Proceedings of the Indiana Academy of Science
(1998) Volume 107 p. 151-166

THE FISHES OF TIPPECANOE COUNTY, INDIANA

Brant E. Fisher
Atterbury Fish and Wildlife Area
7970 South Rowe Street
Edinburgh, Indiana 46124

Stephen P. Wente
Department of Natural Resources
and Environmental Sciences
University of Illinois
S-518 Turner Hall, MC-047
1102 South Goodwin
Urbana, Illinois 61820

Thomas P. Simon
U.S. Fish and Wildlife Service
620 South Walker Street
Bloomington, Indiana 47403-2121

and

Anne Spacie
Department of Forestry and Natural Resources
Purdue University
1159 Forestry Building
West Lafayette, Indiana 47907

ABSTRACT: The fish fauna of Tippecanoe County, Indiana, has been well documented historically. However, a county-wide survey had not been conducted since the mid-1970's. Between June and December 1994, seventy sites were sampled in Tippecanoe County to determine the current distribution of fish species. Ninety-seven species were collected, of which 13 (*Lepisosteus oculatus, Dorosoma petenense, Umbra limi, Erimystax dissimilis, Macrhybopsis storeriana, Notropis wickliffi, Phoxinus erythrogaster, Noturus eleutherus, Morone chrysops* x *M. saxatilis, Lepomis microlophus, Percina phoxocephala, P. sciera,* and *P. shumardi)* were new county records. Many of the new species, including *U. limi, E. dissimilis, M. storeriana, P. phoxocephala,* and *P. sciera*, were collected at several sites during the present survey. *Etheostoma camurum*, a state endangered species which had not been recorded in the County since 1942, was once again collected. *Cyprinella whipplei, Pimephales vigilax, Cycleptus elongatus,* and *Micropterus punctulatus*, historically uncommon species, have expanded their ranges in the County since the previous survey. Twelve fish species historically recorded from the County were not collected in 1994; notably absent was *Ammocrypta pellucida*, a state species of special concern, which had been collected during all three pre-

vious surveys. The total number of fish species recorded from Tippecanoe County is now 109.

KEYWORDS: Fish distribution, Tippecanoe County, Indiana, Wabash River.

INTRODUCTION

Historical Tippecanoe County Fish Surveys. Distribution records for Tippecanoe County fishes have been compiled on a fairly regular basis. The initial ichthyofaunal picture of Tippecanoe County was provided by Gerking (1945), who collected fish from 412 sites across Indiana between 1940 and 1943 and compiled all the other historical records known at that time. In 1942, Gerking recorded 45 species from four sites (one each from Wea Creek, South Fork Wildcat Creek, Wildcat Creek, and the Wabash River) within Tippecanoe County. Compilation of the historical records revealed two additional species: the river redhorse (*Moxostoma carinatum*; Cope, 1871) and the harelip sucker (*Lagochila lacera*; Evermann and Jenkins, 1892). The initial species count for Tippecanoe County was 47.

Erman and Mumford (unpublished data) periodically collected fish from Tippecanoe County between 1958 and 1965. Although their specific collecting locations were not recorded, species lists for nine major tributaries in Tippecanoe County were compiled. Erman and Mumford recorded 20 new species from the County, bringing the historical total to 67.

Curry and Spacie (1978) compiled species lists for 39 sites in the County after collecting from the Wabash River annually between 1971 and 1977 and from most of the other major drainages in the County between 1974 and 1977. Curry and Spacie (1978) also included work by Lehman (1974), who collected from Wea Creek, and Gorman (1978), who studied the fishes of Indian Creek. Altogether, 86 species were identified from Tippecanoe County, including 28 new species. If the hornyhead chub (*Nocomis biguttatus*), which was collected by Lehman (1974) but was left off the list of Curry and Spacie (1978), is included, the total species known from Tippecanoe County reached 96.

Physical Description of Tippecanoe County. Tippecanoe County is located in west-central Indiana and covers an area of approximately 504 mi^2. The Wabash River is the dominant watershed, entering from the northeast corner of Tippecanoe County and exiting near the middle of the western boundary, almost bisecting the County in half (Figure 1). The Wabash River drains approximately 4,375 mi^2 as it enters Tippecanoe County. Its drainage area nearly doubles by the time it leaves the County after the addition of the Tippecanoe River (1,950 mi^2), Wildcat Creek (805 mi^2), and several smaller watersheds (Hoggatt, 1975).

Tributaries of the Wabash River include the Tippecanoe River, Burnett's Creek, and Indian Creek from the north and Sugar Creek, Buck Creek, Wildcat Creek, and Wea Creek from the south. Moot's Creek is the only major direct tributary to the Tippecanoe River located in the County. The upper portions of the Flint Creek, Big Shawnee Creek, and Little Pine Creek watersheds are also with-

