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Fish Community of Indian Bayou, A Coastal Plain Stream of Remarkable Species Richness in the Lower White River Drainage of Arkansas

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Abstract

It is increasingly important to identify unique aquatic ecosystems in the coastal plain lowlands of Arkansas, because of the extensive human-induced alteration of aquatic habitats and loss of fish diversity in that region. Indian Bayou, part of a small (103 km^2), chute-fed drainage system off the lower White River in Monroe County, Arkansas, has a fish community that is unique among Delta streams in darter (Percidae) species richness. Twenty-five fish samples collected by seine and rotenone from the Indian Bayou drainage system over an 18-year period produced 62 fish species, including 13 darter species. The fish community at one collecting site on the Indian Bayou mainstream remained remarkably stable during the study, and 12 of the darter species were found there between 1971 and 1989. The continued existence of this unique fish assemblage is now threatened by proposals to divert large amounts of water from the White River for agricultural purposes, dredge a wider and deeper navigation channel in the White River, and construct a new interstate highway.

Introduction

The increasing demands of an expanding human population on aquatic resources have caused extensive degradation of aquatic habitats throughout Arkansas (Robison and Buchanan, 1988). Nowhere is this degradation more apparent than in the Mississippi Delta. In the mid 1800s, approximately one-half of the Delta consisted of forested wetlands; today only about ten percent of those wetlands remain (Mallory, 1994). Agricultural activities have caused most of the habitat alteration in the lowlands of Arkansas, and the conversion of forested wetlands to cropland has greatly reduced the species diversity in fish faunal assemblages. It is, therefore, increasingly important to identify and protect remnant fish communities that are more representative of the historically high diversity in the Delta.

Aquatic environments associated with the lower White River in the Delta are now of special concern because of increasing demands to divert large amounts of water from that river, primarily for agricultural purposes. These demands for surface water withdrawal are due to groundwater level declines that have occurred in the alluvial aquifer in most of eastern Arkansas (Louthian, 1995). The recently proposed Grand Prairie Irrigation Project seeks to withdraw approximately 46 m^3 of water per second from the White River at DeVall's Bluff (S. Filipek, Arkansas Game & Fish Commission [AGFC], pers. comm.). Extensive water diversion during summer low-flow periods would decrease water levels in chutes, bayous, natural lakes, and other associated wetlands. Dewatering of these environments would cause extirpation of fish communities and other aquatic organisms. Filipek et al. (1987) discussed the biological implications of the alteration of stream flow and the need to maintain adequate flow in Arkansas streams.

The AGFC and Arkansas Department of Pollution Control and Ecology (ADPCE) are presently compiling information to determine proper allocation flow levels for the White River. However, a single state agency, the Arkansas Soil and Water Conservation Commission, whose nine members are appointed by the governor, has sole authority to set the minimum flow level for all instream uses. Arkansas is one of the few states where the legislature has given this jurisdiction to only one agency.

Another potential threat to aquatic environments along the lower White River is a plan proposed by the U.S. Army Corps of Engineers to dredge a deeper, wider navigation channel in the White River. This project, which has been periodically promoted during the past two decades, would double the width of the present navigation channel and increase its depth by 50 percent. Dredging the lower White River could cause the dewatering of associated wetlands and result in substantial loss of fish and wildlife habitat.

Indian Bayou is a stream, approximately 19.3 km long, on the northern edge of the White River National Wildlife Refuge. Even though the United States Geological Survey (USGS) classifies it as a distinct drainage system with a drainage area of 103 km^2, including Indian Bay (Sullavan, 1974), water from the White River frequently flows through

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Indian Bayou as part of a chute-fed system. During periods of high flow, current from White River enters Cut-Bluff Slough at navigation mile 80, flows into Maddox Bay, then into Indian Bayou before reentering the White River (Fig. 1), a total distance of approximately 47 km. At least two other sloughs provide access points for water to enter Indian Bayou from the White River during high flows, and it often receives water from the larger Green River-Mill Bayou system to the north in Monroe County. Therefore, Indian Bayou is part of a network of wetland drainages of the White River floodplain. In years of normal or high rainfall, current from the White River flows through this system year-round. There are no data available on how much of the annual stream flow of Indian Bayou comes from the White River and how much is due to runoff and groundwater discharge. Even though its watershed is small and lies entirely within Monroe County, Indian Bayou has an assemblage of fishes that is unique among Delta drainages of the state and is remarkable in comparison to all other areas of Arkansas. I herein report on fish samples taken from Indian Bayou over an 18-year period (1971-1989) to document its remarkable species richness and stability, especially among the percids.

