The tile no longer exists, but iron pipe runs for great length along the stream toward the railroad bed. The lower 30 m of this 2-m wide brook is sunlit and supports luxuriant growths of watercress, while upstream it is wooded and lacks watercress.

Water Chemistry and Pesticides: *In-situ* water parameters were recorded near the mouth of the stream, on most monthly visits to SRB, using a Solomat™ 520C multiprobe water chemistry meter. These probes were calibrated the day of use with appropriate standard solutions. Dissolved oxygen, pH, conductivity, and water temperature were routinely recorded.

Laboratory analyses of dissolved ions and carbon fractions, hardness, alkalinity, and nutrients (total ammonia, nitrite, nitrate, and total phosphorus) occurred for a single sample taken 16 June 1998. Procedures were conducted by Jens Sandberg of the INHS Water Quality Laboratory in the Center for Aquatic Ecology. The concentration of 29 metals was also ascertained for this sample date. John Steele of the Illinois State Geological Survey conducted these procedures.

Groundwater contamination by four commonly used agricultural pesticides, atrazine, alachlor (lasso), metolachlor (dual), and chlorpyrifos (lorsban), was assessed at the downstream-most upwelling on 19 March and 12 May 2000. These sampling dates were chosen so as to bracket the period of heavy application.

Bacterial Contamination: The abundance of total aerobic, total coliform, fecal coliform, and fecal streptococcus bacteria (as the number of colony forming units per 100 ml water) were estimated from a single groundwater sample taken 29 August 2000 at the downstream most upwelling. Additionally, the rank order abundance of 26 "species" of bacteria present in the total count were estimated as evidence of the source of bacterial contamination present. The sample was preserved on ice and transported within 8 hours to the Illinois Department of Agriculture's Animal Disease Laboratory in Centralia, Illinois where analysis was conducted.

Quantitative Faunal Sampling: Five quantitative samples were collected from riffles along an 80 m reach that ranged from the railroad bed to the first major upwelling. A two-stage, rectangular dipnet, consisting of an inner 1 mm coarse mesh and an outer 0.3 mm fine mesh, was used to collect the samples. The finer mesh retained even the smallest instars of the caddisflies sought. The sampling period lasted from October 1999 through September 2000, in which time the months October, December through February, May, and July through September were sampled. The same procedure was conducted in March 1999, and these samples were substituted for the lack of a March 2000 sample date.

Processing and Analysis of Faunal Data: Samples were picked in their entirety, and all caddisflies were identified to species and enumerated. Abundances were averaged for all caddisflies combined and for the three most abundant species encountered. Growth of caddisflies was estimated from head capsule width measurements using a calibrated ocular micrometer on a dissecting scope. The greatest width across the head was used as an index of growth. A minimum number of 100 individuals was sought for every month, but once a sample was begun all specimens were measured in order to maintain an unbiased estimate of the size ranges available in a sample. *Diplectrona modesta*, occurred in such low abundance that all specimens available were measured.

The case making *L. libum and N. concinnus* pupated in the summer for extended periods of time. Both teather their cases to substrates and close them off to form a puparium. Larvae that complete this task, yet have not cast off their larval skin to show the pupal morphology below are referred to as prepupae (Wiggins 1977). These prepupae have reached the greatest larval size and their presence was is index of the proportion of the population going to the next life stage. Hence, they were measured and enumerated just as the free roaming larvae were. Any pupae found were sexed, if possible, and enumerated. They were not measured because no growth occurs in the pupal stage.

RESULTS

<u>Water Chemistry and Pesticides</u>: Due to the relatively large influx of groundwater into the brook, water temperature never reached freezing during the year-long study period. Dissolved oxygen was near saturation on every date (Table 1). The brook was slightly basic, with minor dips toward neutrality, mostly during late fall and winter due to the leaching of organic acids from recently fallen leaves. Conductivity, a measure of the ability of water to carry an electrical charge - indirectly the concentration of ions - was within the range of values found in a five-county local area. Dissolved oxygen

concentrations found in the spring upwelling ranged from 2.4 to 3.1 mg/l measured during August and September 2000 visits. This was less than 30% of the mean for the brook and suggested that shallow, well-oxygenated groundwater mixed with deeper, anoxic water to produce this relatively low concentration.

Table 1. In-situ water parameters measured from near mouth of Split Rock Brook, Pecumsaugan Creek and Blackball Mine State Nature Preserve, Utica, Illinois. Measurements from several monthly visits over a two-year period 1998 through 2000.

Parameter	**Mean**	**Standard Deviation**	**Maximum**	**Minimum**	**N**
Temperature °C	11.3	2.28	13.4	8.1	10
Dissolved Oxygen (mg/l)	10.5	0.78	11.8	9.4	9
pH	7.32	0.18	7.66	7.13	10
Conductivity (μm)	655.2	58.19	717.9	547.4	9

Groundwater at the downstream most upwelling was found to have relatively high total alkalinity and hardness, and therefore must be considered a "hardwater" stream (Table 2). This is not unexpected since a small karst region composed of dolomite, a calcareous rock with a high magnesium content, encompasses the area (S. Panno, Illinois State Geological Survey, personal communication). Additional layers of sandstone also occur interspersed with the dolomite. Examination of metals from the upwelling suggested that none were of high concentration except magnesium, calcium, sodium, and silica, all more indicative of the parent bedrock of the region than any anthropogenic contamination (Table 3).

Table 2. Groundwater concentrations of dissolved inorganic, organic, and total dissolved carbon, sulfate, total ammonia, nitrite, nitrate, total phosphorus, hardness, chlorides, total dissolved solids, alkalinity, and lead concentration from the downstream-most upwelling of Split Rock Brook, 16 June 1998. All values are in mg/l (ppm), except Hg, which is in μg/l (ppb). Second row contains measured values. Third row denotes detectable limit concentration.

