DISTRIBUTIONAL CHANGES OF THE FISHES OF THE HATCHIE RIVER IN WEST TENNESSEE AND NORTH MISSISSIPPI

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Dedication

This thesis is dedicated to my late father, John S. Keck, for always supporting me and encouraging me to learn, to my mother, Cindy S. Lange, for always caring for me and guiding me, and to my wife, Julia A. Keck, for her love, friendship, and understanding.

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Abstract

The Hatchie River in northern Mississippi and western Tennessee is the only coastal plain river in TN that escaped the extensive channelization efforts of the Army Corps of Engineers in the region. As such, it is one of the last refuges for many of the endemic coastal plain fishes that have experienced wide spread extirpation. The Hatchie was thoroughly surveyed by W.C. Starnes in 1973. He concluded that barring extensive channelization of the system or increased deleterious agricultural practices the ichthyofauna of the Hatchie should remain intact. At that point 90 species had been recorded from the system and 109 species were expected to occur. Eleven of those species were ictalurids, which gives the system the distinction of having the most diverse catfish fauna in North America. The current survey was conducted to determine if the distributions of fishes in the Hatchie have changed since the mid-1970s. The use of the relatively new method of boat shocking drastically improved knowledge of big river fish distributions in the system. Collections during the field seasons of 2001-2003 resulted in records of 88 species, in 19 families. This brings the total known species for the system to a total of 108 and 125 are expected to occur. Six new species (*Polyodon spathula, Ctenopharyngodon idella, Pimephales promelas, Erimyzon sucetta, Ictiobus niger*, *Ameiurus nebulosus*) were recorded in the system. *Cyprinella lutrensis* appears to be the only known species that is expanding its range while *Lythrurus umbratilis* and *Etheostoma parvipinne* have apparently been nearly extirpated from those same regions that *C. lutrensis* is populating. The apparent range reductions of *Phenacobius mirabilis* and *Amia calva* are most likely artifacts of collection methods. Currently, the main threat to the stability of the Hatchie River ichthyofauna appears to be deleterious agricultural

and sylvicultural practices, which are the most likely cause of heavy silt loads and rapid rates of channel incision and resultant sand deposition.

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List of Abbreviations

BLH	Bottom Land Hardwood
ca.	approximately
CFI	Conservation Fisheries, Inc.
Co.	County
CPOM	Coarse Particulate Organic Matter
CU	Cornell University Ichthyological Collection
E	east
EMP	Eastern Middle Portion of the Hatchie River
ENE	east-northeast
ESE	east-southeast
HRS	Hatchie River system
I-40	Interstate 40
I-45	Interstate 45
INHS	Illinois Natural History Survey
LCP	Lower Coastal Plain
LP	Lower Portion of the Hatchie River system
mm	millimeters
MMNS	Mississippi Museum of Natural Science
MS	Mississippi
MSU	Mississippi State University Ichthyology Collection
N	north
NNE	north-northeast

NNW	north-northwest
Rd.	road
S	south
SIUC	Southern Illinois University, Carbondale
SL	standard length
SSE	south-southeast
SSW	south-southwest
TL	total length
TN	Tennessee
TNC	The Nature Conservancy
TU	Tulane University Museum of Natural History
TWRA	Tennessee Wildlife Resources Agency
UM	University of Mississippi
UMMZ	University of Michigan Museum of Zoology
UCP	Upper Coastal Plain
UP	Upper Portion of the Hatchie River system
US	United States Highway
USM	University of Southern Mississippi Museum of Ichthyology
UT	University of Tennessee Research Collection of Fishes
W	west
WMP	Western Middle Portion of the Hatchie River system
WNW	west-northwest
WSW	west-southwest

Chapter I

Introduction

The purpose of this thesis is to report any changes in the distributions of fishes of the Hatchie River system (HRS) in western Tennessee and northern Mississippi since the first survey of the HRS by W.C. Starnes (1973). At that time 90 species had been recorded from the HRS and 109 were suspected to occur there. Since then, the total number of species collected has increased to 109 and the number suspected has increased to 125. The results of this survey, conducted between 2001 and 2003, were combined with all available historical records to determine any changes in the distribution of HRS fishes between 1975 and the present. The date of the comparison was selected because a break in the sampling effort on the HRS occurred after a few follow-up collections were completed in 1974; frequency of sampling did not greatly increase until the 1990s.

Most river systems in the coastal plain of the Mississippi River Valley have been heavily impacted by intensive channelization projects undertaken by the Army Corps of Engineers and by detrimental agricultural practices. The main channel of the Hatchie River escaped channelization but several of its tributaries were channelized. Luckily, channelization has all but ceased in the region after the responsible agencies realized that it was responsible for increased soil erosion and stream siltation along with a drop in the water table (Etnier and Starnes, 1993). However, agricultural practices remain a serious threat to the ichthyofauna of the HRS. The coastal plain is the most productive agricultural region in Tennessee with the main crops being cotton, millet, and soybeans. Current detrimental agriculture methods include planting to the stream banks (often

resulting in channel incision) and the heavy application of fertilizers and pesticides (occasionally resulting in fish kills).

This thesis includes an annotated list of all fish species known or suspected to occur in the HRS. Appendices include dot plot maps of the HRS showing the historical and current distribution of each species (Appendix A) and a chronological list of all localities with species collected, abundance information, and (if available) museum information for vouchered specimens from each locality (Appendix B).

Historical records

Very few records exist from before the start of the 1973 (W.C. Starnes) survey of the HRS. The earliest record is a collection by R.M. Bailey on the Tuscumbia River in August of 1939. From 1939 to 1968 there were only a few collections made by various North American ichthyologists, the Tennessee Game and Fish Commission, and the Mississippi Game and Fish Commission. In 1965 D.A. Etnier came to the University of Tennessee, Knoxville and his first collections from the HRS date from 1968.

The 1973 survey included data from 109 localities, 85 of which were collected during that survey. The majority of those collections were made using sodium cyanide to incapacitate fish, although samples also were taken with gill nets and seines. The lower end of the Hatchie River main channel was inundated by abnormally high water levels during the later half of the 1973 survey and thus it remained essentially uncollected by Starnes. The flooding along with the lack of more efficient methods of sampling bigger water created a weak, but by no means incomplete, area in the knowledge of big river fishes of the HRS.

After 1973 there were only a few collections made in 1974, mostly by D.A. Etnier or his students, and then the HRS was largely unsampled until the 1980s when collectioning occurred sporadically. Again, in the 1980s, D.A. Etnier and his students were the primary collectors of the HRS. Tennessee Wildlife Resources Agency (TWRA) did not start making collections on the HRS until 1989 and no voucher specimens exist from any of their collections, which is unfortunate as it would help clear up some of their reports of species not found by other collectors, including the author, in the same localities or, in some cases, the entire HRS.

The 1990s marked an increase in sampling frequency of the HRS with TWRA and Etnier making more regular collections. Conservation Fisheries Inc. (CFI) of Knoxville, Tennessee, also began collecting localities on the HRS looking for species listed as "In need of management" by TWRA for their captive propagation program.

Current records

Fifty-nine localities were collected during this survey that started in May 2001 and continued through July 2003. Eighty-eight species were collected during this survey, five of which were new records for the HRS. The new species were *Polyodon spathula, Ctenopharyngodon idella, Pimephales promelas, Erimyzon sucetta, Ictiobus niger,* and *Ameiurus nebulosus*. The main collection method was seining but larger sections of the main channel were sampled using a boat shocker, a method that drastically improved the knowledge of big river fishes in the HRS.

Extra effort was expended during the survey to search for rare, jeopardized, and non-endemic species known to occur in the HRS including *Ichthyomyzon castaneus, I. unicuspus, Scaphirhyncus platorhyncus, Polyodon spathula, Atractosteus spatula,*

Lythrurus bellus, Macrhybopsis gelida, Cycleptus elongatus, Moxostoma erythrurum, Noturus stigmosus, Lepomis auritus, Ammocrypta beanii, A. vivax, Etheostoma asprigene, Etheostoma fusiforme, Etheostoma zonistium, and *Percina shumardi.*

Chapter II

Description of Study Area

Geography and geology

The HRS can be divided into two major regions and four sub-regions. The HRS flows through the Upper Coastal Plain (UCP) and Lower Coastal Plain (LCP) regions of Tennessee and Mississippi. Flowing through the UCP are the Upper Portion (UP) of the HRS (the headwaters in Alcorn, Tippah, Prentiss, and Union counties of Mississippi, and McNairy County, Tennessee) and the Eastern Middle Portion (EMP) of the HRS (Hardeman, Chester, and Madison counties of Tennessee). Flowing through the LCP are the Western Middle Portion (WMP) of the HRS (Haywood and Fayette counties of Tennessee) and the Lower Portion (LP) of the HRS (Lauderdale, and Tipton counties of Tennessee) (Figure 1).

The river origins in Mississippi are at an elevation of nearly 500 ft and flow north towards Tennessee while the origins in Tennessee flow to the west from a similar elevation. The river takes a northwesterly course from there and descends to its confluence with the Mississippi River at an elevation of approximately 250 feet. The HRS travels about 110 air miles and over 180 river miles from its origins to its mouth, which is approximately 30 miles north of Memphis, Tennessee. The main channel in the EMP has a slope of approximately three feet per mile; tributaries to these portions flow down slopes up to 15 feet per mile. The main channel in the WMP has a slope of approximately one foot per mile while tributaries have slopes approaching three feet per mile and the LP has even less gradient.

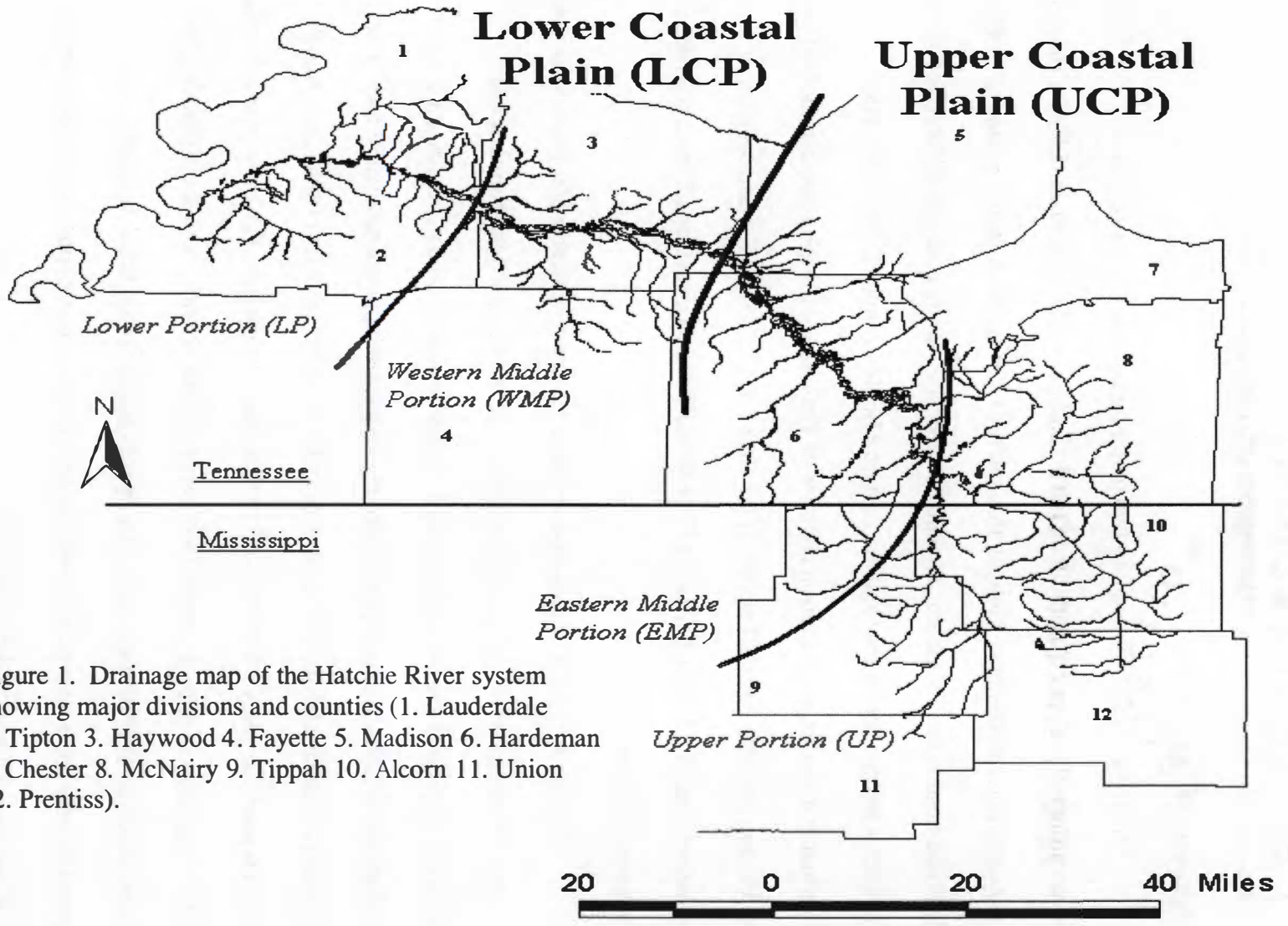

Figure 1. Drainage map of the Hatchie River system showing major divisions and counties (1. Lauderdale 2. Tipton 3. Haywood 4. Fayette 5. Madison 6. Hardeman 7. Chester 8. McNairy 9. Tippah 10. Alcorn 11. Union 12. Prentiss).

The Hatchie River, Tuscumbia River, and Muddy Creek make up the Mississippi HRS headwaters while the Tennessee headwaters are Cypress, Mosses, and Little Hatchie creeks. All of these headwaters make up the UP and flow over the Owl Creek geologic formation, which is composed of sand and very hard clays (Hardeman, 1966). The headwaters come together in the southeast section of Hardeman County, Tennessee, and it is at this point that the EMP begins. The EMP also contains the upper sections of the Hatchie Bottoms – low-lying, swampy areas occupied by the meandering channel of the main stem HRS. Spring, Piney, and Clover creeks are the major tributaries to the EMP and flow over an eastern component of the Wilcox Group of geologic formations, the Holly Springs Formation, composed of sandy clays. The WMP flows over the western component of the Wilcox Group, the Grenada formation, composed of silt and sandy clay, and contains the lower part of the Hatchie Bottoms. Lagoon, Cypress, Sugar, Little Muddy, and Big Muddy creeks are tributaries in the WMP and generally take northerly or southerly courses to the main channel. The LP flows over loess soil deposits and the only major tributaries that retain significant amounts of water are Cane Creek in Lauderdale County and Indian Creek in Tipton County, both in Tennessee; most of the other creeks in the LP are intermittent.

Description of habitat

The HRS watershed includes some of the largest remaining tracts of Bottom Land Hardwood (BLH) and intact wetland habitat in west Tennessee. Two Federal Wildlife Management Areas exist in the HRS, one on the main channel just south of Brownsville and I-40, and the other at the mouth of the HRS and extending several miles upstream near the West Tennessee State Penitentiary. These two lower portion refuges do not

encompass a representative range of all the habitats that occur in the HRS; there are significant differences between the lower and upper reaches of this system.

The creeks in the UP and EMP are generally cooler, faster flowing streams with low turbidity and coarser, clean substrates. However, these streams are being impacted by increased levels of clear cutting, especially in McNairy County, Tennessee, and are starting to show greater levels of turbidity and channel incision. The creeks in the WMP and UP are typically slow moving and warmer, have higher turbidity, and more fine substrates. The location of these streams in fertile agricultural areas has resulted in many of them suffering the effects of channelization and deleterious agricultural practices.

The main channel of the HRS flows through the Hatchie Bottoms for approximately 50 air miles in the WMP and EMP of the HRS. This low-gradient section of the main channel offers habitat preferred by big river fishes. Oxbows and sloughs are found throughout the HRS and offer habitat for species that prefer virtually no flow, abundant organic matter, mud substrates, and cypress growth.

Several streams in the EMP and UP are beginning to show significant amounts of sand deposition. Sand deposition occurs when the higher gradient portions of the stream incise to the underlying sand and wash it downstream. Once the sand-laden water reaches a lower gradient the sand will fall out of suspension and build up. As the sand builds up it raises the streambed and thus lowers the gradient even more. This process may continue until valley plugs form and the stream becomes anastomosed, often resulting in the destruction of BLH in this section of stream.

Chapter III

Methods

Historical records and records from this survey were used to determine any distributional or faunal changes in the fishes of the HRS since 1975. Historical records were compiled from natural history museums, unpublished theses, field notes, and state agency data bases. Historical data were used to locate all previously sampled sites (fig. 2), to expose any poorly sampled areas in the HRS, and to determine the historical distribution of fishes in the HRS. The current survey was conducted primarily during the summers of 2001, 2002, and 2003 during which nearly all historical localities and several new localities were sampled (fig. 3). The historical localities that remained unsampled in this study were either full of debris so that the site could not be sampled, the streambed was dry, or the access had been cut off. Distribution maps were created using ArcView version 8.1 (Environmental Systems Research Institute, Inc.) and US Census Bureau TIGER maps.

Collection of fishes during this survey was accomplished using several sizes of 1/4" mesh seines, boat shocking, dip nets, and angling (techniques listed in decreasing order of use). Use of a backpack electro-shocker was not effective due to the low conductivity of the water. Sampling the same segment of stream with a seine yielded a more representative sample. Boat shocking was effective only at the highest voltage levels (~ 9000) on alternating current. The main stem of the HRS was sampled with the boat shocker at every road crossing down-stream of Bolivar, Tennessee. At other localities upstream of Bolivar the volume of the boat's hull displacement

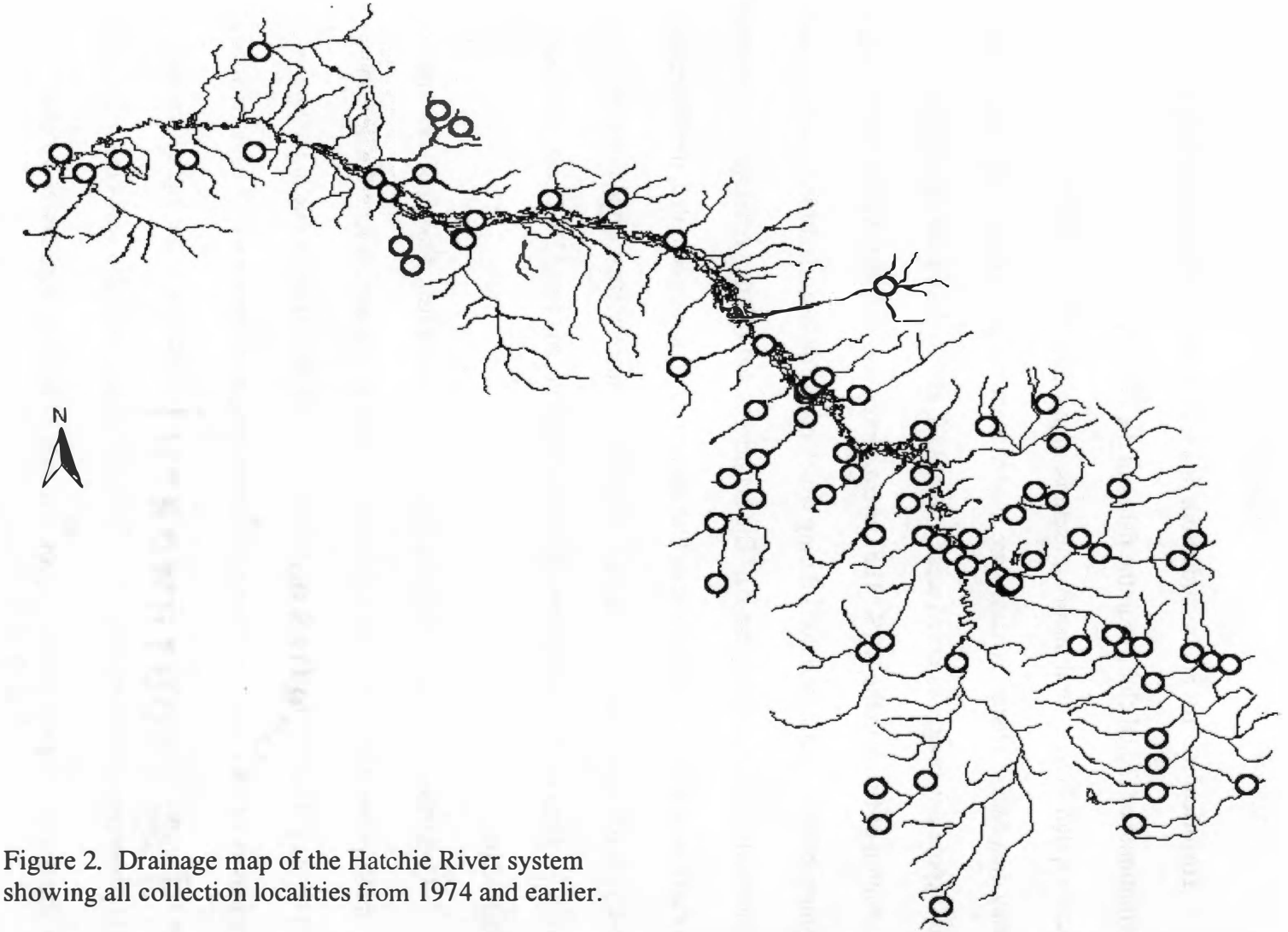

Figure 2. Drainage map of the Hatchie River system showing all collection localities from 1974 and earlier.

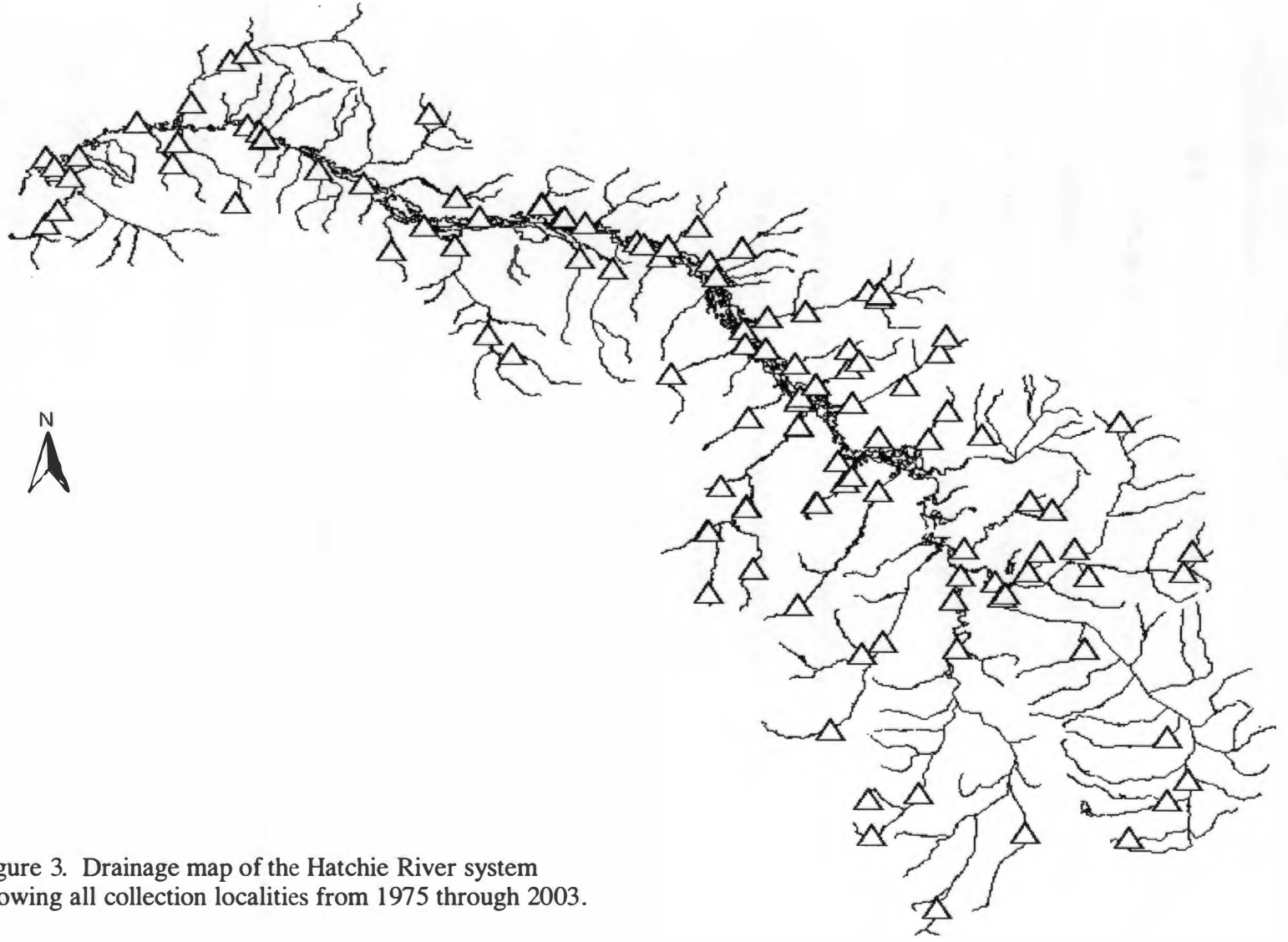

Figure 3. Drainage map of the Hatchie River system showing all collection localities from 1975 through 2003.

exceeded that of the available water. The majority of the boat shocking occurred during the summer of 2002, while a shorter excursion focusing on spring sucker runs occurred in early March of 2002. Various seining methods were employed across all habitat types along the course of the river including flooded BLH during December 2001 and April 2002. Dip netting was used in streams too small for a seine to be effective or in streams with extensive woody debris. Collection crews were typically composed of three people and varied from two people for smaller streams to 12 or more for some oxbow and main channel sampling.

Each habitat type identified at a locality was sampled until no new species were taken during three more samplings of that habitat type. Habitat types were grouped into three main categories (run, riffle, or pool) and then sub-divided into more specific categories. Runs were classified by canopy (direct sun or shade); substrate (rip-rap, sand, packed clay, or loose clay); structure (woody debris, tires, other refuse, or absent); flow (fast or moderate); depth (less than one foot or more than one foot deep). Riffles were classified by cover (direct sun or shade); substrate (rip-rap, loose clay, or packed clay); structure (if any) – woody debris or refuse. Pools were classified by: cover – direct sun or shade; substrate– rip-rap, sand, packed clay, loose clay, mud, or coarse particulate organic matter (CPOM); flow – undetectable, slow, or moderate; depth – one to two feet, two feet to four feet, or greater than 4 feet. All rip-rap observed in this study was loose limestone boulders, approximately 8-15" in diameter.

At each locality a representative sample was taken along with any questionable specimens and preserved in the field with a 10% formaldehyde solution. All samples were later sorted and identified using keys from Etnier and Starnes (1993), Ross (2001)

and comparative material from the University of Tennessee Research Collection of Fishes (UT). After positive identification, voucher specimens were given UT catalogue numbers and deposited into the collection.

Collections were made under permits issued to the author by TWRA, permit number 1257, and Mississippi Museum of Natural Science. Collections were also taken under TWRA permit number 791, issued to Dr. David Etnier and the author.

Chapter IV

Species Accounts

The following is an annotated list of all fish species known from or suspected to occur in the HRS. The number preceding each species account is the designated number for that species; these numbers will be used in the appendices. Species are listed in phylogenetic order by family and alphabetically by genus and species epithet within family. Phylogenetic order and taxonomy follow Nelson et al. (in press).

Petromyzontidae – lampreys

1. *Ichthyomyzon castaneus* Girard – chestnut lamprey (figure A1): The first documented chestnut lamprey was taken in Cub Creek near the mouth in 1998 and is deposited at the Illinois Natural History Survey (INHS) 32010. Several more were collected during this survey in the main channel of the HRS while boat shocking near Bolivar, Hardeman County, Tennessee, and at the US 51 bridge in Tipton County, Tennessee. Of the specimens collected during this survey one was attached to a *Dorosoma cepedianum* while the rest were attached to *Ictiobus cyprinellus.* Individauls of *Ichthyomyzon castaneus* in the HRS could possibly come from two sources. Despite limited substrate for nest building the HRS may support reproducing populations of chestnut lampreys. Records nearer the mouth may represent individuals that are brought into the HRS while parasitizing big river fish such as *Ictiobus* sp.. The chestnut lamprey is listed as a Species of Special Concern in Mississippi.

2. *Ichthyomyzon unicuspus* Hubbs and Trautman – silver lamprey: There are no records of the Silver lamprey from the HRS but their range includes the Mississippi River as far South as Northern Louisiana. Any future records of this lamprey in the HRS

are likely to come from the main channel and fall within the range for *Ichthyomyzon castaneus.*

3. *Lampetra aepyptera* Abbott – least brook lamprey (figure A2): Least brook lampreys were collected from streams in the UCP, in areas of sand substrate or CPOM. Least brook lamprey ammocoetes were collected in larger numbers in streams beginning to suffer from sand deposition, particularly at the margin of sand deposition. These ammocoetes were best collected by dragging the lead line of the seine through the loose sand.

Acipenseridae – sturgeons

4. *Scaphirhynchus platorynchus* (Rafinesque) – shovelnose sturgeon: There are no documented records of shovelnose sturgeon but it is likely they occur in the larger portions of the HRS. Starnes (1973) noted that commercial fishermen in the area had encountered them. The shovelnose sturgeon is listed as a Species of Special Concern in Mississippi.

Polyodontidae – paddlefish

5. *Polyodon spathula* (Walbaum)—paddlefish (figure A3): One specimen was collected during this survey at the US 51 bridge in the main channel while boat shocking. Paddlefish probably sporadically occur in the larger portions of the HRS. Paddlefish are becoming more highly sought after for their eggs to sell as caviar as the world market for caviar grows and the supply of sturgeon based caviar declines (Carlson and Bonislawsky, 1981; Semmens and Shelton, 1986). This increased pressure has led to the over-fishing of paddlefish populations and most states have regulations on the

harvesting of paddlefish. The paddlefish is listed as a Species of Special Concern in Mississippi and harvest is regulated in Tennessee.

Lepisosteidae – gars

6. *Atractosteus spatula* (Lacepede) – alligator gar: Starnes (1973) reported seeing a photograph of an alligator gar supposedly taken from the lower HRS but no other records have been documented. If the alligator gar still occurs in the HRS it is certainly rare. The alligator gar is listed as a Species of Special Concern in Mississippi and Tennessee.

7. *Lepisosteus oculatus* (Winchell) – spotted gar (figure A4): Spotted gar were collected throughout the system and were the predominant gar in tributaries. Spotted gar were always taken in the deeper pools of these tributaries and most of the time were only collected when an individual had been seen by a collector and specifically targeted. Spotted gar likely represent the dominant piscivore, other than *Amia calva*, in these tributaries.

8. *Lepisosteus osseus* (Linnaeus) – longnose gar (figure A5): Longnose gar have historically been found throughout the system but they were collected only by boat shocking in the main channel and LCP in this study. The previous records of longnose gar were typically from trap netting and sodium cyanide applications, two methods not used in this study. Thus, longnose gar probably still occur throughout the system and the lack of records in this survey is an artifact of collection methods.

9. *Lepisosteus platostomus* Rafinesque – shortnose gar (figure A6): Shortnose gar were only collected in the main channel of the LCP portions of the HRS

and likely remain in the main channel throughout the system. However, shortnose gar were the predominant gar species in samples from the main channel.

Amiidae – bowfin

10. *Amia calva* Linnaeus – bowfin (figure A7): Bowfin have been collected throughout the system in areas of sluggish water, such as sloughs and oxbows, were they are one of the dominant predators. Lack of records in this survey from historical localities in the UCP are probably artifacts of collection methods and not true range reduction.

Hiodontidae – mooneyes

11. *Hiodon alosoides* (Rafinesque) – goldeye (figure A8): The goldeye has only been collected in the main channel in Haywood and Tipton counties. The goldeye is probably restricted to the lower portion of the HRS and does not regularly enter tributaries.

12. *Hiodon tergisus* Lesueur – mooneye (figure A9): No mooneye were collected during this survey but a 1999 collection from the main channel at the US 76 bridge in Haywood County contained one specimen (UT 36.59). The range of the mooneye probably approximates that of the goldeye.

Anguillidae – freshwater eels

13. *Anguilla rostrata* (Lesueur) – American eel: No American eels have been recorded from the HRS. It is likely to occur in the HRS as it has been collected from the Forked Deer system to the north (Etnier and Starnes, 1993) and many other direct tributaries to the Mississippi river.

Clupeidae – herrings and shad

14. *Alosa chrysochloris* (Rafinesque) – skipjack herring (figure A10): One specimen of skipjack was taken by angling in the main channel near the mouth of Clover Creek in May 2001 (UT 29.219). Skipjack herring probably occur throughout the larger portions of the main channel and approximate the distribution of the *Hiodon* sp.

15. *Dorosoma cepedianum* (Lesueur) – gizzard shad (figure A11): Gizzard shad were collected from most habitat types throughout the system but were most common in oxbows and larger pools in streams. The sampling of one such stream pool, Cypress Creek at Gunn Bottom Road, resulted in 4-5 seine hauls full of juveniles. The majority of one of these hauls was preserved and yielded 346 individuals between 18 and 54 mm SL (UT 29.233).

16. *Dorosoma petenense* (Guenther) – threadfin shad (figure A12): No threadfin shad were taken during this survey. A 1956 Tennessee Game and Fish Commission collection from the main channel near the US 70-79 bridge remains the only record of threadfin shad from the HRS. However, none of these specimens were vouchered and because of potential misidentification and the lack of subsequent records, this record remains suspect. If threadfin are present in the HRS their distribution likely approximates that of *Dorosoma cepedianum*.

Cyprinidae – minnows

17. *Carassius auratus* (Linnaeus) – goldfish (figure A13): Starnes (1973) collected two large specimens near the main channel in Hardeman County. No specimens have been reported since then. This Eurasian species probably makes it into the HRS

through "bait bucket" introductions, or more likely, aquarium releases, but not in large enough numbers to maintain a noticeable presence.

18. *Ctenopharyngodon idella* (Valenciennes) – grass carp (figure A14): Grass carp were recorded from two localities on the main channel. The first record is from a dead specimen found in 2001 near the mouth of Clover creek, downstream of Bolivar. This represents the farthest upstream record for this fish but it likely occurs throughout much of the main channel upstream. The second specimen (UT 44.9567, 740 mm SL) was taken in 2002 while boat shocking downstream of the US 51 bridge. This specimen was nearly lost because the boat's driver (Todd Sink) took several minutes to recover from the cephalic bludgeoning administered by the grass carp during an aerial feat typical of the species.

19. *Cyprinella camura* (Jordan and Meek) – bluntface shiner (figure A15): Bluntface shiners are primarily found in the UCP in tributaries with clean sand substrates and moderate flow. There are several records from the LCP, but these are mostly records of one or two individuals from the main channel and likely represent transients or displaced individuals.

20. *Cyprinella lutrensis* (Baird and Girard) – red shiner (figure A16): A major range expansion has occurred in the distribution of red shiners. The 1973 survey recorded red shiners from only three creeks in the LP of the HRS compared to 10 creeks in both the LP and WMP of the HRS in this survey. The red shiner has a particularly wide tolerance range to environmental conditions and this probably plays a large role in its range expansion abilities (Matthews and Hill, 1977).

21. *Cyprinella venusta* Girard – blacktail shiner (figure A17): Blacktail shiners were collected throughout the HRS and were most common in the UP of the HRS. However, during this survey blacktail shiners were collected in many more localities in the LCP than in previous collections.

22. *Cyprinus carpio* Linnaeus – common carp (figure A18): Collections of common carp during this survey were from portions in the LCP, whereas previous collections have found them throughout the system, mainly in the main channel and larger tributaries. The only collection of common carp (juveniles) in relatively high numbers was in Richland Creek at Cotton Lake Road in Tipton Co., Tennessee, which has been altered to the point it is essentially an agricultural ditch extending approximately 1 mile upstream. The apparent range reduction is likely an artifact of collection methods.

23. *Hybognathus hayi* Jordan – cypress minnow (figure A19): The cypress minnow has been collected throughout the system but never in great numbers. It is typically found in swampy areas with slow current, heavy vegetation, and cypress growth.

24. *Hybognathus nuchalis* Agassiz – Mississippi silvery minnow (figure A20): Mississippi silvery minnows are still widespread and abundant in the HRS. During this survey they were collected in the greatest numbers in the pool areas of medium sized tributaries with clay or sandy clay substrates.

25. *Hybopsis amnis* (Hubbs and Greene) – pallid shiner (figure A21): This minnow is found predominantly in the main channel and larger tributaries in areas of moderate current over sand substrate. The pallid shiner is listed as a Species of Special Concern in Mississippi.

26. *Hypophthalmichthys molitrix* (Valenciennes) – silver carp: This East Asian carp has never been collected in the HRS but new records will likely begin to appear in the next several years as they move in from the Mississippi River. Silver carp will likely have a distribution restricted to the main channel and may occur purely as transients because of the necessity of big rivers for successful spawning.

27. *Hypophthalmichthys nobilis* (Richardson) – bighead carp: There have been no records of bighead carp in the HRS but they will likely be collected from the HRS before the silver carp as it is more common in the Mississippi River. The bighead carp's eventual distribution will presumably be similar to that of the silver carp.

28. *Luxilus chrysocephalus* Rafinesque – striped shiner (figure A22): Striped shiners are restricted to streams in the UCP and were most often collected in pool areas created by debris dams; they were never collected from the main channel.

29. *Lythrurus bellus* Hay – pretty shiner (figure A23): One specimen (MMNS 20819) of this introduced species was collected and identified by CE Hollis in 1981. This record is from Hurricane Creek, a tributary to the Tuscumbia River, on the edge of the boundary between the Hatchie watershed and the Tombigbee watershed in which it naturally occurs. Sampling of this locality and many adjacent localities during this survey yielded no pretty shiners. The author does not find reason to question the validity of the identification after communication with Steven Ross. Since the native range of this fish is so close, "bait bucket" introduction is likely.

30. *Lythrurus fumeus* (Evermann) – ribbon shiner (figure A24): This minnow was collected in nearly all habitat types and is common throughout the HRS. It is one of the most widely distributed cyprinids in the HRS and is a fairly tolerant minnow.

31. *Lythrurus umbratilis* (Girard) – redfin shiner (figure A25): Historically the redfin shiner was distributed throughout the HRS, although more common in the UCP portions, but it has nearly disappeared from the LCP. Only one specimen (UT 44.9922) was collected in the LCP during this survey and this was from the headwaters of Hurricane Creek in Tipton Co., Tennessee.

32. *Macrhybopsis gelida* (Girard) – sturgeon chub: There are no records of sturgeon chub from the HRS but they have been taken from the Mississippi River near the mouth of the HRS. Sturgeon chub distribution is virtually restricted to the main channel of the Missouri and lower Mississippi Rivers. The sturgeon chub is listed as a Species of Special Concern in Tennessee.

33. *Macrhybopsis hyostoma* (Gilbert) – spotted chub (figure A26): Sixteen specimens (UT 44.8795) of spotted chub were collected in the main channel approximately 0.4 miles above the mouth in 2000. This Mississippi River fish probably occurs in the HRS for several miles farther upstream over gravel/sand bars, which are fairly common in the HRS.

34. *Macrhybopsis meeki* (Jordan and Evermann) – sicklefin chub: While the sicklefin chub has never been collected in the HRS it has been collected from the Mississippi River and is often collected with *Macrhybopsis gelida*. The distribution of *Macrhybopsis meeki* likely approximates that of *Macrhybopsis gelida*.

35. *Macrhybopsis storeriana* (Kirtland) – silver chub (figure A27): The silver chub has been recorded once near the US 51 bridge by CFI in 2000. It probably does not extend much farther upstream than this locality.

36. *Notemigonus crysoleucas* (Mitchill) – golden shiner (figure A28): The golden shiner is one of the most widely distributed cyprinids in the HRS. It was most often collected in the pool areas of tributaries and was usually one of the more abundant minnows when collected.

37. *Notropis ammophilus* Suttkus and Boschung – orangefin shiner (figure A29): Orangefin shiners were found only in the UPC portions of the HRS. This minnow is very habitat specific as it was only found in areas of moderate current, sand substrate, and water depth of less than one foot. However, where it occurs it is found in large numbers.

38. *Notropis atherinoides* Rafinesque – emerald shiner (figure A30): Emerald shiners are found along the entire course of the HRS but are most common in the main channel and larger tributaries. During two days of collecting effort in December 2001 of flooded BLH near Brownsville, Tennessee, only one specimen of *N. atherinoides* and two specimens of *Labidesthes sicculus* were collected.

39. *Notropis blennius* (Girard) – river shiner (figure A31): This big river shiner has been collected once 0.4 miles above the mouth (UT 44.8797) and likely occurs throughout the lower portions of the main channel.

40. *Notropis maculatus* (Hay) – taillight shiner (figure A32): The taillight shiner was only collected in oxbows, sloughs, and backwater areas, but it was present in these habitats throughout the HRS. It should be noted that taillight shiners were never abundant, usually only a few individuals were collected even during collecting events including eight or more people and resulting in at least 10 man-hours of labor.

41. *Notropis shumardi* (Girard) – silverband shiner: This big river shiner has never been collected in the HRS but it occurs in the Mississippi River near the mouth of the HRS. The distribution of this shiner likely approximates that of the other big river shiners in the lower portions of the main channel.

42. *Notropis volucellus* (Cope) – mimic shiner (figure A33): The mimic shiner has been collected once (UT 44.3072) at the US 76 bridge on the main channel. This locality is probably close to the farthest upstream most of the big river shiners regularly occur. Records of mimic shiners from small streams were reported by TWRA but these data were omitted because of the likelihood of misidentification.

43. *Notropis wickliffi* Trautman – channel shiner (figure A34): Five specimens (UT 44.8795) were collected in the same sample as *Notropis blennius* (above) and its distribution is probably close to that of the other big river shiners.

44. *Opsopoeodus emiliae* Hay – pugnose minnow (figure A35): The pugnose minnow is mainly restricted to the backwaters of the anastomosed portion of the main channel in the Hatchie Bottoms and a few sluggish parts of the tributaries to this portion of the HRS. It was always present in collections containing *Notropis maculatus*, but the relationship is not reciprocal suggesting that *O. emiliae* is not as habitat specific.

45. *Phenacobius mirabilis* (Girard) – suckermouth minnow (figure A36): Records of *P. mirabilis* during this survey were limited to the lower end of the HRS whereas in previous collections they had been recorded as far upstream as the Tuscumbia River. The suckermouth minnow is listed as a Species of Special Concern in Mississippi.

46. *Pimephales notatus* (Rafinesque) – bluntnose minnow (figure A37): *Pimephales notatus* is restricted to the tributaries in the UCP, typified by faster current

and clean substrates. When it was collected in the main channel it was usually only a few individuals and outnumbered by *Pimephales vigilax*.

47. *Pimephales promelas* Rafinesque – fathead minnow (figure A38): The first records of this common bait fish were collected during this survey from creeks in the LP and EMP; they were most common in sluggish pools. Most collections contained several individuals but they were never the predominant minnow. Several specimens were smaller (25-36 mm SL, UT 44.9918) than sizes typically seen being sold as bait, thus suggesting these were individuals from reproducing populations.

48. *Pimephales vigilax* (Baird and Girard) – bullhead minnow (figure A39): The bullhead minnow is the predominant *Pimephales* throughout the main channel of the HRS but they are not found in any significant numbers in tributaries. It was most often collected in areas of moderate current at the margins of the bank in the main channel or in flowing pools of larger tributaries.

49. *Platygobio gracilis* (Richardson) – flathead chub: The flathead chub has never been collected from the HRS but it has been taken from several Mississippi River localities including one near the mouth of the HRS. Thus, *Platygobio gracilis* may enter the lower portions of the HRS where the appropriate habitat is afforded.

50. *Semotilus atromaculatus* (Mitchill) – creek chub (figure A40): Creek chubs were collected throughout the system but are more common in the EMP and UP of the HRS. They were most often associated with pool habitats much like those preferred by *Luxilus chrysocephalus,* which was often present in samples containing *S. atromaculatus*.

Catostomidae – suckers

51. *Carpiodes carpio* (Rafinesque) – river carpsucker (figure A41): This big river fish is likely present throughout the main channel of the HRS. Adults have been collected several times in the main channel and juveniles have been collected in several larger tributaries.

52. *Carpiodes cyprinus* (Lesueur) – quillback carpsucker (figure A42): The quillback was collected twice by the Tennessee Game and Fish Commission, once in 1956 and once in 1963. Both of these collections were made at the US 70-79 bridge. Quillback carpsuckers probably occur throughout the range of river carpsuckers but are much less common.

53. *Cycleptus elongatus* (Lesueur) – blue sucker (figure A43): Blue suckers have been collected from a couple of localities along the main channel and likely occur throughout the larger portions of the HRS. TWRA crews have reported multiple specimens from the main channel just downstream of the Bolivar wastewater effluent (Frank Fiss, pers. com.). Blue suckers are listed as Threatened in Tennessee and as a Species of Special Concern in Mississippi.

54. *Erimyzon oblongus* (Mitchill) – creek chubsucker (figure A44): Creek chubsuckers were most common in the UCP but were collected from tributaries with moderate current and sand substrates throughout the HRS.

55. *Erimyzon sucetta* (Lacepede) – lake chubsucker (figure A45): The first records for the HRS of *E. sucetta* were both from McNairy Co., Tennessee – two individuals from the Tuscumbia slough (UT 45.1787) and one individual from Oxford Creek (UT 45.1788). They prefer habitats with sluggish flow and heavy vegetation such

as oxbows and backwaters, but they move into creeks with sandy substrate during spawning activities in the spring, when the Oxford Creek individual was collected.

56. *Hypentelium nigricans* (Lesueur) – northern hogsucker (figure A46): Northern hogsuckers are restricted to the UCP portions of the HRS and are most common in the tributaries of the EMP. They most often occurred in larger tributaries with moderate current, clean substrates, and depths of one to two feet.

57. *Ictiobus bubalus* (Rafinesque) – smallmouth buffalo (figure A47): Smallmouth buffalo were the most abundant buffalo in boat shocking collections during this survey. Adults were only taken in the main channel while one juvenile was collected in Hurricane Creek, Tipton Co., Tennessee (70 mm SL, UT 45.1865).

58. *Ictiobus cyprinellus* (Valenciennes) – bigmouth buffalo (figure A48): Bigmouth buffalo were the second most commonly collected buffalo in the HRS and were only collected in the main channel. *Ictiobus cyprinellus* also seemed to be the most common host for *Ichthyomyzon castaneus* (see species account for *I. castaneus*), or other possible *Ichthyomyzon* sp., as most specimens seen during the survey had wounds, fresh and healed, typical of those left after parasitism by lampreys.

59. *Ictiobus niger* (Rafinesque) – black buffalo (figure A49): One juvenile black buffalo (50 mm SL, UT 45.1862) was collected from the lower portion of Cane Creek in Lauderdale County. It likely occurs in the same areas as the other buffalo, but is typically less common (Etnier and Starnes, 1993). Black buffalo are listed as Species of Special Concern in Mississippi.

60. *Minytrema melanops* (Rafinesque) – spotted sucker (figure A50): This sucker is confined to the main channel of the HRS but juveniles move into the larger

tributaries. A collection on March 2nd 2002 from the main channel made with a boat shocker contained a 325 mm SL male that was fully tuberculate (UT 45.1754).

61. *Moxostoma erythrurum* (Rafinesque) – golden redhorse (figure A51): No golden redhorse were collected during this survey and there is only one record of this species, from the upper part of the HRS in McNairy County. This species is probably restricted to the headwaters of the HRS and occurs in very low numbers as this part of the HRS has been sampled more thoroughly than other areas. Golden redhorse are listed as a Species of Special Concern in Mississippi.

62. *Moxostoma poecilurum* (Jordan) – blacktail redhorse (figure A52): The distribution of the blacktail redhorse approximates that of *Minytrema melanops* but it is more common and juveniles were collected farther upstream in tributaries and in smaller tributaries.

Ictaluridae – catfishes

63. *Ameiurus melas* (Rafinesque) – black bullhead (figure A53): This bullhead was collected almost exclusively from pools, one to three feet deep, in smaller tributaries throughout the system; it was never collected from the main channel. *Ameiurus melas* was not as common or abundant as *A. natalis*.

64. *Ameiurus natalis* (Lesueur) – yellow bullhead (figure A54): *Ameiurus natalis* was collected from pool habitats in tributaries of all sizes and from the main channel throughout the HRS. However, it does not penetrate as far into tributaries as *A. melas* does.

65. *Ameiurus nebulosus* (Lesueur) – brown bullhead (figure A55): The first specimen of brown bullhead (UT 48.1088) was collected from Boles Branch on the

eastern edge of Big Hill Pond State Park. This stream is mostly pools with very little flow and has many Cypress trees growing along the banks; this represents typical brown bullhead habitat. It is not surprising that this is the first record of this fish from the HRS as brown bullheads are not often encountered in this part of their range and their preferred habitat is difficult to sample.

66. *Ictalurus furcatus* (Lesueur) – blue catfish (figure A56): Only two records of blue catfish exist for the HRS, both from the LCP main channel. It is likely a common fish in the main channel but much less common than *Ictalurus punctatus.*

67. *Ictalurus punctatus* (Rafinesque) – channel catfish (figure A57): Channel catfish are common throughout the HRS with adult records from the main channel and many records of juveniles in the tributaries.

68. *Noturus gyrinus* (Mitchill) – tadpole madtom (figure A58): Tadpole madtoms were primarily collected from sluggish streams, sloughs, and oxbows where there is plentiful CPOM. During this survey no *N. gyrinus* were collected in the LP of the HRS but they were found in all other parts of their known range.

69. *Noturus hildebrandi* (Bailey and Taylor) – least madtom (figure A59): The least madtom is most common in the UCP portions of the HRS, and has only two records from the main channel in the LCP. This madtom prefers flowing pool habitats often with vegetation available.

70. *Noturus miurus* Jordan – brindled madtom (figure A60): *Noturus miurus* was most often collected when seining through areas of CPOM, mostly leaves, in 1 to 1.5 feet of water with moderate current. Also, it was only collected from larger tributaries and the main channel and was most common in the EMP.

71. *Noturus nocturnus* Jordan and Gilbert – freckled madtom (figure A61): The freckled madtom was collected throughout the HRS from backwaters of the main channel and the lower ends of larger tributaries. These localities usually afforded *Noturus nocturnus* with flowing pools, one to two feet deep with CPOM or undercut banks.

72. *Noturus phaeus* Taylor – brown madtom (figure A62): The brown madtom was the most common madtom collected from the HRS. It was collected from all portions of the HRS but was much more prevalent in the EMP, occurring in most tributaries of that portion. Like most madtoms, *Noturus phaeus* was usually associated with CPOM or other cover, generally avoiding areas in the thalweg of the stream.

73. *Noturus stigmosus* Taylor – northern madtom (figure A63): This large madtom was only represented in collections from larger tributaries and the main channel in the EMP. However, previous records from the UP were unsubstantiated during this survey and it was the least collected *Noturus* in the HRS. *Noturus stigmosus* were usually associated with deeply undercut banks or large piles of woody debris in slowly flowing pools, one to two feet deep. Northern madtoms are listed as a Species of Special Concern in Mississippi and Tennessee.

74. *Pylodictis olivaris* (Rafinesque) – flathead catfish (figure A64): This big river catfish was primarily collected from the main channel while boat shocking and tended to be associated with fallen trees and the few wing dams that exist in the main channel; both juveniles and adults were taken in these habitats.

Esocidae – pikes

75. *Esox americanus* Gmelin – grass pickerel (figure A65): *Esox americanus* was the more common of the two pickerels and collected in all portions of the HRS. *Esox americanus* was most common in flowing pool habitats in tributaries of the EMP, where there was abundant prey and cover.

76. *Esox niger* Lesueur – chain pickerel (figure A66): This pickerel was more abundant than *E. americanus* in the main channel and larger tributaries, but appears to avoid smaller tributaries and the upper portions of larger tributaries.

Osmeridae – smelts

77. *Osmerus mordax* (Mitchill) – rainbow smelt: No specimens of rainbow smelt have been collected in the HRS but specimens have been collected from the adjacent Mississippi River. However, these probably represent transient fish as they are typically only collected during cooler months and breeding populations this far south are unlikely (Etnier and Starnes, 1993).

Aphredoderidae – pirate perch

78. *Aphredoderus sayanus* (Gilliams) – pirate perch (figure A67): The pirate perch was collected from nearly every habitat type found in the HRS and is probably one of the most universally occurring fishes in the HRS. Habitats they were collected from ranged from small, moderate current headwater tributaries with clean substrates to the LP main channel and oxbows with high silt loads or still water. They were most commonly collected from swampy, forested areas in the EMP.

Gadidae – codfishes

79. *Lota lota* (Linnaeus) – burbot: The only report of the burbot in Tennessee comes from the HRS but the specimen was not retained and this record is dependent on accepting the identification made by TWRA officer John David (Etnier and Starnes, 1993). This specimen was collected during the winter of 1982-1983 and any future collection will likely occur during the winter when water temperatures fall into the range preferred by burbot.

Fundulidae – topminnows

80. *Fundulus dispar* (Agassiz) – northern starhead topminnow (figure A68): This colorful topminnow was collected only in swampy, forested areas with clear water and plentiful vegetation. Despite its close association with this patchy habitat type, it was found in these habitats throughout the HRS, from the Tuscumbia slough in southern McNairy Co., Tennessee, to Champion Lake in western Lauderdale Co., Tennessee. The northern starhead topminnow is listed as a Species of Special Concern in Mississippi.

81. *Fundulus notatus* (Rafinesque) – blackstripe topminnow (figure A69): *Fundulus notatus* is more abundant than *F. olivaceus* in portions of the HRS in the LCP but the reverse is true of portions in the UCP. Also, it seems to be the more abundant of the two in the main channel and was rarely collected in upper portions of tributaries.

82. *Fundulus olivaceus* (Storer) – blackspotted topminnow (figure A70): As stated above, *F. olivaceus* was more common in the EMP and UP of the HRS and was rarely collected from the main channel. The blackspotted topminnow was most abundant in highly vegetated, low flow sections of tributaries.

Poeciliidae – livebearers

83. *Gambusia affinis* (Baird and Girard) – western mosquitofish (figure A71): The widely distributed mosquitofish has a fairly extensive distribution in the HRS, ranging from the smallest headwaters in Mississippi to the main channel just upstream of the mouth at the Mississippi River and including nearly every habitat type. *Gambusia* were most abundant in the shallow backwaters and pools of streams where large schools would congregate and move en masse when approached by a predator or lurking ichthyologist.

Atherinopsidae – New World silversides

84. *Labidesthes sicculus* (Cope) – brook silverside (figure A72): Brook silversides have a patchy distribution throughout the HRS but they were often locally abundant. *Labidesthes sicculus* was most often collected from backwaters on the main channel and pool type habitats in the larger tributaries. It was one of two species, *Notropis atherinoides* being the other, collected from flooded BLH forest in December 2001 during two days of collecting effort.

85. *Menidia audens* (Hay) – Mississippi silverside: The inland silverside was not collected during this survey and has not been collected in the HRS. It has been collected in large numbers in the Mississippi River and is presumed to enter the lower part of the main channel (Starnes, 1973; Etnier and Starnes, 1993).

Mugilidae – mullets

86. *Mugil cephalus* Linnaeus – mullet: No mullets were collected during this survey but they are presumed to travel up the Mississippi River as far as Missouri (Etnier

and Starnes, 1993); thus they may occasionally find their way into the lower portion of the HRS.

Moronidae – temperate basses

87. *Morone chrysops* (Rafinesque) – white bass (figure A73): A 1956 Tennessee Game and Fish Commission collection contained one specimen of white bass and represents the only collection of this species in the HRS. White bass probably stay in the larger portions of the HRS and in deeper water, making them hard to collect.

88. *Morone mississippiensis* Jordan and Eigenmann – yellow bass: No yellow bass have been collected in the HRS but this is likely a consequence of the fish's preferred habitat which is similar to that of the white bass.

89. *Morone saxatilis* (Walbaum) – striped bass: Striped bass have never been collected in the HRS. However, considering the increasing frequency of records from the Mississippi River, they likely occur in the HRS with a distribution approximating that of the other *Morone*.

Elassomatidae – pygmy sunfishes

90. *Elassoma zonatum* Jordan – banded pygmy sunfish (figure A74): The diminutive *Elassoma zonatum* was most common in collections from sections of tributaries lying in the HRS flood plain. These localities were typified by slow current pools, abundant vegetation, and were usually no more than one foot deep. In areas where the low gradient afforded marsh like conditions, *E. zonatum* were found in the small, vegetated channels meandering through the marsh.

Centrarchidae – sunfishes

91. *Centrarchus macropterus* (Lacepede) – flier (figure A75): During this survey, fliers were collected from tributaries in the LP and WMP of the HRS. These localities were dominated by sluggish pools and extensive cypress growth. Historical records from the EMP and UP were unsubstantiated during this study, but they likely still occur in these portions.

92. *Lepomis auritus* (Linnaeus) – redbreast sunfish (figure A76): Seven specimens of redbreast sunfish were collected from the Tuscumbia River (Mississippi Museum of Natural Science (MMNS) 20163) in 1972. However, no redbreast were collected during this survey anywhere in the Tuscumbia River, or anywhere else in the HRS, suggesting that these individuals were not part of an established population. A few TWRA records of redbreast sunfish were omitted because of the lack of voucher specimens and the liklihood of confusion with the abundant and very similar longear and green sunfish. These collections lacked any records of green sunfish or longear sunfish. Redbreast sunfish do not naturally occur in the HRS and when records do occur they will most likely be of fish that escaped from stocked ponds (Starnes, 1973).

93. *Lepomis cyanellus* Rafinesque – green sunfish (figure A77): *Lepomis cyanellus* was the most common and abundant sunfish in the HRS and was collected from tributaries throughout all portions. Like most other sunfish it was rarely collected from the main channel and was collected most often in the pool areas of tributaries.

94. *Lepomis gulosus* (Cuvier) – warmouth (figure A78): Warmouth were collected from tributaries throughout the HRS. Most warmouth collected during this survey were associated with sluggish portions of streams and debris piles or exposed root

masses in undercut banks. When *L. gulosus* was present in a collection, it usually contained only one adult and possibly one or two juveniles.

95. *Lepomis humilis* (Girard) – orangespotted sunfish (figure A79): The second smallest *Lepomis* was found in all portions of the HRS and collections suggest a fairly even distribution throughout its range except for the UP. The only collection from the UP to contain orangespotted sunfish was one from the Tuscumbia slough in southern McNairy Co., Tennessee. Nearly all *L. humilis* were collected in backwaters of the main channel or the sluggish lower parts of tributaries within the HRS flood plain.

96. *Lepomis macrochirus* Rafinesque – bluegill (figure A80): The distribution of bluegill approximates that of *L. cyanellus*, occupying all portions of the HRS, and the two species were often collected in the same pools.

97. *Lepomis marginatus* (Holbrook) – dollar sunfish (figure A81): *Lepomis marginatus* was collected primarily from pool habitat in smaller tributaries and only from a few backwaters on the main channel. The dollar sunfish was most common in collections from the EMP and least common from the LP.

98. *Lepomis megalotis* (Rafinesque) – longear sunfish (figure A82): The longear sunfish was collected from all portions of the HRS and seems to have a fairly uniform abundance throughout. *Lepomis megalotis* utilized habitat similar to that of *L. marginatus* but also occupied areas with more flow.

99. *Lepomis microlophus* (Guenther) – redear sunfish (figure A83): Historical records of *L. microlophus* at both ends of the HRS were unsubstantiated in this survey. However, redear sunfish were collected from multiple localities throughout areas between these previous records where no records existed before. Thus, the redear is

likely distributed throughout the HRS but very uncommon. *Lepomis microlophus* is probably restricted to oxbows and backwaters of the main channel, where they are afforded quiet waters with plenty of cover.

100. *Lepomis miniatus* – redspotted sunfish (figure A84): Redspotted sunfish were collected from scattered localities primarily in the EMP. They were usually associated with heavily vegetated side channels and backwaters of medium to large tributaries.

101. *Lepomis symmetricus* Forbes – bantam sunfish (figure A85): The smallest of all *Lepomis* was collected from a few streams and oxbows in the LCP portions of the HRS. The habitat at all localities was predominantly still water, one to three feet deep with abundant vegetation or CPOM. *Lepomis symmetricus* is likely restricted to such habitats and it is unlikely that it will be found in other habitats available in the HRS.

102. *Micropterus punctulatus* (Rafinesque) – spotted bass (figure A86): Spotted bass were collected from larger tributaries and the main channel throughout the HRS. Although widely distributed they were nowhere abundant.

103. *Micropterus salmoides* (Lacepede) – largemouth bass (figure A87): The largemouth bass was collected more often than *Micropterus punctulatus* and juveniles occupied smaller streams. Largemouth bass were most common in collections from larger streams with ample pool habitat. Several collections of UP backwaters in May 2002 resulted in many seine hauls containing hundreds of 10 to 15 mm SL juvenile *M. salmoides*.

104. *Pomoxis annularis* Rafinesque – white crappie (figure A88): Most *Pomoxis annularis* were collected from the main channel in backwaters and oxbows

where open water and little current predominate. The spotty distribution of records suggest that the white crappie is not particularly common in the HRS.

105. *Pomoxis nigromaculatus* (Lesueur) – black crappie (figure A89): Black crappie are more common than white crappie in the HRS but by no means are they abundant. *Percina nigromaculatus* were usually collected from the sluggish lower portions of the larger tributaries that have abundant cypress growth; only a few have been taken from backwaters on the main channel.

Percidae – perches

106. *Ammocrypta beanii* Jordan – naked sand darter (figure A90): *Ammocrypta beanii* was most common in larger tributaries of the EMP where abundant sand substrates occur. The water in these areas is one to one and half feet deep with moderate currents. The most effective way to collect the naked sand darter was to pull the lead line of the seine through the sand while moving downstream. *Ammocrypta beanii* were most abundant in Piney Creek at Ebenezer - Walnut Grove road where approximately 100 individuals were collected (most were released). *Ammocrypta beanii* is listed as a Species of Special Concern in Tennessee.

107. *Ammocrypta vivax* Hay – scaly sand darter (figure A91): *Ammocrypta vivax* were collected in habitats much like those containing *A. beanii* but were restricted to localities in larger tributaries or the main channel. Every collection containing *A. vivax* also included *A. beanii*. *Ammocrypta vivax* is listed as a Species of Special Concern in Tennessee.

108. *Etheostoma asprigene* (Forbes) – mud darter (figure A92): No mud darters were collected during this survey and only one specimen has been collected in the

HRS. This darter is most likely restricted to oxbows and similar habitats making it difficult to collect.

109. *Etheostoma chlorosoma* (Hay) – bluntnose darter (figure A93): Bluntnose darters were collected from every habitat type, excluding oxbows, and every size stream throughout all portions of the HRS. It was most common in areas with slow current and vegetation or CPOM.

110. *Etheostoma fusiforme* (Girard) – swamp darter (figure A94): The swamp darter was not collected during this survey and has a distribution approximating that of the mud darter, thus making it difficult to collect this darter as well.

111. *Etheostoma gracile* (Girard) – slough darter (figure A95): The range of the slough darter approximates that of *E. chlorosoma* but their distribution is spottier. *Etheostoma gracile* was most often associated with areas of sluggish water over clay substrates and CPOM.

112. *Etheostoma histrio* Jordan and Gilbert – harlequin darter (figure A96): Harlequin darters were rarely collected during this survey, but their current distribution in the WMP and EMP is unchanged from historical records. *Etheostoma histrio* were collected in areas of variable depth (six inches to three feet) and moderate flow over sand substrate with embedded CPOM.

113. *Etheostoma lynceum* Hay – brighteye darter (figure A97): *Etheostoma lynceum* was commonly collected in the UCP portions and a few individuals were collected from the WMP. They were most often associated with areas of moderate flow over sand substrates and plentiful vegetation.

114. *Etheostoma parvipinne* Gilbert and Swain – goldstripe darter (figure A98): Goldstripe darters were limited to collections in the UCP portions of the HRS and historical records from the LP and WMP were unsubstantiated during this survey. *Etheostoma parvipinne* localities typically had clay substrates with moderate currents and occasional woody debris.

115. *Etheostoma proeliare* (Hay) – cypress darter (figure A99): *Etheostoma proeliare* was collected from all portions of the HRS but was uncommon in the portions of the LCP. It was also never as common as *E. chlorosoma* even though it is associated with the same habitats – sluggish stream segments with abundant vegetation or CPOM.

116. *Etheostoma stigmaeum* (Jordan) – speckled darter (figure A100): Speckled darters were most common in the Hatchie Bottoms area of the WMP and EMP and did not penetrate the tributaries very far upstream. *Etheostoma stigmaeum* was almost always associated with large piles of woody debris in areas of moderate current and depths ranging from six inches to over three feet. These darters were most effectively collected by placing the seine downstream of the woody debris pile and then disturbing the pile along with all surrounding substrate.

117. *Etheostoma swaini* (Jordan) – gulf darter (figure A101): *Etheostoma swaini* was most abundant in the EMP and UP of the HRS, occurring most often in the tributaries but also in the shallow side channels of the main river in the Hatchie Bottoms. In tributaries and side channels it was associated with moderate flow over sand substrate and at least some available vegetation or CPOM. Gulf darters were collected less frequently from the Hatchie Bottoms area in the WMP, but these localities afforded similar habitat to that of the Hatchie Bottoms in the EMP.

118. *Etheostoma zonistium* Bailey and Etnier – bandfin darter (figure A102): *Etheostoma zonistium* was only collected from Spring Creek and Pleasant Creek, which are adjacent to each other. Bandfin darters were consistently collected from West Prong Spring Creek in numbers usually nearing 20 or 30 individuals, although most were released. These creeks offer habitat dominated by moderate flow over clean sand substrates plus abundant vegetation and CPOM. In fact, West Prong Spring Creek has such an abundance of submerged of large woody debris that movement of collectors in the stream is seriously impeded and collection of this site always resulted in torn seines and bloody shins. The bandfin darter is listed as a Species of Special Concern in Mississippi.

119. *Percina maculata* (Girard) – blackside darter (figure A103): Blackside darters were never collected in any great numbers and were usually outnumbered by *Percina sciera*. Only four of the 21 pre 1975 records of *Percina maculata* were repeated since 1975, three of which were substantiated during this survey. These darters were typically associated with moderate currents, clean sand or gravel substrates, variable amounts of vegetation or CPOM, and variable depth. Blackside darters range from the headwaters in the UP to the lower parts of the Hatchie Bottoms in the WMP. However, they were collected from tributaries only in the EMP and UP of the HRS.

120. *Percina sciera* (Swain) – dusky darter (figure A104): The distribution of *Percina sciera*, and the habitats it was most closely associated with, approximate that of *Percina maculata*. The dusky darter was much more abundant and common in the HRS than any other *Percina* during this survey.

121. *Percina shumardi* (Girard) – river darter (figure A105): River darters have been collected from the main channel at the TN 54 bridge on three separate occasions but from no other localities. It is presumed that river darters occur throughout the larger portions of the HRS but that their preference for these waters limits the frequency of collection (Etnier and Starnes, 1993).

122. *Percina vigil* (Hay) – saddleback darter (figure A106): Records of *Percina vigil* were confined to collections from the main channel and the lower end of a few larger tributaries. *Percina vigil* was collected in deeper water, three to four feet, with moderate current over clean, course sand substrates. Nearly every historical record was substantiated and several new localities were added for the saddleback darter during this survey.

123. *Sander canadense* (Griffith and Smith) – sauger: No sauger were collected during this survey and they have never been reported from the HRS. However, sauger have been collected in the Mississippi River downstream of the mouth of the HRS and likely enter the lower portions at least occasionally.

124. *Sander vitreus* (Mitchill) – walleye: No records of walleye exist for the HRS but they probably enter its lower portions. Walleye are typically found in habitat similar to *Sander canadense* but are less abundant than their relative in Tennessee waters.

Scianidae – drums

125. *Aplodinotus grunniens* Rafinesque – freshwater drum (figure A107): Drum were collected from several localities on the main channel during this survey. This big river fish probably has a distribution throughout the HRS main channel with juveniles moving into tributaries.

Chapter V

Discussion

One hundred and eight species in 19 families have been recorded from the HRS since 1939 (table 1). Ninety species had been confirmed as occurring in the HRS by 1973 and it was speculated that 109 species potentially occurred (Starnes, 1973). Of the 19 species added to the HRS fish fauna since 1973, this survey has added six: one extra-continental species, *Ctenopharyngodon idella*; one introduced North American species, *Pimephales promelas*; and four new records of fish suspected to be native to the HRS, *Ameiurus nebulosus, Ictiobus niger, Erimyzon sucetta,* and *Polyodon spathula.*

A variety of factors has affected the distribution of fishes in the HRS ranging from invasive species from the Mississippi River and "bait bucket" introduction to potential habitat alteration such as sand deposition and vegetative cover removal. Sampling of HRS sites is often difficult because of cypress knees and other such obstacles which reduce the likelihood of collecting all species that live in such habitats. The sampling methods used in the current study were more sensitive to the above than the sodium cyanide method used by W.C. Starnes (1973). Boat shocking collections on the HRS have been infrequent since the relatively recent introduction of this method, and such collections made in this survey drastically improved the knowledge of big river fish distribution throughout the HRS.

Substantiated species

Of the 88 species recorded in this survey six were new, eight show range restriction, and one shows range expansion. The new record of *Ctenopharyngodon idella*

Table 1. List of all fishes collected from or suspected to occur in the Hatchie River system. Past records substantiated during this survey (PRS), new record during this survey (NR), past records unsubstantiated during this survey (PRU), expected to occur but never collected (EO). Potentially extirpated species are denoted by (E); species with reduced ranges are denoted by (R); species with expanded ranges are denoted by (P); introduced North American species are denoted by (I); introduced extra-continental species are denoted by (V)

Family Species (common name)	PRS	NR	PRU	EO
Petromyzontidae				
Ichthyomyzon castaneus (chestnut lamprey)	O			
I. unicuspus (silver lamprey)				O
Lampetra aepyptera (least brook lamprey)	O			
Acipenseridae				
Scaphirhynchus platorhyncus (shovelnose sturgeon)				O
Polyodontidae				
Polyodon spathula (paddlefish)		O		
Lepisosteidae				
Atractosteus spatula (alligator gar)			O	
Lepisosteus oculatus (spotted gar)	O			
L. osseus (longnose gar)	O			
L. platostomus (shortnose gar)	O			
Amiidae				
Amia calva (bowfin)	O			
Hiodontidae				
Hiodon alosoides (goldeye)			O	
H. tergisus (mooneye)			O	
Anguillidae				
Anguilla rostrata (American eel)				O
Clupeidae				
Alosa chrysochloris (skipjack herring)	O			
Dorosoma cepedianum (gizzard shad)	O			
D. petenense (threadfin shad)			O	
Cyprinidae				
Carassius auratus (goldfish)			V	
Ctenopharyngodon idella (grass carp)		V		
Cyprinella camura (bluntface shiner)	O			
C. lutrensis (red shiner)	P			

Table 1. (continued)

Family Species (common name)	PRS	NR	PRU	EO
C. venusta (blacktail shiner)	O			
Cyprinus carpio (common carp)	V			
Hybognathus hayi (cypress minnow)	O			
H. nuchalis (Mississippi silvery minnow)	O			
Hybopsis amnis (pallid shiner)	O			
Hypophthalmichthys molitrix (silver carp)				V
H. nobilis (bighead carp)				V
Luxilus chrysocephalus (striped shiner)	O			
Lythrurus bellus (pretty shiner)			I	
L. fumeus (ribbon shiner)	O			
L. umbratilis (redfin shiner)	R			
Macrhybopsis gelida (sturgeon chub)				O
M. hyostoma (spotted chub)			O	
M. meeki (sicklefin chub)				O
M. storeriana (silver chub)			O	
Notemigonus crysoleucas (golden shiner)	O			
Notropis ammophilus (orangefin shiner)	O			
N. atherinoides (emerald shiner)	O			
N. blennius (river shiner)			O	
N. maculatus (taillight shiner)	O			
N. shumardi (silverband shiner)			O	
N. volucellus (mimic shiner)			O	
N. wickliffi (channel shiner)			O	
Opsopoeodus emiliae (pugnose minnow)	O			
Phenacobius mirabilis (suckermouth minnow)	O			
Pimephales notatus (bluntnose minnow)	O			
P. promelas (fathead minnow)		I		
P. vigilax (bullhead minnow)	O			
Platygobio gracilis (flathead chub)				O
Semotilus atromaculatus (creek chub)	O			
Catostomidae				
Carpiodes carpio (river carpsucker)	O			
C. cyprinus (quillback)			O	
Cycleptus elongatus (blue sucker)			O	
Erimyzon oblongus (creek chubsucker)	O			

Table 1. (continued)

Family Species (common name)	PRS	NR	PRU	EO
E. sucetta (lake chubsucker)		O		
Hypentelium nigricans (northern hogsucker)	O			
Ictiobus bubalus (smallmouth buffalo)	O			
I. cyprinellus (bigmouth buffalo)	O			
I. niger (black buffalo)		O		
Minytrema melanops (spotted sucker)	O			
Moxostoma erythrurum (golden redhorse)			O	
M. poecilurum (blacktail redhorse)	O			
Ictaluridae				
Ameiurus melas (black bullhead)	O			
A. natalis (yellow bullhead)	O			
A. nebulosus (brown bullhead)		O		
Ictalurus furcatus (blue catfish)			O	
I. punctatus (channel catfish)	O			
Noturus gyrinus (tadpole madtom)	O			
N. hildebrandi (least madtom)	O			
N. mirurus (brindled madtom)	O			
N. nocturnus (freckled madtom)	O			
N. phaeus (brown madtom)	O			
N. stigmosus (northern madtom)	O			
Pylodictis olivaris (flathead catfish)	O			
Esocidae				
Esox americanus (grass pickerel)	O			
E. niger (chain pickerel)	O			
Osmeridae				
Osmerus mordax (rainbow smelt)				O
Aphredoderidae				
Aphredoderus sayanus (pirate perch)	O			
Gadidae				
Lota lota (burbot)				O
Fundulidae				
Fundulus dispar (northern starhead topminnow)	O			
F. notatus (blackstripe topminnow)	O			
F. olivaceus (blackspotted topminnow)	O			

Table 1. (continued)

Family Species (common name)	PRS	NR	PRU	EO
Poeciliidae				
Gambusia affinis (western mosquitofish)	O			
Mugilidae				
Mugil cephalus (striped mullet)				O
Atherinopsidae				
Labidesthes sicculus (brook silverside)	O			
Menidia audens (Mississippi silverside)				O
Moronidae				
Morone chrysops (white bass)			O	
M. mississipiensis (yellow bass)				O
M. saxatilis (striped bass)				O
Elassomatidae				
Elassoma zonatum (banded pygmy sunfish)	O			
Centrarchidae				
Centrarchus macropterus (flier)	O			
Lepomis auritus (redbreast sunfish)			I	
L. cyanellus (green sunfish)	O			
L. gulosus (warmouth)	O			
L. humilis (orangespotted sunfish)	O			
L. macrochirus (bluegill)	O			
L. marginatus (dollar sunfish)	O			
L. megalotis (longear sunfish)	O			
L. microlophus (redear sunfish)	O			
L. miniatus (redspotted sunfish)	O			
L. symmetricus (bantam sunfish)	O			
Micropterus punctulatus (spotted bass)	O			
M. salmoides (largemouth bass)	O			
Pomoxis annularis (white crappie)	O			
P. nigromaculatus (black crappie)	O			
Percidae				
Ammocrypta beanii (naked sand darter)	O			
A. vivax (scaly sand darter)	O			
Etheostoma asprigene (mud darter)			O	
E. chlorosoma (bluntnose darter)	O			
E. fusiforme (swamp darter)			O	

Table 1. (continued)

Family Species (common name)	PRS	NR	PRU	EO
E. gracile (slough darter)	O			
E. histrio (harlequin darter)	O			
E. lynceum (brighteye darter)	O			
E. parvipinne (goldstripe darter)	R			
E. proeliare (cypress darter)	O			
E. stigmaeum (speckled darter)	O			
E. swaini (gulf darter)	O			
E. zonistium (bandfin darter)	O			
Percina maculata (blackside darter)	O			
P. sciera (dusky darter)	O			
P. shumardi (river darter)			O	
P. vigil (saddleback darter)	O			
Sander canadense (sauger)				O
Sander vitreus (walleye)				O
Sciaenidae				
Aplodinotus grunniens (freshwater drum)	O			

in the HRS is not a surprise as this species is invading many rivers in Tennessee and throughout the coastal plain. The HRS records of *C. idella* are most likely invaders from the Mississippi river, where there are reproducing populations (personal observation). Similarly, some individuals of *Ichthyomyzon castaneus* likely enter the HRS from the Mississippi River by "hitching rides" on big river fishes such as *Ictiobus* and *Carpiodes* species. However, *I. castaneus* may very well have reproducing populations in the HRS despite the limited amount of suitable nest building substrate. The new records of the large pelagic *Polyodon spathula* in the HRS could be attributed to the use of boat shocking; in past surveys this species most likely eluded detection because of the lack of an adequate method to thoroughly sample larger protions of the HRS. *Ameiurus nebulosus* has a very wide distribution, including the entire state of Tennessee, but is never common, especially in the Southeast. Its detection in the HRS is further complicated by its preference for habitats with virtually no flow (which limited the effectiveness of past cyanide application) and abundant snags (which limit the effectiveness of seine sampling). The addition of the 12th ictalurid species, *A. nebulous,* to the ichthyofauna of the HRS is also noteworthy because the HRS already contained the most diverse ictalurid fauna in North America with 11 species. *Erimyzon sucetta* prefers habitat much like that of *Ameiurus nebulosus* and this likely explains why it had not been collected before. *Erimyzon sucetta* is more typically collected in the LCP but the two specimens collected during this study are from localities in the UCP, one from a slough and the other from a low gradient headwater, Oxford Creek, in McNairy County. However, specimens have been collected from the headwaters of nearly every other west Tennessee coastal plain stream (Etnier and Starnes, 1993) and more specifically from

Hogwallow Creek in the Forked Deer River headwaters 13.9 air miles north of the Oxford Creek locality (Boronow, 1975).