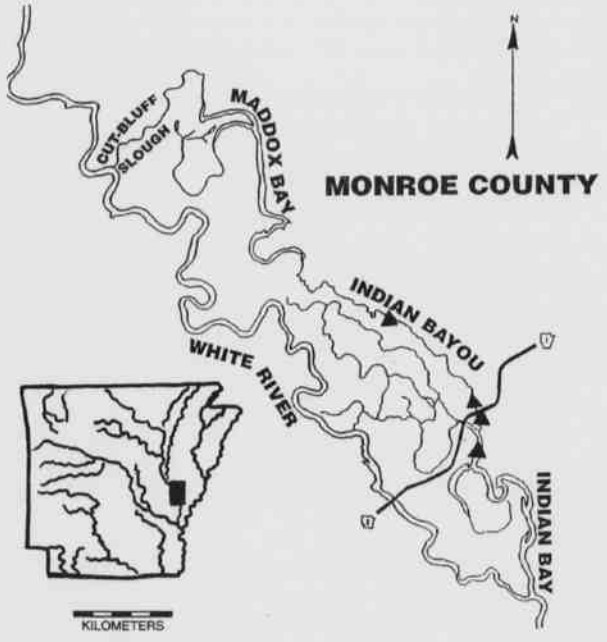

Fig. 1. Indian Bayou illustrating the mainstream drainage sequence. Triangles indicate mainstream sampling sites.

Materials and Methods

Eleven fish samples were made from four localities on the Indian Bayou mainstream between April 1971 and November 1989. Eight samples came from Indian Bayou at State Highway 1, approximately 13 km above its confluence with the White River. At that site, a 100 m section of the stream was sampled; seven of the samples were taken with a 3 x 1.2 m nylon seine of 3.2 mm mesh, and the eighth sample was made with an ichthyocide (rotenone) in a backwater area. The State Highway 1 locality was sampled twice in 1971, and once each in 1972, 1974, 1976, 1977, 1988, and 1989. The lack of roads and general inaccessibility throughout most of the Indian Bayou watershed caused much of the sampling to be focused at the State Highway 1 site. The other three Indian Bayou localities were sampled by seine in 1971 and 1972. Fourteen other sites in the Indian Bayou drainage system were sampled once each between 1973 and 1989 (seven with seines and seven with rotenone). Habitat features recorded during each sampling event were substrate composition and distribution, current (estimated as none, slow, moderate, or swift), water temperature, maximum depth, depth of capture, and turbidity.

At each collecting site, all available habitats were sampled as completely as possible to obtain a sample of fishes representative of the natural abundance of all species at the site. Specimens were preserved in 10% formalin and later transferred to 45% isopropanol. All fish species present at each site were identified in the laboratory from preserved samples, and most of the specimens were deposited in the Westark Community College Zoology Collection. A few specimens were deposited in the Texas Natural History Collection of the University of Texas and in the Tulane University Museum of Natural History.

Results and Discussion

Sixty-two fish species were collected from the Indian Bayou drainage system with 48 found in the Indian Bayou mainstream (Table 1). This species richness is remarkable because of the drainage area size, the types and amount of collecting effort, and the number of darter species present. A comparison with other drainages throughout the Mississippi Delta of eastern Arkansas (and other regions of the state) also shows the unusual richness of the Indian Bayou fish community. Data for these comparisons were from fish samples collected by the ADPCE, the published reports of stream surveys by other researchers, and from my own unpublished results of fish collections taken during the past two and a half decades.

In the mid 1980s, the ADPCE subdivided Arkansas into six ecoregions based on the homogeneity of land surface

Table 1. Fish species collected from Indian Bayou and associated waters (tributary streams, natural lakes and swamps), April 1971-November 1989.

