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Abstract

(July 2007) - Distribution and Status of Etheostoma tecumsehi, the Shawnee Darter, a Species Endemic to the Pond River, Green River Drainage, Kentucky. By Ronald R. Cicerello and Robert S. Butler

Assessment and Control of an Invasive Aquaculture Species: An Update on Nile Tilapia (Oreochromis niloticus) in Coastal Mississippi after Hurricane Katrina. By Pamela J. Schofield, W. Todd Slack, Mark S. Peterson and Denise R. Gregoire

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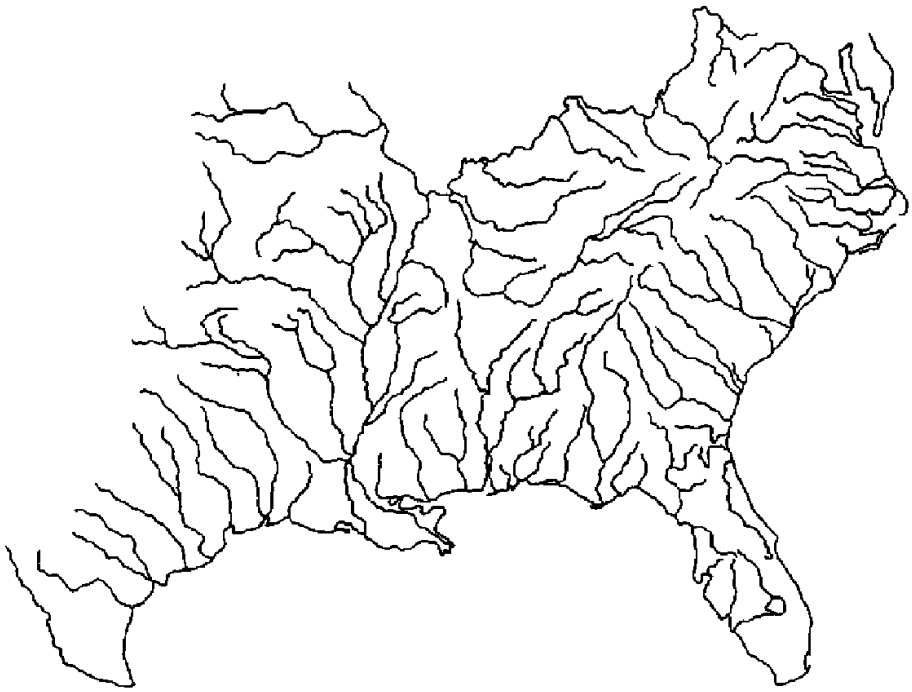

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33rd Annual Meeting, Southeastern Fishes Council

The SFC will meet in Chattanooga, Tennessee on Thursday and Friday, the 8th and 9th of November 2007, with possible field trips on Saturday, the 10th. Our meeting host is Tennessee Aquarium. The finalized program and call for abstracts will be posted on our website <sefishescouncil.org>.

Distribution and Status of *Etheostoma tecumsehi*, the Shawnee Darter, a Species Endemic to the Pond River, Green River drainage, Kentucky

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ABSTRACT

We determined the distribution and status of *Etheostoma tecumsehi*, the Shawnee darter, an endemic of Pond River (Green River drainage), Kentucky, in 2002. We compiled historical and current distribution information, and sampled 30 sites. Prior to this study, *E. tecumsehi* was known from 20 sites in the upper Pond River system. We found young-of-the-year and adult *E. tecumsehi* at 24 of 30 sampling sites extending from the headwaters downstream to and including the Elk Pond Creek system. *Etheostoma tecumsehi* is relatively common and was found at more sites than any other species encountered. Mean patch density at eight sites ranged from 0/m^2 to 4.58/m^2 (± 2.16 2SE). *Etheostoma tecumsehi* appears to be secure, in part, because it inhabits many headwater streams with suitable habitat. We recommend monitoring of activities that increase stream temperature, reduce base flow, block dispersal routes, or fragment and isolate populations.

INTRODUCTION

Etheostoma tecumsehi, the Shawnee darter, is a member of the *Etheostoma spectabile* complex (Percidae; subgenus *Oligocephalus*) and is endemic to the headwaters of Pond River (Green River drainage) in western Kentucky (Ceas and Page, 1997). Because of its small range (ca. 600 km^2; Ceas, 1998) and presumed habitat degradation (i.e., pollution, impoundment construction), Ceas and Page (1997) recommended *E. tecumsehi* be considered for listing as threatened under the Endangered Species Act by the United States Fish and Wildlife Service (USFWS). We conducted this study to determine the distribution and status of *E. tecumsehi*.

STUDY AREA

Pond River drains 1,968 km^2 of Christian, Hopkins, McLean, Muhlenberg, and Todd counties in western Kentucky and discharges into the Green River at river km 87.7 (Harker et al., 1981; Warren and Cicerello, 1982). The Pond River system lies within the Pennsylvanian age Shawnee Hills Section of the Interior Low Plateaus Province, but streams on the southern periphery dissect the Dripping Springs Escarpment and lie in the Mississippian age Highland Rim Section.

In the southern half of the Pond River system (the upper watershed), where *E. tecumsehi* has been collected, headwater streams are high gradient with abundant gravel, sand, and cobble riffles and narrow forested floodplains (Fig. 1). Larger streams such as the East Fork Pond River (EF) and those in the system interior are low gradient with silt, sand, gravel, and clay substrates and broad floodplains containing wetland habitats. Forested riparian zones, albeit sometimes narrow, shade most streams, but extensive row crops and pasture, the dominant land uses, fragment upland woods. Many streams are impounded for flood control, apparently by the U.S. Department of Agriculture, Natural Resources Conservation Service (formerly Soil Conservation Service). Others such as Buck Fork Pond River and Jarrels Creek are channelized. Coal occurs only in the northern portion of the southern half of the system. Mining has occurred adjacent to lower McFarland and Jarrels creeks and near the confluence of West and East Forks Pond rivers.

In the northern half of the system (the lower watershed), the Pond River and many tributaries are low gradient with soft substrates, abundant organic material, and few riffles. Streams with higher gradients and gravel or bedrock bottoms are present mainly along the system periphery. Extensive riparian wetlands and oxbow lakes are present along the river and its tributaries, many of which are channelized. Agriculture is the primary land use

and oil wells are scattered throughout the region. Broad areas have been surface-mined for coal, leaving abandoned mine lands and highly degraded terrestrial and aquatic habitats. Many streams, including the entire mainstem Pond River, do not support or only partially support designated uses (e.g., aquatic life, drinking water, fish consumption) because of pollutants and other factors (e.g., low pH, PCBs, pathogens, chlorides, habitat alteration, silt) emanating from degraded areas (Kentucky Division of Water [KDOW], 1996; 2002).

