LISTS OF SPECIES

Fish, Conewango Creek, Allegheny River Drainage, New York, USA

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Abstract
Fishes of the Conewango Creek basin of the Allegheny River watershed were surveyed in 2004 and 2005. This basin is a part of the extreme northeastern portion of the vast Mississippi River drainage in North America and includes several species on the periphery of their range; many are rare in the state of New York, USA. One goal of the survey was to develop a species list for the system and assess the change in status of species by comparing recent catches to those of a synoptic survey conducted in 1937. We collected representatives of 70 species and three hybrid taxa. Ten of these fishes have not been reported from the system previously. Prior to this survey, 69 species of fish were reported from the basin. We failed to collect representatives from nine of these species. We collected representatives from 16 families, with 26 species in Cyprinidae and 11 in Percidae, the two most speciose families.

Introduction
Changes in fish distribution are important in understanding environmental change and in establishing management goals. Unfortunately, early baseline data for making the necessary comparisons are often unavailable. The state of New York, USA, North America, is an ideal area for these types of assessments because the fish in each of the state's watersheds were sampled between 1926 and 1939. Although these surveys were conducted long after the state's watersheds ceased to be unaffected by human activities, they provide a baseline not available in most other areas. We resurveyed the fishes of the Conewango Creek basin, of the Allegheny River watershed, to identify changes in fish distribution and relative abundance when compared to the results of an earlier survey (Greeley 1938). Because the three basins of the Allegheny River watershed include several species of rare and imperiled fish (Carlson et al. 1999), monitoring change and delineating within-basin ranges is an important management goal. Here we build upon earlier surveys and refine the information on the macrodistribution of each of the species present in the basin, particularly those slated for special management. We focused on the Conewango Creek system because recent work has not been comprehensive in this basin and because it is a difficult stream system to sample.

Although the ichthyofauna of this basin is similar to that found in other parts of the upper Allegheny River system, the streams differ from the other upland sites within the watershed. Conewango Creek and its major tributaries are deep, muddy streams often with steep, eroding banks. In contrast, the upper Allegheny River is relatively shallow, with extensive riffle areas and gravel-rubble substrates. Habitats similar to those of the Allegheny River exist within the Conewango Creek basin, but are less common. Because of these physical characteristics, sampling over the years has been problematic. The first synoptic survey was conducted in 1937 when 101 sites within the basin were sampled (Greeley 1938). It has been sampled episodically in intervening years.

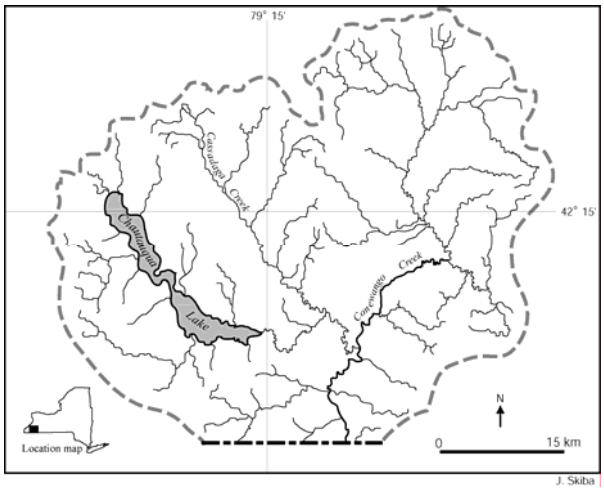

Figure 1. Conewango Creek basin in southwestern New York, U.S.A. Conewango Creek enters the Allegheny River in Pennsylvania and is part of the Mississippi River drainage.

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Materials and methods

The Conewango Creek basin drains 2,325 km^2 in New York and Pennsylvania. The New York portion of the drainage is 2,200 km^2 (Figure 1). Surrounding land use practices vary, but much of the land adjacent to the streams is agricultural. One major urban center, Jamestown and surrounding suburbs, is present along the shore of Chautauqua Lake. Chautauqua Lake drains into Conewango Creek via Chadakoin River. Forested areas were found only at headwater stream sites, distant from the main stem, although riparian vegetation was present sporadically at sites at all elevations.

In order to achieve the objective of the study, to develop a complete species list for the basin, all habitats were sampled using a variety of gear. We concentrated on streams only. The survey comprised 121 sampling sites: of these, 31 sites were on the main channel of Conewango Creek, 20 sites were tributaries of Chautauqua Lake, 14 of the sites were on Cassadaga Creek a major tributary of the Conewango, and the remaining sites were on the other smaller tributaries. Due to habitat variation within the basin an assortment of gear was used in sampling. Samples were taken using seines of different sizes, backpack electroshockers, an electroshocking boat, cast nets and a bottom trawl (Table 1). All collected fish were identified to species and counted. Specimens were saved to verify identification and are archived at the New York State Museum (NYSM), Albany, NY, USA.