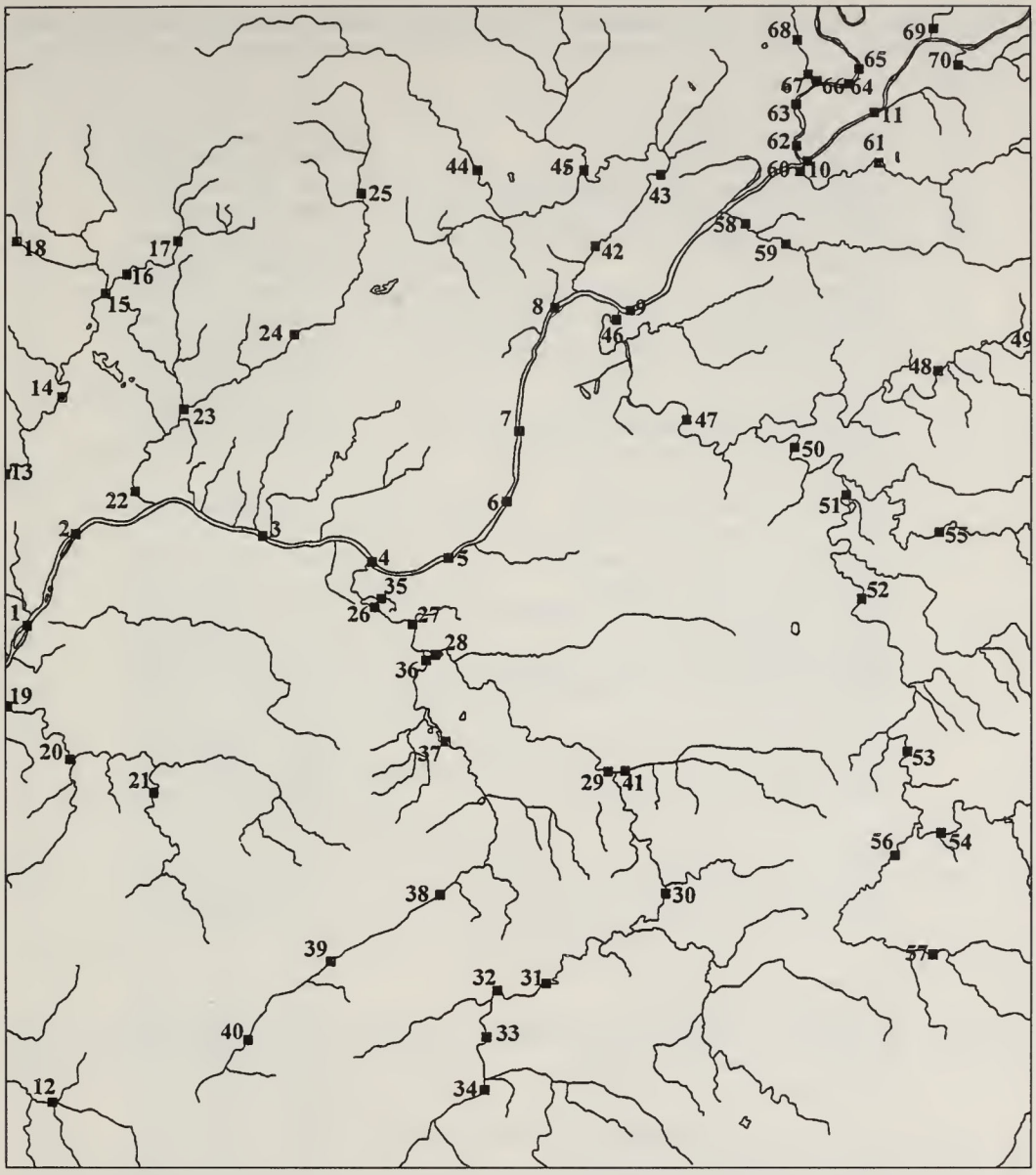

Figure 1. Tippecanoe County and our 1994 collection locations.

in Tippecanoe County but enter the Wabash River further downstream in Warren and Fountain Counties. Tippecanoe County contains the urban areas of West Lafayette and Lafayette, both centrally located, to the west and east of the Wabash River, respectively.

Objectives. Since almost two decades had elapsed since the last county-wide survey had been completed, we felt it was appropriate to resample the fishes of Tippecanoe County. The objectives of our present survey were to: 1) determine the current composition and distribution of fish species inhabiting the flowing waters of Tippecanoe County; 2) use replicable methods to establish baseline, site specific, fish community data with which future sampling efforts

Table 1. Site locations (C&S = Curry and Spacie, 1978). The single, solid lines separate sites by watershed.

Site	C&S	Location	Map Section
1	39	Wabash River at Collier's Island	Sec. 3 and 10, T22N, R6W
2	38	Wabash River at Goose Island	Sec. 26, T23N, R6W
3	37	Wabash River at the mouth of Jordan Creek	Sec. 28, T23N, R5W
4	36	Wabash River at the mouth of Wea Creek	Sec. 35, T23N, R5W
5	35	Wabash River at Lafayette Sewage Treatment Plant	Sec. 31, T23N, R4W Sec. 36, T23N, R5W
6	34	Wabash River at West Lafayette Sewage Treatment Plant	Sec. 20 and 29, T23N, R4W
7	33	Wabash River at Mascouten Park	Sec. 17, T23N, R4W
8	—	Wabash River at Heron Island	Sec. 4, T23N, R4W Sec. 33, T24N, R4W
9	—	Wabash River at the U.S. 65 bridge	Sec. 2 and 3, T23N, R4W
10	32	Wabash River at the mouth of the Tippecanoe River	Sec. 20, T24N, R3W
11	31	Wabash River at the Americus bridge	Sec. 9 and 16, T24N, R3W
12	—	Big Shawnee Creek at State Road 25	Sec. 26, T21N, R6W
13	25	Little Pine Creek at County Line Road	Sec. 22, T23N, R6W
14	—	Little Pine Creek at State Road 26	Sec. 14, T23N, R6W
15	—	Little Pine Creek at County Road 800 West	Sec. 1, T23N, R6W
16	24	Little Pine Creek at U.S. 52	Sec. 36, T24N, R6W
17	—	Little Pine Creek at County Road 500 North	Sec. 30, T24N, R5W
18	—	Otterbein Ditch at County Road 500 North	Sec. 34, T24N, R6W
19	2	Flint Creek at Turner Road (Burnett's Reserve)	Sec. 1, T22N, R6W
20	1	Flint Creek at County Road 510 South (Burnett's Reserve)	Sec. 4, T22N, R6W
21	—	Flint Run at County Road 600 South	Sec. 19 and 30, T22N, R5W
22	28	Indian Creek at Division Road	Sec. 24, T23N, R6W
23	27	Indian Creek at the mouth of Goose Creek	Sec. 18, T23N, R5W
24	26	Indian Creek at County Road 400 West	Sec. 4, T23N, R5W
25	—	Indian Creek at County Road 600 North	Sec. 23, T24N, R5W
26	—	Wea Creek at Eli Lilly Road	Sec. 2, T22N, R5W
27	—	Wea Creek at State Road 25	Sec. 1, T22N, R5W
28	9	Wea Creek at the mouth of Little Wea Creek	Sec. 12, T22N, R5W
29	8	Wea Creek at County Road 200 East	Sec. 22, T22N, R4W
30	7	Wea Creek at County Road 800 South	Sec. 35, T22N, R4W Sec. 2, T21N, R4W
31	6	Wea Creek at County Road 100 East	Sec. 9, T21N, R4W
32	5	Wea Creek at State Road 43/U.S. 231	Sec. 17, T21N, R4W
33	4	Kellerman Leaming Ditch at State Road 28	Sec. 18, T21N, R4W
34	3	Loafland Ditch at County Road 1200 South	Sec. 30, T21N, R4W
35	—	Wea Creek side channel at Eli Lilly Road	Sec. 2, T22N, R5W
36	14	Little Wea Creek at its mouth	Sec. 12, T22N, R5W
37	—	Little Wea Creek at County Road 500 South	Sec. 18 and 19, T22N, R4W
38	13	Little Wea Creek at County Road 800 South	Sec. 1, T21N, R5W
39	12	Montgomery Ditch at County Road 950 South	Sec. 10, T21N, R5W
40	11	Montgomery Ditch at State Road 28	Sec. 16 and 21, T21N, R5W
41	10	Kenny Ditch at County Road 250 East	Sec. 22, T22N, R4W
42	29	Burnett's Creek at Burnett's Road	Sec. 27 and 34, T24N, R4W
43	—	Burnett's Creek at State Road 225 (Battle Ground)	Sec. 23, T24N, R4W
44	—	Burnett's Creek at County Road 650 North	Sec. 19, T24N, R4W
45	—	North Fork Burnett's Creek at County Road 650 North	Sec. 21, T24N, R4W

Table 1. Site locations (C&S = Curry and Spacie, 1978). The single, solid lines separate sites by watershed.