MATERIALS AND METHODS

We reviewed and summarized collection records for *E. tecumsehi* (Appendix). Between May and December 2002 we sampled for *E. tecumsehi* and other fish species using a 1.8 m x 3.0 m seine (3.2 mm mesh) at a total of 30 sites (Fig. 1). Of these sites, 25 were sampled qualitatively. At 3 of the 25 sites sampled qualitatively and 5 additional sites we also quantitatively sampled *E. tecumsehi* to determine patch density of the species. Our efforts included re-sampling 11 historical sites (Table 1). We also sampled shallow creeks and headwater streams, targeting riffles of gravel and cobble along with adjacent pools and runs – typical habitats for members of the *E. spectabile* complex (Ceas and Page, 1997). For qualitative sampling, we made 10-25 seine sets/hauls per site expending greater effort at sites yielding no or few *E. tecumsehi*. We selected quantitative sampling sites via pilot studies to determine the presence of *E. tecumsehi*. We sampled habitat patches (1.2 – 12.6 m^2) by disturbing the substrate - typically gravel, sand, and cobble in riffles - and allowing the current to wash dislodged individuals downstream into a seine (i.e., a kick set). To estimate patch density at a site, we divided the mean number of *E. tecumsehi* collected by mean patch size. In each patch, we characterized habitat by measuring stream depth at three points and by recording dominant substrate. We measured current velocity in each patch by timing a floating object through a given distance three times. At the 22 non-quantitative sites, we determined habitat characteristics subjectively.

RESULTS

Prior to this study, *E. tecumsehi* was known from 20 sites in the upper Pond River system (Appendix). The furthest downstream *E. tecumsehi* occurred was West Fork Pond River (WF) at KY 813, WF at Barnett Road, and McFarland Creek at Ackerson Schoolhouse Road. Only 1-2 individuals were taken at each of these lowland sites where suitable habitat is limited. *Etheostoma tecumsehi* was relatively common at several upland sites such as Shelton Branch (51 specimens in 1999), East Branch WF (25 specimens in 1999), and Forbes Creek (41 specimens in 2002). The type locality (East Branch WF, 4.4 km northwest of Fruit Hill) has been sampled more than any other site. Relatively few ($\leq$ 8) specimens were found at most (14) other sites, but this could be a collecting artifact due to non-targeted sampling.

Our 2002 survey showed that *E. tecumsehi* was widely distributed within the study area but exhibited highly variable abundances among sites. The species occurred at 24 of 30 sampling sites extending from the headwaters downstream to and including the Elk Pond Creek system (Table 1) and was the most widely encountered species in our survey (Table 2). The number of individuals found in 2002 at all sites ranged from one or a few at sites with apparently poor or limited habitat (e.g., sites 15, 21, and 22) to more than 20 at several small, upland stream sites (e.g., sites 1, 3, and 26). The species was not detected at sites with a preponderance of lowland habitat (e.g., sites 16-19) or those immediately downstream from impoundments (e.g., sites 4 and 20).

Estimated patch densities of *E. tecumsehi* at the 8 quantitative sites were highly variable and showed no relationship with measured physical characteristics of patches (Table 3). Mean patch density at the 8 sites ranged from 0/m^2 at WF at KY 813 (site 17) to 4.58/m^2 ($\pm$ 2.16 2SE) at Buck Creek at KY 189 (site 3; Table 3). It should be noted that mean patch densities for sites are likely positively biased because we sampled habitat patches presumed to contain *E. tecumsehi*. Across sites, mean patch density (n = 7 after removing site 17) was not correlated with mean patch velocity (Pearson r = - 0.43, p $\leq$ - 4.643) or mean patch depth (r = - 0.05, p $\leq$ -1.127 E+07). Across all patches where *E. tecumsehi* was present (n = 29), patch density was not correlated with velocity (r = - 0.11, p $\leq$ 0.5768) or depth (r = - 0.09, p $\leq$ 0.6351). The ranked relative abundance of fish species most frequently encountered with *E. tecumsehi* in quantitative samples was *E. flabellare*, *Lythrurus fasciolaris*, *Semotilus atromaculatus*, *E. squamiceps*, *L. chrysocephalus*, *E. kennicotti*, *Pimephales notatus*, *Campostoma oligolepis*, and *E. nigrum*. At qualitative sites, the ranked relative abundance of darter species was *E. tecumsehi*, *E. squamiceps*, *E. kennicotti*, *E. flabellare*, *E. nigrum*, *Percina sciera*, *E. gracile*, *E. blennoides*, *P. maculata*, *P. phoxocephala*, *E. histrio*, and *E. asprigene*.

We observed that *E. tecumsehi* moved from riffles into adjacent pools as stream flow declined. In May, brilliantly colored males and gravid females inhabited gravel and cobble riffles, runs, and flowing pools. Young-of-the-year (YOY) individuals first occurred in samples in early June. At this time as flow declined and riffles were nearly dry, adults and YOY used the same habitats, but both groups were more abundant in pools of some streams (e.g., sites 10 and 13). Some streams ceased flowing in July and *E. tecumsehi* was stranded in isolated pools in smaller streams (e.g., sites 23, 24, and 26) or occupied the only remaining flowing riffles in larger streams (e.g., site 22).

DISCUSSION

Etheostoma tecumsehi is widely distributed and is relatively common in small streams ranging from the southern Pond River system headwaters downstream to, and including, the Elk Pond Creek system. We are confident it is more widely distributed and abundant than our current study indicates. For example, there are numerous additional streams in the upper system that could potentially support *E. tecumsehi*. Many of these streams are inaccessible or could not be sampled during the timeframe of our study. We also observed that YOY *E. tecumsehi* were abundant at several sites, although these individuals were not included in our analyses.

We concur with Ceas and Page (1997) that *E. tecumsehi* is restricted to upland tributaries of the upper Pond River system. Fish sampling in the northern (lower) Pond River system (i.e., downstream from Elk Pond Creek) has not revealed *E. tecumsehi* or any members of the *E. spectabile* complex (Harker et al., 1981; Warren and Cicerello, 1982; Retzer et al., 1983; Bell and Rold, 2002). Unpublished data from the KDOW, Southern Illinois University at Carbondale (SIUC), and the Kentucky State Nature Preserves Commission (KNP) confirm this. While *E. tecumsehi* appears to be common at numerous sites within its small range, we also recognize that many aquatic systems, including headwater streams along the lower Pond River system periphery, have been degraded and destroyed by surface mining and by stream channelization associated with agriculture (Harker et al., 1981; Kentucky Division of Water, 1996; 2002).