Species	Indian Bayou at St. Hwy 1	Other Indian Bayou sites	Associated waters
Lepisosteus oculatus	X		X
Lepisosteus osseus	X		X
Lepisosteus platostomus			X
Amia calva			X
Dorosoma cepedianum			X
Dorosoma petenense	X		X
Esox americanus	X	X	X
Esox niger	X		X
Cyprinella venusta	X	X	X
Cyprinus carpio	X		
Hybognathus hayi	X	X	X
Hybognathus nuchalis	X	X	X
Lythrurus fumeus	X	X	X
Macrhybopsis storeriana	X	X	
Notemigonus crysoleucas	X		X
Notropis amnis			X
Notropis atherinoides	X	X	X
Notropis buchanani	X	X	
Notropis maculatus			X
Notropis texanus	X	X	X
Notropis volucellus	X	X	X
Opsopoeodus emiliae	X	X	X
Pimephales notatus	X		
Pimephales vigilax	X	X	
Ictiobus bubalus			X
Ictiobus cyprinellus			X
Minytrema melanops	X	X	X
Ameiurus natalis	X		X
Noturus gyrinus	X	X	X
Noturus nocturnus	X		
Pylodictis olivaris			X
Aphredoderus sayanus	X	X	X
Fundulus notatus		X	X
Fundulus olivaceus	X	X	X
Gambusia affinis	X	X	X
Labidesthes sicculus	X	X	X
Morone chrysops			X
Lepomis cyanellus			X
Lepomis gulosus	X	X	X
Lepomis humilis		X	X
Lepomis macrochirus	X	X	X
Lepomis megalotis	X	X	X
Lepomis miniatus			X
Micropterus punctulatus	X	X	X
Micropterus salmoides	X		X
Pomoxis annularis			X
Pomoxis nigromaculatus	X		X
Elassoma zonatum	X		
Crystallaria asprella	X		
Etheostoma asprigene	X	X	X
Etheostoma chlorosomum	X	X	X
Etheostoma fusiforme			X
Etheostoma gracile	X		X
Etheostoma histrio	X	X	
Etheostoma proeliare	X	X	X
Etheostoma stigmaeum	X		X
Percina caprodes	X	X	X
Percina maculata	X	X	
Percina sciera	X		
Percina shumardi	X		
Percina vigil	X		
Aplodinotus grunniens			X

forms, natural vegetation, soil types and land uses (Fig. 2). Fishes were sampled from reference streams having the least amount of point source and non-point source disturbances in each ecoregion (Giese et al., 1987; Keith, 1987; Rohm et al., 1987). One locality was sampled in each stream during the spring high-flow period with trammel nets and during the summer low-flow period with rotenone and an electroshocker. Fish communities of the reference streams were distinctively different among the ecoregions with the Delta Ecoregion streams having the lowest species richness; the dominant fish families (percent of all species) in Delta Ecoregion streams were as follows: Centrarchidae (24%), Cyprinidae (20%), Catostomidae (10%), Ictaluridae (10%), and Percidae (10%). The Indian Bayou mainstream fish community differed substantially from other Delta streams in family dominance with the same five families comprising the following percentages of the fish species present: Cyprinidae (27%), Percidae (25%), Centrarchidae (20%), Catostomidae (6%), and Ictaluridae (6%). Matthews et al. (1992) also found that the Delta Ecoregion of Arkansas had a distinctive fish assemblage correlated with generally low water quality, and they demonstrated a relationship between fish distribution and a set of 14 water quality variables.