Table 1. Sampling gear used during survey of Conewango Creek basin, New York, USA, 2004-2005.

Net type	Dimensions (m)	Bag mesh (cm)	Wing mesh (cm)
Seine	30.48 X 2.44	0.635	0.635
	15.24 X 1.52	0.318	0.635
	9.14 X 1.22	0.318	0.794
Castnet	3.66 diameter	0.635	
8’ Missouri mini trawl	2.44 X 3.35	0.318	0.318

Results and discussion

Seventy-nine species of fish have been reported from the streams of the Conewango Creek basin (Table 2). We collected representatives from 70 species during 2004-05. We also collected two different minnow hybrids, a sunfish hybrid, and lamprey ammocoetes that we were unable to identify to species. Ten species were not reported previously (Daniels et al. 2006). Of these, three were introduced species and seven were native species that may have expanded their range into this basin.

In 1937, 57 fishes were collected (Table 2). In the intervening eight decades, an additional 22 species were added to the species list of the Conewango Creek basin. Most of the species not reported in 1937 may have gained access to the system by migration from downstream sites in recent decades or may have been overlooked in the original survey (Daniels et al. 2006). Only seven were introduced exotic species, which is low when compared to other New York watersheds (Carlson and Daniels 2004).

Percentage frequency of occurrence provides an estimate of the extent of the range of a species within the basin and the change in frequency of occurrence between the surveys offers insight into trends in abundance. Many of the widely distributed species in 1937 were still found throughout the basin in 2004-05. We noted a change in frequency of occurrence of less than 20 % in *Catostomus commersonii*, *Hypentelium nigricans*, *Moxostoma erythrurum*, *Luxilus cornutus*, *Notropis volucellus*, *Pimephales notatus*, *Rhinichthys obtusus*, *Lepomis gibbosus*, *Micropterus dolomieu*, *M. salmoides*, *Etheostoma caeruleum*, *E. flabellare*, *E. nigrum*, *Percina caprodes* and *P. maculata*. *Campostoma anomalum*, *Clinostomus elongatus*, *Semotilus atromaculatus*, and *Cottus bairdii* were found at fewer sites in the later survey, but remained widely distributed throughout the basin (Table 2).

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Table 2. Percentage frequency of occurrence of fishes in the Conewango Creek basin of the Allegheny River watershed. Percentages from 1937 are based on 101 survey sites (Greeley 1938). Carlson et al. (1999) reviewed all earlier survey work and identified the species marked with "X" as present in the subbasin; the 1937 survey results were included in the assessment. The 2004-05 frequency of occurrence is based on the results of 124 survey sites. Family names are in bold. Names follow Nelson et al. (2004).