"Bait bucket" introductions of *Pimephales promelas* have likely led to the establishment of populations in several areas of the HRS. These introduced fish had never before been collected in the HRS and several collections in this survey contained more than 10 individuals, suggesting that individuals were not recently released. The localities with larger populations of *P. promelas* appear to have a reduced diversity of other minnows suggesting some type of exclusion is occuring. Habitat alteration may be the excluding factor as these localities have extensive sand deposition or are surrounded by agricultural fields.

Cyprinella lutrensis has expanded its range in lowland tributaries of the Mississippi River in agricultural areas of Illinois (Page and Smith, 1970), and has shown the ability to quickly repopulate degraded streams (Rhodes and Hubbs, 1992). The range expansion of *C. lutrensis* into the WMP and throughout the LP of the HRS is probably attributable to the intensive agriculture in the region, which often drastically alters stream characteristics. Also, the range expansion of *C. lutrensis* may be correlated with the range reduction seen in *Lythrurus umbratilis* and *Etheostoma parvipinne*, which no longer occur in the LCP portions of the HRS.

The habitat differences between the UCP and the LCP remain a significant faunal barrier in the HRS and several species show distributions supporting this. Species that have habitat preferences similar to that of *C. lutrensis* and were collected primarily in the LCP are *Lepomis symmetricus*, and *Etheostoma fusiforme.* However, *Lampetra aepyptera, Cyprinella camura, Luxilus chrysocephalus, Notropis ammophilus,*

Pimephales notatus, Hypentelium nigricans, Noturus hildebrandi, N. phaeus, Fundulus olivaceus, Etheostoma swaini, and *E. zonistium* are species that prefer the faster flowing, cooler water with clean substrates found in streams in the UCP and tend to remain there.

The apparent reduction in ranges of *Amia calva, Phenacobius mirabilis, Noturus gyrinus, Noturus stigmosus, Centrarchus macropterus,* and *Percina maculata* are most likely artifacts of collection methods used in this study. Due to their habitat preferences, these species are difficult to collect with seines and are often spotty in their distributions. Use of another method such as sodium cyanide application would probably yield a distribution much like that found previously. Tennessee's only extant populations of *Ammocrypta beanii* and *A. vivax* appear to be doing well in the HRS. These fishes were likely extirpated from other coastal plain streams in Tennessee during channelization projects that physically removed them from streams (dredging) and also removed the moderately shallow sand runs, with which *Ammocrypta* are closely associated. The ranges of the other substantiated fishes (table 1) are very similar to their historical ranges.

Unsubstantiated species

The single historical records of both *Lythrurus bellus* and *Lepomis auritus* were not corroborated despite increased collection efforts at their original collection sites; the historical localities are very near the Tombigbee River system, which is in the range of both species. Assuming correct identification of the specimens, these appear to represent introduced specimens and not individuals of established populations. *Lepomis auritus* has expanded its range throughout much of east Tennessee (Etnier and Starnes, 2001), but remains relatively uncommon in west Tennesse waters and most coastal plain drainages.

Several species with historical records from the HRS were unsubstantiated during this study, and likely represent either transients from the Mississippi River or are locally rare. *Moxostoma erythrurum* is represented by only one record (Starnes, 1973) but probably still occurs in the HRS in low numbers. *Etheostoma asprigene* and *E. fusiforme* were not collected during this survey but probably still occur in the HRS and avoided detection only because of the difficulty in sampling their preferred habitats. *Macrhybopsis hyostoma, M. storeriana, Notropis blennius, N. shumardi, N. volucellus,* and *N. wickliffi* are big river species that probably do not often penetrate more than a couple of miles into the HRS, remaining in habitat that is similar to that found in the Mississippi River. *Hiodon alosoides, H. tergisus, Dorosoma petenense, Carpiodes cyprinus, Cycleptus elongatus, Ictalurus furcatus*, and *Morone chrysops* are big river fishes that probably penetrate farther upstream in the HRS. *Atractoseus spatula* may very well be extirpated from the HRS. The few reports of *A. spatula* sightings in the HRS during this study were highly suspect and were probably based on sightings of *Lepisosteus platostomus*, the most common member of the gar family collected in the main channel of the HRS.

Fishes that have never been collected but are suspected to occur in the HRS are probably locally rare and/or are introduced species that have not yet expanded their range into the HRS. *Ichthyomyzon unicuspus, Scaphirhynchus platorhyncus, Anguilla rostrata, Macrhybopsis gelida, Osmerus mordax, Lota lota, Mugil cephalus, Menidia audens, Morone mississippiensis*, and *Sander canadense* are all species that occur near the mouth of the HRS or have ranges that extend to the HRS and likely enter the river to various distances. *Hypophthalmichthys molitrix* and *H. nobilis*, both introduced Asian carps,

have not previously been collected in the HRS but will most likely be collected in the HRS in the future as they have been collected from the Mississippi River near the mouth of the HRS.

Habitat degradation

It was noted in the 1973 study that several previously channelized, but un-maintained, streams had begun to re-develop their normal substrate and regain much of their original ichthyofauna, namely Clover Creek and Piney Creek in Hardeman County, Tennessee. The fish faunas in these streams remains diverse and are comparable to some of the more diverse streams in the Hatchie drainage. However, it was suggested that the recovery of Cane Creek in Lauderdale County, Tennessee, would "probably be slow or nonexistent" because the re-channelization of that stream two years previous had so extensively degraded the habitat by removing substrate and all riparian vegetation. The habitat degradation coupled with heavy silt runoff from adjacent agricultural fields has likely prevented the accumulation of the original substrates. Cane Creek has incised to depths of nearly 13 meters in some places and the only fish that have repopulated the stream since 1973 are *Hybopsis amnis*, *Notropis atherinoides*, and *Phenacobius mirabilis*.

The 1973 study also noted that a fish kill was observed in Tarebreeches Creek (Alcorn Co., Mississippi) that resulted after a heavy rain had presumably washed a recent application of pesticide from a field. During this survey a 45-minute sampling effort in Big Muddy Creek in Fayette Co., Tennessee, yielded three species, one individual of each. Cotton fields line either side of the creek for much of the upstream portion of this site and a local farmer who was checking gypsy moth traps confirmed that the field had

been sprayed with pesticide in the past week and it had rained heavily soon after the application. However, it is suspected (Starnes, 1973), that effects of pesticide runoff are limited to small streams in intensively cultivated sections of the HRS while the main channel and larger creeks probably withstand such runoff due to dilution of these chemicals. These fish kills may be a serious threat to the long-term diversity of the HRS fishes, especially if they increase in frequency or become more widespread as agricultural fields expand. An increase could result in the inability of fish to re-colonize affected streams and, coupled with larger segments of stream being affected, could eventually lead to the extirpation of fishes from large areas of the drainage due to the loss of refuges.

Coastal Plain streams are often subject to channel incision and downstream sand deposition which can significantly reduce fish fauna in the stream (Shields et al., 1998). Streams such as Clover Creek are beginning to suffer the deleterious effects of sand deposition. Sand deposition in several tributaries to Clover Creek has resulted in the stream moving underground and thus removing any aquatic habitat for fish. Not only are these streams useless as fish habitat, but the anastomosed or valley plugged stream will spread sand throughout the surrounding BLH causing significant economic damage.

Taxonomic considerations

Following a ruling in the fourth edition of *International Code of Zoological Nomenclature* (ICZN, 1999) for spellings of specific epithets ending in *-i* and *–ii*, *Ammocrypta beani* is now spelled *Ammocrypta beanii*. Matthew Thomas of Southern Illinois University, Carbondale (SIUC) is studying the systematics of *Noturus stigmosus* and will likely be elevating the southern form, including the HRS population, to the species level. *Menida audens* (Hay) has been removed from the synonymy of *Menida*

beryllina (Cope) by Suttkus and Thompson (2002). The subfamily Menidiinae, which contains *Menidia audens* and *Labidesthes sicculus,* has been placed in the Family Atherinopsidae by Dyer and Chernoff (1996). *Stizostedion canadense* and *Stizostedion vitreum* have been placed in the genus *Sander* because of its chronological priority (Nelson et al., 2001).

Conclusions

Despite detrimental agricultural practices and past channelization events the HRS remains one of the most diverse systems in Tennesse with 109 known species and 16 more expected to occur. W.C. Starnes (1973) concluded that "...the rich fauna of the system should remain ... if channelization and careless agricultural practices are curbed in the near future." While channelization has all but ceased, the poor agricultural practices remain a serious threat to the ichthyofauna of this system through fish kills, sand deposition, and reduction of riparian vegetation. Future work may show that the range reductions of *Lythrurus umbratilis* and *Etheostoma parvipinne* are due to such practices.

However, The Nature Conservancy (TNC) has opened an office in Brownsville and has begun a campaign to protect the HRS. TNC has started projects to reduce channel incision and downstream sand deposition; the Richland Creek project involved returning a natural meander to the stream and reducing its gradient. Through the efforts of TNC many land owners and farmers have become amenable to altering their land use patterns to ones that will help preserve the integrity of the river.

This thesis may help in TNC's and any other organization's effort to preserve the ichthyofauna of the HRS by providing a current distribution of fishes and a list of all

known and potentially occurring species. Data from this thesis could be combined with historical and current land use maps to help determine possible causes of distributional changes which, after being identified, could help direct conservation efforts in the HRS and other coastal plain rivers. It should also be noted that not all of the habitat types that influence the ichthyofauna are represented in the two existing Federal Wildlife Management Areas, such as the habitat found in tributaries in the headwaters and middle portions of the HRS. With the information presented in this thesis representation of all such habitats in protected areas may be accomplished more efficiently.

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Appendices

Appendix A

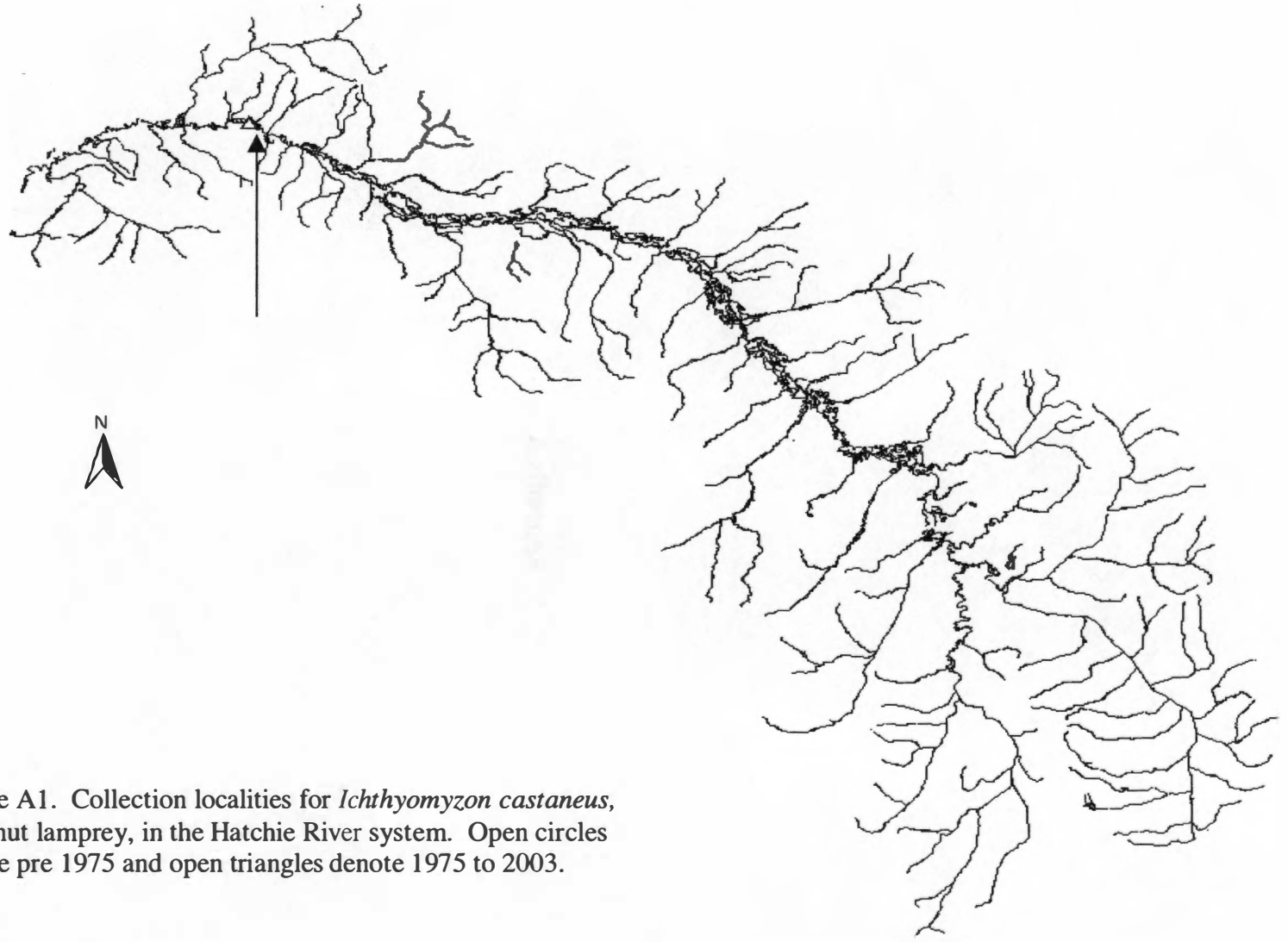

Figure A1. Collection localities for *Ichthyomyzon castaneus,* chestnut lamprey, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

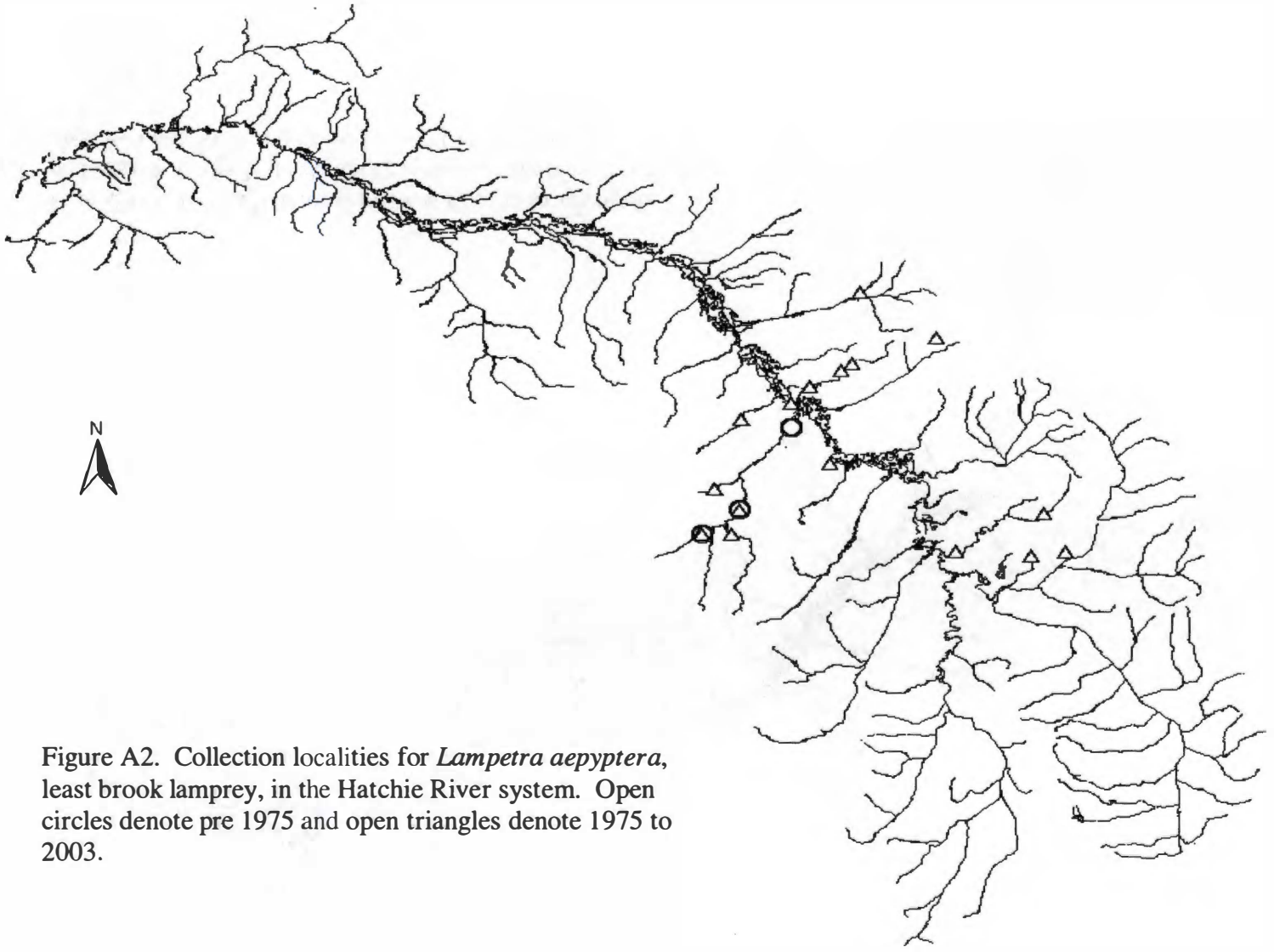

Figure A2. Collection localities for *Lampetra aepyptera*, least brook lamprey, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

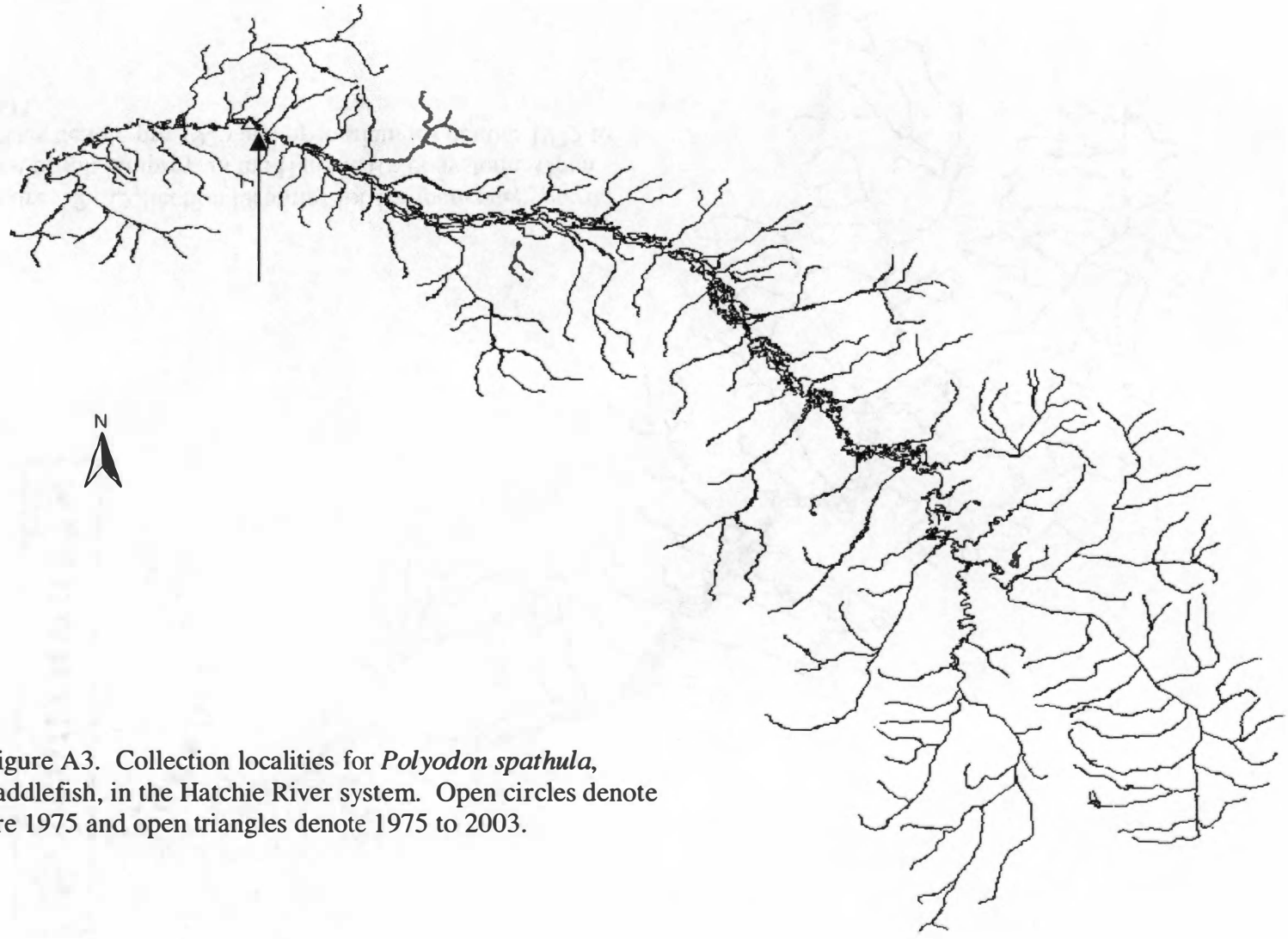

Figure A3. Collection localities for *Polyodon spathula*, paddlefish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

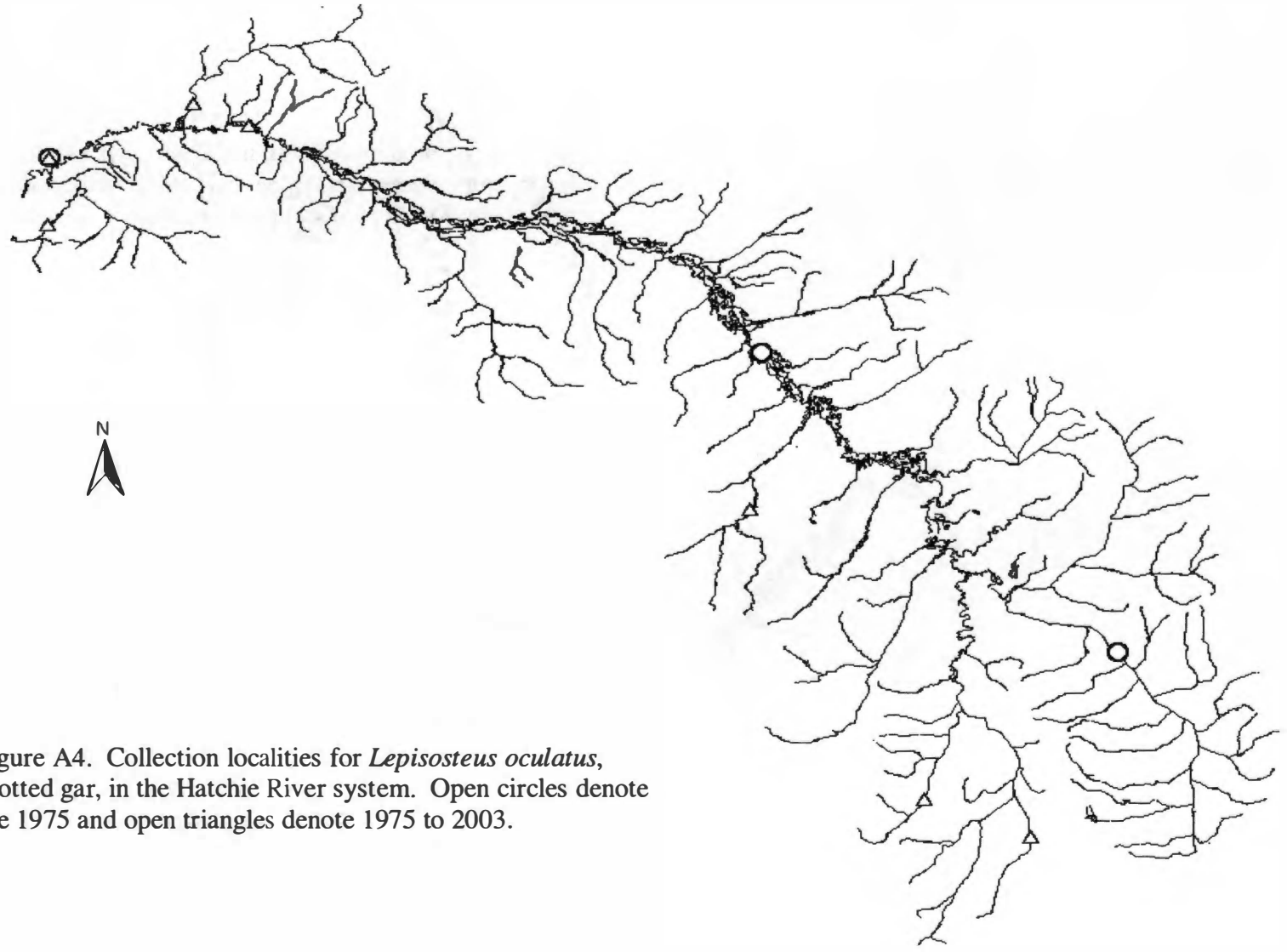

Figure A4. Collection localities for *Lepisosteus oculatus*, spotted gar, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

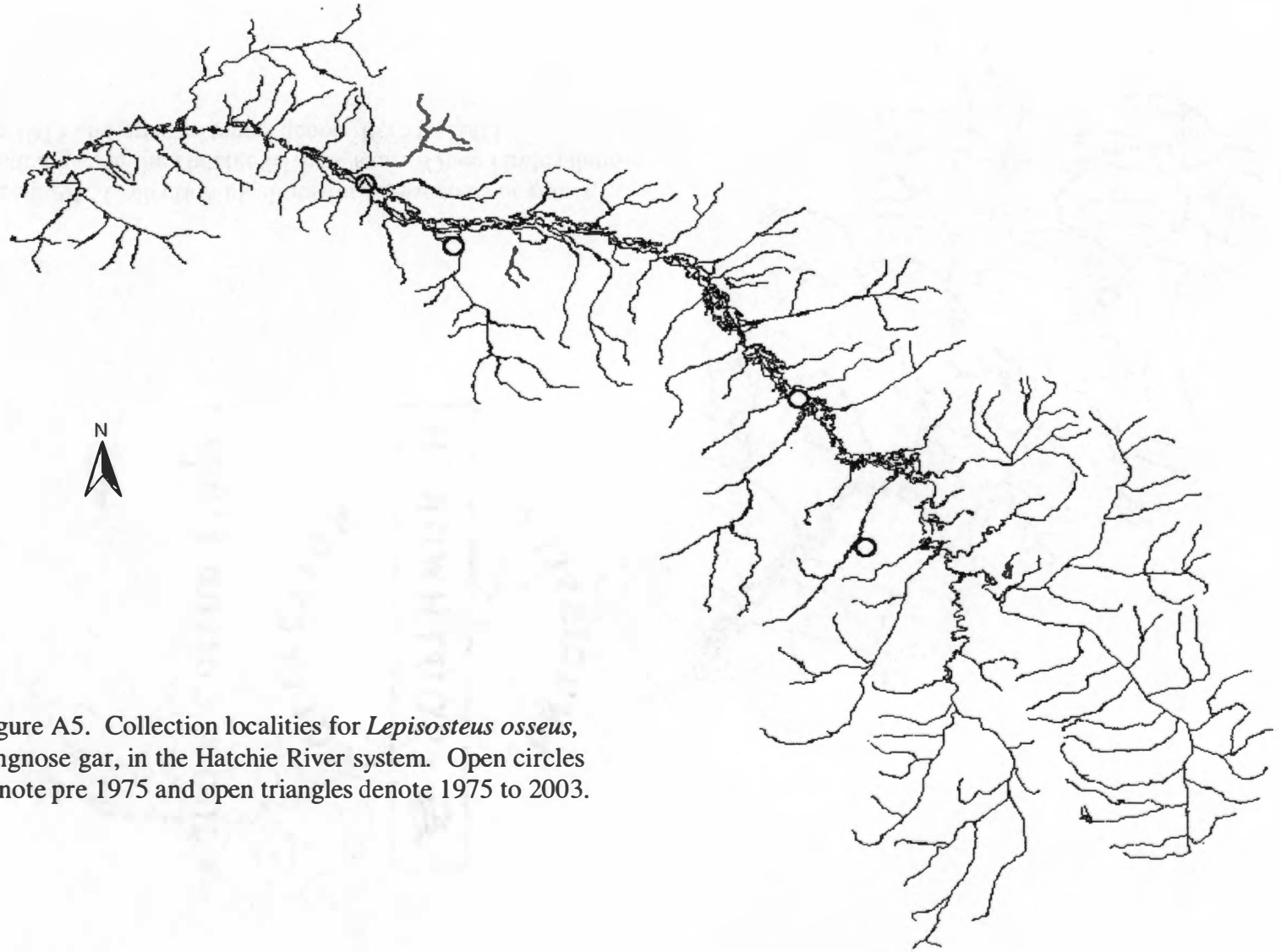

Figure A5. Collection localities for *Lepisosteus osseus,* longnose gar, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

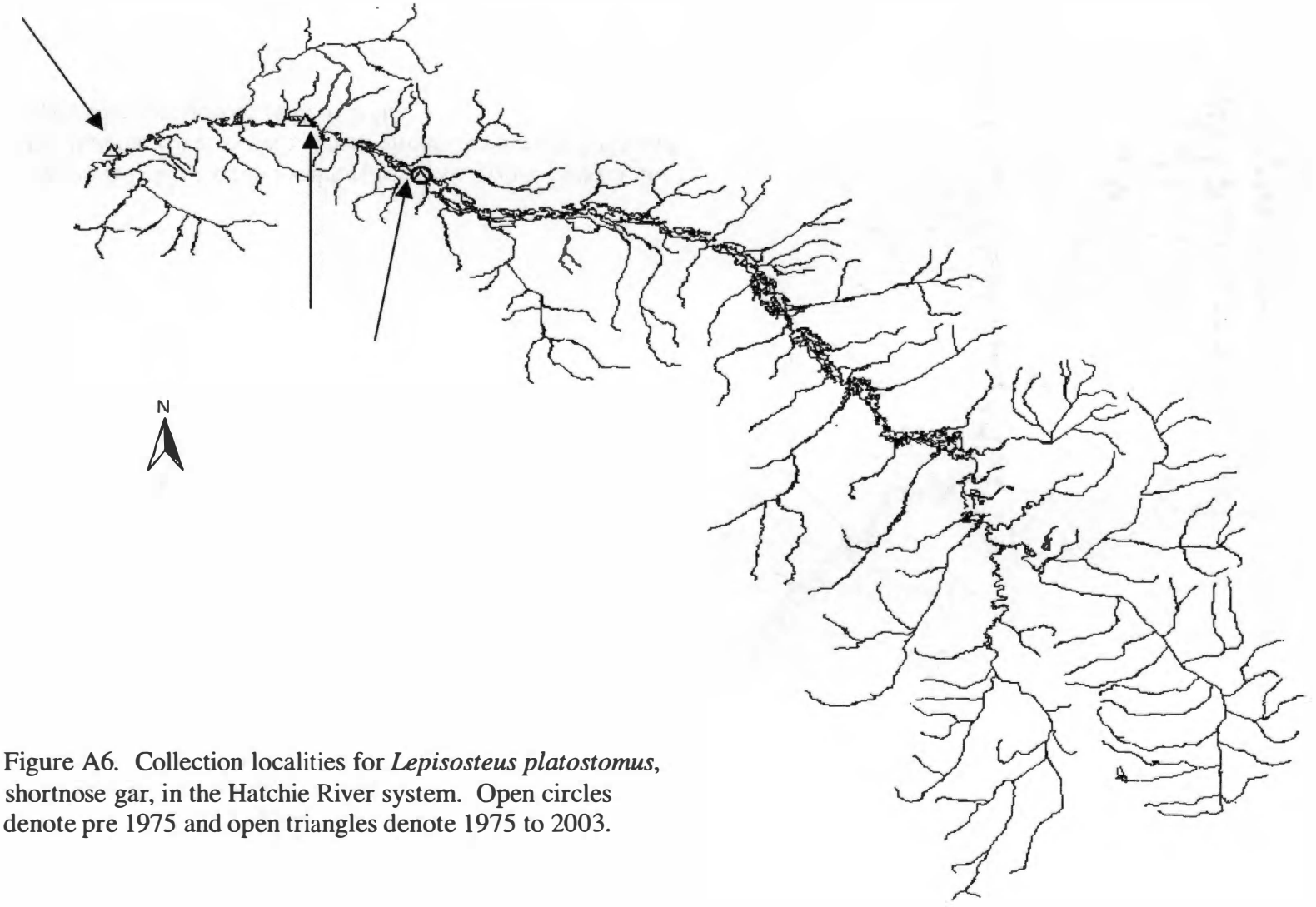

Figure A6. Collection localities for *Lepisosteus platostomus*, shortnose gar, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

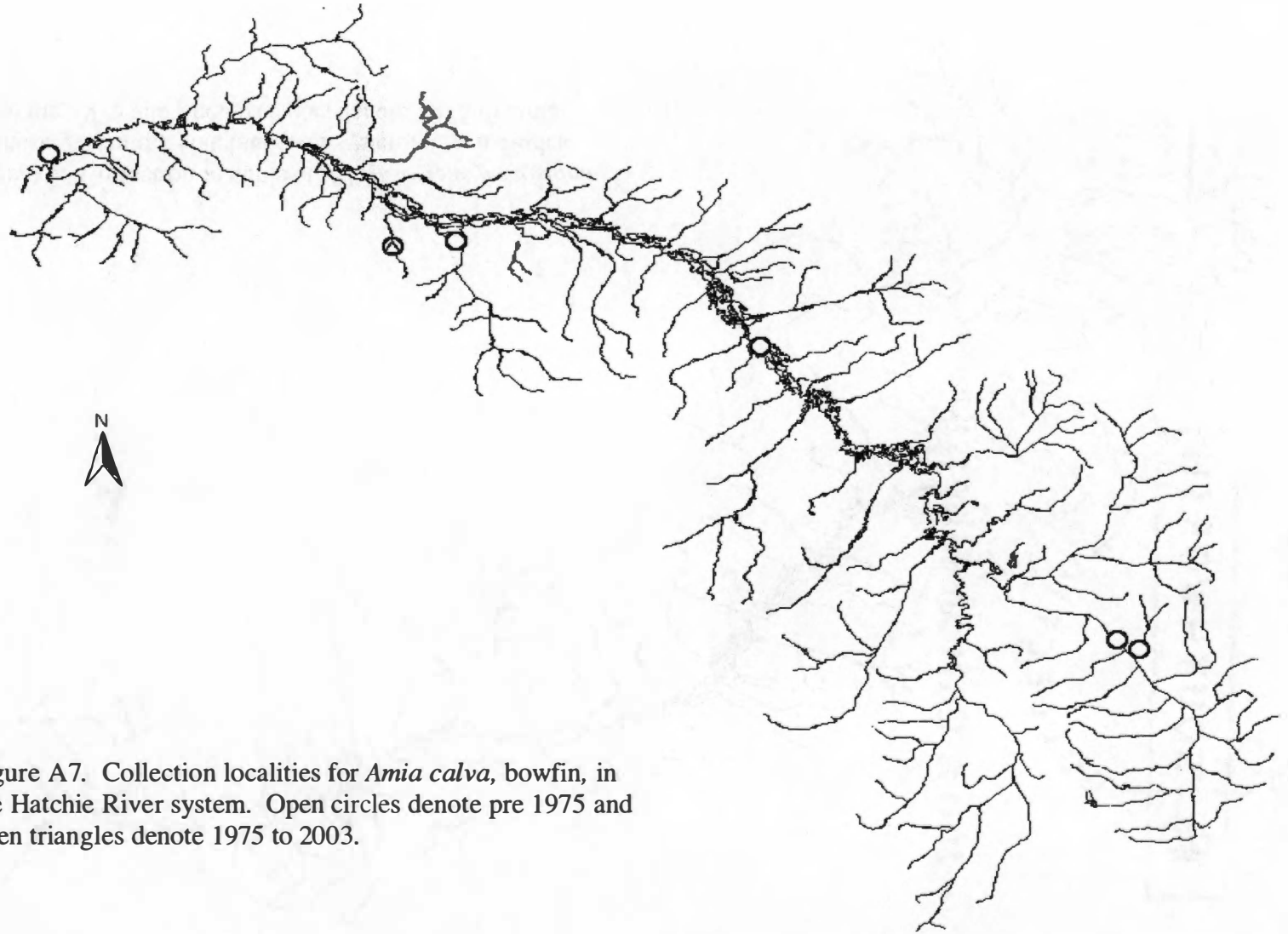

Figure A7. Collection localities for *Amia calva,* bowfin, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

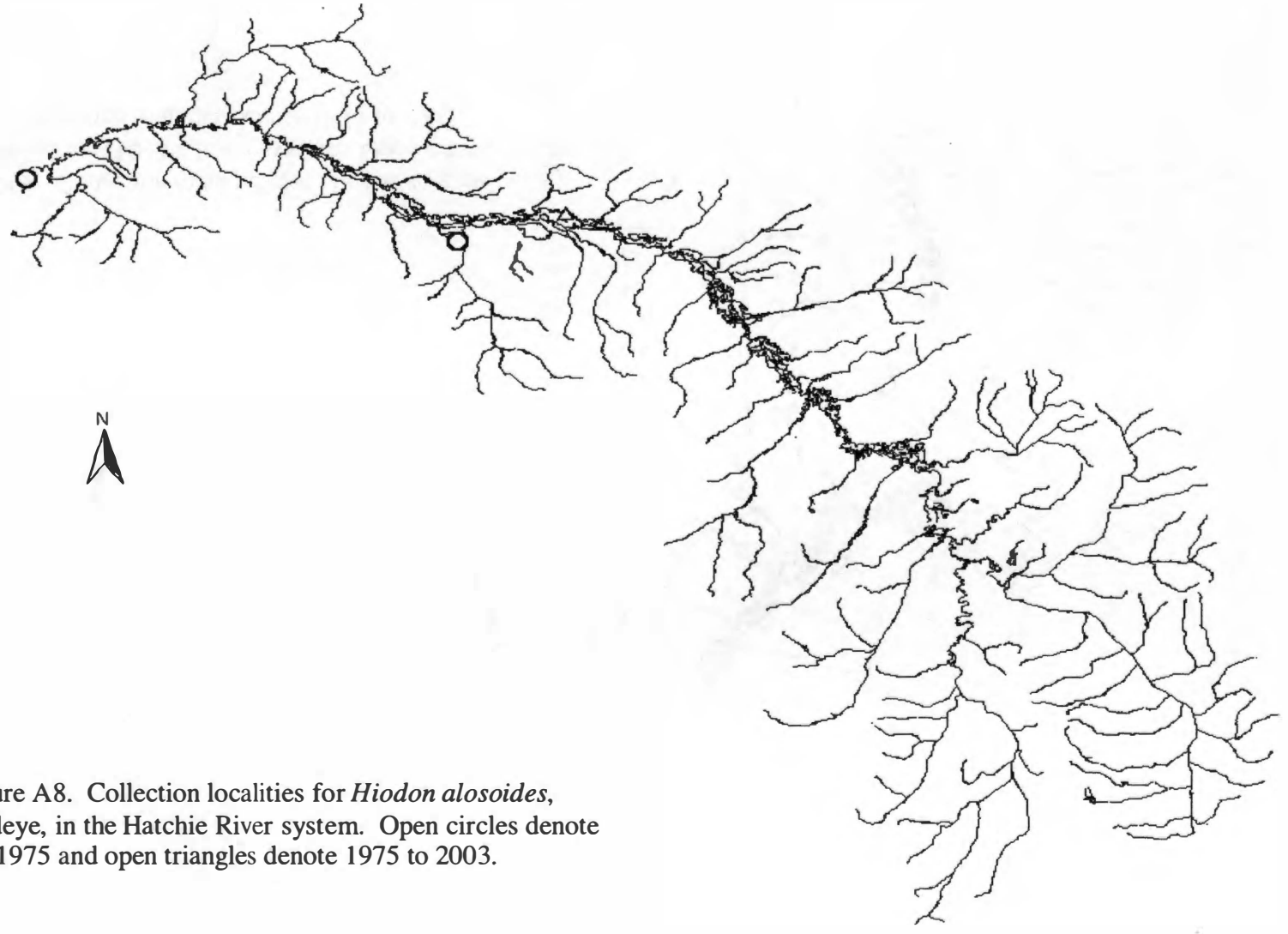

Figure A8. Collection localities for *Hiodon alosoides*, goldeye, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

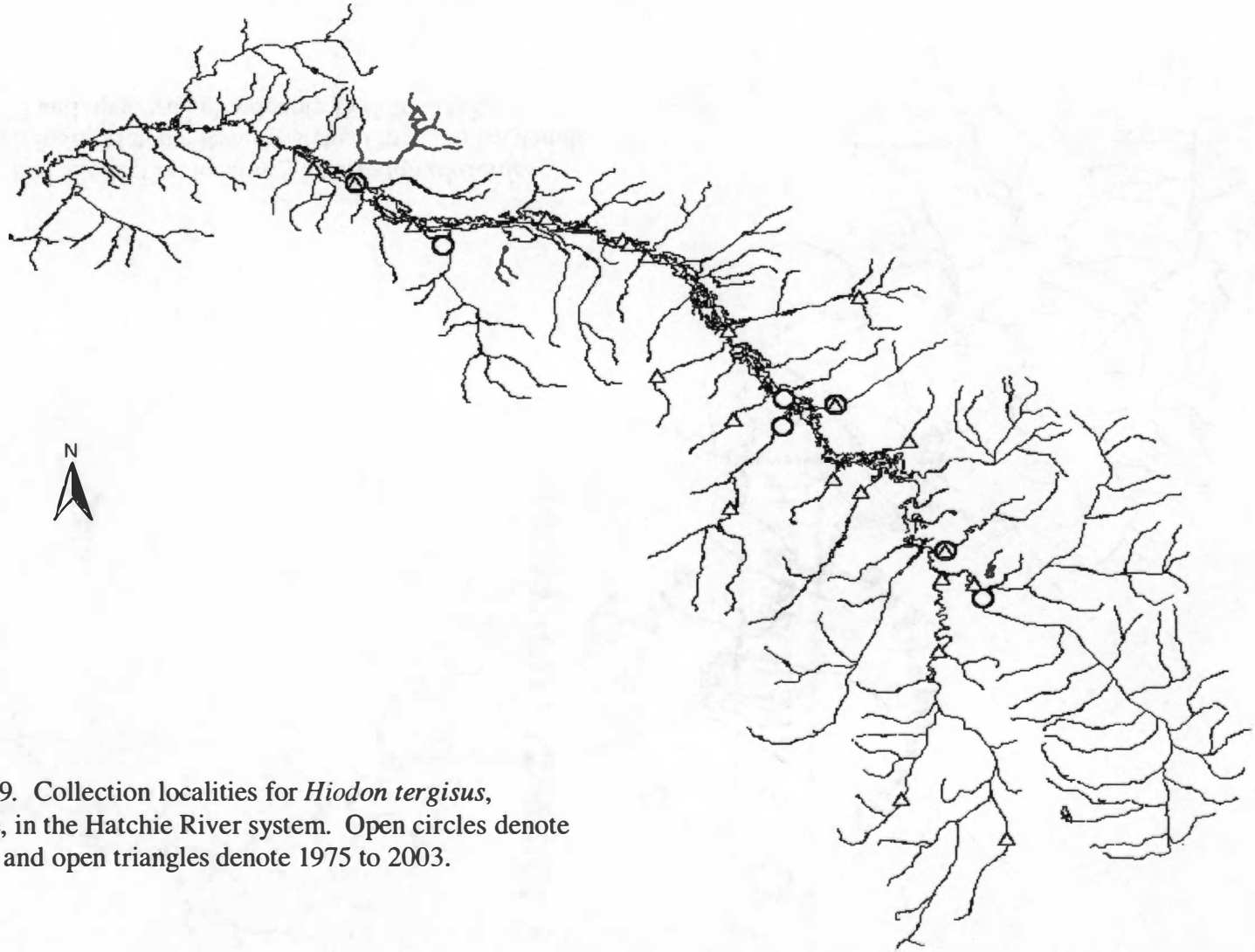

Figure A9. Collection localities for *Hiodon tergisus*, mooneye, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

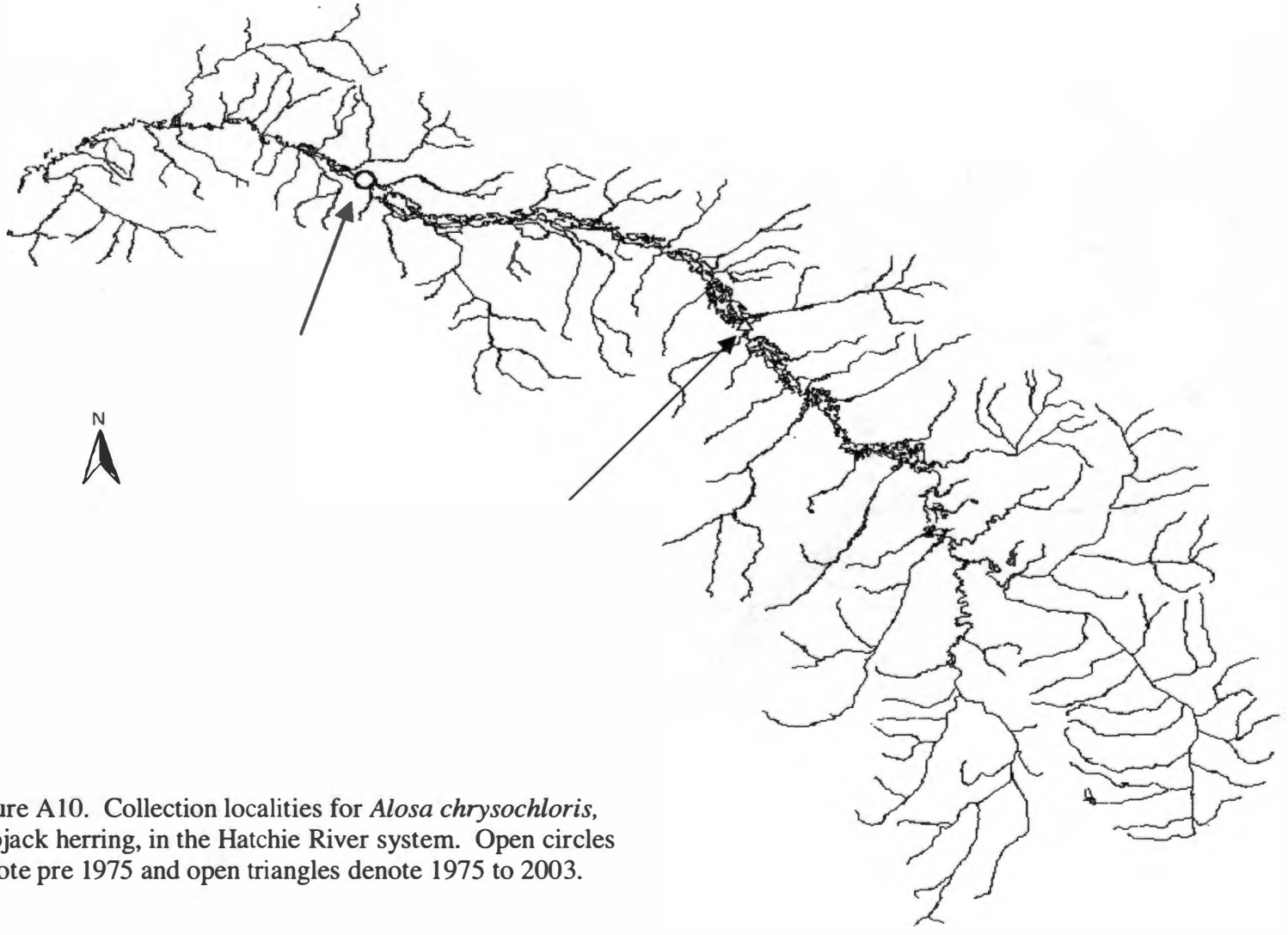

Figure A10. Collection localities for *Alosa chrysochloris*, skipjack herring, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

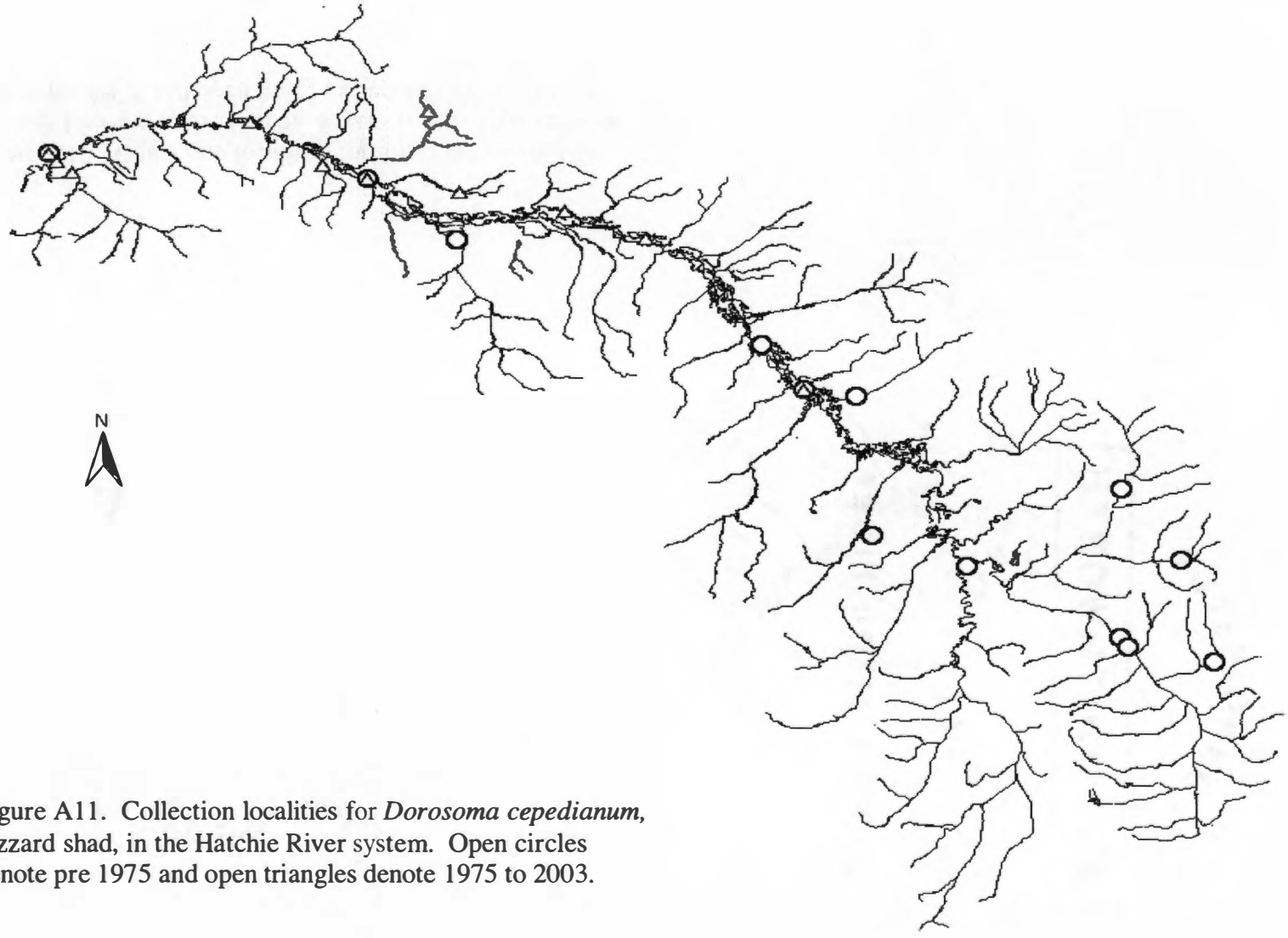

Figure A11. Collection localities for *Dorosoma cepedianum,* gizzard shad, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

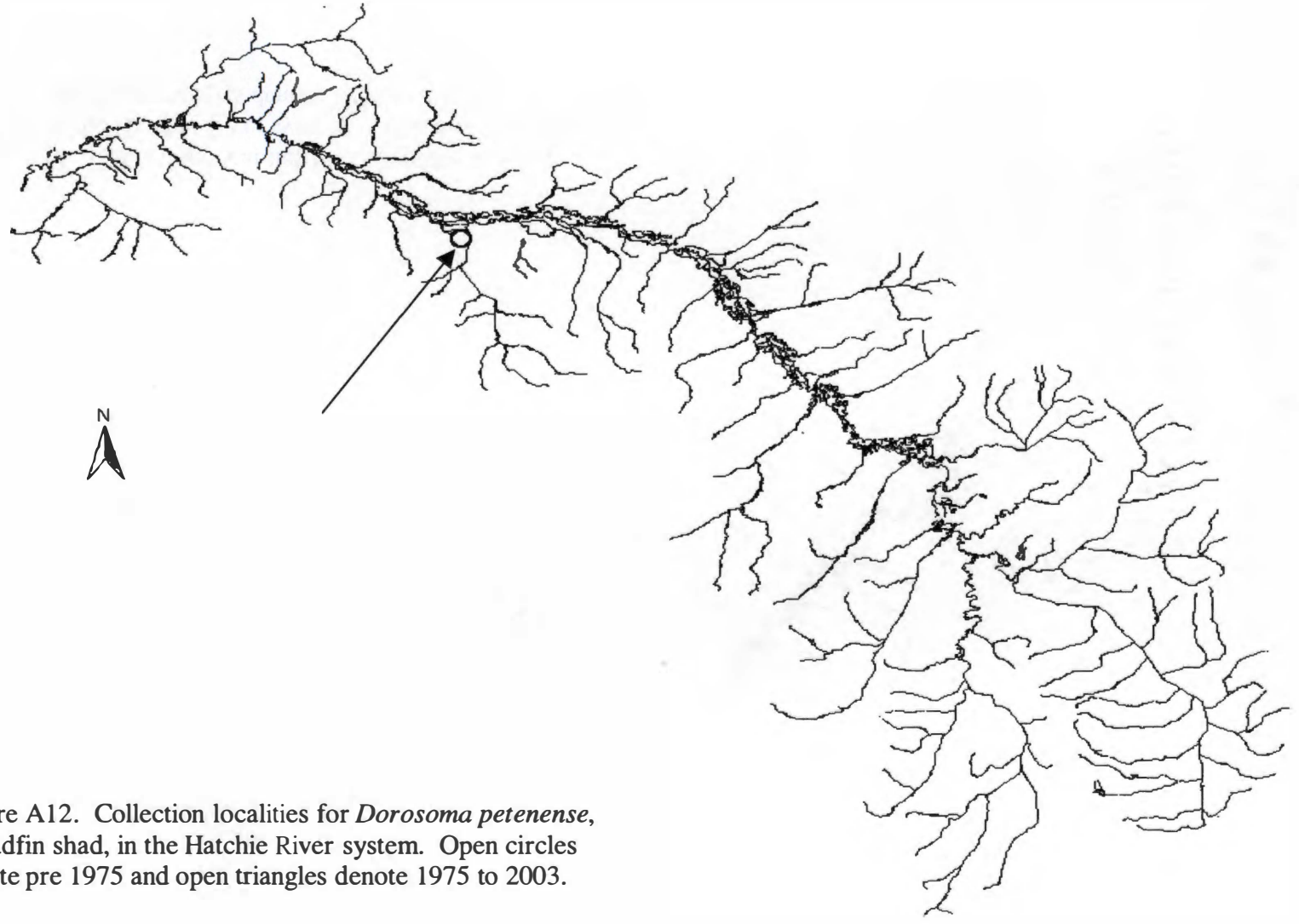

Figure A12. Collection localities for *Dorosoma petenense*, threadfin shad, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

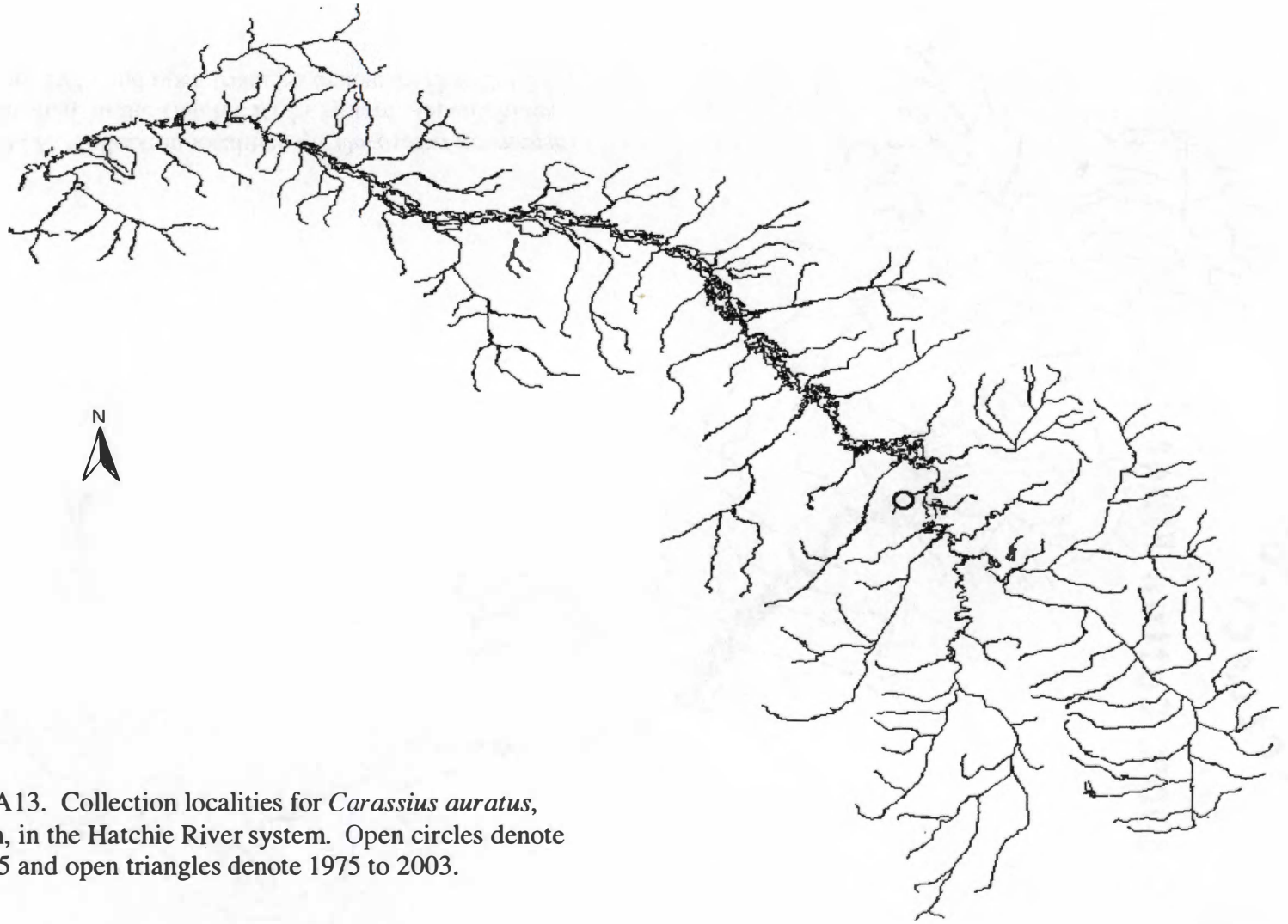

Figure A13. Collection localities for *Carassius auratus*, goldfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

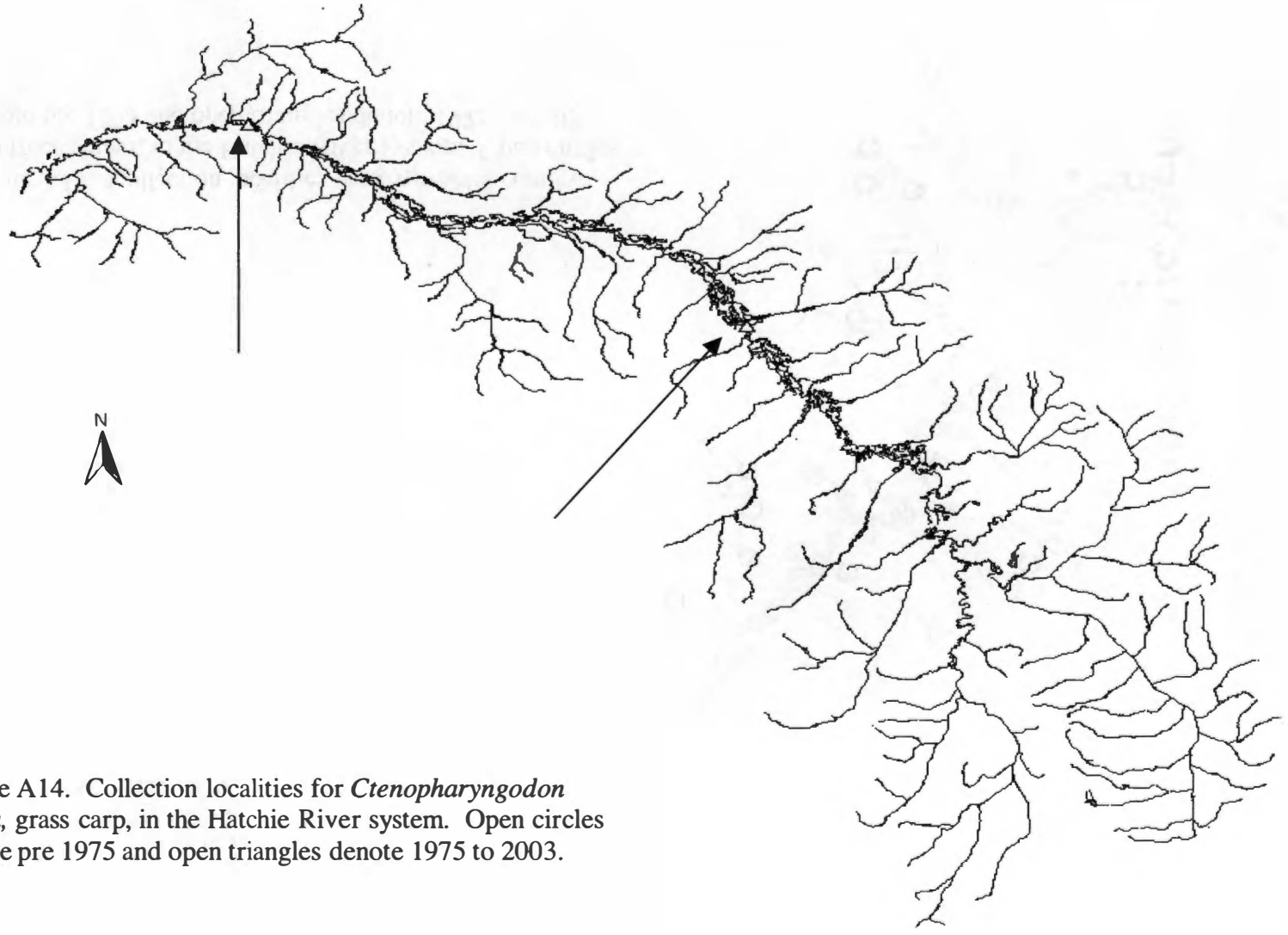

Figure A14. Collection localities for *Ctenopharyngodon idella,* grass carp, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

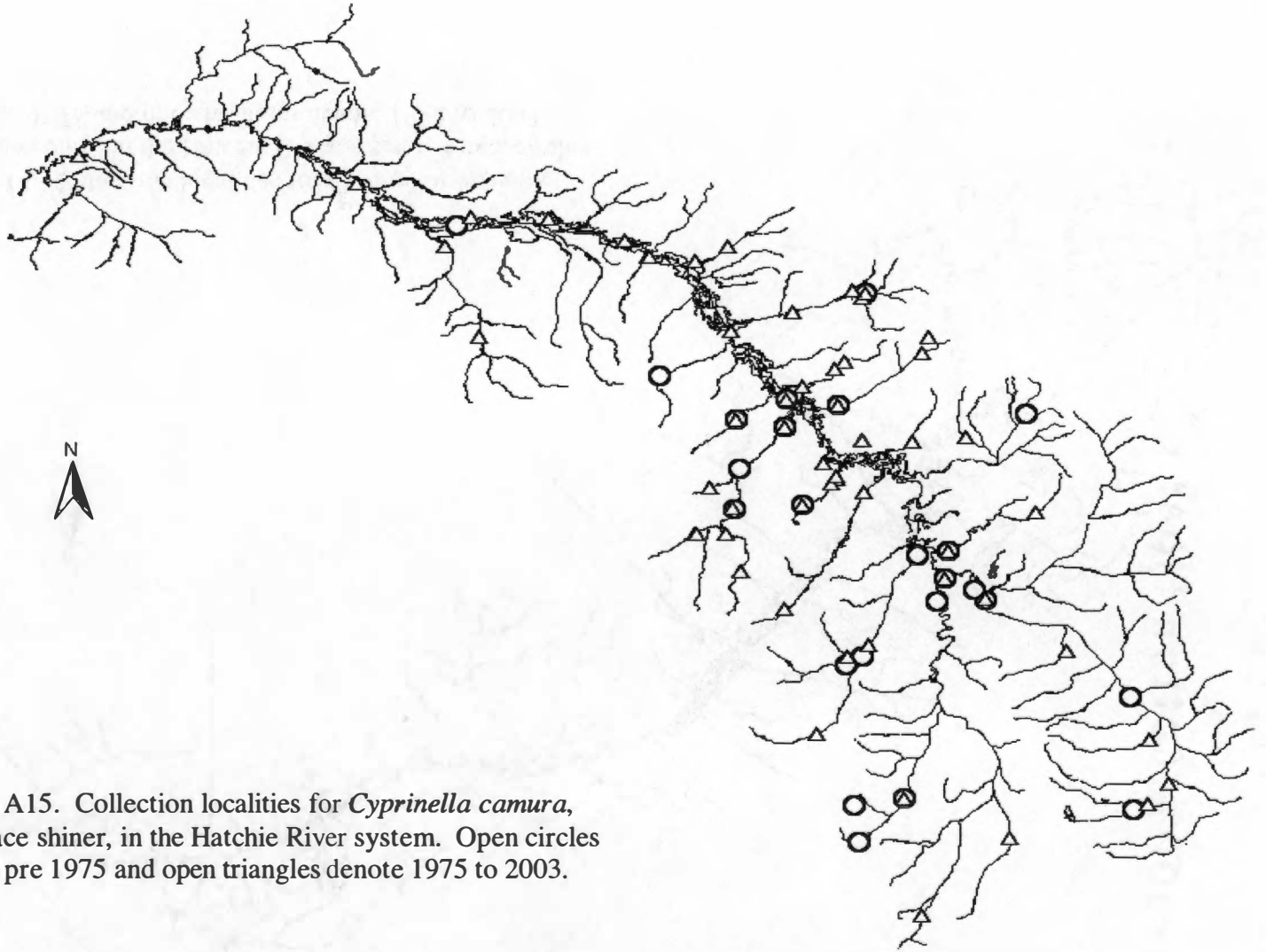

Figure A15. Collection localities for *Cyprinella camura*, bluntface shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

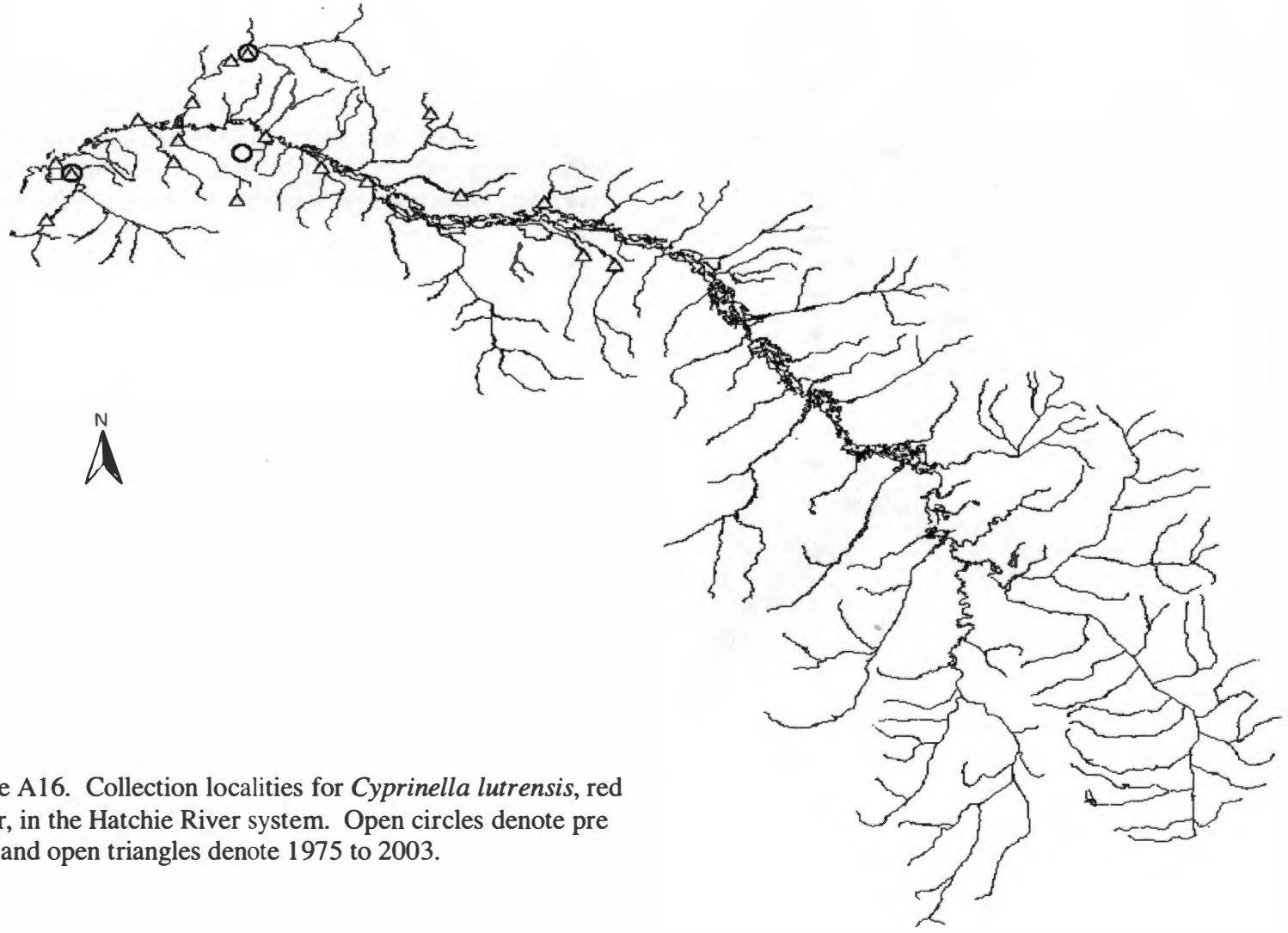

Figure A16. Collection localities for *Cyprinella lutrensis*, red shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

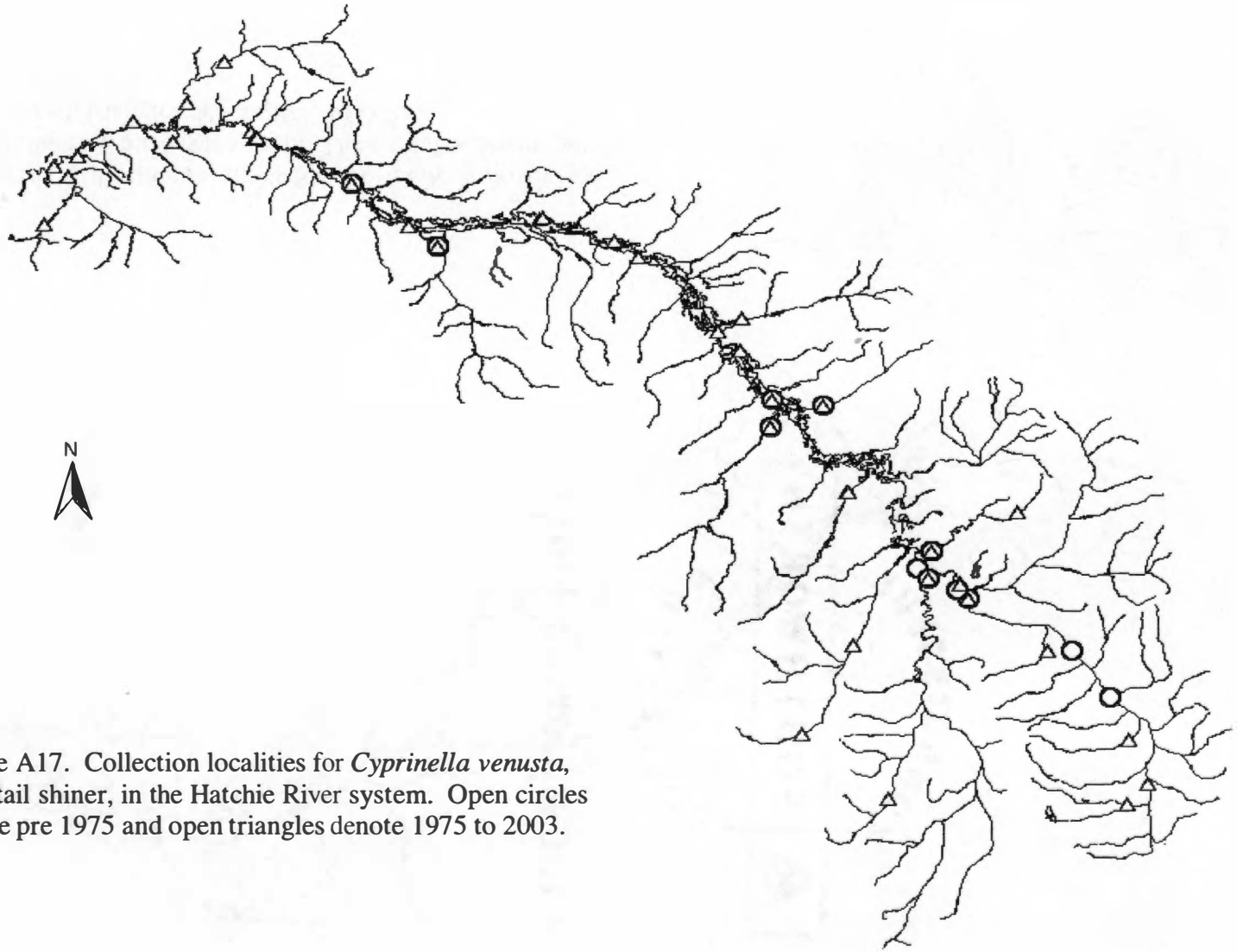

Figure A17. Collection localities for *Cyprinella venusta*, blacktail shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