We found that *E. tecumsehi* was more abundant than syntopic *E. flabellare* and that numbers of *E. tecumsehi* were comparable to those reported for other members of the *E. spectabile* complex. *Etheostoma flabellare*, a common inhabitant of small, upland streams in Kentucky (Burr and Warren, 1986), was the second-most frequently encountered species in quantitative samples. Whereas *E. tecumsehi* patch density ranged from 0 to 4.58 /m^2 (± 2.16 2SE), mean *E. flabellare* site density per m^2 (± 2SE) was 0.14 (± 0.10), 0.37 (± 0.22), 0.40 (± 0.58), and 0.09 (± 0.12) at sites 1, 2, 6, and 10, respectively. In comparison, *E. burri* abundance determined via mark and recapture in two Missouri streams was 1.58 and 2.18 / m^2 (Martin et al., 1999). Assignment of a special concern conservation status to *E. burri* was deemed not warranted pending results of additional surveys in other tributaries (Martin et al., 1999). In similar survey work, the density of *E. spectabile* in an Ohio stream was found to be 1.35 / m^2 (Ingersoll et al., 1984).

The fishes most frequently collected with *E. tecumsehi* (Table 2) are all common inhabitants of small upland Kentucky streams (Burr and Warren, 1986). Sites not yielding *E. tecumsehi* generally had low gradient, fine bottom materials, organic debris, and few riffles. These sites contained fishes characteristic of lowland Kentucky streams (e.g., *Lepisosteus oculatus*, *Lythrurus fumeus*, *Erimyzon oblongus*, *Noturus gyrinus*, *Lepomis humilis*, and *E. asprigene*).

Etheostoma tecumsehi appears to be secure, in part, because it inhabits many headwater streams with abundant suitable habitat. This dispersed distribution pattern confers a level of protection not available to organisms inhabiting less common habitats such as medium-sized rivers and springs (Etnier, 1997). However, *E. tecumsehi* is vulnerable to habitat degradation because the flow and water quality of headwater streams are tied more closely to local land use than are larger streams. Most streams in the Pond River system have 7-day, 10-year low flows of zero, even those with watersheds as large as EF at KY 189 near Apex with a drainage area of 502 km^2 (Ruhl and Martin, 1991). With the possible exception of WF at KY 813 (site 17), all streams in the upper Pond River system have smaller watersheds than EF at KY 189. We observed several upper Pond River system streams that were reduced to isolated pools during the relatively dry summer of 2002. Some headwater streams normally cease flowing in summer, but conversion of forests to other uses could have increased the duration and extent of zero flow periods. Continued clearing of upland and riparian forests could negatively affect *E. tecumsehi*, especially during drought years, by raising stream water temperature and reducing ground water inflows that maintain base stream flow.

Population isolation and fragmentation via impoundments could also influence long-term viability of *E. tecumsehi*. Downstream movement and gene flow in many streams is precluded by flood control reservoirs present in the Pond River headwaters that have isolated numerous populations (Fig. 1). Migrating *E. tecumsehi* would encounter stocked predatory game fishes (e.g., *Lepomis* spp., *Micropterus* spp.), inhospitable reservoir habitat, and dams that block dispersal routes and fragment populations. In light of these potential threats, we recommend a re-survey in 5-10 years to re-examine the status of *E. tecumsehi*. In the interim, the potential impact on *E. tecumsehi* of any reservoir proposed for construction in the upper Pond River system should be determined.

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TABLE 1. Sampling Locations for *Etheostoma tecumsehi* within the Pond River system, Kentucky, including dates, number collected, and habitat characteristics.

Site	Location	Date	No. coll.	Habitat	Substrate
1	Trib. to Buck Fork Pond R. at Flat Rock Rd. ford, Todd Co.	6-May/10-Jun-02	22/2	upland	gravel/sand
2	* Forbes Cr. at KY 189, Christian Co.	6-May/10-Jun-02	13/0	upland	gravel/sand/bedrock
3	* Buck Cr. at KY 189, Christian Co.	6-May/10-Jun-02	72/68**	upland	gravel/sand/cobble
4	Coal Cr. at KY 189, Christian Co.	6-May-02	0	upland	gravel/cobble
5	* Kate Br. at Blue Hole Rd., Todd Co.	29-May-02	23	upland	bedrock/gravel/cobble
6	Wolf Br. at Blue Hole Rd., Todd Co.	29-May-02	15	upland	cobble/boulder/gravel
7	* Shelton Br. at Shanklin Rd., Todd Co.	29-May-02	obs.	upland	gravel/cobble/boulder
8	* Buck Fork Pond R. at KY 507, Todd Co.	10-Jun-02	4	intermediate	gravel/sand/cobble
9	Thompson Cr. at Cavanaugh Rd., Christian Co.	11-Jun-02	10	upland	cobble/gravel