DIC	DOC	TDC	SO4	NH3 -N	NO2-N	NO3-N	TOT. P	HARDNESS	Cl	TDS	TOT. ALK.	Hg
41.4	27.7	69.1	18.7	0.02	<DL	2.90	0.03	325.0	23.7	420.0	237.0	0.10
0.1	0.1	0.1	0.01	0.01	0.01	0.01	0.01	1.0	0.1	4.0	1.0	0.05

Table 3. Groundwater concentrations of metals from downstream most upwelling of Split Rock Brook, 16 June 1998. All values are in values in mg/l (ppm), except Be, La, and Sc, which are in μg/l (ppb).

Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	K
<0.02	<0.1	0.05	0.05	<0.001	71.2	<0.01	<0.01	<0.01	<0.01	<0.01	<1.0
La	**Li**	**Mg**	**Mn**	**Mo**	**Na**	**Ni**	**Pb**	**Sb**	**Sc**	**Se**	**Si**
<0.002	<0.01	35.6	<0.01	<0.02	14.3	<0.03	<0.05	<0.1	<0.003	<0.02	5.58
Sr	**Ti**	**Tl**	**V**	**Zn**							
0.2	<0.01	<0.3	<0.01	<0.01							

Bacterial Contamination: Total bacterial abundance (total aerobic bacteria) in groundwater issuing into Split Rock Brook was comparatively low for the single 29 August 2000 sample date (Table 4). Fecal coliforms, those bacteria most associated with animal feces, including *Escherischia col,i* were also of minor abundance. That there were any coliforms, however, suggested contamination from some source. The source could be from septic tank seepage or from wild or domestic nonhuman animals.

Table 4. Bacterial abundance, in colony forming units (CFUs) per 100 ml water, and rank abundance of bacterial "species" present in downstream-most upwelling of Split Rock Brook, 29 August 2000.										
General Classes of Bacteria (CFUs)				**Rank Order Abundance of Bacterial "Species"**						
Total Aerobic	**Total Coliform**	**Fecal Coliform**	**Fecal Strepto-ccocus**	***Pseudo-monas***	***Sar-cina***	***Ent. faecium***	***Ent. faecalis***	***Citrob. freundii***	***E. coli***	***Bacillus sp.***
730	32	1	208	1	2	3	4	5	6	7

The Caddisfly Community: Only five caddisfly species were taken in quantitative samples at SRB (Table 5). These species were historically present and by comparison with the numbers of specimens found in the INHS insect collection, they were either common or abundant when Ross (1944) investigated its fauna. Several additional species have been taken from SRB, and these bring the total to 13 species. It is unlikely that additional sampling in the brook would yield more caddis species.

Table 5. Caddisfly species present contemporarily and historically in Split Rock Brook, Pecumsaugan Creek – Blackball Mine State Nature Preserve. Rare = < 4 individuals, occasional = 4-10, common = 10-100, abundant = >100. The year of last collection is provided for those taxa that were not taken contemporarily. *Indicates those taxa collected in quantitative samples.

Taxon and Authority	**Contemporary Abundance**	**Historical Abundance (Last year taken)**
Helicopsychidae		
Helicopsyche borealis Hagen	Not Found	Occasional (1941)
Hydropsychidae		
Ceratopsyche bronta Ross	Not Found	Rare (1941)
Cheumatopsyche oxa Ross	Not Found	Rare (1941)
Cheumatopsyche lasia Ross	Not Found	Rare (1941)
Diplectrona modesta Ross*	Common	Common
Hydropsyche betteni Ross	Not Found	Rare
Hydroptilidae		
Hydroptila consimilis Morton	Not Found	Occasional (1941)
Hydroptila perdita Morton	Not Found	Rare (1986)
Ochrotrichia riesi Ross*	Rare	Common
Ochrotrichia spinosa (Ross)	Not Found	Occasional (1941)
Lepidostomatidae		
Lepidostoma libum Ross*	Abundant	Abundant
Philopotamidae		
Chimarra aterrima Hagen	Not Found	Rare (1941)
Chimarra sp.*	Occasional	
Polycentropodidae		
Polycentropus pentus Ross	Not Found	Common (1986)
Uenoidae		
Neophylax concinnus MacLachlan*	Abundant	Abundant

Total and Individual Species Temporal Abundance: Total abundance varied dramatically within months and over the entire year (Fig. 2). The highest abundances were recorded in the winter and coincided with tremendous numbers of small larvae. Abundance decreased in March and remained relatively low through October.

