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MACROINVERTEBRATES AND FISHES OF TROUT PARK NATURE PRESERVE, ELGIN, ILLINOIS

William S. Vinikour
Argonne National Laboratory
Environmental Research Division
Argonne, Illinois 60439

and

Richard V. Anderson
Western Illinois University
Department of Biological Studies
Macomb, Illinois 61445

ABSTRACT

The composition and relative abundance of macroinvertebrate and fish species of Trout Park Nature Preserve, Elgin, Illinois, are reported. The species list reflects an intensive, 1-year survey resulting in 48 species of invertebrates. *Gammarus pseudolimnaeus*, *Asellus intermedius*, and several species of caddisflies were the dominant species. The mottled sculpin was the only fish species collected in the park. Erosion is the major factor accounting for the moderately low number of species inhabiting Trout Park. The species list resulting from this survey can be used as a baseline upon which future investigations can be compared.

INTRODUCTION

The Trout Park Nature Preserve (Elgin Botanical Gardens) is a small 10.5-ha area located on the east bluff of the Fox River in the north end of Elgin. An unususal natural area (Evers and Page, 1977), it is a glacial remnant of the morainic hills of northern Illinois (Paulson, 1972), and known for its diverse floral composition (Illinois Nature Preserves Commission, 1977; Evers and Page, 1977). Trout Park is also known for its diverse caddisfly (Trichoptera) fauna (Ross, 1944) which inhabits the five brooks and numerous springs and seeps.

Other aquatic insects have occasionally been identified in Trout Park, usually in conjunction with reports on particular insect orders within Illinois, e.g., mayflies

(Burks, 1953) and stoneflies (Frison, 1942). Although Unzicker and Sanderson (1974) did a one day survey of the aquatic insects, an intensive survey of the aquatic fauna has not been conducted. The composition and relative abundance of macroinvertebrate and fish species reported herein are based on an intensive, year-long study conducted in the park and should provide a basis for future comparisons to determine the park's status and to examine the macroinvertebrate community structure in the park.

STUDY SITES AND METHODS

Details regarding the location of the Trout Park Nature Preserve and the characteristics of the site have been previously described (Vinikour and Anderson, 1981). Macroinvertebrates were collected by kick nets; surber nets; and hand-picking of rocks, logs, leaf packs, and debris from the streambed. Sampling was conducted monthly from September 1979 through August 1980. The entire length of each major brook and portions of most rivulets and seeps were surveyed on each sampling date. The relative abundance for each species was determined both in terms of specific area collected and park-wide distribution.

RESULTS AND DISCUSSION

During the survey, 48 taxa of macroinvertebrates and 3 species of fish were identified; only 11 invertebrate species were numerically abundant (Table 1).

Although many small streams typically have a naturally low diversity (Hilsenhoff, 1977), the number of macroinvertebrate species of Trout Park is somewhat lower than that found in other spring-fed headwater streams. For example, Mackay (1969) identified at least 120 insect species in her study of a small Quebec stream, and Minckley (1963) identified about 113 invertebrate species (excluding annelids) in his study of Doe Run, Kentucky. Both the shorter length of Trout Park brooks relative to those in the studies mentioned above and perturbations (mainly erosion) to the brooks are causative factors in the observed lower species composition.

The following discussion will provide information on the important species of Trout Park, including information on capture location, importance to the biotic community, and historical comparisons. Species will not be discussed or only briefly mentioned if (1) they are commonly encountered inhabitants of small streams and aspects of their life history are well documented, or (2) they could only be identified to genus and ubiquitously occur in streams of all sizes (e.g., chironomids).

Ephemeroptera. Only one species of mayfly, *Baetis tricaudatus* (= *vagans*), was distributed throughout the park. This species is the most widespread *Baetis* species in North America (Morihara and McCafferty, 1979) and was the only mayfly species reported in Trout Park by Burks (1953). *Potamanthus myops* and *Caenis hilaris* (?) were only collected along the outlet channel of the main brook that leads into the Fox River. The nymphal habitat of both species (see Edmunds et al., 1976) and their rare occurrence in Trout Park strongly imply that they normally inhabit the Fox River. Individuals of these species may rarely venture into the lower reach of Trout Park from the adjacent backwater area of the Fox River.