Table 2 shows the high diversity of the Indian Bayou fish community compared to seven other Delta Ecoregion

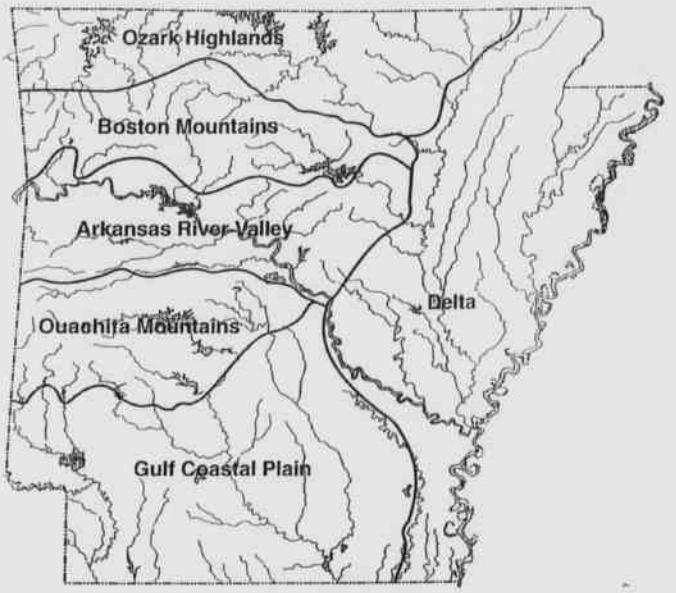

Fig. 2. Ecoregions of Arkansas.

Table 2. Comparison of the fish communities and other attributes of Indian Bayou and seven other streams in the Delta Ecoregion of Arkansas.

Stream	Drainage area (km^2)	Sampling methods***	Total fish species	Total darter species	Greatest no. darter species at one site	Darter community SI****	Native cyprinid species
Indian Bayou drainage system*	103 (54)	S,R	62 (48)	13 (12)	12	—	15 (13)
Boat Gunwale Slash	92	R,T	40	3	3	0.40	2
Second Creek	155	R,T	36	4	4	0.50	6
Wattensaw Bayou	614	S,E,H,T,M	48	3	3	0.40	13
Village Creek	503	S,R,T,D, G,HL	42	2	2	0.29	8
Bayou DeView	1816	S,R,T,D	52	6	6	0.76	7
Bayou Meto	1606	S,E,H,T,M,	64	10	6	0.64	12
Bayou Bartholomew**	5799 [3074]	S	86(79) [62]	17(16) [8]	(15) [5]	0.83 [0.60]	20 [19]

* Numbers in parentheses are for the Indian Bayou mainstream.
** Numbers in brackets are for the Arkansas portion of Bayou Bartholomew, numbers in parentheses are for the Louisiana portion.
*** D(dipnet), E(electroshocker), G(gill net), H(hoop net), HL(hook and line), M(minnow trap), R(rotenone), S(seine), T(trotline).
**** Similarity with Indian Bayou based on the similarity index (SI) of Odum(1971).

streams in eastern Arkansas. Four of the streams, Boat Gunwale Slash (Monroe Co.), Second Creek (Woodruff, Cross, and St. Francis cos.), Village Creek (Randolph, Lawrence, and Jackson cos.), and Bayou DeView (Craighead, Poinsett, Cross, Jackson, Woodruff, and Monroe cos.), were sampled by the ADPC&E as least disturbed reference streams of that ecoregion. Two streams, Bayou Meto (Pulaski, Lonoke, and Arkansas cos.) and Wattensaw Bayou (Lonoke and Prairie cos.), were intensively sampled by Heckathorn (1993a), and Bayou Bartholomew in southeastern Arkansas (Jefferson, Lincoln, Desha, Drew, Chicot, and Ashley cos.) and northeastern Louisiana (Moorehouse Par.) was surveyed by Thomas (1976). Village Creek and Bayou DeView, two of the streams studied by the ADPC&E, were also surveyed by Holt and Harp (1993) and Mauney and Harp (1979), respectively. Table 2 combines data from these stream surveys, as well as from three of my samples from Bayou DeView and two from Boat Gunwale Slash.