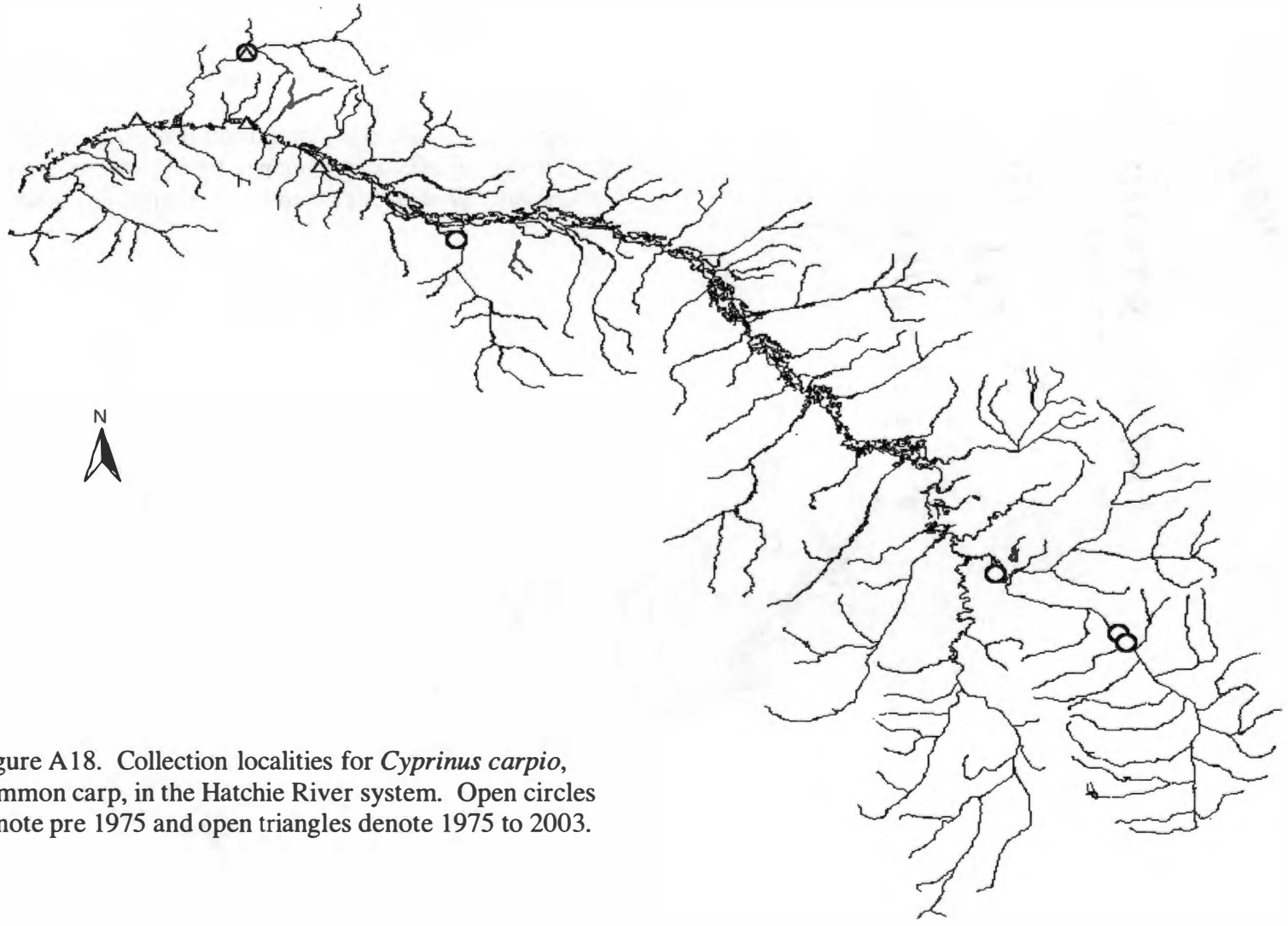

Figure A18. Collection localities for *Cyprinus carpio*, common carp, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

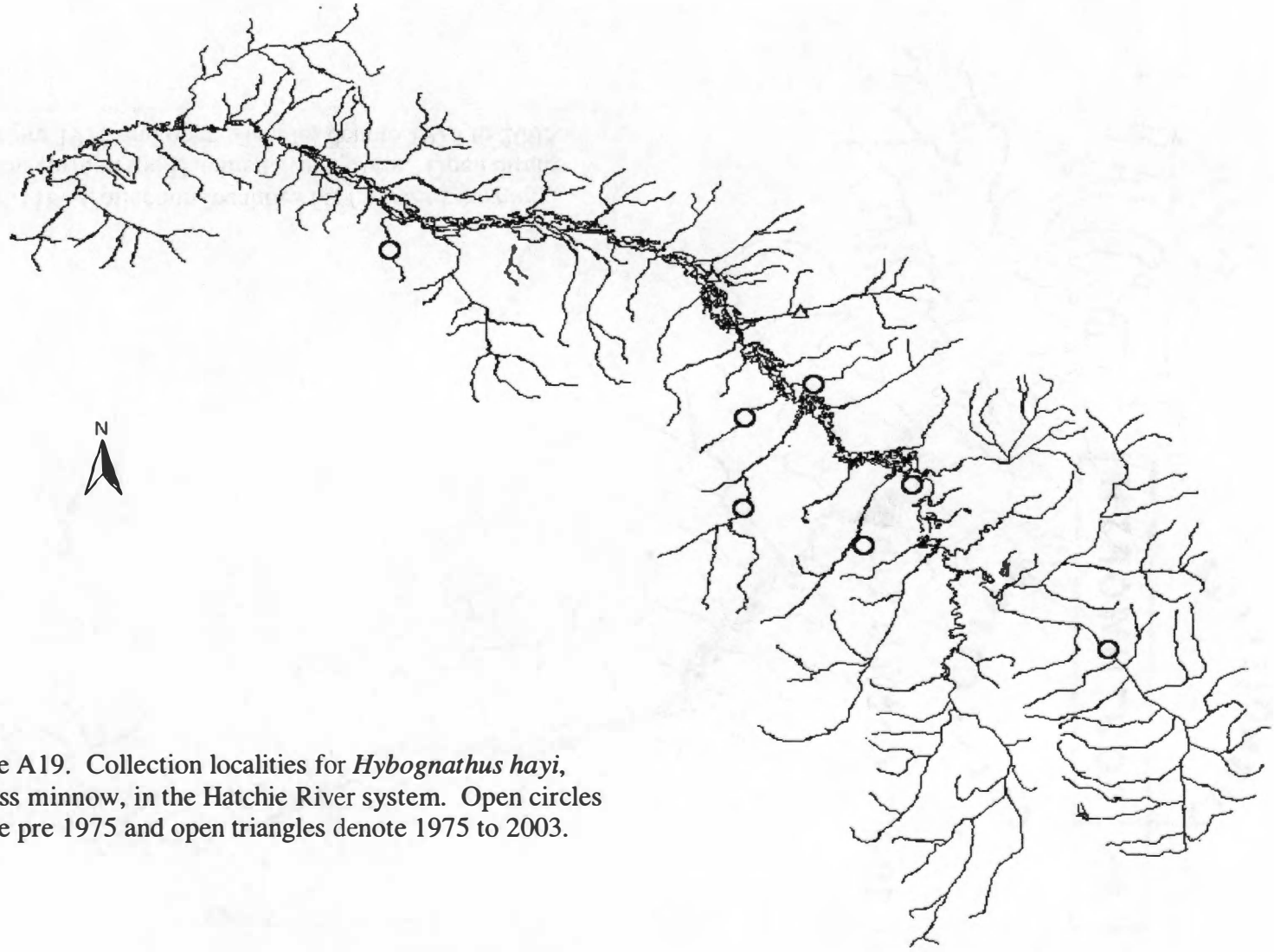

Figure A19. Collection localities for *Hybognathus hayi*, cypress minnow, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

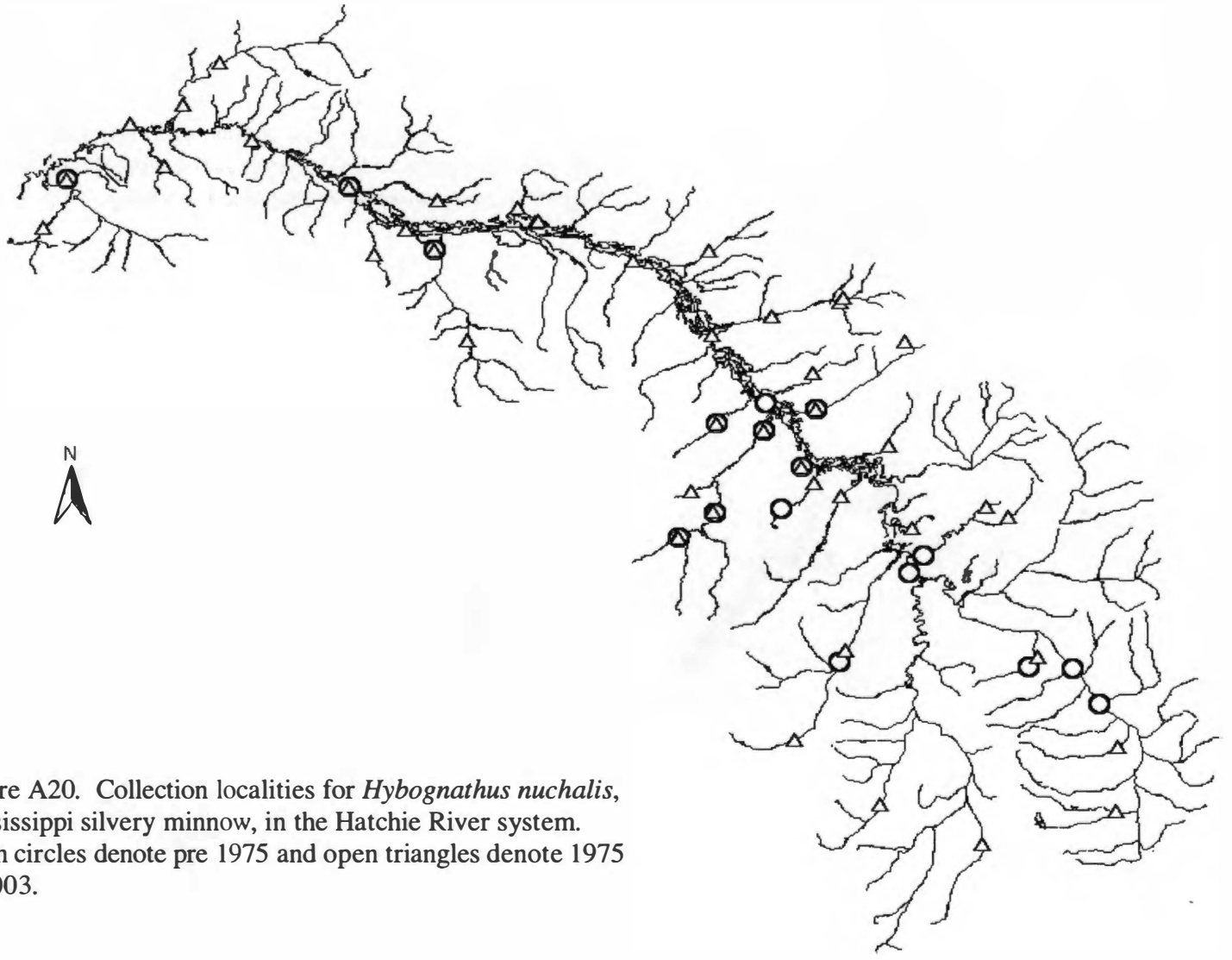

Figure A20. Collection localities for *Hybognathus nuchalis*, Mississippi silvery minnow, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

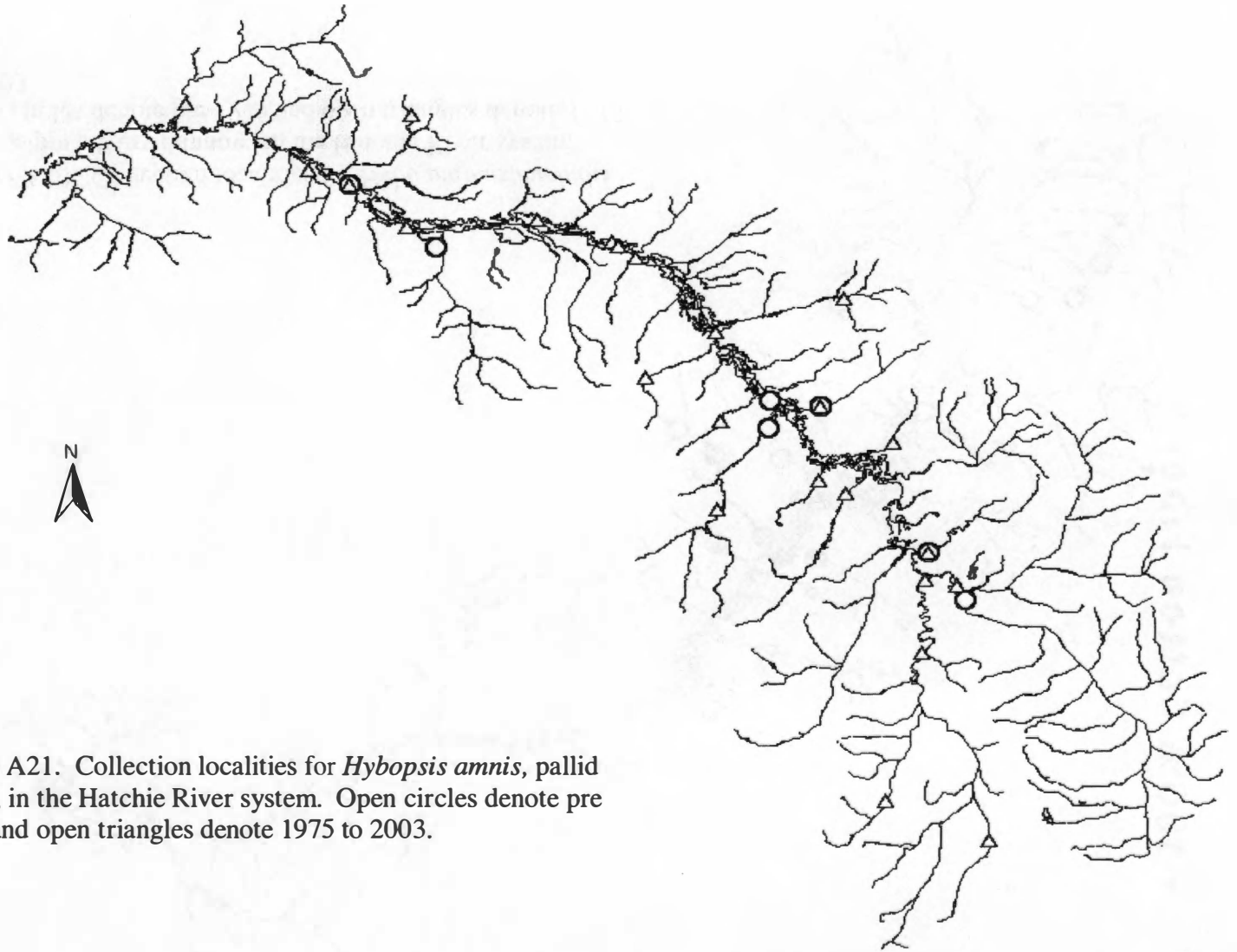

Figure A21. Collection localities for *Hybopsis amnis,* pallid shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

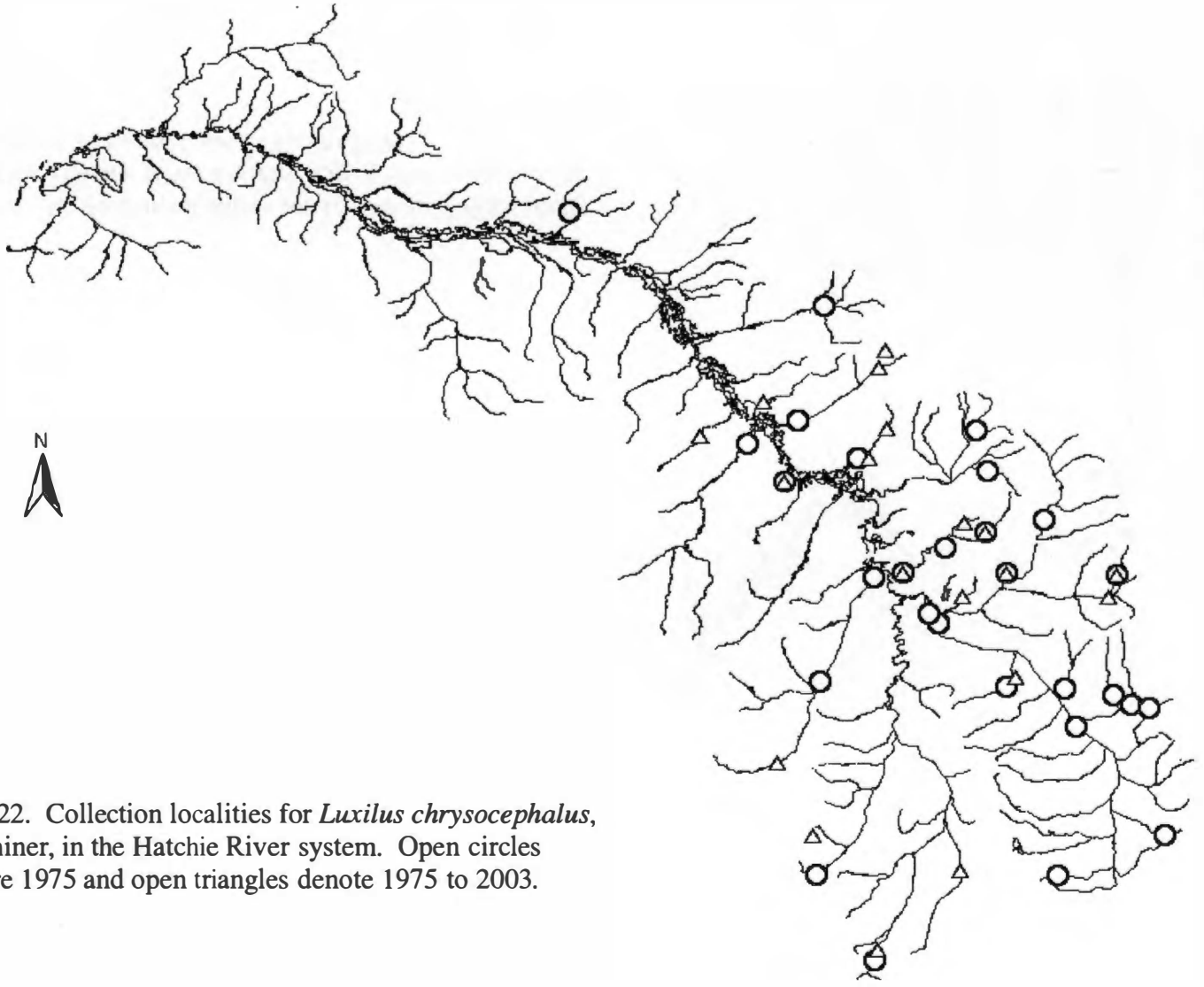

Figure A22. Collection localities for *Luxilus chrysocephalus*, striped shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

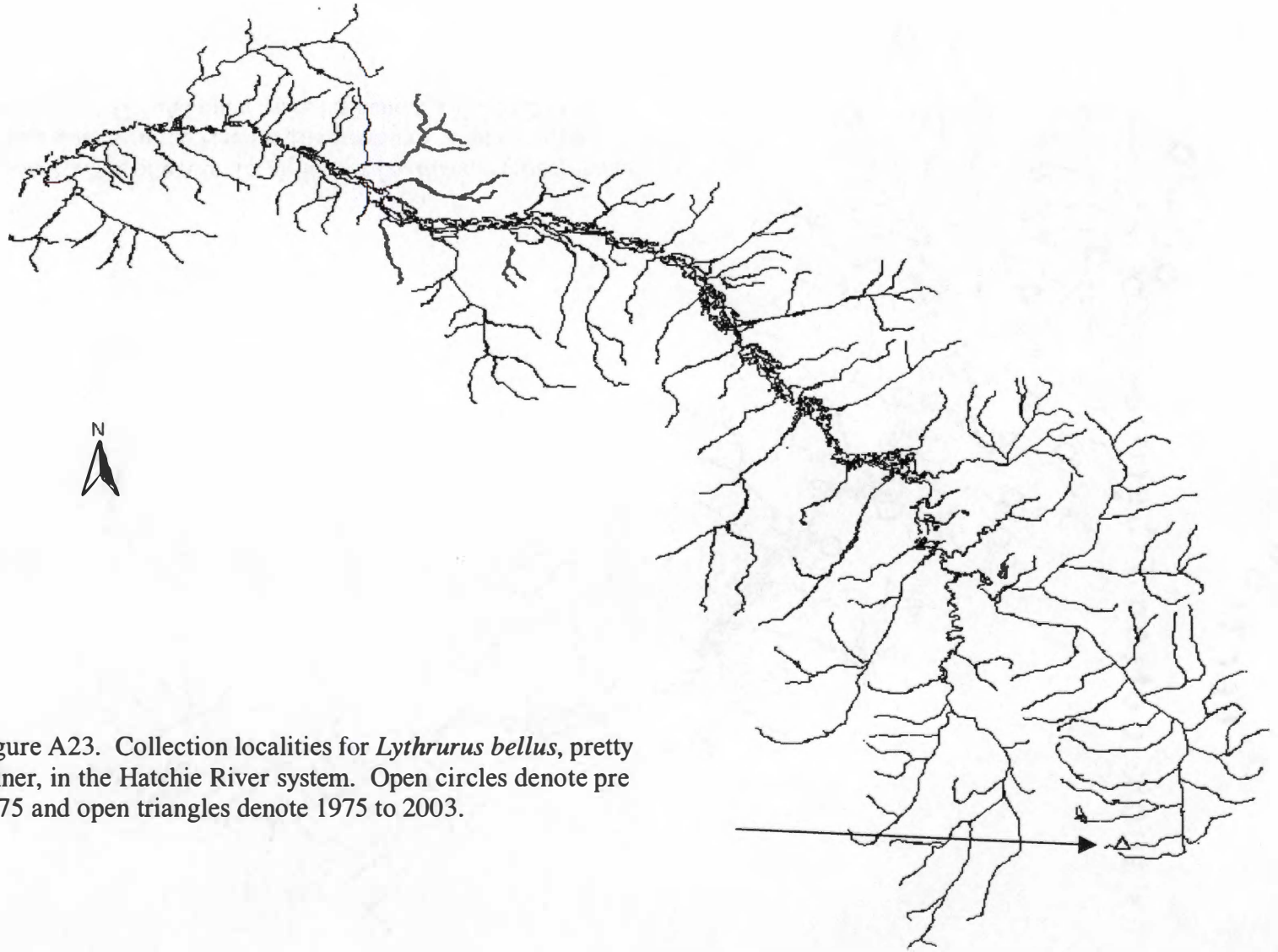

Figure A23. Collection localities for *Lythrurus bellus*, pretty shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

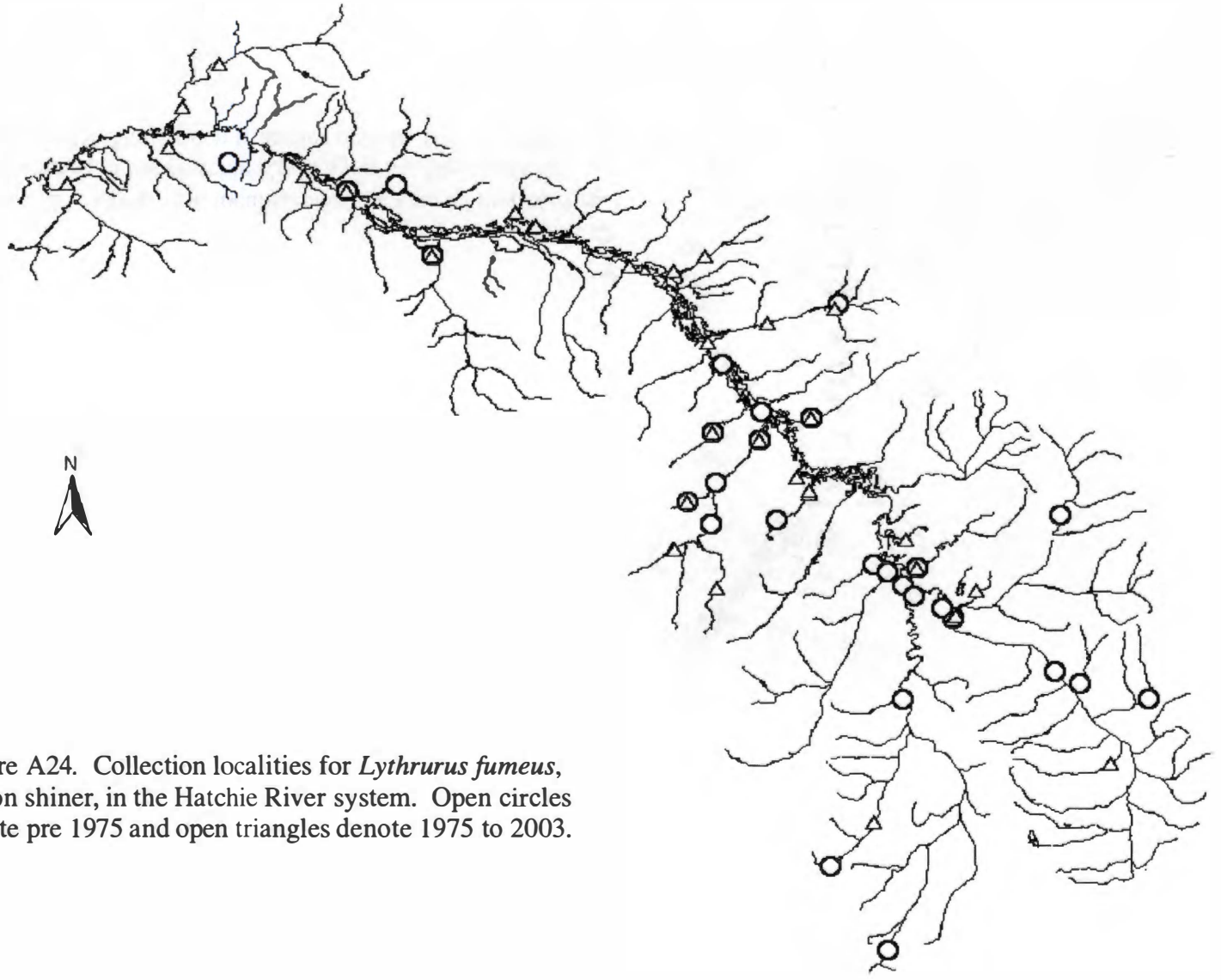

Figure A24. Collection localities for *Lythrurus fumeus*, ribbon shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

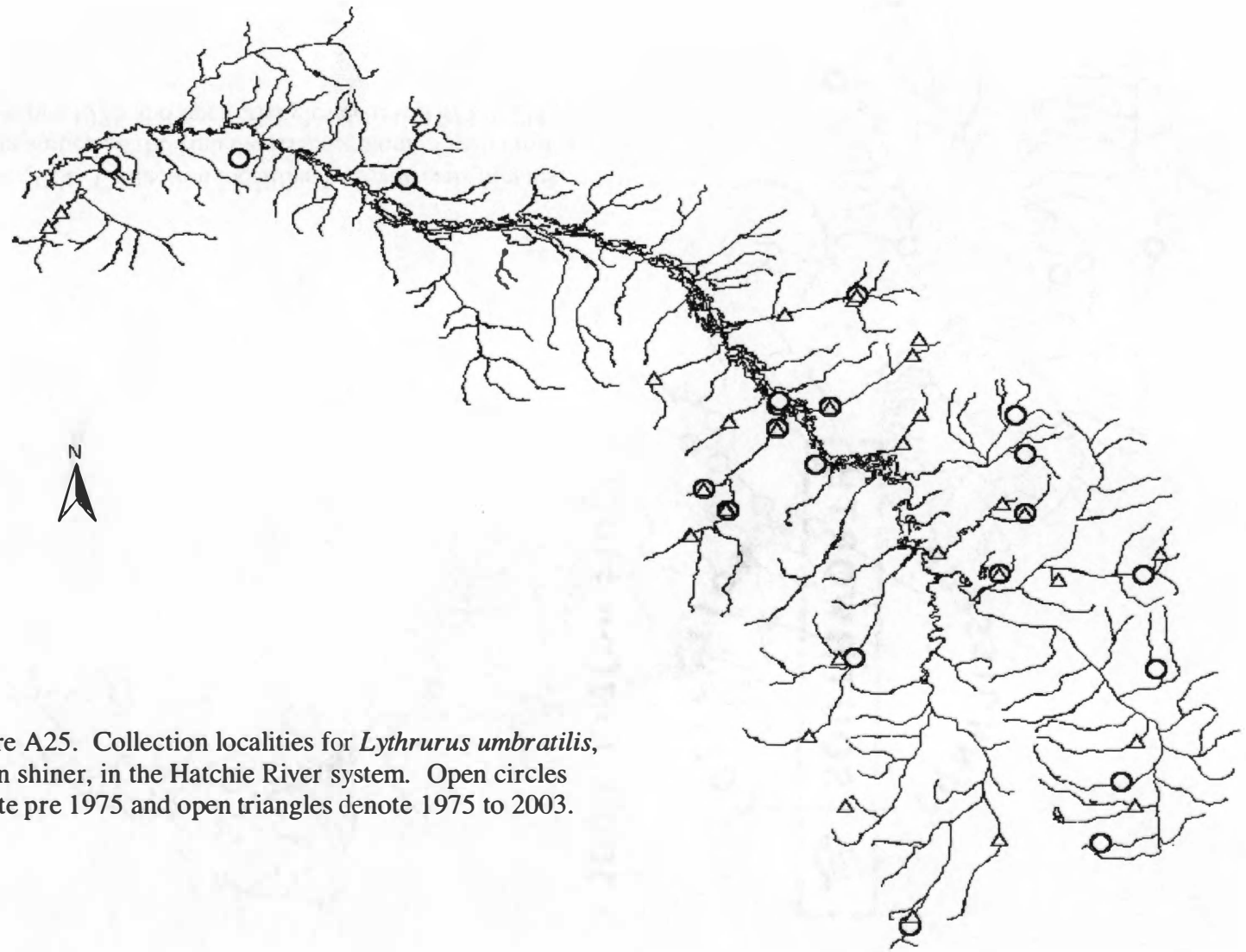

Figure A25. Collection localities for *Lythrurus umbratilis*, redfin shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

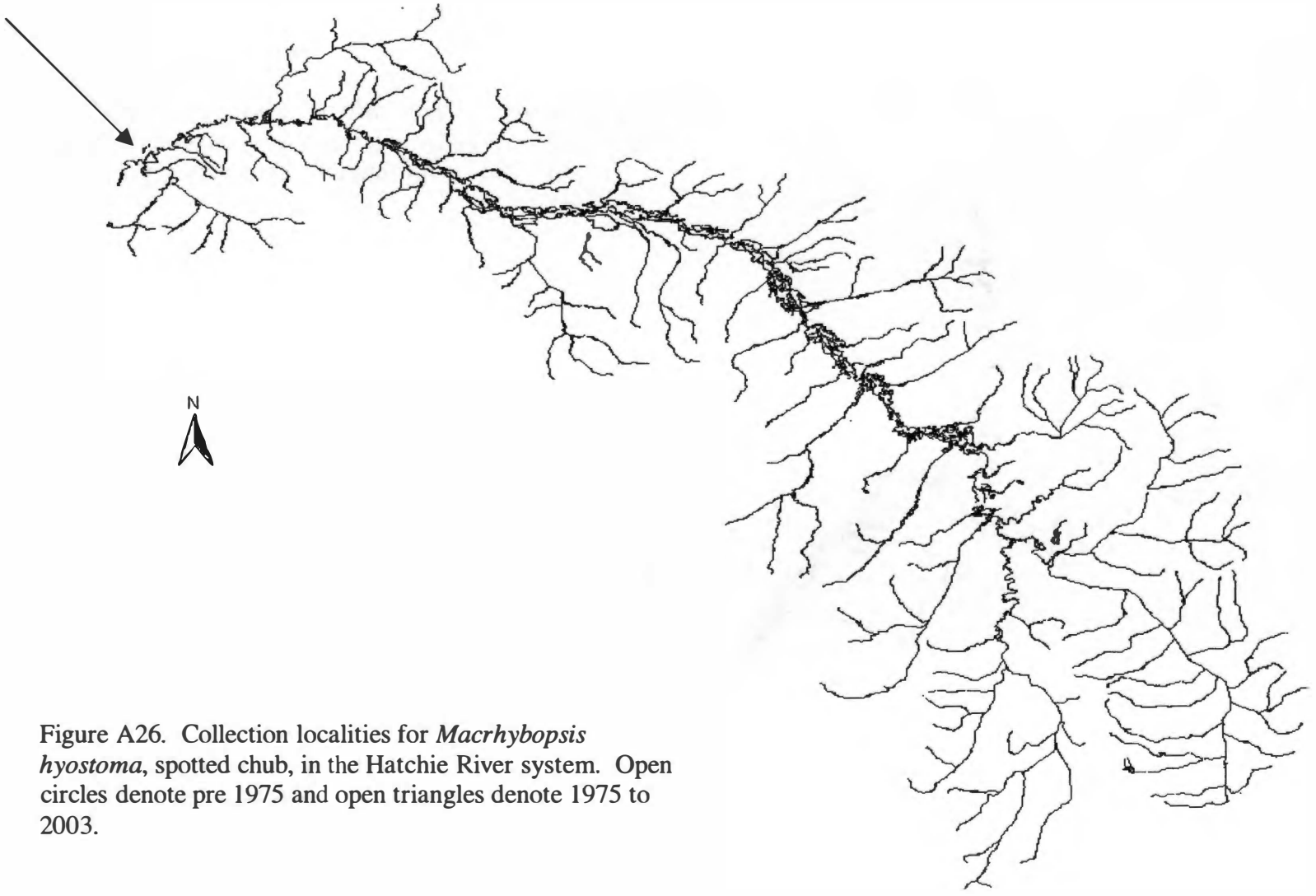

Figure A26. Collection localities for *Macrhybopsis hyostoma*, spotted chub, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

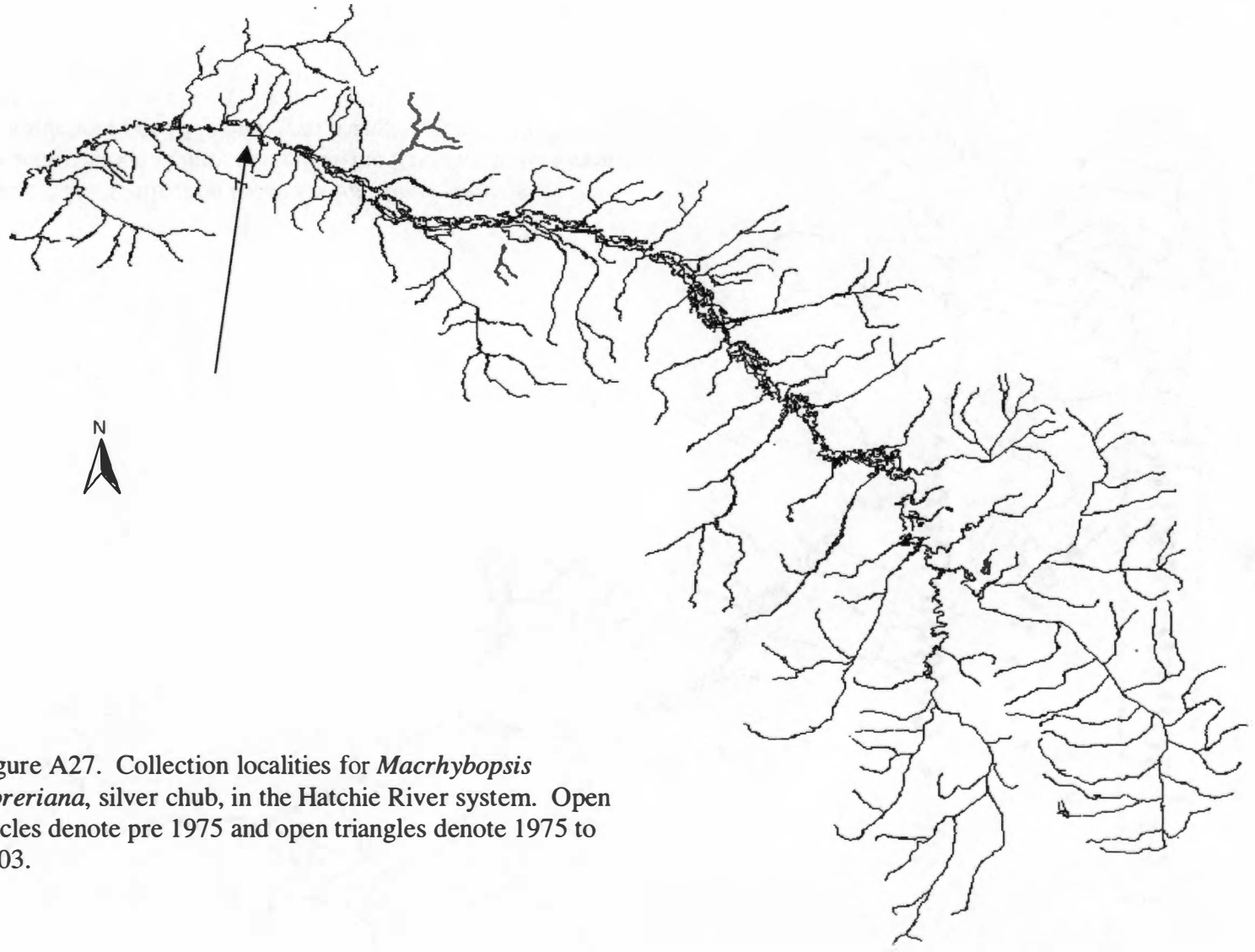

Figure A27. Collection localities for *Macrhybopsis storeriana*, silver chub, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

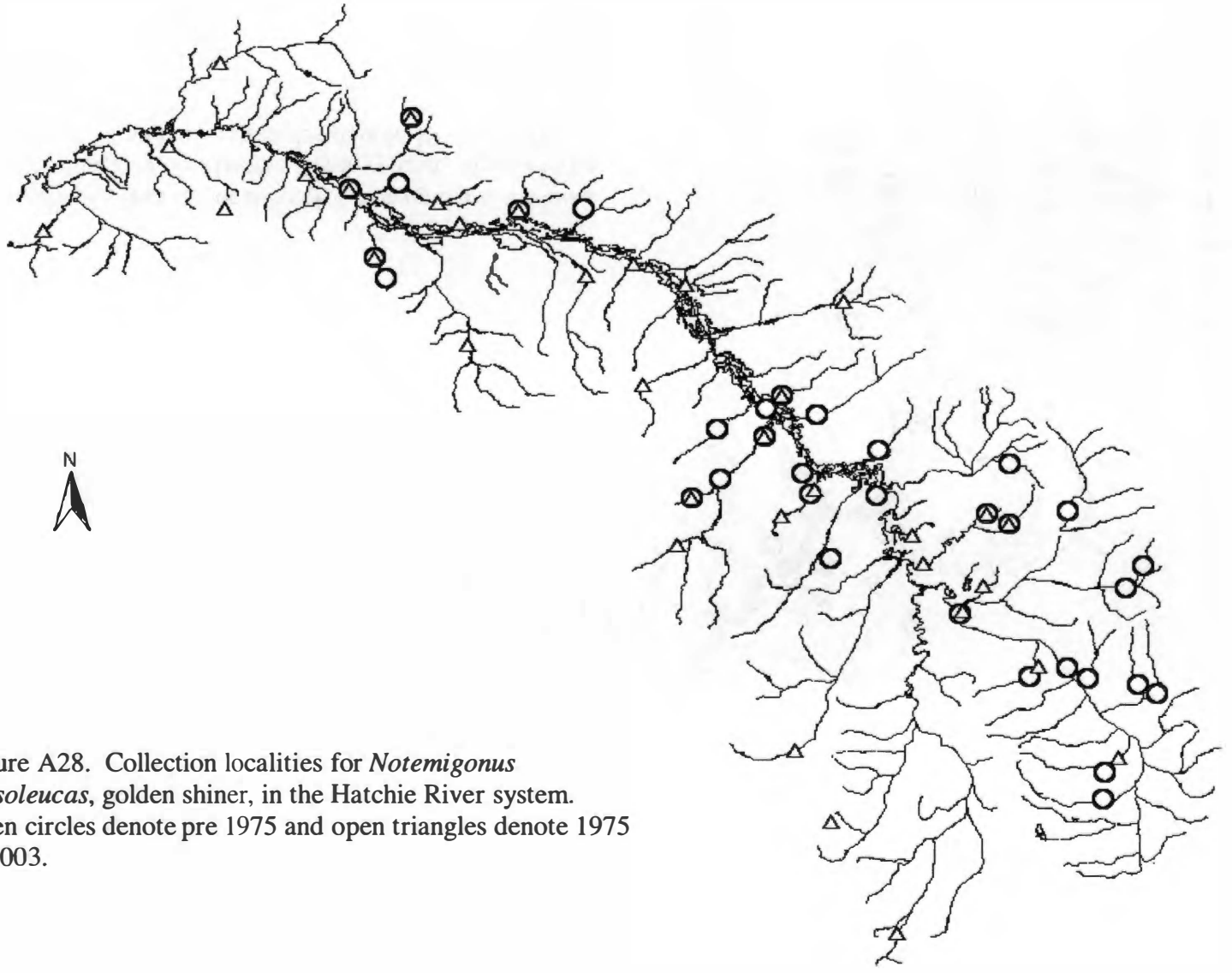

Figure A28. Collection localities for *Notemigonus crysoleucas*, golden shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

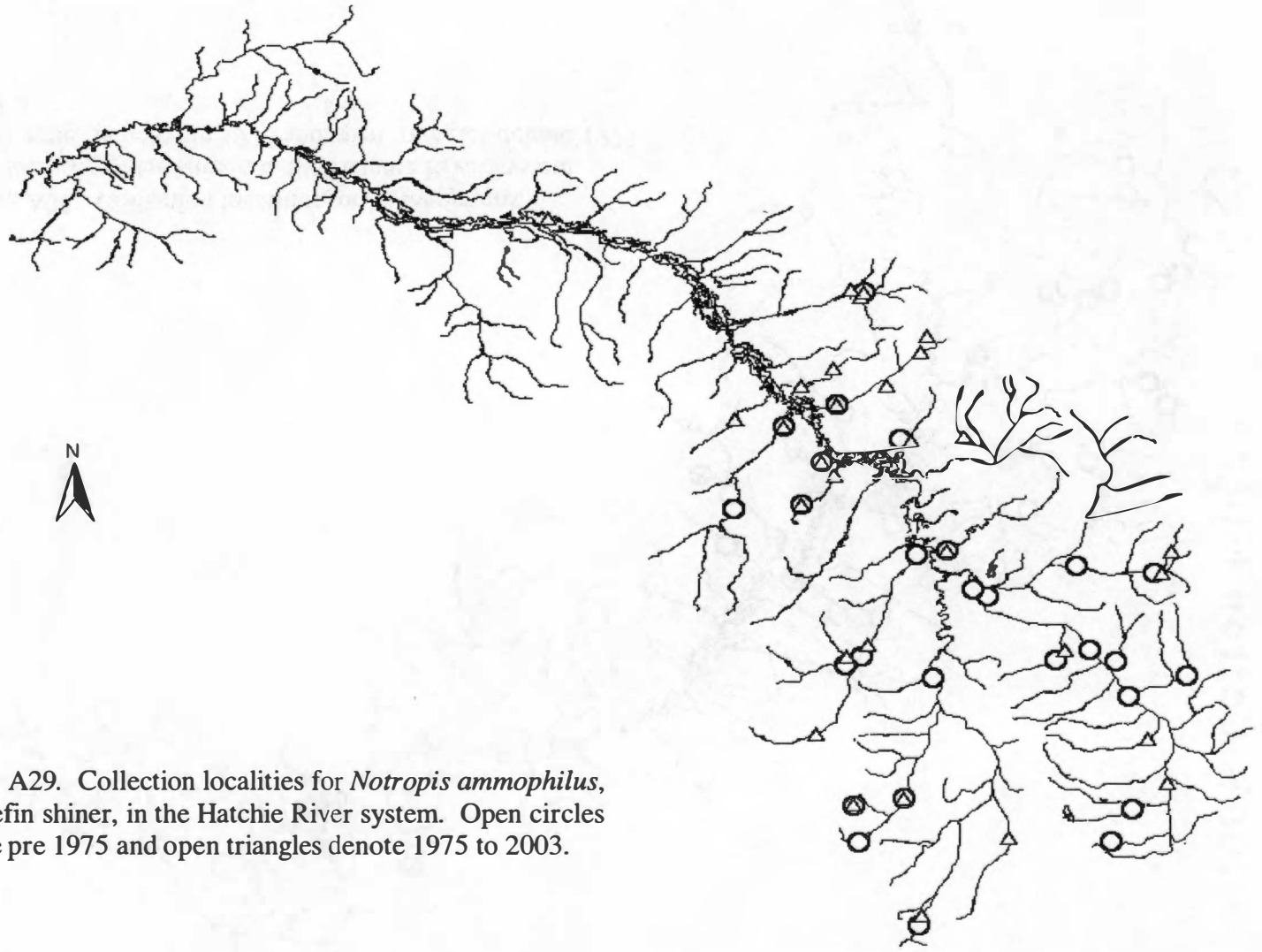

Figure A29. Collection localities for *Notropis ammophilus*, orangefin shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

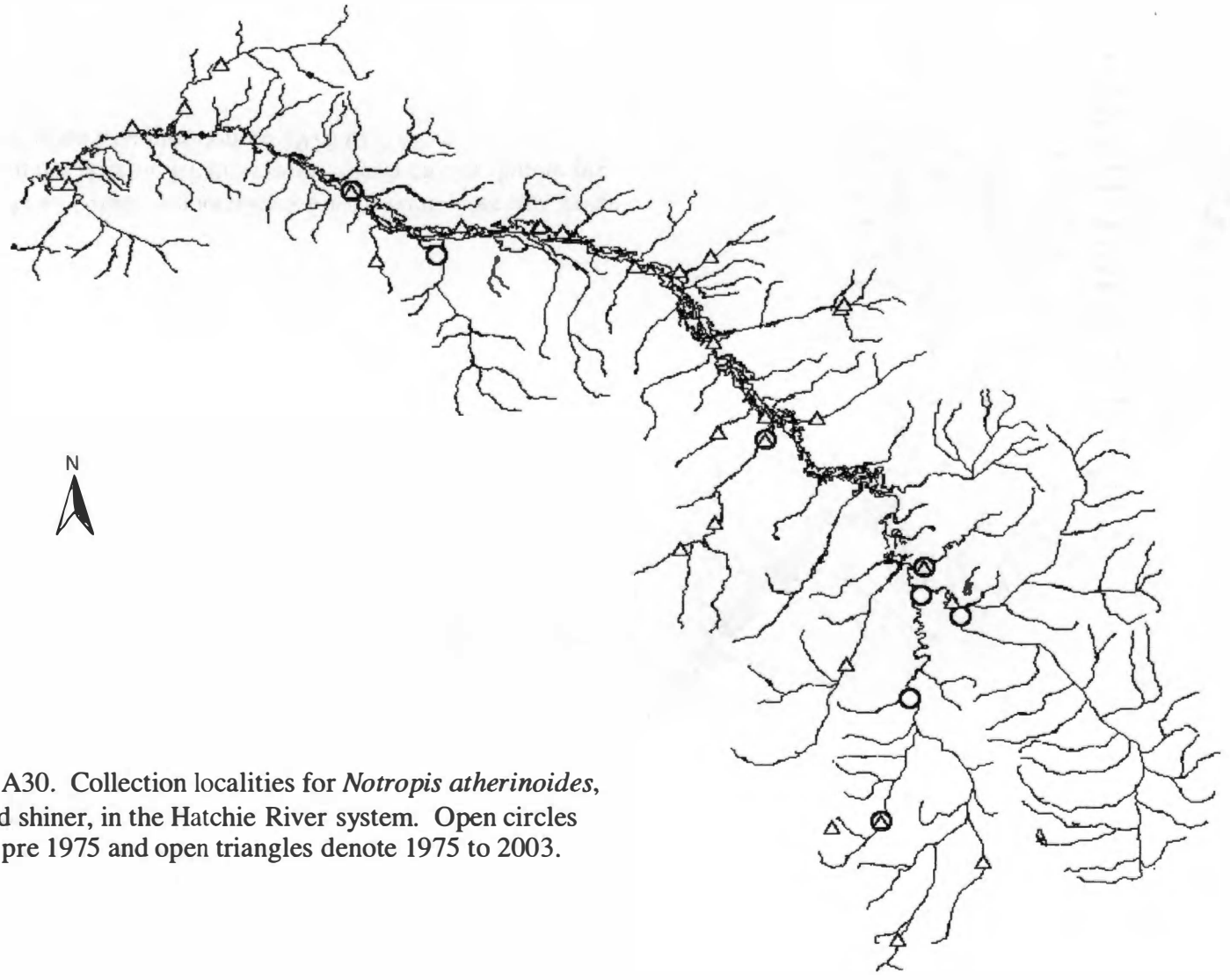

Figure A30. Collection localities for *Notropis atherinoides*, emerald shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

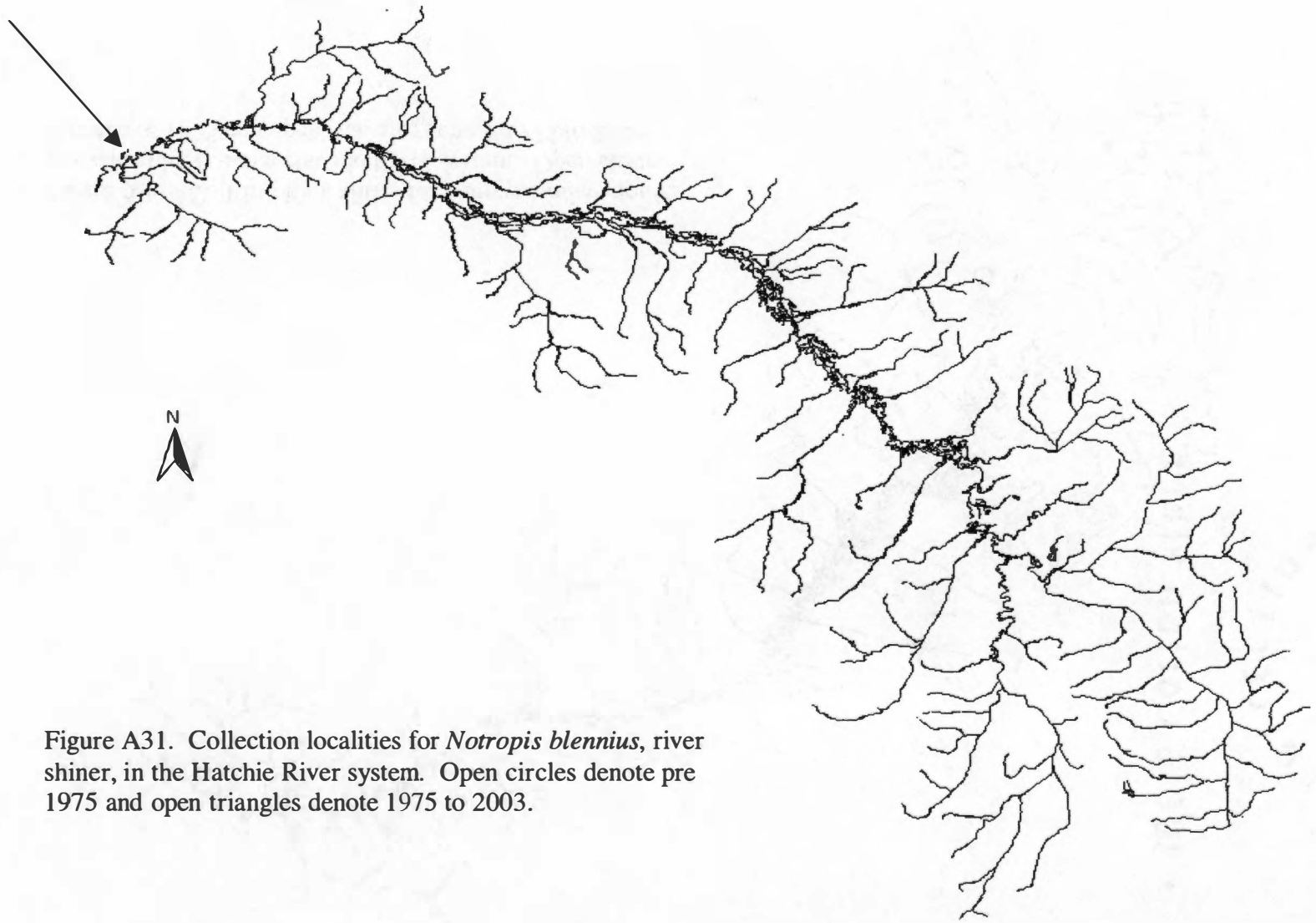

Figure A31. Collection localities for *Notropis blennius*, river shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

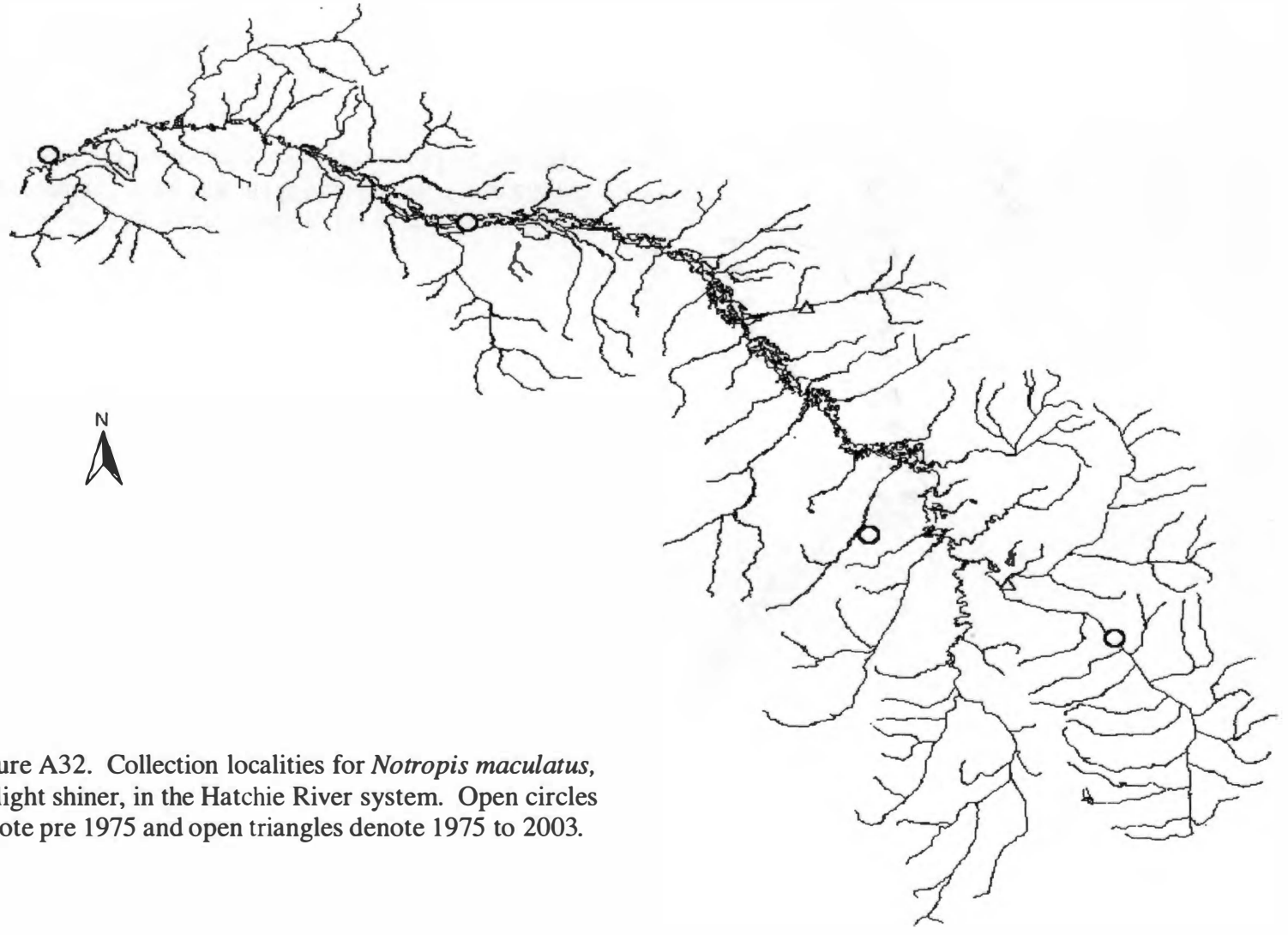

Figure A32. Collection localities for *Notropis maculatus*, taillight shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

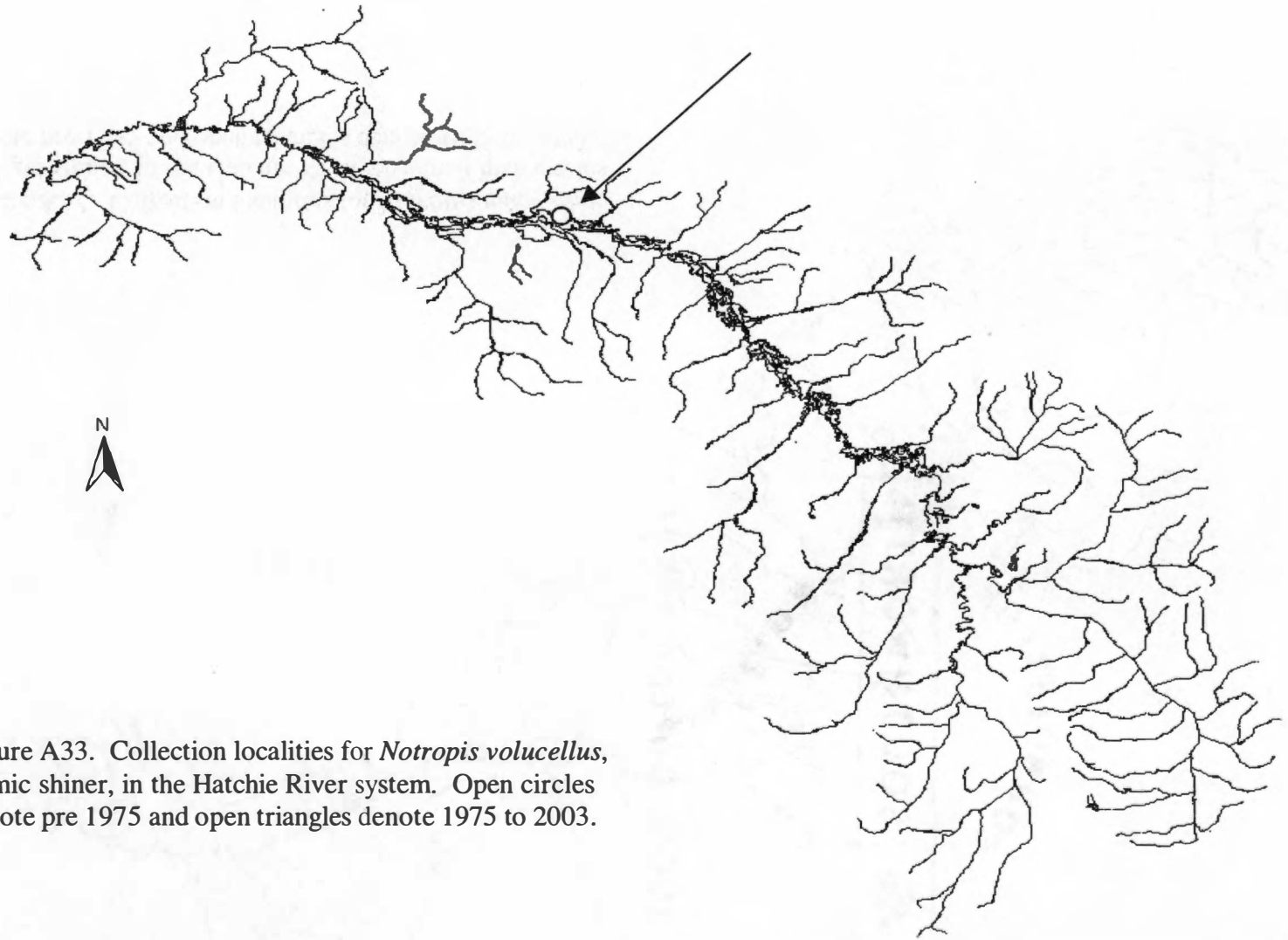

Figure A33. Collection localities for *Notropis volucellus*, mimic shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

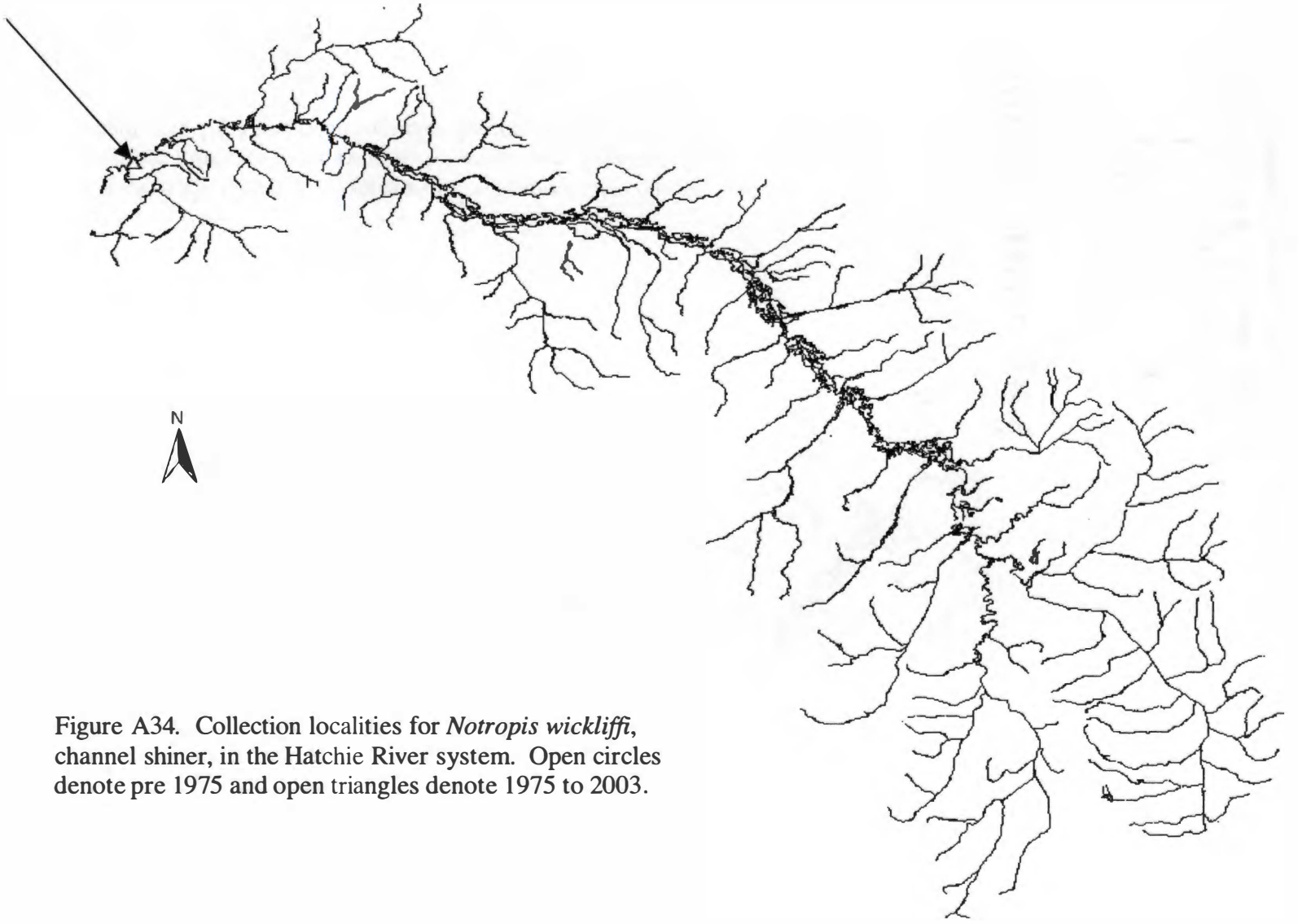

Figure A34. Collection localities for *Notropis wickliffi*, channel shiner, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

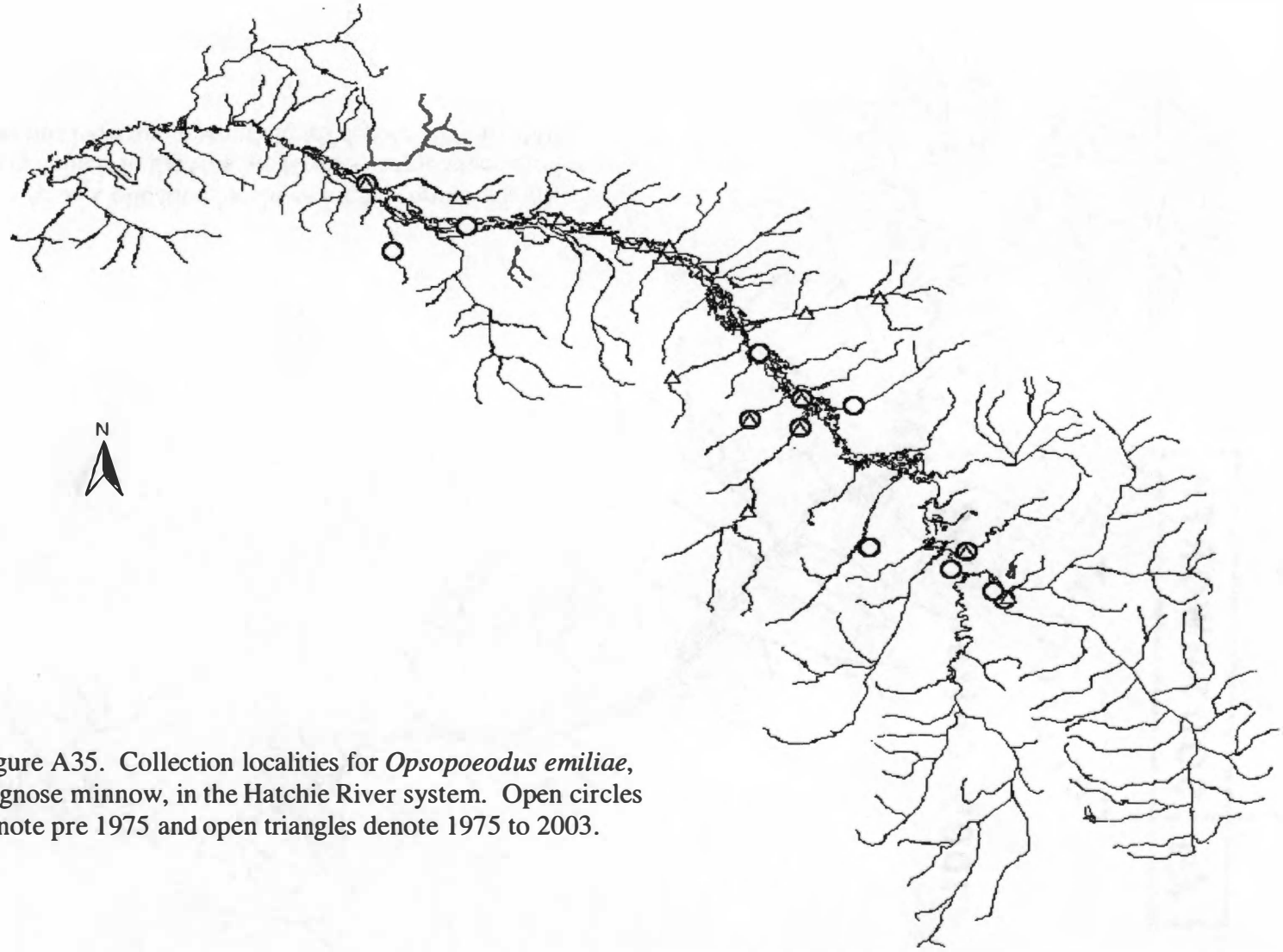

Figure A35. Collection localities for *Opsopoeodus emiliae*, pugnose minnow, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

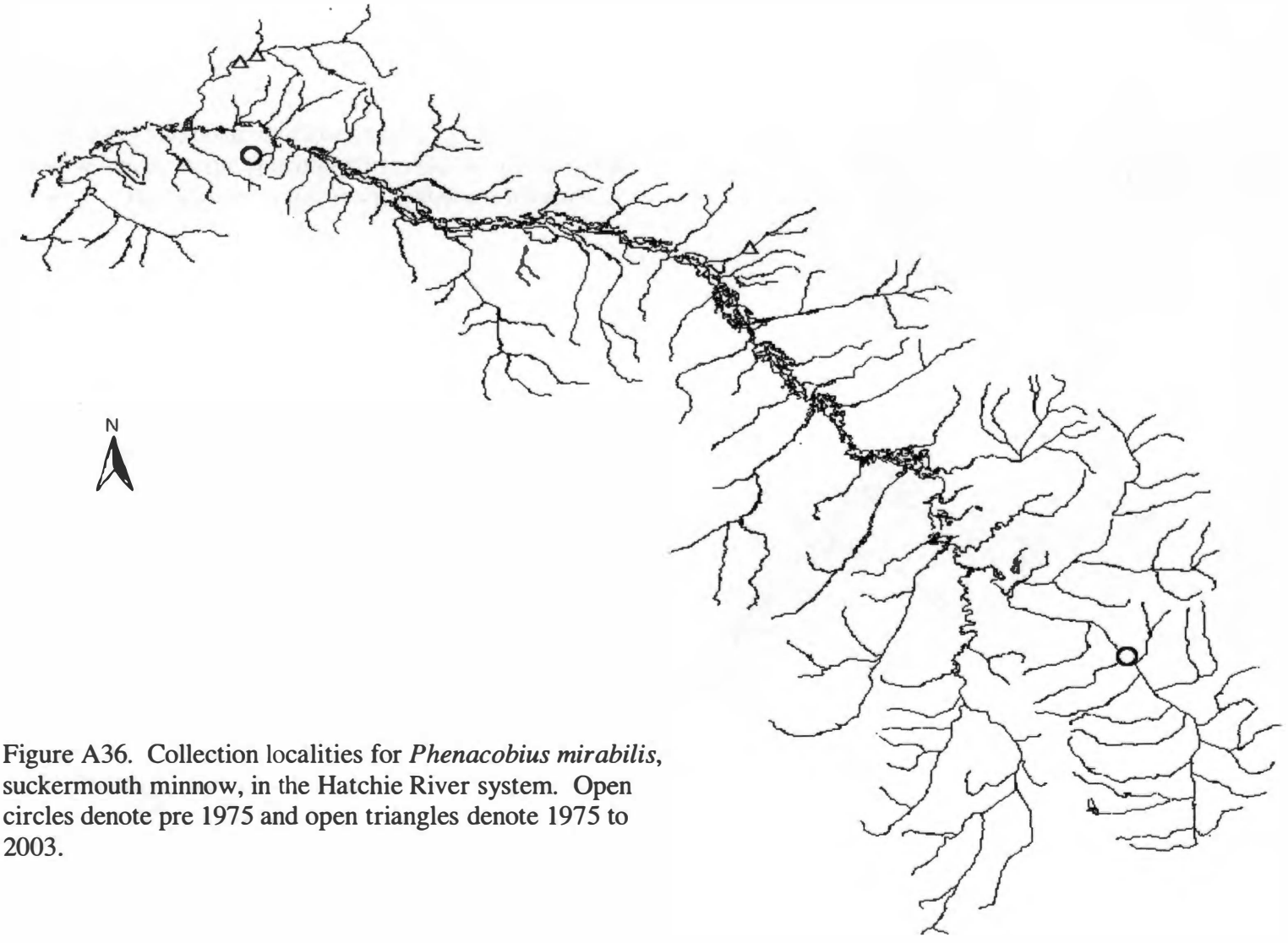

Figure A36. Collection localities for *Phenacobius mirabilis*, suckermouth minnow, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

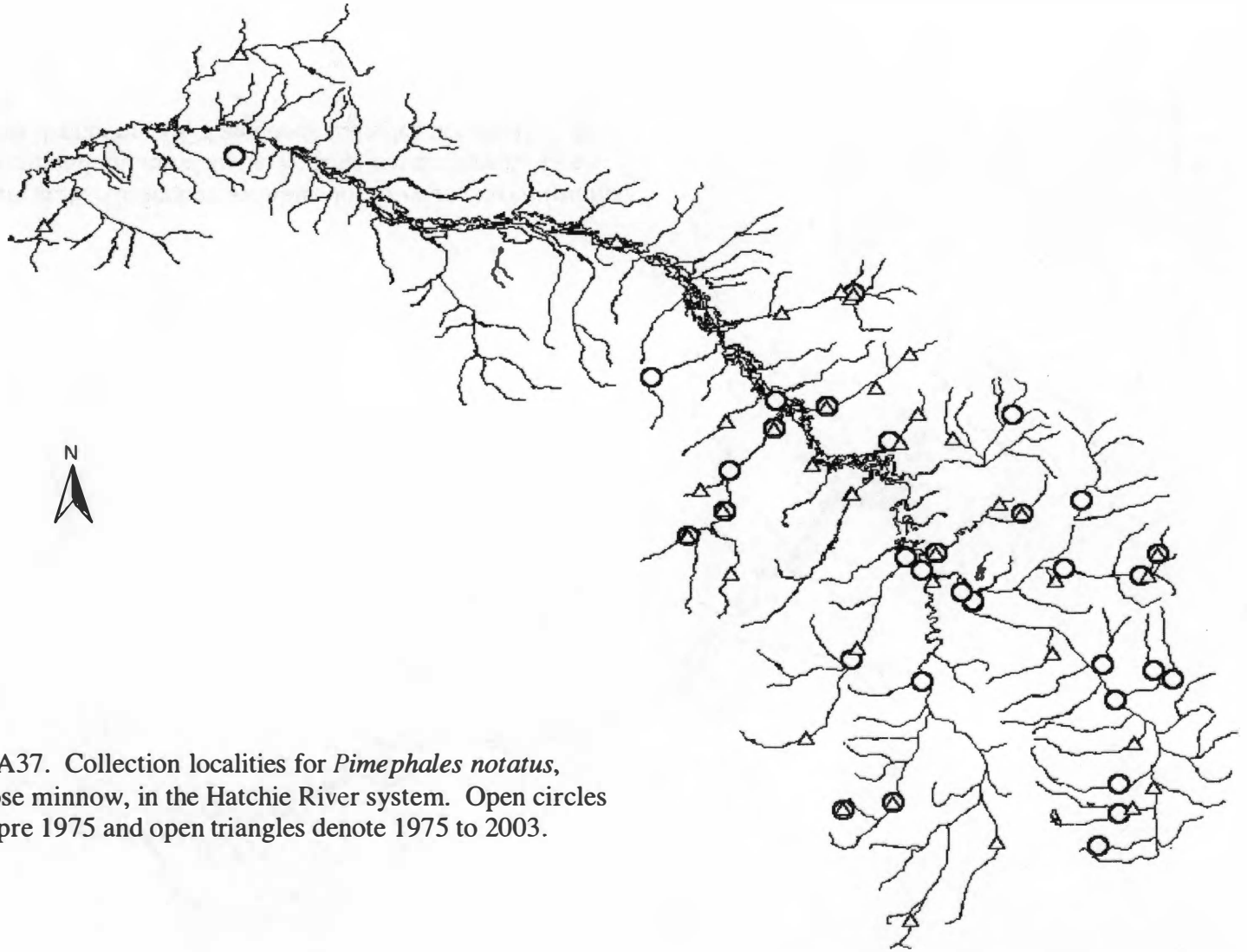

Figure A37. Collection localities for *Pimephales notatus*, bluntnose minnow, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

