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million, including fish, to compete over. At the present human population growth rate of 1.8% per year, humans will consume 100% of net primary production in AD 2044, leaving nothing for other species. It is doubtful that humans can carry their consumption this far; however, there is little doubt that continued population growth will to a considerable extent overrun even the best-conceived environmental protection measures. Perhaps the SFC should consider getting actively involved in the controversial area of human population control.

We have looked back and seen obvious strengths-biological expertise and experience, and resolve and sense of mission in particular. We have also detected some weaknesses-mainly lack of attention to administrative details, insufficient economic and sociopolitical savvy, and inability to create massive public awareness of individual projects. Our weaknesses can be overcome. Increasing population pressures challenge us to continue using our strengths and quickly overcome our weaknesses if we are to fulfill our objectives of protecting the fish fauna of the southeastern United States. We can be effective in the future if we work hard and smart together.

OUR SOUTHEASTERN FISHES--WHAT HAVE WE LOST AND WHAT ARE WE LIKELY TO LOSE

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ABSTRACT

When fish population levels in rivers and large creeks fall below a certain level, it becomes virtually impossible to determine whether the species continues to be present in low numbers and may recover to former levels, or whether it is extirpated from the area. In eastern and central North America, it is conceded that *Lagochila lacera* and *Fundulus albolineatus* are extinct. *Noturus trautmani* (last record 1957) and *Etheostoma sellare* (last record 1988) are likely extinct, but several other species have been absent from collections for much longer periods of time and subsequently recovered to at least moderate levels of abundance (*Noturus flavipinnis*, 75-year collection hiatus; *Erimystax cahni*, 25 years; *Ammocrypta clara* in the Tennessee River drainage, 86 years; *Etheostoma wapiti*, 88 years). Long-term monitoring efforts at key localities are seen as being very helpful in providing early warning of drastic population declines and potential extirpation.

INTRODUCTION

In the early 1800s, when zoologists began to study the aquatic diversity of southeastern United States, there were approximately 228 taxa (species and well differentiated subspecies) of fishes native to the Tennessee River drainage. Only two of these species (*Fundulus albolineatus*, the whiteline topminnow; and *Lagochila lacera*, the harelip sucker) are now thought to be extinct. This number has always seemed surprisingly low to me in light of the 33 Tennessee River drainage taxa recognized as being Threatened or Endangered throughout their range (Etnier and Starnes, 1991). In fact, if we expand our scope to include all of eastern and central North America east of the Pacific slope and north of Mexico, the number of extinct fish species remains very small. Perhaps we have lost one or two taxa of Great Lakes ciscos, and it is feared that the Scioto madtom (*Noturus trautmani*) and the Maryland darter (*Etheostoma sellare*) are extinct (both are discussed below). For the remainder of this discussion, I will focus on the freshwater fish fauna of southeastern United States, with emphasis on those species that occur in Tennessee. Unless otherwise indicated, information has come from Etnier and Starnes (in press). Peggy W. Shute, Tennessee Valley Authority, has provided many of the "last capture dates" for various species from her extensive files.

The fact that only two fish species disappeared from this region during a time when individuals, industries, and government agencies gave little if any consideration to modifying their behavior to prevent fish extinctions might give us cause for being optimistic about the long-term survival of our remaining southeastern freshwater fish fauna. Even though many populations of jeopardized species have been extirpated, our fish fauna is virtually intact. Surely we are doing a much better job of protecting these fishes at present, and perhaps optimism is justified.

On the other hand, application of concepts associated with island biogeography to the small or highly fragmented populations of jeopardized southeastern fishes indicate that additional extirpations of populations and extinctions of species are imminent or already have occurred. I believe the latter scenario is closer to the truth.