Considerable information exists for North American streams showing that the number of fish species occurring in a drainage increases with increased drainage size (Horwitz, 1978; Jenkins and Burkhead, 1993; Sheldon, 1988). The data in Tables 2 and 3 generally support this trend for Arkansas streams, but Indian Bayou stands out as an obvious exception. The Indian Bayou drainage is far smaller than the drainages of five of the seven Delta Ecoregion streams compared, but its overall species richness (62 species) exceeded that of all Delta streams except Bayou Meto and Bayou Bartholomew. The Bayou Meto watershed is over 15 times larger than that of Indian Bayou and drains a small portion of the foothills of the Interior Highlands of central Arkansas as well as the Delta. Bayou Meto was subjected to a well-documented point source contamination by dioxin in the 1970's (Heckathorn, 1993b), and Heckathorn (1993a) found that its fish community differed from that of an undisturbed reference stream, Wattensaw Bayou, primarily by the absence of rare species (presumably those that are more sensitive to disturbance) in the former. Indian Bayou had the same number of fish species as the Arkansas portion of Bayou Bartholomew, which has a drainage area 30 times larger.

The fish species richness of Indian Bayou is almost certainly related to its proximity to the White River main channel. Gorman (1986) was one of the first researchers to consider the influence of downstream conditions on upstream fish communities. Osborne and Wiley (1992), in a study of the warmwater fish communities of three Illinois drainage basins, found that fish species richness in a given stream segment was more closely related to the downstream link (stream size at the next downstream confluence) than to any other measure of stream size including drainage area and stream order. They reported significantly higher numbers of fish species were collected from tributary streams located lower in a drainage network and connected to a main channel system than from similarly sized streams located in the headwaters. The influence of the White River main channel on the fish community of the Indian Bayou mainstream (a second order segment) was substantiated by the frequent collection of large numbers of the riverine species, *Macrhybopsis storeriana*, *Notropis atherinoides*, *Pimephales vigilax*, and *Percina shumardi* in Indian Bayou. Several other species normally associated with larger order streams were also found there (Table 1).

The uniqueness of the Indian Bayou fish community is primarily found in its rich assemblage of darters (family: Percidae, tribe: Etheostomatini). No other Delta Ecoregion stream in Arkansas, regardless of watershed size, is known to have as many darter species, although the Louisiana portion of Bayou Bartholomew has more. Even the lower White River mainstream has only 11 reported darter species (Robison and Buchanan, 1988). It is not appropriate to compare the darter diversities of Indian Bayou and the other Delta Ecoregion streams by any of the commonly used diversity indices because of differences in sample size, number, and sampling techniques used by various researchers. However, it is possible to quantify the similarities of Delta streams with Indian Bayou with respect to presence-absence of darter species by using the index of similarity of Odum (1971), S=2C/A+B, where C is the number of darter species common to both streams, A is the total number of darter species in Indian Bayou, and B is the total number of darter species in the other stream being compared (Table 2). The darter community of Indian Bayou was similar to that of Bayou DeView, a Delta Ecoregion stream with a much larger drainage area. However, the greatest similarity was with the entire Bayou Bartholomew drainage. All other Delta streams compared had low similarity indices.

Darters form a functional type or guild (Huston, 1994) within aquatic ecosystems due to their trophic level similarities and other similar niche utilization patterns. Most darters are small, first- and second-level carnivores that feed mainly on microcrustaceans as juveniles and on immature aquatic insects as adults (Page, 1983). More importantly, darters as a group are very sensitive to environmental disturbance, and various authors have cited their value as indicators of good water quality and overall aquatic health (Burr and Warren, 1986; Jenkins and Burkhead, 1993; Kuehne and Barbour, 1983; Page, 1983). Even though individual species vary in their sensitivity to habitat disturbance (e.g., *Percina caprodes* tolerates a wider range of habitat and water quality parameters than most darters), darters are probably better indicators of environmental disturbance than any other taxon of native fishes.

Twelve of the thirteen species of darters found in the Indian Bayou watershed occurred in the Indian Bayou mainstream. Three of the four currently recognized darter genera were represented, and over 30% of all darter species known to occur in Arkansas were found there. Indian Bayou

Table 3. Fish community and other characteristics of streams of various drainage areas in the five ecoregions outside the Delta of Arkansas.