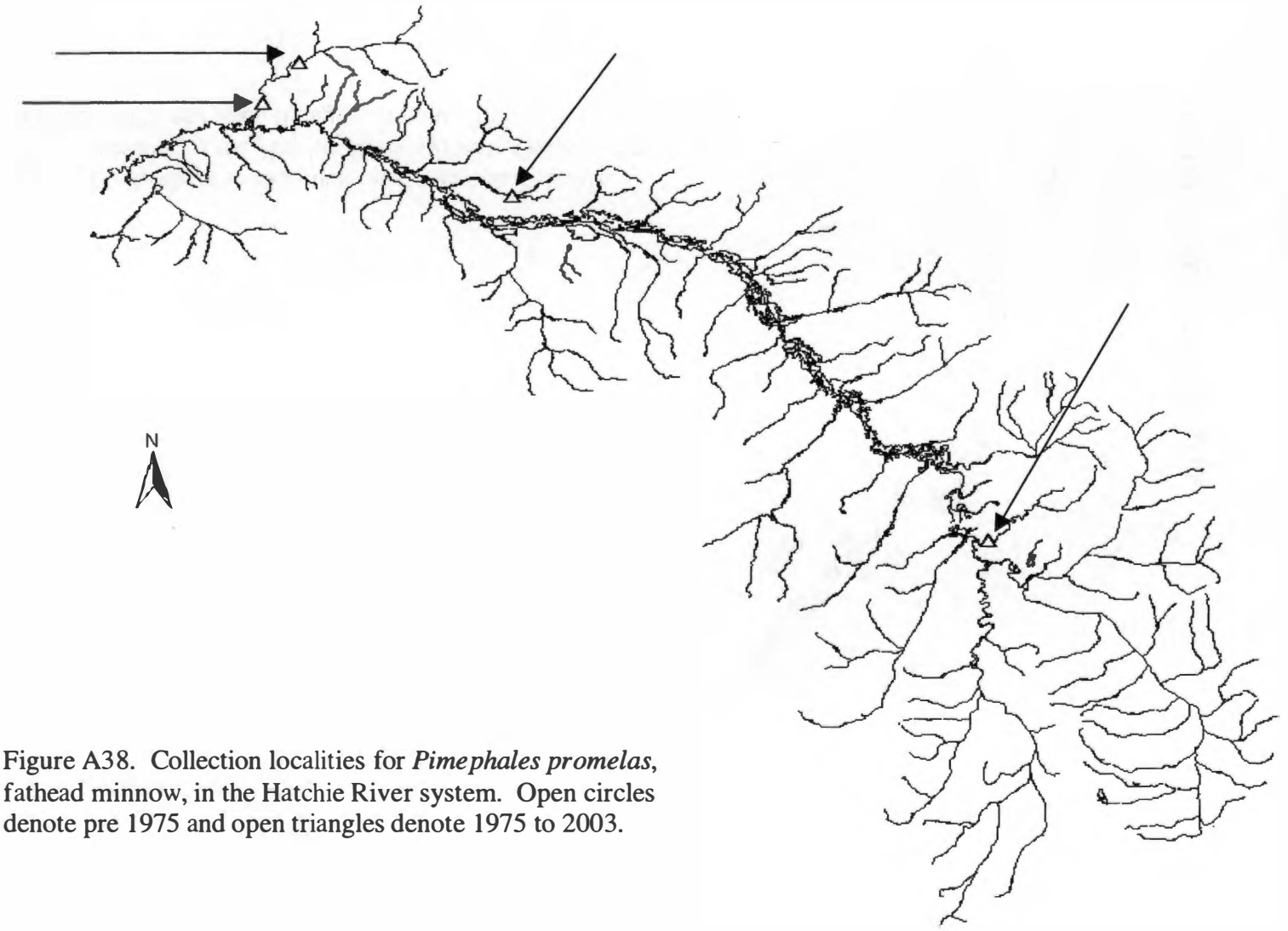

Figure A38. Collection localities for *Pimephales promelas*, fathead minnow, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

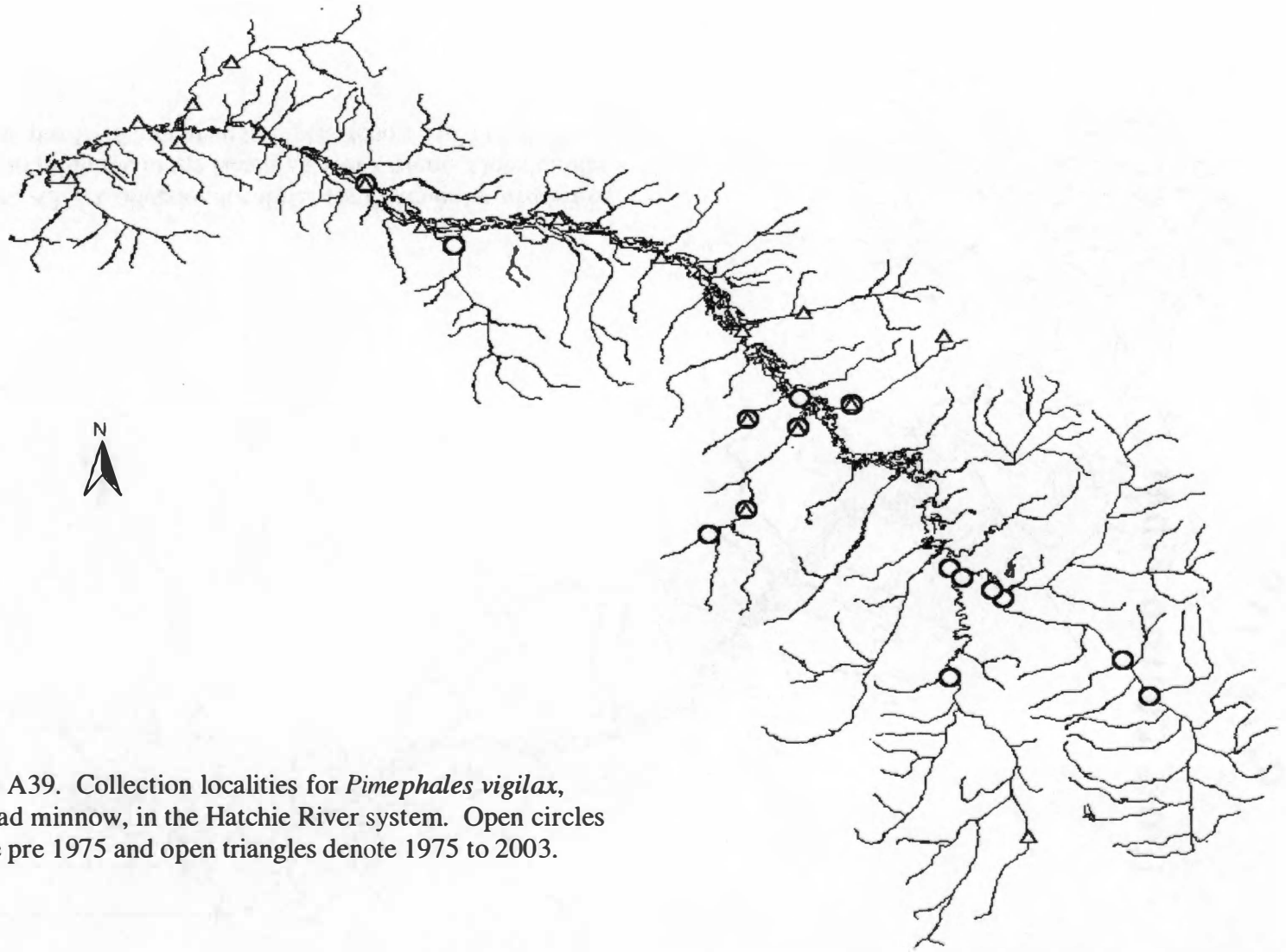

Figure A39. Collection localities for *Pimephales vigilax*, bullhead minnow, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

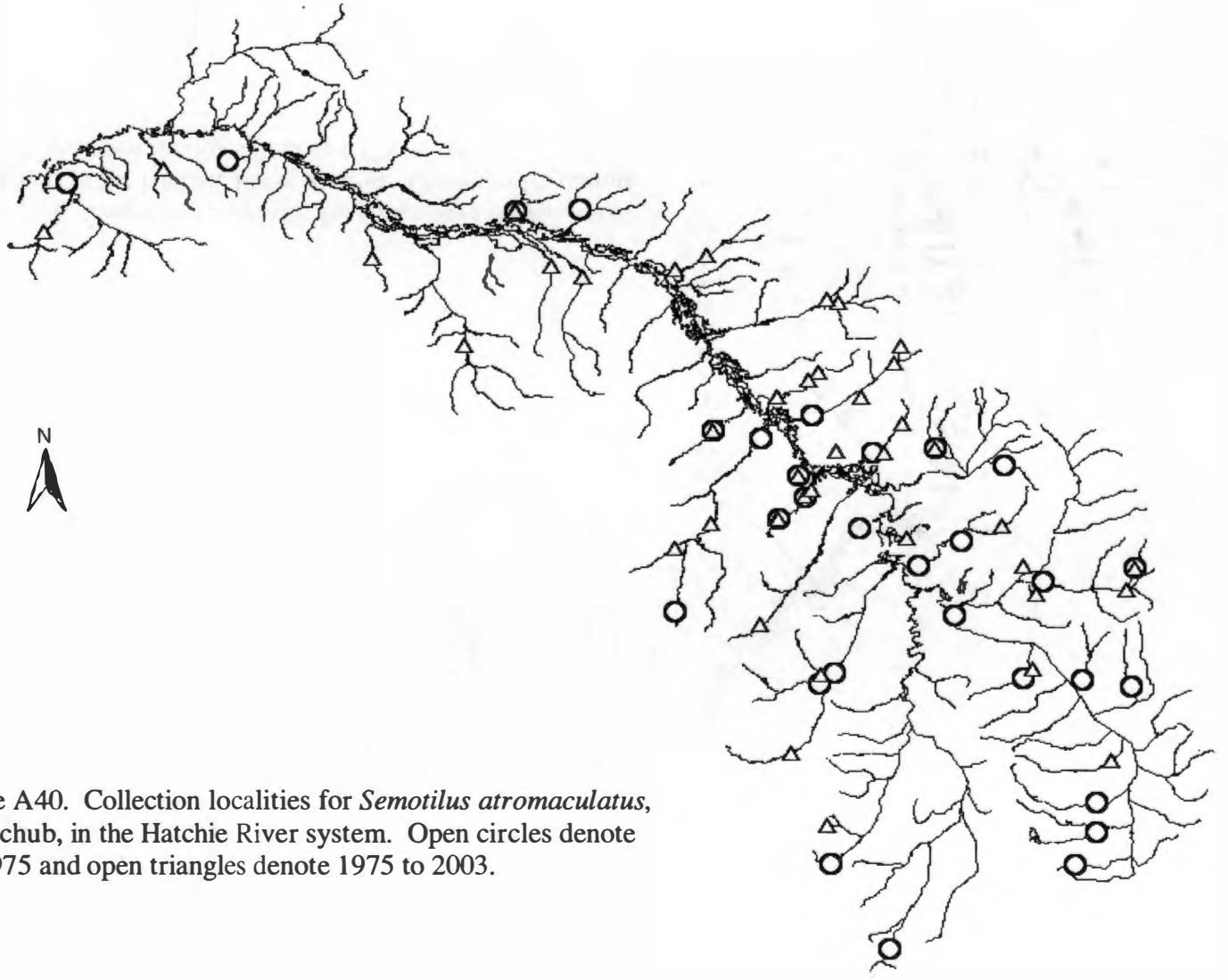

Figure A40. Collection localities for *Semotilus atromaculatus*, creek chub, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

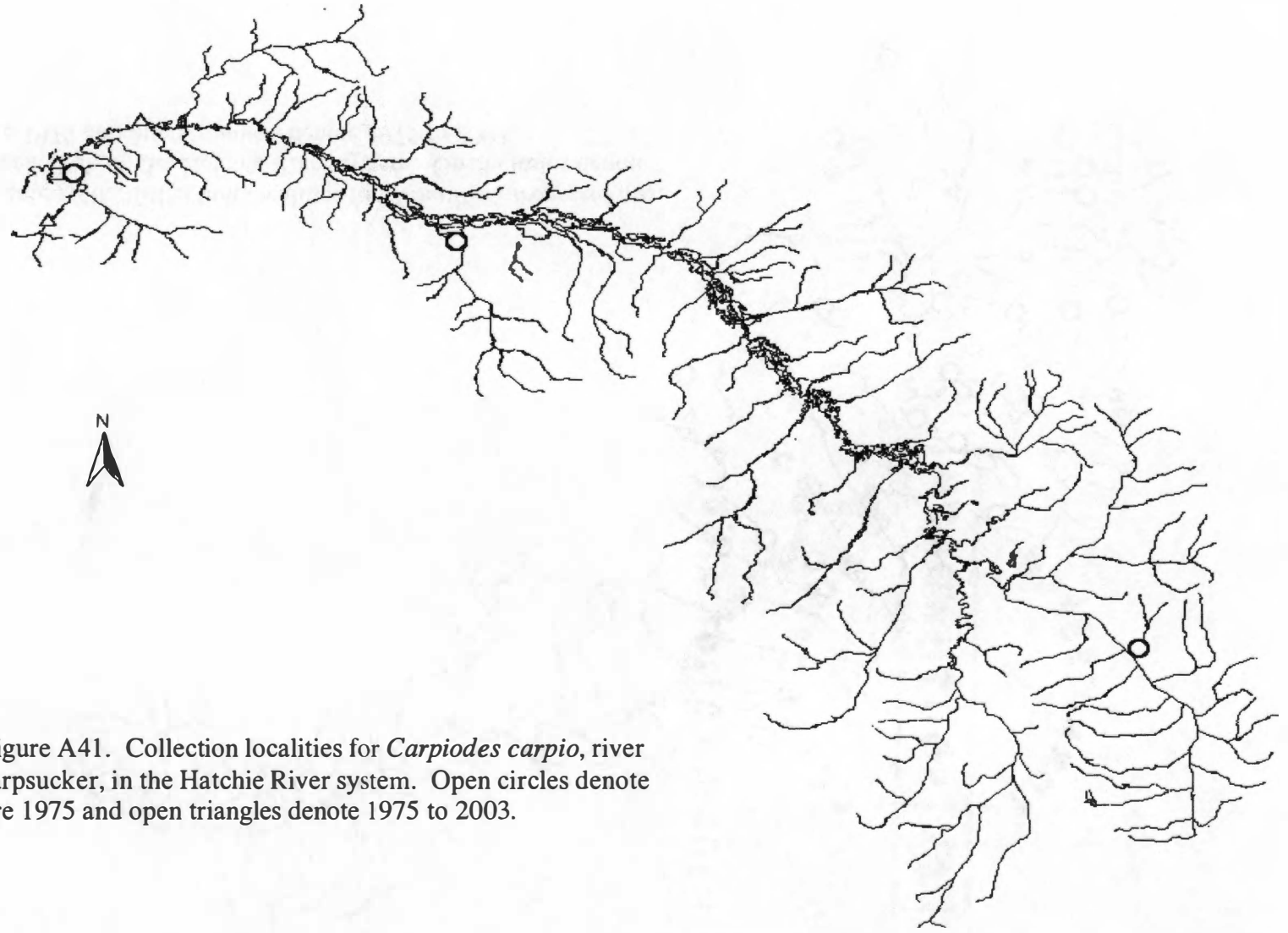

Figure A41. Collection localities for *Carpiodes carpio*, river carpsucker, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

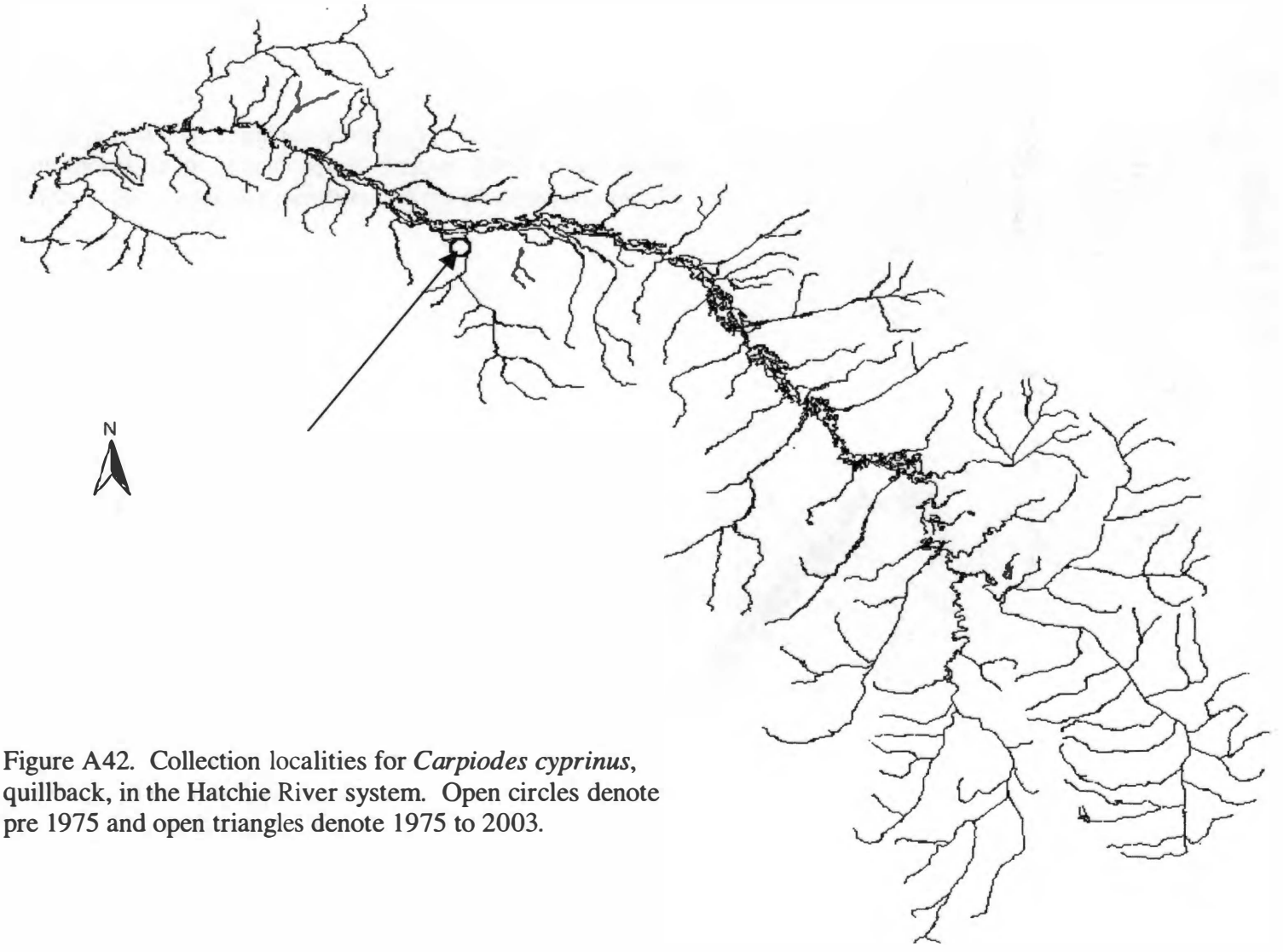

Figure A42. Collection localities for *Carpiodes cyprinus*, quillback, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

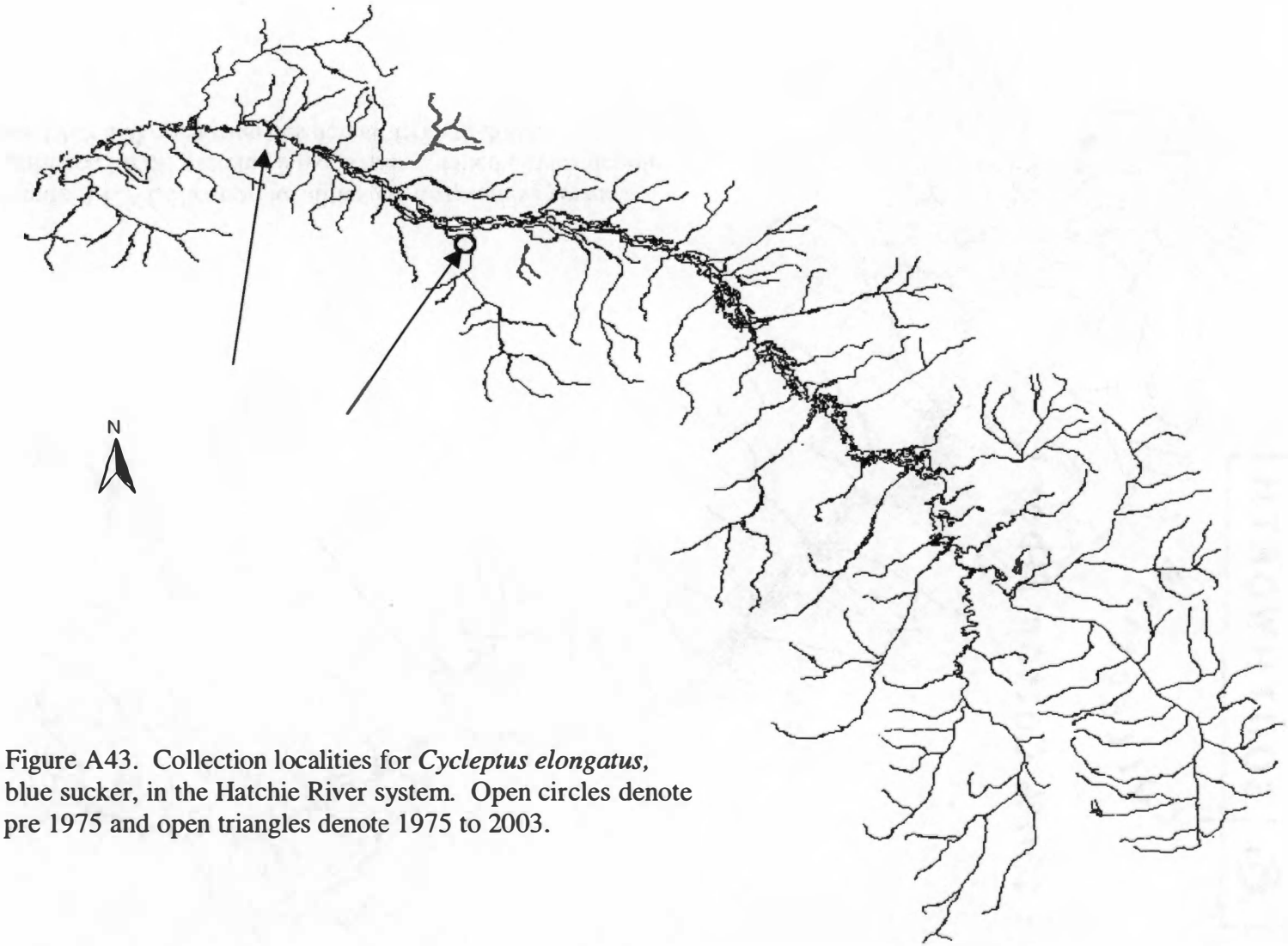

Figure A43. Collection localities for *Cycleptus elongatus,* blue sucker, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

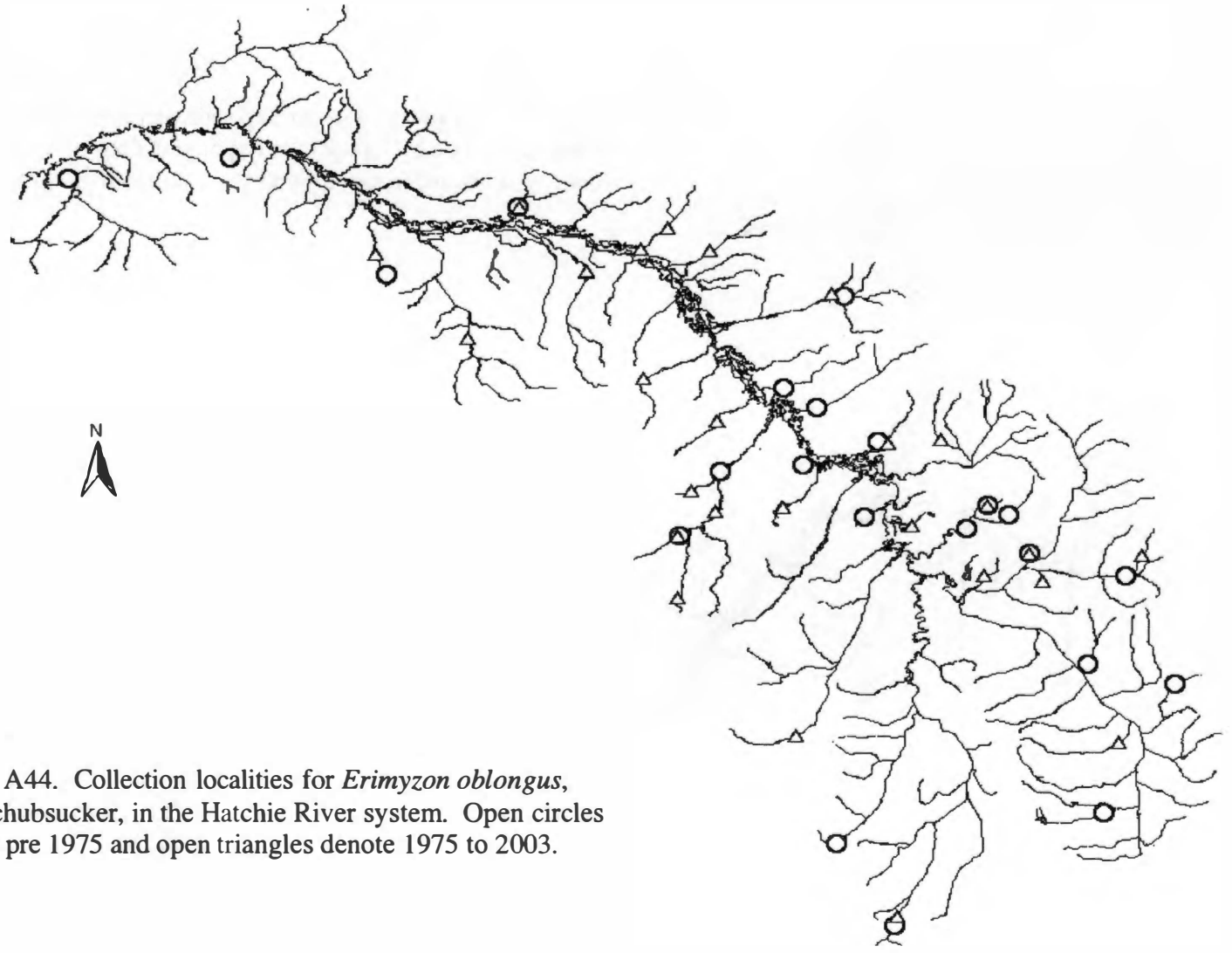

Figure A44. Collection localities for *Erimyzon oblongus*, creek chubsucker, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

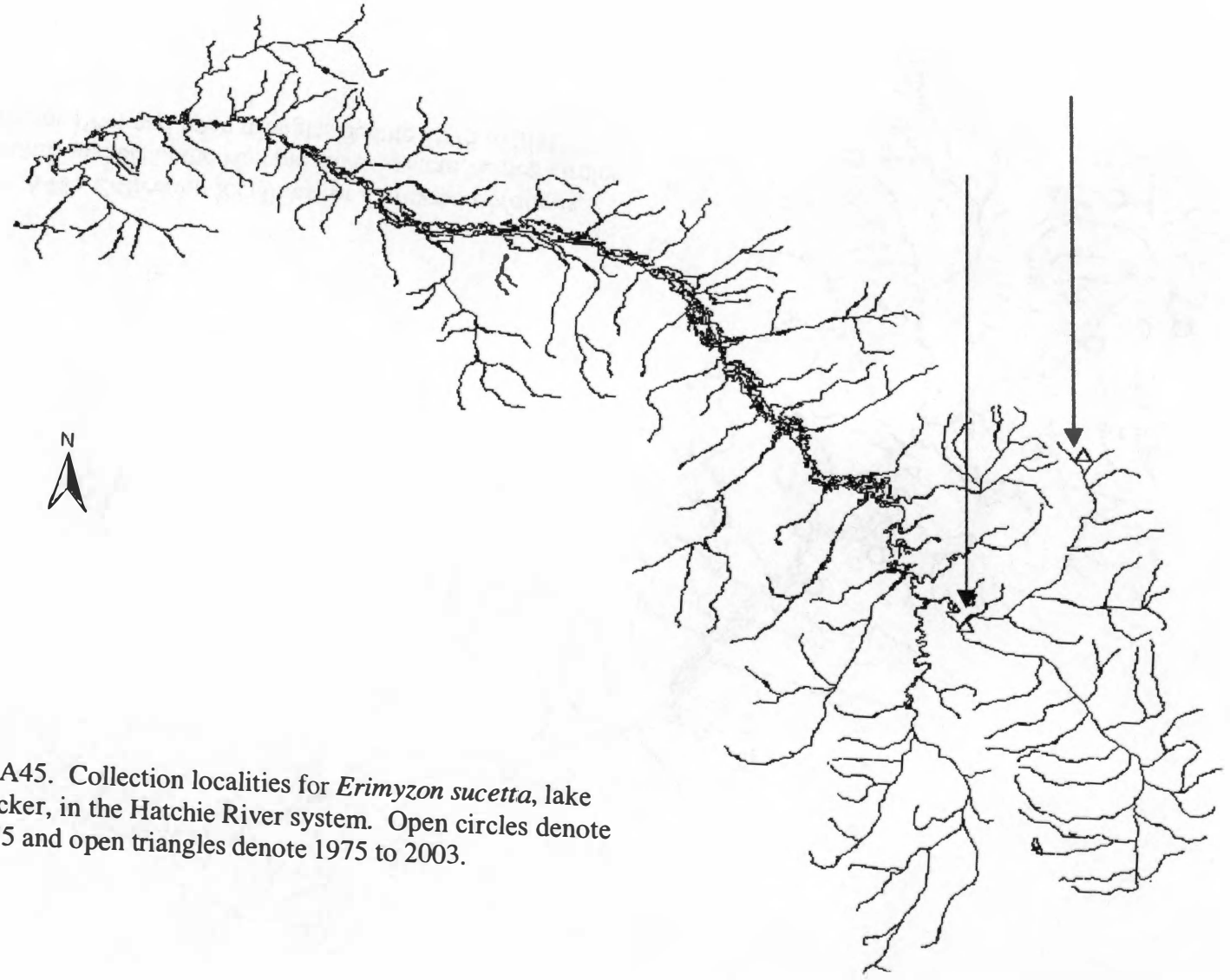

Figure A45. Collection localities for *Erimyzon sucetta*, lake chubsucker, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

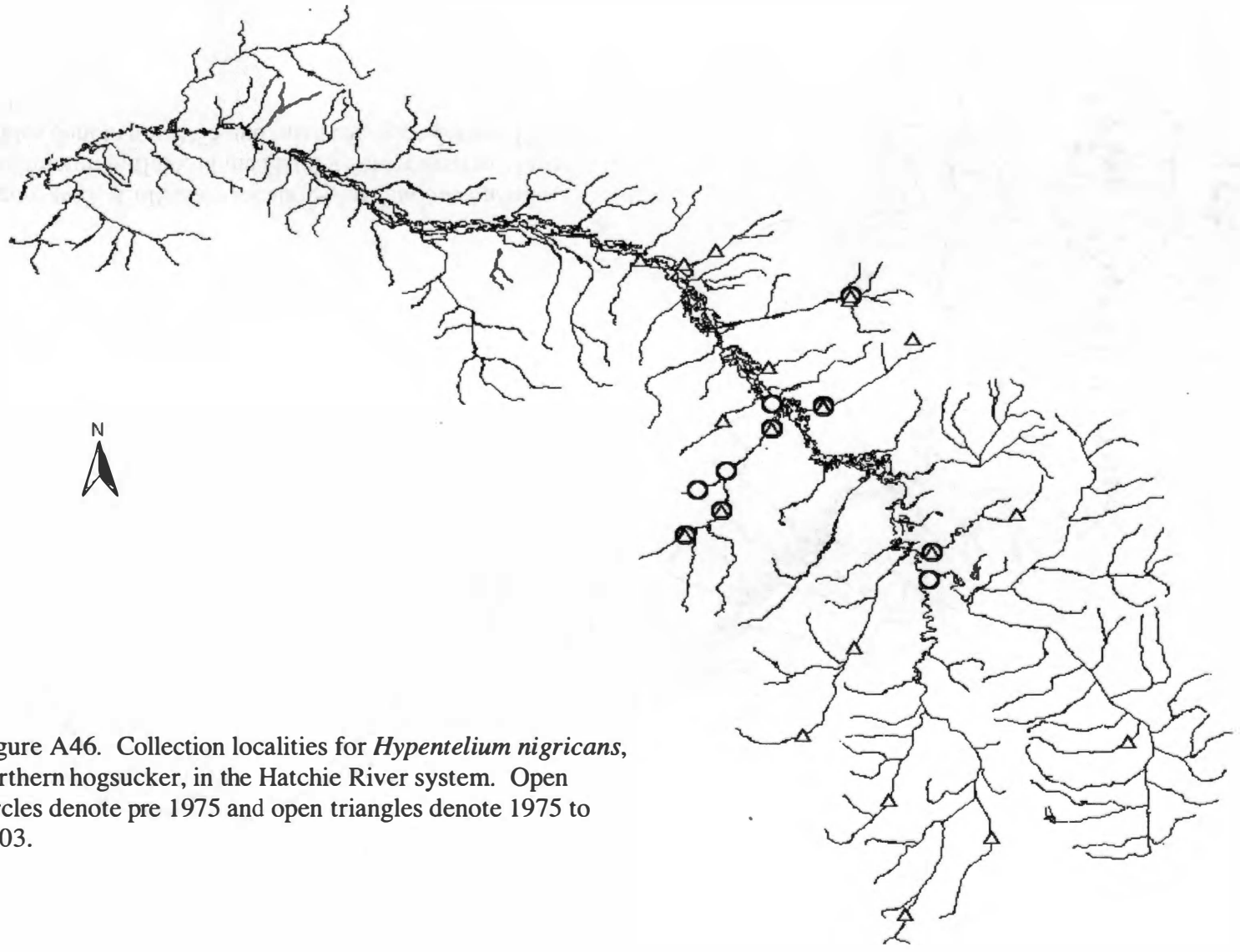

Figure A46. Collection localities for *Hypentelium nigricans*, northern hogsucker, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

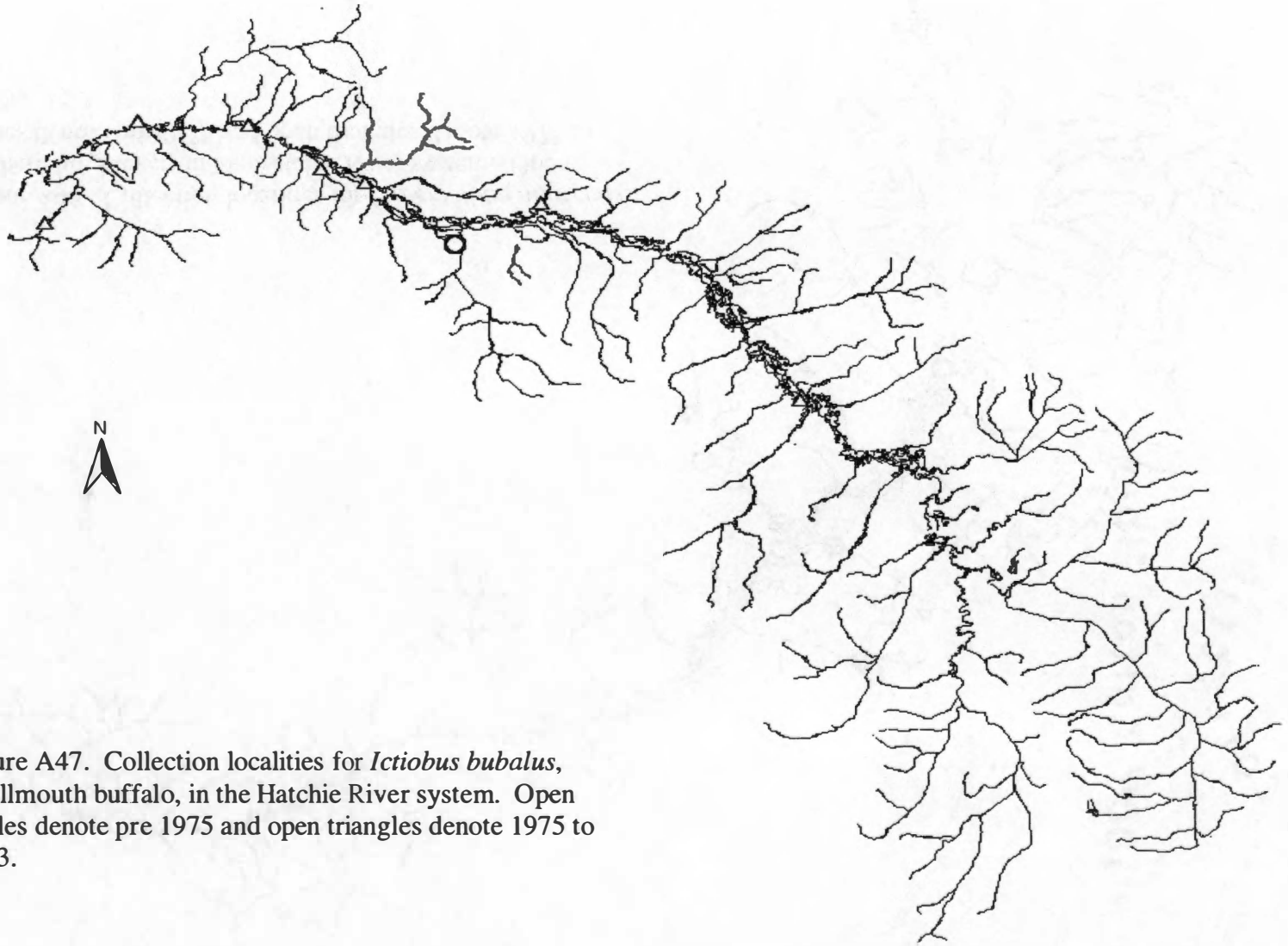

Figure A47. Collection localities for *Ictiobus bubalus*, smallmouth buffalo, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

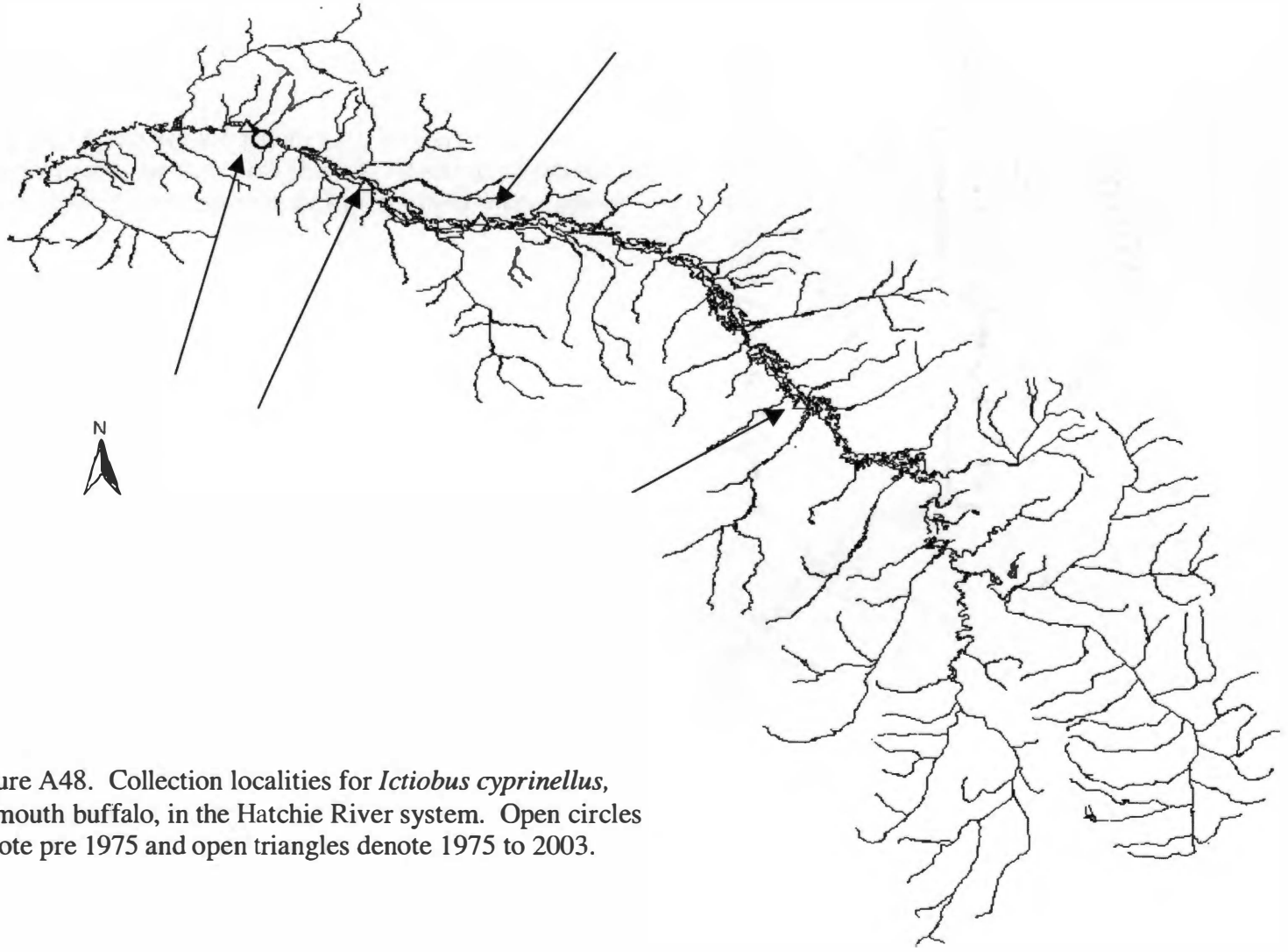

Figure A48. Collection localities for *Ictiobus cyprinellus,* bigmouth buffalo, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

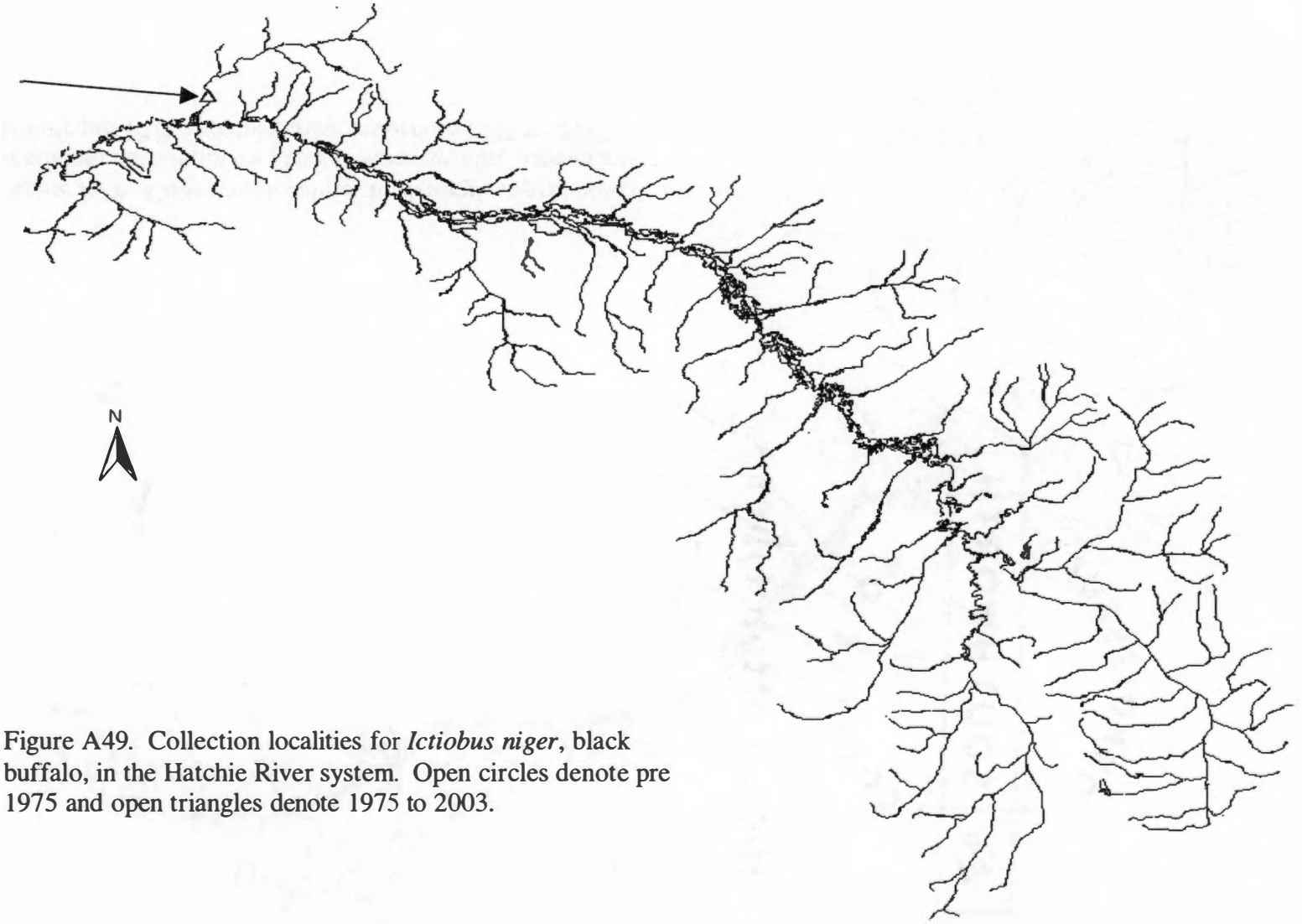

Figure A49. Collection localities for *Ictiobus niger*, black buffalo, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

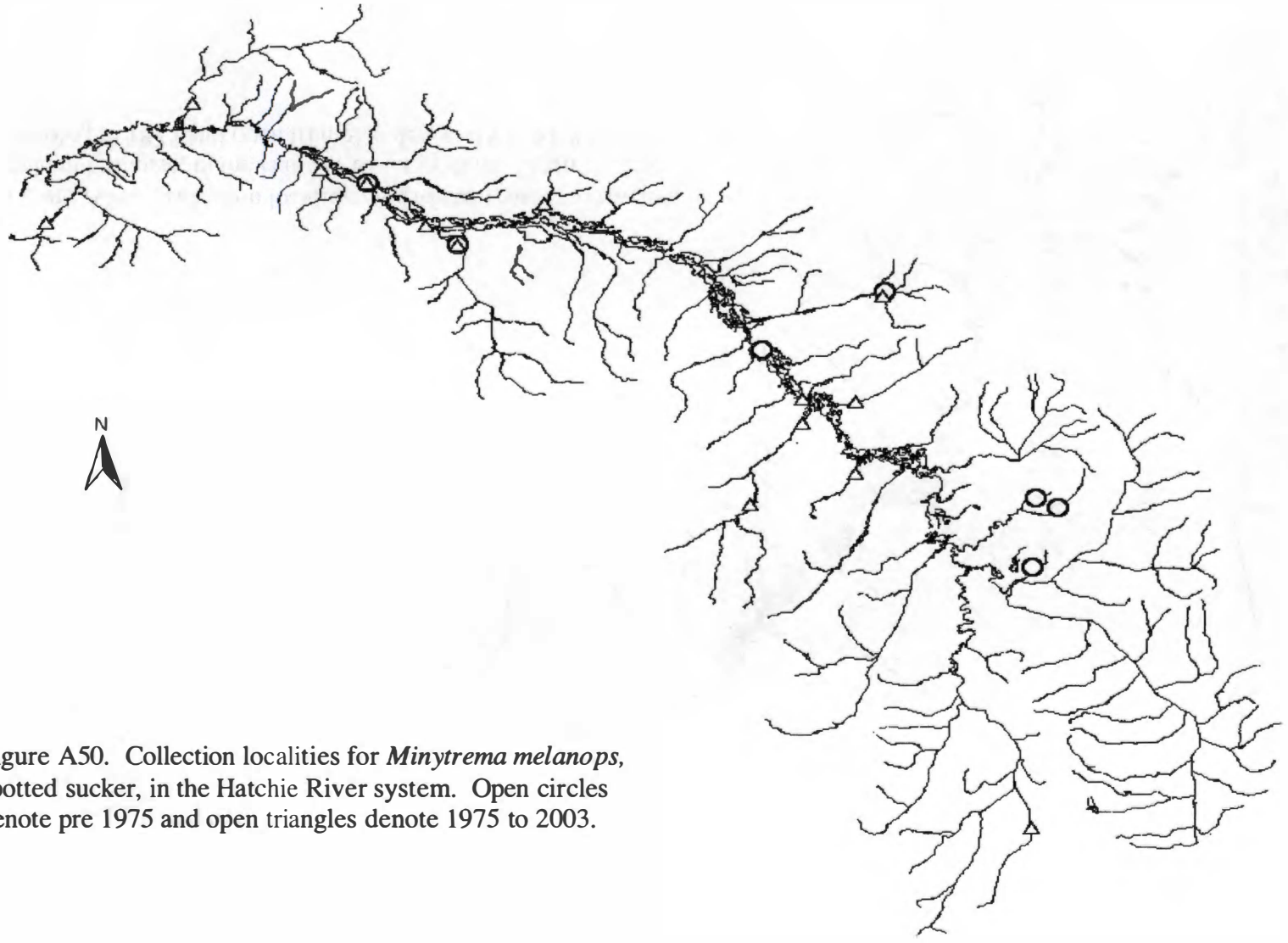

Figure A50. Collection localities for *Minytrema melanops,* spotted sucker, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

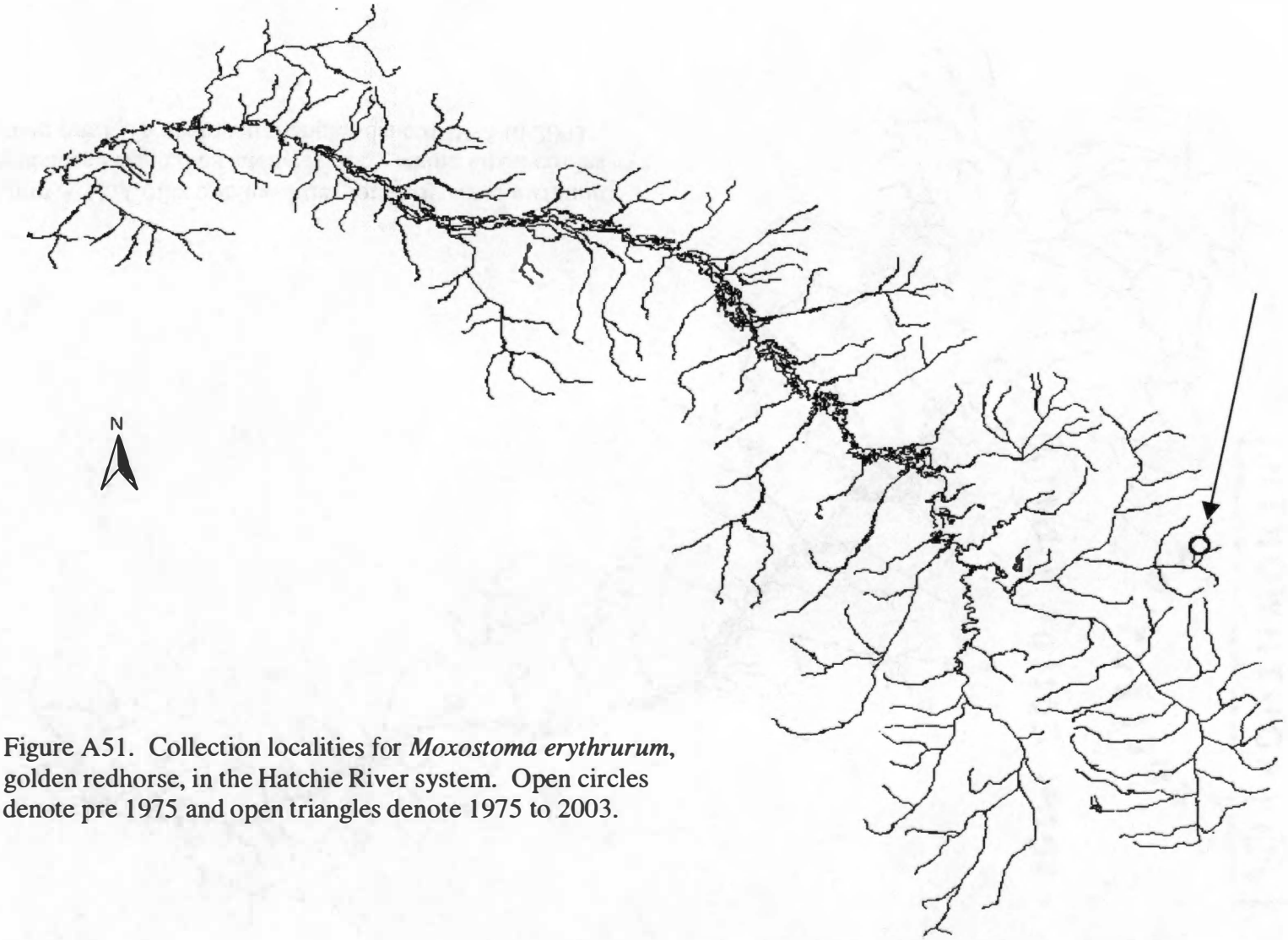

Figure A51. Collection localities for *Moxostoma erythrurum*, golden redhorse, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

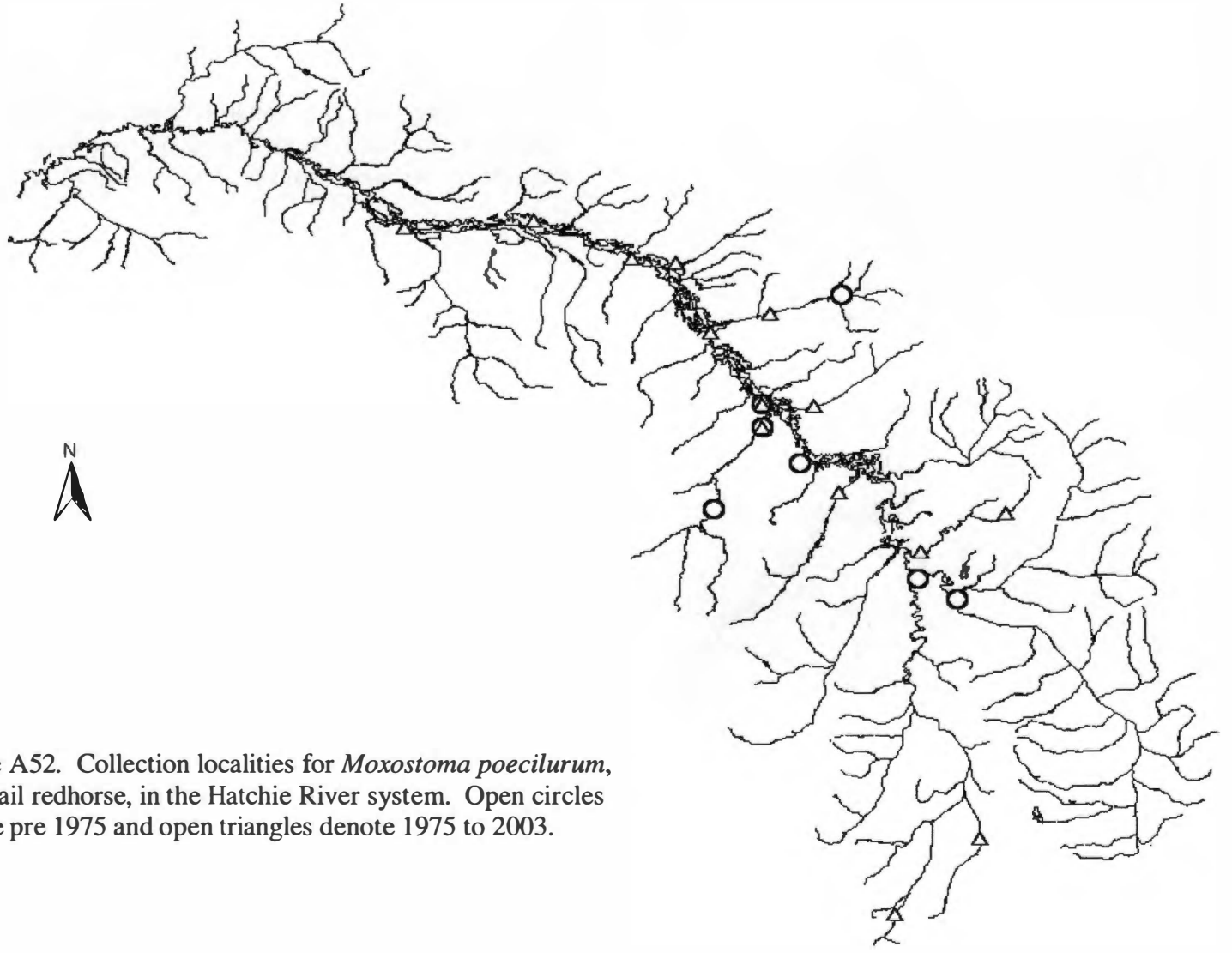

Figure A52. Collection localities for *Moxostoma poecilurum*, blacktail redhorse, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

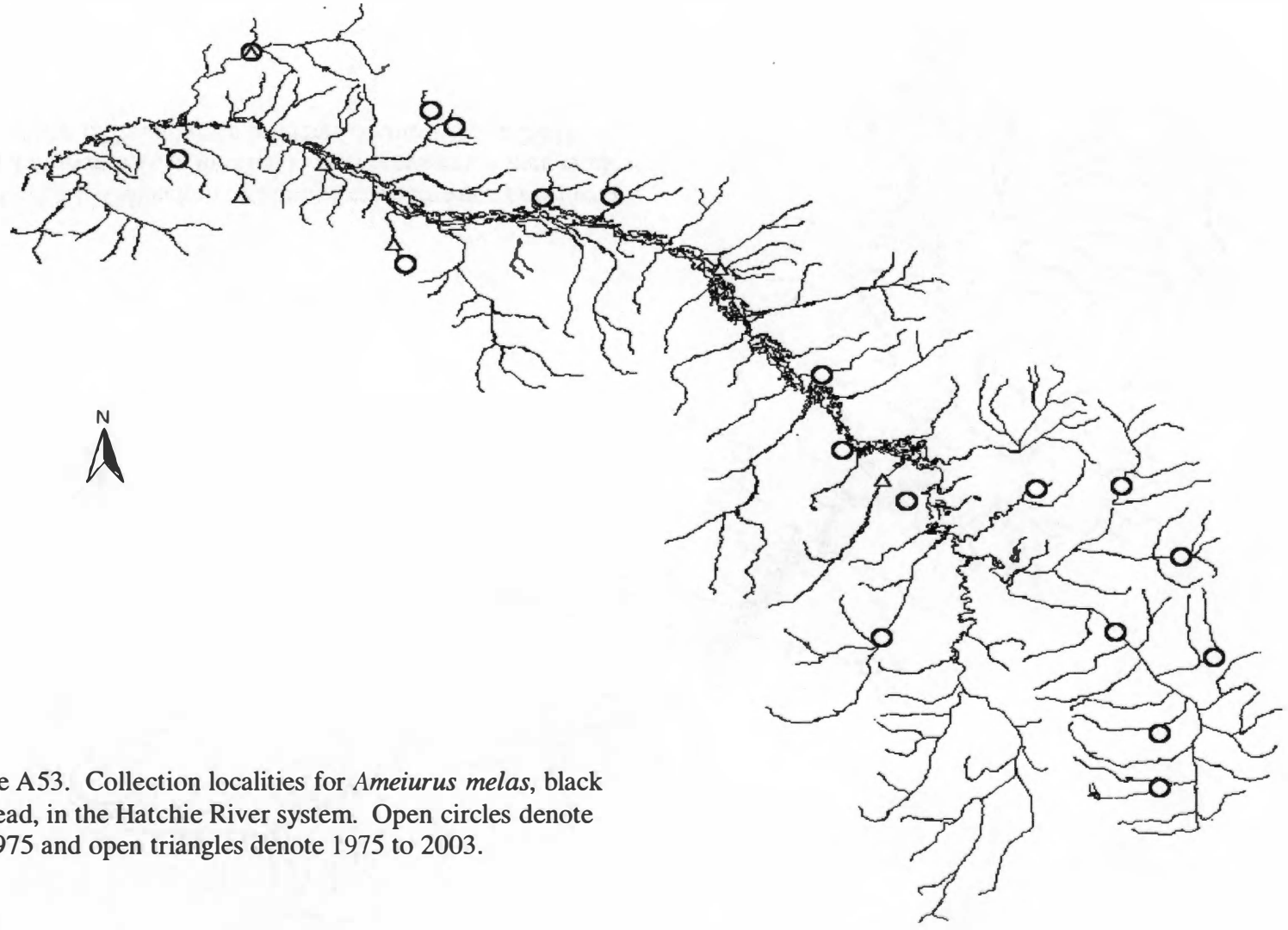

Figure A53. Collection localities for *Ameiurus melas*, black bullhead, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

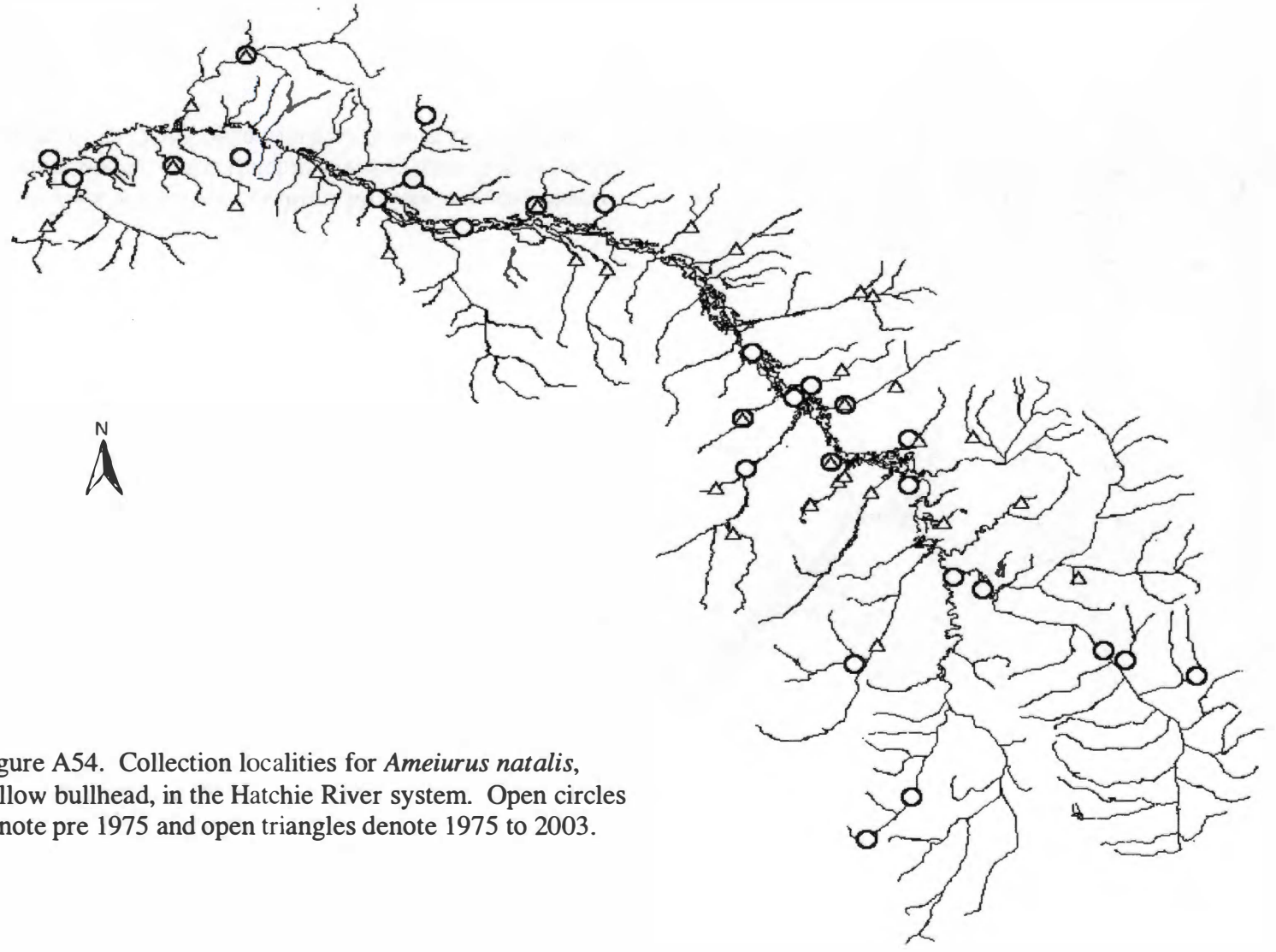

Figure A54. Collection localities for *Ameiurus natalis*, yellow bullhead, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

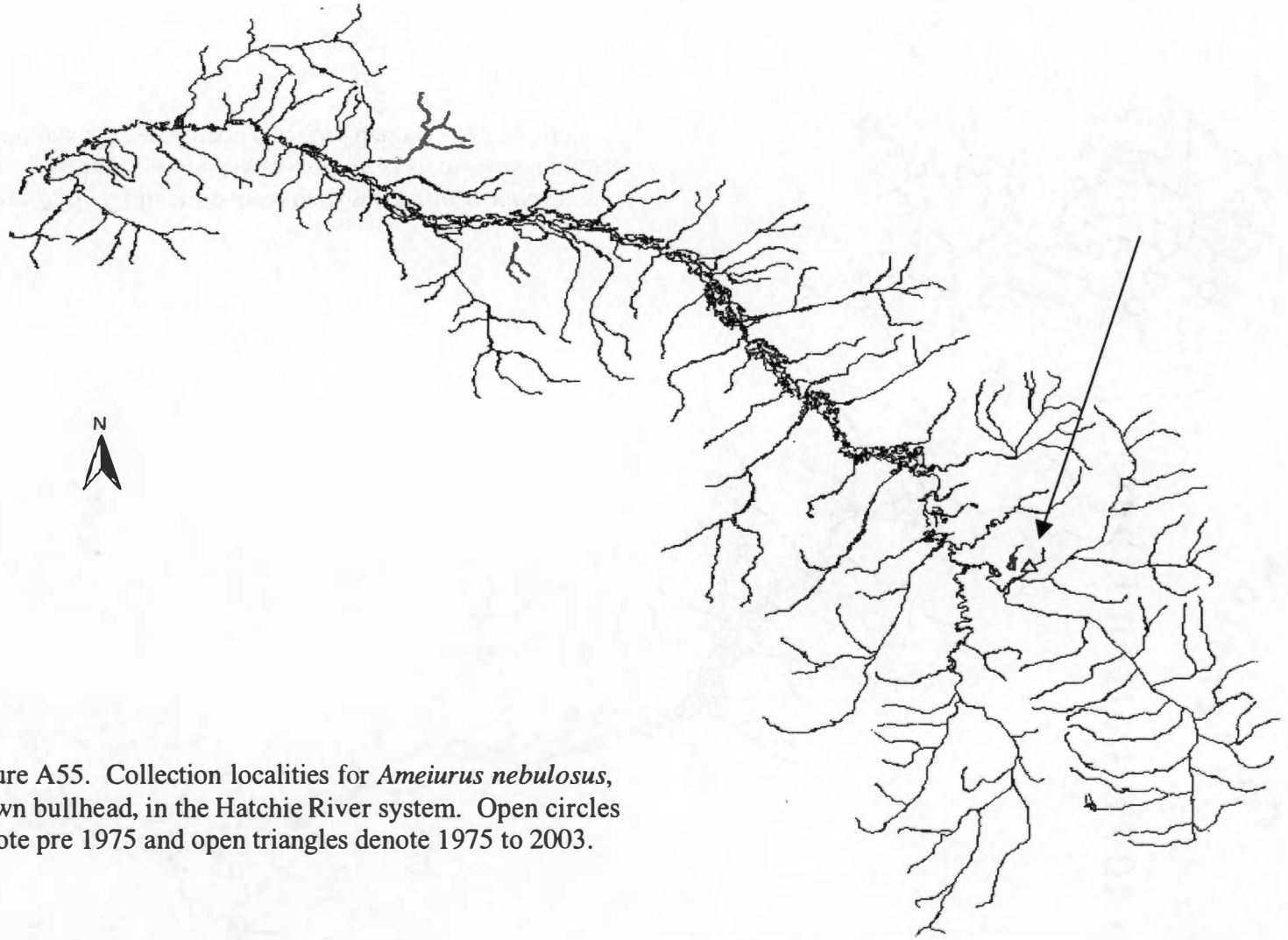

Figure A55. Collection localities for *Ameiurus nebulosus*, brown bullhead, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

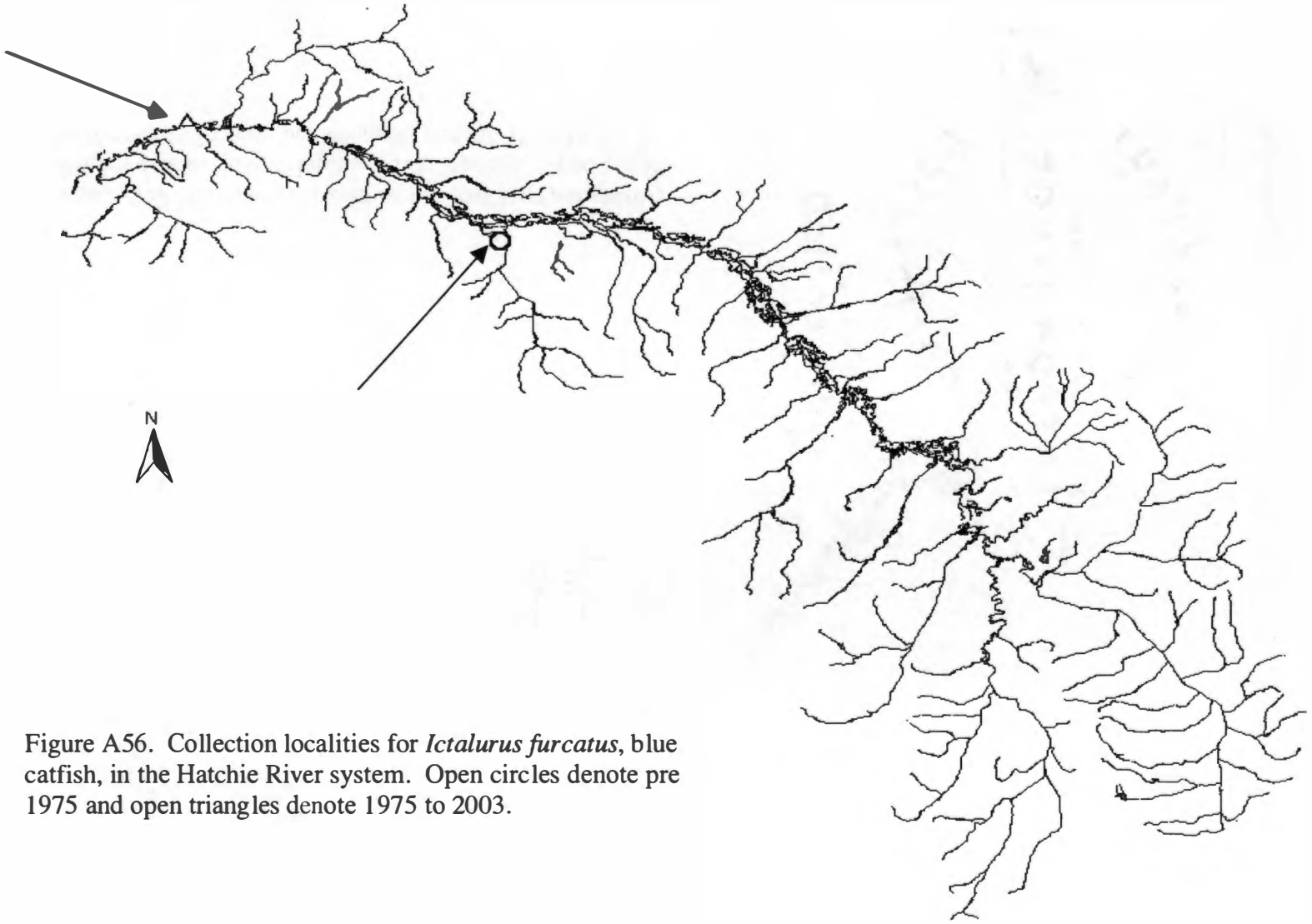

Figure A56. Collection localities for *Ictalurus furcatus*, blue catfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

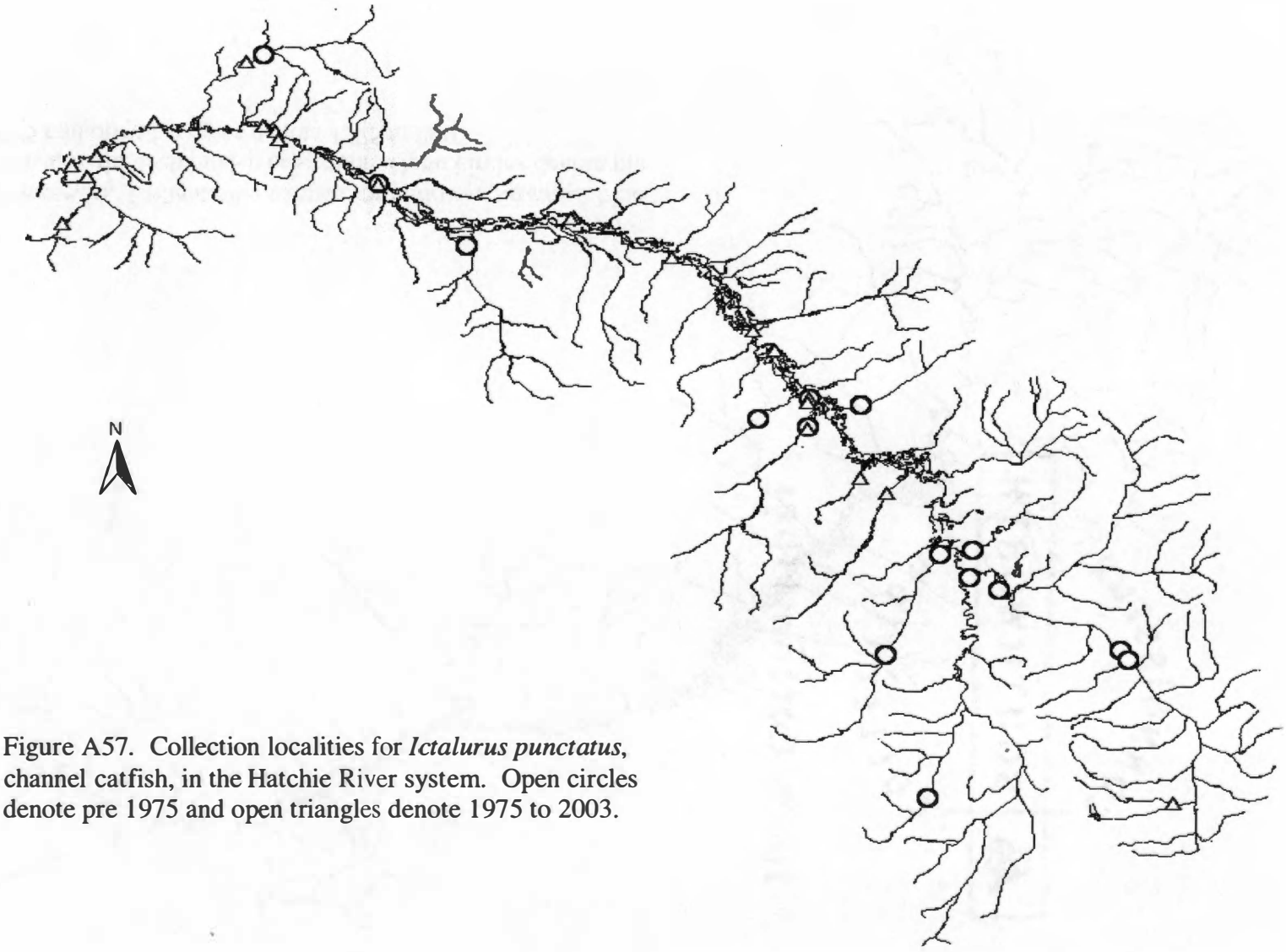

Figure A57. Collection localities for *Ictalurus punctatus*, channel catfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