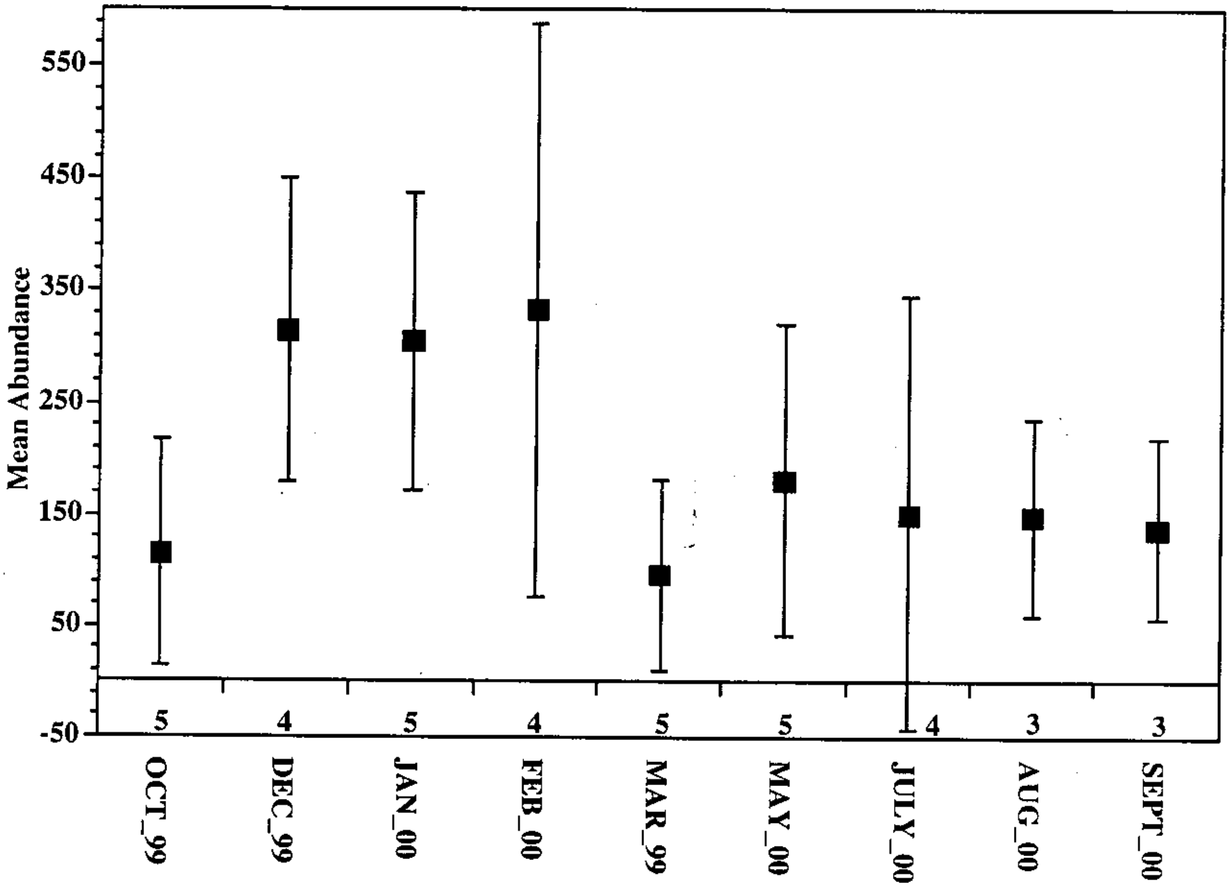

Fig. 2. Total monthly abundance for caddisfly species in Split Rock Brook in Pecumsaugan and Blackball Mine Nature Preserve, Utica, Illinois. Points indicate means and bars +/- 1 standard deviation. Number of quantitative samples is indicated at bottom of graph.

Diplectrona modesta demonstrated low abundance throughout the year (Fig. 3). Near zero abundance occurred in both October and May. The latter date was after the emergence of adults of this species; hence, the low abundance was not surprising. The lack of individuals in October could not be readily explained except that this species was always low in abundance and therefore ran the risk of being under represented in samples. August and September samples produced relatively large numbers of new recruits.

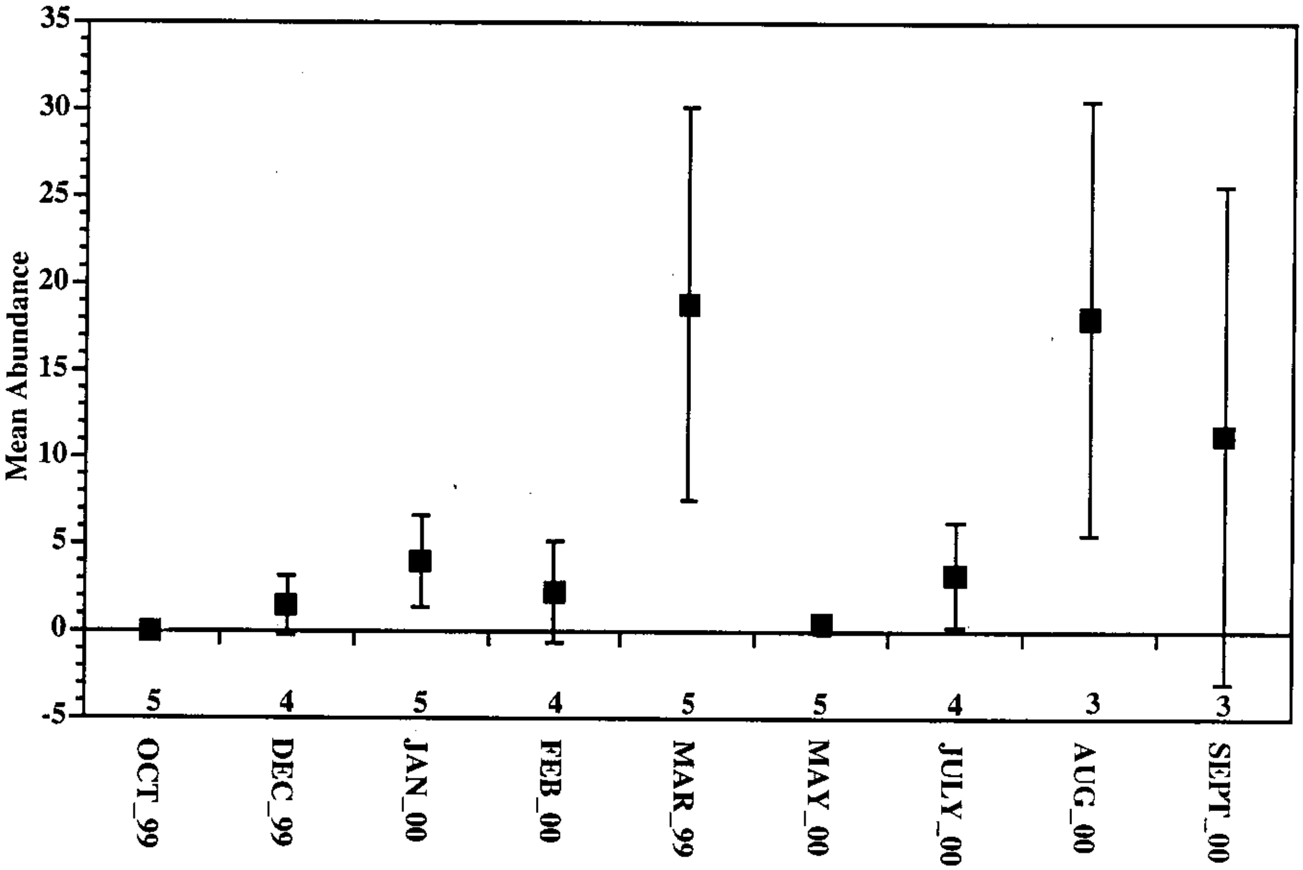

Fig. 3. Monthly abundance of *Diplectrona modesta* in Split Rock Brook of Pecumsaugan-Blackball Mine State Nature Preserve, Utica, Illinois. Points indicate means and bars +/- 1 standard deviation. Number of quantitative samples is indicated at bottom of graph.