Stream	Ecoregion*	Data source	Drainage area (km²)	Years sampled	Number of samples	Total fish species	Darter species	Native cyprinid species
Moro Creek	G	Robison and Winters (1978), Keith (1987)	1173	1972-77, 1985-86	34	63	14	16
Ten Mile Creek	G	Jeffers and Bacon (1979)	155	1976-79	28	53	9	10
Caddo River	Ou	Fruge (1971), Dewey and Moen (1978)	757	1970-71, 1974-75	119	89	21	19
Cossatot River	Ou, G	Cloutman and Olmsted(1974), Keith (1987)	312	1972, 1984-85	21	53	9	15
Gulpha Creek	Ou	Buchanan et al. (1978)	124	1978	32	27	2	7
Big Creek	Oz	Jackson and Harp (1973)	174	1970-71	39	30	4	10
Buffalo River	B, Oz	Cashner and Brown (1977)	3582	1965-66	30	48	9	15
Saline River	Ou, G	Reynolds (1971)	8241	1969-71	62	85	21	23
Jane's Creek	Oz	Fowler and Harp (1974)	203	1971-72	40	52	10	17
Piney Creek	Oz	Matthews and Harp (1974), Matthews(1978)	460	1972-73	>18	47	4	17
Strawberry River	Oz	Robison and Beadles (1974), Robison (1979)	2100	1967-78	37	107	23	30
Clear Creek	B	Buchanan's collections	668	1971-1989	31	40	10	13
Lee Creek	B	Buchanan's collections	1291	1971-1993	29	52	13	12
Mulberry River	B	Olmsted et al. (1972)	970	1972	19	57	11	13
Poteau River**	A	Cross and Moore (1952), Buchanan's collections	4908 [1572]	1947, 1973-1993	>60 [23]	93 [51]	16 [9]	21 [12]
Vache Grasse Creek	A	Buchanan's collections	326	1972-1996	37	55	10	15

* Letters represent the following ecoregions: A (Arkansas River Valley), B (Boston Mountains), G (Gulf Coastal Plain), OU (Ouachita Mountains), Oz (Ozark Highlands).
** Numbers in brackets are for the Arkansas portion of the Poteau River drainage.

is also noteworthy for its diversity of native cyprinids, with 13 species of minnows. The species richness of minnows in Indian Bayou is greater than that of most other Delta Ecoregion streams; however, minnows do not form a natural functional type like the darters. Cyprinids exhibit a wide range of tolerance to environmental disturbances, and while some species are environmentally sensitive, minnows as a group are not necessarily reliable indicators of water quality. However, a high cyprinid species richness probably indicates good water quality.

The darter species richness of Indian Bayou is not only unique to the Delta Ecoregion of Arkansas, but is apparently unmatched by streams similar in watershed size in all other ecoregions of the state. In the reference stream fish surveys of Keith (1987), the only other Arkansas stream that had darter diversity exceeding that of Indian Bayou was Moro Creek (also surveyed by Robison and Winters, 1978) in the Gulf Coastal Plain Ecoregion. Fourteen darter species were reported from Moro Creek, a stream with a drainage area eleven times that of Indian Bayou. Table 3 provides a comparison of Indian Bayou with streams of different drainage areas in the five ecoregions of Arkansas outside the Delta. All stream data reported in Table 3 are based on more fish samples than I obtained from Indian Bayou. Some streams with large drainage areas in other ecoregions have more darter species than Indian Bayou. The extensively sampled Caddo, Poteau, Saline, and Strawberry rivers (all with drainage areas >750 km^2) have the most darter (and total fish) species and are among the most species-rich streams in North America. Matthews and Robison (1988) concluded that the high species richness of the large stream drainages in Arkansas (eastern-draining or southern slope streams in the eastern Ozark uplift, and in the Ouachita River and Saline River) is related to their position as ecotones, with those streams including both upland and lowland fish species. Streams listed in Table 3 that have drainage areas similar in size to Indian Bayou (Big, Jane's, Gulpha, and Ten Mile creeks) have fewer darter species and total fish species.