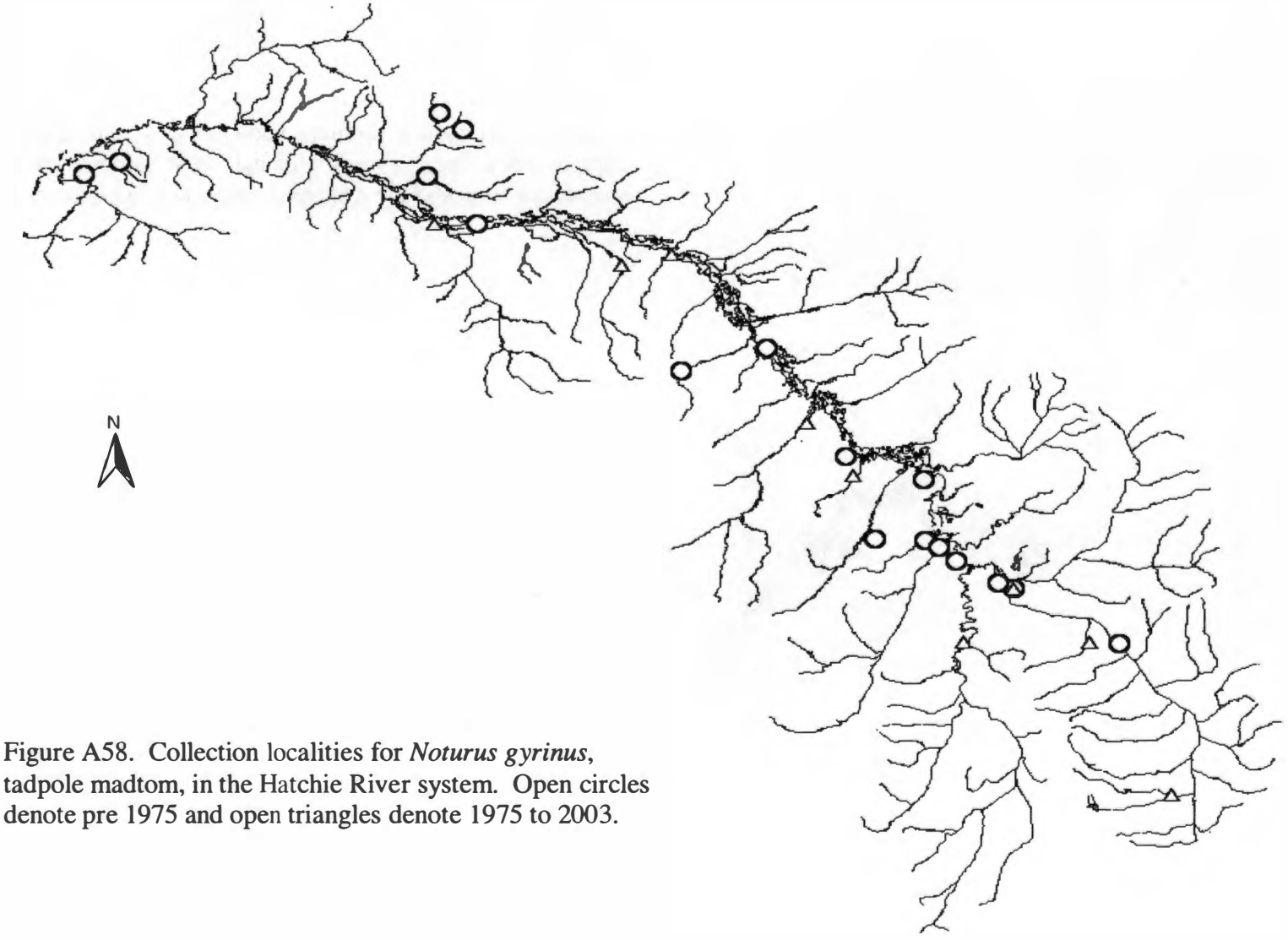

Figure A58. Collection localities for *Noturus gyrinus*, tadpole madtom, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

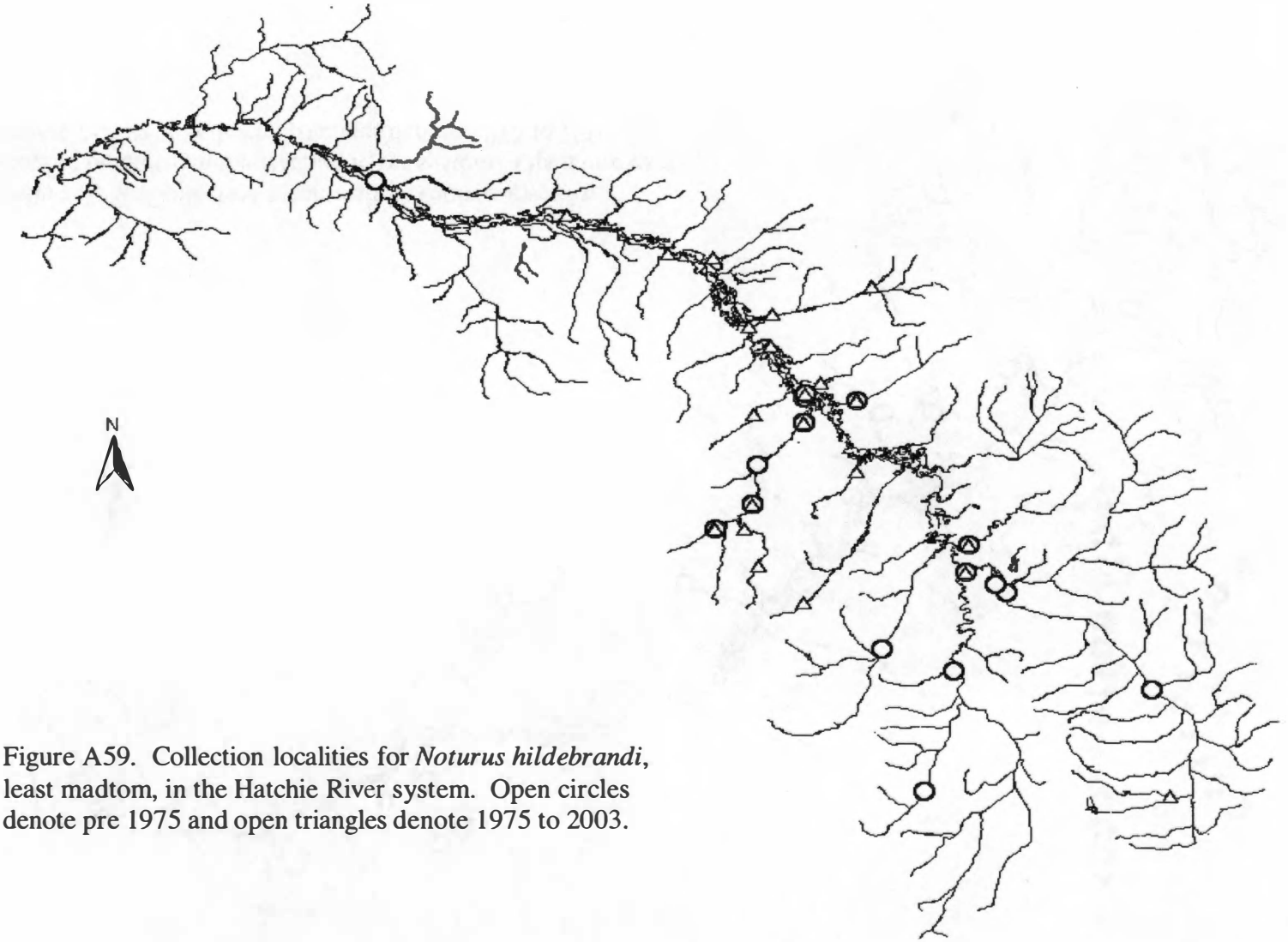

Figure A59. Collection localities for *Noturus hildebrandi*, least madtom, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

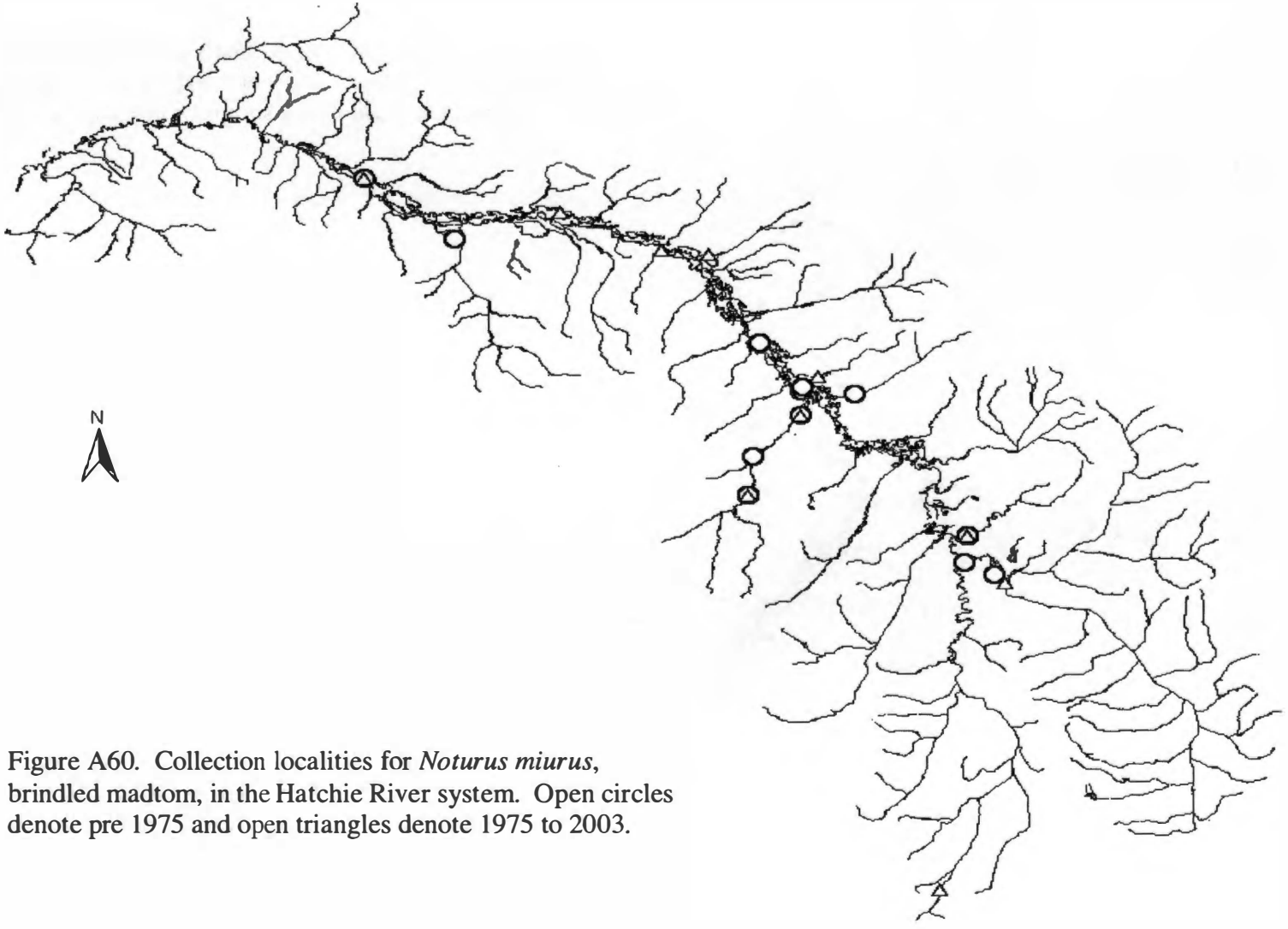

Figure A60. Collection localities for *Noturus miurus*, brindled madtom, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

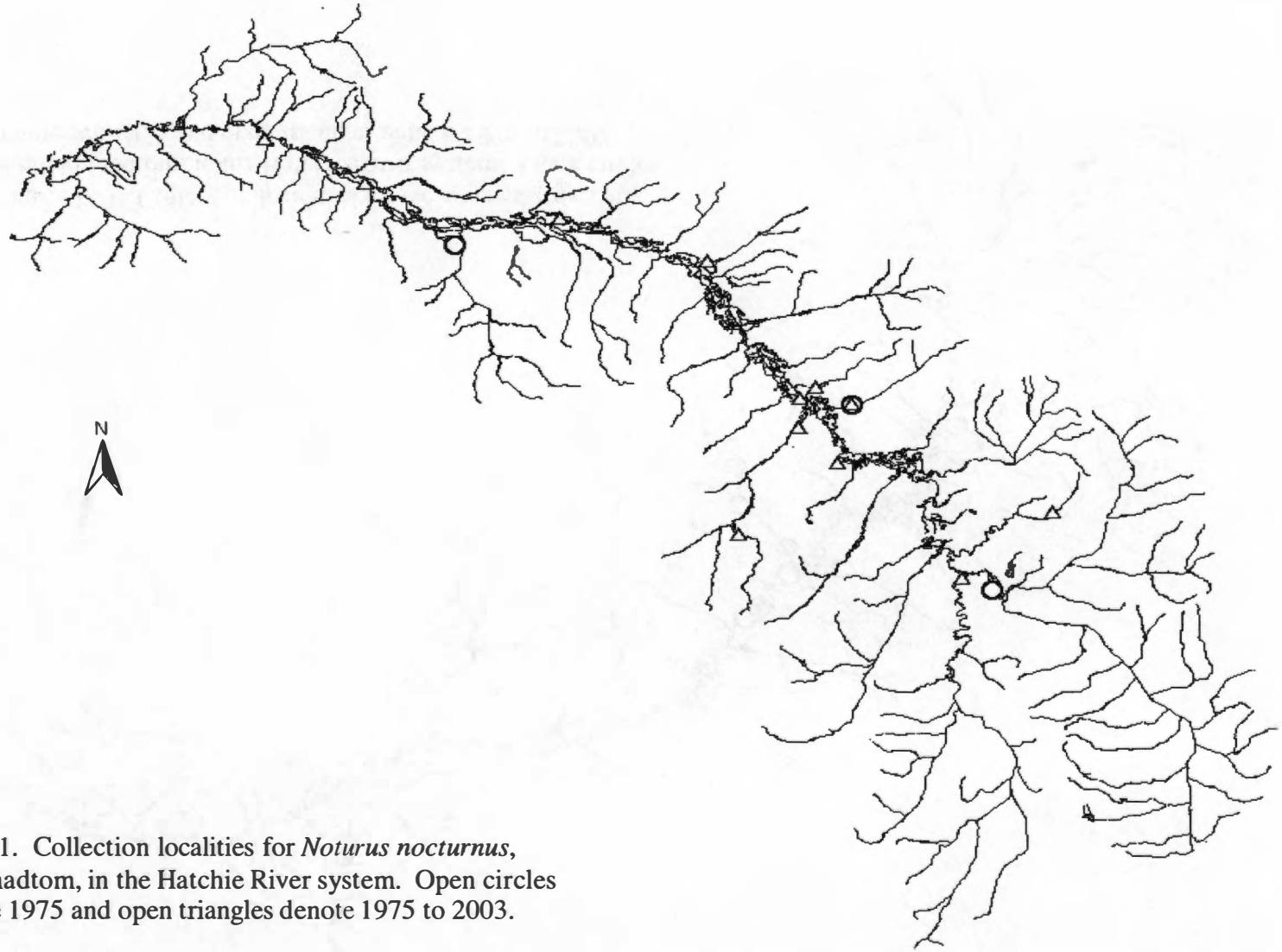

Figure A61. Collection localities for *Noturus nocturnus*, freckled madtom, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

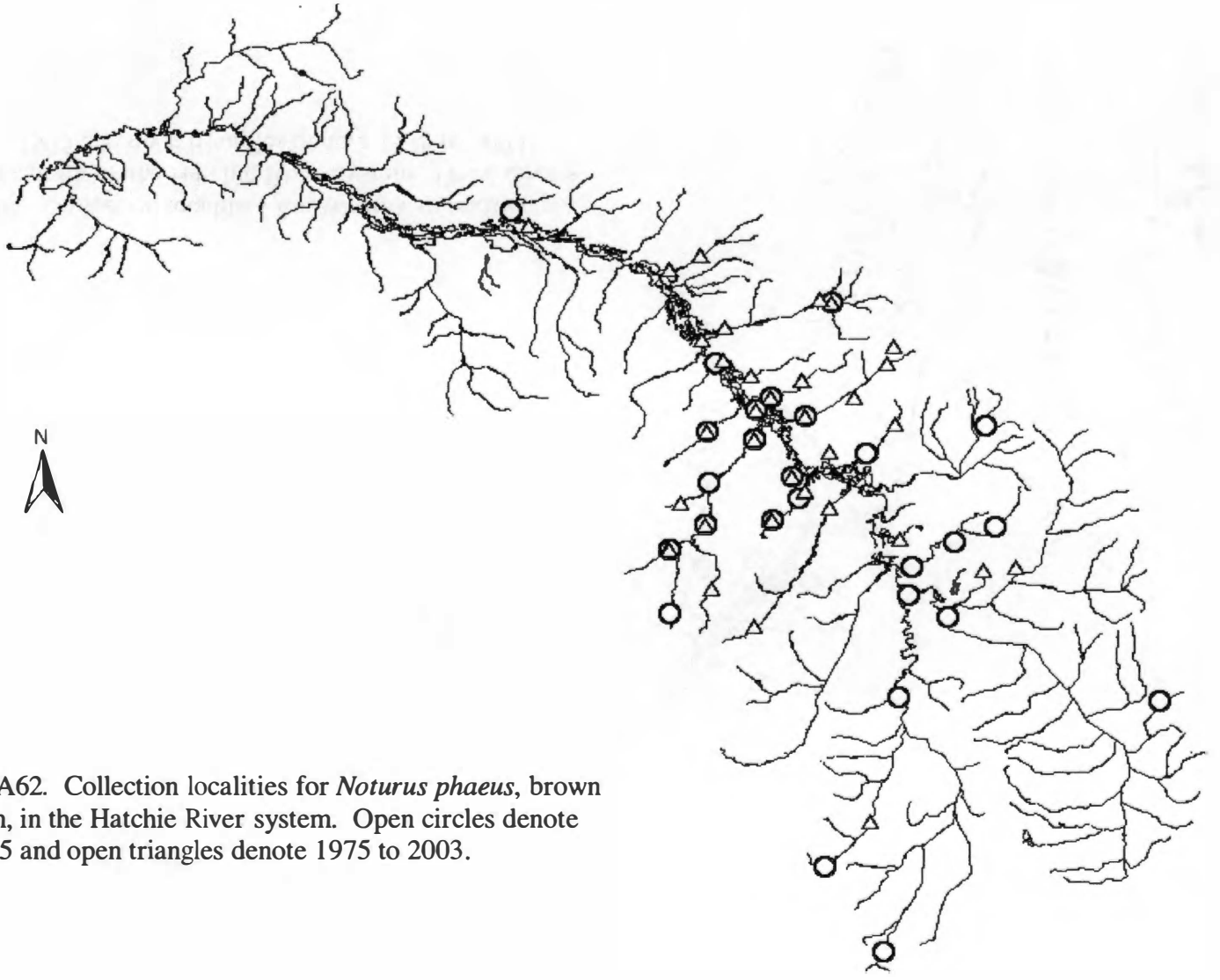

Figure A62. Collection localities for *Noturus phaeus*, brown madtom, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

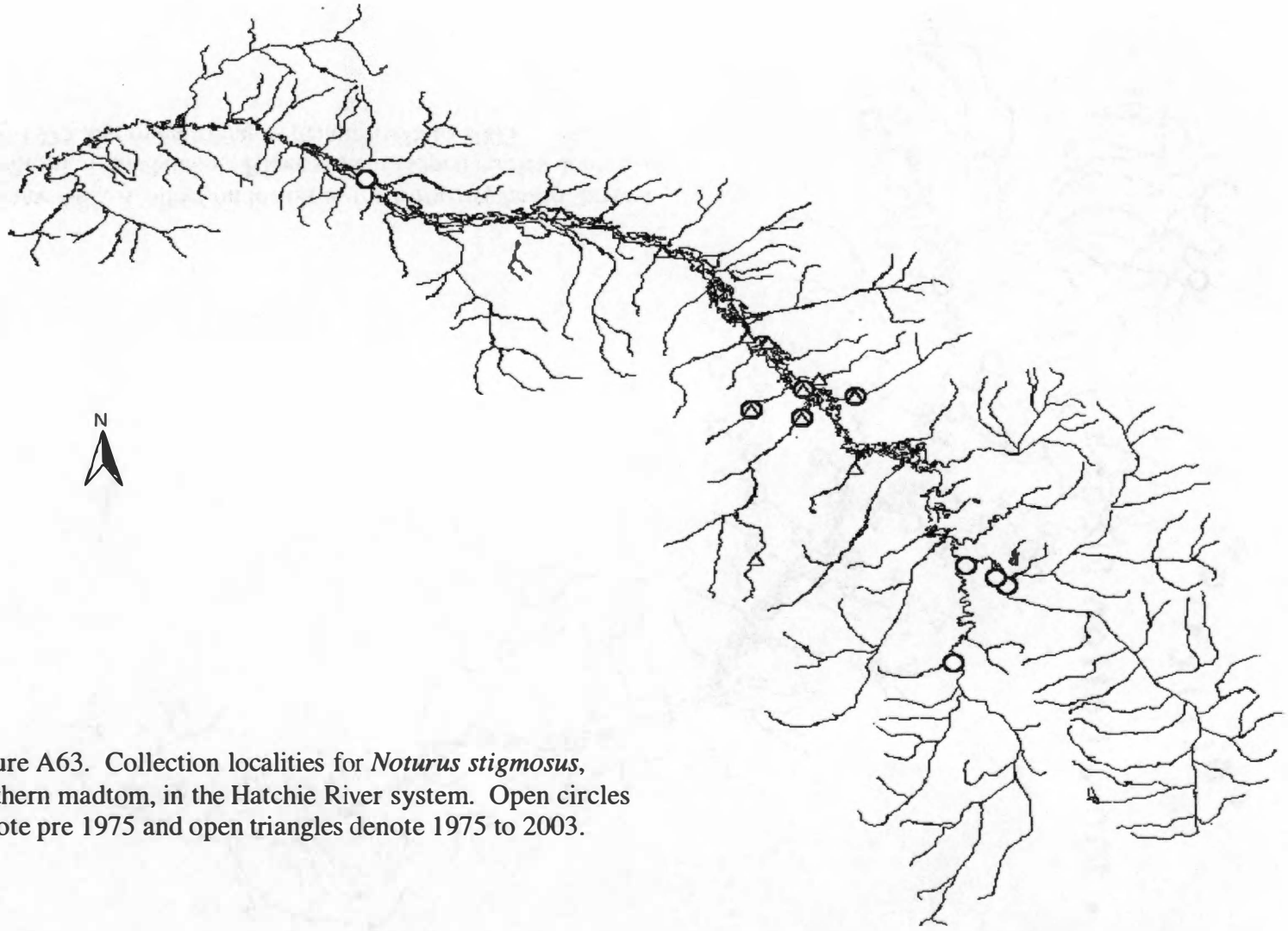

Figure A63. Collection localities for *Noturus stigmosus*, northern madtom, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

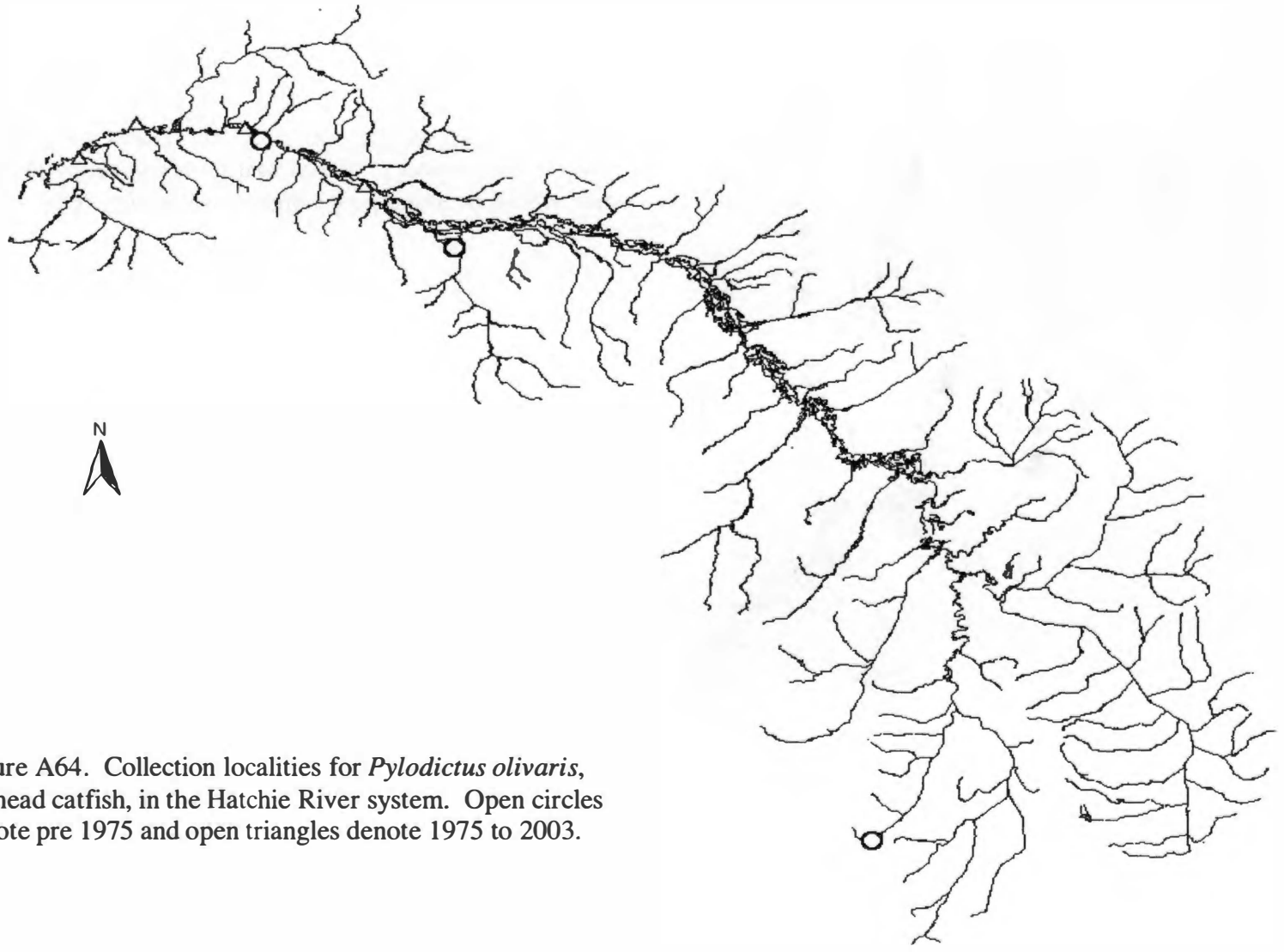

Figure A64. Collection localities for *Pylodictus olivaris*, flathead catfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

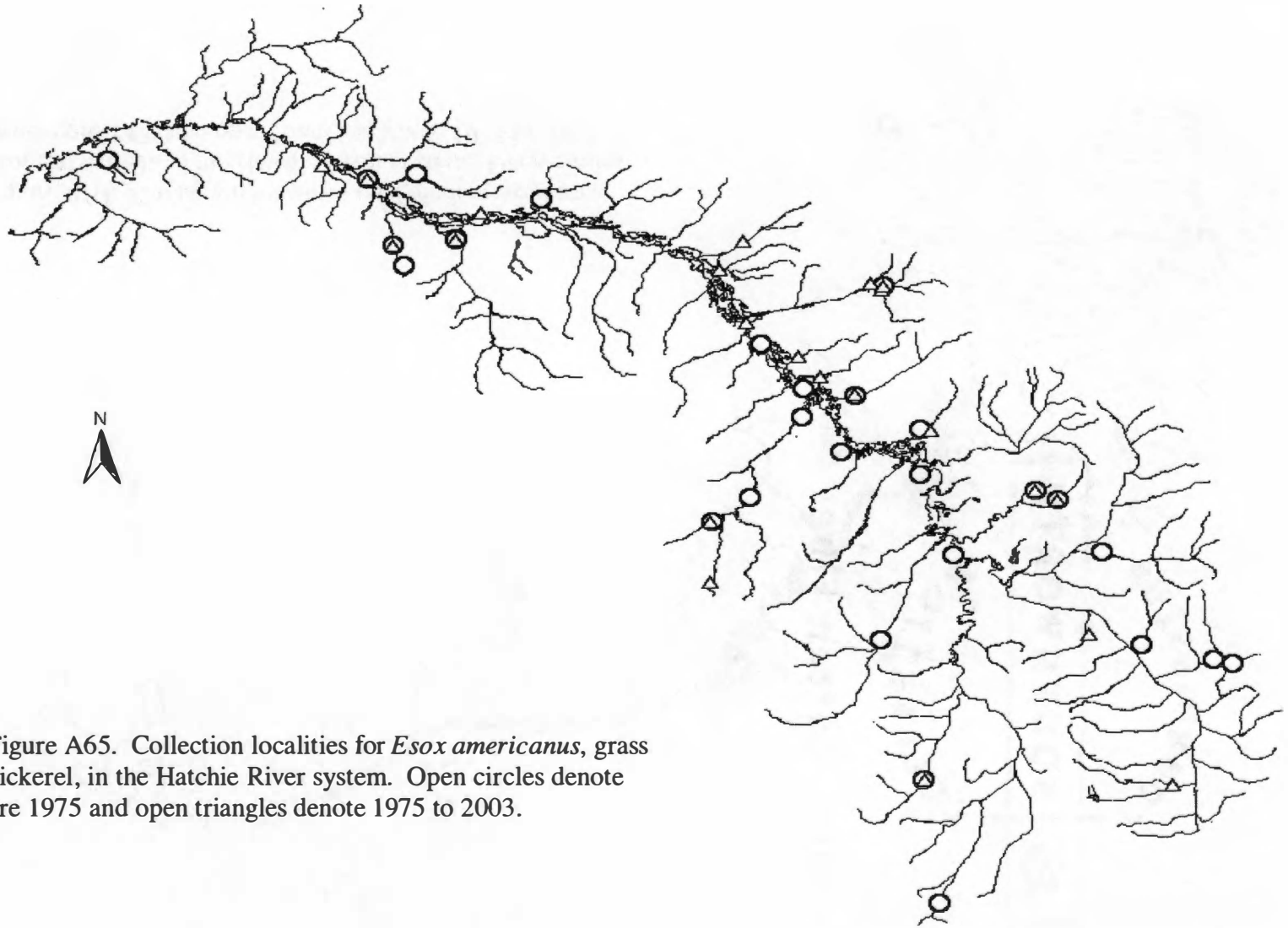

Figure A65. Collection localities for *Esox americanus*, grass pickerel, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

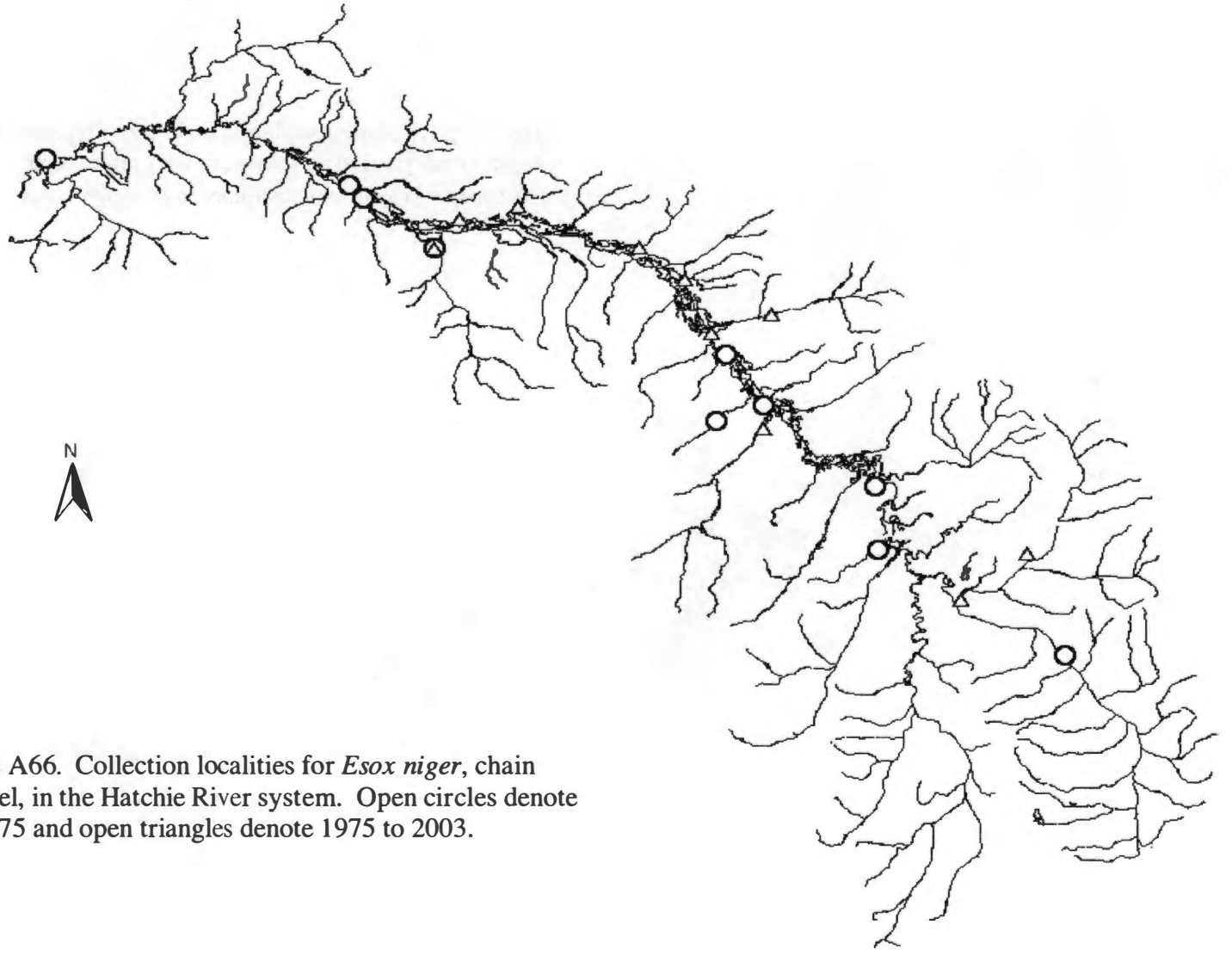

Figure A66. Collection localities for *Esox niger*, chain pickerel, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

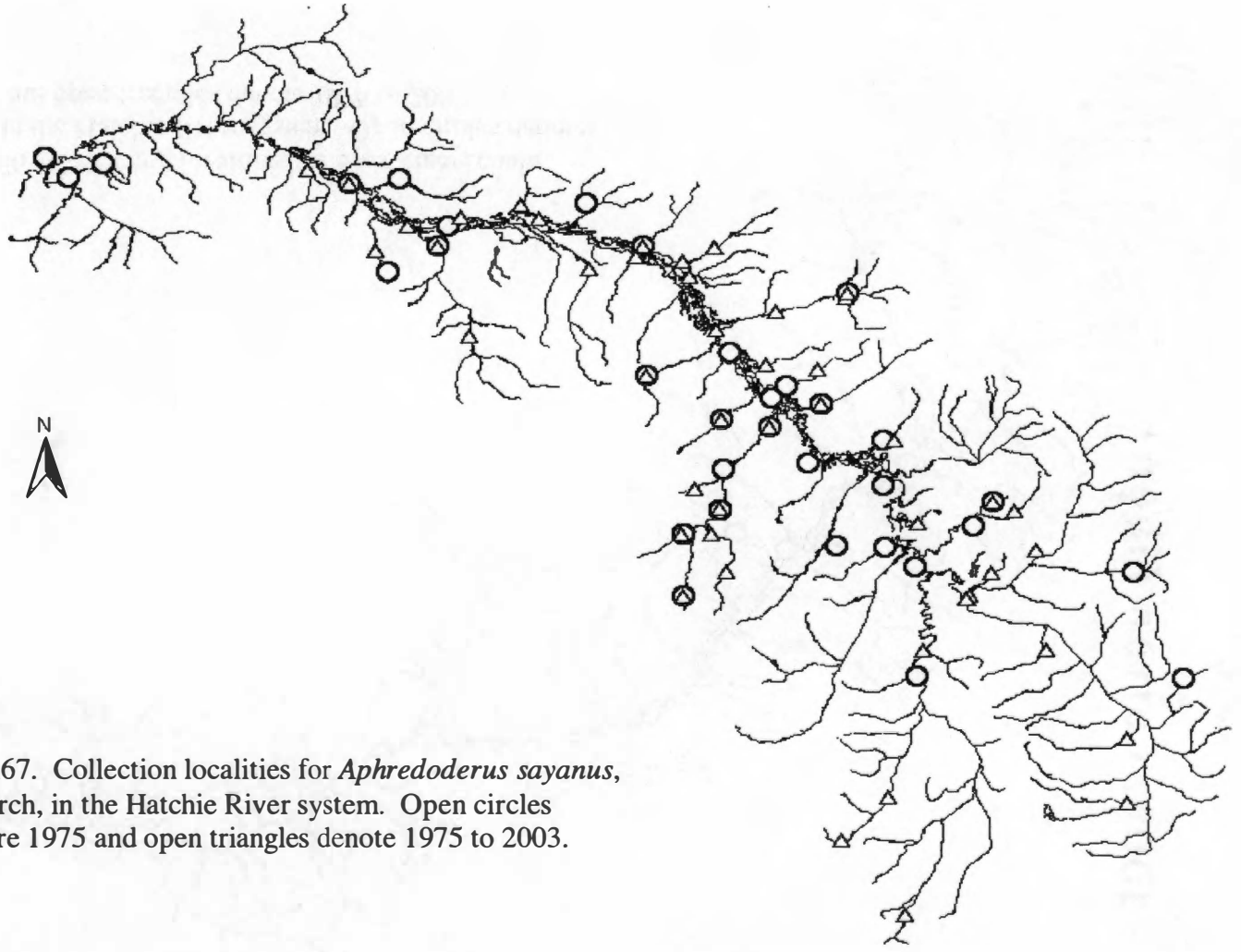

Figure A67. Collection localities for *Aphredoderus sayanus*, pirate perch, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

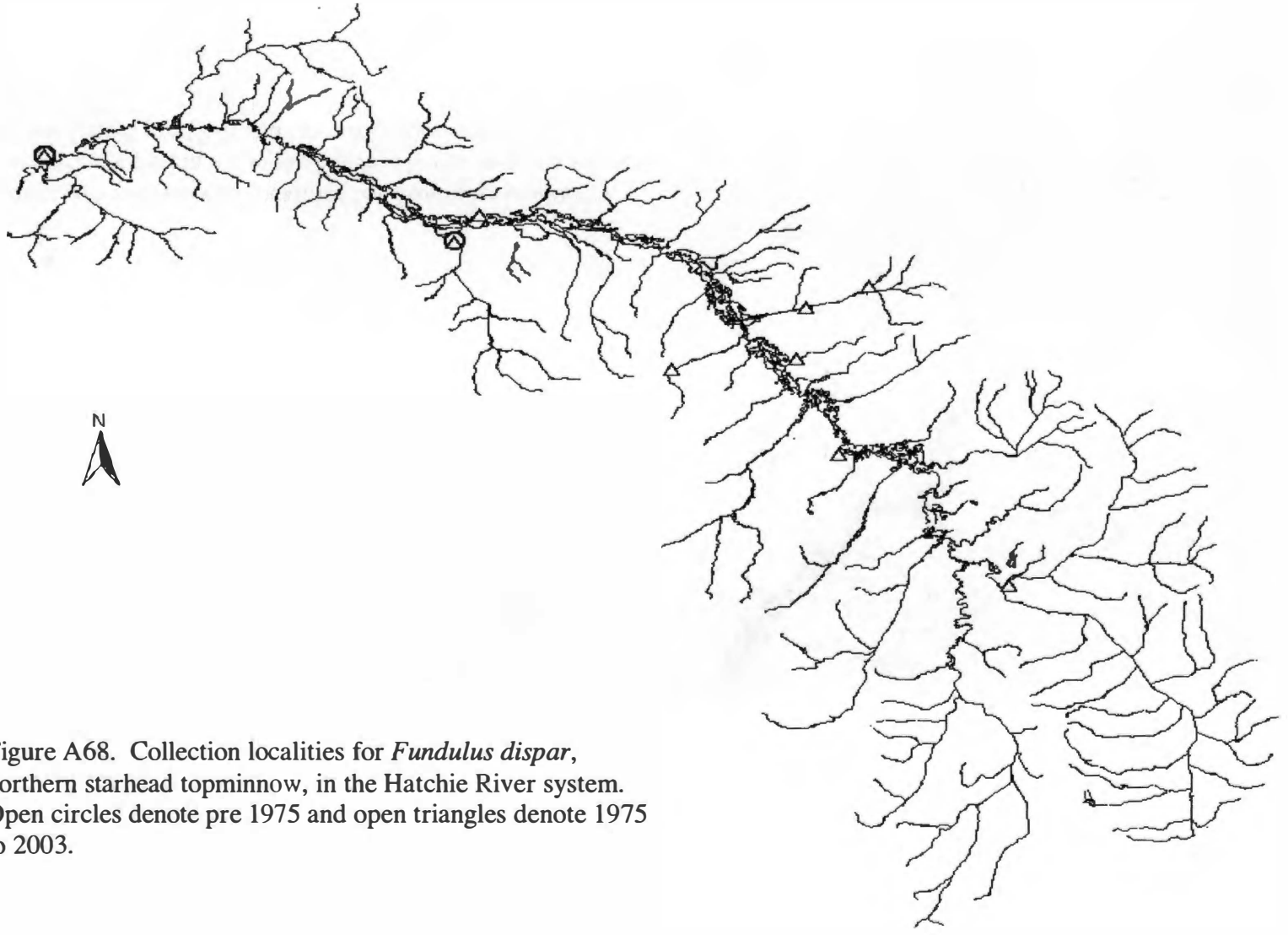

Figure A68. Collection localities for *Fundulus dispar*, northern starhead topminnow, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

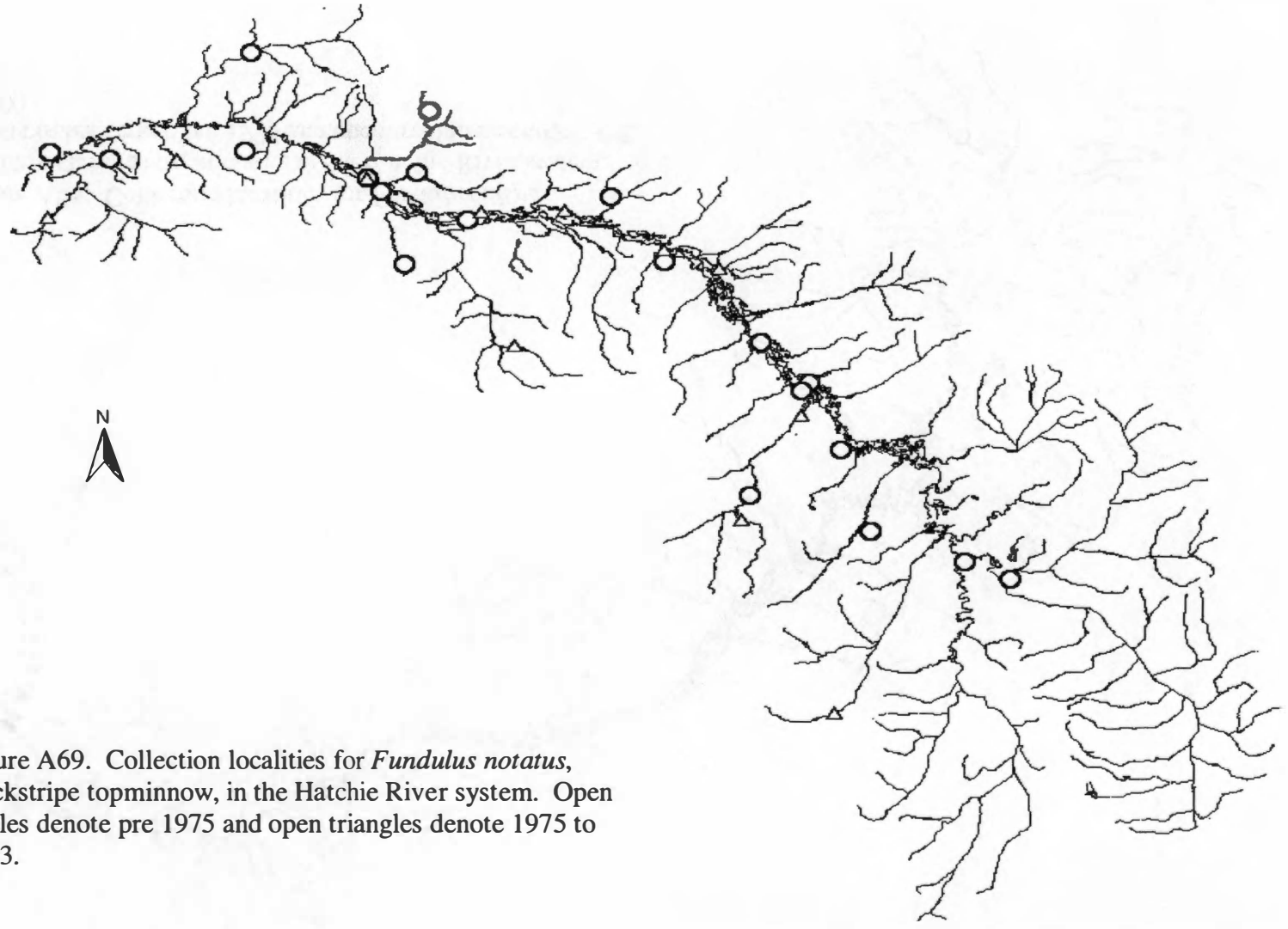

Figure A69. Collection localities for *Fundulus notatus*, blackstripe topminnow, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

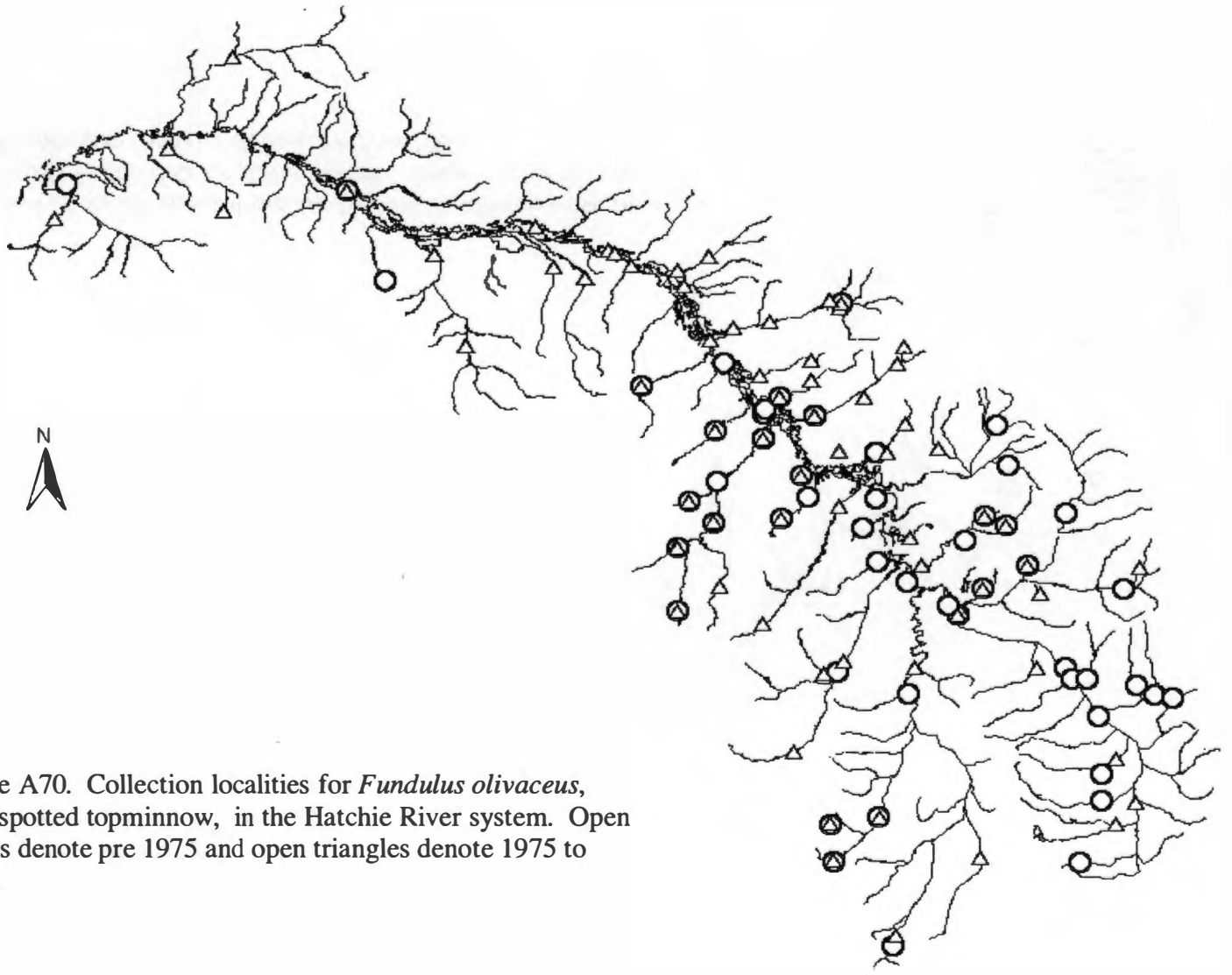

Figure A70. Collection localities for *Fundulus olivaceus*, blackspotted topminnow, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

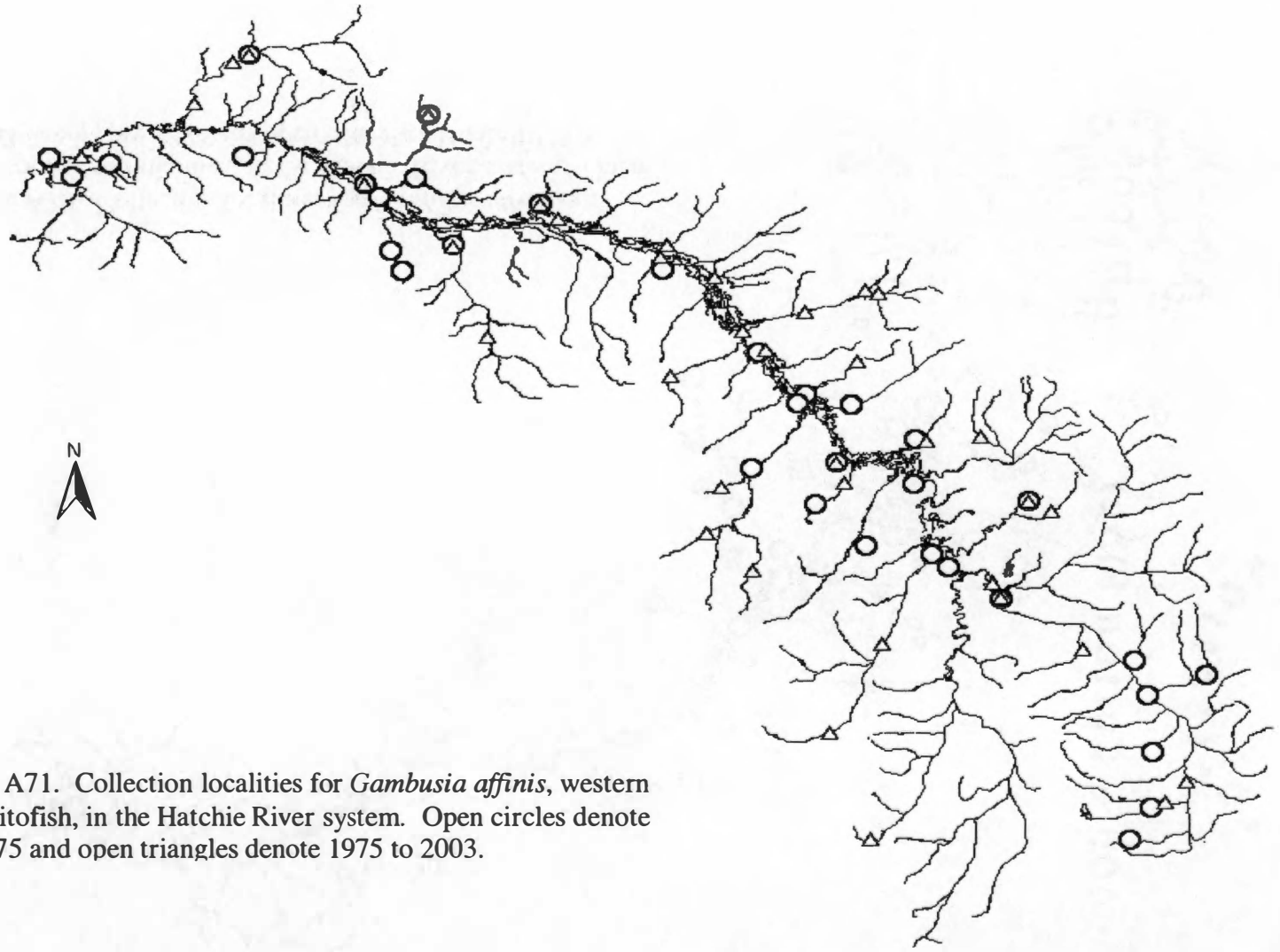

Figure A71. Collection localities for *Gambusia affinis*, western mosquitofish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

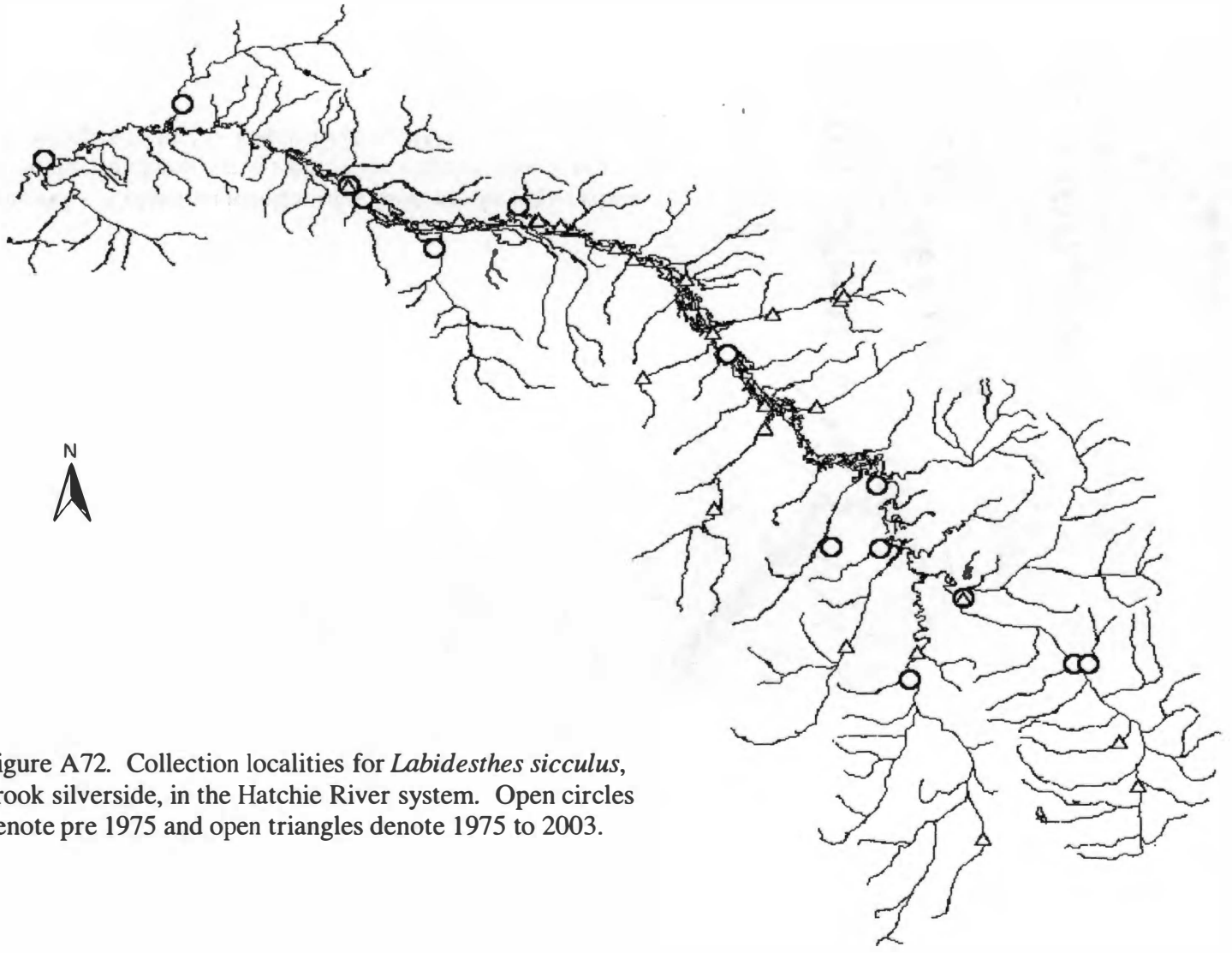

Figure A72. Collection localities for *Labidesthes sicculus*, brook silverside, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

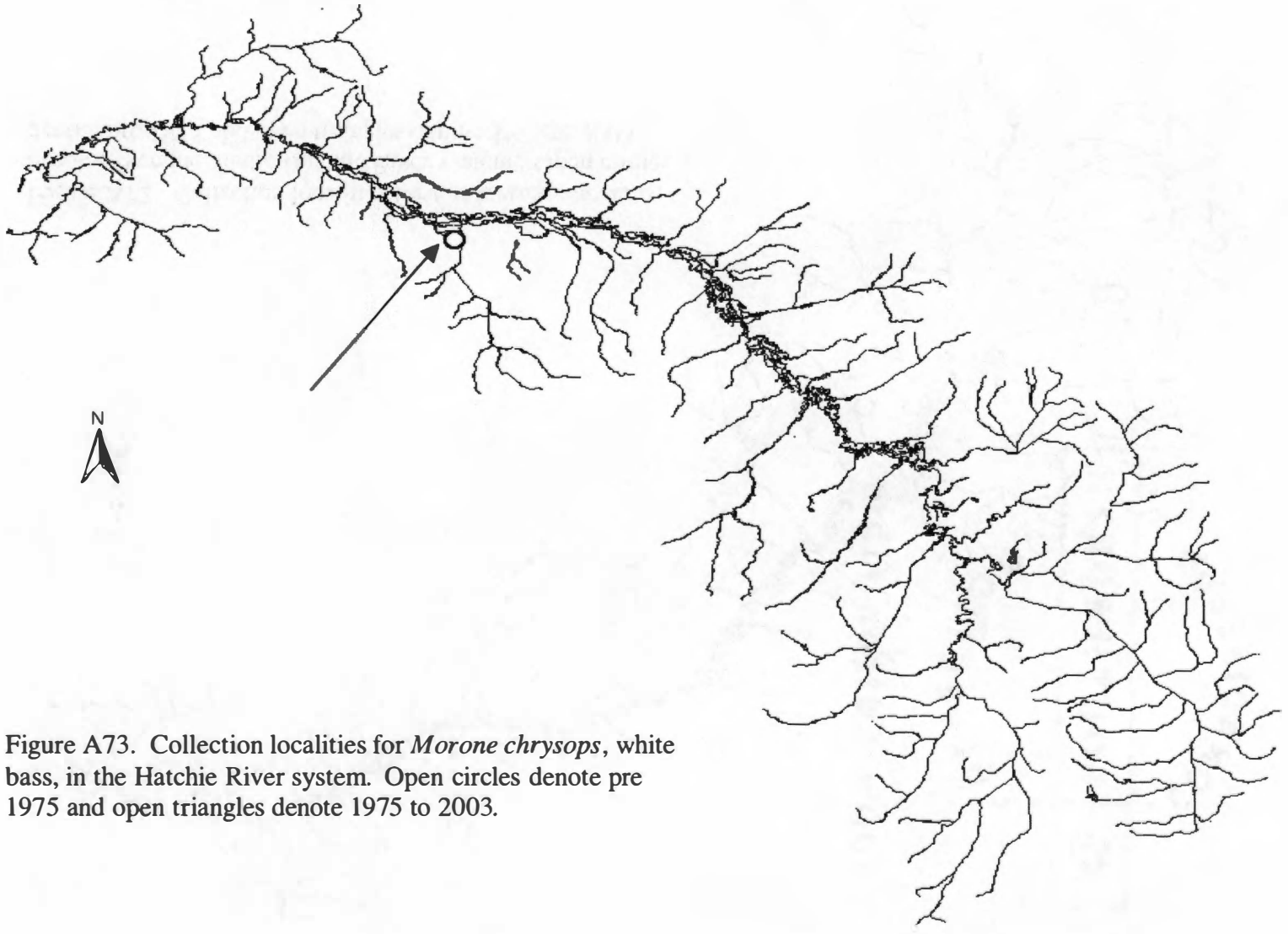

Figure A73. Collection localities for *Morone chrysops*, white bass, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

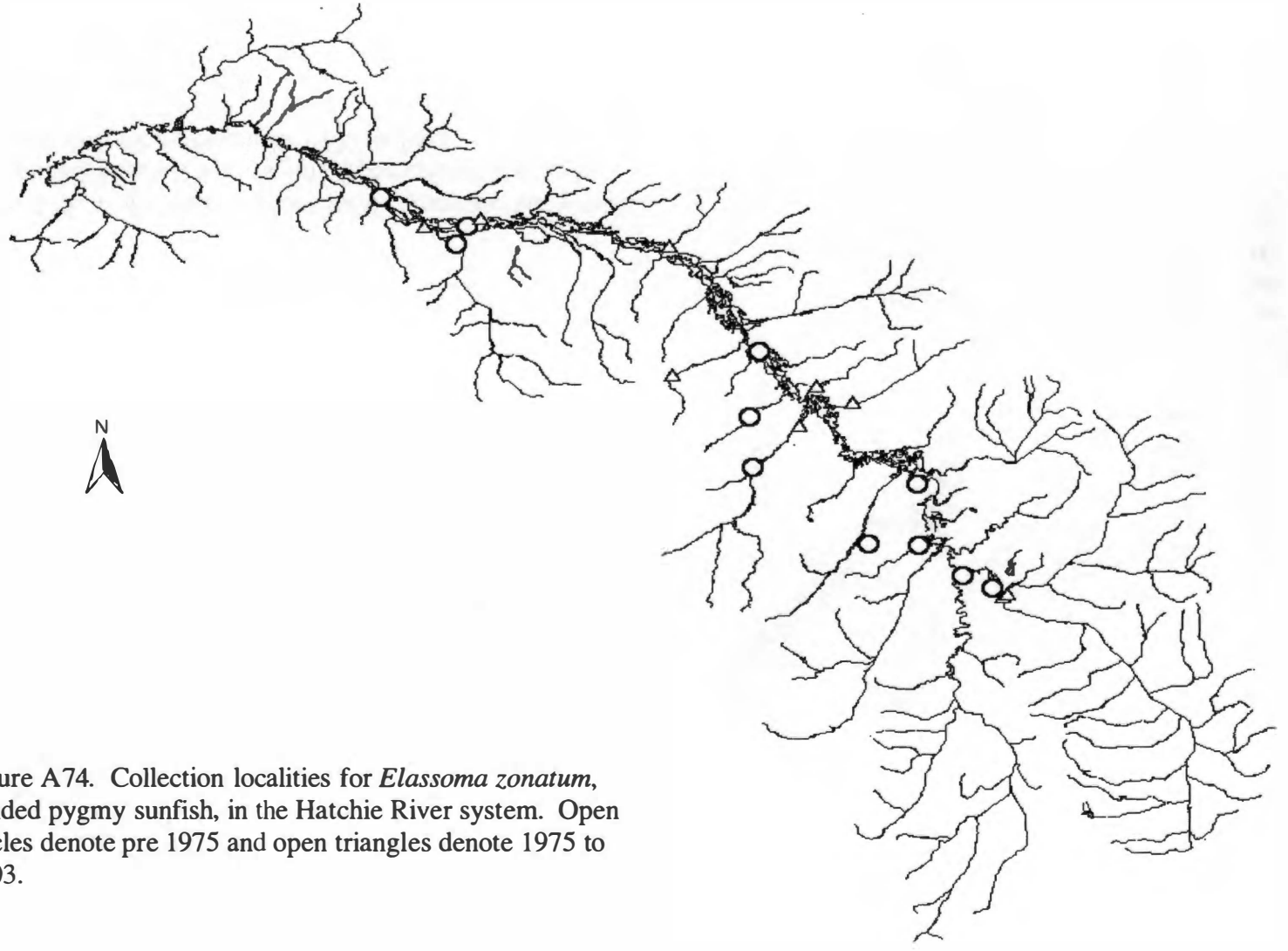

Figure A74. Collection localities for *Elassoma zonatum*, banded pygmy sunfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

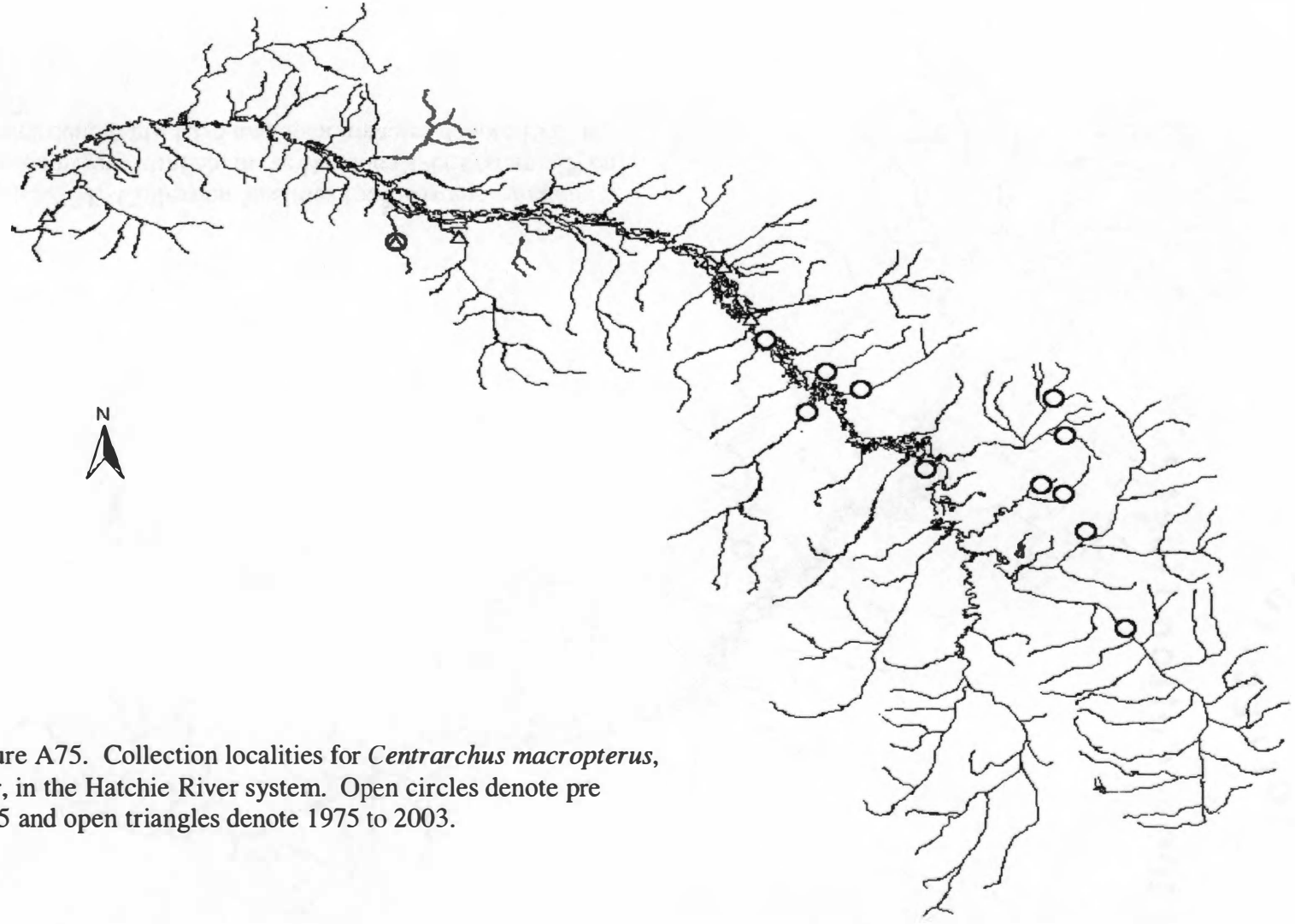

Figure A75. Collection localities for *Centrarchus macropterus*, flier, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

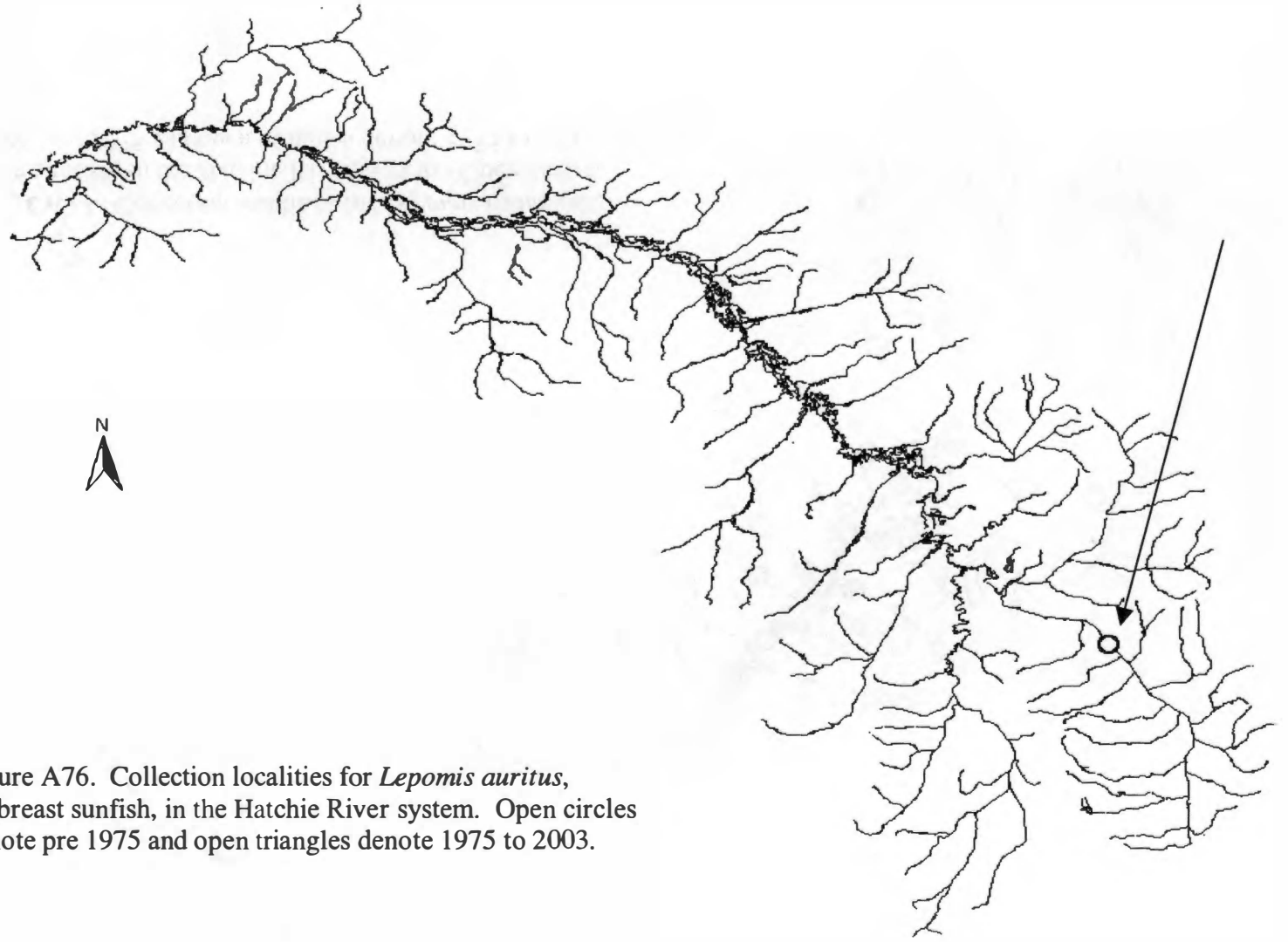

Figure A76. Collection localities for *Lepomis auritus*, redbreast sunfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

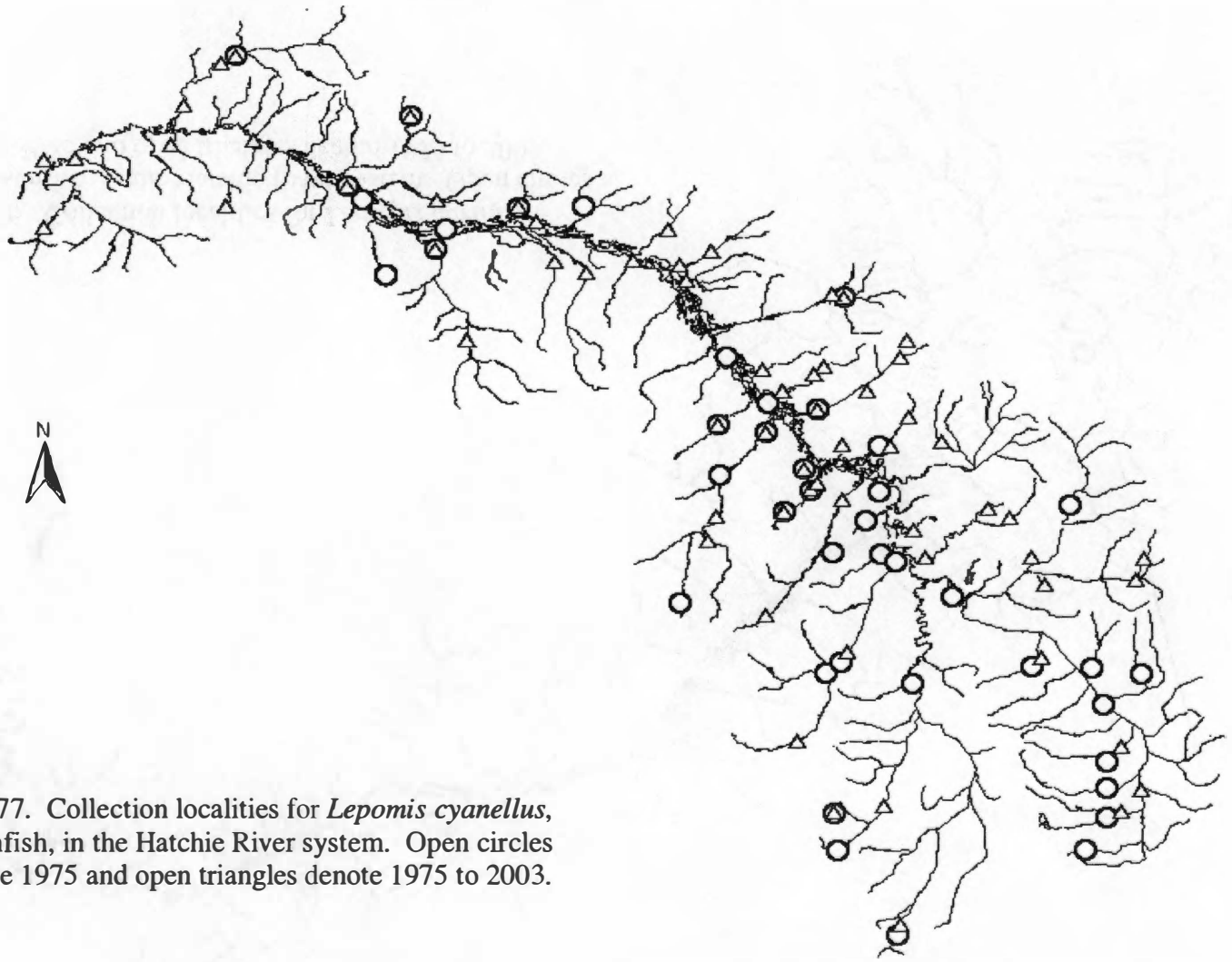

Figure A77. Collection localities for *Lepomis cyanellus*, green sunfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