Site	C&S	Location	Map Section
46	21	Wildcat Creek at its mouth	Sec. 3, T23N, R4W
47	20	Wildcat Creek at Eisenhowser Road	Sec. 14, T23N, R4W
48	19	North Fork Wildcat Creek at County Road 900 East	Sec. 10, T23N, R3W
49	—	North Fork Wildcat Creek at County Line Road	Sec. 12, T23N, R3W
50	—	South Fork Wildcat Creek at County Road 100 North	Sec. 17 and 20, T23N, R3W
51	18	South Fork Wildcat Creek at State Road 26	Sec. 21, T23N, R3W
52	16	South Fork Wildcat Creek at County Road 200 South	Sec. 4, T22N, R3W
53	15	South Fork Wildcat Creek at Wyndotte Road	Sec. 22, T22N, R3W
54	—	South Fork Wildcat Creek at County Road 900 East	Sec. 26, T22N, R3W
55	17	Middle Fork Wildcat Creek at County Road 900 East	Sec. 26 and 27, T23N, R3W
56	—	Lauramie Creek at New Castle Road	Sec. 34, T22N, R3W
57	—	Lauramie Creek at U.S. 52	Sec. 10, T21N, R3W
58	—	Buck Creek at Stair Road	Sec. 30, T24N, R3W
59	23	Buck Creek at County Road 600 East	Sec. 30, T24N, R3W
60	—	Sugar Creek at its mouth	Sec. 20, T24N, R3W
61	22	Sugar Creek at County Road 775 East	Sec. 21, T24N, R3W
62	—	Tippecanoe River at its mouth	Sec. 20, T24N, R3W
63	—	Tippecanoe River at riffle below Moot's Creek	Sec. 17, T24N, R3W
64	—	Tippecanoe River at 2nd island below Pretty Prairie Road	Sec. 8 and 9, T24N, R3W
65	—	Tippecanoe River at Pretty Prairie Road	Sec. 9, T24N, R3W
66	—	Moot's Creek at its mouth	Sec. 8, T24N, R3W
67	30	Moot's Creek at Pretty Prairie Road	Sec. 8, T24N, R3W
68	—	Moot's Creek at Tyler Road	Sec. 5, T24N, R3W
69	—	Bowen's Ditch at County Road 950 North	Sec. 2 and 3, T24N, R3W
70	—	Bridge Creek downstream from State Road 25	Sec. 11, T24N, R3W

can be compared; and 3) compare the current Tippecanoe County fish community with that found in past surveys.

MATERIALS AND METHODS

Fish were collected from 70 sites in Tippecanoe County between June and December 1994 (Figure 1; Table 1). The original intent of the project was to resample the 39 sites where species lists were compiled by Curry and Spacie (1978). As the survey progressed, however, we realized that the distribution records for Tippecanoe County fishes would be incomplete without including sites from the Tippecanoe River, Bowen's Ditch, Lauramie Creek, Big Shawnee Creek, Flint Run, Otterbein Ditch, and Bridge Creek, sites which had not been sampled during any of the previous surveys. Additional sites were also strategically selected from other drainages where gaps in distributional information existed.

A variety of methods were utilized during the survey, including backpack (Smith-Root, Type VII), long-line, and boat (Smith-Root, Type VI-A) electrofishing techniques, seining, and a combination of backpack electrofishing and kick-seining. Each site was first sampled using one of the three electrofishing

methods. The exact distance and time sampled were recorded at each site so that collection effort could be duplicated in future studies. One-thousand-meter reaches were sampled with two boat electrofishing passes at all Wabash River sites. Collection effort at non-Wabash River sites was determined by the unique habitats that existed at each of these sites. Generally, two riffle-run-pool sequences were sampled, if present. Otherwise, the sites were sampled until new species were no longer being collected.

After a standard electrofishing pass was completed at each site, additional sampling methods were employed if the site characteristics warranted them. The additional methods included seining at most sites and backpack electrofishing or a combination of backpack electrofishing and kick-seining at some boat sites. The combination of backpack electrofishing and kick-seining was particularly useful at some of the Wabash River and Tippecanoe River sites. Using this method, one person would securely position a large dip net or small seine on the bottom of the river. Another person, using backpack electrofishing equipment, would walk slowly downstream towards the netter while kicking the substrate. This technique was very effective in collecting darter and madtom species from rocky run and riffle stretches of the Wabash and Tippecanoe Rivers, which could not be adequately sampled using more conventional methods.

RESULTS AND DISCUSSION

New Species Collected During 1994. Thirteen of the 97 fish species collected from Tippecanoe County during 1994 (Table 2) were new records for the County and included the spotted gar (*Lepisosteus oculatus*), threadfin shad (*Dorosoma petenense*), central mudminnow (*Umbra limi*), streamline chub (*Erimystax dissimilis*), silver chub (*Macrhybopsis storeriana*), channel shiner (*Notropis wickliffi*), southern redbelly dace (*Phoxinus erythrogaster*), mountain madtom (*Noturus eleutherus*), hybrid striped bass (*Morone chrysops* x *M. saxatilis*), redear sunfish (*Lepomis microlophus*), slenderhead darter (*Percina phoxocephala*), dusky darter (*P. sciera*), and river darter (*P. shumardi*). Most species were recorded from more than one site, and several were fairly common. The dusky darter was collected from 18 of the 70 sites; the streamline chub, central mudminnow, and slenderhead darter at five; and the silver chub at four sites. The abundance of the dusky darter during the present survey suggests that this species may have been misidentified during previous surveys. Curry and Spacie (1978) did not list the dusky darter, but they recorded the blackside darter from three sites in the Wildcat Creek drainage. In the present survey, the blackside darter was not recorded from the Wildcat Creek drainage, but the dusky darter was collected from eight of twelve sites, including two of the three sites where the blackside darter had previously been recorded. Voucher specimens were not available for re-examination to verify this possible misidentification.