TABLE 1. Macroinvertebrate and Fish Species of Trout Park Nature Preserve, 1979-1980

Taxon		Relative Abundance[1]
Turbellaria		
Planariidae:	Dugesia dorotocephala	Abundant
Amphipoda		
Gammaridae:	Gammarus pseudolimnaeus	Abundant
Isopoda		
Asellidae:	Asellus intermedius	Abundant
Gastropoda		
Amnicolidae:	Amnicola	Common
Physidae:	Physa gyrina	Common
Planorbidae:	Gyraulus parvus	Rare
Coleoptera		
Dryopidae:	Helichus fastigiatus	Common
Dytiscidae:	Agabus	Common
	Copelatus glyphicus	Rare
Elmidae:	Optioservus fastiditus	Rare
Eubriidae:	Ectopria leechi (?)	Rare
Hydrophilidae:	Anacaena limbata	Common
	Cymbiodyta	Common
	Hydrobius tumidus (?)	Common
Ephemeroptera		
Baetidae:	Baetis tricaudatus	Abundant
Caenidae:	Caenis hilaris (?)	Rare
Potamanthidae:	Potamanthus myops	Rare
Hemiptera		
Gerridae:	Gerris remigis	Common
Veliidae:	Microvelia americana	Common
Megaloptera		
Sialidae:	Sialis	Rare

Taxon		Relative Abundance[1]
Plecoptera		
Nemouridae:	Amphinemura delosa	Common
	Nemoura trispinosa	Common
Perlodidae:	Clioperla clio	Abundant
Collembola		
Isotomidae:	Isotomus palustris	Common
Diptera		
Chironomidae:	Corynoneura	Rare
	Cricotopus	Common
	Eukiefferiella	Abundant
	Orthocladius	Rare
	Parametriocnemus	Rare
	Rheocricotopus	Rare
	Polypedilum	Rare
	Microspectra	Rare
Dixidae:	Dixa	Common
Empididae		Common
Simuliidae:	Simulium venustum	Abundant
Stratiomyidae:	Euparyphus	Common
Tipulidae:	Dicranota	Common
	Limonia	Rare
	Tipula abdominalis	Abundant
Trichoptera		
Glossosomatidae:	Glossosoma intermedium	Abundant
Hydropsychidae:	Diplectrona modesta	Abundant
	Symphitopsyche bronta	Rare
	Symphitopsyche slossonae	Rare
Hydroptilidae:	Hydroptila consimilis	Common
Lepidostomatidae:	Lepidostoma liba	Common
Limnephilidae:	Hesperophylax designatus	Common
	Neophylax concinnus	Abundant
Philopotamidae:	Wormaldia moesta	Rare
Pisces		
Cyprinidae:	Semotilus atromaculatus	Rare
Gasterosteidae:	Culaea inconstans	Rare
Cottidae:	Cottus bairdi	Rare

[1] Abundant - found throughout the park, usually in large numbers; common - found throughout the park in low numbers or found in localized areas in large numbers; rare - restricted distribution and density in the park.

Unzicker and Sanderson (1974) collected a fairly diverse assemblage of mayflies in their brief survey of the park: *Baetis tricaudatus*, *Siphloplecton*, *Ephemerella*, *Pseudocloeon*, *Ephemera*, *Epeorus*, *Cloeon*, *Paraleptophlebia moerens*, and *P. praepedita*. Some of these species may have inhabited the main brook due to altered water qualilty and substrate conditions in the late 1960s through 1977 when the storm sewer was routed into the brook.

Plecoptera. The three species of stoneflies—*Amphinemura delosa*, *Nemoura trispinsoa*, and *Clioperla* (= *Isoperla*) *clio*—were common to abundant throughout

much of the park. *Clioperla* is the largest of the species and was commonly encountered within leaf litter packs and upon wood debris. *Clioperla* was the only stonefly species found in the lower reach of the main brook (the reach that receives rerouted storm-sewer drainage), although it occurred only in low numbers.

Initially, Frison (1935) did not report any stonefly species from Trout Park, but he subsequently reported the occurrence of *Nemoura trispinsoa* and *Leuctra tenius* (Frison, 1942). He only collected adults of *L. tenius* and—considering that this species of *Leuctra* is an inhabitant of large, warmwater rivers and streams (Harper and Hynes, 1971)—it is probable that the nymphs inhabit the adjacent Fox River and not Trout Park itself. Unzicker and Sanderson (1974) reported *Acroneuria arida*, *Paracapnia*, and *Alloperla* from Trout Park. As with the mayfly species reported by Unzicker and Sanderson, one can only conjecture that storm-sewer impacts accounted for the above-mentioned species being present in 1974 but absent in either the previous (Frison, 1942) or current survey.