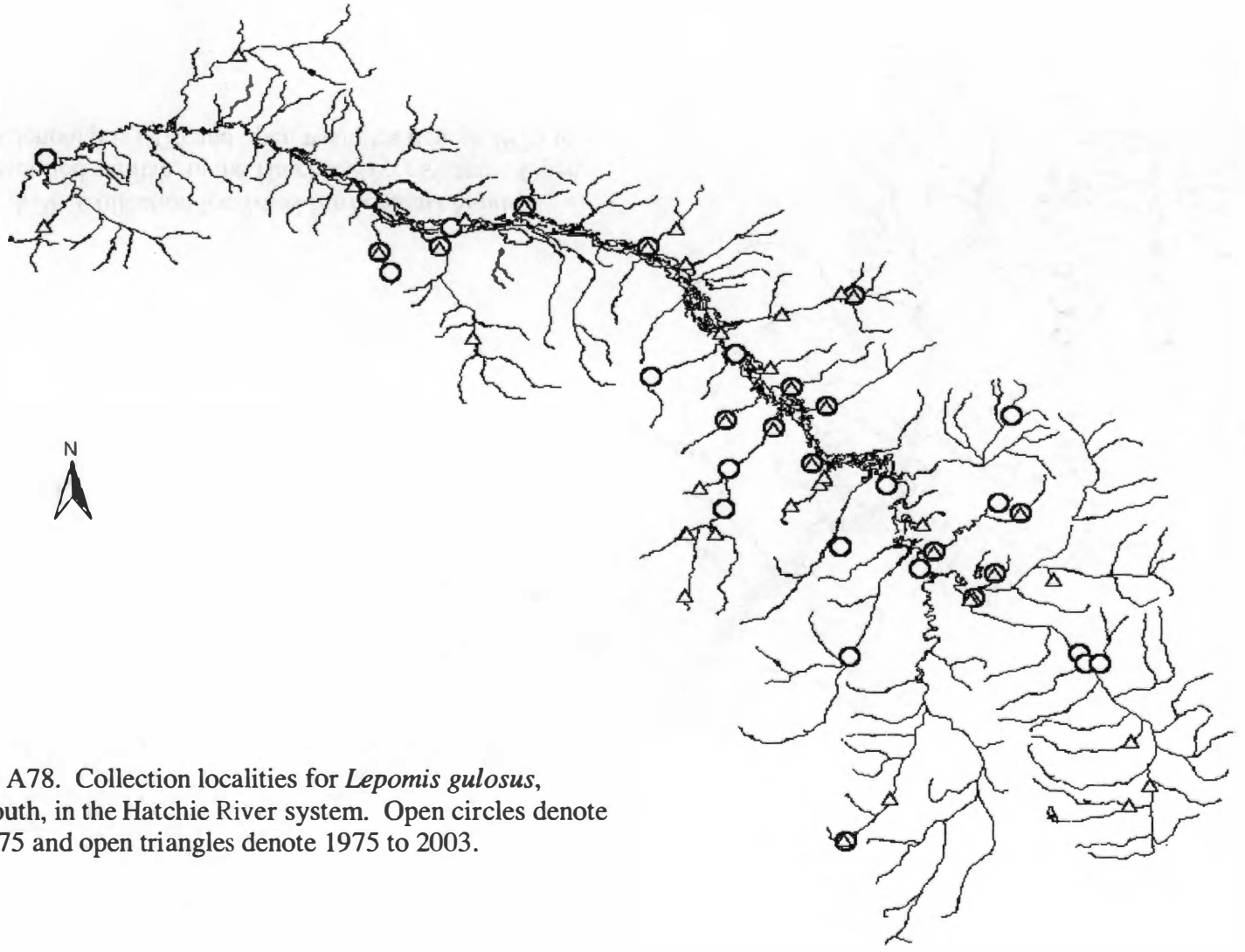

Figure A78. Collection localities for *Lepomis gulosus*, warmouth, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

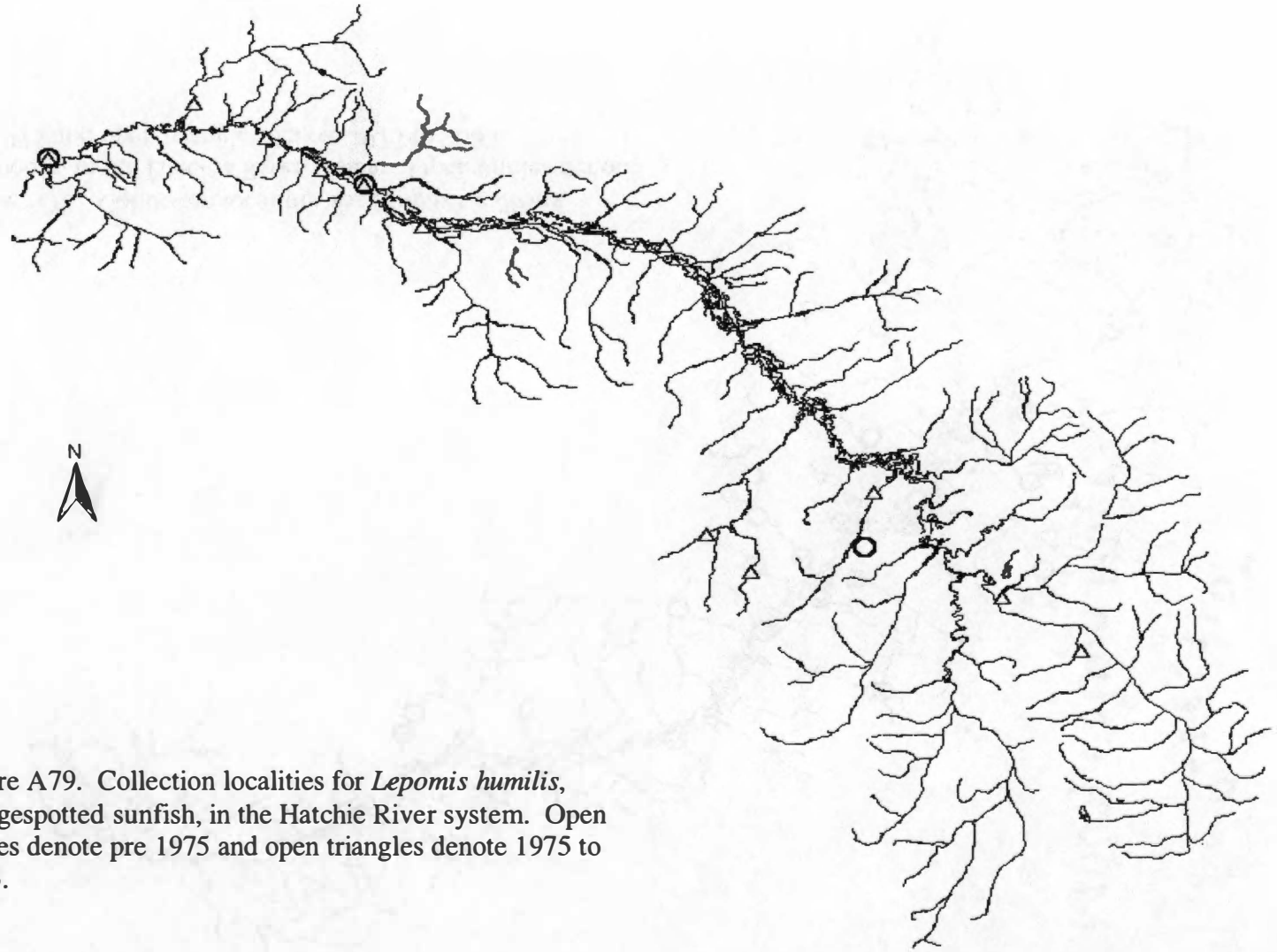

Figure A79. Collection localities for *Lepomis humilis*, orangespotted sunfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

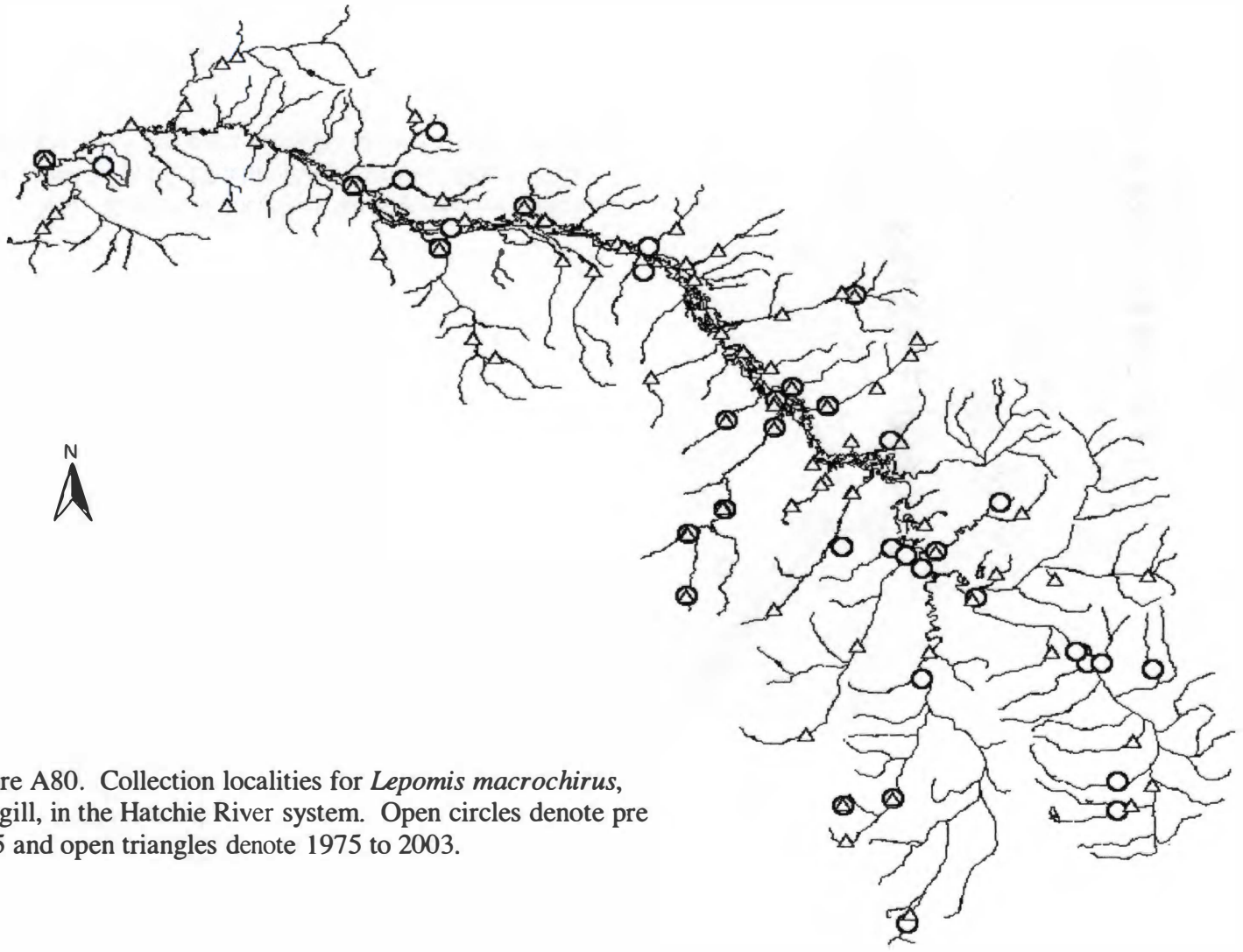

Figure A80. Collection localities for *Lepomis macrochirus*, bluegill, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

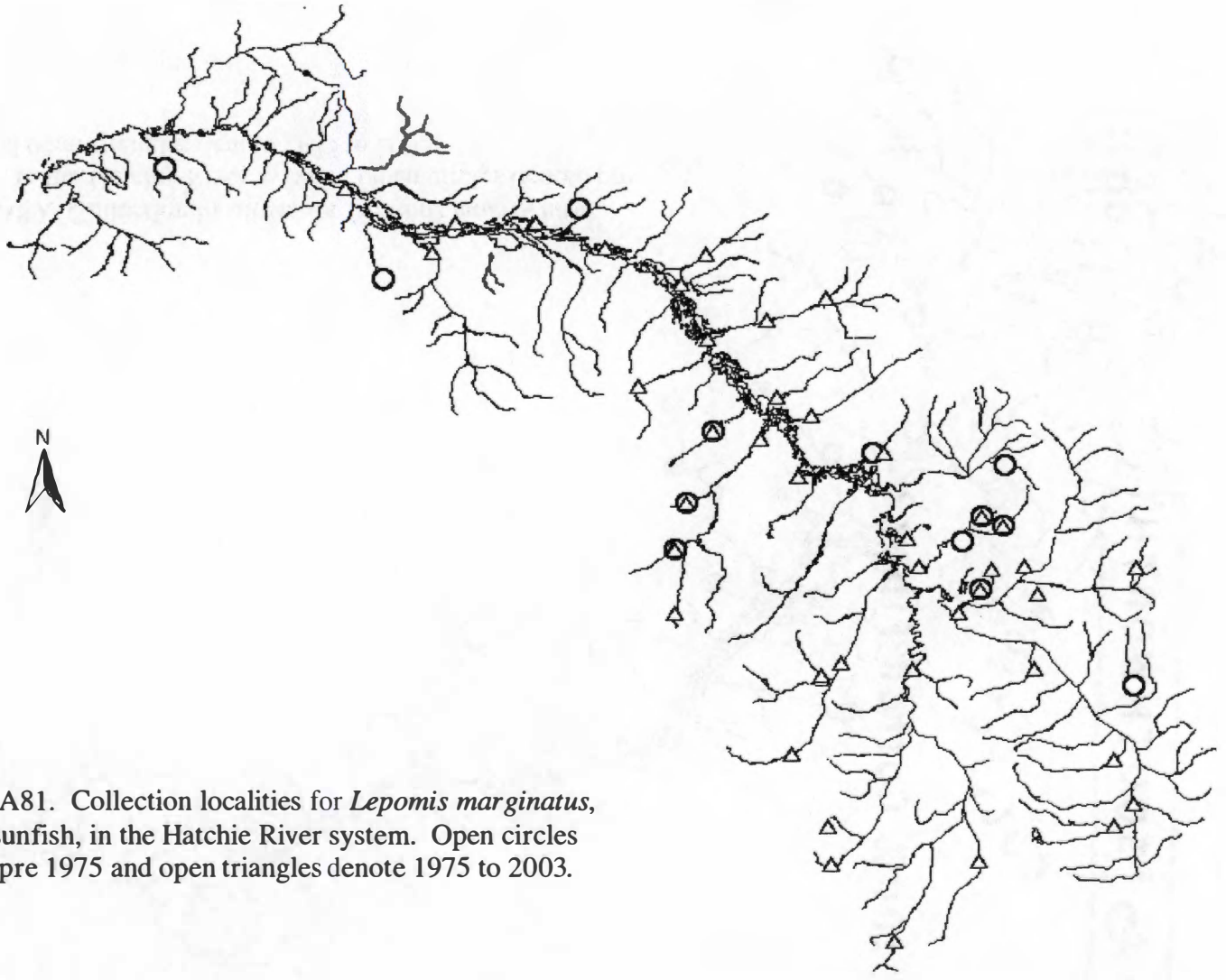

Figure A81. Collection localities for *Lepomis marginatus*, dollar sunfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

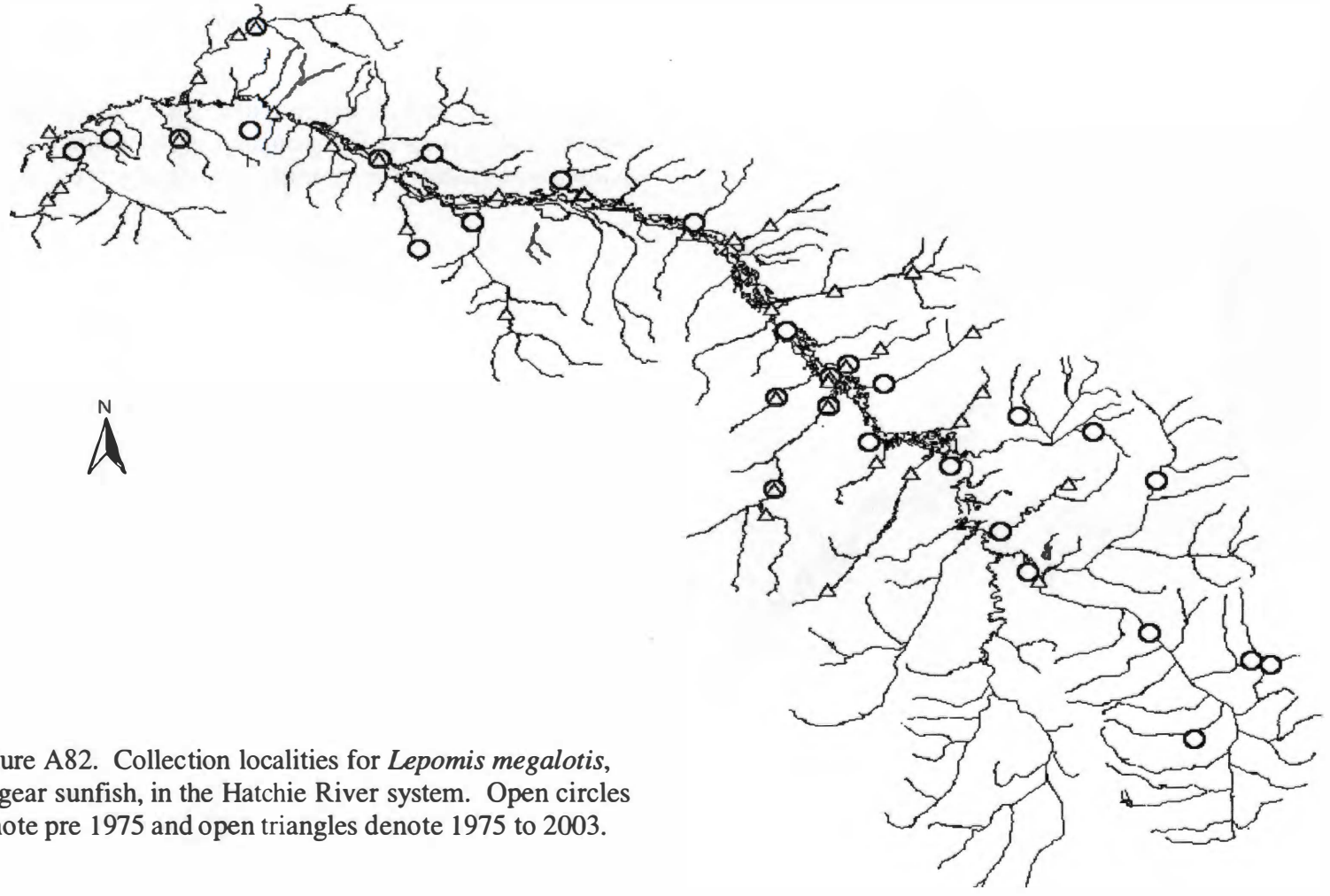

Figure A82. Collection localities for *Lepomis megalotis*, longear sunfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

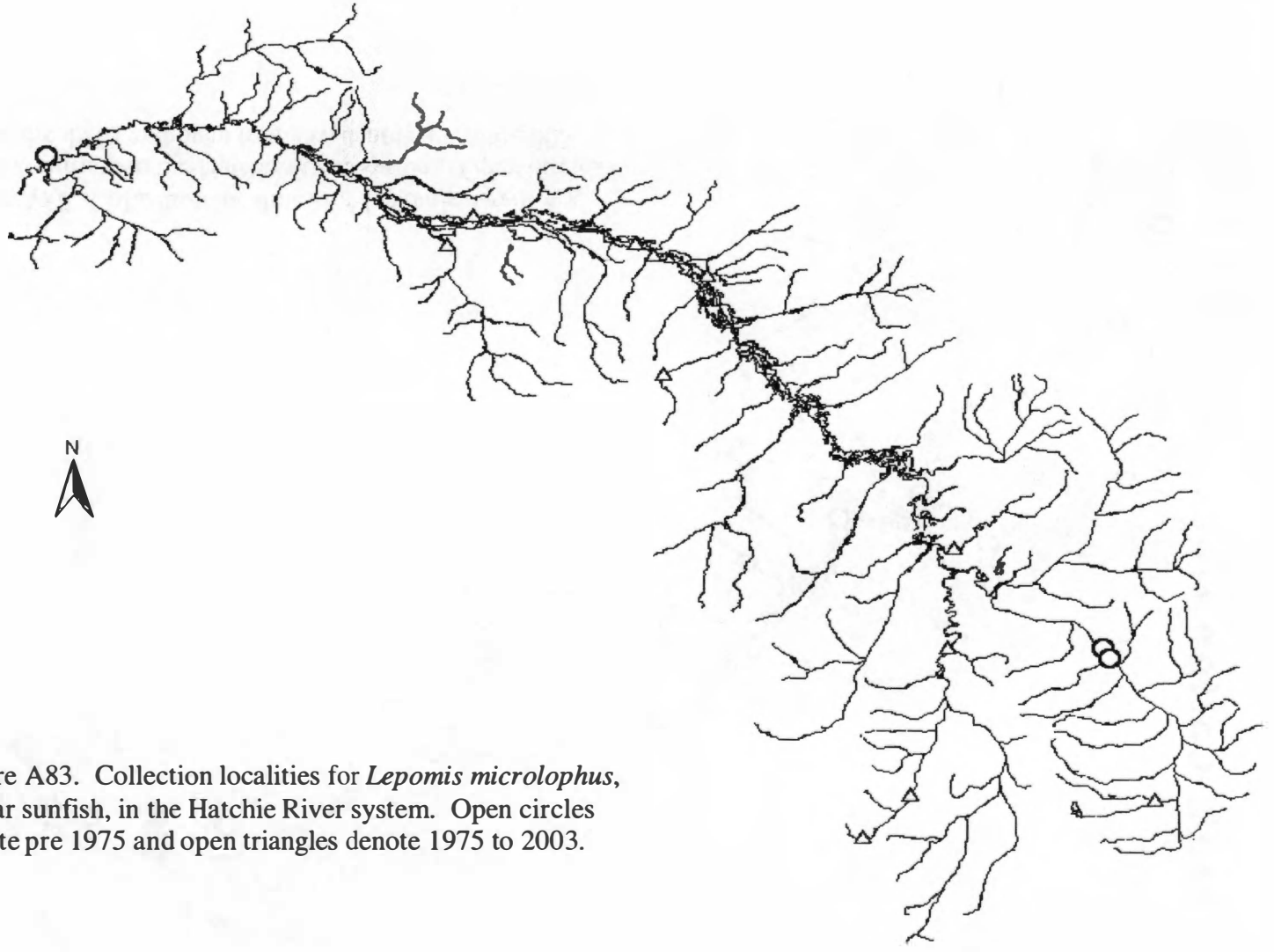

Figure A83. Collection localities for *Lepomis microlophus*, redear sunfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

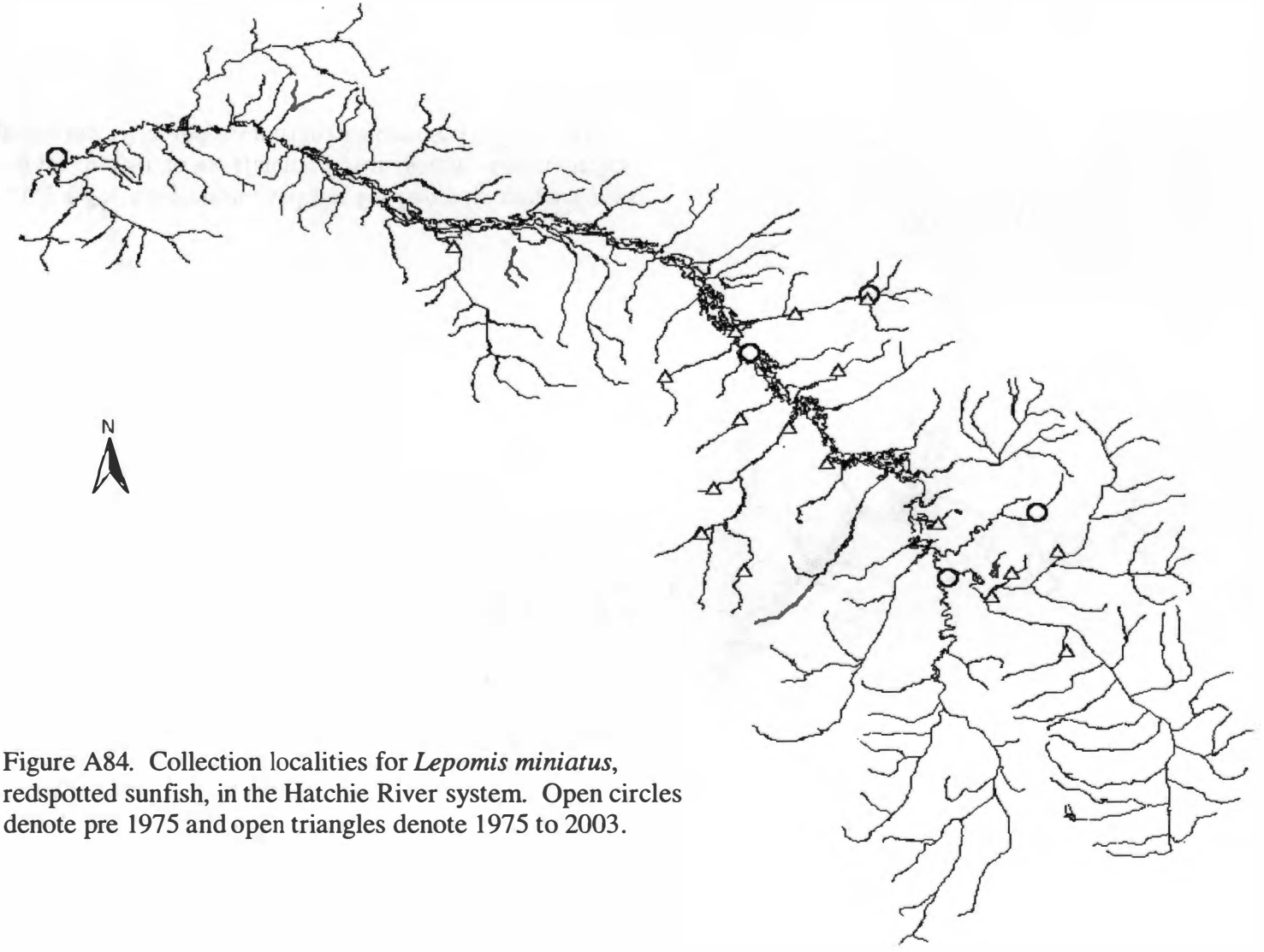

Figure A84. Collection localities for *Lepomis miniatus*, redspotted sunfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

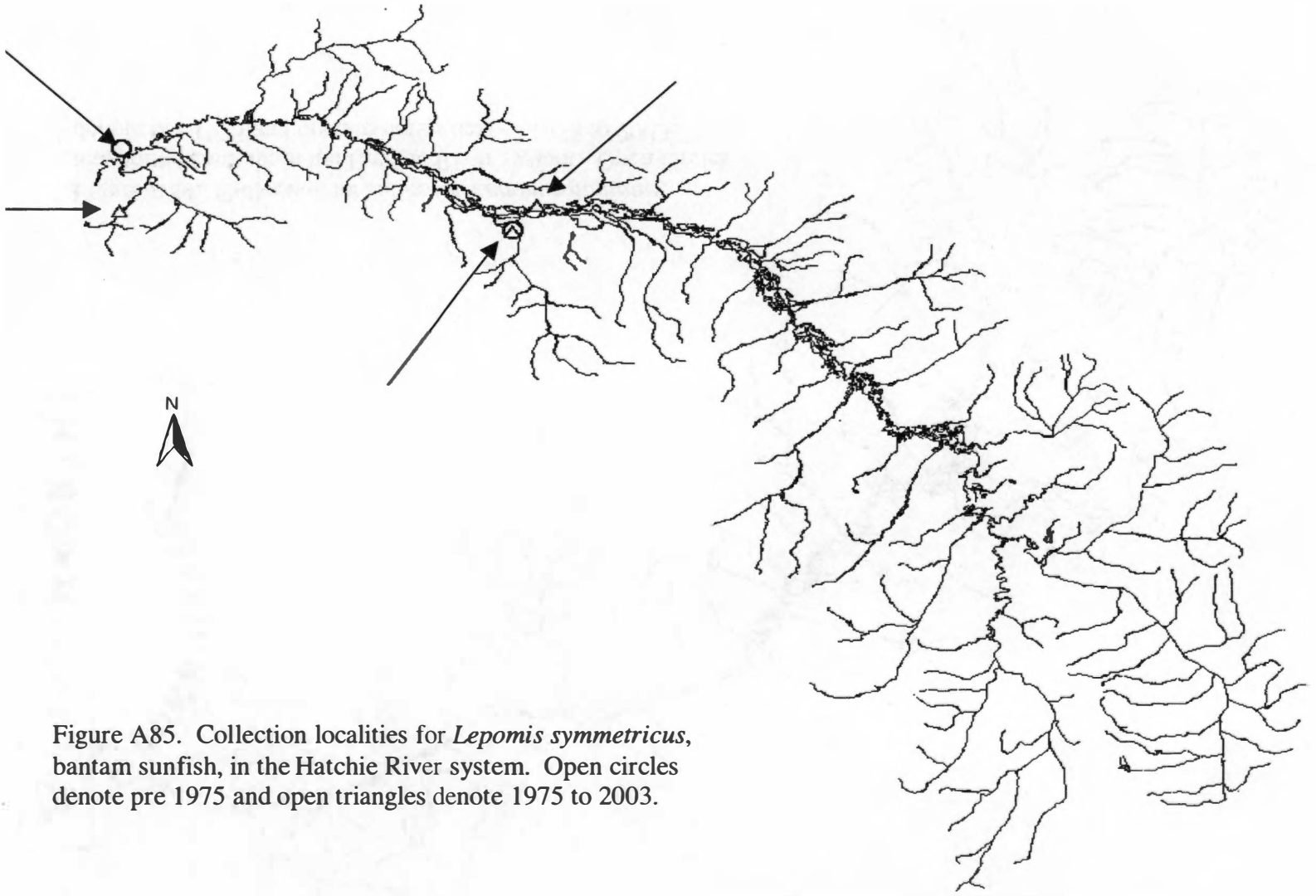

Figure A85. Collection localities for *Lepomis symmetricus*, bantam sunfish, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

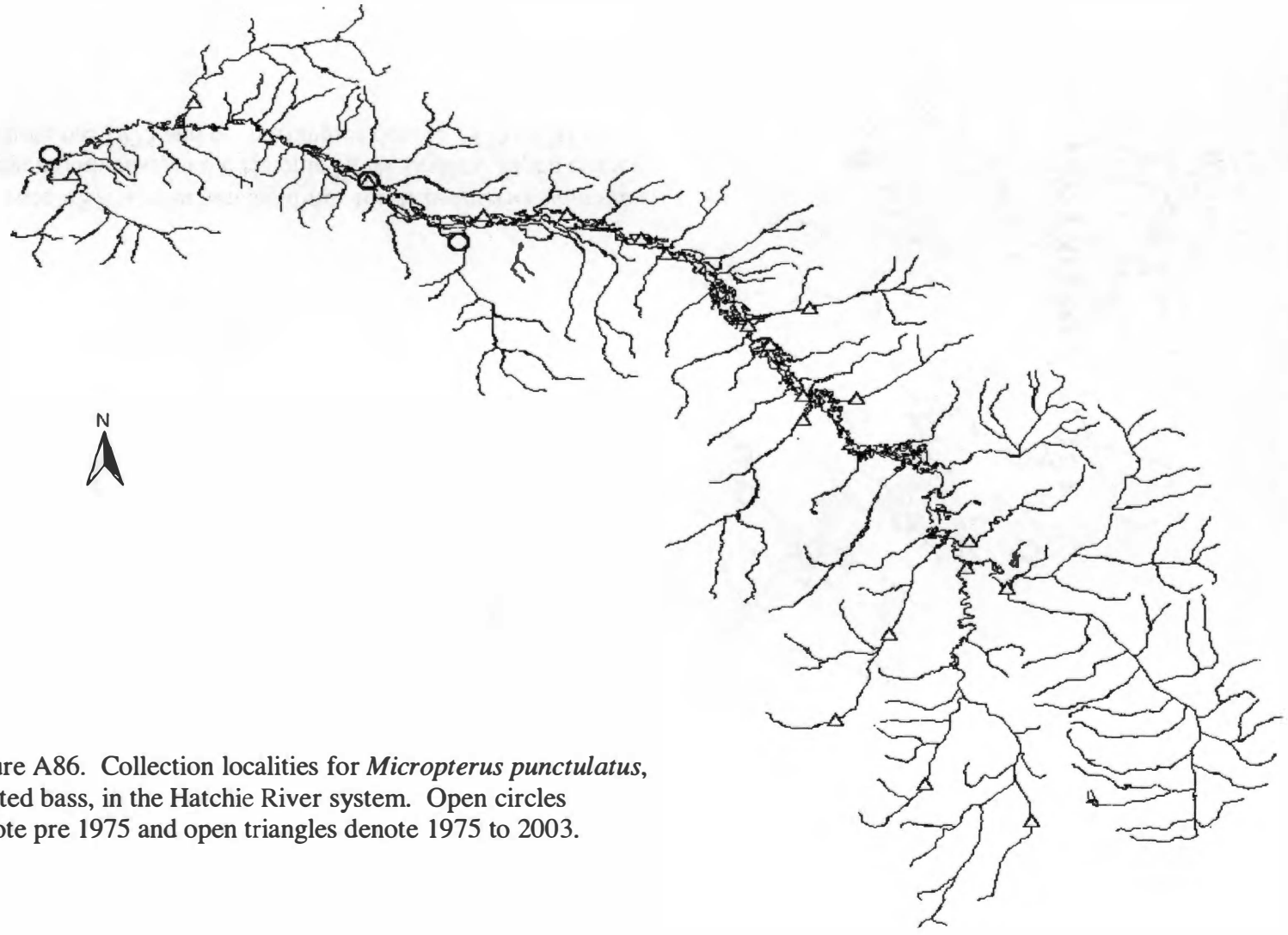

Figure A86. Collection localities for *Micropterus punctulatus*, spotted bass, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

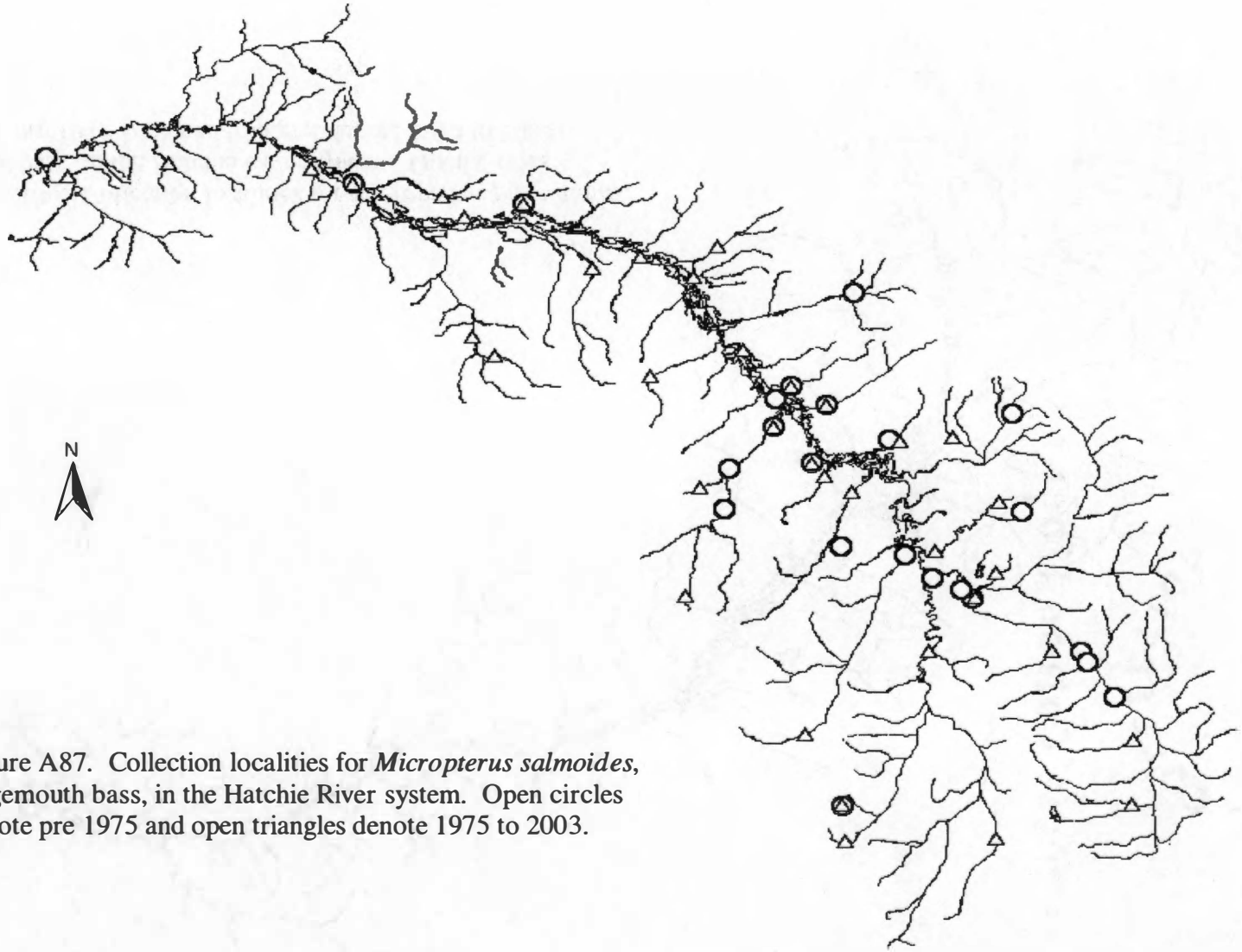

Figure A87. Collection localities for *Micropterus salmoides*, largemouth bass, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

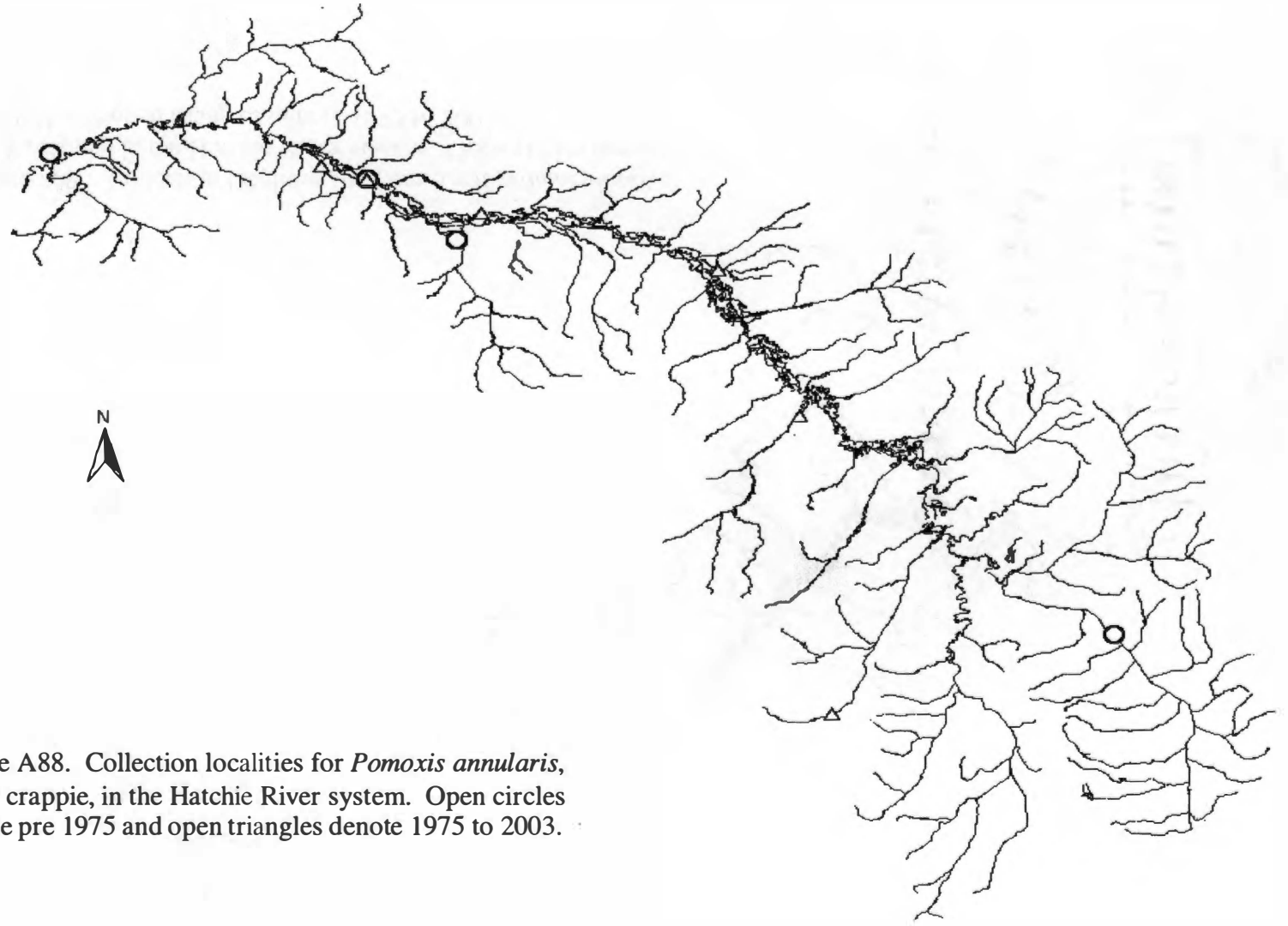

Figure A88. Collection localities for *Pomoxis annularis*, white crappie, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

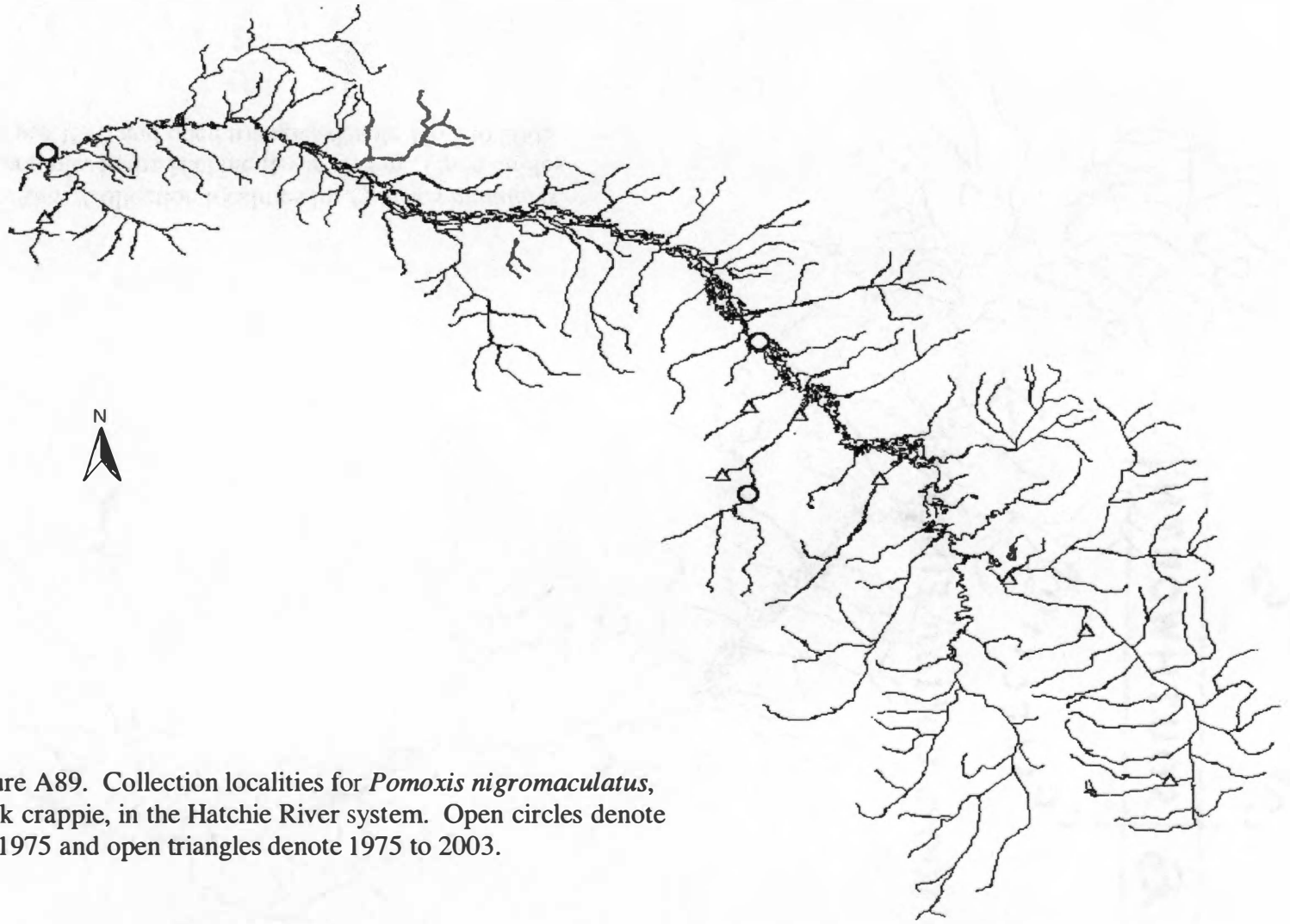

Figure A89. Collection localities for *Pomoxis nigromaculatus*, black crappie, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

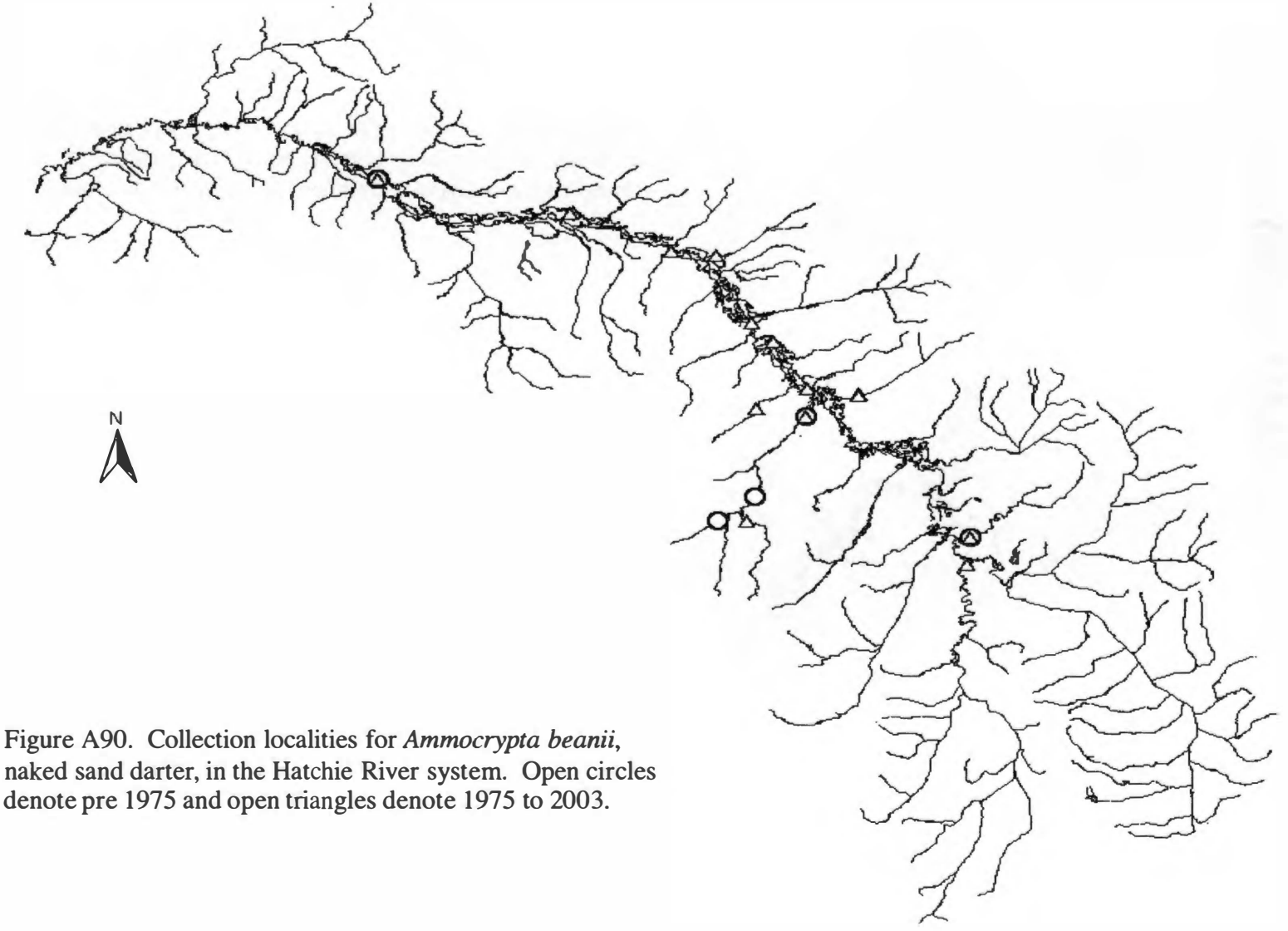

Figure A90. Collection localities for *Ammocrypta beanii*, naked sand darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

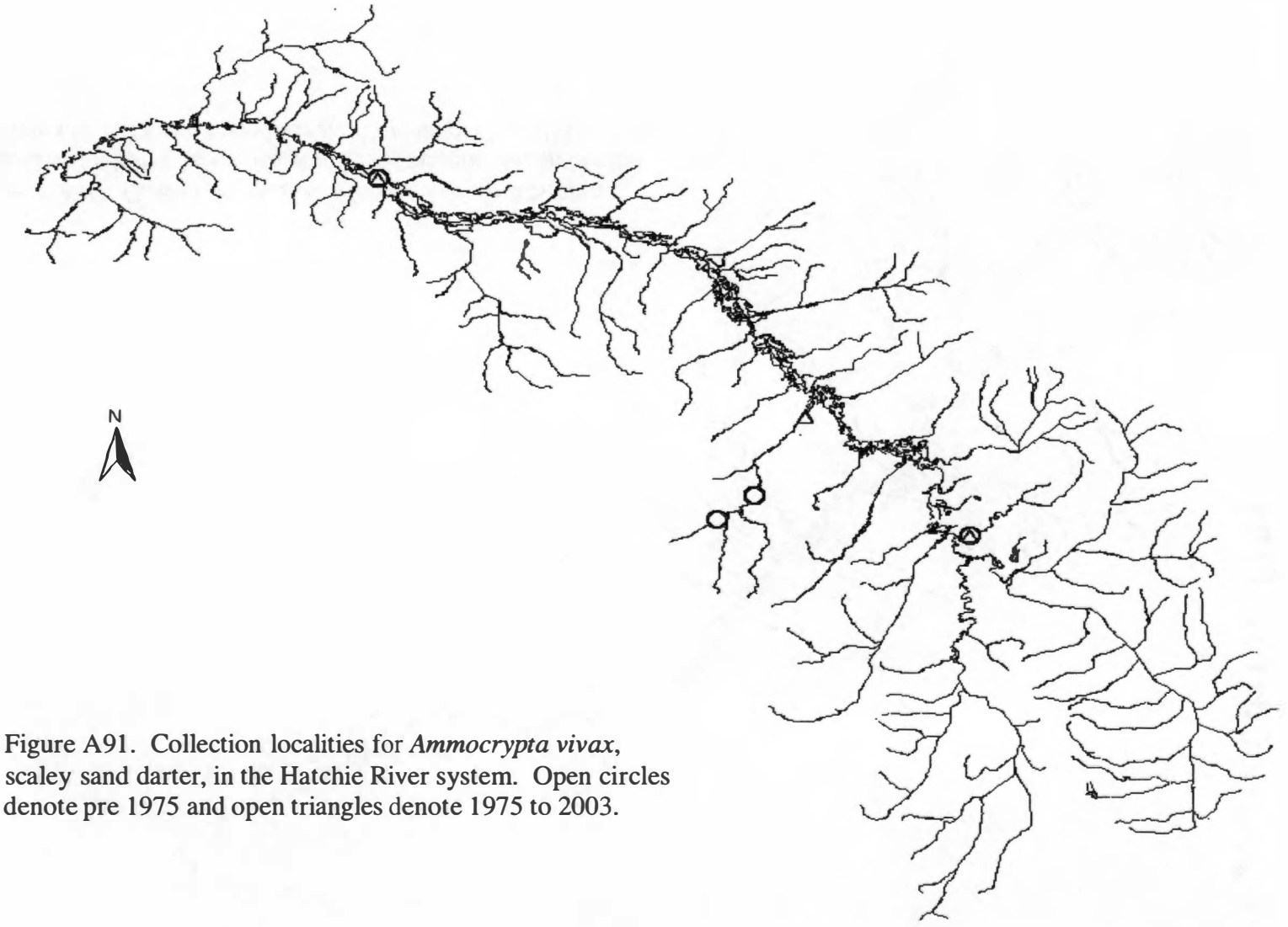

Figure A91. Collection localities for *Ammocrypta vivax*, scaley sand darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

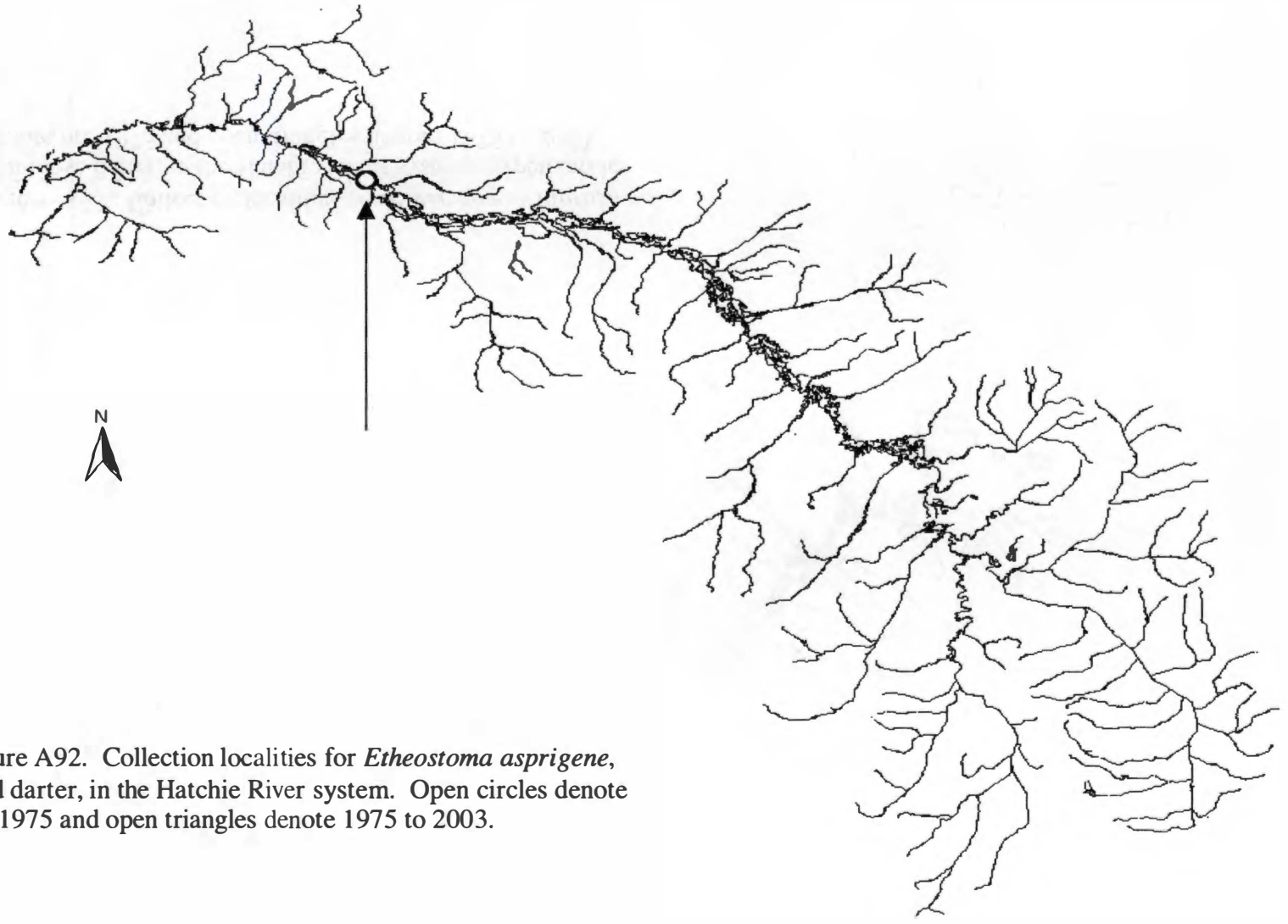

Figure A92. Collection localities for *Etheostoma asprigene*, mud darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

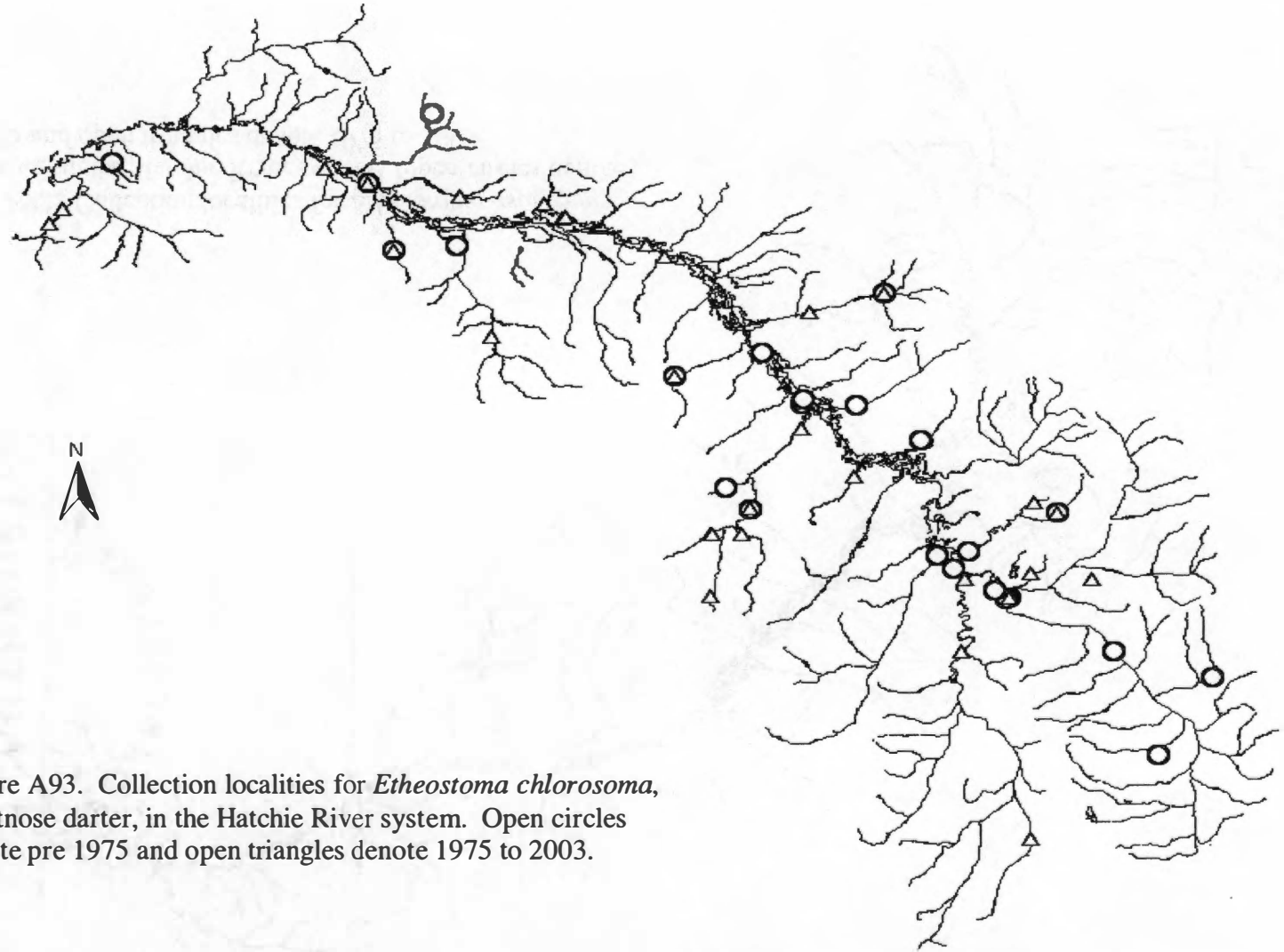

Figure A93. Collection localities for *Etheostoma chlorosoma*, bluntnose darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

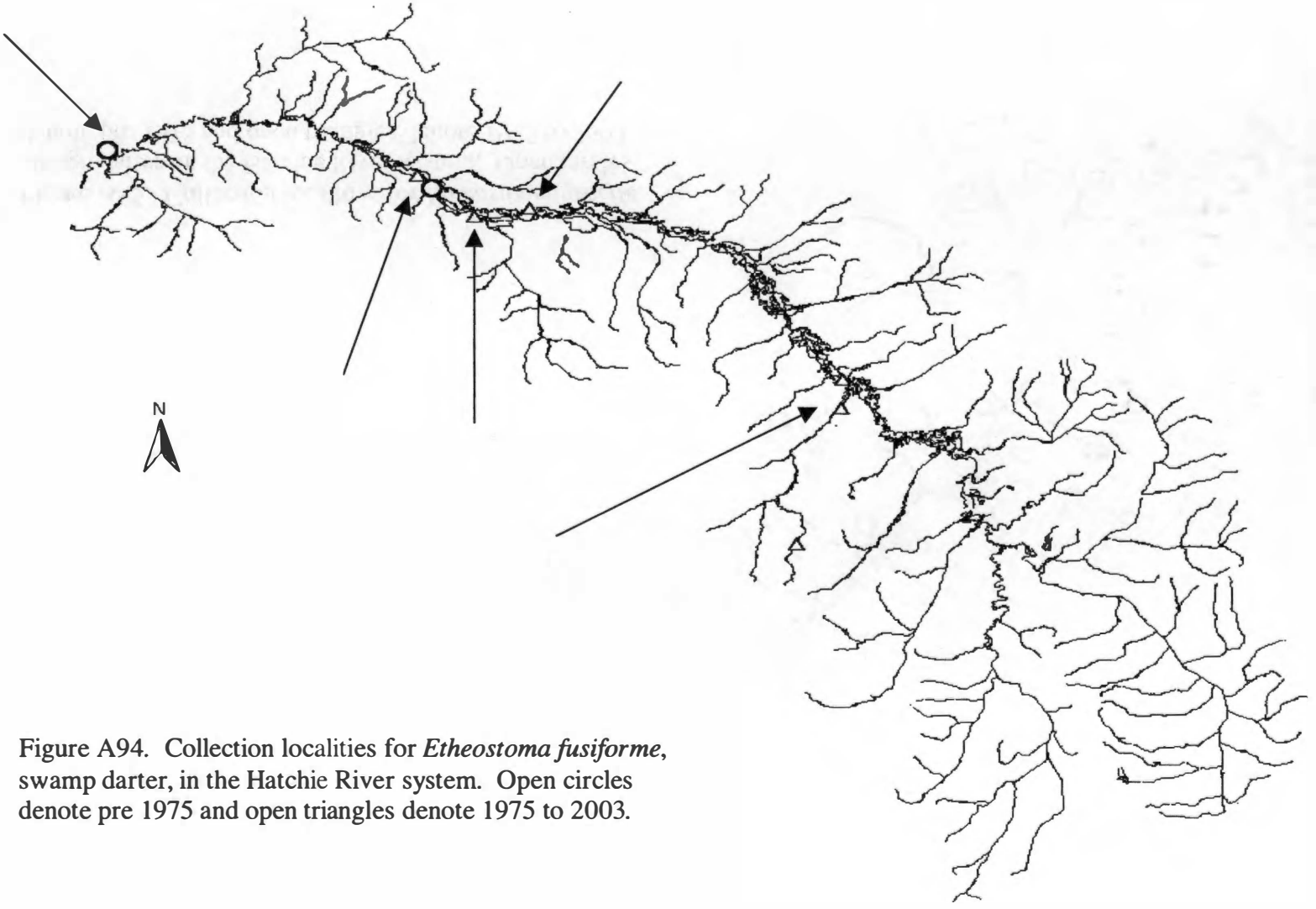

Figure A94. Collection localities for *Etheostoma fusiforme*, swamp darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

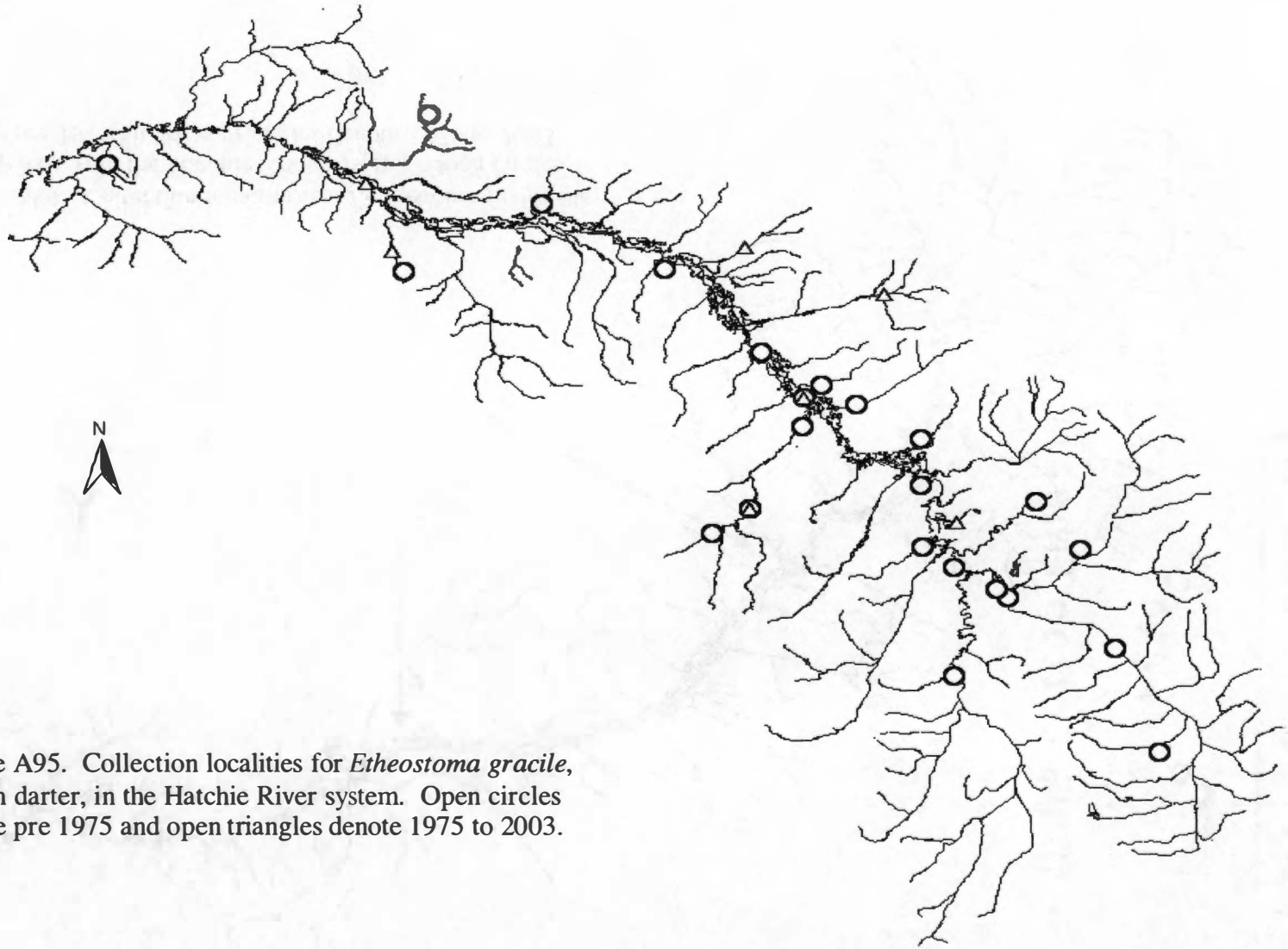

Figure A95. Collection localities for *Etheostoma gracile*, slough darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

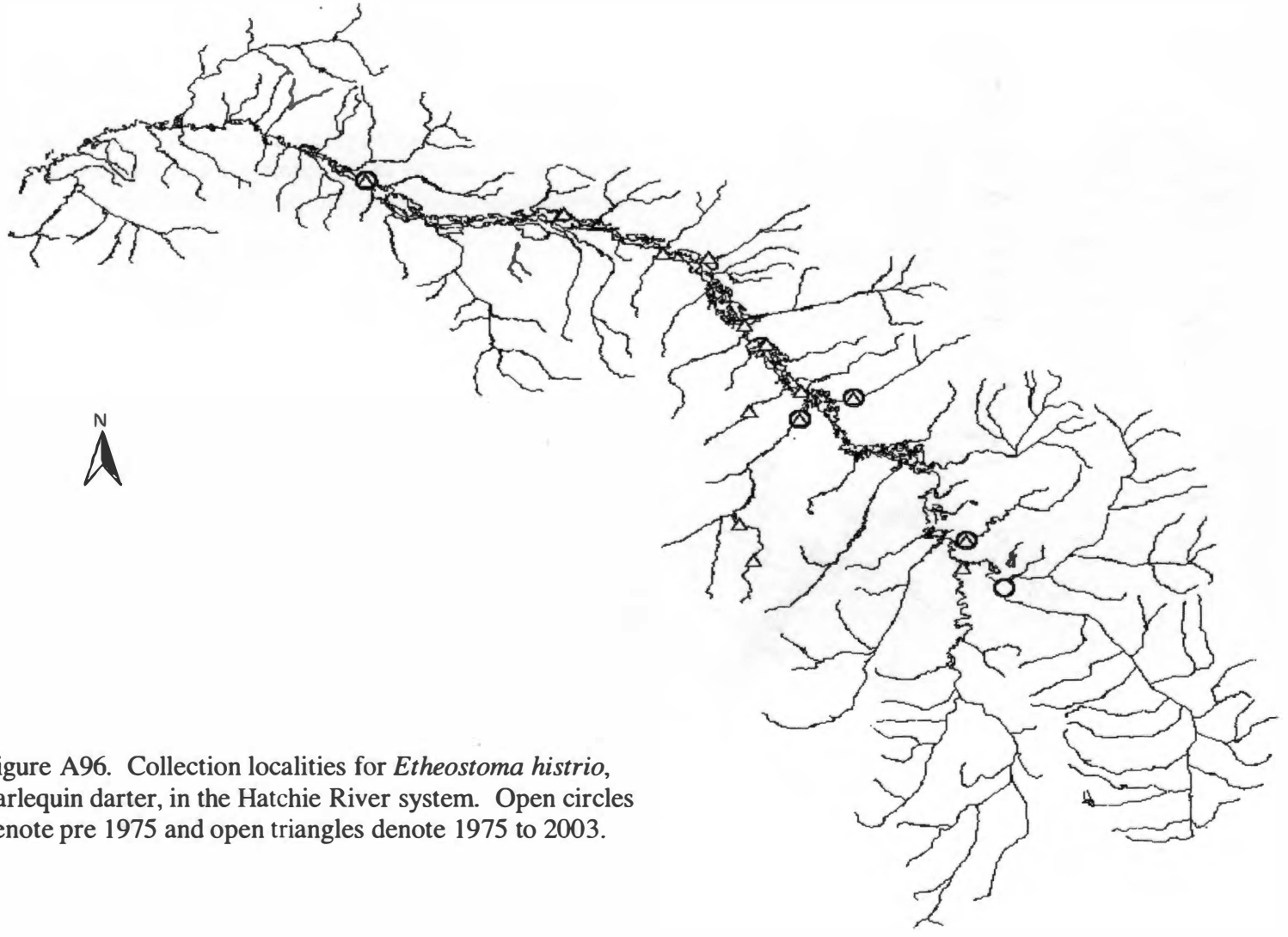

Figure A96. Collection localities for *Etheostoma histrio*, harlequin darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

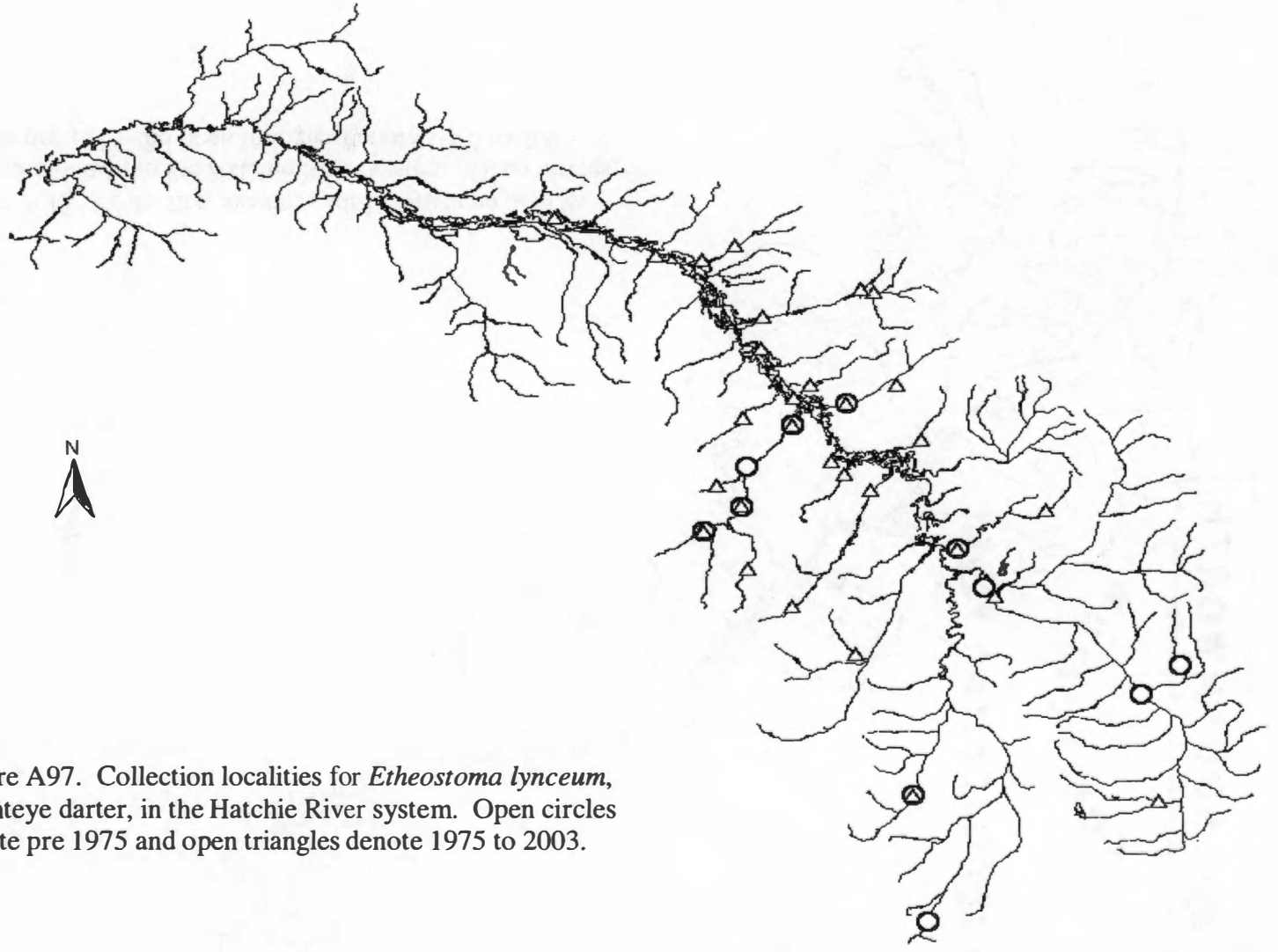

Figure A97. Collection localities for *Etheostoma lynceum*, brighteye darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