Lepidostoma libum occurred in much greater abundance than *D. modesta,* although samples within most months yielded both low and high abundances (Fig. 4). Despite its local high density, this species displayed a contagion of distribution that made this systematic sampling regime inadequate for tracking temporal changes in abundance.

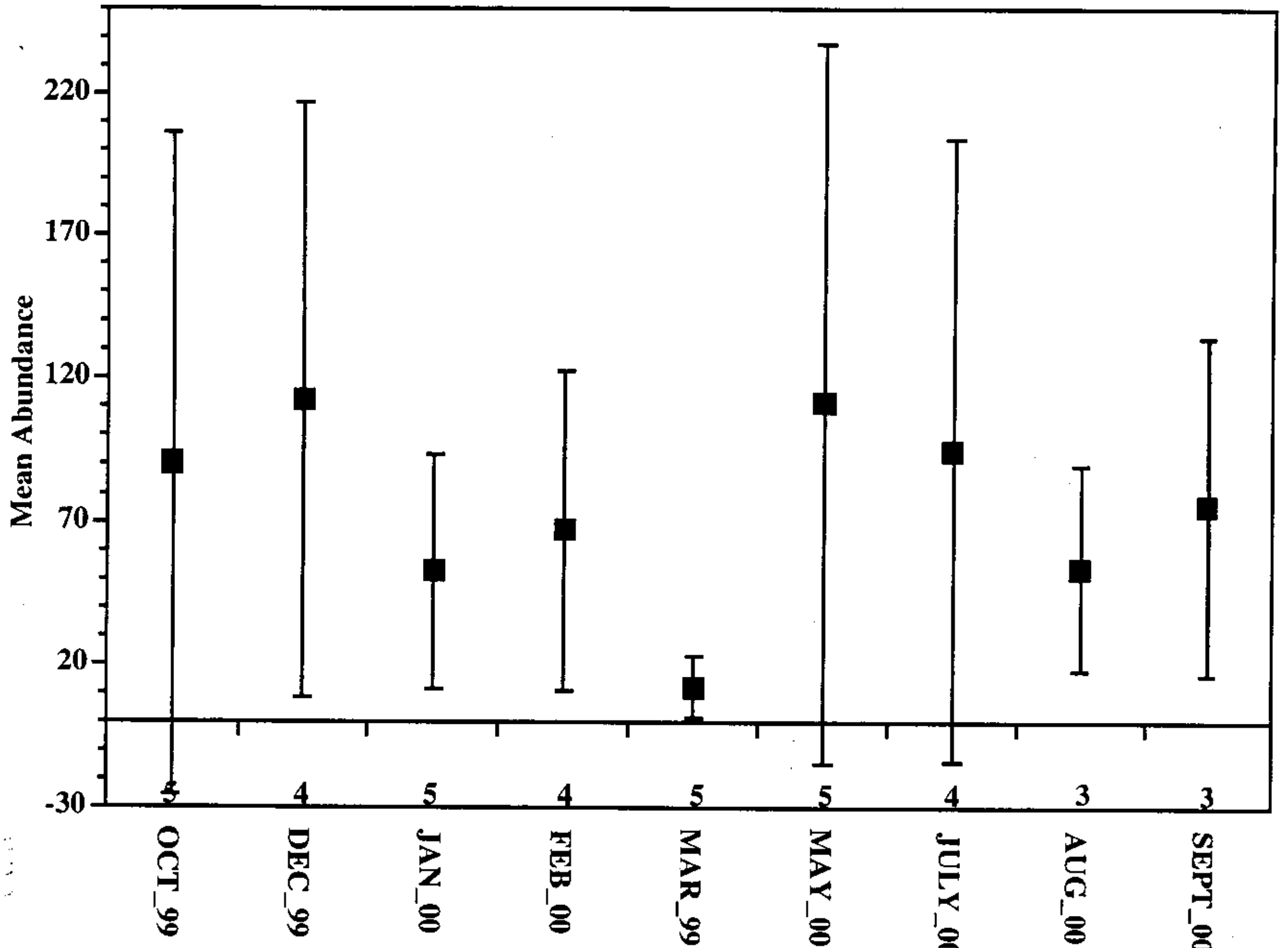

Fig. 4. Monthly abundance of *Lepidostoma libum* in Split Rock Brook of Pecumsaugan and Blackball Mine Nature Preserve, Utica, Illinois. Points indicate means and bars +/- 1 standard deviation. Number of quantitative samples is indicated at bottom of graph.

Neophylax concinnus was the most abundant caddisfly in SRB (Fig. 5). Recruitment of early instar larvae in the winter months provided the highest abundance for this species. This species was the driving force behind the same trend in total abundance. This pulse of recruits is late fall and winter was a direct response to leaf fall and greater food availability. Survivorship declined sharply in the spring, followed by a relatively small number of individuals in summer months.