Indian Bayou is also noteworthy for its darter species richness at a single collecting locality (State Highway 1) and for the temporal stability of that richness. The first fish sample taken from that site (18 April 1971) yielded nine species of darters, as did the last sample collected (10 November 1989). All 12 darter species found at that locality were collected by the fourth sample (12 August 1974). The number of individuals collected and the number of darter species taken during summer low-flow sampling at State Highway 1 remained relatively constant over the 18-year sampling period. Table 4 lists the darter species collected from all Indian Bayou samples combined in decreasing order of abundance; general habitat preferences for each species are also presented (taken largely from Page, 1983). No other collecting locality in the Delta Ecoregion of Arkansas has produced 12 darter species; however, 15 species of darters were reported from one locality on Bayou Bartholomew near Bastrop, Louisiana (Thomas, 1976). The total number of fish species (46) collected at State Highway 1 on Indian Bayou is also remarkable.

Few individual localities in other ecoregions of Arkansas equal the State Highway 1 site in species richness of darters or total fish species, and few authors have commented on the number of fish species occupying a stream site. Keith (1987) found that the average number of fish species collected per site in reference streams in all Arkansas ecoregions was similar (28.8-36.6 species per site), even though the total number and composition of species differed for each ecoregion. Robison (1979) reported a locality of unusual species richness on the Strawberry River (Ozark Ecoregion), where six fish samples over an eleven-year period yielded 51 species, including 17 species of darters. Jenkins and Burkhead (1993) studied Virginia streams and found that small creeks typically had 2-20 species per site, medium-sized streams 15-30, and rivers 20-40, based largely on samples along a 300 - 600 m stream section per site under normal or low water levels. Localities in the Clinch River drainage, Virginia, yielded the largest numbers of species per site (three sites with 51, 46, and 52 species), and Jenkins and Burkhead considered these numbers to be quite high for North American fresh waters. The richest sites reported are from the Duck River, Tennessee (Etnier and Jenkins, 1980), where several collections yielded more than 90 species at one site, and from the Tombigbee River, Mississippi (Boschung, 1989), where a station sampled between 1963-1980 produced 92 species.

Even though darters represent a general functional type within aquatic ecosystems, most darter species have strict habitat requirements. Therefore, it is unusual to find many species of percids at one site, even when a large segment of the stream is sampled. The small segment (100 m) of Indian Bayou sampled at State Highway 1 yielded darter species that prefer a variety of habitat combinations (Table 4). The habitat variety in Indian Bayou was most obvious during summer low-flow periods, with different areas having slow to swift current and substrates predominantly of silt and clay but also with some sand and gravel. The substrate in one 10-m riffle was composed largely of shells and shell fragments from the introduced Asiatic clam, *Corbicula*. This riffle was highly favored by *Etheostoma histrio* and *Percina shumardi*, two of the most frequently collected darters. During every sampling event, the mainstream of Indian Bayou had a moderate to swift current. Backwater areas were present during low-flow periods. The most abundant darter was the riverine form, *P. shumardi*, followed by the predominantly quietwater form, *E. proeliare*. Two other riffle-dwelling species, *E. asprigene* and *E. histrio*, and one other quietwater form, *E. chlorosomum*, were also numerous. The darter least specialized in habitat requirements, *P. caprodes*, was fre-

quently collected, but not in large numbers.

Three species collected from Indian Bayou represent noteworthy disjunct populations. My collections represent the only recent records for the crystal darter, *Crystallaria asprella*, from the Delta Ecoregion portion of the lower White River drainage. The range of *C. asprella* outside Arkansas has declined drastically, and it is considered extirpated in Kentucky (Burr and Warren, 1986) and Tennessee (Etnier and Starnes, 1993). Indian Bayou has one of the few reported Delta Ecoregion populations of the speckled darter, *E. stigmaeum*. Populations of *E. stigmaeum* formerly known in the St. Francis River drainage of the Delta Ecoregion are believed to be extirpated. The taxonomy of *E. stigmaeum* is currently unsettled, and the Indian Bayou population may represent an undescribed species (Simon, 1997). *Percina vigil* (formerly *P. ouachitae*) is primarily an inhabitant of low-gradient streams below the Fall Line in Gulf Coastal drainages throughout its range. The disjunct Indian Bayou population is the only known recent record for this species from the Delta Ecoregion of Arkansas.