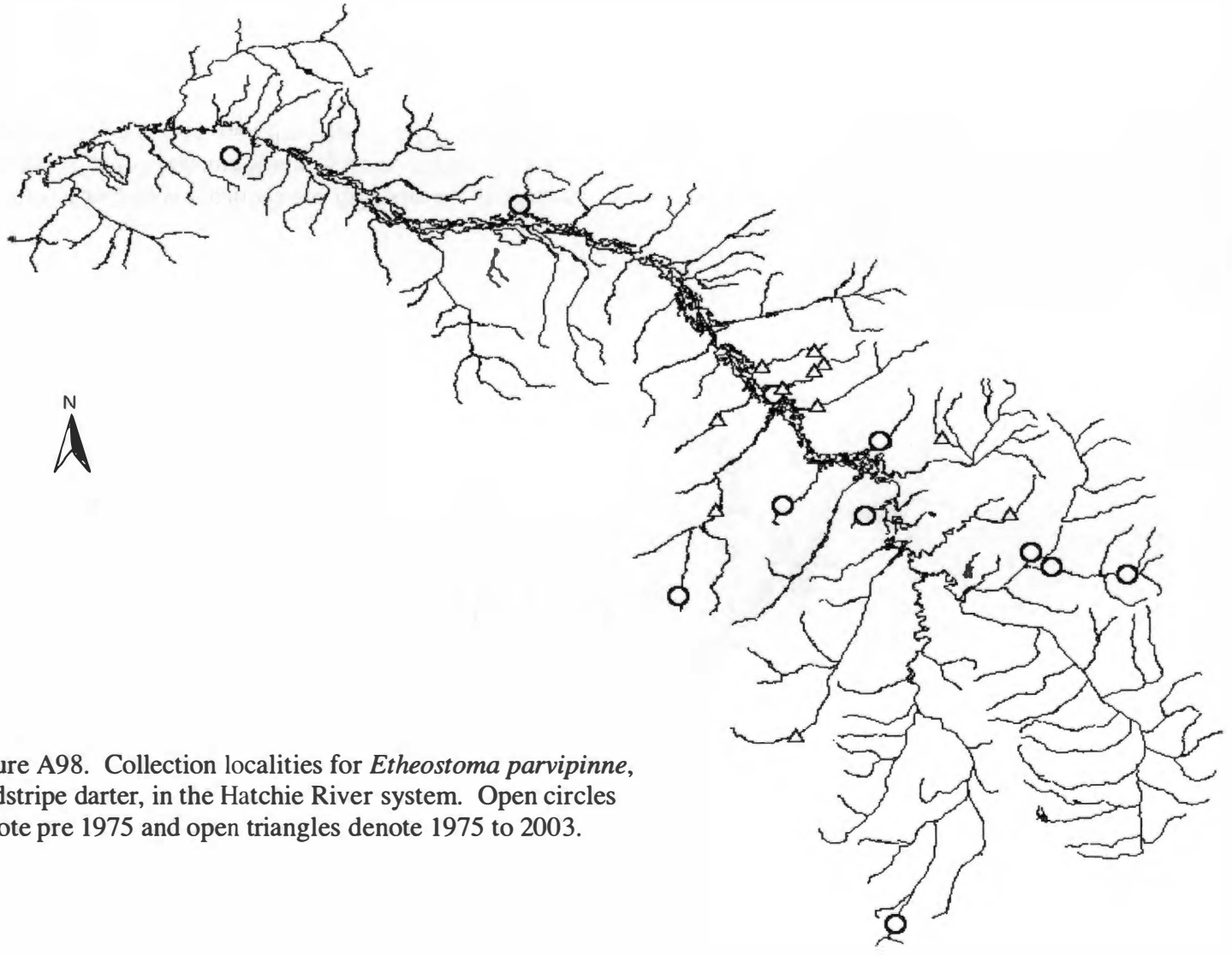

Figure A98. Collection localities for *Etheostoma parvipinne*, goldstripe darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

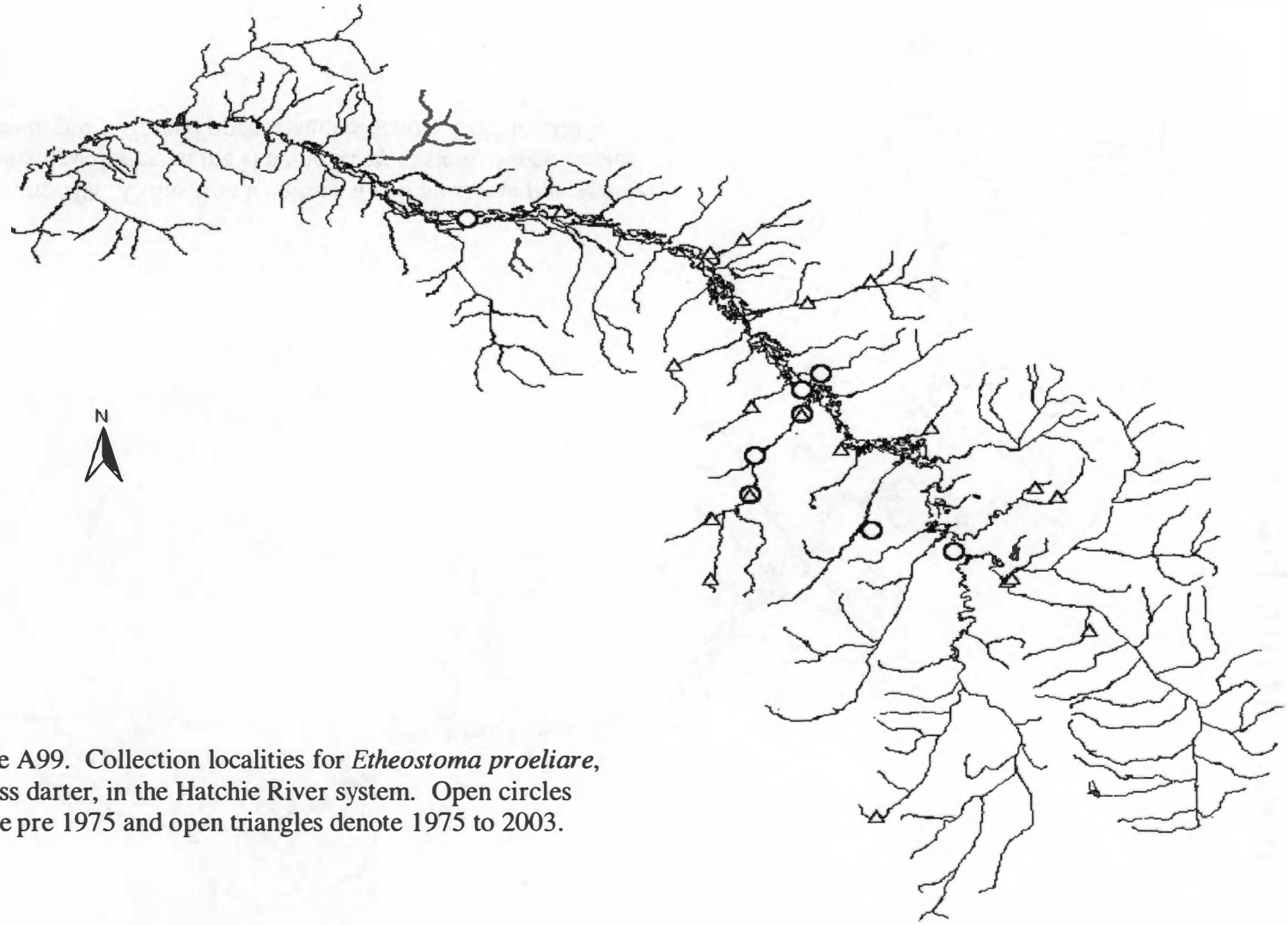

Figure A99. Collection localities for *Etheostoma proeliare*, cypress darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

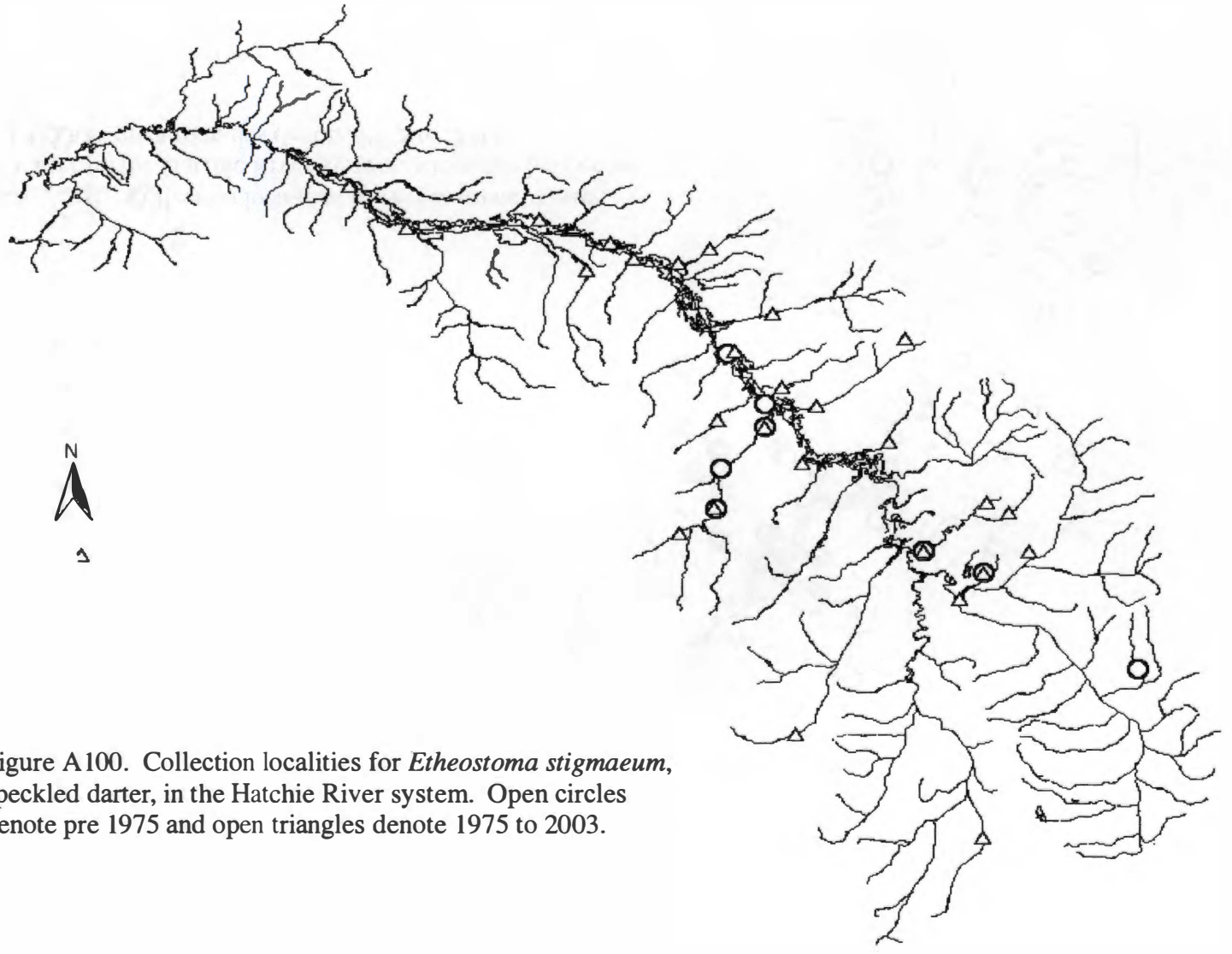

Figure A100. Collection localities for *Etheostoma stigmaeum*, speckled darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

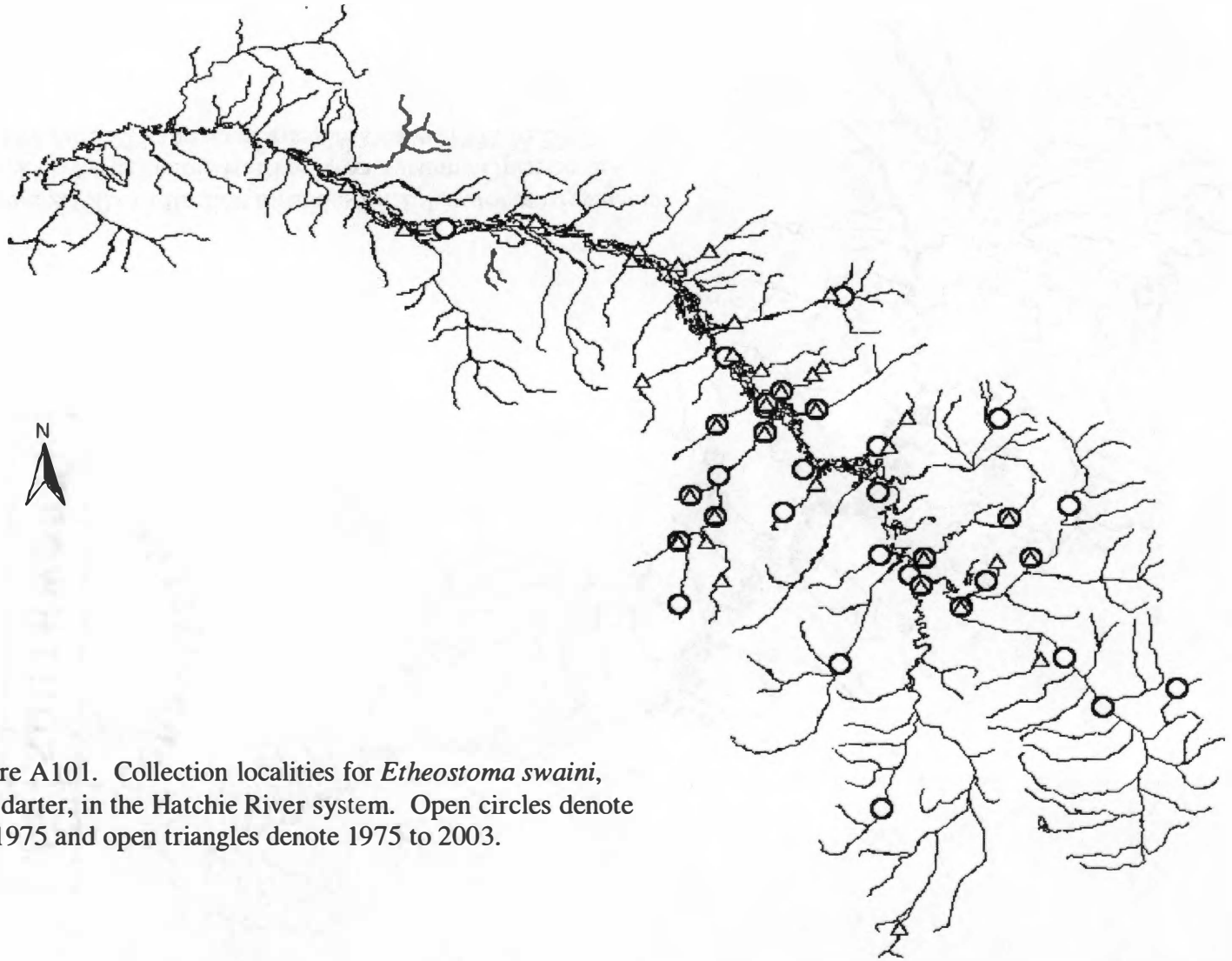

Figure A101. Collection localities for *Etheostoma swaini*, gulf darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

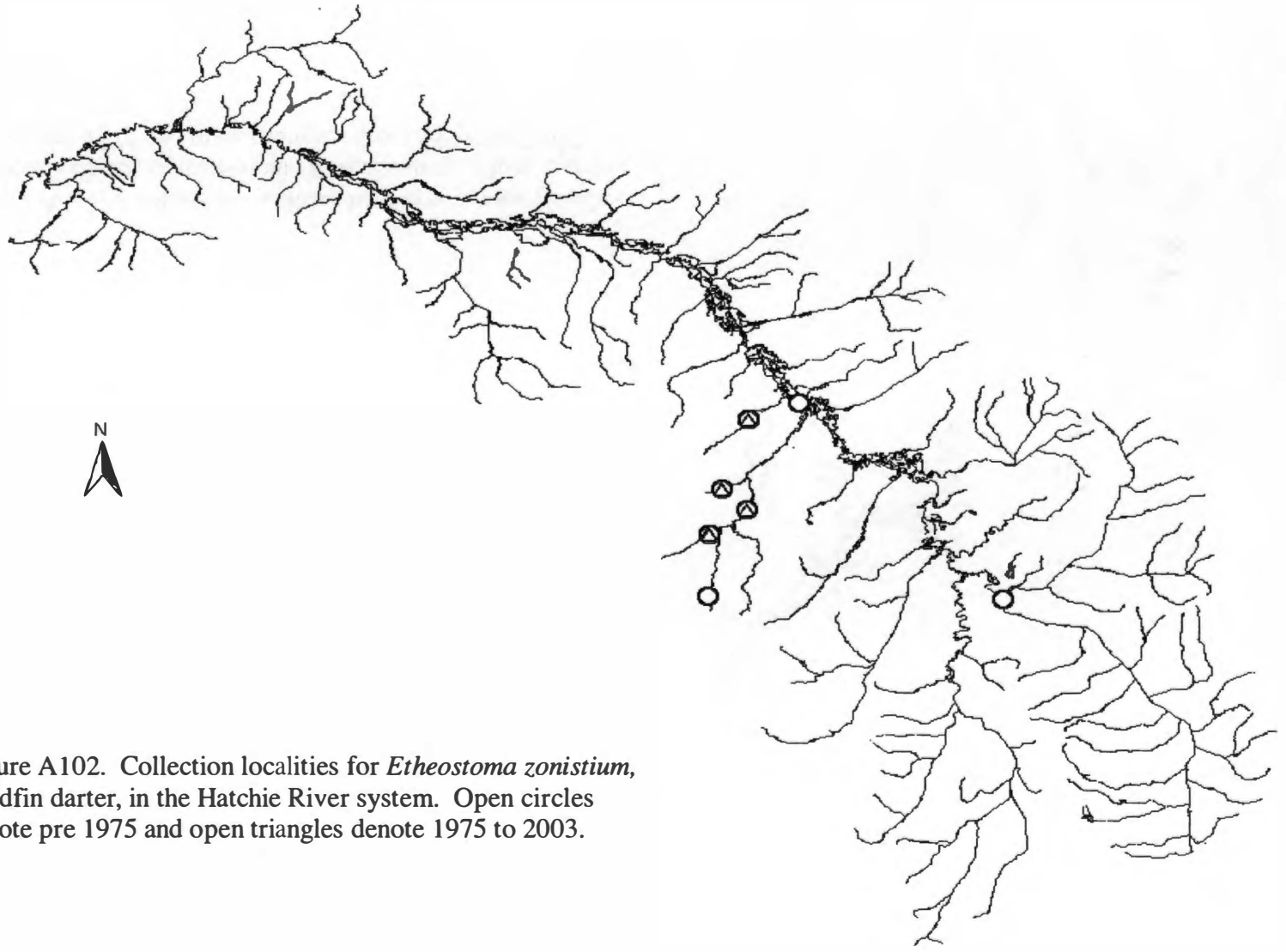

Figure A102. Collection localities for *Etheostoma zonistium,* bandfin darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

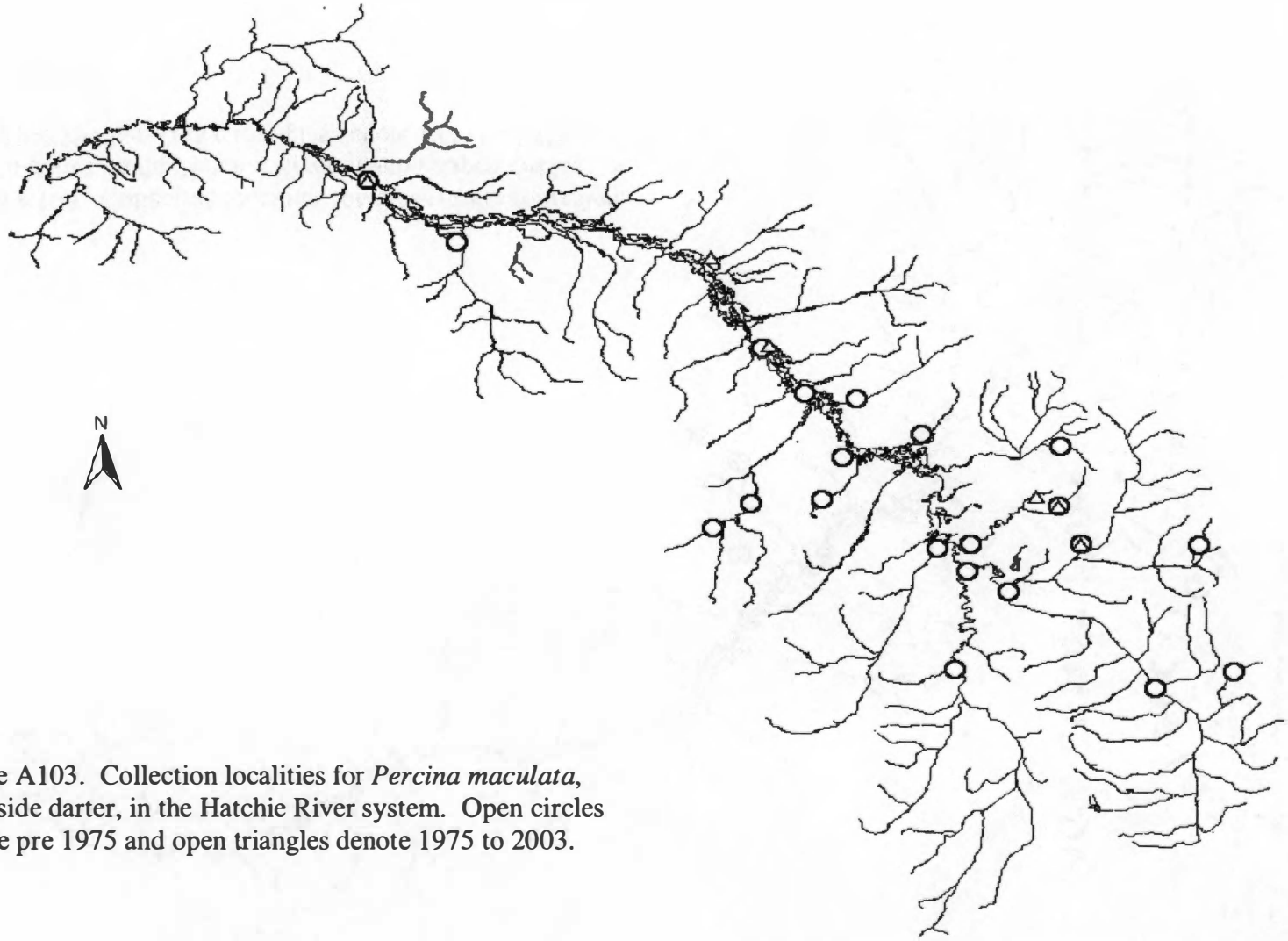

Figure A103. Collection localities for *Percina maculata*, blackside darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

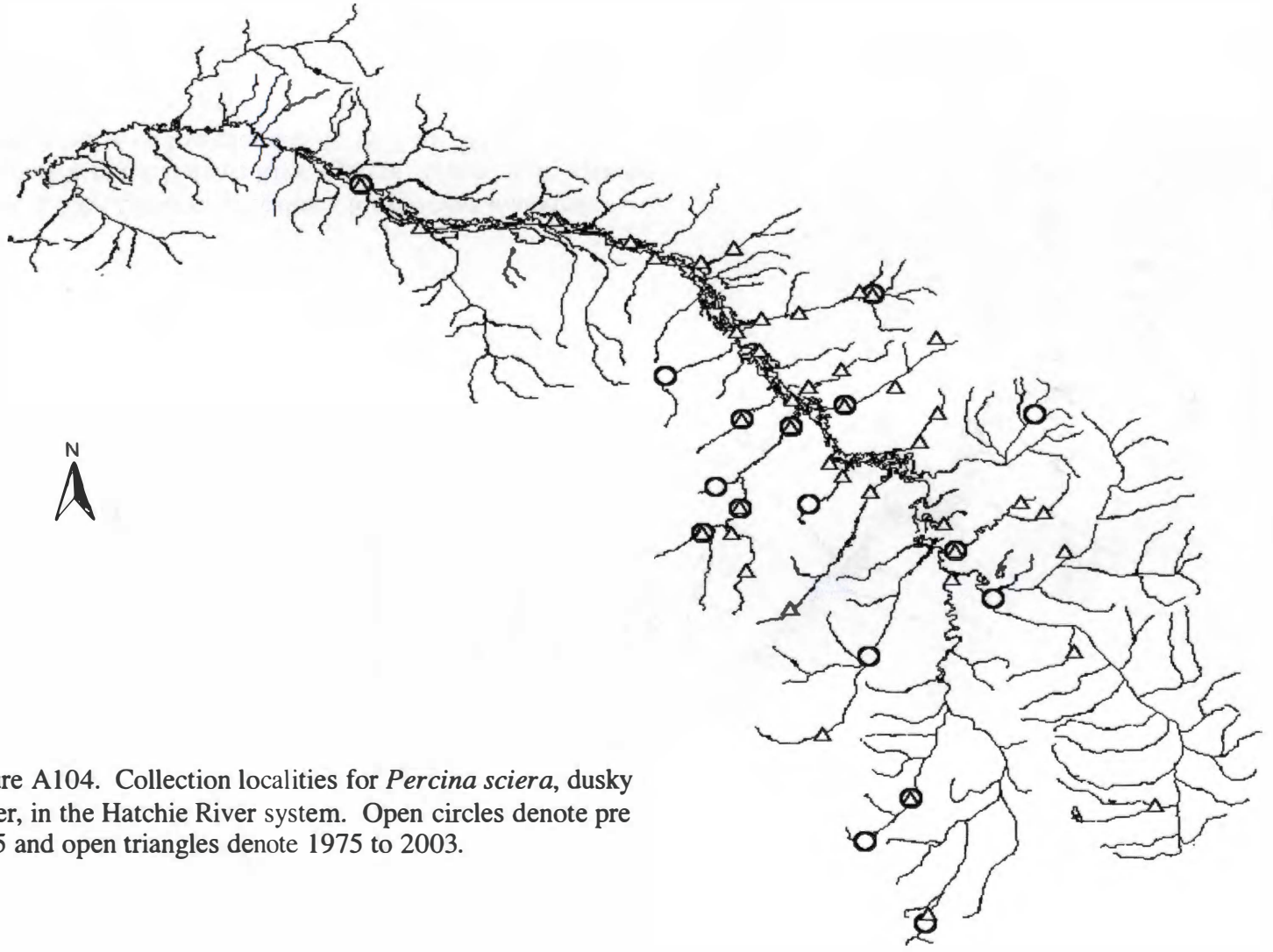

Figure A104. Collection localities for *Percina sciera*, dusky darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

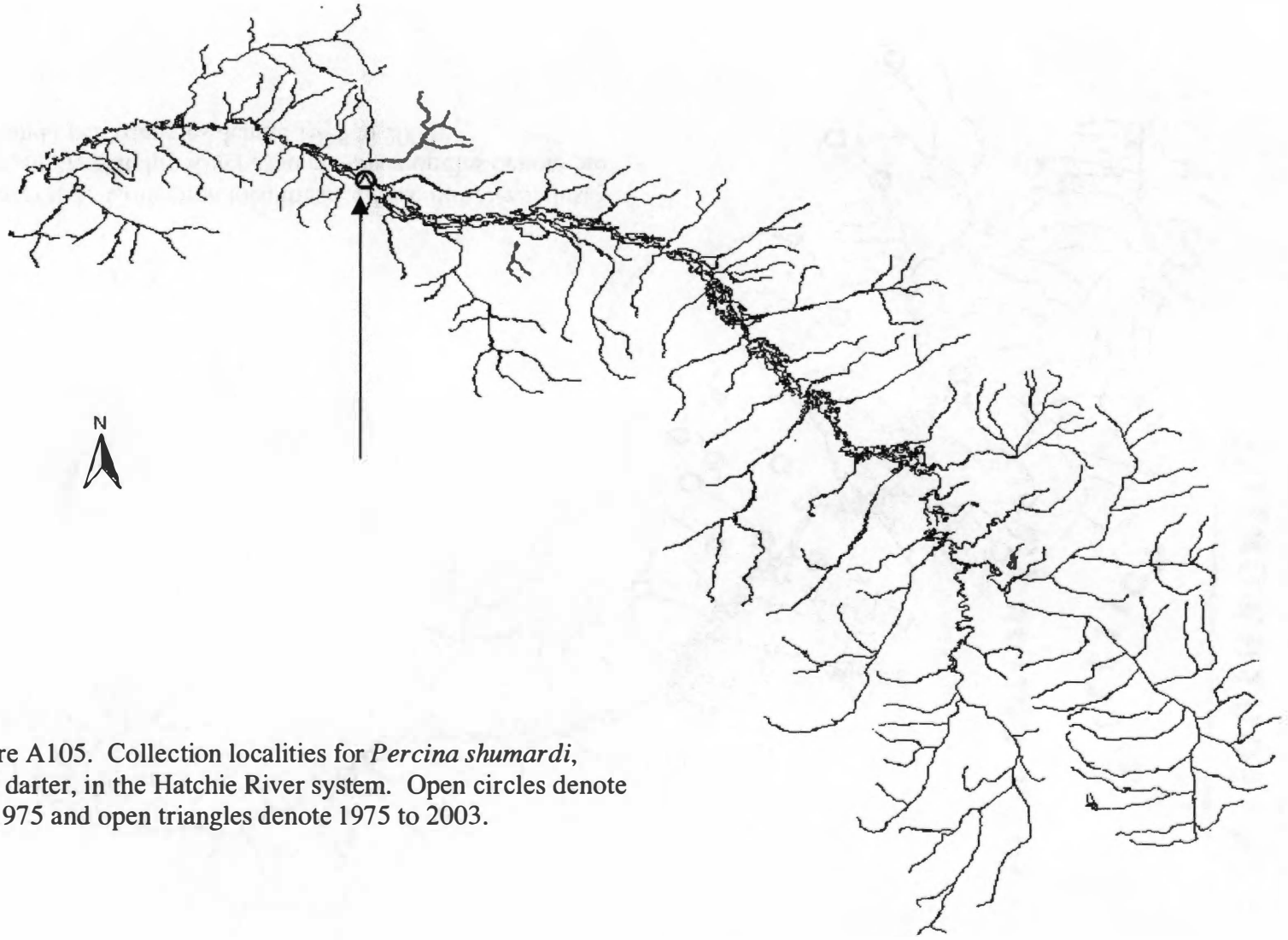

Figure A105. Collection localities for *Percina shumardi*, river darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

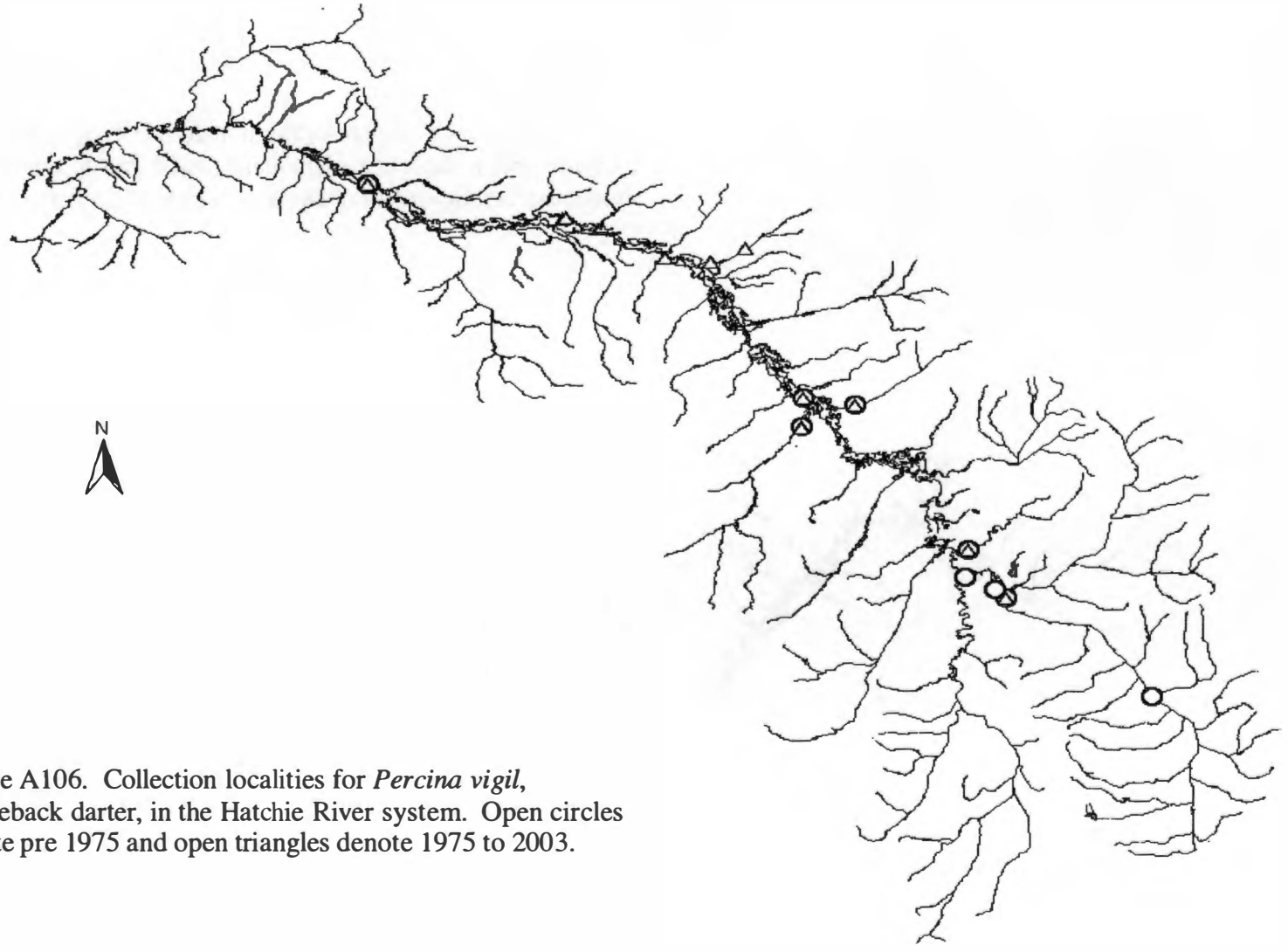

Figure A106. Collection localities for *Percina vigil*, saddleback darter, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

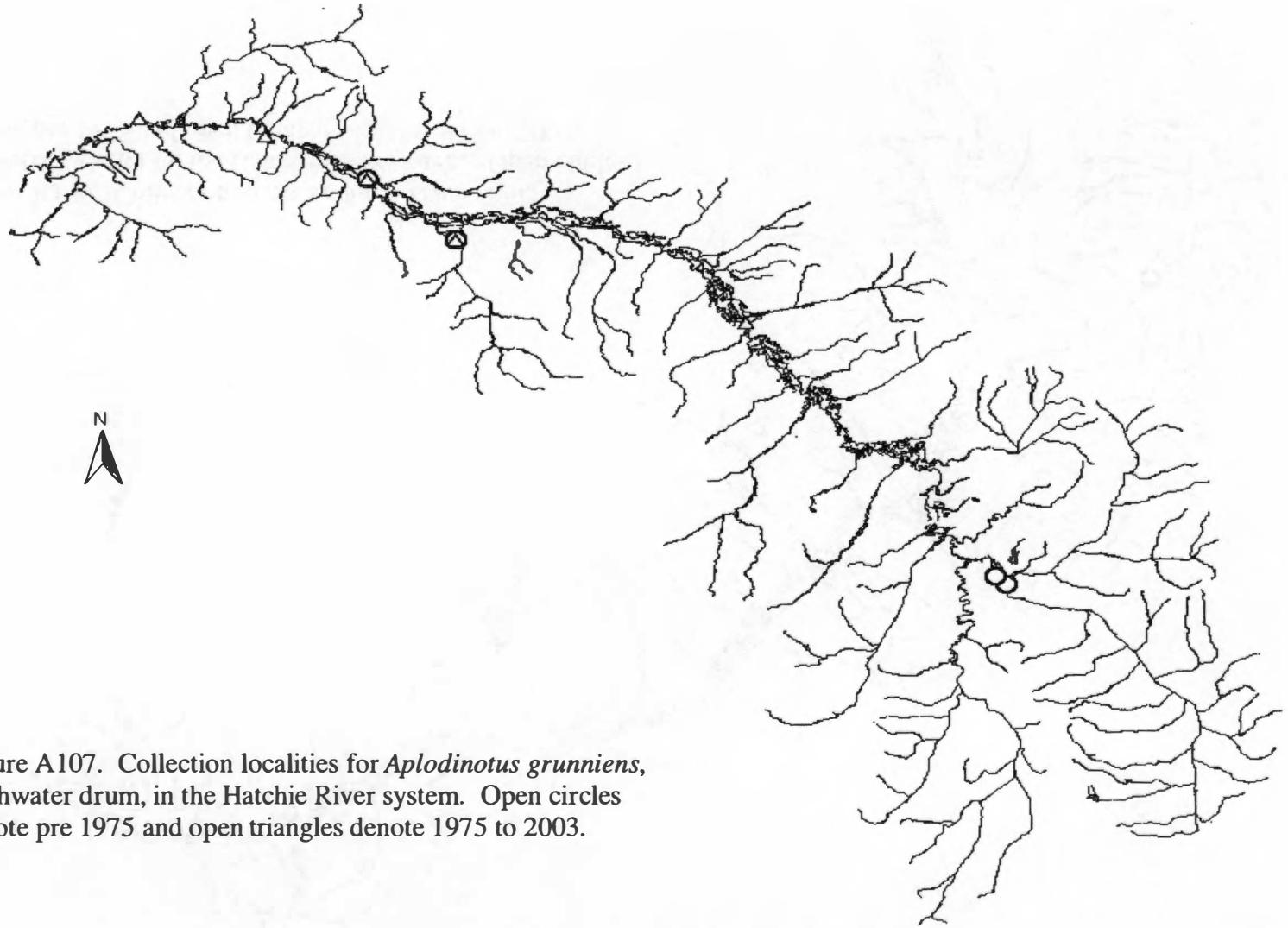

Figure A107. Collection localities for *Aplodinotus grunniens*, freshwater drum, in the Hatchie River system. Open circles denote pre 1975 and open triangles denote 1975 to 2003.

Appendix B

Table B1. Chronological list of all localities in the Hatchie River system where fish were collected, abundance information, and museum information of vouchered specimens from each locality. The number preceding each locality (under the column header "ID") is the assigned identification number for that locality. All available information was included. Information under the column header "Locality" includes the name of the stream or river, a reference location, County, and State. Dates of collection and the collector's names are included under the column headers "Date" and "Collectors", respectively. Both UTM coordinates and GPS coordinates are given under the column headers "*Y*" (UTMY coordinate or GPS north coordinate) and "*X*" (UTMX coordinate or GPS west coordinate). Information under the column header "Species list" includes the species number (as assigned in Chapter IV: Species Accounts), abundance, museum acronym, and museum number. For instance, the entry for a collection of *Ichthyomyzon castaneus* with 3 specimens that has been deposited in the University of Tennessee Research Collection of Fishes and given the accession number 2.358 appears as 1(3, UT 2.358). Hybrid fish are listed, e.g. 20 X 21 represents a *Cyprinella lutrensis* X *Cyprinella venusta* hybrid.

ID	Locality	Date	Collectors	*Y*	*X*	Species list
1	Unnamed Tributary to the Tuscumbia River, MS	15-Aug-39	RM Bailey	357200	3839500	21(1, UMMZ 157718), 24(5, UMMZ 157720), 36(1, UMMZ 157715), 37(3, 157717), 37(3, UMMZ 157716), 48(1, UMMZ 157721), 64(4, UMMZ 157722), 82(68, UMMZ 157723), 83(29, UMMZ 157724), 93(4, UMMZ 157725), 98(3, UMMZ 157726)
2	Bridge Creek of the Tuscumbia River, MS	6-Oct-47	FA Cook	365000	3866500	64(1, UMNS 4124)
3	Clear Creek of the Tuscumbia River, MS	6-Oct-47	FA Cook	36500	3864000	28(1, UMNS 4080)
4	Hinkle Creek of the Tuscumbia River, MS	6-Oct-47	FA Cook	357200	3849000	28(1, UMNS 4054), 78(1, UMNS 4052), 109(1, UMNS 4053)
5	Tuscumbia main channel of Tuscumbia River, MS	6-Oct-47	FA Cook	346000	3873000	19(4, UMNS 4048), 64 (1, UMNS 4038)
6	Polly's Creek, MS	7-Oct-47	FA Cook	357200	3844500	75(1, UMNS 4334), 78(2, UMNS 4073), 94(1, UMNS 4064)
7	Battle Creek, MS	18-Jun-48	FA Cook	364600	3866200	31(2, UMNS 5232), 50(1, UMNS 5243)
8	Bridge Creek, MS	18-Jun-48	FA Cook	365000	3866500	94(1, UMNS 5223), 109(4, UMNS 5221)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
9	Big Muddy Creek, Roadside ditch, overflow from Muddy Creek on US 79, 3 mi NE of Stanton, Lower Hatchie, Haywood Co., TN	2-Apr-49	Taylor, Benson	35 29 12	89 22 45	75(UMMZ 161022), 80(UMMZ 161023), 83(UMMZ 161024), 90(UMMZ 161026), 94(UMMZ 161025), 101(UMMZ 161027)
10	Little Muddy Creek, at US 79, 2.5 mi SW of Stanton, Lower Hatchie, Haywood Co., TN	2-Apr-49	Taylor, Benson	35 27 2	89 26 20	35(UMMZ 161029), 52(UMMZ 161028), 73(UMMZ 161030), 76(UMMZ 161033), 80(UMMZ 161031), 81(UMMZ 161032), 90(UMMZ 161036), 91(UMMZ 161035), 94(UMMZ 161037), 108(UMMZ 161035)
11	Hatchie River, Upper Hatchie, MS	28-Jun-52	Biology 81 d/e	337000	3868100	21, 37, 38, 64, 82, 94, 95, 96, 103, 104, 109
12	Hatchie River, Upper Hatchie, MS	16-Jul-52	McGaha, Barkley	338500	3843500	21(7), 24(1), 28(19), 31(13), 37(1), 38(2), 50(1), 82(5), 93(1), 96(3)
13	Hatchie River, Upper Hatchie, MS	16-Jul-52	McGaha, Barkley	337000	3868100	21(15), 28(2), 38(5)
14	Tuscumbia River, MS	16-Jul-52	McGaha, Barkley	354300	3866500	21(32), 28(9), 37(1), 38(1), 82(44), 83(22), 84(6), 103(5)
15	Mosses Creek at Vernie-Taylor Rd. just N of TN 57, McNairy Co., TN	31-Aug-56	Taylor, Kanazawa	35 4 46	88 46 53	19, 21, 24, 25, 28, 30, 38, 44, 50, 56, 67, 70, 72, 96, 98, 106, 107, 109, 112, 116, 117, 119, 120, 122
16	Hatchie River main channel at US 70-79 bridge, Haywood Co., TN	27-Sep-56	Tennessee Game and Fish Commission	35 29 03	89 22 44	10, 11, 15, 16, 22, 51, 52, 57, 66, 67, 74, 87
17	Dog Tail Creek, W edge of Hornsby on US 64, Hardeman Co., TN	1-Sep-59	Taylor, Kanazawa	35 13 34	88 50 15	28, 37, 46, 50, 54, 64, 82, 83, 103

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
18	Spring Creek, at TN 125, Hardeman Co., TN	1-Sep-59	Taylor, Kanazawa	35 14 37	88 58 38	3, 19, 21, 24, 25, 28, 30,31, 37, 38, 44, 46, 48, 50, 56, 62, 67, 70, 72, 73, 78, 82, 94, 96, 98, 103, 106, 112, 115, 116, 117, 120, 122
19	Hatchie River at US 70-79 bridge, Haywood Co., TN	21-Aug-63	Tennessee Game and Fish Commission	35 29 03	89 22 44	8, 10, 11, 15, 22, 51, 52, 53, 57, 66, 67, 74, 96, 98, 102, 104, 125
20	Tuscmbia River, MS	16-Sep-63	CA Schultz	357800	3860200	25(1, MSU 897), 45(2, MSU 898)
21	Oxbow lake at first oxbow south of Smith Bridge Rd., Alcorn Co., MS	17-Sep-63	Mississippii Game and Fish Commission	34 56 41	88 36 21	7, 10, 15, 22, 23, 36, 40, 64, 67, 68, 76, 82, 91, 94, 96, 99, 103, 104
22	Tuscumbia River main channel at US 79 bridge, Alcorn Co., MS	18-Sep-63	Mississippii Game and Fish Commission	34 55 52	88 35 49	15, 22, 24, 45, 48, 67, 82, 84, 94, 96, 99, 103
23	Piney Creek, at Co. Rd. 8198 bridge, 4.7 air miles ENE of Bolivar, Hardeman Co., TN	11-Jun-67	RE Jenkins & FF Snelson Jr.	35 16 26	88 54 48	19(CU 52582), 21(CU 52586), 24(CU 52578), 25(CU 52579), 28(CU 52583), 30(CU 52584), 31(CU 52585), 36(CU 52580), 46(CU 52587), 48(CU 52588), 50(CU 52589), 56(CU 52590), 82(CU 52591), 91(CU 52592), 96(CU 52593), 103(CU 52594), 119(CU 52595)
24	Piney Creek, at County Rd. 8198, Walnut Grove-Ebenezer Rd., Hardeman Co., TN	11-Jun-67	RE Jenkins & FF Snelson Jr.	35 16 25	88 54 47	19, 25, 30, 36, 44, 75
25	Hatchie River at US 70-79 bridge, Haywood Co., TN	14-Jun-68	Suttkus, Marynick	35 29 03	89 22 44	21, 25, 30, 48, 60, 70, 71, 75, 76, 78, 93, 96, 119

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
26	Grays Creek, at TN 18 second crossing S of Shandy, Hardeman Co., TN	18-Jul-68	Smythe, Mackiewicz, Etnier	35 17 13	88 58 03	19(21, UT 44.286), 64, 75, 81, 83, 114(3, UT 91.203)
27	Hatchie River at TN 18 bridge, Hardeman Co., TN	18-Jul-68	Smythe, Etnier	35 16 32	88 58 36	31(3, UT 44.261), 56(1, UT 45.121), 62(1, UT 45.120), 69(14, UT 48.88), 70(13, UT 48.90), 76(3, UT 38.11), 81(5, UT 60.17), 82(10, UT 60.19), 83, 109(11, UT 91.511), 115(8, UT 91.519), 116(24, UT 91.529), 117(4, UT 91.534), 118(2, 91.525)
28	Hatchie River, at TN 57 bridge, ca 0.5 miles E of Pocahantas, Hardeman Co., TN	18-Oct-68	Reese, Comiskey, Etnier	35 03 21	88 47 58	21(7, UT 44.310), 24, 30, 44, 46, 48, 68, 75, 78, 82, 83, 94, 96, 109, 111, 115, 117
29	Piney Creek at at County Rd. 8198, Walnut Grove-Ebenezer Rd., Hardeman Co., TN	18-Oct-68	Reese, Comiskey, Etnier	35 16 25	88 54 47	19, 24, 25(6, UT 44.328), 28(2, UT 44.327), 30(24, UT 44.333), 31, 37(5, UT 44.321), 46, 67, 78, 82, 83, 93, 96, 98, 109, 111, 112(8, UT 91.261), 117
30	Spring Creek at TN 125, Hardeman Co., TN	18-Oct-68	Reese, Comiskey, Etnier	35 14 37	88 58 38	3(1, UT 2.5), 19(54, UT 44.323), 24(43, UT 44.322), 30(71, UT 44.338), 31, 36, 62(1, UT 45.78), 69(1, UT 48.45), 72(2, UT 48.46), 82, 93, 98, 112(9, UT 91.261), 113(4, UT 91.260), 117(8, UT 91.275), 120(9, UT 91.265)
31	Dog Tail Creek, W edge of Hornsby on US 64, Hardeman Co., TN	19-Apr-69	Gilbert, Seaman, Hastings	35 13 34	88 50 15	28, 36, 46, 50, 54, 72, 75, 78, 82, 93, 96, 97, 109, 111, 114, 117, 119
32	Cub Creek at County Rd. 8158, Lake Hardeman Rd., Hardeman Co., TN	29-Oct-70	Gregory, Henson, Erickson, Etnier	35 8 23	88 57 18	19(8, UT 44.532), 24, 30(7, UT 44.533), 37(60, UT 44.528), 50, 72(2, 48.46), 82, 83, 93, 114(3, UT 91.203), 117(1, UT 91.534), 119(1, UT 91.548), 120

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
33	Mosses Creek at Vernie-Taylor Rd. just N of TN 57, McNairy Co., TN	30-Oct-70	Gregory, Henson, Erickson, Etnier	35 4 46	88 46 53	19, 21(1, UT 44.547), 30, 46, 69(2, UT 48.89), 70, 94, 116(2, UT 91.530), 113(6, UT 91.537), 117(2, UT 91.533), 119, 120
34	Spring Creek at County Rd. 8158, Lake Hardeman Rd., Hardeman Co., TN	30-Oct-70	Gregory, Henson, Erickson, Etnier	35 8 5	89 2 15	3(1, UT 2.17), 19, 24, 30, 31, 37, 46, 48, 56, 69, 70, 72, 78, 82, 94, 96, 103, 105, 106, 107, 109, 111, 113, 116, 118, 120
35	West Fork Spring Creek at Van Buren Rd., ca. 6.8 air miles NE of Grand Junction, Hardeman Co., TN	30-Oct-70	Gregory, Henson, Erickson, Etnier	35 6 6	89 4 56	3(2, UT 2.16), 24, 48, 69(7, UT 48.87), 72, 75, 78, 82, 96, 106(1, UT 91.508), 107(2, UT 91.509), 111(5, UT 91.516), 113(21, UT 91.538), 117(29, UT 91.535), 118(23, UT 91.525), 119(1, UT 91.548), 120(13, UT 91.550)
36	East Fork Spring Creek at TN 57 bridge, ca. 10 miles Eof Grand Junction, Hardeman Co., TN	6-Apr-71	Schmidt, Brommer	35 00 50	88 44 15	28, 82
37	Muddy Creek at TN 57 bridge, McNairy Co., TN	6-Apr-71	Schmidt, Brommer	35 4 38	88 30 48	28, 36, 46, 50, 61, 119
38	Main channel and tributary of Tuscumbia River, MS	8-Apr-71	Clemmer, Heins	354300	3866500	21(43, MSU 1585), 23(2, MSU 1580), 25(1, MSU 1582), 28(1, MSU 1583), 30(158, MSU 1584), 46(8, MSU 1586), 48(9, MSU 1587), 75(1, MSU 1579), 82(32, MSU 1588), 84(2, MSU 1589), 93(2, MSU 1590), 97(1, MSU 1591), 109(3, MSU 1592),

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
39	Tributary to Hathie River, MS	8-Apr-71	Clemmer, Bennett	339000	3849000	19(9, MSU 3754), 28(1, MSU 3755), 37(24, MSU 3753), 50(6, MSU 3756), 54(1, MSU 3752), 113(1, MSU 3758), 82(2, MSU 3757), 119(1, MSU 3759)
40	Tuscumbia River, MS	8-Apr-71	Clemmer, Heins	337000	3868100	30(49, MSU 2660), 40(4, MSU 2661), 44(26, MSU 2662), 82(11, MSU 2663), 84(9, MSU 2664), 94(7, MSU 2665), 96(55, MSU 2666), 97(15, MSU 2667), 99(1, MSU 2668), 109(11, MSU 2669), 115(12, MSU 2670)
41	Hatchie River at TN 54 bridge, Tipton Co., TN	17-Oct-71	Perry, Starnes, Oakberg, Henson, Saylor, Etnier	35 34 05	89 29 04	21, 24, 25(23, UT 44.592), 30, 36, 38, 44, 48, 67, 69,70, 73(1, UT 48.96), 81, 83, 84, 93, 98, 102, 103, 104, 106(30, UT 91.597), 107(8, UT 91.596), 108(1, UT 91.599), 109, 112(4, UT 91.598), 120, 122(24, UT 91.601)
42	Hatchie River at Essary Springs, Hardeman Co., TN	4-May-72	Etnier, Starnes, Saylor, Perry, Henson, Oakberg	35 00 40	88 47 41	19(56, UT 44.616)
43	Cane Creek at US 72 bridge, Alcorn Co., MS	30-Jul-72	Starnes, Nagy, Saylor	34 55 52	88 34 47	10, 28, 30, 36, 37(4, UT 44.823), 46, 50, 51, 54, 64, 75(2, UT 38.21), 82(5, UT 60.77), 83, 84, 93, 94, 96
44	Tarebreeches Creek at US 72 bridge, Alcorn Co., MS	30-Jul-72	Starnes, Nagy, Saylor	34 55 56	88 39 09	24(1, UT 44.851), 28, 36, 37, 50, 93
45	Bridge Creek at US 72 bridge, Alcorn Co., MS	31-Jul-72	Starnes, Nagy, Saylor	34 54 40	88 29 44	15, 28, 30, 36, 37, 46, 63, 64, 75, 82(10, UT 60.82), 83, 98(5, UT 90.764), 109(2, UT 91.912)
46	Hinkle Creek at US 45 bridge, Alcorn Co., MS	31-Jul-72	Starnes, Nagy, Saylor	34 46 22	88 33 36	31, 36, 46, 50, 82, 93, 96
47	Kings Creek at US 45 bridge, Prentiss Co., MS	31-Jul-72	Starnes, Nagy, Saylor	34 41 33	88 35 13	28, 31, 37, 46, 50, 82, 83, 93

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
48	Moores Creek ca 4 air miles E of Tuscumbia River, Prentiss Co., MS	31-Jul-72	Starnes, Nagy, Saylor	34 44 40	88 27 14	28
49	Polly's Creek at US 45 bridge, Prentiss Co., MS	31-Jul-72	Starnes, Nagy, Saylor	34 44 04	88 33 37	19, 37(6, UT 44.843), 46, 50, 54, 63, 83, 93, 96
50	Unnamed Tributary to Bridge Creek at US 72 bridge, Alcorn Co., MS	31-Jul-72	Starnes, Nagy, Saylor	34 55 22	88 31 07	28, 31, 36, 46, 50, 82(2, UT 60.83), 93, 96, 97(1, UT 90.203), 113(1, UT 91.930), 116
51	Unnamed Tributary to Tuscumbia River, S of Paramicha Creek, at US 45, Alcorn Co., MS	31-Jul-72	Starnes, Nagy, Saylor	34 48 30	88 33 35	36, 63, 82, 83, 93, 98, 109(5, UT 91.912), 111
52	Boles Branch at Cypress Rd., E side of Big Hill Pond State Park, McNairy Co., TN	1-Aug-72	Starnes, Nagy, Saylor	35 02 58	88 42 27	31, 60, 82(3, UT 60.75), 94, 97(2, UT 90.1288), 116(1, UT 91.530), 117(1, UT 91.913)
53	Mosses Creek at Dunaway Rd., McNairy Co., TN	1-Aug-72	Starnes, Nagy, Saylor	35 07 54	88 40 38	28(31, UT 44.819), 31, 36, 46, 54, 60(1, UT 45.191), 72, 75, 82(5, UT 60.90), 91(1, UT 90.104), 94, 97(2, UT 90.2510), 100(2, UT 90.2512), 103, 109, 117, 119(3, UT 91.920)
54	Nail Creek at Eldie Foster Rd., McNairy Co., TN	1-Aug-72	Starnes, Nagy, Saylor	35 08 39	88 42 14	36, 54, 60, 63, 75, 78, 82, 83, 91, 94, 96, 97, 111
55	Reedy Branch at Blankenship Rd., McNairy Co., TN	1-Aug-72	Starnes, Nagy, Saylor	35 04 45	88 39 06	28(7, UT 44.840), 54, 82(1 UT 60.77), 91(2, UT 90.104), 111, 114, 117(9, UT 91.905), 119(1, UT 91.897)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
56	Unnamed Tributary to Mosses Creek at Taylor Rd., McNairy Co., TN	1-Aug-72	Starnes, Nagy, Saylor	35 06 43	88 43 47	28(7, UT 44.840), 50, 54(6, UT 45.192), 72, 78, 82(7, UT 60.91), 97(3, UT 90.110)
57	Cypress Creek at Falcon-New Bethel Rd., ca. 0.3 miles W of Falcon, McNairy Co., TN	2-Aug-72	Starnes, Nagy, Saylor	35 08 52	88 36 17	15, 28(6, UT 44.845), 30, 36, 46, 63, 82(1, UT 60.79), 93, 98(1, UT 90.762), 117
58	Kise Creek at Whitten Rd., McNairy Co., TN	2-Aug-72	Starnes, Nagy, Saylor	35 13 52	88 45 38	50, 98
59	Little Hatchie Creek at Joe Kirby Rd., McNairy Co., TN	2-Aug-72	Starnes, Nagy, Saylor	35 15 42	88 41 22	19, 28, 31, 46, 72, 82, 91, 94, 103, 117(3, UT 91.921), 120
60	Muddy Creek at TN 234, McNairy Co., TN	2-Aug-72	Starnes, Nagy, Saylor	35 03 30	88 37 37	37, 46, 50, 114
61	Muddy Creek at US 45 bridge, McNairy Co., TN	2-Aug-72	Starnes, Nagy, Saylor	35 02 56	88 32 04	15, 31, 36, 37(6, UT 44.846), 46, 54, 63, 78, 82(4, UT 60.82), 114
62	Rose Creek at Loop Rd., ca. 2 miles above the mouth of Wilson Creek, McNairy Co., TN	2-Aug-72	Starnes, Nagy, Saylor	35 12 34	88 40 37	28(3, UT 44.832), 31, 36, 50, 82(1, UT 60.75), 91, 97, 98, 119(8, UT 91.897)
63	East Fork Spring Creek at TN 57 bridge, ca. 10 miles Eof Grand Junction, Hardeman Co., TN	3-Aug-72	Starnes, Nagy, Saylor	35 00 50	88 44 15	19, 28, 30, 36, 46, 50, 69(1, UT 48.183), 72, 82(6, UT 60.91), 83, 118

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
64	Marshall Creek at Van Buren Rd., ca. 3.0 miles N of Van Buren, Hardeman Co., TN	3-Aug-72	Starnes, Nagy, Saylor	35 09 43	89 04 01	30(53, UT 44.852), 31(2, UT 44.834), 36, 56(1, UT 45.187), 82(1, UT 60.83), 97, 109, 117(6, UT 91.934), 118(1, UT 91.909), 120(4, UT 91.919)
65	Saulsbury Creek at Slaulsbury-Mississippi State Line Rd., Hardeman Co., TN	3-Aug-72	Starnes, Nagy, Saylor	35 01 09	89 04 58	50, 72(30, UT 48.175), 78, 82, 93, 96, 114(7, UT 91.908), 117(4, UT 91.927), 118
66	Spring Creek at County Rd. 8158, Lake Hardeman Rd., Hardeman Co., TN	3-Aug-72	Starnes, Nagy, Saylor	35 08 05	89 02 15	23, 24, 30, 31, 37, 46, 56(2, UT 45.188), 62, 69(5, UT 48.176), 70(3, UT 48.157), 72, 75, 78, 81(5, UT 60.84), 94, 96, 98, 103, 107, 109(1, UT 91.899), 111(3, UT 91.4308), 113, 115(1, UT 91.519), 117, 119, 120(8, UT 91.901)
67	West Fork Spring Creek at Van Buren Rd., ca. 4.0 miles N of Saulsbury, Hardeman Co., TN	3-Aug-72	Starnes, Nagy, Saylor	35 06 06	89 04 56	46, 54, 56, 72(4, UT 48.171), 78, 97, 113, 117(8, UT 91.921), 118(15, UT 91.851), 120(2, UT 91.914)
68	Clear Creek at US 64, Hardeman Co., MS	4-Aug-72	Starnes, Nagy, Saylor	35 18 42	89 07 35	19, 46, 68(1, UT 48.170), 78, 82(3, UT 60.80), 94, 109(11, UT 91.912), 120(1, UT 91.925)
69	Grays Creek at TN 18, Hardeman Co., MS	4-Aug-72	Starnes, Nagy, Saylor	35 17 53	88 57 19	23, 36, 54, 63, 64, 72, 78, 82(1, UT 60.75), 91(3, UT 90.109), 94, 96, 98, 103, 111, 115(4, UT 91.900), 117(4, UT 91.913)
70	Mill Creek at Cloverport Rd., Hardeman Co., TN	4-Aug-72	Starnes, Nagy, Saylor	34 19 32	88 58 49	36, 46

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
71	Pleasant Creek at mouth of Potters Creek on N side of Bolivar-Somerville Rd., Hardeman Co., TN	4-Aug-72	Starnes, Nagy, Saylor	35 15 16	89 02 05	19(1, UT 44.859), 30, 36, 50, 72(9, UT 48.182), 73(1, UT 48.180), 118, 120(3, UT 91.919)
72	Spring Creek at TN 125, Hardeman Co., TN	4-Aug-72	Starnes, Nagy, Saylor	35 14 37	88 58 38	19, 30, 46, 50, 56, 62, 69, 72, 73, 75, 91, 98, 111, 113, 117, 120
73	Cub Creek at TN 125, Hardeman Co., TN	5-Aug-72	Starnes, Nagy, Saylor	35 10 07	88 55 16	36 50 72, 82, 93
74	Cypress Creek at Pea Vine Rd., ca. 3.5 miles NW of Pocahontas, Hardeman Co., TN	5-Aug-72	Starnes, Nagy, Saylor	35 05 00	88 50 11	30, 68, 76, 78, 82, 84, 90(4, UT 90.107), 93, 96, 111, 117
75	Magbee Branch at Serles Rd., ca. 5.0 miles E of TN 125, Hardeman Co., TN	5-Aug-72	Starnes, Nagy, Saylor	35 09 59	88 50 20	23, 36, 64, 68, 75, 76, 78, 82(2, UT 60.82), 83, 84, 90, 91, 93, 94, 98, 111(4, UT 91.911), 117
76	Muddy Creek at Pea Vine Rd., ca. 0.2 miles NW of Pocahontas, Hardeman Co., TN	5-Aug-72	Starnes, Nagy, Saylor	35 04 23	88 49 09	19, 28, 30, 37(3, UT 44.830), 46, 67, 68, 83, 93, 96, 103, 109, 119
77	Slough to Porters Creek, just S of Porters Creek, at Pea Vine Rd., Hardeman Co., TN	5-Aug-72	Starnes, Nagy, Saylor	35 05 04	88 53 46	36, 40, 44, 81, 84, 93, 94, 95, 96, 103
78	Tuscumbia River slough at Wolf Penn Rd., McNairy Co., TN	5-Aug-72	Starnes, Nagy, Saylor	35 01 03	88 43 56	37, 68, 81(3, UT 60.74), 84(2, UT 158.118), 94, 96, 109

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
79	Hatchie River at Wolf Penn Rd., McNairy Co., TN	6-Aug-72	Starnes, Nagy, Saylor	35 02 30	88 47 08	15, 19, 21(2, UT 44.836), 30, 38, 48(30, UT 44.817), 56(1, UT 45.189), 62, 64, 67, 69(2, UT 48.162), 70(1, UT 48.165), 72, 73(6, UT 48.178), 81, 90, 100, 103, 117, 119(2, UT 91.902), 122(3, UT 91.798)
80	Jeffers Creek, ca. 0.7 miles above mouth, Haywood Co., TN	7-Aug-72	Starnes, Nagy, Saylor	35 29 06	89 07 50	78, 94, 96, 98
81	Slough to Bear Creek, ca. 1.5 miles W of Hillville, Haywood Co., TN	7-Aug-72	Starnes, Nagy, Saylor	35 27 12	89 08 12	81, 83, 96, 111
82	Clover Creek at TN 18, ca. 0.8 miles S of Madison Co. line, Hardeman Co., TN	8-Aug-72	Starnes, Nagy, Saylor	35 25 17	88 52 49	19(UT 44.850), 28(7, UT 44.845), 30, 31, 37, 46, 54, 56, 60, 62(2, UT 45.183), 72(2, UT 48.175), 75, 78, 82(1, UT 60.87), 93, 94, 96, 100, 103, 109, 117(7, UT 91.903), 120(9, UT 91.914)
83	Cypress Creek at Herbert Willis Rd., Haywood Co., TN	8-Aug-72	Starnes, Nagy, Saylor	35 34 28	89 25 29	30, 31(6, UT 44.854), 36, 64, 68(1, UT 48.170), 75, 78, 81(1, UT 60.81), 83, 96, 98(2, UT 90.201)
84	Hatchie River at TN 18 bridge, Hardeman Co., TN	8-Aug-72	Starnes, Nagy, Saylor	35 16 53	88 58 27	8, 15, 19, 21, 24, 25, 30, 31, 36, 44, 46, 48, 64, 67, 69(2, UT 48.173), 70(3, UT 48.167), 72(3, UT 48.171), 73, 75, 78, 82(1, UT 60.86), 93, 96, 98, 103, 109, 111, 117(7, UT 91.934), 119(2, UT 91.920), 122(5, UT 91.798)
85	Hatchie River at TN 54 bridge, Tipton Co., TN	8-Aug-72	Starnes, Nagy, Saylor	35 34 05	89 29 04	8, 9, 21, 24, 48, 60(1, UT 45.184), 81, 107(3, UT 91.906), 119(1, UT 91.895)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
86	Little Muddy Creek, at US 79, 2.5 mi SW of Stanton, Lower Hatchie, Haywood Co., TN	8-Aug-72	Starnes, Nagy, Bouchard	35 27 02	89 26 20	63, 81, 83, 93, 98
87	Unnamed Tributary to Lagoon Creek, ca. 1.0 miles S of St. Peter Chapel, Haywood Co., TN	8-Aug-72	Starnes, Nagy, Saylor	35 38 18	89 22 58	63, 68(1, UT 48.170), 96
88	Tuscumbia River at Wolf Penn Rd., McNairy Co., TN	10-Aug-72	Starnes, Nagy, Saylor	35 00 53	88 44 16	21, 25, 30, 38, 44, 46, 48, 62, 73(1, UT 48.180), 103, 109(14, UT 91.933), 111, 112, 117(40, UT 91.928), 119(3, UT 91.923), 120, 122(1, UT 91.936), 125
89	Coal Creek at Antioch Rd., Tipton Co., TN	11-Aug-72	Starnes, Nagy, Bouchard	35 35 37	89 47 28	31, 64, 68(6, UT 48.170), 75, 78, 81(1, UT 60.81), 83, 96, 98(6, UT 90.200), 109(2, UT 91.926), 111(6, UT 91.932)
90	Wesley Lake off US 70-79, Haywood Co., TN	11-Aug-72	Starnes, Nagy, Saylor	35 30 40	89 21 58	19, 40(3, UT 44.863), 44(2, UT 44.828), 64, 68, 78, 81(1, UT 60.81), 90, 93, 94, 96, 115, 117(1, UT 91.3516)
91	Hatchie River at TN 54 bridge, Tipton Co., TN	12-Aug-72	University of Tennessee Ichthyology Class	35 34 05	89 29 04	15, 24, 25, 38, 48, 67, 73, 75, 78, 96, 98, 104, 106(10, UT 91.597), 107(1, UT 91.596), 109, 112(1, UT 91.598), 119(2, UT 91.710), 121(1, UT 91.709), 122
92	Horseshoe Lake near Haywood-Tipton Co. line, Haywood Co., TN	12-Aug-72	University of Tennessee Ichthyology Class	35 32 58	89 28 03	64, 76, 81, 83, 84, 90(21, UT 91.108), 93, 94, 110(14, UT 91.924)
93	Rocky Branch at Bride Rd., Tipton Co., TN	12-Aug-72	Starnes, Nagy, Bouchard	35 35 39	89 42 44	63, 64, 97, 98(3, UT 90.199)

Table B1. (continued)

ID	Locality	Date	Collectors	Y	X	Species list
94	Grays Creek at Top Rd., ca. 0.7 miles E of Willoughby, Hardeman Co., TN	13-Aug-72	Starnes, Nagy, Bouchard	39 19 49	88 54 20	28(9, UT 44.844), 50, 72(6, UT 48.182), 78, 82(13, UT 60.87), 93, 97(2, UT 90.198), 114(4, UT 91.908), 117(3, 91.918)
95	Lane Branch at TN 125, Hardeman Co., TN	13-Aug-72	Starnes, Nagy, Bouchard	35 11 43	88 55 50	24, 28, 31, 36, 37, 50, 54, 62, 63, 64, 68, 72(57, UT 48.174), 75(2, UT 38.28), 78, 81, 82(24, UT 60.92), 83, 93, 94, 98, 103, 117(6, UT 91.905), 119
96	Prairie Branch at Pea Vine Rd., ca. 2.0 miles N of Lacy, Hardeman Co., TN	13-Aug-72	Starnes, Nagy, Bouchard	35 07 40	88 51 16	17, 50, 54, 63, 82, 93, 114
97	Slough to Porters Creek, just S of Porters Creek, at Pea Vine Rd., Hardeman Co., TN	13-Aug-72	Starnes, Nagy, Bouchard	35 05 04	88 53 46	8, 15, 23, 36, 40, 44, 68, 78, 81, 83, 84, 90, 94, 95, 96, 103, 115
98	Pleasant Creek mouth and cut-off of Hatchie River, ca. 1.0 miles N of TN 18, Hardeman Co., TN	14-Aug-72	Starnes, Nagy, Bouchard	35 15 16	89 02 05	23(1, UT 44.833), 24(49, UT 44.1284), 30, 36, 44, 48, 50, 64, 67, 73, 76(1, UT 38.23), 78, 82, 90, 93, 94, 96, 97(1, UT 90.196), 98(2, UT 90.197)
99	Short Creek at TN 100, Hardeman Co., TN	14-Aug-72	Starnes, Nagy, Bouchard	35 20 37	89 01 28	7, 10(2, UT 26.2), 15, 30, 44, 60, 64, 68, 70(3, UT 48.167), 72, 75(4, UT 38.24), 76(1, UT 38.11), 78, 81, 82(1, UT 60.87), 83, 84, 90, 91, 93, 94, 98, 100, 105, 109(6, UT 91.926), 111(12, UT 91.922), 116, 117(21, UT 91.927), 119(1, UT 91.897)
100	Frog Branch at US 51, Tipton Co., TN	15-Aug-72	Starnes, Nagy, Bouchard	35 36 16	89 37 52	20, 30, 31, 45, 46, 50, 54, 64, 81(2, UT 60.81), 83, 98(6, UT 90.111), 114(4, UT 91.908)
101	Hatchie River near Rialto, Lauderdale Co., TN	15-Aug-72	Obtained from fisherman by Starnes	35 37 35	89 36 20	58, 74

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
102	Indian Creek at Randolph Rd., Tipton Co., TN	15-Aug-72	Starnes, Nagy, Bouchard	35 34 34	89 50 04	20, 24(UT 44.824), 50, 51, 54, 64, 68(7, UT 48.177), 78, 82(2, UT 60.89), 83, 98
103	Champion Lake off TN 87, Lauderdale Co., TN	16-Aug-72	Starnes, Nagy, Bouchard	35 36 08	89 51 44	40(6, UT 44.835), 64, 78, 80, 81(4, UT 60.85), 83, 84, 94, 96, 100, 103, 105, 110(4, UT 91.931)
104	Lagoon Creek off TN 19, S of Nutbush, Haywood Co., TN	16-Aug-72	Starnes, Nagy, Bouchard	35 39 39	89 24 33	36, 63, 64, 68, 81, 83, 93, 109, 111
105	Hatchie River at US 70-79 bridge, Haywood Co., TN	17-Aug-72	Starnes, Nagy, Bouchard	35 29 03	89 22 44	21(8, UT 44.826), 24, 30, 38, 48(27, UT 44.818), 84, 98, 109
106	Little Muddy Creek at Co. Rd. 8052, Haywood Co., TN	17-Aug-72	Starnes, Nagy, Bouchard	35 28 39	89 27 10	10, 23, 36, 44, 75, 83, 91, 94, 109
107	Sugar Creek at Sugar Creek Rd., ca. 1.5 miles W of Sunny Hill, Haywood Co., TN	17-Aug-72	Starnes, Nagy, Bouchard	35 32 25	89 16 44	36, 50, 54, 63, 64, 72, 75, 83, 84, 93, 94, 96, 98(4, UT 90.478), 103, 111, 114
108	Unnamed Tributary to Carter Creek at Beech Grove Rd., ca. 3.5 miles E of Sunny Hill, Haywood Co., TN	17-Aug-72	Starnes, Nagy, Bouchard	35 32 30	89 12 00	28, 36, 50, 63, 64, 78, 81, 93, 97
109	Cane Creek ca. 1.0 miles SE of Lightfoot, Lauderdale Co., TN	18-Aug-72	Starnes, Nagy, Bouchard	35 44 30	89 37 28	20, 22, 63, 64, 67, 81(1, UT 60.88), 83, 93, 98(1, UT 90.112)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
110	Piney Creek at at County Rd. 8198, Walnut Grove-Ebenezer Rd., ca. 5.0 miles SE of Willoughby, Hardeman Co., TN	18-Aug-72	Starnes, Nagy, Bouchard	35 16 25	88 54 47	15, 19(47, UT 44.860), 24, 25, 28(6, UT 44.864), 30, 31, 37(4, UT 44.825), 46(8, UT 44.835), 48, 50, 54, 56(3, UT 45.186), 64, 67(1, UT 48.155), 69(6, UT 48.183), 70(1, UT 48.163), 71(9, UT 48.164), 72(17, UT 48.179), 73(1, UT 48.166), 78, 82(4, UT 60.78), 83, 93, 94, 113(1, UT 91.917), 117(16, UT 91.903), 120(7, UT 91.896), 122(3, UT 91.904)
111	Muddy Creek at Chewalla Rd., McNairy Co., TN	19-Aug-72	Starnes, Nagy, Bouchard	35 03 30	88 37 37	75
112	Tuscumbia River at Watson bridge, McNairy Co., TN	19-Aug-72	Starnes, Nagy, Bouchard	35 01 35	88 45 00	19, 21(12, UT 44.836), 22, 28, 30(141, UT 44.820), 37(2, UT 44.843), 44, 46(9, UT 44.835), 48, 64, 67, 68(2, UT 48.121), 69(1, UT 48.159), 70(1, UT 48.163), 71,(1, UT 48.156), 73(1, UT 48.160), 82(3, UT 60.86), 90, 93, 98, 103, 109(3, UT 91.926), 111(1, UT 91.922), 113, 122(2, UT 91.916), 125
113	Hatchie River at Co. Rd. 163, Union Co., MS	20-Aug-72	Starnes, Nagy	34 34 52	88 48 57	28(9, 44.829), 30, 31, 37(6, UT 44.830), 50, 54, 72, 75, 82(2, UT 60.80), 93, 96, 113, 114, 120
114	Hurricane Creek at MS 15, ca. 1.5 miles S of Walnut, Tippah Co., MS	20-Aug-72	Starnes, Nagy	34 55 33	88 54 13	19(34, UT 44.857), 37(60, UT 44.862), 50, 64, 93
115	Little Hatchie River at MS 2, Tippah Co., MS	20-Aug-72	Starnes, Nagy	34 45 00	88 50 03	19(26, UT 44.842), 37(5, UT 44.846), 38(5, UT 44.827), 46, 64, 67, 69(2, UT 48.184), 75, 82, 96, 113(1, UT 91.930), 117, 120(5, UT 91.925)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
116	Little Hatchie River at MS 370, Tippah Co., MS	20-Aug-72	Starnes, Nagy	34 41 30	88 53 18	19(10, UT 44.857), 28(9, UT 44.831), 30, 37(3, UT 44.825), 50, 54(4, UT 45.185), 64, 72(29, UT 48.161), 74, 82(7, UT 60.73), 93, 94, 120(5, UT 91.925)
117	Owl Creek, ca. 0.8 miles N of MS 4, Tippah Co., MS	20-Aug-72	Starnes, Nagy	34 44 29	88 53 37	19(26, UT 44.855), 37(104, UT 44.837), 46, 82(1, UT 60.86), 93, 96, 103
118	Hatchie River at first bridge S of US 72, Alcorn Co., MS	22-Aug-72	Starnes, Nagy, Saylor	34 54 36	88 47 56	30, 37, 38, 46, 48, 69(2, UT 48.173), 72, 73, 78, 82(1, UT 60.83), 84, 93, 96, 111(4, UT 91.911), 119(1, UT 91.920)
119	Tuscumbia River at mouth of first creek S of Paramicha Creek, Alcorn Co., TN	22-Aug-72	Starnes, Nagy	34 53 00	88 33 54	19(19, UT 44.838), 21(3, UT 44.836), 24, 28(1, UT 44.831), 37(13, UT 44.822), 46, 48, 69(2, UT 48.159), 82, 83, 93, 103, 113(2, UT 91.1358), 117, 119(1, UT 91.902), 122
120	Tuscumbia River at Smith Bridge Rd., Alcorn Co., MS	22-Aug-72	Starnes, Nagy	34 56 47	88 36 40	21, 30, 37, 63, 96, 98, 109, 111, 117
121	Spring Creek, ca. 0.7 miles upstream of Hammer Creek and ca. 8.0 miles SSW of Bolivar, Hardeman Co., TN	24-Aug-72	Starnes, Nagy	35 11 13	89 01 56	19, 30, 36, 46, 54, 56, 64, 69, 70(5, UT 48.172), 72(17, UT 48.171), 78, 82(2, UT 60.80), 83, 90(1, UT 90.107), 93, 94, 103, 113, 115(4, UT 91.190), 116, 117(12, UT 91.921)
122	Brush Creek, ca. 2.0 air miles E of Bridge Creek, Alcorn Co., MS	27-Aug-72	Starnes, Wyatt	34 54 23	88 28 24	28, 54, 72, 75, 78, 82(2, UT 60.73), 98, 117(3, UT 91.898), 119(1, UT 91.902)
123	Muddy Creek at MS 354, ca. 1.0 miles E of Walnut, Tippah Co., MS	27-Aug-72	Starnes, Wyatt	34 56 20	88 53 03	19(49, UT 44.859), 24, 28(3, UT 44.844), 31, 37(19, UT 44.841), 46, 50, 63, 67, 69(3, UT 48.173), 75, 82(9, UT 60.79), 93, 94, 117(1, UT 91.921), 120(2, UT 91.914)
124	Tuscumbia River, MS	30-Aug-72	Schultz, Shaw, Griffin	354300	3866500	92(7, MMNS 20163)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
125	Champion Lake off TN 87, Lauderdale Co., TN	10-Oct-72	Etnier, Starnes, Saylor, Perry, Henson, Oakberg	35 36 08	89 51 44	7, 10, 15, 76, 78, 80(20, UT 60.76), 81(22, UT 60.88), 83, 84(20, UT 158.21), 94, 95, 96, 99, 100(55, UT 90.106), 101(28, UT 90.102), 102, 104, 105, 110(2, UT 91.931)
126	Hatchie River at TN 54 bridge, Tipton Co., TN	4-Aug-73	University of Tennessee Ichthyology Class	35 34 05	89 29 04	14(1, UT 29.10), 21(1), 24(84), 25(148, UT 44.805), 30(2), 48(52), 67(1), 76(1), 82(2, UT 60.71), 83(1), 84(2), 95(15, UT 90.99), 96(1), 98(1), 102(1), 106(8), 107(6), 109(6), 120(1), 122(1), 125(1)
127	Pleasant Creek at mouth of Potters Creek on N side of Bolivar-Somerville Rd., Hardeman Co., TN	27-Apr-74	Starnes et al.	35 15 16	89 02 05	19(1), 64(2), 117(3), 118(1)
128	Hatchie River at mouth with Mississippi River, Tipton Co., TN	28-Oct-74	Etnier, Starnes, et al.	35 34 12	89 53 24	11(2, UT 36.8)
129	Muddy Creek, MS	23-Jun-75	Teels, et al.	326600	3863000	19(21, MMNS 7032), 28(3, MMNS 7028), 50(9, MMNS 7027), 82(2), 102(1, MMNS 7031)
130	Tuscumbia River, MS	28-Dec-79	FA Cook	346000	3873000	36(6, MMNS 4029)
131	Mosses Creek at Dunaway Rd., McNairy Co., TN	23-Oct-80	Bouchard	35 07 54	89 40 38	114(12, UT 91.860), 115(2, UT 91.146)
132	Spring Creek at TN 125, Hardeman Co., TN	6-Jun-81	Greenburg, Duersch	35 14 33	88 58 36	19(CU 65760), 31(CU 65761), 46(CU 65763), 62(CU 65772), 78(CU 65767), 94(CU 65764), 98(CU 65765), 107(CU 65768), 109(CU 65769), 116(CU 65770), 120(65771)
133	Hurricane Creek, MS	15-Jul-81	CE Hollis	363050	3853100	29(1, MMNS 20819)
134	Moores Branch, MS	15-Jul-81	CE Hollis	361600	3848600	28(2, MMNS 8092), 50(2, MMNS 8096), 82(29, MMNS 8096), 83(2, MMNS 8095)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
135	West Fork Spring Creek at Van Buren Rd., ca. 4.0 miles N of Saulsbury, Hardeman Co., TN	19-Sep-81	Etnier, et al.	35 06 07	89 04 59	3(12, UT 2.101), 19(4, UT 44.2438), 24(54, UT 44.2436), 30(124, UT 44.2439), 36(23, UT 44. 2437), 46(29, UT 44.2440), 54(6, UT 45.394), 56(3, UT 45.395), 69(25, UT 48.421), 72(24, UT 48.422), 78(16, UT 80.15), 82(10, UT 60.229), 83(4, UT 61.31), 94(1, UT 90.566), 97(22, UT 90.567), 100(1, UT 90.568), 113(34, UT 91.2286), 115(11, UT 91.2283), 117(19, UT 91.2285), 118(40, UT 91.2284), 120(33, UT 91.2287)
136	West Fork Spring Creek at Van Buren Rd., ca. 4.0 miles N of Saulsbury, Hardeman Co., TN	16-May-82	University of Tennessee Regional Faunas Class	35 06 07	89 04 59	3(41), 19(7), 24(23), 30(4), 31(4), 36(14), 46(5), 54(4, UT 45.394), 56(3, UT 45.395), 69(11), 72(19), 75(5, UT 38.66), 78(9, UT 80.15), 82(8, UT 60.229), 83(1), 96(1), 97(12, UT 90.567), 100(3, UT 90.568), 109(1, UT 91.2348), 113(14, UT 91.2286), 115(3, UT 91.2283), 117(7, UT 91.2285), 118(32, UT 91.2385), 120(19)
137	Hurricane Creek at TN 59 bridge, Tipton Co., TN	17-May-82	University of Tennessee Regional Faunas Class	35 31 54	89 50 53	31, 82, 96, 98, 109