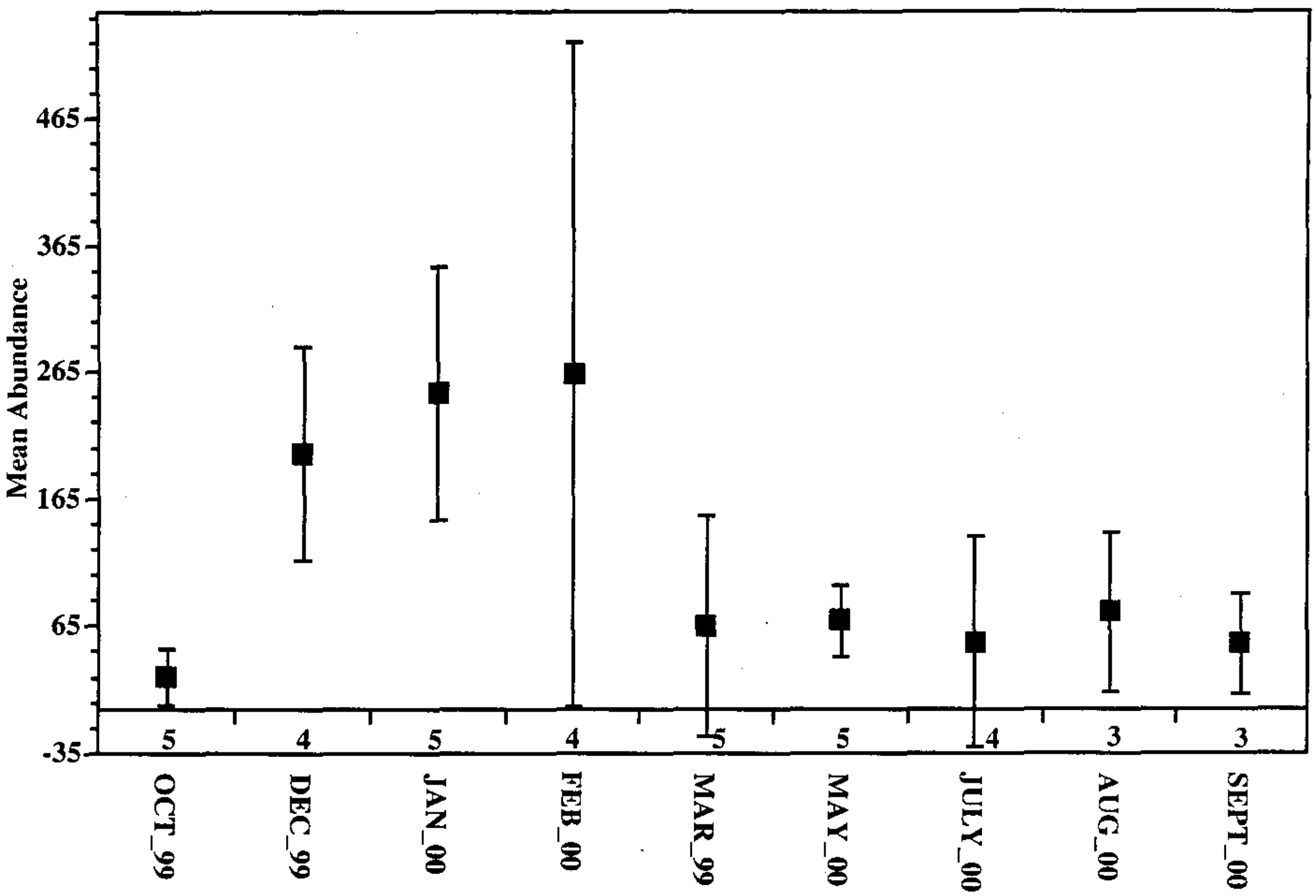

Fig. 5. Monthly abundance of *Neophylax concinnus* in Split Rock Brook of Pecumsaugan and Blackball Mine Nature Preserve, Utica, Illinois. Points indicate means and bars +/- 1 standard deviation. Number of quantitative samples is indicated at bottom of graph.

Larval Growth and Development: *Diplectrona's* greatest size occurred in February and March (Fig. 6). Three of nine individuals present in February were prepupae, indicating that a portion of the population was moving to the next stage. Conversely, no prepupae or pupae were taken in March when 96 individuals were measured. No other prepupae were taken during other months. During May, only two larvae were collected, and it was assumed that the population emerged in May and June, the latter being a month for which no samples exist. Larval recruitment ensued in July and August, and growth of these early instars can be seen in September samples. No larvae were taken during the October sampling period, but December samples indicate substantial growth in fall. The growth rate then declined