TABLE 1 *(cont'd)*

Site	Location	Date	No. coll.	Habitat	Substrate
10	Trib. to WF Pond R. on Macedonia-Crofton Rd., Christian Co.	11-Jun-02	18	upland	gravel/cobble/sand
11	Trib. to Buck Fork Pond R., 1.4 km ESE W. Union Church, Christian Co.	11-Jun-02	7**	upland	gravel
12	Weathers Br. at Froghop Rd., Christian Co.	11-Jun-02	10	upland	gravel/cobble
13	* Dulin Cr. at KY 800, Christian Co.	11-Jun-02	19**	upland	bedrock/boulder
14	Trib. to Dulin Cr. at KY 800, Christian Co.	11-Jun-02	67**	upland	bedrock/gravel/boulder
15	* McFarland Cr. at Cemetery Rd., Christian Co.	12-Jun-02	1	lowland	sand/gravel
16	* McFarland Cr. at Ackerson School Rd., Christian Co.	12-Jun-02	0	lowland	gravel/debris
17	* West Fork Pond R. at KY 813, Hopkins/Muhlenberg cos.	1-Jul-02	0	lowland	cobble/gravel/debris
18	Pond R. at Mt. Carmel-Pond R. Rd., Hopkins/Muhlenberg cos.	1-Jul-02	0	lowland	silt/mud/sand
19	Jarrels Cr. at Greens Chapel Rd., Muhlenberg Co.	1-Jul-02	0	lowland/ channelized	mud/debris
20	Coal Cr. at Coal Cr. Rd., Christian Co.	2-Jul-02	0	upland	clay/gravel/sand
21	Bull Cr. at Coal Cr. Rd., Christian Co.	2-Jul-02	1	upland	clay/gravel
22	* East Fork Pond R. at KY 171, Todd Co.	2-Jul-02	3	intermediate/ channelized	gravel/cobble/boulder
23	Pepper Cr. at KY 107, Todd Co.	2-Jul-02	22	upland	sand/mud/cobble
24	Horse Cr. at KY 171, Todd Co.	2-Jul-02	7**	upland	bedrock/gravel/sand
25	* East Fork Pond R. at Shanklin Rd., Todd Co.	2-Jul-02	8+	intermediate	cobble/boulder
26	McFarland Cr. at Pennyrile Parkway, Christian Co.	3-Jul-02	120**	upland	gravel/clay/bedrock
27	Trib. to Cow Cr. along Squire Graves Rd., Todd Co.	18-Dec-02	27	upland	cobble/boulder/gravel
28	Caney Cr. at KY 171, Muhlenberg Co.	18-Dec-02	3	upland	clay/gravel
29	Long Cr. at Gene T. Jones Rd., Muhlenberg Co.	18-Dec-02	11	upland	gravel/sand
30	Trib. to Elk Pond Cr. at Depoy-Sharon Rd., Muhlenberg Co.	18-Dec-02	5	upland	gravel

* = site sampled historically; ** = young-of-the-year observed.

TABLE 2. Species list for fishes collected from the Pond River basin, Kentucky, in 2002. See Table 1 for site localities.

	Sites																												
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Lepisosteus oculatus																		X												
Campostoma oligolepis	X	X	X	X	X	X	X	X	X	X			X	X	X					X	X	X		X	X	X	X	X	X	
Cyprinella whipplei				X												X	X	X			X	X								
Cyprinus carpio																	X													
Hybognathus nuchalis																					X									
Luxilus chrysocephalus	X	X	X	X		X		X	X					X						X	X								X	
Lythrurus fasciolaris		X	X					X	X							X				X	X							X		
Lythrurus fumeus																X	X					X								
Lythrurus umbratilis			X								X														X				X	
Notemigonus crysoleucas																X									X		X			
Notropis boops								X																						
Phoxinus erythrogaster					X	X						X	X	X																
Pimephales notatus		X	X	X		X	X	X	X	X	X		X	X			X	X		X	X	X	X	X	X			X	X	X
Pimephales promelas							X																							
Pimephales vigilax																	X	X				X								
Semotilus atromaculatus			X		X	X			X	X	X	X	X	X						X	X		X	X	X		X	X	X	X
Catostomus commersoni		X				X				X			X											X	X					
Erimyzon oblongus	X		X					X	X						X					X	X		X	X						
Minytrema melanops				X																										
Moxostoma erythrurum				X													X					X								
Ameiurus natalis															X		X					X			X					
Noturus gyrinus																	X													
Noturus miurus																	X													
Esox americanus	X														X	X	X			X	X	X								
Aphredoderus sayanus																	X	X												
Labidesthes sicculus				X													X	X				X								
Fundulus notatus				X				X									X				X	X			X		X		X	
Fundulus olivaceus															X	X	X					X								
Gambusia affinis															X		X		X											
Centrarchus macropterus															X	X				X	X									
Lepomis cyanellus			X			X		X	X				X	X	X		X			X	X	X	X	X	X				X	
Lepomis gulosus											X					X	X		X					X						
Lepomis humilis																		X				X								
Lepomis macrochirus		X		X			X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X		X	
Lepomis megalotis	X	X	X	X	X			X	X		X	X		X	X	X	X		X	X	X	X	X	X			X	X		
Lepomis microlophus															X															
Lepomis miniatus																X	X			X										
Micropterus punctulatus		X						X	X								X	X												
Micropterus salmoides				X												X				X				X	X					
Pomoxis annularis																		X		X		X			X					
Pomoxis nigromaculatus																						X								
Etheostoma asprigene																	X		X											
Etheostoma blennioides		X																X												
Etheostoma flabellare	X	X	X	X		X		X	X	X															X			X	X	
Etheostoma gracile																		X	X											
Etheostoma histrio																		X												
Etheostoma kennicotti		X	X	X				X	X							X	X						X						X	
Etheostoma nigrum		X	X					X		X						X	X	X	X			X							X	
Etheostoma squamiceps	X	X	X	X			X	X	X	X	X	X			X	X				X	X	X	X	X	X			X	X	
Etheostoma tecumsehi	X	X	X		X	X	X	X	X	X	X	X	X	X	X						X	X	X	X	X	X	X	X	X	X	X
Percina maculata	X	X						X											X			X								
Percina phoxocephala																		X												
Percina sciera																X	X	X				X								

TABLE 3. Estimated *Etheostoma tecumsehi* density and habitat characteristics at eight sites in the Pond River, Kentucky, in 2002. See Table 1 for descriptions of site localities. N = number of habitat patches sampled; A = mean patch size (range in parentheses); E = mean estimated site density (number per m^2); D = mean depth (range in parentheses); V = velocity; Substrate = dominant particle type; CW = channel width. E, D, and V +/- 2SE.

Site	N	A (m^2)	E (#/m^2)	D (cm)	V (m/sec)	Substrate	CW (m)
1	7	4 (4)	1.07 ± 0.30	7 (5-10) ± 1.46	0.2 ± 0.07	gravel/sand	10.4
2	7	3.9 (2.6-5)	0.22 ± 0.31	11 (6-14) ± 2.45	0.34 ± 0.21	gravel/sand/bedrock	14.6
3	5	2.4 (1.2-4.9)	4.58 ± 2.16	14 (11-18) ± 2.57	0.09 ± 0.09	gravel/sand/cobble	11.2
5	5	7.5 (4-11)	0.32 ± 0.25	14 (9-18) ± 2.8	0.47 ± 0.30	bedrock/gravel/cobble	6.8
6	5	4 (4)	1.4 ± 0.73	16 (5-26) ± 7.40	0.42 ± 0.15	cobble/boulder/gravel	10
7	5	4 (4)	0.95 ± 1.20	28 (15-51) ± 12.38	0.38 ± 0.16	gravel/cobble/boulder	8.5
10	6	3.6 (2.1-4.9)	0.46 ± 0.47	18 (5-35) ± 8.30	0.03 ± 0.05	gravel/cobble/sand	8
17	3	7.5 (3.9-12.6)	0	14 (12-16) ± 2.58	0.67 ± 0.03	cobble/gravel/debris	12.7

APPENDIX. Summary of all known *Etheostoma tecumsehi* collection records prior to this study. Collection locations are followed by date, source and/or catalog number, and the number of specimens in parentheses. Institutions and acronyms are: Illinois Natural History Survey (INHS); Kentucky Division of Water (KDOW); Kentucky State Nature Preserves Commission (KNP); Southern Illinois University (SIUC); and Western Kentucky University (WKU).