Trichoptera. Nine species of caddisflies were collected (Table 1). Three of these species—*Glossosoma intermedium*, *Hesperophylax designatus*, and *Wormaldia moesta*—are not known from other Illinois locales, whereas two of the species—*Diplectrona modesta* and *Lepidostoma liba*—have only been found locally elsewhere in Illinois (Ross, 1944). *Hydroptila consimilis* primarily occurred on *Cladophora* located in the lower portions of the main brook, whereas *Glossosoma* occured abundantly on cobble in portions of the brooks that had open canopies. The other commonly to abundantly occurring species primarily inhabited wood debris, although *Diplectrona* also inhabited leaf packs and *Neophylax concinnus* also occurred on *Cladophora*. Conditions in the main brook have improved since rerouting of the storm sewer (i.e., all nine species were found in the main brook in the current study compared to no caddisflies observed by Unzicker and Sanderson in 1974). However, the park as a whole is continuing to deteriorate, especially the smaller brooks. Several of these brooks have sediments predominated by fine silts and marl. In those brooks, caddisflies are confined to selected reaches where cobble or wood debris still occur. Elimination of several of the less common species and a decrease in the more common ones are foreseeable if off-trail hiking and unlimited access from the bluff top, which create erosive conditions, are allowed to persist.

Amphipoda and Isopoda. Gammarus pseudolimnaeus and *Asellus intermedius* were the only amphipod and isopod species encountered in this survey. *Gammarus* was more abundant than *Asellus*, and occurred throughout most of the park, including the small rivulets and seepage areas. Watercress beds particularly harbored high densities of *Gammarus*. Watercress beds increase streambed area and reduce stream velocities, thereby enhancing sedimentation and aiding seston and leaf litter retention. This expedites detrital processing, and the watercress itself becomes a major source of autochthonous detrital matter (Anderson and Sedell, 1979), which probably accounts for the large population densities of *Gammarus* in watercress.

Asellus was more prominant in the lower reaches of the brooks where leaf packs occurred. Being tolerant of organically enriched areas (Ellis, 1961), *Asellus* was the most abundant species within the outlet area of the main brook. Storm-sewer discharge is similar in many respects to sewage effluent and creates a situation in the lower reach of the main brook where only the species tolerant to organic pollution can thrive.

Although only a single species each of amphipod and isopod occur in Trout Park, the low species richness is compensated for by the fact that both species have high biomass, mixed age distribution, and year-round presence (Anderson and Sedell, 1979). Their abundance in Trout Park, coupled with being principally detritivores, make *Gammarus* and *Assellus* the primary link in the energy transfer between the terrestrial and aquatic systems in Trout Park.

Coleoptera. Eight beetle species were collected (Table 1), predominantly on wood debris. All these species belong to genera normally encountered within spring-brook environments. In the park, logs remain relatively unaltered, irregardless of changes to the mineral substrates occurring due to erosion. As erosion has led to tree fall within the park, brook habitat capable of supporting the beetle species has increased over time. Unzicker and Sanderson (1974) reported four of the species (*Agabus*, *Optioservus*, *Helichus*, and *Cymbiodyta*) in their survey, which suggests that the beetle species composition has remained relatively unchanged within recent years.

It is uncertain as to whether the *Ectopria* species is *leechi* or the more commonly known *nervosa*. *Ectopria leechi* is a recently described species (Brigham, 1981) with a distribution and larval habitat that emcompasses the locale and habitat conditions of Trout Park. Unfortunately, only two larvae were collected, ruling out a specific determination at this time.

Diptera. Fifteen dipteran species representing six families were collected. Chironomids accounted for eight of the species. Midge density was low within the brooks, a situation that may indicate some improvement in quality of the main brook since the storm sewer has been rerouted. Unzicker and Sanderson (1974) reported chironomids to be abundant in the main brook, probably due to nutrient enrichment and sedimentation caused by the storm sewer at that time.

In the current survey, only areas of fine silt deposits (usually associated with logjams) harbored high densities of midges. However, midges, in particular *Eukiefferiella*, were commonly encountered within pupal cases of the caddisflies *Glossosoma intermedium* and *Hesperophylax designatus* (Vinikour and Anderson, 1981). Considering that these caddisflies are numerous within the park, the abundance of *Eukiefferiella* is also potentially high.