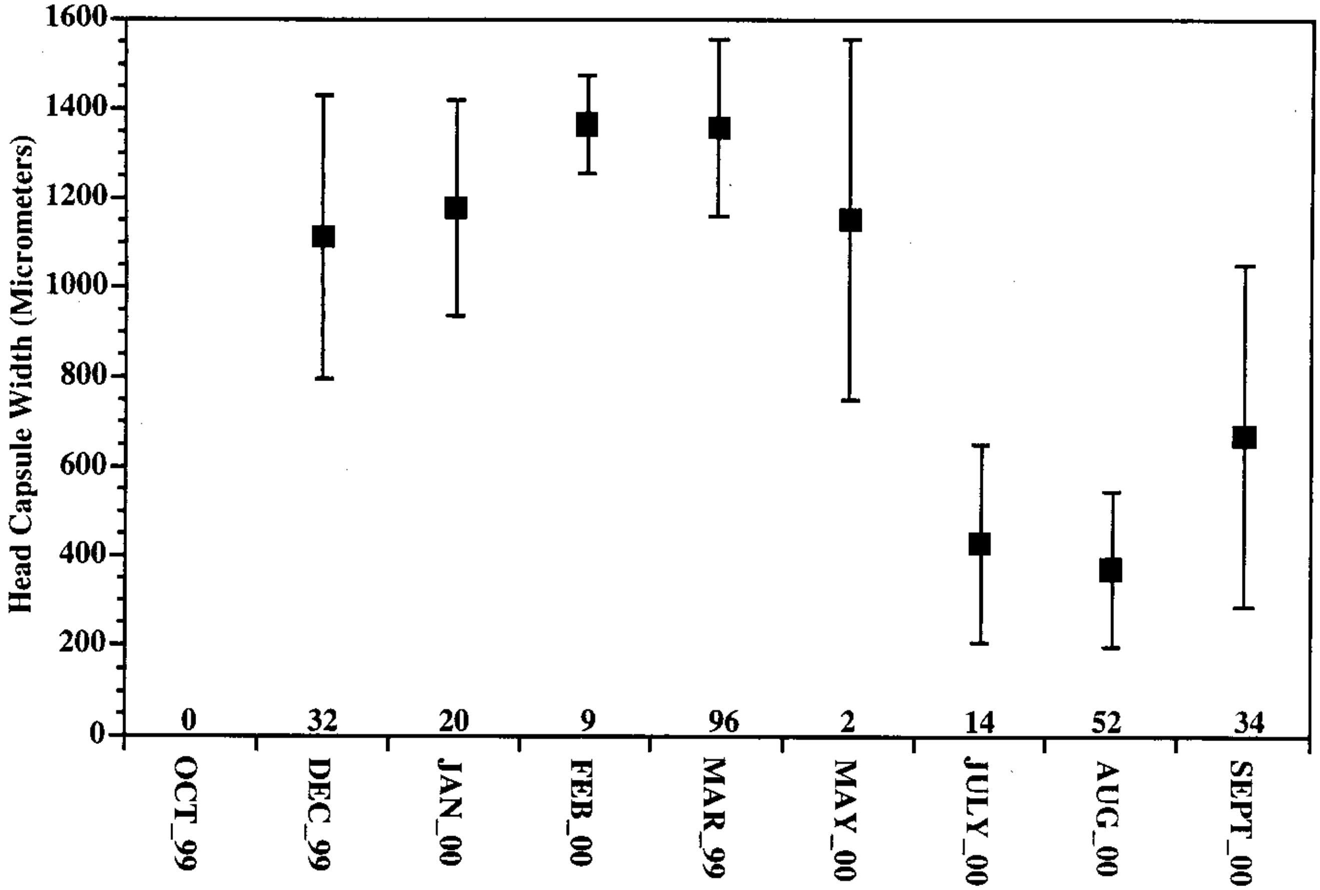

Fig. 6. Growth of *Diplectrona modesta* larvae in Split Rock Brook of Pecumsaugan Creek and Blackball Mine State Nature Preserve. Points indicate means and bars +/- 1 standard deviation. Number of specimens measured indicated at bottom of graph. No advanced life stages were found in the samples used for growth determination.

during January but increased again in February. This species has a univoltine (one-year) life cycle with continuous growth throughout the year.

Lepidostoma libum reached peak size in May (Fig. 7). In July and August 29.2 and 41.4% of all individuals in prepupal and pupal stages, respectively. Conversely, only 1.7% of the population was in advanced life stages in September indicating that the bulk of emergence of adults took place then. Larval recruits were found in samples in August and September, after which their growth was linear with no apparent abatement in the winter months.

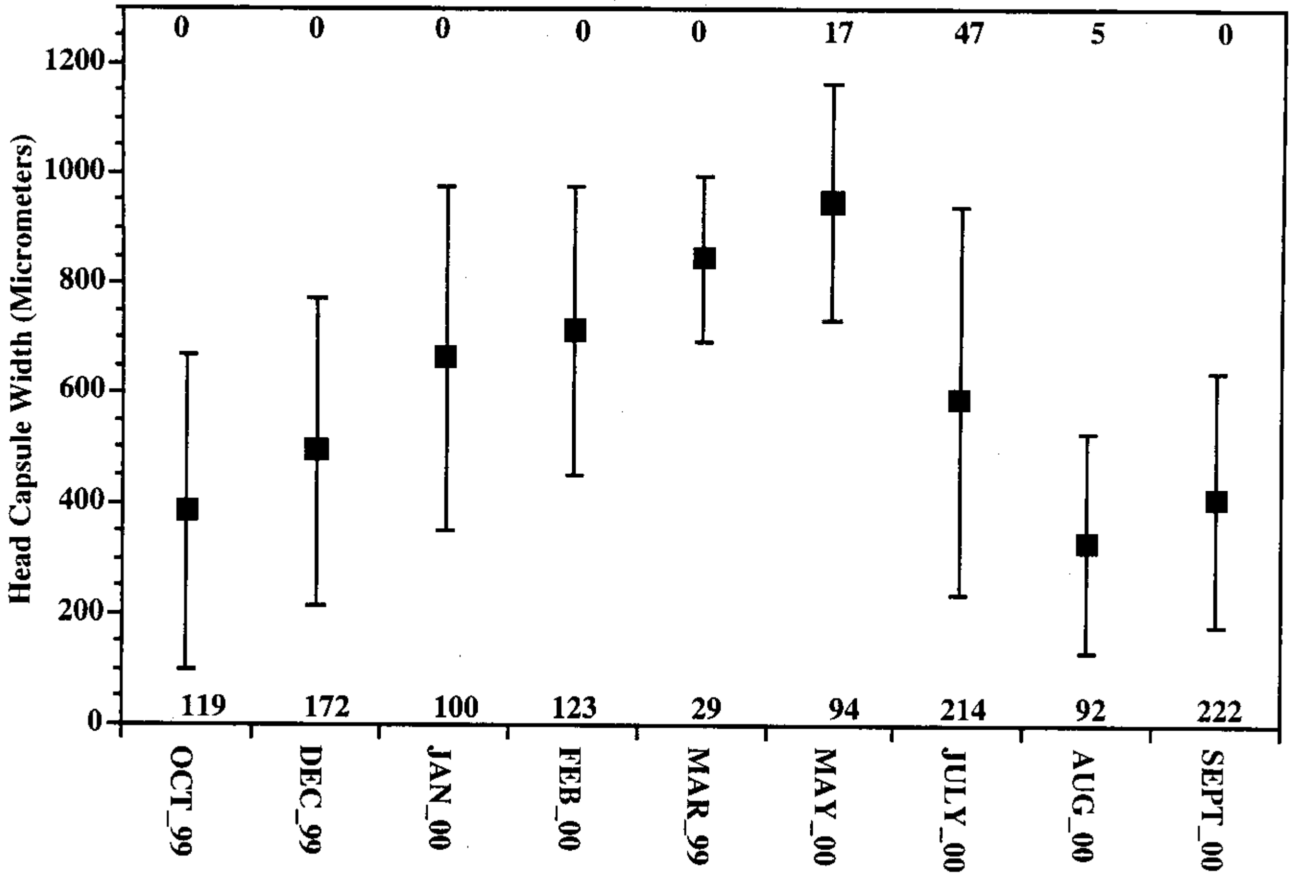

Fig. 7. Growth of *Lepidostoma libum* larvae in Split Rock Brook of Pecumsaugan Creek and Blackball Mine State Nature Preserve. Points indicate means and bars +/- 1 standard deviation. Number of specimens measured indicated at bottom of graph while prepupae, those larvae that have closed their puparia but have not taken on pupal morphology, are indicated at the top of the graph.