There are few long-term data bases documenting population trends in stream fish assemblages. Matthews (1986, 1990) and Matthews et al. (1988) provided valuable information on temporal variation and stability of some North American fish faunas. In three of the streams studied (Piney Creek, Arkansas, and Brier Creek and the Kiamichi River, Oklahoma) the fish faunas were persistent regarding presence-absence of species, and the overall faunal structure was stable over 5- to 17-year survey periods. The darter fauna of Indian Bayou remained relatively stable and persistent over an 18-year period based on abundance and presence-absence of species. No species were lost from the State Highway 1 site, and no rare species became common.

Fletcher and Burr (1992) noted that historically there has been little interest in the protection of fish species occupying lowland habitats. There are now so few streams having diverse and unusual fish communities in the Delta Ecoregion of Arkansas, that the identification of a unique ecosystem should stimulate preservation efforts. There is no evidence that other streams similar in darter species richness to Indian Bayou exist on the large (51,802 ha.) White River National Wildlife Refuge. Between 1970-81, I made 42 samples by seine, rotenone, and electroshocker in all major drainages of that refuge without finding a stream as remarkable in fish species richness as Indian Bayou. Even though the Indian Bayou mainstream lies entirely within the White River National Wildlife Refuge, that does not ensure its protection from human environmental assaults. Its fish community withstood the construction of a new and larger bridge at State Highway 1 in 1980-81 with no long-term effects on darter species richness or abundance at that site. The 1988 and 1989 samples, made several years after the bridge was completed, yielded seven and nine darter species, respectively. The relatively rapid reestablishment of the rich darter community at this site was probably related to the chute-fed flow regime from the White River, which served as a source of fishes for repopulation. Osborne and Wiley (1992) summarized evidence that large streams often provide a pool of immigrants for subsequent recolonization of their tributaries following disturbances.

Also during the 1980s, the U.S. Fish and Wildlife Service considered a proposal to build a dam (which has not been built) on Indian Bayou to create a greentree reservoir for fall and winter waterfowl habitat. The most immediate threats to the continued existence of the unique fish assemblage of Indian Bayou are the proposed plans to withdraw irrigation water from the White River just upstream from the chute feeding water into the Indian Bayou drainage system and the proposed project to dredge a wider, deeper navigation channel in the White River. Another potential environmental threat looms on the horizon: Indian Bayou lies in the middle of a proposed corridor for a new interstate highway (I-69) through Arkansas.

Even though Indian Bayou contains no federally designated endangered or threatened species, it is unique among Arkansas Delta Ecoregion streams in the diversity of its percid community and in its overall fish species richness. The stream drainages of other ecoregions that exceed Indian Bayou in darter species richness rarely have individual sampling sites that equal the richness of the State Highway I locality. Because of the extensive loss of aquatic habitats in the Delta Ecoregion, it has become increasingly important to protect not only the habitats of rare and endangered species, but also those habitats of unusual biodiversity. Lydeard and Mayden (1995) provided examples of species interactions in aquatic ecosystems that support the need to shift emphasis toward protecting communities and ecosystems rather than just particular species. My largely descriptive study of the unusual darter species richness of Indian Bayou supports the importance of future studies to test hypotheses regarding lowland fish assemblages in general and the role of darters as indicators of aquatic ecosystem stability and functioning in particular.

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Table 4. Darters of Indian Bayou mainstream listed in decreasing order of abundance for all collections (1971-89) combined, with general preferences for habitat and position in water column.

Species	% of all darter specimens collected	Preferred habitat	Stratum occupied
Percina shumardi	32.9	riffle	benthic
Etheostoma proeliare	15.9	quiet pool	benthic
Etheostoma asprigene	14.8	riffle	benthic
Etheostoma histrio	12.3	riffle	benthic
Etheostoma chlorosomum	9.9	quiet pool	benthic
Etheostoma stigmaeum	6.3	pool with current	benthic
Percina caprodes	2.7	generalist, but prefers gravel riffle or raceway	benthic
Percina sciera	2.5	gravel raceway	midwater
Crystallaria asprella	1.4	sand raceway	benthic
Etheostoma gracile	0.5	quiet pool	benthic
Percina maculata	0.5	gravel raceway	midwater
Percina vigil	0.3	sand raceway	benthic

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