East Branch West Fork Pond River, 4.4 km NW Fruit Hill, Johnson Mill Rd., Christian Co., 7 Jul 1975, Retzer et al., (1983) (?); 22 Aug 1979, Retzer et al., (1983) (2); 22 Mar 1990, INHS 58147 (19); 23 Apr 1992, INHS 27900 (13); 3 Apr 1993, INHS 29566 (18); 26 Mar 1994, INHS 32400 (26); 22 Apr 1994, INHS 32703 (22); 4 Apr 1995, INHS 36033 (10); 4 Apr 1995, INHS 37504 (1); 1Apr 1999, SIUC 35226 (25); 14 Aug 2001, KNP (3). **Dublin [Dulin] Creek**, 1.2 km NE Fruit Hill [KY 800], Christian Co., 10 Mar 1979, Retzer et al., (1983), SIUC 556 (3). **Buck Fork Pond River**, 3.2 km W Allegre [KY 507], Todd Co., 10 Mar 1979, Retzer et al., (1983), SIUC 2215 (3). **Coal Creek**, 1.6 km N Haleys Mill, Christian Co., 11 Mar 1979, Retzer et al., (1983) (6). **West Fork Pond River**, 1.6 km SE Mt. Carmel [KY 813], Hopkins Co., 6 Aug 1979, Retzer et al., (1983), SIUC 1330 (1). **East Branch [Fork] Pond River**, 0.8 km N Kirkmansville [KY 171], Todd Co., 22 Aug 1979, Retzer et al., (1983), SIUC 2203 (8). **[East Fork] Pond River**, 3.2 km NE Allegre [Shanklin Rd.], Todd Co., 22 Aug 1979, SIUC 2184 (6). **West Branch [Buck Fork] Pond River**, 5.6 km W Kirkmansville [KY 107], Christian Co., 22 Aug 1979, Retzer et al., (1983), SIUC 566 (1); 14 Aug 1980, Harker et al., (1981), SIUC 9124 (3); 14 Aug 2001, KNP (1). **Trib [Kate Branch?] to East Fork Pond River**, 3.2 km NW Cedar Grove [Blue Hole Rd.], Todd Co., 22 Aug 1979, Retzer et al., (1983), SIUC 2189 (16). **West Fork Pond River**, at Barnett [Apex-Orange] Rd., 0.2 km SW Barnett [Apex-Orange] Rd. and No. 5 Schoolhouse Rd. jct., Christian Co., 5 Aug 1980, Harker et al., (1981), Retzer et al., (1983), SIUC 7123 (1). **Forbes Creek**, at KY 189, Christian Co., 14 Aug 1980, Harker et al., (1981), Retzer et al., (1983) (30); 21 Feb 2002, WKU (41). **Shagland [Shelton] Branch West Fork Pond River**, 2.4 km N Allegre [Shanklin Rd.], Todd Co., 11 Apr 1985, INHS 68340 (13); 1 May 1989, INHS 64799 (7); 18 Apr 1996, INHS 38656 (26); 1 Apr 1999, SIUC 35235 (51). **West Fork Pond River [Thompson Creek?]**, near Kelly, Christian Co., no date, Retzer et al., (1983) (?). **McFarland Creek**, at Ackerson Schoolhouse Rd. and Wynn-Red Hill Rd., Christian Co., 20 Jun 2001, KDOW (2). **West Fork Pond River**, at Ralston Rd.- J.P. Grace Rd., Christian Co., 20 Jun 2001, KDOW (1). **Buck Fork Pond River**, 5 km SW Kirkmansville [River Rd?], Christian Co., 9 Aug 2001, WKU (13). **Buck Creek**, at KY 189, Christian Co., 9 Aug 2001, WKU (66). **West Fork Pond River**, at KY 800, Christian Co., 14 Aug 2001, KNP (1). **Trib to West Fork Pond River** at Fuller Rd. ca. 4.8 km SE Crofton, Christian Co., 17 Dec 2001, N. Lang, pers comm (6). **McFarland Creek**, 7 km NE Crofton [Cemetery Rd], Christian Co., 21 Feb 2002, WKU (4).