Table 6. Percentages of life stages present for each month for the caddisflies *Lepidostoma libum* and *Neophylax concinnus* from Split Rock Brook, Pecumsaugan Creek-Blackball Mine State Nature Preserve, Utica, Illinois. These data are pooled from all samples within a month that were completed at the time of press.

	Life Stages	Oct. '99	Dec. '99	Jan. '00	Feb. '00	Mar. '99	May '00	July '00	Aug. '00	Sept. '00
Lepidostoma libum	N	452	450	262	267	94	557	379	162	229
	larva	100	100	100	100	100	82.4	71.8	58.6	98.3
	prepupa	0	0	0	0	0	6.5	14.0	3.1	0.9
	pupa female	0	0	0	0	0	5.6	4.2	17.3	0.8
	pupa male	0	0	0	0	0	5.3	10.0	20.4	0.0
	pupa not sexed	0	0	0	0	0.0	0.2	0.0	0.6	0.0
Neophylax concinnus	N	125	804	1241	1052	386	347	208	230	159.00
	larva	95.2	99.6	97.6	98.1	100.0	96.5	21.6	9.1	35.90
	prepupa	0	0	1.1	1.1	0.0	3.5	73.6	77.8	6.3
	pupa female	2.4	0.12	0.1	0.0	0.0	0.0	2.9	5.7	23.30
	pupa male	1.6	0.2	1.2	0.7	0.0	0.0	1.4	6.5	28.30
	pupa not sexed	0.8	0	0.0	0.1	0.0	0.0	0.5	0.9	6.30

Neophylax concinnus larvae reached peak size in July (Fig. 8) when 78.4% of the individuals were in advanced stages of development (Table 6). August samples increased this to 90.9%, most of these still in the prepupal stage. Pupae first outnumbered prepupae in September. This made for at least a three-month period when no growth took place, a quiescence lasting until an October emergence. Eggs hatched directly in October, with growth to 350 μm being rapid. The larval growth rate abated during December through February, but resumed in March and May (and presumably June) at a relatively rapid rate (Fig. 8). February specimens used for growth demonstrated that a relatively small percentage of the population was in an advanced life stage. Pooling of all samples (Table 6) confirmed this and also demonstrated that

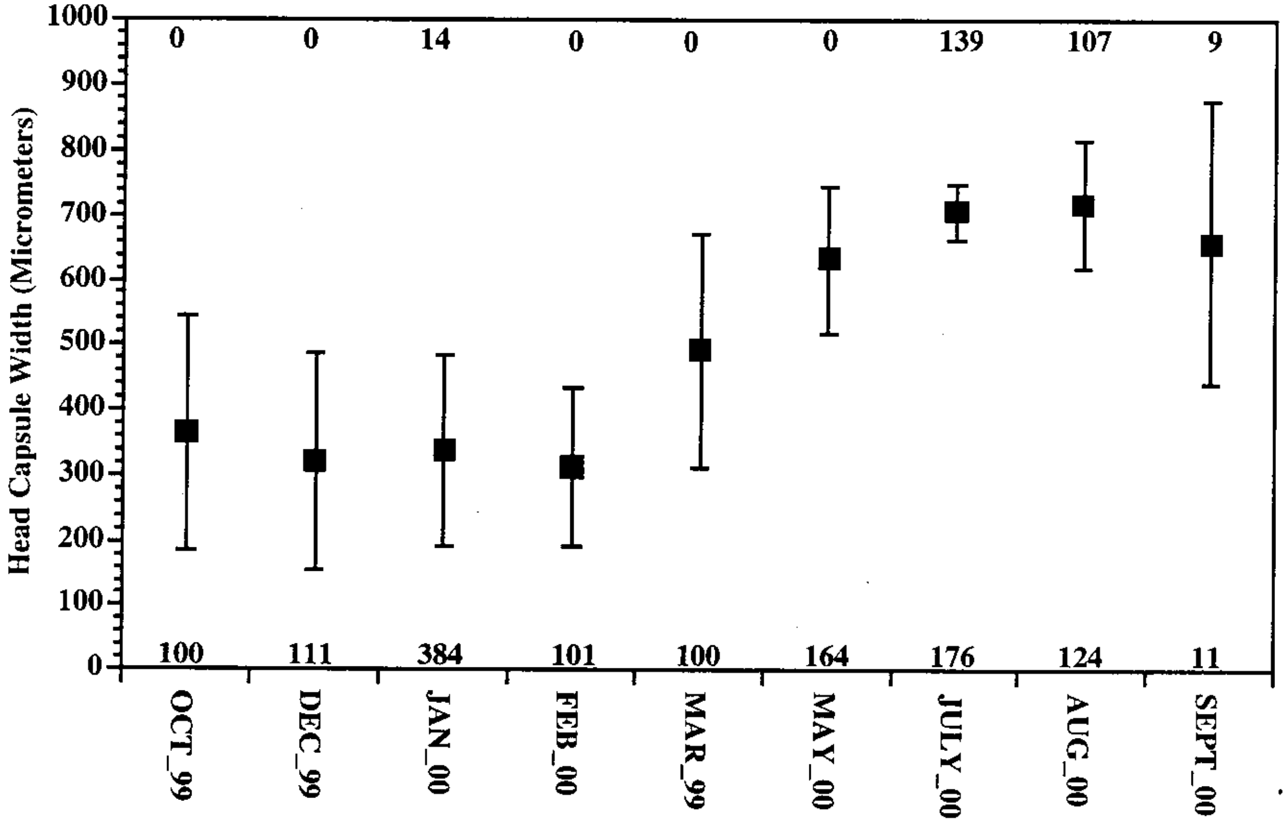

Fig. 8. Growth of *Neophylax concinnus* larvae in Split Rock Brook of Pecumsaugan Creek and Blackball Mine State Nature Preserve. Points indicate means and bars +/- 1 standard deviation. Number of specimens measured is indicated at the bottom of graph while prepupae, those larvae that have closed their puparia but have not taken on pupal morphology, are indicated at the top of the graph.

a small and constant percentage of the population was composed of both prepupae and pupae throughout all winter months. This explains the small number of adults of *N. concinnus* taken during this time. It may also explain the presence of a small percentage of the population of larvae that achieved approximately 50% greater size than most larvae at pupation. If adults successfully laid eggs in the winter, the resultant larvae might not reach sufficient size to pupate by summer. This would require them to hold over until the following spring or summer, attaining greater size with a longer larval period. In summary, the life history of this species involved a univoltine life cycle, about eight months of larval growth, an extended pupal confinement from June through September, emergence in October, and immediate hatching of eggs in the fall.