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
138	Hatchie River at TN 54 bridge, Tipton Co., TN	22-Oct-83	Etnier, et al.	35 34 05	89 29 04	7(1, UT 25.25), 19(2), 20(2, UT 44.3066), 21(79, UT 44.3065), 23(10, UT 44. 3067), 24(25), 25(110, UT 44.3062), 30(1), 36(5), 38(17), 40(32, UT 44.3063), 44(29, UT 44. 3064), 48(109), 60(3, UT 45.474), 70(6, UT 48.476), 71(4, UT 48.475), 74(1, UT 48.474), 78(3), 81(18, UT 60.297), 82(20, UT 60.296), 83(5), 84(57), 93(1), 94(9), 95(38, UT 90.697), 96(50, UT 90.695), 97(1, UT 90.698), 98(20), 102(2), 103(1), 104(6), 106(11, UT 91.2651), 107(4, UT 91.2650), 109(19), 111(1), 112(4, UT 91.2649), 115(3), 117(2), 120(9), 122(7), 95 X 98(1, UT 90.696)
139	Hatchie River at TN 76 bridge, Haywood Co., TN	23-Oct-83	Etnier, et al.	35 31 15	89 15 25	19(56, UT 44.3070), 21, 24(60, UT 44.3068), 25(19, UT 44.3069), 30(28, UT 44.3071), 38(7), 42(1, UT 44.3072), 44(3), 48(70), 67(1), 69(7, UT 48.477), 70(5, UT 48.478), 71(5, UT 48.479), 73(2, UT 48.480), 78(1), 82, 84(1), 93(1), 96(3), 97(2, UT 90.699), 98(1), 106(17, UT 91.2652), 109(17, UT 91.2653), 112(4, UT 91.2654), 115(2), 117(6, UT 91.2655), 120(2), 122(3)
140	Maness Branch, MS	25-Oct-83	Jones, Wiseman	366200	3856500	72(1, UMS 1580), 117(2, UMS 1732)
141	Unknown MS	10-Jun-88	Parsons, Richardson	338200	3843200	73(2)
142	Unknown MS	20-Jun-88	Parsons	338300	3843400	73(5)
143	Unknown MS	20-Jun-88	Parsons, Richardson	340800	3845800	73(1)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
144	Hatchie River at TN 54 bridge, Tipton Co., TN	22-Oct-88	University of Tennessee Ichthyology Class	35 34 05	89 29 04	19(3), 21(32), 23(2, UT 44.4452), 24(2, UT 44.4453), 25(13), 30(10, UT 44.4454), 40(12, UT 44.4455), 48(132), 67(4), 70(4, UT 48.652), 71(2, UT 48.653), 81(8, UT 60.423), 82(5, UT 60.424), 83(5), 84(3), 94(1, UT 90.1101), 95(10), 96(6), 98(22, UT 90.1102), 102(2, UT 90.110), 104(1, UT 90.1098), 105(1, UT 90.1099), 106(3, UT 91.3484), 107(25, UT 91.3485), 109(29, UT 91.3486), 110(1, UT 91.3487), 112(3, UT 91.3488), 115(1, UT 91.3489), 117(4, UT 91.3490), 120(9, UT 91.3491), 121(2, UT 91.3492), 122(3, UT 91.3493)
145	Unknown MS	26-Aug-89	Parson, Sylvester	337400	3869300	73(1)
146	Spring Creek at Saulsbury-Hickory Valley Rd., ca. 4.0 miles NE of Saulsbury, Hardeman Co., TN	23-Oct-89	TWRA Biologists	35 06 07	89 02 47	3(1), 19(11), 64(1), 69(3), 71(5), 78(8), 81(31), 93(5), 94(1), 98(5), 106(1), 109(2), 112(1), 117(5), 120(1)
147	Spring Creek at TN 125, Hardeman Co., TN	23-Oct-89	TWRA Biologists	35 14 35	88 58 38	19(13), 30(9), 46(4), 69(1), 71(5), 81(2), 93(1), 98(4), 117(3), 120(2)
148	Cane Creek at Charlie Jones Rd., ca. 2.0 miles ESE of Lightfoot, Lauderdale Co., TN	4-Apr-90	TWRA Biologists	35 44 30	88 58 38	20(40), 22(2), 45(4), 46(1), 63(6), 64(4), 82(4), 83(1), 93(74), 94(10), 96(5), 98(3)

Table B1. (continued)

ID	Locality	Date	Collectors	Y	X	Species list
149	Big Muddy Creek at Joyners Campground Rd., ca. 9.0 miles N of Somerville, Madison Co., TN	31-May-90	TWRA Biologists	35 21 52	89 20 22	24(6), 36(2), 82(7), 93(2), 96(6), 98(6)
150	Big Muddy Creek at US 70, ca. 9.0 miles SW of Brownsville, Haywood Co., TN	31-May-90	TWRA Biologists	35 29 03	89 22 44	19(3), 21(4), 24(22), 30(2), 60(2), 75(1), 82(1), 91(1), 93(2), 94(4), 96(5), 125(2)
151	Big Muddy Creek at US 70-79 bridge, Haywood Co., TN	11-Jun-90	Etnier, Starnes, Bryant	35 29 03	89 22 44	76(1, UT 38.125), 78(5, UT 80.45), 80(6, UT 60.526), 82(1), 83(1), 91(2, UT 90.1437), 97(3, UT 90.699), 99(1, UT 90.1328), 100(1, UT 90.1439), 101(1, UT 90.1438)
152	East Fork Spring Creek at Saulsbury-Hickory Valley Rd., Hardeman Co., TN	11-Jun-90	Etnier, Starnes, Bryant	35 03 06	89 01 46	19, 30, 46, 73(1, UT 48.760), 82, 95(1), 117(1), 120(1)
153	Hatchie River at TN 54 bridge, Haywood Co., TN	11-Jun-90	Etnier, Starnes, Bryant	35 34 05	89 29 04	15(1), 21, 24, 44(7, UT 44.3062), 48, 67(1), 70(1, UT 48.652), 75(3), 78, 82(2, UT 60.296), 94, 95(1, UT 90.697), 96, 97, 103, 104, 109(17, UT 91.3486), 111(4, UT 91.4291), 115(2, UT 91.3489), 119(1, UT 91.710), 121(2, UT 91.3492)
154	Hatchie River overflows at US 70-79 bridge, Haywood Co., TN	11-Jun-90	Etnier, Starnes, Bryant	35 31 21	89 20 57	36, 75, 76, 78, 80(4, UT 60.529), 81(8, UT 60.499), 83, 84, 90, 94, 96, 97(2, UT 90.699), 99, 101(5, UT 90.140), 103, 104, 110(6, UT 91.3487)
155	Lane Branch at TN 125, Hardeman Co., TN	11-Jun-90	Etnier, Starnes, Bryant	35 11 43	88 55 50	19(1, UT 44.5727), 37(12, UT 44.5727), 72(1, UT 48.761), 93

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
156	Porter Creek at Pea Vine Rd., Hardeman Co., TN	11-Jun-90	Etnier, Starnes, Bryant	35 09 25	88 55 00	21(2, UT, 44.5726), 46, 95, 96, 98, 113
157	Grays Creek at Top Rd., ca. 0.7 miles E of Willoughby, Hardeman Co., TN	12-Jun-90	Etnier, Starnes, Bryant	35 19 50	88 54 19	3, 19, 50, 83, 93, 114, 117
158	Spring Creek at TN 125, Hardeman Co., TN	12-Jun-90	Etnier, Starnes, Bryant	35 14 37	88 58 38	19(17, UT 44.2438), 21(2, UT 44.310), 24(4), 30(10), 31(5, UT 44.2563), 36(4), 37(5, UT 44.1673), 48(2), 56(3, 45.121), 62(3, UT 45.1053), 69(4, UT 48.45), 70(4, UT 48.157), 71(1, UT 48.164), 72, 76, 78(7, UT 80.44), 82(5, UT 60.78), 90(1, UT 90.107), 93, 97, 98, 103, 106(5, UT 91.4408), 112(2, UT 91.261), 113(1, UT 91.4299), 116(2, UT 91.529), 117(UT 91.929), 120(UT 91.901), 122(1, UT 91.4298)
159	Unnamed Tributary to Mill Creek, ca. 1.0 miles N of TN 138/TN 18 junction, Hardeman Co., TN	12-Jun-90	Etnier, Starnes, Bryant	35 20 52	88 55 01	82, 114(26, UT 91.4240)
160	Town Creek at junction of Pill Jerk Rd. and Bull Lane, ca. 5.0 miles NW of Covington, Tipton Co., TN	26-Mar-91	TWRA Biologists	35 37 24	89 42 22	20(9), 21(1), 30(3), 36(2), 48(1), 82(1), 93(5)
161	Town Creek at TN 384, ca. 1.0 miles SE Covington, Tipton Co., TN	26-Mar-91	TWRA Biologists	35 32 32	89 38 15	20(10), 36(2), 63(6), 64(2), 82(6), 93(39), 96(4)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
162	Hatchie River in Lower Hatchie National Wildlife Refuge, ca. 1.0 miles S of TN 87, Lauderdale Co., TN	20-Aug-91	TWRA Biologists	35 39 00	89 45 19	8(1), 20(2), 21(3), 22(7), 24(9), 25(8), 38(16), 48(3), 51(3), 57(1), 66(10), 67(3), 74(1), 96(2), 125(15)
163	Hatchie River, MS	21-Aug-91	Ross, Slack	338500	3843500	19(23, USM 10770), 21(1, USM 10771), 24(3, USM 10778), 25(4, USM 10768), 31(2, USM 10773), 37(2, USM 10786), 38(9, USM 10774), 46(5, USM 10784), 48(2, USM 10783), 67(1, USM 10777), 69(2, USM 10775), 72(2, USM 10776), 106(11, USM 10788), 112(27, USM 10779), 113(33, USM 10780), 116(1, USM 10782), 120(10, USM 10781)
164	Little Hatchie River, MS	21-Aug-91	Ross, Slack	333000	3850000	19(36, USM 10815), 21(4, USM 10184), 25(5, USM 10816), 30(3, USM 10790), 37(1, USM 10805), 46(2, USM 10813), 64(1, USM 10807), 69(1, USM 10789), 70(1, USM 10808), 72(1, USM 10810), 82(9, USM 10801), 93(2, USM 10796), 90(3, USM 10795), 95(1, USM 10797), 96(16, USM 10794), 97(7, USM 10806), 93(3, USM 10798), 102(1, USM 10800), 103(2, USM 10799), 109(3, USM 10792), 112(7, USM 10803), 113(13, USM 10804), 116(1, USM 10793), 117(3, USM 10791), 120(5, USM 10802)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
165	Hatchie River at TN 54 bridge, Haywood Co., TN	2-Oct-91	University of Tennessee Regional Faunas Class	35 34 05	89 29 04	19(2), 21(14), 24(23, UT 44.4453), 25(37, UT 44.3062), 30(9), 38(40), 44(10), 48(41, UT 44.5410), 60(3), 67(2), 78(1), 82(6), 83(39, UT 61.99), 84(6), 94(2), 95(28), 96(14), 98(8), 102(1), 103(1, UT 90.1541), 104(1) 105(1), 106(1, UT 91.3484), 107(2, 91.3485), 109(9), 116(2, UT 91.4072) 119(3, UT 91.710), 120(3), 122(3)
166	Hatchie River at Big Eddie, off Hillville Loop Rd., Haywood Co., TN	3-Oct-91	University of Tennessee Regional Faunas Class	35 28 15	89 08 16	19(25, UT 44.5403), 21(48, UT 44.5404), 24(30, UT 44.5405), 25(23, UT 44.5406), 30(40, UT 44.5407), 36(1), 38(14, UT 44.5408), 44(4, UT 44.5409), 48(7, UT 44.5410), 56(1, UT 45.974), 67(1), 68(1, 48.733), 69(3, UT 48.734), 70(1, UT 48.735), 73(6, UT 48.736), 78(4), 81(2, UT 60.499), 82(10, UT 60.500), 83(1), 84(8, UT 158.118), 93(1), 96(2), 98(2), 99(1, UT 90.1328), 102(2, UT 90.1329), 106(10, UT 91.4068), 109(5, UT 91.4069), 112(7, UT 91.4070), 113(3, UT 91.4071), 116(4, UT 91.4072), 117(3, UT 91.4073), 120(7, UT 91.4074), 122(38, UT 91.4075)
167	Lane Branch at TN 125, Hardeman Co., TN	7-Nov-91	Starnes, Bryant	35 11 43	88 55 50	19(2, UT 44.5727), 30(5, UT 44.2562), 37(7, UT 44.5751), 71(1, UT 48.766), 80(1, UT 60.526), 94(1, UT 90.567), 97(2, UT 90.567), 100(2, UT 90.568), 113(3, UT 91.917), 115(4, UT 91.519)
168	Big Black Creek at Co. Rd. S of Estanula Rd., Haywood Co., TN	10-Feb-93	TWRA Biologists	35 27 53	89 04 58	70(1), 72(1), 78(2), 82(3), 93(1), 94(3), 96(3), 98(19), 112(2), 115(4), 120(4), 122(1)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
169	Big Black Creek at TN 138, ca. 1.0 miles NNW of Mercer, Madison Co., TN	10-Feb-93	TWRA Biologists	35 28 57	89 02 38	45(1), 50(22), 64(1), 72(10), 78(1), 82(7), 93(2), 96(1), 98(3), 111(3), 117(3), 120(8), 122(5)
170	Caney Creek at TN 234, ca. 3.0 miles S of Ramer, McNairy Co., TN	19-May-94	TWRA Biologists	35 02 32	88 38 11	31(1), 46(2), 50(3), 54(3), 64(3), 82(14), 93(14), 94(2), 96(4), 97(1), 109(1)
171	Jeffers Creek at Batchelor Levee Rd., ca. 10.0 miles SE of Brownsville, Haywood Co., TN	3-Apr-95	TWRA Biologists	35 30 43	89 05 45	54(3), 64(3), 93(11), 94(3), 96(12)
172	Sugar Creek at Sugar Creek Rd., ca. 1.5 miles W of Sunny Hill, Haywood Co., TN	3-Apr-95	TWRA Biologists	35 32 26	89 16 46	24(33), 50(5), 64(4), 93(1), 94(1)
173	Clover Creek at TN 138, ca. 1.0 miles S of Cloverport, Hardeman Co., TN	10-Apr-95	TWRA Biologists	35 23 22	89 00 46	21(1), 69(1), 72(24), 82(1), 113(1), 117(11), 120(3)
174	Clover Creek at TN 18, ca. 0.8 miles S of Madison Co. line, Hardeman Co., TN	10-Apr-95	TWRA Biologists	35 25 15	88 52 49	19(5), 64(1), 78(2), 82(8), 93(5), 94(2), 96(3), 111(1), 120(10)
175	Pleasant Creek at mouth of Potters Creek on N side of Bolivar-Somerville Rd., Hardeman Co., TN	10-Apr-95	TWRA Biologists	35 15 15	89 02 05	19(3), 24(15), 30(1), 44(2), 50(9), 54(1), 56(3), 64(1), 69(4), 72(6), 78(1), 82(2), 94(1), 96(7), 97(9), 100(2), 114(3), 120(6)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
176	Piney Creek at County Rd. 8198, Walnut Grove-Ebenezer Rd., Hardeman Co., TN	13-Apr-95	TWRA Biologists	35 16 26	88 54 48	19(4), 24(53), 25(7), 30(26), 37(6), 48(2), 64(2), 69(3), 72(4), 73(5), 75(1), 78(5), 82(6), 93(8), 94(6), 96(3), 103(1), 106(5), 113(1), 117(2), 120(3)
177	Piney Creek at TN 125, ca. 1.0 miles W of Silerton, Hardeman Co., TN	13-Apr-95	TWRA Biologists	35 20 33	88 48 44	19(42), 28(2), 31(1), 37(19), 46(13), 50(8), 72(7), 82(7), 98(8),
178	Cub Creek at Lake Hardeman Rd., ca. 7.0 miles SSE of Bolivar, Hardeman Co., TN	17-Apr-95	TWRA Biologists	35 08 23	88 57 20	19(15), 37(6), 50(4), 54(8), 64(4), 72(41), 93(7), 94(1), 96(7)
179	Cub Creek at Pea Vine Rd., ca. 6.4 miles SE of Bolivar, Hardeman Co., TN	17-Apr-95	TWRA Biologists	35 10 29	88 54 51	19(9), 24(13), 25(2), 30(5), 36(4), 60(1), 67(2), 72(13), 73(1), 93(1), 94(2), 96(2), 117(1)
180	Porters Creek at Cut Birth Rd., ca. 3.0 miles S of Rogers Springs, Hardeman Co., TN	18-Apr-95	TWRA Biologists	35 00 07	88 58 38	19(8), 50(8), 69(8), 72(17), 82(1), 93(11), 96(2), 98(1), 113(1), 120(5)
181	Porters Creek at Pea Vine Rd., ca 9.1 miles SE of Bolivar, Hardeman Co., Tn	18-Apr-95	TWRA Biologists	35 09 25	88 54 51	19(1), 21(2), 24(1), 25(15), 46(5), 62(1), 63(1), 64(3), 67(8), 72(5), 82(4), 93(2), 96(5), 98(12), 103(2), 105(1), 120(2)
182	Boles Branch at TN 57 bridge, ca. 7.5 miles E of the Hardeman Co. line, McNairy Co., TN	24-Jul-95	Porterfield, Taylor	35 04 28	88 41 33	3(1, INHS 37496), 72(2, INHS 37497), 97(1, INHS 37499), 117(1, INHS 37498)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
183	Marshall Creek at Van Buren Rd., ca. 3.0 miles N of Van Buren, Hardeman Co., TN	25-Jul-95	Porterfield, Taylor	35 09 43	89 04 01	3(2, INHS 37475), 19(1, INHS 37484), 24(1, INHS 37476), 30(4, INHS 37477), 46(1, INHS 37478), 82(2, INHS 37479), 100(1, INHS 37480), 113(1, INHS 37481), 117(1, INHS 37482), 118(1, INHS 37483)
184	Mill Creek at Cloverport Rd., Hardeman Co., TN	27-Mar-97	TWRA Biologists	35 19 33	88 58 52	56(1), 72(10), 75(1), 78(4), 80(1), 82(3), 93(10), 94(2), 96(4), 114(2), 117(2)
185	Grays Creek at Ebeneezer - Walnut Grove Rd., ca. 6.0 miles NE of Bolivar, Hardeman Co., TN	2-Apr-97	TWRA Biologists	35 19 17	88 55 01	19(6), 50(10), 64(1), 72(19), 82(2), 93(14), 98(1), 117(1), 120(2)
186	Grays Creek at TN 18, ca. 3.2 miles NE of Bolivar, Hardeman Co., TN	2-Apr-97	TWRA Biologists	35 17 50	88 57 22	28(1), 36(6), 70(1), 72(2), 73(1), 82(4), 93(9), 94(2), 96(14), 98(1), 117(4), 120(3)
187	Hayes Creek at Hornsby Rd., ca. 4.0 miles W of Hornsby, Hardeman Co., TN	2-Apr-97	TWRA Biologists	35 13 38	88 53 02	19(9), 50(9), 72(3), 82(1), 93(9), 96(1)
188	Greasey Creek at Isaac Jordan Rd., ca. 8.3 miles NE Bolivar, Hardeman Co., TN	3-Apr-97	TWRA Biologists	35 17 52	88 51 13	37(5), 46(1), 50(3), 64(1), 72(8), 82(2), 93(4), 96(3), 113(3), 120(2)
189	Wades Creek at North Howell Rd., ca. 5.0 miles NNE of Hornsby, Hardeman Co., TN	3-Apr-97	TWRA Biologists	35 15 51	88 48 08	28(20), 31(2), 46(8), 50(17), 72(9), 82(8), 93(3), 98(1), 117(1), 120(2)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
190	Lee Creek at Carlins Rd., ca. 5.0 miles NNE of Pocahontas, Hardeman Co., TN	8-Apr-97	TWRA Biologists	35 06 58	88 47 44	24(1), 30(4), 36(8), 50(1), 54(5), 64(2), 72(11), 78(1), 82(12), 93(13), 94(5), 96(2), 97(12), 100(6), 111(1), 120(1)
191	Big Muddy Creek at first crossing E of US 45, McNairy Co., TN	24-Apr-97	TWRA Biologists	35 02 56	88 31 27	28(3), 37(53), 46(15), 50(5), 93(32), 96(3)
192	Bear Creek, ca. 4.0 miles NE of Eurekaton, Haywood Co., TN	22-May-97	TWRA Biologists	35 27 15	89 11 46	20(9), 36(2), 50(51), 54(1), 82(6), 93(19), 96(28)
193	Poplar Creek at Camey Rd., ca. 2.5 miles E of Willis, Haywood Co., TN	22-May-97	TWRA Biologists	35 28 08	89 14 00	20(5), 50(28), 64(2), 82(10), 93(13), 96(2)
194	Big Muddy Creek at Joyners Campground Rd., ca. 9.0 miles N of Somerville, Madison Co., TN	20-Oct-97	TWRA Biologists	35 21 52	89 20 22	19(1), 24(4), 50(6), 54(1), 78(1), 82(9), 83(1), 93(4), 94(2), 96(3), 103(2), 109(1)
195	Spring Creek at Lake Hardeman Rd., ca. 10 miles SSW of Bolivar, Hardeman Co., TN	24-Mar-98	Near, Steinberg	35 08 05	89 02 15	3(4, INHS 45818), 31(2, INHS 45819), 50(2, INHS 45820), 54(4, INHS 45821), 56(1, INHS 45822), 69(1, INHS 45831), 72(9, INHS 45830), 82(2, INHS 45823), 93(2, INHS 45824), 96(2, INHS 45825), 109(3, INHS 45826), 111(1, INHS 45827), 113(12, INHS 45834), 114(4, INHS 45833), 115(1, INHS 45828), 117(12, INHS 45832), 118(1, INHS 45835), 120(1, INHS 45829)

Table B1. (continued)

ID	Locality	Date	Collectors	Y	X	Species list
196	Hatchie River at US 76 bridge, S of Sunnyhill, Haywood Co., TN	12-Aug-99	Paxton, Waces, Evans	35 25 00	88 53 00	11(2, UT 36.58), 12(1, UT 36.59), 15(1, UT 29.202), 19(12, UT 44.8427), 21(56, UT 44.8428), 24(58, UT 44.8915), 30(6, UT 44.5407), 38(34, UT 44.8431), 48(1, UT 44.5410), 67(1, UT 48.987), 81(7, UT 60.499), 84(7, UT 158.118), 96(1, UT 90.695), 97(2, UT 90.698), 98(3, UT 90.1102), 102(1, UT 90.1329), 106(2, UT 91.2652), 109(1, UT 91.4069), 112(1, UT 91.4070), 113(1, UT 91. 4071), 116(5, UT 91.4072), 120(3, UT 91.3491), 122(1, UT 91.3493), 93 X 98(1, 90.2584)
197	Clover Creek at TN 18, ca. 0.8 miles S of Madison Co. line, Hardeman Co., TN	23-Aug-00	Environmental Protection Agency	35 25 00	88 53 00	19(8, UT 44.8923), 24(11, UT 44.8915), 25(3, UT 44.8916), 30(4, UT 44.8917), 31(9, UT 44.8918), 37(4, UT 44.8919), 38(5, UT 44.8920), 44(1, UT 44.8922), 46(36, UT 44.8921), 56(2, UT 44.1684), 60(1, UT 45.1685), 75(1, UT 38.190), 78(1, UT 80.77), 82(4, UT 60.701), 84(9, UT 158.215), 100(1, UT 90.2720)
198	Hatchie River at TN 18 bridge, Hardeman Co., TN	29-Aug-00	CFI	35 16 53	88 58 27	19, 21, 67, 69, 71, 72, 73, 96, 98, 106, 110, 111, 112, 113, 117, 120, 122
199	Cub Creek at Pea Vine Rd., ca. 6.4 miles SE of Bolivar, Hardeman Co., TN	30-Aug-00	CFI	35 10 38	88 54 51	19, 30, 37, 50, 64, 69, 72, 93, 94, 103, 109, 113, 117, 120
200	Cub Creek at TN 125, Hardeman Co., TN	30-Aug-00	CFI	35 10 07	88 55 15	19, 50, 64, 68, 83, 93, 94, 96, 98

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
201	East Fork Spring Creek at Saulsbury-Hickory Valley Rd., Hardeman Co., TN	30-Aug-00	CFI	35 03 06	89 01 46	19, 69, 72, 78, 83, 100, 110, 112, 113, 117, 120
202	East Fork Spring Creek at TN 57 bridge, ca. 10 miles Eof Grand Junction, Hardeman Co., TN	30-Aug-00	CFI	35 00 50	88 44 15	30, 83, 117
203	Hatchie River at Wolf Penn Rd., McNairy Co., TN	30-Aug-00	CFI	35 02 30	88 44 15	19, 21, 25, 46, 69, 71, 102, 106, 109, 112, 117, 120
204	Spring Creek at TN 125, Hardeman Co., TN	30-Aug-00	CFI	35 14 32	88 58 36	19, 30, 38, 48, 56, 62, 67, 68, 69, 72, 73, 78, 84, 94, 96, 98, 106, 107, 109, 110, 113, 117, 120, 122
205	Tuscumbia River at Wolf Penn Rd., McNairy Co., TN	30-Aug-00	CFI	35 00 53	88 44 16	21, 78, 83, 90, 94, 96, 102, 115
206	Grays Creek at TN 18 bridge, Hardeman Co., TN	31-Aug-00	CFI	35 17 51	88 57 21	19, 50, 69, 71, 72, 90, 93, 96, 97, 103, 113, 114, 117, 120
207	Hatchie River at mouth of Richland Creek, at Big Eddie, Haywood Co., TN	31-Aug-00	CFI	35 28 15	89 08 22	19, 70, 73
208	Hatchie River at TN 100, Hardeman Co., TN	31-Aug-00	CFI	35 20 49	89 00 53	21, 67, 69, 72, 73, 83, 96, 102, 103, 106, 112, 113, 116, 117, 119, 120
209	Piney Creek at Ebeneezer - Walnut Grove Rd., Hardeman Co., TN	31-Aug-00	CFI	35 16 26	88 54 48	19, 25, 37, 56, 69, 71, 72, 78, 90, 93, 97, 103, 106, 113, 114, 117, 120

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
210	Big Black Creek at lowest Powell Rd. crossing, Haywood Co., TN	18-Oct-00	CFI	35 27 53	89 04 58	19, 30, 38, 50, 56, 62, 69, 71, 72, 106, 113, 116, 117, 119, 120, 122
211	Hatchie River at TN 54 bridge, Haywood Co., TN	18-Oct-00	CFI	35 34 05	89 29 04	21, 30, 48, 96, 109, 120
212	Hatchie River at TN 76 bridge, Haywood Co., TN	18-Oct-00	CFI	35 31 05	89 15 25	19, 25, 37, 48, 62, 67, 69, 70, 71, 72, 73, 83, 106, 113, 117, 120
213	Jeffers Creek at Estanaula Rd., Haywood Co., TN	18-Oct-00	CFI	35 29 06	89 07 50	54, 78, 83, 90, 94, 95, 117
214	Hatchie River at Club Rd., Tipton Co., TN	19-Oct-00	CFI	35 36 14	89 49 25	19, 21, 30, 38, 67, 71, 72, 74, 83, 93
215	Hatchie River at rail road bridge upstream of US 51 bridge, Tipton Co., TN	19-Oct-00	CFI	35 37 36	89 36 21	21, 67, 71, 72, 120, 125
216	Hatchie River at US 51 bridge, Tipton Co., TN	19-Oct-00	CFI	35 38 15	89 36 35	21, 35, 38, 48, 53, 67, 125
217	Big Muddy Creek, ca. 1.0 miles above confluence with Hatchie River, Haywood Co., TN	20-Oct-00	CFI	35 30 37	89 24 55	21, 24, 25, 48, 60, 62, 68, 78, 90, 95, 110, 116, 117, 120
218	Hatchie River, ca. 0.4 miles above mouth with Mississippi River, Tipton Co., TN	20-Oct-00	University of Tennessee Regional Faunas Class	35 35 28	89 51 08	15(3, UT 29.209), 20(2, UT 44.8794), 21(9, UT 44.8793), 33(16, UT 44.8795), 38(22, UT 44.8796), 39(3, UT 44.8797), 43(5, UT 44.8798), 48(5, UT 44.8799), 51(1, UT 45.1659), 67(4, UT 48.1026), 125(3, UT 100.127)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
219	Clover Creek at Teague Rd., Hardeman Co., TN	17-May-01	Keck, Etnier, Wilson, University of Tennessee Fisheries Techniques Class	35 23 50	88 58 06	19(2), 23(1, UT 44.9084), 24(3, UT 44.9085), 30(2, UT 44.9087), 31(24), 40(2, UT 44.9093), 44(1, UT 44.9094), 46(5, UT, 44.9095), 48(1, UT 44.9096), 62(2, UT 45.1715), 76(4, UT 38.197), 78(2), 80(5, UT 60.726), 82(13), 83(1), 84(6, UT 158.220), 94(4), 96(4, UT 90.2804), 97(3, UT 90.2806), 98(3, UT 90.2807), 100(3, UT 90.2805), 102(5, UT 90.2808), 109(1, UT 91.6009), 115(1, UT 91.6011), 116(1, UT 91.6010), 120(1, UT 91.6015)
220	Hatchie River and mouth of Clover Creek, Hardeman Co., TN	18-May-01	Keck, Etnier, Wilson, University of Tennessee Fisheries Techniques Class	35 22 21	89 02 28	14(1, UT 29.219), 18(1), 19(16), 21(58, UT 44. 9086), 24(4), 25(7, UT 44.9089), 30(8, UT 44.9087), 38(3, UT 44.9092), 48(18, UT 44.9096), 62(1, UT 45.1715), 67(1), 69(1, UT 48.1064), 72(1, UT 48.1065), 75(7, UT 38.198), 76(4, UT 38.197), 78(5, UT 80.83), 82(10), 83(8, UT 61.268), 84(1), 91(3, UT 90.2801), 94(8, UT 90.2802), 96(13), 97(14), 98(6, UT 90.2807), 100(2, UT 90.2805), 102(1, UT 90.2808), 106(5, UT 91.6016), 112(12, UT 91.6012), 120(6, UT 91.6015), 125

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
221	Mosses Creek at Vernie-Taylor Rd. just N of TN 57, McNairy Co., TN	18-May-01	Keck, Etnier, Wilson, University of Tennessee Fisheries Techniques Class	35 04 46	88 46 53	3(3, UT 2.355), 19(9, UT 44.9194), 25(2, UT 44.9195), 28(1), 30(1), 31(6, UT 44.9196), 36(5, UT 44.9197), 38(15, UT 44.9198), 44(1), 46(4), 56(1), 62(1), 69(5, UT 48.1089), 70(6, UT 48. 1090), 93(2), 94(1), 96(1), 97(5), 106(9, UT 91.6083), 107(2, UT 91.6084), 113(3, UT 91. 6086), 116(32, UT 91.6087), 117(2, UT 91.6088), 120(21, UT 91.6089), 122(1, UT 91.6090)
222	Clover Creek at TN 18, ca. 1.5 miles W of Henderson (Chester Co.), Hardeman Co., TN	18-Jul-01	Keck, Doosey, Andreadis	35 25 17	88 52 49	19(27, UT 44. 9083), 24(25, UT 44.9085), 31(102, UT 44.9088), 36(15, UT 44.9090), 37(2, UT 44.9091), 38(3, UT 44.9092), 46(8, UT 44.9095), 50(1, UT 44.9097), 56(1, UT 45.1714), 72(1, UT 48.1065), 75(2, UT 38.198), 78(2, UT 80.83), 82(5), 83(4), 84(2), 93(2, UT 90.2803), 94(1, UT 90.2802), 96(1), 98(8), 109(1, UT 91.6009), 113(2, UT 91.6013), 120(5, UT 91.6015), 93 X ?(1)
223	Sandy Creek at the end of Jared Rd., just S of Madison Co. line, Hardeman Co., TN	18-Jul-01	Keck, Doosey, Andreadis	35 25 35	88 53 43	3(4, UT 2.348), 19(10), 37(21, UT 44.9091), 50(2, UT 44.9097), 54(1, UT 45.1713), 64(1, UT 48.1063), 69(6, UT 48.1064), 72(3, UT 48.1065), 75(2, UT 38.198), 80(10, UT 60.726), 82(16, UT 60.727), 83(13, UT 61.268), 93(5, UT 90.2803), 94(3), 96(2, UT 90.2804), 97(8,UT 90.2806), 113(8, UT 91.6013), 115(7, UT 91.6011), 117(2, UT 91.6014), 120(2), 97 X 100(2, UT 90.2809)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
224	Grays Creek at Ebeneezer - Walnut Grove Rd., ca. 6.0 miles NE of Bolivar, Hardeman Co., TN	19-Jul-01	Keck, Doosey, Andreadis	35 19 17	88 55 02	3(1, UT 2.353), 19(5, UT 44.9158), 24(1, UT 44.9159), 37(5, UT 44.9160), 50(1), 72(6, UT 48.1077), 78(1), 82(4), 93(1), 100(1), 114(1, UT 91.6060), 117(2, UT 91.6061), 120(1)
225	Grays Creek at TN 18, ca. 3.2 miles NE of Bolivar, Hardeman Co., TN	19-Jul-01	Keck, Doosey, Andreadis	35 17 53	88 57 19	3(1, UT 2.353), 37(9, UT 44.9160), 50(1), 75(1), 82(3), 114(2, UT 91.6060), 116(1), 117(3, UT 91.6061), 120(4)
226	Piney Creek at Ebeneezer - Walnut Grove Rd., Hardeman Co., TN	19-Jul-01	Keck, Doosey, Andreadis	35 16 25	88 54 47	19(6, UT 44.9098), 21(7, UT 44.9099), 24(24, UT 44.9101), 25(15, UT 44.9100), 30(7, UT 44.9104), 31(21, UT 44.9103), 37(12, UT 44.9105), 38(6, UT 44.9106), 46(3, UT 44.9107), 56(3, UT 45.1717), 60(1(UT, 45.1719), 62(2, UT 45.1718), 69(2, UT 48.1067), 72(1, UT 48.1066), 73(1, UT 48.1068), 82(2, UT 60.728), 84(4, UT 158.221), 96(2, UT 90.2814), 102(4, UT 90.2815), 106(36, UT 91.6021), 112(1, UT 91.6022), 113(1, UT 91.6023), 116(17, UT 91.6024), 120(2, UT 91.6025), 122(1, UT 91.6026)
227	Piney Creek at TN 125, ca. 1.0 miles W of Silerton, Hardeman Co., TN	19-Jul-01	Keck, Doosey, Andreadis	35 21 51	88 48 17	3(1, UT 2.349), 19(4, UT 44.9098), 24(5, UT 44.9101), 28(2, UT 44.9102), 31(2, UT 44.9103), 37(7, UT 44.9105), 48(2, UT 44.9108), 50(2, UT 44.9109), 56(2, UT 45.1717), 72(1, UT 48.1066), 82(3, UT 60.728), 93(3, UT 90.2812), 96(2, UT 90.2814), 116(1, UT 90.6024), 120(2, UT 91.6025), 93 X ?(1, UT 90.2813)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
228	Kise Creek at TN 225, ca. 4.0 mi E Hornsby (Hardeman Co.), McNairy Co., TN	20-Jul-01	Keck, Doosey, Andreadis	35 13 52	88 45 38	19(2, UT 44.9065), 37(4, UT 44.9066), 46(1, UT 44.9067), 50(1, UT 44.9068), 54(1, UT 45.1707), 64(1, UT 48.1059), 82(3, UT 60.723), 83(1, UT 61.267), 93(2, UT 90.2788), 103(2, UT 90.2789), 114(5, UT 91.5996)
229	Nail Creek at Eldie Foster Rd., ca. 6.5 miles W of Selmer, McNairy Co., TN	20-Jul-01	Keck, Doosey, Andreadis	35 08 39	88 42 14	24(5), 28(2), 31(11), 36(1), 46(4), 54(6, UT 45.1716), 64(1), 75(1), 78(3), 82(5), 83(5), 93(1), 97(8, UT 90.2811), 98(9, UT 90.2810), 103(1), 109(16, UT 91.6017), 115(4, UT 91.6018), 116(6, UT 91.6019), 119(2, UT 91.6020), 120(1)
230	Wade Creek at US 64/TN 15 in Hornsby, Hardeman Co., TN	20-Jul-01	Keck, Doosey, Andreadis	35 13 28	88 49 30	19(1), 24(5), 25(1, UT 44.9120), 28(2), 31(3), 37(4, UT 44.9121), 46(2), 50(1), 54(2), 64(1), 75(2), 78(1), 82(4), 83(2), 93(1), 96(3), 97(3, UT 90.2830), 98(10, UT 90.2831), 103(4, UT 90.2829), 113(1, UT 91.6041), 115(1, 91.6044), 116(5, UT 91.6042), 117(1, UT 91.6043), 120(1)
231	Boles Branch at Cypress Rd., E side of Big Hill Pond State Park, McNairy Co., TN	21-Jul-01	Keck, Doosey, Andreadis	35 02 58	88 42 27	28(1), 30(2), 31(9, UT 44.9196), 36(1, UT 44.9197), 54(2), 65(1, UT 48.1088), 78(4), 82(4), 94(3), 96(3), 97(2), 100(1), 103(2), 109(6, UT 91.6085), 116(2, UT 91.6087)
232	Reedy Branch at Blankenship Rd., ca. 2.0 miles W of Ramer, McNairy Co., TN	21-Jul-01	Keck, Doosey, Andreadis	35 04 45	88 39 06	3(1, UT 2.347), 28(9, UT 44.9069), 50(1, UT 44.9070), 54(4, UT 45.1708), 72(1, UT 48.1060), 76(1, UT 38.195), 78(1, UT 80.81), 82(2, UT 60.724), 93(1, UT 90.2791), 97(1, UT 90.2790), 100(2, UT 90.2792), 116(4, UT 91.5998), 117(8, UT 91.5997), 119(8, UT 91.6000), 120(9, UT 91.5999)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
233	Big Black Creek at TN 138, ca. 1.0 miles NNW of Mercer, Madison Co., TN	7-Aug-01	Keck, Doosey, Andreadis	35 28 59	89 02 39	19(11, UT 44.9076), 24(3, UT 44.9077), 30(5, UT 44.9078), 38(4, UT 44.9079), 50(5, UT 44.9080), 54(1, UT 45.1711), 56(2, UT 45.1710), 72(4, UT 48.1062), 75(3, UT 38.196), 78(4, UT 80.82), 82(3, UT 60.725), 93(1, UT 90.2795), 97(1, UT 90.2796), 103(1, UT 90.2797), 113(2, UT 91.6004), 115(1, UT 91.6007), 116(3, UT 91.6005), 117(4, UT 91.6006), 120(9, UT 91.6008)
234	Muddy Creek at Sturdivant Crossing Rd., ca. 18 miles SW of Jackson, Madison Co., TN	7-Aug-01	Keck, Doosey, Andreadis	35 26 39	89 04 23	23(1, UT 44.9199), 36(9, UT 44.9200), 63(2, UT 48.1091), 75(1), 76(1), 78(2), 81(1, UT 60.738), 82(5), 83(1), 84(2), 91(1, UT 90.2870), 93(1), 96(4, UT 90.2871), 97(3, UT 90.2872), 99(3, UT 90.2873), 103(1), 104(4, UT 90.2875)
235	Cub Creek at Lake Hardeman Rd., ca. 7.0 miles SSE of Bolivar, Hardeman Co., TN	8-Aug-01	Keck, Doosey	35 08 23	88 57 18	19(16, UT 44.9188), 36(1), 37(13, UT 44.9191), 50(2, UT 44.9192), 54(3), 64(4, UT 48.1086), 72(6, UT 48.1087), 82(4), 93(2), 96(6)
236	Lane Branch at TN 125, ca. 5.5 miles S of Bolivar, Hardeman Co., TN	8-Aug-01	Keck, Doosey, Andreadis	35 11 43	88 55 50	3(1), 24(13, UT 44.9189), 28(20, UT 44.9190), 37(13, UT 44.9191), 46(1), 50(5, UT 44. 9192), 64(1, UT 48.1086), 72(2, UT 48.1087), 82(5), 83(1), 96(3), 97(1), 103(1), 116(8), 120(1), 93 X
237	Muddy Creek at Pea Vine Rd., ca. 3.0 miles NW of Pocahontas, Hardeman Co., TN	8-Aug-01	Keck, Doosey	35 04 23	89 49 08	19(55, UT 44.9071), 21(35, UT 44.9072), 24(5, UT 44.9073), 37(48, UT 44.9074), 46(2, UT 44.9075), 56(1, UT 45.1709), 64(1, UT 48.1059), 67(1, UT 48.1061), 82(3, UT 60.724), 83(1, UT 61.267), 96, 102(5, UT 90.2793), 103(3, UT 90.2789), 106(1, UT 91.6001), 113(19, UT 91. 6002), 116(4, UT 91.6003)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
238	Spring Creek at TN 125, Hardeman Co., TN	8-Aug-01	Keck, Doosey, Andreadis	35 14 37	88 58 38	19(6, UT 44.9165), 21(5, UT 44.9166), 24(3, UT 44.9167), 30(17, UT 44.9168), 31(2, UT 44.9169), 36(1), 38(10, UT 44.9170), 44(4, UT 44.9174), 56(1, UT 45.1739), 60(1, UT 45.1740), 62(2, UT 45.1741), 69(1, UT 48.1078), 72(3, UT 48.1080), 73(1, UT 48.1081), 76(1, UT 38.203), 78(1, UT 80.89), 84(9), 96(3), 98(5, UT 90.2856), 100(2, UT 90.2857), 102(1, UT 90.2859), 103(2, UT 90.2860), 104(6, UT 90.2861), 105(3, UT 90.2862), 106(9, UT 91.6067), 113(5, UT 91.6068), 115(2, UT 91.6069), 116(8, UT 91.6070), 117(2, UT 91.6071), 120(5, UT 91.6072), 93 X 96(1, UT 90.2858)
239	Muddy Creek at TN 57 bridge, ca. 3.0 miles E of Eastview, McNairy Co., TN	9-Aug-01	Keck, Doosey	35 04 38	88 30 48	28(1), 31(5, UT 44.9081), 37(2), 46(21, UT 44.9082), 50(6), 54(14, UT 45.1712), 82(4), 93(10, UT 90.2798), 97(1, UT 90.2799), 93 X 97(2, UT 90.2800)
240	Hatchie River in Hatchie River National Wildlife Refuge, ca. 2.0 road miles E on Refuge Rd., Haywood Co., TN	1-Sep-01	University of Tennessee Wetlands Ecology Class	35 29 27	89 09 59	19(4), 21(5), 25(1), 46(3), 82(4), 96(1), 97(2), 102(1), 116(4), 120(1)
241	Kelso Lake, at boat ramp, in Hatchie River National Wildlife Refuge, Haywood Co., TN	1-Sep-01	University of Tennessee Wetlands Ecology Class	35 29 12	89 09 33	15(1, UT 29.220), 25(2, UT 44.9201), 40(1, UT 44.9202), 44(2, UT 44.9203), 82(1), 84(6), 95(3, UT 90.2874), 96(2, UT 90.2871), 99(1), 105(6, UT 90.2875), 109(2)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
242	Clear Creek at US 64, ca. 3.0 miles SE of Whiteville, Hardeman Co., MS	14-Oct-01	University of Tennessee Regional Faunas Class	35 18 42	89 07 35	25(2, UT 44.9161), 31(2, UT 44.9164), 36(9, UT 44.9162), 44(3, UT 44.9163), 54(1, UT 45. 1738), 78(2, UT 80.88), 80(20, UT 60.735), 82(5, UT 60.736), 83(10, UT 61.274), 84(7, UT 158.224), 90(7, UT 90.2849), 96(1, UT 90.2851), 97(2, UT 90.2850), 99(1, UT 90.2853), 100(1, UT 90.2852), 103(1, UT 90.2855), 109(3, UT 91.6064), 115(31, UT 91.6065), 117(2, UT 91.6066), 96 X 99(1, UT 90.2854)
243	Marshall Creek at Van Buren Rd., ca. 3.0 miles N of Van Buren, Hardeman Co., TN	15-Oct-01	University of Tennessee Regional Faunas Class	35 09 43	89 04 01	3, 19, 30, 31, 36, 46, 54, 64, 72, 78, 82, 83, 94, 97, 103, 105, 113, 117, 118
244	Pleasant Run at Russell Rd., Hardeman Co., TN	15-Oct-01	University of Tennessee Regional Faunas Class	35 15 15	89 02 05	3(3), 19(20), 24(30), 25(10), 28(50), 30, 31, 37(30), 38(5), 46(5), 48(15), 50(15), 54, 56(10), 69(10), 72, 78, 82(10), 93, 96, 97, 98, 105, 106, 112, 113, 114, 115, 116, 117
245	Saulsbury Creek at Slaulsbury-Mississippi State Line Rd., Hardeman Co., TN	15-Oct-01	University of Tennessee Regional Faunas Class	35 01 09	89 04 58	54(2), 75(4, UT 38.204), 78(1), 82(5), 94(5, UT 90.2868), 96(1), 97(6, UT 90.2869), 103(3), 109(1), 115(1)
246	West Fork Spring Creek at Lake Hardeman Rd., Hardeman Co., TN	15-Oct-01	University of Tennessee Regional Faunas Class	35 08 06	89 02 17	7(1), 19(2, UT 44.9165), 24(18, UT 44.9167), 25(2, UT 44.9173), 31(2, UT 44.9169), 38(1, UT 44.9170), 44(3, UT 44.9174), 46(14, UT 44.9175), 48(4, UT 44.9176), 60(1, UT 45.1740), 70(4, UT 48.1079), 78(3), 82(5), 84(4), 96(1), 98(6, UT 90.2856), 111(1, UT 91.6073), 116(6, UT 91.6070), 117(1, UT 91.6071)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
247	Flooded BLH near Hatchie River National Wildlife Refuge, ca. 1 to 2.5 miles upstream of TN 76 bridge, Haywood Co., TN	5-Dec-01	Keck, Doosey, Wyss, Gallien	35 30 57	89 13 38	38(1), 84(2)
248	Hatchie River at TN 18 bridge, Northern crossing, to ca. 2.5 river miles downstream, Hardeman Co., TN	1-Mar-02	Keck, Sink, Nichols	35 16 53	88 58 28	1(2, UT 2.358), 15, 38(9, UT 44.9249), 44(1), 57(1, UT 45.1752), 58, 62, 84, 120(1)
249	Hatchie River at TN 70 bridge to ca. 1.2 river miles upstream, Haywood Co., TN	1-Mar-02	Keck, Sink, Nichols	35 31 21	89 20 57	19, 38, 58(1, UT 45.1751), 98, 102
250	Hatchie River at TN 18 bridge, Southern crossing, ca. 400 meters up and downstream of bridge, Haywood Co., TN	2-Mar-02	Keck, Sink, Nichols	35 16 32	88 58 35	3(1, UT 2.359), 38, 57, 58, 60(2, UT 45.1754), 62(1, UT 45.1753), 67, 84, 96, 98, 102
251	Jeffers Creek at Estanaula Rd., Haywood Co., TN	6-Apr-02	University of Tennessee Floodplain Ecology Class	35 29 06	89 07 50	44, 76, 83
252	Tuscumbia River at SW edge of Big Hill Pond State Park, McNairy Co., TN	16-May-02	Keck, Carberry, Martin	35 02 05	88 44 46	21, 25, 38, 83

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
253	Dry Creek at MS 4, ca. 4.0 miles W of Jumpertown, Prentiss Co., MS	17-May-02	Keck, Carberry, Martin	34 41 55	88 42 30	7(1, UT 25.9), 19(5), 24(3, UT 44.9434), 25(30, UT 44.9431), 28(3, UT 44.9432), 31(6, UT 44.9433), 37(1, UT 44.9435), 38(6), 46(1, UT 44.9436), 48(2, UT 44.9437), 56(1), 60(1, UT45.1785), 62(1), 82(2), 84(2), 97(2), 102(1), 103(1), 109(1, UT 91.6224), 116(1, UT 91.6225)
254	Hatchie River at MS Co. Rd. 260, ca. 5.0 miles SE of Dumas, Union Co., MS	17-May-02	Keck, Carberry, Martin	34 35 40	88 48 42	19(3, UT 44.9420), 28(3, UT 44.9426), 31(13, UT 44.9425), 36(2, UT 44.9430), 37(1, UT 44.9427), 38(9, UT 44.9428), 46(5, UT 44.9429), 54(2, UT 45.1782), 56(2, UT 45.1783), 62(1, UT 45.1784), 70(2, UT 48.1114), 78(1, UT 80.95), 82(2, UT 60.752), 93(3, UT 90.2973), 96(1, UT 90.2976), 97(1, UT 90.2974), 117(1, UT 91.6222), 120(1, UT 91.6223)
255	Little Hatchie River at MS 370, ca. 7.0 miles SE of Ripley, Tippah Co., MS	17-May-02	Keck, Carberry, Martin	34 41 38	88 53 24	78(1, UT 80.95), 82(6, UT 60.752), 83(5, UT 61.286), 94(2, UT 90.2975), 96(6, UT 90.2976), 97(2, UT 90.2974), 99(4, UT 90.2977), 103(6, UT 90.2978), 115(1, UT 91.6221)
256	Owl Creek at MS 2, ca. 4.0 miles E of Ripley, Tippah Co., MS	17-May-02	Keck, Carberry, Martin	34 44 30	88 53 35	28(5, UT 44.9432), 31(3, UT 44.9433), 36(1), 37(25, UT 44.9433), 38(1), 46(2, UT 44.9436), 50(2, 44.9438), 82(3), 93(3), 96(5), 97(2), 103(2)
257	Muddy Creek at Houston Cemetery Rd., ca. 4.0 miles SW of Eastview, McNairy Co., TN	18-May-02	Keck, Carberry, Martin	34 02 59	88 33 34	19(4), 21(3), 28(2), 31(2), 36(2), 37(51, UT 44.9474), 38(1), 46(8), 47(12, UT 44.9475), 50(1, UT 44.9473), 82(9), 83(1), 93(3), 94(1), 96(2), 96 X 99(1)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
258	Paramicha Creek at Huggins Rd., E off I-45, ca. 1.5 miles ESE of Biggersville, Alcorn Co., MS	18-May-02	Keck, Carberry, Martin	34 49 43	88 32 29	19(15, UT 44.9449), 21(11, UT 44.9449), 24(5, UT 44.9451), 30(1, UT 44.9454), 31(33, UT 44.9453), 36(1, UT 44.9455), 37(4, UT 44.9456), 46(10, UT 44.9457), 50(1), 54(3), 56(1), 78(1), 82(5), 84(4), 93(3), 94(2), 96(2), 97(6), 103(1)
259	Tarebreeches Creek at Co. Rd. 750, N of US 72, ca. 10 miles WNW of Corinth, Alcorn Co., MS	18-May-02	Keck, Carberry, Martin	34 56 44	88 38 26	19(19, UT 44.9449), 21(8, UT 44.9450), 24(2, UT 44.9451), 28(3, UT 44.9452), 36(1, UT 44.9455), 37(22, UT 44.9456), 46(9, UT 44.9457), 50(1), 68(1, UT 48.1119), 75(3, UT 38.212), 78(1), 82(3), 83(1), 93(4), 95(1), 96(2), 97(4), 100(2), 103(1), 105(1), 115(1, UT 91.6231), 117(1, UT 91.6232), 120(1, UT 91.6233)
260	Tuscumbia River at MS 356, ca. 1.0 miles NE of Rienzi, Alcorn Co., MS	18-May-02	Keck, Carberry, Martin	34 46 12	88 31 07	19(6), 21(22), 37(5), 46(5), 82(1), 83(10), 84(2), 93(1), 94(1), 96(2), 97(3)
261	Oxford Creek at Ramer-Selmer Rd., ca. 5.0 miles S of Selmer, McNairy Co., TN	19-May-02	Keck, Carberry, Martin	34 07 23	88 36 01	19(7, UT 44.9460), 21(1, UT 44.9461), 24(22, UT 44.9462), 25(5, UT 44.9463), 28(9, UT 44.9465), 31(17, UT 44.9464), 36(1), 37(3, UT 44.9466), 38(8, UT 44.9467), 46(20, UT 44.9468), 55(1, UT 45.1788), 62(1), 76(1), 82(8), 84(7, UT 158.235), 93(5, UT 90.2992), 95(1, UT 90.2993), 97(6, UT 90.2994), 99(1, UT 90.2995), 103(1), 109(1), 116(1), 120(4, UT 91.6235)
262	Hatchie River at Big Eddie, off Hillville Loop Rd., Haywood Co., TN	7-Jun-02	Hatchie Fest Crew	35 28 15	89 08 16	19(8, UT 44.9476), 21(4, UT 44.9477), 24(1, UT 44.9478), 48(3, UT 44.9484), 62, 78(1), 96(2, UT 90.2997), 103(1, UT 90.3000), 106, 112(6, UT 91.6237), 117(3, UT 91.6240), 120(2, UT 91.6243), 122(5, UT 91.6244)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
263	Hatchie River behind Bell Shack, ca. 2.0 river miles N of TN 100, Hardeman Co., TN	7-Jun-02	Wales	35 21 11	89 02 22	73(1, UT 48.1152)
264	Mill Creek at Cloverport Rd., ca. 2.0 miles S of TN 100 and ca. 6.0 miles N of Bolivar, Hardeman Co., TN	7-Jun-02	Keck, Sink	34 19 32	88 58 49	19(13, UT 44.9476), 21(3, UT 44.9477), 24(2, UT 44.9478), 30(5, UT 44.9479), 31(2, UT 44.9480), 37(16, UT 44.9481), 50(4, UT 44.9485), 72(2, UT 48.1124), 76(1), 78(2), 82(1), 93(2, UT 90.2996), 96(1, UT 90.2997), 97(1, UT 90.2998), 113(1, UT 91.6238), 117(2, UT 91.6240), 120(1, UT 91.6243)
265	Pleasant Run at Russell Rd., Hardeman Co., TN	7-Jun-02	Hatchie Fest Crew	35 15 15	89 02 05	3, 19, 24, 25, 28, 30, 31, 37, 38, 46, 48, 50, 54, 56, 69, 72, 73, 78, 82, 93, 96, 97, 98, 105, 106, 112, 113, 114, 115, 116, 117, 118
266	Mosses Creek at Vernie-Kirk Rd., McNairy Co., TN	8-Jun-02	Hatchie Fest Crew	35 04 46	88 46 53	19(5, UT 44.9194), 21(2, UT 44.9458), 30(6, UT 44.9459), 36(1, UT 44.9197), 37, 38(3, UT 44.9198), 47, 69(1, UT 48.1089), 70(3, UT 48.1090), 82(1), 99(1, UT 90.2989), 102(1, UT 90.2990), 103(1, UT 90.2991), 106(1, UT 91.6083), 107, 112(1, UT 91.6234), 113(3, UT 91.6086), 116(4, UT 91.6087), 117(1, UT 91.6088), 120(1, UT 91.6089)
267	Tuscumbia River at Wolf Penn Rd., McNairy Co., TN	8-Jun-02	Hatchie Fest Crew	35 00 53	88 44 16	19(2, UT 44.9445), 21(5, UT 44.9446), 70(1, UT 48.1118), 78(1), 82(1), 83(4), 94(1), 98(3), 113(1), 116(1), 117(6, UT 91.6228), 122(1, UT 91.6229)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
268	Tuscumbia River slough at Wolf Penn Rd., McNairy Co., TN	8-Jun-02	Hatchie Fest Crew	35 01 03	88 43 56	30(1), 36(2), 40(1, UT 44.9448), 44(25, UT 44.9447), 55(2, UT 45.1787), 68(3, UT 45.1787), 68(3, UT 48.1117), 76(1, UT 38.211), 78(4), 80(2, UT 60.753), 82(2), 83(5), 84(4), 90(2, UT 90.2985), 94(1), 95(2, UT 90.2986), 97(4), 100(2, UT 90.2987), 103(4), 105(2, UT 90.2988), 109(3), 115(6, UT 91.6227), 117(3, UT 91.6228)
269	West Fork Spring Creek at Van Buren Rd., Hardeman Co., TN	8-Jun-02	Hatchie Fest Crew	35 06 06	89 04 56	19(2, UT 44.9476), 24(3, UT 44.9478), 30(5, UT 44.9479), 31(11, UT 44.9480), 38(5, UT 44.9482), 46(3, UT 44.9483), 56(1, UT 45.1792), 69(1, UT 48.1123), 72(3, UT 48.1124), 82(1), 97(3, UT 90.2998), 100(1, UT 90.2999), 109(2, UT 91.6236), 113(3, UT 91.6238), 115(1, UT 91.6239), 116(1, UT 91.6241), 117(6, UT 91.6240), 118(12, UT 91.6242), 120(6, UT 91.6243)
270	Sandy Creek at the end of Jared Rd., just S of Madison Co. line, Hardeman Co., TN	9-Jun-02	Hatchie Fest Crew	35 25 35	88 53 43	19, 37, 46, 69, 72, 82, 93, 96, 113
271	Sugar Creek at Sugar Creek Rd., ca. 1.5 miles W of Sunny Hill, Haywood Co., TN	9-Jun-02	Hatchie Fest Crew	35 32 25	89 16 44	20(17, UT 44.9469), 24(13, UT 44.9470), 30(5, UT 44.9471), 36(6, UT 44.9472), 50(18, UT 44.9473), 54(2, UT 45.1789), 57(1, UT 45.1790), 60(1, UT 45.1791), 64(4, UT 48.1121), 76(1, UT 38.195), 78(4, UT 80.96), 83(1), 94(2), 96(1), 103(1), 109(1)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
272	Unnamed Tributary to Bear Creek at Hillville Rd., Haywood Co., TN	9-Jun-02	Hatchie Fest Crew	35 27 16	89 11 45	20(51, UT 44.9469), 50(16, UT 44. 9473), 54(7, UT 45.1789), 64(1, UT 48.1121), 68(1, UT 48.1122), 78(2, UT 80.96), 82(5), 96(2), 103, 116
273	Hatchie River at Lauderdale-Tipton Co. line, ca. 2.0 miles downstream of US 51 bridge, Lauderdale Co., TN	28-Jun-02	Keck, Sink, Ritter	35 38 42	89 37 25	1(3, UT 2.358), 5(1, UT 23.17), 9(5, UT 25.94), 7(1, UT 25.93), 8(2, UT 25.92), 15(4, UT 29.224), 18(1, UT 44.9567), 22(1), 57(2, UT 45.1803), 58(1, UT 45.1811), 67(1), 74(3, UT 48.1126)
274	Hatchie River at Lauderdale-Tipton Co. line, ca. 2.5 miles upstream of US 51 bridge, Lauderdale Co., TN	28-Jun-02	Keck, Sink, Ritter	35 37 44	89 36 09	20(2, UT 44.9543), 21(7, UT 44.9544), 24, 48(5, UT 44.9545), 93(1), 95(2, UT 90.3027), 96(1), 98(3, UT 90.3029), 102(2), 103(2), 20 X 21(3, UT 44.9542)
275	Champion Lake off TN 87, Lauderdale Co., TN	29-Jun-02	Keck, Sink, Ritter	35 36 08	89 51 44	7, 8, 9, 15, 80, 93, 95, 96, 98
276	Hatchie River at TN 54 bridge, ca. 0.2 miles downstream to 0.5 miles upstream, Tipton Co., TN	29-Jun-02	Keck, Sink, Ritter	35 34 05	89 29 04	7, 8, 9, 15(1, UT 29.224), 19, 21(4, UT 44.9544), 57 58, 67, 71(1, UT 48.1127), 74(1, UT 48.1134), 97(1, UT 90.3028), 102, 104(2, UT 90.3030), 125
277	Hatchie River at US 72, ca. 6.0 miles E of Walnut, Alcorn Co., MS	12-Jul-02	Keck, Carberry, Carberry	34 56 45	88 47 23	25(9, UT 44.9423), 68(2, UT 48.1113), 78(1, UT 80.95), 82(4, UT 60.752), 84(11, UT 158.233), 96(1, UT 90.2976), 97(1, UT 90.2974), 99(1, UT 90.2977), 103(279, UT 90.2978), 109

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
278	Little Hatchie River at MS 2, ca. 7.0 miles ENE of Ripley, Tippah Co., MS	12-Jul-02	Keck, Carberry, Carberry	34 44 60	88 49 60	7, 19(6, UT 44.9420), 21(1, UT 44.9421), 24(1, UT 44.9422), 25(4, UT 44.9423), 30(4, UT 44.9424), 37(5, UT 44.9427), 38(22, UT 44.9428), 46(1, UT 44.9429), 56(1, UT 45.1783), 72(1, UT 48.1115), 75(1), 78(1, UT 80.95), 82(5, UT 60.752), 93(1, UT 90.2973), 94(1, UT 90.2975), 96(1, UT 90.2976), 99(1, UT 90.2977), 102(1, UT 90.2979), 113(1, UT 91.6220), 120(1, UT 91.6223)
279	West Prong Muddy Creek at MS 15, ca. 0.2 miles S of Faulkner, Tippah Co., MS	12-Jul-02	Keck, Carberry, Carberry	34 50 07	88 56 19	19(10, UT 44.9532), 21(8, UT 44.9532), 24(3, UT 44.9533), 28(2, UT 44.9535), 31(25, UT 44.9534), 36(1, UT 44.9538), 37(8, UT 44.9536), 46(5, UT 44.9539), 50(2, UT 44.9540), 54(1, UT 45.1802), 56(1), 81(1, UT 60.757), 82(3, UT 60.758), 83(2, UT 61.291), 93(1), 96(2), 97(2), 102(1), 103(2), 104(1), 114(1, UT 91.6251), 116(1, UT 91.6252), 120(2, UT 91.6250)
280	Big Creek at MS 15, ca. 0.5 miles S of Walnut, Tippah Co., MS	13-Jul-02	Keck, Carberry, Carberry	34 56 17	88 54 03	19(2, UT 44.9541), 31(4, UT 44.9534), 37(5, UT 44.9536), 50(3, UT 44.9540), 82(1, UT 60.758), 97(1), 113(1, UT 91.6253)
281	Muddy Creek at US 72, ca. 2.0 miles E of Walnut, Tippah Co., MS	13-Jul-02	Keck, Carberry, Carberry	34 57 10	88 52 34	19(1, UT 44.9541), 21(5, UT 44.9532), 24(10, UT 44.9533), 37(7, UT 44.9536), 38(5, UT 44.9539), 46(3, UT 44.9539), 56(1), 64(5, UT 48.1125), 82(4, UT 60.758), 83(4, UT 61.291), 84(1), 93(3), 96(2), 97(3), 102(2)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
282	Polly's Creek at Co. Rd. 1021, ca. 6.0 miles N of Booneville, Prentiss Co., MS	13-Jul-02	Keck, Carberry, Carberry	34 44 33	88 32 35	19(6, UT 44.9449), 21(23, UT 44.9450), 24(1, UT 44.9451), 31(6, UT 44.9451), 46(7, UT 44.9457), 67(1, UT 48.1118), 68(1, UT 48.1119), 69(2, UT 48.1120), 75(2, 38.212), 78(1), 82(3), 83(2), 93(1), 94(1), 96(3), 97(2), 99(4), 103(2), 105(2), 113(2, UT 91.6230), 120(3, UT 91.6233)
283	Mosses Creek at Dunaway Rd., ca. 6.0 miles SW of Selmer, McNairy Co., TN	14-Jul-02	Keck, Carberry, Carberry	35 07 54	88 40 38	3(2, UT 2.355), 19, 21, 24(6, UT 44.9555), 28(5, UT 44.9557), 31(11, UT 44.9556), 36(4, UT 44.9197), 46(5, UT 44.9559), 50(4, UT 44.9558), 56(1, UT 45.1806), 62(1, UT 45.1807), 71(1, UT 48.1132), 75(1, UT 38.213), 78(1, UT 80.81), 82(3, UT 60.724), 83(1, UT 61.267), 93(1, UT 90.3031), 94(2, UT 90.3032), 96(2, UT 90.3034), 97(2, UT 90.3033), 109(1, UT 91.6017), 113(3, UT 91.6086), 115(2, UT 91.6018), 116(10, UT 91.6087), 117(3, UT 91.6088), 119(1, UT 91.6020), 120(3, UT 91.6089), 94 X 96(1, UT 90.3036), 99 X 96(1, UT 90.3035)
284	Cane Creek at Lynn School Rd., ca. 5.0 miles WSW of Ripley, Lauderdale Co., TN	17-Jul-03	Keck, Sink, Hollingsworth	35 43 57	89 38 36	20(83, UT 44.9910), 21(4, UT 44.9911), 24(28, UT 44.9912), 30(13, UT 44.9914), 36(41, UT 44.9915), 38(28, UT 44.9916), 45(1, UT 44.9917), 47(1, UT 44.9918), 48(3, UT 44.9919), 67(4, UT 48.1176), 83(3, UT 61.319), 93(2), 96(5), 98(2, UT 90.3221)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
285	Cane Creek at TN 371, ca. 4.0 miles E of Fort Pillow State Penitentiary, Lauderdale Co., TN	17-Jul-03	Keck, Sink, Hollingsworth	35 40 31	89 41 22	7(1), 20(8, UT 44.9910), 21(7, UT 44.9911), 24(58, UT 44.9912), 25(4, UT 44.9913), 30(51, UT 44.9914), 38(17, UT 44.9916), 47(2, UT 44.9918), 48(3, UT 44.9919), 59(1, UT 45.1862), 60(1, 45.1863), 64(1, UT 48.1175), 83(1, UT 60.319), 93(2), 95(1, UT 90.3222), 96(1), 98(1, UT 90.3221), 102(1, UT 90.3223)
286	Cypress Creek at Gunn Bottom Rd., ca. 8.0 miles SW of Brownsville, Haywood Co., TN	17-Jul-03	Keck, Sink, Hollingsworth	35 33 00	89 22 32	15(346, UT 29.233), 20(4, UT 44.9903), 24(8, UT 44.9905), 36(36, UT 44.9907), 44(1, UT 44.9908), 47(3, UT 44.9909), 64(1), 83(5), 93(3), 96(2), 103(1), 109(1, UT 91.6400)
287	Lagoon Creek at Elm Tree Rd., ca. 10.0 miles NW of Brownsville, Haywood Co., TN	17-Jul-03	Keck, Sink, Hollingsworth	35 39 39	89 24 33	10(1, UT), 15(5, UT 29.233), 20(2, UT 44.9903), 25(1, UT 44.9904), 31(1, UT 44.9906), 36(6, UT 44.9907), 54(1), 83(1), 93(1), 96(4)
288	Hurricane Creek at McClerkin Rd., ca. 12.5 miles WSW of Covington, Tipton Co., TN	18-Jul-03	Keck, Sink, Hollingsworth	35 30 49	89 51 49	7(1), 20(2, UT 44.9920), 21(1), 24(2, UT 44.9921), 31(1, UT 44.9922), 36(3, UT 44.9923), 46(3, UT 44.9924), 50(1), 51(1, UT 45.1864), 57(1, UT 45.1865), 60(1, UT 45.1866), 64(1), 67(1), 81(1), 91(5, UT 90.3224), 93(1, UT 90.3225), 94(1, UT 90.3226), 96(1), 98(4, UT 90.3227), 101(2, UT 90.3228), 105(1, UT 90.3229), 109(1, UT 91.6401)
289	Indian Creek at Randolph Rd., ca. 12.0 miles W of Covington, Tipton Co., TN	18-Jul-03	Keck, Sink, Hollingsworth	35 34 34	89 50 04	8(1), 15(2), 20(27, UT 44.9925), 21(2, UT 44.9927), 24(13, UT 44.9928), 30(2, UT 44.9929), 38(2, UT 44.9930), 48(7, UT 44.9929), 67(1), 102(1, UT 90.3230), 103(1, UT 90.3231), 20 X 21(3, UT 44.9926)

Table B1. (continued)

ID	Locality	Date	Collectors	*Y*	*X*	Species list
290	Mathis Creek at Bride Rd., ca. 4.0 miles NE of Covington, Tipton Co., TN	18-Jul-03	Keck, Sink, Hollingsworth	35 35 39	89 42 44	20(8, UT 44.9948), 24(6, UT 44.9949), 45(1, UT 44.9950), 46(4, UT 44.9951), 50(4, UT 44.9952), 64(2), 81(4, UT 60.782), 98(1), 103(1)
291	Richland Creek at Cotton Lake Rd., ca. 5.5 miles ENE of Covington, Tipton Co., TN	18-Jul-03	Keck, Sink, Hollingsworth	35 35 09	89 32 15	19(4), 15(4, UT 29.234), 20(5, UT 44.9953), 22(7, UT 44.9958), 23(11, UT 44.9954), 25(2, UT 44.9955), 30(3, UT 44.9956), 36(8, UT 44.9957), 57(5, UT 45.1872), 60(2, UT 45.1873), 63(1, UT 48.1178), 64(2, UT 48.1179), 75(2, UT 38.236), 78(40, UT 80.110), 83(8, UT 61.322), 91(2, UT 90.3245), 95(2, UT 90.3247), 98(2, UT 90.3248), 103(1, UT, 90.3249), 104(6, UT 90.3250), 109(2, UT 91.6411), 93 X 98(1, UT 90.3246)
292	Big Muddy Creek at Old Brownsville Rd., ca. 4.0 miles S of Pineyville, Fayette Co., TN	19-Jul-03	Keck, Sink, Hollingsworth	35 20 19	89 18 40	81(1), 96(1), 103(1)
293	Little Muddy Creek at TN 179, ca. 5.0 miles WNW of Stanton, Haywood Co., TN	19-Jul-03	Keck, Sink, Hollingsworth	35 28 40	89 27 10	10(2, UT 26.28), 24(8, UT 44.9946), 36(5, UT 44.9947), 38(1), 50(2), 54(4, UT 45.1871), 63(3, UT 48.1177), 64(2), 75(1, UT 38.235), 78(5, 90.109), 91(1, UT 90.3240), 94(3, UT 90.3241), 96(4, UT 90.3242), 98(1), 109(5, UT 91.6409), 111(2, UT 91.6410)
294	West Prong Spring Creek at Van Buren Rd., ca. 2.5 miles N of Van Buren, Hardeman Co., TN	19-Jul-03	Keck, Sink, Hollingsworth	35 06 06	89 04 56	3, 24, 38, 46, 50, 69, 72, 82, 94, 95, 96, 110, 116, 117, 118, 120

Vita

Benjamin Paul Keck was born on 31 March 1977, in Louisville, Kentucky. He attended public school in Jefferson Co., Kentucky, through the 2nd grade after which he attended Oldham Co., Kentucky, public schools until he graduated from South Oldham High School in 1995. In 1999 he graduated from Centre College of Kentucky with the Bachelor of Science degree with a major in biology and a minor in anthropology. He enrolled at the University of Tennessee, Knoxville, in 2000 and received the Master of Science degree with a major in Ecology and Evolutionary Biology in December 2003.

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