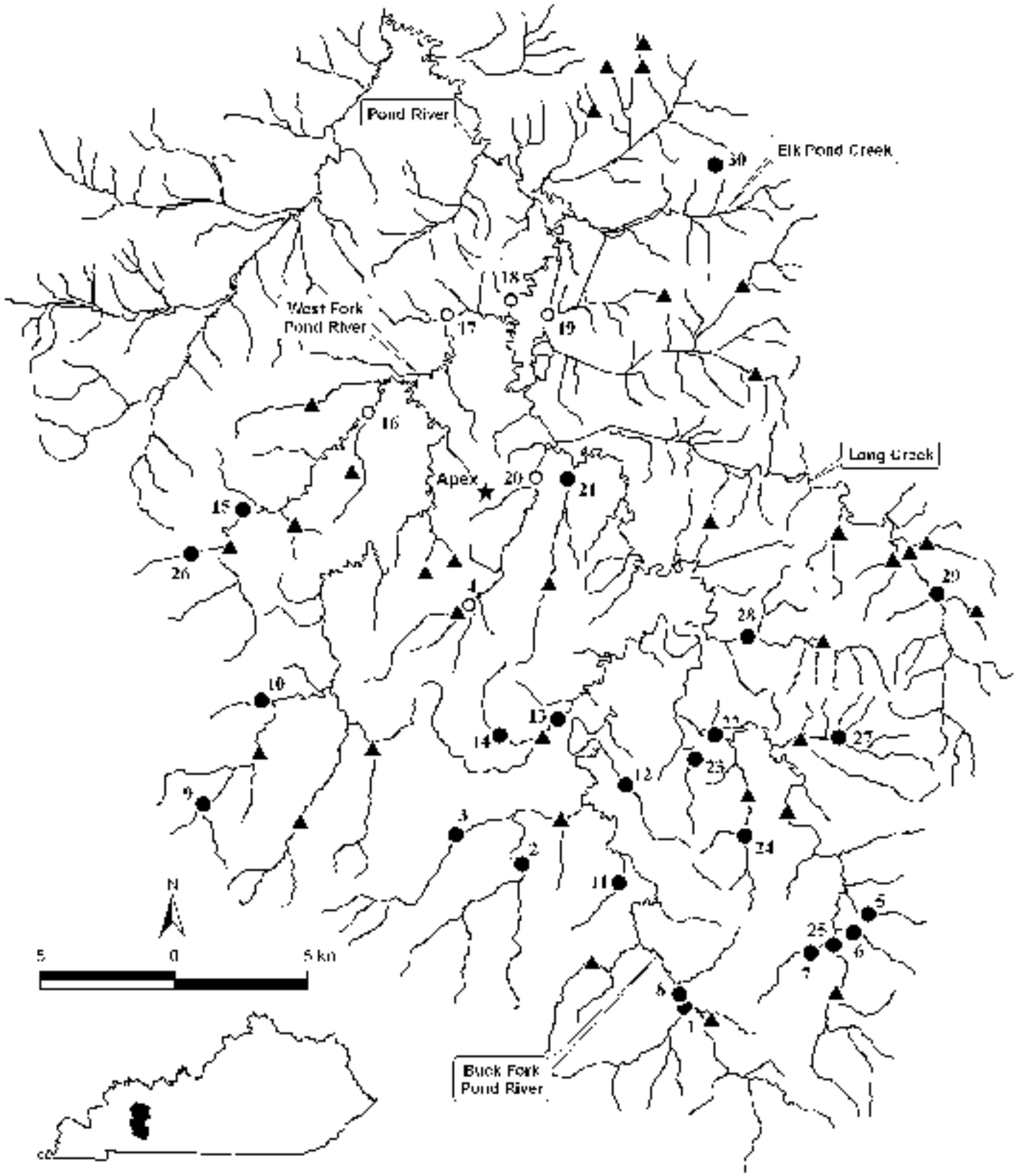

FIGURE 1. Pond River, Green River drainage, 2002 sampling sites for *Etheostoma tecumsehi* (dots) and reservoir dam locations (triangles).

Assessment and Control of an Invasive Aquaculture Species: An Update on Nile Tilapia (*Oreochromis niloticus*) in Coastal Mississippi after Hurricane Katrina

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ABSTRACT

We provide information about the effects of Hurricane Katrina on populations of an invasive fish, the Nile tilapia (*Oreochromis niloticus*) in southern Mississippi. By re-sampling areas surveyed before the storm, we attempted to determine whether the species expanded its range by moving with storm-related floods. Additionally, we used rotenone to eradicate individuals of this species at a hurricane-damaged aquaculture facility on the Mississippi coast. Although our survey was limited geographically, we did not find the species to occur beyond the aquaculture facility, other than in an adjacent bayou. Our rotenone treatment of the facility appeared effective with only a single *O. niloticus* being collected six weeks after the treatment. To reduce the spread of *O. niloticus* in the southeastern U.S., it is important to continue to control feral populations, work to eliminate vectors for dispersal, and continue monitoring their distribution.

INTRODUCTION

Maintaining the integrity of aquatic ecosystems and their fish resources in the face of ever-increasing rates of introduction and establishment of non-native species can be problematic and hierarchical. It is believed that the first level should be prevention, followed by eradication prior to dispersal, and then finally the use of detailed knowledge of population biology to develop effective and adaptive management protocols (Simberloff, 2003). The eradication of aquatic invasive species works well if populations have yet to disperse far from their point of introduction or are limited to small, confined water bodies or both (e.g., Hill and Cichra, 2005; Lazur et al., 2006).

Tilapias (Family Cichlidae) are warm-water fishes native to Africa and the Middle East of the genera *Oreochromis*, *Sarotherodon*, and *Tilapia* (Trewavas, 1983). These fishes are used widely in aquaculture because of their quick growth, tolerance of a wide range of environmental conditions, and ability to feed at different trophic levels (Costa-Pierce, 2003; Canonico et al., 2005). While these attributes make tilapias valuable for use in aquaculture, they also contribute to their ability to colonize non-native environments (Peterson et al., 2005). Nile tilapia (*Oreochromis niloticus*) has been introduced to at least 88 countries and has become established in at least 49 of them (Casal, 2006). After common carp (*Cyprinus carpio carpio*) and Mozambique tilapia (*O. mossambicus*), *O. niloticus* ranks third world-wide in negative ecological consequences and frequency of establishment (Casal, 2006).

In the United States, *O. niloticus* is one of the most commonly used tilapias in aquaculture (Costa-Pierce, 2003) and has been raised in fish farms in southern Mississippi since the late 1980s (Peterson et al., 2002). As has happened in other regions where it has been cultured, *O. niloticus* has escaped from culture and has been reported in rivers and marshes of coastal Mississippi since the

mid-1990s (Peterson et al., 2002; 2005). Studies on food habits, habitat use, and reproductive strategies of *O. niloticus* in Mississippi indicate that the species has successfully colonized freshwater and low-salinity regions of the area (Peterson et al., 2004, 2005, 2006; McDonald, 2006).

On 29 August 2005, Hurricane Katrina impacted a large portion of coastal Louisiana, Mississippi, and western Alabama. In western and eastern portions of coastal Mississippi, storm surge heights reached 7.5 m and 6 m, respectively. Damage and flooding from the storm provided *O. niloticus* with potential corridors of expansion across a large geographic area (Fig. 1). Within the zone of impact, one aquaculture facility was severely damaged by the storm and was closed for business immediately afterwards. Prior to the 2005 storm season the facility had cultured both *O. niloticus* and giant Asian prawn, *Macrobrachium rosenbergii*. In examining this facility after the storms, we were concerned that these aquaculture species might have gained access to adjacent freshwater and low-salinity waterways as a result of the storm surge. Our initial inspection revealed that *O. niloticus* persisted in small in-ground ponds at the facility from which the species might disperse into adjacent coastal marshes. Thus, the focus of our study was to: 1. document post-hurricane changes to the distribution of *O. niloticus* based on selected pre-hurricane data (Peterson et al., 2005), and 2. actively control the number of *O. niloticus* at the damaged aquaculture facility in an attempt to stem the expansion of this species into nearby natural areas. We also made an effort to document any occurrences of *M. rosenbergii* during our survey because specimens of this non-native species had been collected in 2001 from Simmons Bayou which is adjacent to the damaged facility (Woodley et al., 2002).