CASE HISTORIES

Endangered fish species are often very rare, and it can be difficult to demonstrate whether or not extirpation or extinction has occurred, or if the population is merely so low that collection of even a single individual is difficult. For instance, Woolman (1892) reported *Ammocrypta clara* (as *A. pellucida*) to be abundant in the Powell River in the vicinity of the U.S. 25E bridge in Claiborne County, Tennessee, in 1890. The species was not seen again in the Clinch or Powell river systems until 1976 (Starnes et al., 1977) when it appeared in the same area where Woolman had collected it. Two specimens were taken in the well-collected Clinch River, one in Hancock County, Tennessee, and one in Scott County, Virginia, during June of 1980 by TVA biologists. Both of these rivers originate in Virginia and flow into Norris Reservoir in Tennessee. The species had never been taken in either river in Virginia, and could not have reinvaded from downstream because of absence of darter habitat in Norris Reservoir and the absolute barrier to upstream migration provided by Norris Dam. Furthermore, there are no records of this species from anywhere downstream in the Tennessee River drainage. The inescapable conclusion is that *Ammocrypta clara* had been present in both the Clinch and Powell rivers above Norris Reservoir throughout this 84-year period, but in levels so low that it was not detected in any of the numerous fish collections made in these rivers during that time. A related species, *Ammocrypta vivax*, the scaly sand darter, is known from a preimpoundment collection of two specimens from a western tributary to the lower Tennessee River in Kentucky (probably extirpated) and from a single specimen from the Tennessee River drainage in Tennessee (Starnes et al., 1977). The more recent specimen was collected by Neil Douglas and students at a site in the Buffalo River, Wayne County, Tennessee, in 1976. The site had been visited often by ichthyologists, and additional specimens were not obtained in approximately ten recent collections.

Notropis ariommus, the popeye shiner, was well known to early ichthyologists, but then virtually disappeared from fish collections (only three specimens collected between 1894 and 1949) for over 50 years (Gilbert, 1969). It has been a reasonably abundant species at numerous localities since 1949, and it is virtually certain that this 50-year period of extreme rarity is factual rather than an artifact of lack of collecting effort.

The highfin carpsucker, *Carpiodes velifer*, was questionably included in the Tennessee fauna based on a total of four juvenile specimens collected in both the Cumberland and Tennessee river drainages between 1930 and 1975. Subsequently, adults have been captured in the Nolichucky River (1987), Clinch River (1988, 1990), Duck River (1988, 1990, 1992), lower French Broad River (1990), Little Pigeon River (1990), Sequatchie River (1992), and Hiwassee River (1992). Many of these collections were from sites that had been previously collected, and all of these rivers had received considerable attention from ichthyologists in previous years.

The yellowfin madtom, *Noturus flavipinnis*, is known from the well-collected Powell River from single specimens collected at adjacent sites near Alanthus Hill, Claiborne County, Tennessee, in 1968, 1979, and 1983. This is a species that was not collected anywhere during a 75-year interval between 1893 and 1968, and it was considered to be extinct. It is now known from three localities (Powell River, Copper Creek, VA, and Citico Creek, TN), but it has not been collected again at any of the localities from which it was known in the 1800s. In Copper Creek it was discovered in 1969 (Taylor et al., 1969) and found to occupy the lower 40 miles of the creek where it was rather common. Recent habitat deterioration in Copper Creek has resulted in that population's drastic decline. A single specimen was located there on 24 June 1993 near the mouth of Obey's Creek, Creek Mile 14, during a snorkeling search for the species, but its outlook for survival in Copper Creek appears to be gloomy (pers. comm. P. W. Shute). Yellowfin madtoms were not collected in Citico Creek, Monroe County, Tennessee, until 1981 (Bauer et al., 1983). Ichthyologists previously had spent considerable effort searching Citico Creek for the apparently extinct smoky madtom (*Noturus baileyi*), and the Tennessee Wildlife Resources Agency had routinely conducted surveys to evaluate the status of the trout population. This indicates how difficult it can be to demonstrate the presence of a particular madtom species. Yellowfin madtoms were discovered in Citico Creek during a study of the ecology of the smoky madtom in the same stream. Smoky madtoms were not discovered in Citico Creek until 1980, and were considered to be extinct since they could not be found at the type locality (Abrams Creek, collected only during 1957), the unimpounded upper Little Tennessee River, or the other two major Little Tennessee River tributaries with similar habitats (Tellico River and Citico Creek). Later work indicated that the Citico Creek population of yellowfin madtoms was about 500 adults in a 0.9 mile reach, and that there were about 700 smoky madtoms in a 2.6 mile reach (Shute, 1984; Dinkins, 1984).