Tipula abdominalis was the largest invertebrate found in Trout Park; it was abundant in leaf litter packs and common within areas of accumulated wood debris. Its size and abundance makes it important in the initial breakdown of leaf litter and, therefore, nutrient cycling within the brooks. *Tipula* also loosens the material within leaf packs, allowing other species to penetrate the packs (Cummins, personal communication—cited in Anderson and Sedell, 1979).

Dixa (Dixidae) was confined to the shallow (5 cm) rivulets located in the upper reaches of the brooks.

Simulium venustum, a well-known pest species (Westwood and Brust, 1981) and one of the commonest blackfly species in the United States (Stone, 1964), was abundant in Trout Park, expecially within the lower reaches of the main brook. Temperature requirements for development (see Mokry, 1976) and food resource limitations may account for its low density within the upper reach of the main brook.

As with *Eukiefferiella*, larvae of an unidentified species of Empididae were commonly encountered within *Glossosoma* and *Hesperophylax* pupal cases. This can be considered an ectoparasitic association in that the empidids feed upon the

pupal caddisflies. Vinikour and Anderson (1981) postulated that the association may aid in the regulation of caddisfly populations in streams where vertebrate and large invertebrate predators are scarce.

Turbellaria. The planarian *Dugesia dorotocephala* was abundant especially in the main brook under the I-90 overpass. This species is a common inhabitant of cool, unpolluted springs, creeks, and spring-fed marshes and lakes (Kenk, 1944). The species was abundant in the same area in 1976 when the storm sewer was still routed into the main brook and while I-90 snowmelt drainage was discharging directly on them (Vinikour, unpublished data). This indicates that *D. dorotocephala* may be more tolerant of polluted conditions than previously reported and more limited by thermal requirements.

Gastropoda. The snail species common to Trout Park, *Physa gyrina* and *Amincola*, are typical inhabitants of small streams. Both species predominantly inhabited wood debris. The snails' feeding activities (grazing on periphyton) aid in detrital particle size reduction by removing the superficial layers of wood. Snails therefore contribute to the initial degradation of coarse particulate organic matter (Anderson et al., 1978; Anderson and Sedell, 1979).

Pisces. Trout Park receieved its name because an early owner of the land stocked trout in the 1850s. Trout probably have not occurred in the brooks for over a hundred years, and 1930 newspaper articles on the park make no mention of trout (see Evers and Page, 1977). Evers and Page (1977) did list the mottled sculpin and brook stickleback as unusual vertebrates occurring in the spring-fed rivulets of Trout Park, which implies that these species are common in Trout Park. It is doubtful, however, that the species have been common to the park since perturbation by I-90 construction and storm-sewer routing. Currently, these species and the creek chub are rare inhabitants of the park.

Only the mottled sculpin occurs within the park proper, primarily confined within a small area of the main brook (Vinikour and Anderson, 1980) although two individuals have recently been observed in the upper reach of the main brook. This indicates that logjams and other impediments are passable, at least during high flows, and that a large stretch of the main brook may eventually be populated by the sculpin. The occurrence and preservation of the mottled sculpin in Trout Park is important in that much of its habitat within northern Illinois is being rapidly destroyed by stream alterations (Smith, 1979).

Only a few specimens of creek chub were collected, all within the lower reach of the main brook near the outlet to the Fox River. Apparently the creek chub does not populate Trout Park and its occurrence only indicates forays by individuals a short distance into the brook from the Fox River.

Several brook sticklebacks were also collected within the lower outlet reach of the main brook. A stickleback population also occurs within the drainage area of two of the smaller brooks in a cattail-infested area with silt substrates, reduced flows, and shallow (<0.3m) water. Stickleback inhabitation of the drainage area probably centers around the breeding season, whereas they tend to overwinter in deeper water (Wootton, 1976), preferring temperatures of 15 to 19°C (MacLean and Gee, 1971).

CONCLUSION

Although Trout Park is currently degraded in comparison to conditions that existed prior to I-90 construction and storm-sewer routing, most invertebrates that inhabit the brooks are normally encountered in good-to high-quality streams (see Hilsenhoff, 1977). This reflects the presence of unaltered reaches that still exist in the brooks, abundant wood debris that harbors many of the species, and the fact that erosion rather than water quality degradation is the primary impact to the park.

It is hoped that mitigative measures will be implemented in an effort to control the erosive conditions that are accelerated by off-trail hikers. Even though the faunistic composition of the Trout Park brooks is restricted due to past and ongoing perturbations, the brooks still contain an unusual aquatic community including several rare species of caddisflies. The current survey can serve as a reference to which future conditions may be compared, allowing the effectiveness of mitigative measures to be measured.

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