The streamline chub, slenderhead darter, river darter, and mountain madtom were collected almost exclusively from rocky runs of the Tippecanoe and/or Wabash Rivers, where they were often locally abundant. Their dependence on

Table 2. List of all known fish species collected from Tippecanoe County, Indiana. Site numbers accompany those species collected during 1994. The literature citations represent the last records for those species not collected during 1994.

Species	Collection Site
Petromyzontidae	
Lampetra appendix, American brook lamprey	49 (adult); 26, 27, 42, 49, 67 (ammocoete)
Ichthyomyzon unicuspis, silver lamprey	1, 4, 11 (adult); 49, 51, 53, 64 (ammocoete)
Polyodontidae	
Polyodon spathula, paddlefish	7
Acipenseridae	
Scaphirhynchus platorynchus, shovelnose sturgeon	1, 3, 4, 7, 8, 10
Lepisosteidae	
Lepisosteus oculatus, spotted gar	62
L. osseus, longnose gar	1-11, 26, 53, 62
L. platostomus, shortnose gar	1-6, 9, 11, 26
Amiidae	
Amia calva, bowfin	1, 2, 7
Anguillidae	
Anguilla rostrata, American eel	Curry and Spacie (1978)
Clupeidae	
Alosa chrysochloris, skipjack herring	2, 4, 7, 10
Dorosoma cepedianum, gizzard shad	1-11, 46, 48, 49, 51, 52, 62, 67
D. petenense, threadfin shad	62
Hiodontidae	
Hiodon alosoides, goldeye	1, 3, 6, 7, 10
H. tergisus, mooneye	1-3, 5-7, 9-11, 62
Umbridae	
Umbra limi, central mudminnow	26, 28, 35, 36, 70
Esocidae	
Esox americanus vermiculatus, grass pickerel	12, 15, 16, 18, 32, 35, 39
E. lucius, northern pike	Curry and Spacie (1978)
Cyprinidae	
Campostoma anomalum, central stoneroller	1-4, 8, 12-14, 19-34, 36-61, 65-70
Cyprinella spiloptera, spotfin shiner	1-11, 14, 22, 25, 26, 28-31, 36, 42, 46-56, 58, 60, 62-68, 70
C. whipplei, steelcolor shiner	1-9, 11, 26, 28, 42, 46-52, 60, 62-68
Cyprinus carpio, carp	1-11, 14-17, 26, 31, 33, 46, 51-53, 62, 69
Ericymba buccata, silverjaw minnow	1-4, 7, 10, 13, 19-23, 26, 28, 29, 31, 32, 34, 36-38, 40-42, 44-46, 49-51, 53, 55-57, 59, 61, 65-68
Erimystax dissimilis, streamline chub	5, 8, 48, 62, 63
E. x-punctata, gravel chub	4, 5, 8, 10, 63, 65
Extrarius aestivalis, speckled chub	1, 5, 7, 8, 10, 46, 63, 65
Hybognathus nuchalis, Mississippi silvery minnow	4
Hybopsis amblops, bigeye chub	1, 4, 7, 13, 21, 28, 29, 49, 50-53, 55, 56, 64, 65, 67, 68
Luxilus chrysocephalus, striped shiner	1, 2, 3, 5, 6, 12-14, 19-23, 26-30, 33, 34, 36- 48, 51-58, 60, 61, 65, 67, 68
Lythrurus umbratilis, redfin shiner	12, 14, 15, 17, 24, 25, 31-33
Macrhybopsis storeriana, silver chub	1, 2, 4, 62

Table 2. *(continued)*

Species	Collection Site
Nocomis biguttatus, hornyhead chub	27, 58, 61, 66, 67
N. micropogon, river chub	19, 20, 22, 26-30, 36, 37, 42, 46-56, 60, 61, 63, 66-68
Notemigonus crysoleucas, golden shiner	9, 17
Notropis atherinoides, emerald shiner	1-4, 6-11, 26, 46, 49, 62, 63, 66, 67
N. blennius, river shiner	1, 3, 4, 8, 10, 26, 46, 66
N. dorsalis, bigmouth shiner	Erman and Mumford (unpublished data)
N. ludibundus, sand shiner	1-8, 10, 11, 22, 26, 28-34, 42, 46-54, 56, 63, 65-68
N. rubellus, rosyface shiner	1-3, 6, 8, 26, 28-31, 52, 53, 55, 56, 66-68
N. volucellus, mimic shiner	29, 30, 50, 68
N. wickliffi, channel shiner	2-4, 7, 8, 28, 50, 62, 68
Opsopoeodus emiliae, pugnose minnow	Gerking (1945); Erman and Mumford (unpublished data)
Phenacobius mirabilis, suckermouth minnow	1, 3, 8-10, 13, 19, 22, 27, 46-51, 55, 60, 63, 66-68
Phoxinus erythrogaster, southern redbelly dace	58, 59
Pimephales notatus, bluntnose minnow	1-3, 6-17, 19-34, 36-40, 42-62, 65-70
P. promelas, fathead minnow	7, 54, 69
P. vigilax, bullhead minnow	1-4, 6-11, 46, 62, 64, 65
Rhinichthys atratulus, blacknose dace	5, 7, 8, 10-12, 19, 20, 22-25, 27, 28, 30, 34, 36-46, 51, 55-61, 67-70
Semotilus atromaculatus, creek chub	1-3, 7, 12-26, 28-34, 36-46, 48, 49, 51, 53, 55-61, 65, 67-70
Catastomidae	
Cycleptus elongatus, blue sucker	1, 3-6, 8-10
Carpiodes carpio, river carpsucker	1-11, 29, 46, 64, 65, 68
C. cyprinus, quillback	1-5, 7, 9, 10, 62
C. velifer, highfin carpsucker	6, 8-10, 47
Catostomus commersoni, white sucker	7, 12, 14-17, 19, 21-34, 36-45, 52, 54, 56, 57, 60, 61, 65, 67-70
Erimyzon oblongus, creek chubsucker	12, 14-18, 33-35
Hypentelium nigricans, northern hogsucker	3-5, 7-11, 13, 15, 19-21, 26-34, 36-39, 41-44, 46-58, 60-63, 65-68
Ictiobus bubalus, smallmouth buffalo	1-11
I. cyprinellus, bigmouth buffalo	3-5, 7, 11
I. niger, black buffalo	Curry and Spacie (1978)
Lagochila lacera, harelip sucker	Evermann and Jenkins (1892)
Minytrema melanops, spotted sucker	2, 9, 14, 15, 31, 33, 46, 60
Moxostoma anisurum, silver redhorse	1-3, 5-11, 42, 49, 51, 53, 54, 60, 62, 64, 65
M. carinatum, river redhorse	6, 8, 10, 11
M. duquesnei, black redhorse	2-4, 6-11, 22, 28, 29, 46, 49-55, 62, 65, 68
M. erythrurum, golden redhorse	1-11, 29-32, 36, 47-49, 51, 54, 55, 60, 62, 66, 67, 69
M. macrolepidotum, shorthead redhorse	2-11, 47-50, 52, 60, 62, 64-66, 69
Ictaluridae	
Ameiurus melas, black bullhead	14, 16, 17, 51
A. natalis, yellow bullhead	9, 13-17, 22, 25, 27, 30-32, 34, 38, 44, 45, 51, 55-57, 60, 61, 64, 67, 68
Ictalurus punctatus, channel catfish	1-11, 26, 28, 36, 42, 46, 49, 64, 65, 67
Noturus eleutherus, mountain madtom	8, 10
N. flavus, stonecat	3, 10, 13, 14, 19, 26, 27, 33, 46, 49, 51, 55, 60, 61, 67
N. gyrinus, tadpole madtom	60
N. miurus, brindled madtom	53, 65
Pylodictis olivaris, flathead catfish	1-4, 6-9, 46, 50, 65
Gadidae	
Lota lota, burbot	Curry and Spacie (1978)