During the 1970s my students and I made several unsuccessful efforts to find an extant population of the sharphead darter (*Etheostoma acuticeps*) in the Nolichucky River near Erwin, Tennessee. At present it is sufficiently abundant in that area that a single reasonable collecting effort concentrating on sharphead darter habitat would almost certainly produce specimens. These specimens may be derived from a population that migrated downstream from a persistent population in the Cane River in North Carolina, but I think it much more likely that sharphead darters were present but undetected by our efforts during the 1970s, and subsequently have increased greatly.

I have attempted to indicate how difficult it may be to demonstrate the presence of a fish species in an area, even though it occurs there in viable (e.g., recoverable) numbers. With that in mind, Figure 1 presents my concept of what the long range population density of a riverine fish population might look like. In this hypothetical example, if the population is above the dashed horizontal line, its presence can be demonstrated, but when it drops below that line, our

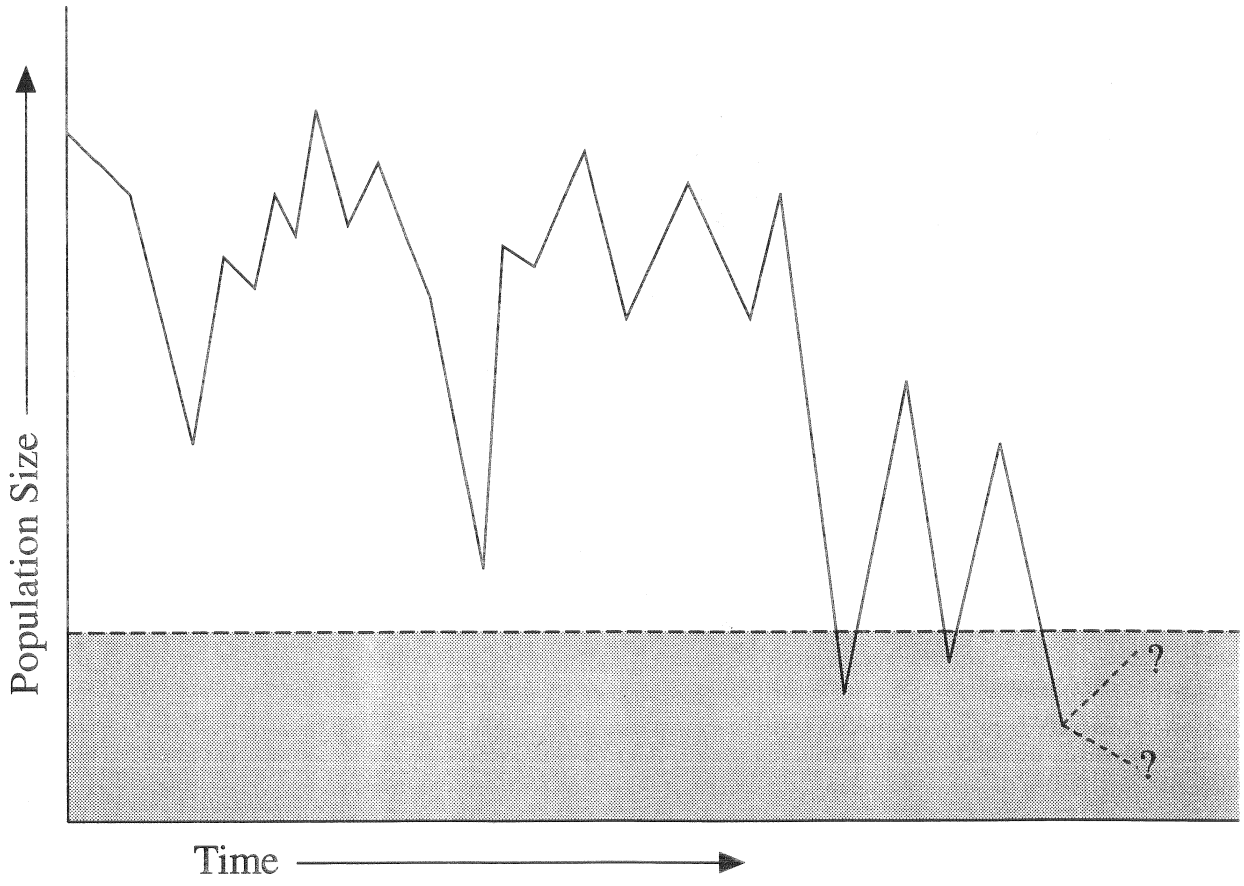

Figure 1. Author's conceptualization of variation of a fish population's numbers through time.

methodology is not likely to produce any specimens in what we would currently consider a concerted effort. When the population is below the dashed line, we will typically be unable to determine whether the population is headed for eventual recovery or extinction (Fig. 1, lower right), and this uncertainty can persist for decades as indicated in several earlier examples. This suggests that several fish species currently on our Threatened or Endangered lists are already extinct.

For instance, the Scioto madtom and Maryland darter, mentioned above, are currently considered as "probably extinct". The Scioto madtom, known only from Big Darby Creek, tributary to the Scioto River, Ohio River drainage, Pickaway County, Ohio, has not been collected since 1957 (Trautman, 1981), even though efforts to find additional specimens have been extensive. The Maryland darter is known only from a small area in Maryland. It was discovered in 1912 in Swan Creek, a small Susquehanna River tributary near Aberdeen, Harford County (Knapp, 1976), and was not seen again until 1962 when a single