MATERIALS AND METHODS

Post-hurricane survey. In October and November 2006 we surveyed Simmons Bayou, Graveline Bayou (east of the facility), and Biloxi Back Bay (west of the facility) to test for the presence of *O. niloticus* and *M. rosenbergii* (Fig. 1). To assess physico-chemical conditions, we measured water temperature, salinity, and dissolved oxygen in each of the water bodies (Table 1). Using the same gear types and techniques of Peterson et al. (2005), we sampled those same areas that had been surveyed prior to the hurricane. In Simmons and Graveline bayous, sampling consisted of fishing trammel nets overnight. Trammel nets were 30 to 60 m long and 2.4 m deep with 0.36 m square mesh outer panels and 0.06 m square mesh inner panels. A total of 335.3 m of trammel nets was fished. Seines (3 m length with 0.5 cm DELTA mesh) and dipnets (0.41 m by 0.41 m frame with 0.5 cm ACE mesh) were used for sampling in Simmons Bayou and Biloxi Back Bay.

Control of tilapia at aquaculture facility. In October 2006 we visited the aquaculture facility with the goal of taking action to control the expansion of the *O. niloticus* population. The facility consisted of 14 ponds (designated A – M) and three ditches (designated back ditch, G ditch, and H ditch). Pond L did not have enough water to sample and was excluded from our analyses. Water-quality data were collected from the other 13 ponds and three ditches with a calibrated YSI model 556 MPS meter (Table 2). Preliminary sampling of ponds and ditches with minnow traps (baited with bread, 2 h soak time), seines (6.1 m with 0.5 cm DELTA mesh), and cast nets revealed that there were no fish in six ponds: ponds A, B, C, J, K, and L. The eight remaining ponds (ponds D, E, F, G, H, I, M, and N) and three ditches contained fishes and on 24 October we treated these with a Prentox© rotenone solution at 5 ppm (concentrations for total product, not active ingredient, per conventional use; Bettoli and Maceina, 1996; Lockett, 1998; McClay, 2000; Lazur et al., 2006). Fishes and decapod crustaceans were collected from the ponds and ditches from 23–26 October. All *O. niloticus* collected during 24 and 25 October were measured (TL to the nearest mm) whereas individuals collected on 26 October were simply counted. All fishes collected (other than voucher specimens) were buried on site. The facility was revisited on 27 November 2006 (six weeks after the rotenone treatment) and ponds that had yielded *O. niloticus* were re-sampled with seines (3 m and 6.1 m with 0.5 cm DELTA mesh). Voucher specimens of all fishes were deposited into the Ichthyology Collection at the Mississippi Museum of Natural Science.

RESULTS

Post-Hurricane Katrina surveys using the same sampling gear and effort as Peterson et al. (2005) produced only two *O. niloticus* in Simmons Bayou (Table 1; MMNS 48981 and 48985). These individuals (332 and 308 mm TL, respectively) were taken in trammel nets just downstream from the aquaculture facility. Physico-chemical conditions measured during these collections (water temperature, salinity, and dissolved oxygen) were typical for the time of year (Table 2). No *O. niloticus* were collected in Graveline Bayou or Biloxi Back Bay.

Twenty-five taxonomically recognizable units (23 fishes and 2 decapod crustaceans) were collected from the ponds and ditches within the damaged aquaculture facility after treatment with rotenone (Table 3). The most interesting discovery was that of 21 juvenile tarpon (*Megalops atlanticus*; 69 – 199 mm TL) that were collected from pond F. Pond F also contained numerous potential prey species (e.g., *Gambusia* spp., *Poecilia latipinna*, *Menidia* spp., and *Mugil cephalus*) as well as other predator species (*Lepisosteus oculatus* and *L. osseus*; Table 3). A total of 9,173 *O. niloticus* were collected from four main ponds: ponds F, G, H, and I (Table 2). One indi-

vidual *O. niloticus* was taken from pond E. These *O. niloticus* ranged in size from 20 to 360 mm TL, though the size structure varied among ponds. For example, pond F and G tended to have larger individuals (mean TL: pond F = 104 mm; pond G = 144 mm) while pond H contained smaller individuals (mean TL: pond H = 49 mm). Pond I had the highest abundance of *O. niloticus* with 94% of individuals occurring between 6 - 120 mm TL (mean TL: pond I = 74 mm). Some *O. niloticus* collected from the ponds contained eggs in their mouths indicating that the species (a maternal mouthbrooder) was actively reproducing in the ponds at the facility. When we returned to the facility six weeks after the rotenone treatment, only a single *O. niloticus* (165 mm TL, pond I) was collected. While specimens of *M. rosenbergii* had been collected from Simmons Bayou in 2001 (Woodley et al., 2002), none were collected during our 2006 sampling.

DISCUSSION

While Hurricane Katrina devastated coastal Mississippi in 2005, our sampling at and around a coastal aquaculture facility suggests that two invasive species, *O. niloticus* and *M. rosenbergii*, did not expand their ranges into nearby natural areas as a result of the facility being damaged. Admittedly our sampling was not comprehensive and did not encompass all of coastal Mississippi. Therefore we cannot definitively claim that ranges for *O. niloticus* or *M. rosenbergii* either stayed the same or shrank as a result of the hurricane. Our rotenone treatment of the ponds and ditches of the facility appeared effective with only a single *O. niloticus* being collected six weeks after the treatment. The treated ponds and ditches were typical of aquaculture facilities, being relatively small and unconnected to flowing waterways (Hill and Cichra, 2005; Lazur et al., 2006). Though our treatment efforts greatly reduced the *O. niloticus* population at the facility, it is possible that some individuals may have persisted.