Scientific name	Common name	1937 %	1999	2004-05 %
Petromyzontidae				
Ichthyomyzon bdellium (Jordan, 1885)	Ohio lamprey			1
Ichthyomyzon greeleyi Hubbs and Trautman, 1937	mountain brook lamprey			1
Ichthyomyzon sp.	lamprey ammocoetes			2
Lampetra appendix (DeKay, 1842)	American brook lamprey	2	X	19
Clupeidae				
Dorosoma cepedianum (Lesueur, 1817)	gizzard shad		X	1
Ictaluridae				
Ameiurus natalis (Lesueur, 1819)	yellow bullhead		X	10
Ameiurus nebulosus (Lesueur, 1819)	brown bullhead	21	X	9
Noturus flavus Rafinesque, 1818	stonecat			2
Noturus miurus Jordan, 1877	brindled madtom	3	X	2
Catostomidae				
Carpiodes cyprinus (Lesueur, 1817)	quillback		X	5
Catostomus commersonii (Forster, 1773)	white sucker	69	X	70
Hypentelium nigricans (Lesueur, 1817)	northern hog sucker	34	X	27
Moxostoma anisurum (Rafinesque, 1820)	silver redhorse	6	X	3
Moxostoma breviceps (Cope, 1870)	smallmouth redhorse			1
Moxostoma duquesnei (Lesueur, 1817)	black redhorse		X	3
Moxostoma erythrurum (Rafinesque, 1818)	golden redhorse	15	X	16
Cyprinidae				
Campostoma anomalum (Rafinesque, 1820)	central stoneroller	82	X	45
C. anomalum X *L. cornutus*	hybrid			1
C. anomalum X *R. cataractae*	hybrid			1
Clinostomus elongatus (Kirtland, 1838)	redside dace	41	X	23
Cyprinella spiloptera (Cope, 168)	spotfin shiner	4	X	6
Cyprinus carpio Linnaeus, 1758	common carp	5	X	11
Exoglossum laurae (Hubbs, 1931)	tonguetied minnow	18	X	2
Hybognathus hankinsoni Hubbs, 1929	brassy minnow		X	1
Luxilus chrysocephalus (Rafinesque, 1820)	striped shiner	12	X	6
Luxilus cornutus (Mitchill, 1817)	common shiner	53	X	48
Lythrurus umbratilis (Girard, 1857)	redfin shiner			2
Margariscus margarita (Cope, 1868)	pearl dace	23	X	3
Nocomis micropogon (Cope, 1865)	river chub	7	X	3
Notemigonus crysoleucas (Mitchill, 1814)	golden shiner	2	X	15
Hybopsis amblops (Rafinesque, 1820)	bigeye chub	11	X	3
Notropis atherinoides Rafinesque, 1818	emerald shiner		X	2
Notropis buccatus (Cope, 1865)	silverjaw minnow			1
Notropis dorsalis (Agassiz, 1854)	bigmouth shiner	2	X	1
Notropis heterolepis Eigenmann and Eigenmann, 1893	blacknose shiner	5		
Notropis hudsonius (Clinton, 1824)	spottail shiner	1	X	2
Notropis photogenis (Cope, 1865)	silver shiner	14	X	8
Notorpis rubellus (Agassiz, 1850)	rosyface shiner	10	X	25

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Notropis stramineus (Cope, 1865)	sand shiner	11	X	20
Notropis volucellus (Cope, 1865)	mimic shiner	14	X	17
Phoxinus eos (Cope, 1862)	northern redbelly dace	2	X	
Phoxinus neogaeus Cope, 1868	finescale dace	1	X	
Pimephales notatus (Rafinesque, 1820)	bluntnose minnow	56	X	48
Pimephales promelas Rafinesque, 1820	fathead minnow	3	X	15
Rhinichthys cataractae (Valenciennes, 1842)	longnose dace		X	8
Rhinichthys obtusus Agassiz, 1854	western blacknose dace	56	X	52
Semotilus atromaculatus (Mitchill, 1818)	creek chub	78	X	56
Cobitidae				
Misgurnus anguillicaudatus (Cantor, 1842)	oriental weatherfish			2
Salmonidae				
Oncorhynchus mykiss (Walbaum, 1792)	rainbow trout	3	X	
Salmo trutta Linnaeus 1758	brown trout	11	X	25
Salvelinus fontinalis (Mitchill, 1815)	brook trout	3	X	
Umbridae				
Umbra limi (Kirtland, 1841)	central mudminnow	4	X	8
Esocidae				
Esox americanus vermiculatus Lesueur, 1818	grass pickerel		X	17
Esox lucius Linnaeus, 1758	northern pike		X	4
Esox masquinongy Mitchill, 1824	muskellunge	8	X	1
Percopsidae				
Percopsis omiscomaycus (Walbaum, 1792)	trout-perch	9	X	14
Gadidae				
Lota lota (Linnaeus, 1758)	burbot	2	X	2
Fundulidae				
Fundulus diaphanus (Lesueur, 1817)	banded killifish		X	
Atherinopsidae				
Labidesthes sicculus (Cope, 1865)	brook silverside	3	X	2
Gasterosteidae				
Culaea inconstans (Kirtland, 1840)	brook stickleback	11	X	2
Cottidae				
Cottus bairdii Girard, 1850	mottled sculpin	31	X	46
Moronidae				
Morone americana (Gmelin, 1789)	white perch			2
Morone chrysops (Rafinesque, 1820)	white bass		X	
Centrarchidae				
Ambloplites rupestris (Rafinesque, 1817)	rock bass	9	X	15
Lepomis cyanellus Rafinesque, 1819	green sunfish			3
Lepomis gibbosus (Linnaeus, 1758)	pumpkinseed	30	X	33
L. gibbosus X *L. macrochirus*	hybrid			1
Lepomis macrochirus Rafinesque, 1818	bluegill	8	X	15
Micropterus dolomieu Lacepède, 1802	smallmouth bass	33	X	27
Micropterus salmoides (Lacepède, 1802)	largemouth bass	21	X	23
Pomoxis annularis Rafinesque, 1818	white crappie	12	X	
Pomoxis nigromaculatus (Lesueur, 1829)	black crappie	19	X	3
Percidae				
Ammocrypta pellucida (Putnam, 1863)	eastern sand darter			6
Etheostoma blennioides Rafinesque, 1819	greenside darter	11	X	24
Etheostoma caeruleum Storer, 1845	rainbow darter	36	X	40