Table 2. *(continued)*

Species	Collection Site
Fundulidae	
Fundulus notatus, blackstripe topminnow	14, 15
Atherinidae	
Labidesthes sicculus, brook silverside	65
Moronidae	
Morone chrysops, white bass	3, 4, 6, 9, 10
M. chrysops x *M. saxatilis*, hybrid striped bass	9, 10
Centrarchidae	
Ambloplites rupestris, rock bass	11, 19, 20, 26-32, 34, 36, 42, 43, 46, 48, 49, 51-53, 55, 56, 60-66,68
Lepomis cyanellus, green sunfish	1, 3, 9-12, 14-26, 28-32, 35, 38, 42-46, 50-53, 55, 56, 60, 61, 63, 65, 67, 68, 70
L. gulosus, warmouth	Erman and Mumford (unpublished data)
L. humilis, orangespotted sunfish	2, 64, 65
L. macrochirus, bluegill	1-5, 7-9, 11, 19, 22-24, 26, 28, 36, 45, 46, 49, 51-53, 60, 62, 63, 65, 66
L. megalotis, longear sunfish	2-4, 6-17, 19-21, 24, 26, 28-34, 36-39, 42, 43, 46, 49-57, 60, 62-68
L. microlophus, redear sunfish	51
Micropterus dolomieu, smallmouth bass	1-4, 6-11, 13, 19-21, 26-30, 36-39, 46-56, 60, 62-65, 67, 68
M. punctulatus, spotted bass	1-11, 14, 24-26, 28, 35, 46, 47, 49-51, 53, 62, 64-68
M. salmoides, largemouth bass	7, 14, 32
Pomoxis annularis, white crappie	1, 3, 8-11, 15, 51
P. nigromaculatus, black crappie	7, 62
Percidae	
Ammocrypta pellucida, eastern sand darter	Gerking (1945); Erman and Mumford (unpublished data); Curry and Spacie (1978)
Etheostoma blennioides, greenside darter	6, 10-14, 21, 26-31, 33, 34, 36-39, 46-56, 60, 62-65, 68
E. caeruleum, rainbow darter	1-4, 6, 8, 11, 13, 19-21, 26-28, 36, 37, 39, 40, 49-56, 63-68
E. camurum, bluebreast darter	10
E. flabellare, fantail darter	11, 13, 19-21, 26-28, 36-39, 55-57, 60
E. microperca, least darter	Erman and Mumford (unpublished data)
E. nigrum, johnny darter	2, 4, 9-12, 14, 15, 17, 18, 21, 23-27, 29-32, 34, 37-39, 42, 44-46, 49, 51, 53, 55-58, 60, 63-68
E. spectabile, orangethroat darter	11, 12, 19-21, 24-26, 28-32, 36-41, 49, 51, 53, 56, 57, 68
Perca flavescens, yellow perch	Gerking (1945); Curry and Spacie (1978)
Percina caprodes, logperch	2, 10, 48, 64, 65
P. copelandi, channel darter	Gerking (1945)
P. maculata, blackside darter	14, 62
P. phoxocephala, slenderhead darter	4, 11, 63-65
P. sciera, dusky darter	4, 10, 15, 26, 42, 46, 48-51, 53, 55, 56, 63-67
P. shumardi, river darter	10, 65
Stizostedion canadense, sauger	3-6, 8-11, 46, 65
S. vitreum, walleye	1, 6, 8, 10, 11, 62
Sciaenidae	
Aplodinotus grunniens, freshwater drum	1-11, 46
Cottidae	
Cottus bairdi, mottled sculpin	8, 12-14, 19-24, 26-31, 33, 34, 36, 38-45, 51, 52, 55-58, 60, 61, 67, 68, 70

this habitat limited their distribution. These species were most easily captured using the combination of backpack electrofishing and kick-seining. The only specimens of the mountain madtom were collected using this combination. These species were probably not collected during previous sampling efforts because their preferred habitats were inadequately sampled or, in the case of the Tippecanoe River, not sampled at all.

A thriving population of the central mudminnow was also found in a rather unique habitat. The central mudminnow was one of the most abundant, by number, of all the species found in an oxbow-like side channel near the mouth of Wea Creek. This refuge holds a seed population from which the species disperses to surrounding areas, as the central mudminnow was also collected from three of the four closest sites sampled on Wea Creek.

The silver chub was only collected from Wabash River sites and at the mouth of the Tippecanoe River. Specimens collected during the present survey were quite distinct and, if present during past surveys, would probably not have been overlooked. Gammon (1995b) has reported collecting silver chub in Tippecanoe County since the mid-1970's. The species' current presence in the County may be a result of the natural extension of its range upstream on the Wabash River over the last twenty years.

The channel shiner was recently recognized as a species distinct from the mimic shiner (*Notropis volucellus*; Gong and Cavender, 1991). During Gerking's (1945) survey, three mimic shiner subspecies were recognized: the northern mimic shiner (*Notropis v. volucellus*), channel mimic shiner (*N. v. wickliffi*), and ghost mimic shiner (*N. v. buchanani*). Unfortunately, the distributions of these three subspecies were not separated out when the mimic shiner's distribution was mapped. The channel shiner may have been present in Tippecanoe County when Gerking (1945) and Curry and Spacie (1978) collected, as both recorded the mimic shiner.