juvenile was collected from adjacent Gasheys Run, a small creek that enters the lower Susquehanna River (Chesapeake Bay) in the same embayment as Swan Creek. In April of 1965 Knapp collected an adult female in Gasheys Run, and in May of 1965 E. C. Raney and F.J. Schwartz discovered a population in Deer Creek, a considerably larger Susquehanna tributary which has its mouth 13 river miles upstream from the embayment shared by Swan Creek and Gasheys Run. Later work indicated the Deer Creek population to be substantial but restricted to the lower portion of the Creek. Knapp speculated that the two original types from Swan Creek and the two specimens from Gasheys Run represented waifs that had dispersed downstream from the Deer Creek population. In spite of extensive efforts, Maryland darters have not been collected since 1979, nor seen since 1988 (Raesly, 1992). Both the Scioto madtom and the Maryland darter are feared to be extinct.

In the Tennessee and Cumberland river drainages a number of jeopardized fish species appear to be somewhere below the dashed line in Figure 1, and it may be several decades before we will discover them to have recovered to detectable population levels or place them in the "probably extinct" category of the Scioto madtom and the Maryland darter. Included in this category is the slender chub (*Erimystax cahni*), which has not been collected from the Clinch River system since 1986, nor from the Powell River system since 1986, in spite of several collections targeted for this species and a 1993 status survey conducted by N.M. Burkhead. The single Holston River specimen was collected in 1941 prior to impoundment of Cherokee Reservoir, and the Holston River population is almost certainly extirpated. The slender chub was not collected anywhere between 1939 and 1964, but was often abundant in both the Clinch and Powell

rivers above Norris Reservoir in the 1969-1980 period. Perhaps it will again be abundant in these areas, but its absence from recent collections is foreboding.

An undescribed darter from the Cumberland drainage, related to the bluebreast darter (*Etheostoma camurum*) is known from three 1951 specimens from Pine Creek, tributary to Caney Fork River, DeKalb County, Tennessee, and a single 1961 specimen from East Fork Stones River below the Walter Hill Dam (U.S. Highway 231). Is it extinct?