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Etheostoma flabellare Rafinesque, 1819	fantail dater	47	X	39
Etheostoma nigrum Rafinesque, 1820	johnny darter	59	X	53
Etheostoma variatum Kirtland, 1838	variegate darter		X	5
Etheostoma zonale (Cope, 1868)	banded darter	7	X	19
Perca flavescens (Mitchill, 1814)	yellow perch	9	X	31
Percina caprodes (Rafinesque, 1818)	logperch	23	X	19
Percina maculata (Girard, 1860)	blackside darter	27	X	31
Sander vitreus (Mitchill, 1818)	walleye	1	X	
	Richness	57	69	70

Many of the species found at less than 10 % of the sites in 1937 continued to have restricted ranges in 2004-05. These species are: *Noturus miurus*, *Moxostoma anisurum*, *Cyprinella spiloptera*, *Cyprinus carpio*, *Nocomis micropogon*, *Notropis dorsalis*, *N. hudsonius*, *N. photogenis*, *Umbra limi*, *Percopis omiscomaycus*, *Lota lota*, *Labidesthes sicculus*, *Ambloplites rupestris*, and *Lepomis macrochirus*. In total, the distribution of 33 species (42 % of those present in the basin) remained relatively constant between the two surveys.

Several species were more widely distributed in the later survey, including *Lampetra appendix*, *Notemigonus crysoleucas*, *Notropis rubellus*, *N. stramineus*, *Pimephales promelas*, *Salmo trutta*, *Etheostoma zonale* and *Perca flavescens*. These species tended to be relatively rare in 1937, but each was present at more than 10 % of the collections sites in 2004-05. *Ameiurus natalis*, *Rhinichthys cataractae* and *Esox americanus vermiculatus* were not collected at any site in 1937, but were common in the 2004-05 collections and had been collected in the intervening years.

Ten species were reported from this basin for the first time (Daniels et al. 2006). These include three introduced exotic species and seven species that immigrated into the basin recently or were previously overlooked or misidentified.

The reverse situation was noted for five species where steep declines were noted. Four are relatively small fishes and have declined in numbers in other drainages as well (Carlson and Daniels 2004). *Margariscus margarita*, *Exoglossum laurae*, *Notropis amblops* and *Culaea inconstans* were present at more than 10 % of the 1937 sites, but presence dropped to 3 % or less in the 2004-05 sites. *Pomoxis nigromaculatus* showed a steep decline in distribution, but this is primarily a pond fish and its absence from streams may indicate stream improvement.

We did not collect nine species that were collected during past surveys. These species are a mix of native fishes that have become rare in, or possibly extirpated from, the basin and exotic species that failed to establish themselves or to persist in the basin. Of particular importance are three minnows that were rare in 1937 and remain rare in the basin: *Notropis heterolepis*, *Phoxinus eos*, and *P. neogaeus*. Although we resampled the sites where these species were captured in 1937, we were unable to find individuals at the original sites, neighboring areas, or in the basin at large. An individual of *P. eos* was caught in 2002 in Dewittville Creek, a tributary of Chautauqua Lake (D. Carlson, NYS Department of Environmental Conservation, pers. comm.). The other two species have not been collected in the drainage in recent decades. Also interesting is the absence of *Oncorhynchus mykiss*, *Salvelinus fontinalis* and *Pomoxis annularis*. *Oncorhynchus mykiss* is exotic and the individuals caught in 1937 may have been stocked and not representatives of established populations. The absence of *S. fontinalis*, rare in 1937, signals a possible decline in the extent or quality of cool, clean streams required by this native salmonid (Smith 1985). Its decline may be associated with the decline of other upland species such as *M. margarita*. *Pomoxis annularis* may have declined, like its congener, because of changes to available pool habitat in the streams. We failed to capture *Sander*

vitreus, but it has been taken in the basin in recent years (Table 2).

The fish assemblages of Conewango Creek and its tributaries remain robust and relatively dynamic. Most of the species present in the early 1937 survey remained and almost half were as widely distributed in the later survey as they were in the early one. The loss of some species, serious declines in frequency of occurrence in others, and the arrival of several other species may indicate that environmental conditions have changed in the basin. Although surveys such as these do not provide information that identifies the habitat changes that affect fish distribution and abundance, they document a change that can provide a framework for future studies.

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