Other new additions to the County's species list were collected more rarely during the present survey. The southern redbelly dace was collected from two sites, both on Sugar Creek, a small tributary in the northeastern section of the County. The absence of this species from previous surveys could be the result of its limited range, or its current presence could be the result of human introduction and/or natural movements. The hybrid striped bass now occurs in the County as a result of stockings in the reservoirs upstream from Tippecanoe County on the Tippecanoe and Wabash Rivers. Single specimens of spotted gar, threadfin shad, and redear sunfish were collected during the present survey. If they inhabited the County during past surveys, they must have been rare.

Historically Uncommon Species Collected During 1994. The spotted bass (*Micropterus punctulatus*), tadpole madtom (*Noturus gyrinus*), and bluebreast darter (*Etheostoma camurum*) were collected during the current survey and were also recorded by Gerking (1945) or by Erman and Mumford (unpublished data). However, these species were not collected by Curry and Spacie (1978). The spotted bass was very common during the present survey. This species was collect-

ed from 29 of the 70 sites sampled and had been reported by both Gerking (1945) and Erman and Mumford (unpublished data). The spotted bass was probably misidentified as the largemouth bass (*Micropterus salmoides*) by Curry and Spacie (1978). The tadpole madtom was reported by Erman and Mumford (unpublished data) from a single location on Little Pine Creek. During the present survey, a single specimen was collected from Sugar Creek. This species was probably present in Tippecanoe County when Curry and Spacie (1978) sampled, but it was rare. The bluebreast darter was last recorded by Gerking (1945), who collected it from the South Fork of Wildcat Creek. The only specimens of the bluebreast darter collected during the entire study were captured from a rocky run on the Wabash River using the combination of backpack electrofishing and kick-seining. This habitat may have been inadequately sampled in the past.

Historic Species Not Collected During 1994. The American eel (*Anguilla rostrata*), northern pike (*Esox lucius*), black buffalo (*Ictiobus niger*), burbot (*Lota lota*), yellow perch (*Perca flavescens*), and eastern sand darter (*Ammocrypta pellucida*) were recorded by Curry and Spacie (1978) but were not collected during the current survey. These species were probably never common in Tippecanoe County, as none were recorded from more than three sites by Curry and Spacie (1978). Only one specimen of the northern pike was collected during seven years of sampling from the Wabash River. Each Wabash River site was visited only once during the present survey. Curry and Spacie (1978) also employed techniques (hoop and D-nets) that we did not use. They state that the burbot, although rare, was occasionally collected during spring D-net sampling. These species could still persist in low numbers in Tippecanoe County, but, because each site was sampled only once, and certain species-specific methods were not employed, they were not recorded in 1994.

Of the six species, only the yellow perch and eastern sand darter were also recorded by either Gerking (1945) or Erman and Mumford (unpublished data). The absence of the eastern sand darter, a state species of special concern, was the most discouraging, as this species had been recorded during all three previous surveys. Mumford (pers. comm.), who observed the eastern sand darter at the mouth of Wildcat Creek for many years, expressed concern that the population had recently become extirpated. He has not recorded a specimen from the site for several years. Further collecting effort should be expended to confirm the extirpation of the eastern sand darter from the County.

Six species reported by either Gerking (1945) or Erman and Mumford (unpublished data) were not found by Curry and Spacie (1978) or during our survey: the bigmouth shiner (*Notropis dorsalis*), pugnose minnow (*Opsopoeodus emiliae*), harelip sucker, warmouth (*Lepomis gulosus*), least darter (*Etheostoma microperca*), and channel darter (*Percina copelandi*). Inclusion of the harelip sucker (now extinct) in the County list is questionable. Evermann and Jenkins (1892) examined specimens of this species from the "Tippecanoe River, west of Delphi," and they were told that it also occurred in the Wabash River. Whether the harelip sucker ever inhabited Tippecanoe County is questionable. Inclusion

of the channel darter is also questionable since the dot on the Wabash River in Tippecanoe County on Gerking's (1945) distribution map is contradicted by the accompanying text which states that the species was only found in Fountain and Warren Counties. Even if Gerking (1945) was in error, the sites listed in the text are relatively close to Tippecanoe County. Recent evidence suggests that the channel darter may still occur here. Carney, *et al.* (1993) recorded the species from the Tippecanoe River in Carroll County, just upstream from the Tippecanoe County Line, and Page (1983) recorded the channel darter from two sites on the Wabash River just upstream from Tippecanoe County.

The pugnose minnow was reported by both Gerking (1945) and Erman and Mumford (unpublished data) but has not been reported since. The warmouth, least darter, and bigmouth shiner have only been reported by Erman and Mumford (unpublished data). The warmouth was collected from a pond at the Purdue-Baker Wildlife Area, where the species may have been introduced (Erman and Mumford, unpublished data). Since Erman and Mumford's collections, this pond has been drained several times. Therefore, the continued existence of the warmouth at this location seems highly unlikely. However, this and other pond habitats, where the warmouth is more likely to occur, were not sampled during the present survey, and the current status of this species is unknown. Erman and Mumford (unpublished data) recorded the least darter and bigmouth shiner only once from Moot's and Sugar Creeks, respectively. The bigmouth shiner has only been recorded at two other sites in Indiana and may have been misidentified by Erman and Mumford (unpublished data). Voucher specimens could not be located to confirm the identification of the least darter and bigmouth shiner. If these two species still occur in Tippecanoe County, they must be extremely rare.

Fish Community Composition in 1994. Several species were very common in the Wabash River tributaries during the present survey. Seventeen species were collected from at least 50% of the 59 non-Wabash sites sampled (Table 3). The bluntnose minnow (*Pimephales notatus*), central stoneroller (*Campostoma anomalum*), and creek chub (*Semotilus atromaculatus*) were all collected at more than 75% of the sites. Several species, although not common in the tributaries, were very common in the Wabash River (Table 3). Ten species were found at all eleven Wabash River sites, and seven others were collected from ten sites. Thirty species had distributions limited to the Wabash River, Tippecanoe River, or the mouth of Wildcat Creek (16 total sites). Of these species, the shovelnose sturgeon (*Scaphirhynchus platorynchus*), mooneye (*Hiodon tergisus*), gravel chub (*Erimystax x-punctata*), speckled chub (*Extrarius aestivalis*), bullhead minnow (*Pimephales vigilax*), blue sucker (*Cycleptus elongatus*), smallmouth buffalo (*Ictiobus bubalus*), sauger (*Stizostedion canadense*), walleye (*S. vitreum*), and freshwater drum (*Aplodinotus grunniens*) were collected from six or more of the 16 sites. The American brook lamprey (*Lampetra appendix*), central mudminnow, grass pickerel (*Esox americanus vermiculatus*), redfin shiner (*Lythrurus umbratilis*), hornyhead chub, creek chubsucker (*Erimyzon*

Table 3. Most common species collected during 1994.