Additional jeopardized Tennessee fish species appear to be declining in certain areas, and, although extinction is not imminent, extirpation of populations may have occurred already for some. The boulder darter (*Etheostoma wapiti*) has not been collected in Shoal Creek since 1884 (Florence, Lauderdale County, Alabama), and has almost certainly been extirpated from that system (Etnier and Williams, 1989). It persists in lower Elk River in Tennessee and Alabama in low numbers. *Ammocrypta clara* has again dropped below the dashed line in both the Clinch and Powell River systems, where it was last collected in 1980 (Clinch River) and 1987 (Powell River). As mentioned earlier, *Ammocrypta vivax* has not been collected in the Tennessee River drainage since 1976, and *Noturus flavipinnis* has not been seen in the Powell River system since 1983. *Ammocrypta asprella*, the crystal darter, has not been recorded from the entire Cumberland drainage since 1939 and is almost certainly extirpated from that drainage. The blotchside logperch (*Percina burtoni*), known from three Cumberland River drainage localities, was last collected there in the late 1800s, and is probably extirpated from the drainage. It persists in the Tennessee River drainage, but four populations in that drainage (South Fork Holston River, last collected in 1947; French Broad River, 1934; Nolichucky River, 1980; Little Tennessee River, 1957 collection from Abrams Creek and underwater observation by Rick Eager at River Mile 6.8, now Tellico Reservoir, in 1975) are likely extirpated. If these populations are extirpated, extirpation has occurred in 7 of 15 known populations. With remaining populations isolated by reservoirs, additional extirpations are likely and permanent, and the long term outlook for the species is gloomy. The channel darter (*Percina copelandi*) has not been collected in the French Broad River system or the Tennessee River drainage below Knoxville since the 1940s, and its recent absence from areas in the Clinch and Powell rivers where it had been common indicate that it has slipped into the "limbo" area of Figure 1 for the entire Tennessee River drainage. The stonecat (*Noturus flavus*) has been extirpated from much of the upper Tennessee River drainage; Tennessee drainage populations may represent an undescribed taxon (LeGrande and Cavender, 1980). Two of six known populations of the undescribed duskytail darter (subgenus *Catonotus* of *Etheostoma*) have been extirpated, and populations appear to be decreasing in extant populations in Little River, Blount County, Tennessee, and in Copper Creek, Scott County, Virginia. The population in lower Citico Creek, Monroe County, Tennessee, is tiny and very localized, leaving only the lower Big South Fork population as potentially vigorous. About half of the 20 or so known populations of the longhead darter (*Percina macrocephala*) have likely been extirpated, and the species was last taken in the Cumberland River drainage in 1891 (Page, 1978); other populations appear to be vulnerable to extirpation because of their small size, recent declines, or both. The ashy darter (*Etheostoma cinereum*) is similar to the longhead darter in having 7 of 16 known populations probably extirpated, with 5 of 8 Cumberland River drainage populations probably gone (Shepard and Burr, 1984; Burr and Warren, 1986).

Additional examples could be offered. The point to be made is that several Endangered species and many populations of other jeopardized species have apparently moved into the gray area below the dashed line in Figure 1, and we do not know and perhaps can not know whether they will rebound to detectable abundance or will become or are already extinct or extirpated. Admittedly, our lack of knowledge is in many cases based on a woefully inadequate effort to determine if populations are extant. Additional collecting effort at sites where jeopardized species were formerly known to occur would result in moving the dashed line closer to the horizontal axis of the graph and reduce the "limbo" area. Funding for this sort of work, especially for species not on the federal list of Endangered or Threatened species, has been virtually nonexistent. Survey work to determine the status of these populations has been further hampered by unrealistic requirements for scientific collecting permits for fishes in several states, and additional requirements for collecting permits for other jurisdictions (state and national parks and preserves, etc.). In some cases, requirements and constraints of state and federal endangered species laws designed to protect these species are sufficiently cumbersome and intimidating to thwart survey efforts before they are even attempted.