DISCUSSION

SRB constitutes a pristine coldwater brook for the region. Water temperature and dissolved oxygen concentrations were favorable for the maintenance of coldwater fauna, at least below the waterfall. Other upstream areas have not been sampled so thoroughly and might suggest otherwise. Groundwater chemistry such as hardness, alkalinity, total dissolved solids (Table 2) and the concentrations of magnesium and calcium attest to a dolomite primary bedrock type. Water issuing from the downstream-most upwelling was hypoxic suggesting a mixing of deep and shallow groundwater.

Contamination of groundwater sources by commonly used agricultural pesticides was nonexistent, at least for the period encompassing March through May, peak time for application of these chemicals. Bacterial contamination is minor, but supported the contention that some sources of fecal contamination have crept into the groundwater. This could be from residential areas atop the bluff or from wild or domestic nonhuman animals. Additional analysis of pesticide and bacterial contamination is warranted, on both temporal and longitudinal scales, to determine the extent to which the brook is threatened.

Three species were found to be abundant enough to characterize their larval growth and to infer other life history characteristics. *Diplectrona modesta* was the least abundant, but was found to have a univoltine-slow life cycle where growth culminated in adult emergence in May and June. Eggs hatched within one month. A similar combination of life history traits was reported by Haefner and Wallace (1981) for two streams in southern Appalachia. They also found that this species fed primarily on plant detritus with about 10% animal matter.

Lepidostoma liba displayed a univoltine life cycle, with an extended emergence period lasting from May through August. This extended emergence is supported by the work of Moulton and Stewart (1996) who collected adults of this species in the Ozark Mountains region in both the spring and fall. Hatching of larvae occurred within one month of egg laying. Currently, only anecdotal information exists about the larval growth rates or other life history parameters for this species. Sketchy information exists for a distant relative in the northwestern United States, *Lepidostoma unicolor* (Banks) (Anderson 1967) which has been surmised to have a univoltine life cycle.

Neophylax concinnus was the most abundant caddisfly in SRB. It too had a univoltine life cycle with a prepupal diapause lasted through two or three summer months. This has been discussed as an adaptation to stream flow intermittence (Moulton and Stewart 1996). Most often, these prepupae can be found in large aggregations on the undersides of cobbles in SRB and have been noted in intermittent streams in the Shawnee Hills of southern Illinois (Ross 1944). A published life history is available for this and four co-occurring *Neophylax* species studied in southern Ontario, Canada (Bean and Wiggins 1986). They found that *N. concinnus* was the dominant *Neophylax* in streams 1 to 5 m wide, with summer water temperatures from 8.3 to 13.3°C, and with stream gradients of from 6 to 30 m/km. Eggs were found attached, out of the water, on grass stems and roots overhanging the bank and on cobbles at the water's edge. They found that larvae hatched in November, grew rapidly until mid-June when the entire population was in prepupal diapause, and then emerged in October for approximately three weeks. Larval growth lasted only five to six months. This contrasted with the SRB population whose members had actively crawling larvae for nine to 10 months per year; although more than half the population was in advanced life stages by July.

Comparison of the present quantitative data to available qualitative records is heartening. Ross's (1944) efforts documented the past community at 13 species (Table 5). Only species, *O. riesi*, may have declined in abundance. Quantitative samples yielded only two specimens and several empty cases. This species may be more abundant elsewhere in the drainage. Moulton and Stewart (1996) documented that it used the wet faces of waterfalls and other vertical surfaces. Additional investigation of this habitat type is warranted to determine the status of this species.

Ross (1944) reported *Polycentropus pentus* Ross from SRB, to date its only Illinois location. It has not been seen in Illinois since the original collection in 1941, and the original specimens confirming its identity were lost from the INHS insect collection. Recently all the Trichoptera specimens at the INHS have been entered into a database, permitting us to search all records for SRB material. A former INHS entomologist, Ed Lisowski, left many 1986 collected SRB specimens in the INHS insect collection.

These contained 12 specimens of *P. pentus*. It appears that this species is still doing well somewhere in SRB, but was not available to us with our quantitative methods.

Several species of hydropsychid caddisflies have been reported from SRB but were not found in quantitative samples (Table 5). These include *Ceratopsyche bronta* (Ross), *Hydropsyche betteni* Ross, *Cheumatopsyche lasia* Ross, and *C. oxa* Ross. Only the latter is a sensitive species and, like the others, prefers slightly warmer water than found in the lowest 100 m of SRB. These species may be found in the vicinity of the waterfall, and above, with additional effort.

Overall, this springbrook is a prime example of a high quality, springfed bluff stream, quite possibly the finest and least disturbed in existence in Illinois. Throughout the state these bluff streams have been degraded through organic and nutrient enrichment, siltation, and deforestation of upstream areas. While agriculture cannot develop these slopes for crops, residential development of bluff areas is occurring at an alarming rate.

Webb et. al (1998) have demonstrated that many Illinois springs and their associated springbrooks have been degraded extensively. Additionally, groundwater systems in karst regions of Illinois and Missouri have been significantly degraded and pose serious threats to human health and to cave dwelling fauna, several of the latter are either threatened or endangered at the state or federal level (S. J. Taylor, personal communication). Therefore, threats to the well being of streams with significant groundwater flows are serious.

The small community atop the bluff at SRB could have negative impacts in the form of bacterial contamination from ineffective septic systems. Agricultural lands in the headwaters also could provide silt, organic and nutrient enrichment, and agricultural pesticides into the drainage. Several of these concerns should be addressed with further small sources of funding to document possible contaminants and with outreach and restoration activities in the basin to help prevent the degradation of this unique resource.

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