Overall	#/70	Wabash River Tributaries	#/59	Wabash River	#/11
Pimephales notatus	63	*Pimephales notatus*	54	*Lepisosteus osseus*	11
Campostoma anomalum	56	*Campostoma anomalum*	51	*Dorosoma cepedianum*	11
Semotilus atromaculatus	53	*Semotilus atromaculatus*	49	*Cyprinella spiloptera*	11
Hypentelium nigricans	51	*Hypentelium nigricans*	43	*Cyprinus carpio*	11
Lepomis megalotis	51	*Lepomis megalotis*	42	*Carpiodes carpio*	11
Luxilus chrysocephalus	46	*Luxilus chrysocephalus*	41	*Ictiobus bubalus*	11
Lepomis cyanellus	44	*Catostomus commersoni*	41	*Moxostoma erythrurum*	11
Cyprinella spiloptera	42	*Lepomis cyanellus*	39	*Ictalurus punctatus*	11
Catostomus commersoni	42	*Cottus bairdi*	37	*Micropterus punctulatus*	11
Etheostoma nigrum	42	*Etheostoma nigrum*	37	*Aplodinotus grunniens*	11
Micropterus dolomieu	41	*Rhinichthys atratulus*	34	*Cyprinella whipplei*	10
Ericymba buccata	40	*Ericymba buccata*	34	*Notropis atherinoides*	10
Rhinichthys atratulus	39	*Etheostoma blennioides*	33	*Notropis ludibundus*	10
Cottus bairdi	38	*Cyprinella spiloptera*	31	*Pimephales vigilax*	10
Notropis ludibundus	36	*Micropterus dolomieu*	31	*Moxostoma anisurum*	10
Etheostoma blennioides	36	*Ambloplites rupestris*	29	*Moxostoma macrolepidotum*	10
Nocomis micropogon	35	*Nocomis micropogon*	28	*Micropterus dolomieu*	10

#/70 = The number of sites at which each listed species was found out of the 70 total sites that were sampled in the current survey.
#/59 = The number of sites at which each listed species was found out of the 59 Wabash River tributary sites.
#/11 = The number of sites at which each listed species was found out of the 11 Wabash River mainstem sites.

oblongus), black bullhead (*Ameiurus melas*), tadpole madtom, blackstripe topminnow (*Fundulus notatus*), and redear sunfish were never collected from the Wabash or Tippecanoe Rivers. Eight species were collected from only one site during the present survey: paddlefish (*Polyodon spathula*), spotted gar, threadfin shad, Mississippi silvery minnow (*Hybognathus nuchalis*), tadpole madtom, brook silverside (*Labidesthes sicculus*), redear sunfish, and bluebreast darter.

Of the 70 sites sampled, site 10 (Wabash River at the mouth of the Tippecanoe River) was the most diverse with 49 species collected. More than 40 species were collected from seven of the eleven Wabash River sites; the Wabash River sites averaged 40 species. The most diverse fish community of the non-Wabash River sites was found at site 65 on the Tippecanoe River, where 37 species were collected. Thirty or more species were collected from eight Wabash tributary sites: Wea Creek (site 26), Wildcat Creek (46), North Fork Wildcat Creek (49), South Fork Wildcat Creek (51), the Tippecanoe River (62 and 65), and Moot's Creek (67 and 68). Generally, species diversity increased with increasing drainage area. Utilizing a variety of collection methods was very beneficial in increasing the number of species that were collected from each site. Seining at smaller stream sites almost always resulted in the discovery of at least one or two additional species, even after extensive electrofishing had been completed. At boat electrofishing sites, additional collection methods yielded, on the average, ten additional species per site.

Although specific comparisons of species distribution and abundance can not be made between Curry and Spacie (1978) and our survey, some general trends are evident. Besides the spotted bass and dusky darter, which have already been discussed, other species have seemingly increased their range and abundance in the County since the 1970's (Table 4). During the present survey, the bullhead minnow and steelcolor shiner (*Cyprinella whipplei*) were both collected from ten of eleven Wabash River sites, and the blue sucker was collected from eight. Curry and Spacie (1978) did not record the bullhead minnow or steelcolor shiner from any of their nine Wabash River sites, and they collected the blue sucker from only one. Both the bullhead minnow and steelcolor shiner may have been misidentified by Curry and Spacie (1978). If so, the perceived increase in abundance is merely a reflection of this error. However, the blue sucker could hardly be misidentified. Curry and Spacie (1978) "sighted one blue sucker while electrofishing in the Wabash River. . . ." during seven years of collecting. During the current survey, this species was collected from eight of eleven Wabash River sites. The results of this survey and those of Gammon (1993, 1995a) demonstrate the remarkable recovery this species has made over the past twenty years. The increase in the blue sucker was one of several signs that the Wabash River may be supporting a much more abundant and diverse fish community than it did two decades ago.

Hypothetical Species. Several species have never been recorded from within Tippecanoe County but may now occur (or may soon occur) there. The Tippecanoe darter (*Etheostoma tippecanoe*) has been collected from the Tippecanoe River just upstream from the County Line (Ecological Specialist, Inc., 1993; Simon, unpublished data). If more sites had been sampled within Tippecanoe County on the Tippecanoe River, this species may well have been discovered. The western mosquitofish (*Gambusia affinis*), a species widely stocked for mosquito control, has probably been introduced into some small ponds or wetland areas in the County. It will only be a matter of time before this species is found in the streams and rivers of the County. The goldfish (*Carassius auratus*) probably occurs in the County but remains rare. Records for other exotics, such as the grass carp (*Ctenopharyngodon idella*) and bighead carp (*Hypopthalmichthys nobilis*), have been on the rise across Indiana in the last few years and will probably be reported from Tippecanoe County in the near future.

Conclusions. Some may question the usefulness of collecting fish from within political boundaries because fish do not recognize county lines. However, studying the fauna of a region containing several different watersheds can provide important information about the statewide distribution of certain fish species. As noted in the present survey, several new species now occur in Tippecanoe County, possibly as the result of range extensions, either by natural or anthropogenic means. Also, the ranges of rarer species can be better defined as the result of intensive collecting in a region of the State rather than in only one watershed. Important information about the current distribution of the bluebreast darter (state endangered), blue sucker, river redhorse, and eastern sand darter (all state species of special concern) was provided by the present survey.

Table 4. Species with the greatest percent increase in occurrence from the 39 sites shared by both Curry and Spacie (1978) and our survey. Only those species found from at least three of the overall and Wabash River tributaries sites and two of the Wabash River sites during the 1994 survey are compared.