I feel that some of the uncertainties presented by the gray area below the dashed line in Figure 1 can be resolved with increased effort. I applaud TVA's recent "Index of Biotic Integrity" (IBI) program, an effort to provide long-term and repeatable monitoring of significant aquatic communities throughout the Tennessee River drainage. The National Park Service has initiated additional long-term monitoring of rivers within Great Smoky Mountains National Park. Additional intensive and long-term collecting efforts, especially at large river sites with concentrations of jeopardized fish taxa, are seen as necessary to reduce our current ignorance to a more acceptable level.

LITERATURE CITED

Bauer, B.H., D.A. Etnier and G.R. Dinkins. 1983. Discovery of *Noturus baileyi* and *N. flavipinnis* in Citico Creek, Little Tennessee River system. Copeia 1983: 558-560.

Burr, B.M. and M.L. Warren, Jr. 1986. A distributional atlas of Kentucky fishes. Ky. Nature Preserves Comm., Sci. and Tech. Series 4. 398 pp.

Dinkins, G.R. 1984. Aspects of the life history of the smoky

madtom, *Noturus baileyi* Taylor, in Citico Creek. M.S. Thesis, Univ. Tenn. 50 pp.

Etnier, D.A. and W.C. Starnes. 1991. An analysis of Tennessee's jeopardized fish taxa. J. Tenn. Acad. Sci. 66: 129-133.

Etnier, D.A. and W.C. Starnes. In press. The fishes of Tennessee. University of Tennessee Press, Knoxville.

Etnier, D.A. and J.D. Williams. 1989. *Etheostoma (Nothonotus) wapiti* (Osteichthyes: Percidae, a new darter from the southern bend of the Tennessee River in Alabama and Tennessee. Proc. Biol. Soc. Wash. 102: 987-1000.

Gilbert, C.R. 1969. Systematics and distribution of the American cyprinid fishes *Notropis ariommus* and *Notropis telescopus*. Copeia 1969: 474-492.

Knapp, L.W. 1976. Redescription, relationships and status of the Maryland darter, (*Etheostoma sellare* (Radcliffe and Welsh), an endangered species. Proc. Biol. Soc. Wash. 89: 99-118.

LeGrande, W.H. and T.M. Cavender. 1980. The chromosome complement of the stonecat madtom, *Noturus flavus* (Siluriformes: Ictaluridae), with evidence for the existence of a possible chromosomal race. Copeia 1980: 341-344.

Page, L.M. 1978. Redescription, distribution, variation, and life history notes on *Percina macrocephala* (Percidae). Copeia 1978: 655-664.

Raesly, R.L. 1992. Population status of the Endangered Maryland darter, *Etheostoma sellare* (Radcliffe and Welch). Final report prepared for Maryland Natural Heritage Program, Frederick, MD 21701. 13 pp.

Shepard, T.E. and B.M. Burr. 1984. Systematics, status, and life history aspects of the ashy darter, *Etheostoma cinereum* (Pisces: Percidae). Proc. Biol. Soc. Wash. 97: 693-715.

Shute, P.W. 1984. Ecology of the rare yellowfin madtom, *Noturus flavipinnis* Taylor, in Citico Creek, Tennessee. M.S. Thesis, Univ. Tenn. 101 pp.

Starnes, W.C., D.A. Etnier, L.B. Starnes and N.H. Douglas. 1977. Zoogeographic implications of the rediscovery of the percid genus *Ammocrypta* in the Tennessee River drainage. Copeia 1977: 283-286.

Taylor, W.R., R.E. Jenkins and E.A. Lachner. 1969. Rediscovery and description of the ictalurid catfish, *Noturus flavipinnis*. Proc. Biol. Soc. Wash. 83: 469-476.

Trautman, M.B. 1981. The fishes of Ohio. Second Edition, Ohio State Univ. Press, Columbus. 782 pp.

Woolman, A.J. 1892. Report of the examination of fishes of Kentucky with lists of the fishes obtained. Bull. U.S. Fish. Comm. 10: 249-289.