Overall (#/39)	'78	'94	Wabash River Trib. (#/30)	'78	'94	Wabash River (#/9)	'78	'94
Micropterus punctulatus	0	16	*Micropterus punctulatus*	0	7	*Micropterus punctulatus*	0	9
Percina sciera	0	9	*Percina sciera*	0	7	*Cyprinella whipplei*	0	8
Pimephales vigilax	1	9	*Notropis ludibundus*	2	17	*Pimephales vigilax*	0	8
Cyprinella whipplei	2	16	*Cyprinus carpio*	1	7	*Etheostoma caeruleum*	0	6
Cycleptus elongatus	1	6	*Ameiurus natalis*	2	12	*Rhinichthys atratulus*	0	4
Ambloplites rupestris	3	18	*Ambloplites rupestris*	3	17	*Notropis rubellus*	0	4
Ameiurus natalis	2	12	*Moxostoma erythrurum*	2	10	*Etheostoma blennioides*	0	3
Lepomis macrochirus	4	17	*Lepomis macrochirus*	2	10	*Macrhybopsis storeriana*	0	3
Notropis rubellus	3	12	*Dorosoma cepedianum*	1	5	*Percina phoxocephala*	0	2
Ictalurus punctatus	4	14	*Ictalurus punctatus*	1	5	*Percina sciera*	0	2
Noturus flavus	3	10	*Hybopsis amblops*	2	8	*Noturus flavus*	0	2
Etheostoma flabellare	3	9	*Cyprinella whipplei*	2	8	*Cycleptus elongatus*	1	6
Erimystax x-punctata	1	3	*Lepomis cyanellus*	6	20	*Stizostedion vitreum*	1	4
Lepomis cyanellus	8	24	*Micropterus dolomieu*	6	17	*Lepomis macrochirus*	2	7
Erimyzon oblongus	1	3	*Etheostoma flabellare*	3	8	*Erimystax x-punctata*	1	3
Hybopsis amblops	4	11	*Notropis rubellus*	3	8	*Ictalurus punctatus*	3	9
Micropterus dolomieu	10	25	*Noturus flavus*	3	8	*Carpiodes cyprinus*	3	7

#/39 = The number of sites at which each listed species was found out of the 39 sites that were sampled by Curry and Spacie.

#/30 = The number of sites at which each listed species was found out of the 30 Wabash River tributary sites sampled by Curry and Spacie.

#/9 = The number of sites at which each listed species was found out of the 9 Wabash River mainstem sites samples by Curry and Spacie.

Ninety-seven species of fish, of which 13 were new county records, were collected from 70 sites sampled in Tippecanoe County during 1994; 12 species recorded during previous surveys were not collected. The addition of several new species and the range extension and increased abundance of several others suggest that the water quality, especially of the Wabash River, has improved over the last two decades in Tippecanoe County. Tippecanoe County has and continues to support a diverse fish community (109 species of fish have now been recorded). The methods by which the present survey were conducted have successfully provided baseline data to which future surveys can be significantly and accurately compared. The authors of this study hope to continue their investigation of Tippecanoe County fishes into the 21st Century.

ACKNOWLEDGMENTS

The authors would like to express their appreciation to John Stanley and Dave Caylor who volunteered their time to help net fish from the Wabash River. Although the U.S. Environmental Protection Agency funded a portion of this study, no Agency endorsement should be inferred.

ADDENDUM

Several new species have been collected from Tippecanoe County since the initial survey was completed in 1994. The bighead carp (1997) and grass carp (1998) were both caught by local anglers from a pond connected to the Wabash River at site 7 (Dave Kellam, pers. comm.). The pirate perch (*Aphredoderus sayanus*) was collected by the authors during sampling in 1996 at site 65 on the Tippecanoe River, and western mosquitofish was collected during 1998 between sites 36 and 37 on the Wabash River. The addition of these four species brings the known total recorded from Tippecanoe County to 113.

LITERATURE CITED

Carney, D.A., L.M. Page, and T.M. Keevin. 1993. Fishes of the Tippecanoe River, Indiana: An outstanding Midwestern stream. Proc. Indiana Acad. Sci. 101: 201-219.

Cope, E.D. 1871. A partial synopsis of the fishes of the fresh waters of North Carolina. Proc. Amer. Phil. Soc. 11: 448-495.

Curry, K.D. and A. Spacie. 1978. Distribution of stream fishes in Tippecanoe County, Indiana. Proc. Indiana Acad. Sci. 87: 182-188.

Ecological Specialists, Inc. 1993. Mussel habitat suitability and impact analysis of the Tippecanoe River. Final Rep. Nongame Endangered Wildl. Prog., Div. Fish Wildl., Indiana Dep. Natur. Res., Indianapolis, Indiana, 102 pp.

Evermann, B.M. and O.P. Jenkins. 1892. Notes on Indiana fishes. Rep. State Fish Comm. 1892: 108-127.

Gammon, J.R. 1993. The Wabash River: Progress and promise. *In:* L.W. Hesse, C.B. Stalnaker, N.G. Benson, and J.R. Zuboy (Eds.), *Restoration Planning for the Rivers of the Mississippi River Ecosystem*, pp. 142-161, Biol. Rep. 19, Nat. Biol. Surv., U.S. Dep. Interior, Washington, D.C.

_____. 1995a. Environmental assessment and fish populations of the Wabash River and its tributaries. Natur. Areas J. 5: 259-266.

_____. 1995b. The Wabash River ecosystem, II. Final Rep. for PSI-Energy and Eli Lilly and Company, Plainfield and Indianapolis, Indiana, 235 pp.

Gerking, S.D. 1945. The distribution of the fishes of Indiana. Invest. Indiana Lakes Streams 3(1): 1-137.

Gong, L. and T.M. Cavender. 1991. Systematics of *Notropis volucellus* and *Notropis wickliffi* (Cyprinidae: Pisces) from Ohio waters. Ohio J. Sci. 91(2): 23 (abstr).

Gorman, O.T. and J.R. Karr. 1978. Habitat structure and stream fish communities. Ecology 59(3): 507-515.

Hoggatt, R.E. 1975. Drainage areas of Indiana streams. U.S. Dep. Interior, Geol. Surv., Water Res. Div., Indianapolis, Indiana, 231 pp.

Lehman, L.L. 1974. Some effects of PL 566 small watershed project on fish populations and selected water quality variables within and below a channelized area. M.S. Thesis, Purdue University, West Lafayette, Indiana, 115 pp.

Page, L.M. 1983. Handbook of darters. TFH Publ., Inc., Neptune City, New Jersey, 271 pp.