Hurricanes may affect large geographic areas with high winds and flood waters, causing great damage and either facilitating invasion by non-native species or distributing them directly. For example, the first records of lionfish (*Pterois volitans*) in marine waters off Florida occurred in 1992 shortly after Hurricane Andrew damaged a large outside aquarium housing the fish and liberated them into the Atlantic Ocean (Courtenay, 1995). After passage of Hurricane Andrew, wind damage to trees created large-scale light gaps in hammocks that were quickly colonized by invasive non-native plants that were superior competitors of native species (Horovitz et al., 1998; Kwit et al., 2000). Additionally, flooding from Hurricane Katrina in 2005 allowed rapid dispersal by non-native African jewelfish (*Hemichromis letourneuxi*) in Everglades National Park (Loftus et al., 2006). In contrast, hurricanes may restrict the range of non-natives by creating environmental conditions not conducive to survival or by directly killing them. For example, distribution of giant Salvinia (*Salvinia molesta*) along the Pascagoula River in southern Mississippi was greatly reduced after the 2005 hurricane season (Fuller and Diaz, in prep). Much of the population of giant Salvinia was moved onto dry land where it died, while the salinity of storm surge waters killed most of the remaining plants. This range reduction was so significant that it allowed natural resource managers to control remaining populations with herbicide, a task not possible before the storms (Fuller and Diaz, in prep).

The ability of a non-native species to use altered environments and expand its range is certainly dependent on the environmental tolerances and life-history attributes of the species. The region in which *O. niloticus* evolved is prone to seasonal floods, so the species is tolerant to a wide range of environmental conditions, including low salinity and hypoxia (Lowe-McConnell, 1991; Avella et al., 1993; Chapman et al., 1995). Additionally, *O. niloticus* is a trophic generalist and can feed on a wide array of food items (Peterson et al., 2006; McCrary et al., 2007). Thus, conditions following the 2005 hurricane season would have been advantageous for *O. niloticus* to disperse and expand its range beyond the area determined by Peterson et al. (2005). Nevertheless, we collected only two *O. niloticus* from Simmons Bayou, which is adjacent to the aquaculture facility and where the species had been collected previously. No other specimens were collected in either of the other adjacent bayous we surveyed. It was interesting, however, that the fish and decapod crustacean assemblage collected at the aquaculture facility consisted of a combination of freshwater, estuarine, and marine organisms (Table 3). We think this illustrates the ability of hurricanes to move aquatic assemblages considerable distances in a short time and that many species can persist in isolated ponds and ditches for more than a year after storm-related inundation. The most convincing evidence of this was the occurrence of juvenile *M. atlanticus* at the facility after the hurricane. This species was not being cultured at the facility so the collected individuals must have originated from marine or estuarine habitats.

The relevance of our findings to the conservation of native Southeastern fishes is that tilapia species such as *O. niloticus* have caused great harm to natural systems where they have gained access and become established. Some negative consequences of tilapia introductions, in general, include competition with native fishes for food or space or both, agonistic interactions with native species, direct predation on eggs and fry of native fishes, genetic introgression, spread of disease, shifts in the composition of native fish assemblages, and environmental alterations that degrade habitats such as the reduction or elimination of vegetation, bioturbation, and eutrophication (Courtenay, 1997; Canonico et al., 2005; Casal, 2006;

McCrary et al., 2007). In Nicaragua, *O. niloticus* has eliminated submersed aquatic vegetation that once served as habitat for native species and has supplanted native fish species in local markets (McCrary et al., 2007). Nonnative tilapias inhabit watersheds that cover more than half of Nicaragua and are thought to be responsible for spreading a disease that causes blindness in native fishes (McCrary et al., 2007). Ramifications of the introduction, spread, and establishment of *O. niloticus* in Nicaragua are poignant as researchers suggest there is no realistic mechanism to control the species now that it is so widespread (McCrary et al., 2007).

The *O. niloticus* colonization of natural systems in the southeastern U.S. is in its early stages. We feel there may still be time to protect native fishes and other natural resources against the spread of this highly invasive species. Currently, established populations of *O. niloticus* exist in southern Mississippi (Peterson et al., 2005), bayous of Galveston Bay and Texas (Texas Parks and Wildlife Department, unpublished data). Populations also may exist in Lake Seminole on the Florida-Georgia border (Fuller et al., 1999; J.D. Williams, pers. comm.) and peninsular Florida (Jelks and Nico, pers. comm.). To reduce the further spread of *O. niloticus* in the Southeast, it is important to control existing feral populations. Sources and vectors of dispersal for new and existing populations need to be eliminated and continual monitoring of distributions is necessary to detect possible expansions. It is paramount that we implement successful management strategies with the aquaculture industry that minimize or completely prevent introductions during periods of normal operation. However, it is even more important to do so in regions that can be regularly impacted by natural disasters such as hurricanes. Successful conservation of native Southeastern aquatic organisms will require, in part, a vigilance for invasive species and the use of adaptive preventative management.

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TABLE 1. Summary of physico-chemical conditions and number of *Oreochromis niloticus* collected in bayous adjacent or near an aquaculture facility that was damaged as a result of Hurricane Katrina. Simmons Bayou was sampled with trammel nets and seines, Biloxi Back Bay with seines and dipnets, and Graveline Bayou with trammel nets. Each area sampled with trammel nets was set with seven total nets overnight (length = 335.3 m).

Waterbody	**dates sampled**	**temp. (°C)**	**salinity (ppt)**	**dissolved oxygen (mg/L)**	**number of *O. niloticus***
Simmons Bayou	7-8 Nov. 2006	19.3-20.6	12.4-18.4	3.5-3.8	2
Graveline Bayou	28-29 Nov. 2006	21.6-22.5	16.6-17.4	6.5-9.2	0
Biloxi Back Bay	29 Nov. 2006	17.7-21.0	2.1-12.6	5.4-6.2	0

TABLE 2. Physico-chemical conditions, estimated water volumes, and total number of *Oreochromis niloticus* removed from ponds at an aquaculture facility that was damaged as a result of Hurricane Katrina. Sampling was conducted 23-26 October 2006. Pond L was not sampled due to lack of water. Water volumes are given only for ponds treated with rotenone.

pond/ditch designation	temp (°C)	sal (ppt)	dissolved oxygen (mg/L)	cond. (mS/cm)	volume (acre-ft)	number of *O. niloticus*
A	24.59	5.7	10.17	10.12	–	0
B	22.8	5.92	14.85	10.02	–	0
C	23.15	3.94	14.33	6.91	–	0
D	23.35	9.75	13.65	16.07	0.094	0
E	21.78	9.18	16.8	14.73	0.138	1
F	23.55	16.74	16.6	26.51	0.546	93
G	23.08	13.69	13.78	21.86	0.548	994
H	21.9	11.78	9.3	18.58	0.284	595
I	22.17	4.08	9.1	6.98	0.628	7,490
J	23.67	0.25	8.69	0.51	–	0
K	24.18	0.12	4.6	0.24	–	0
M	22.25	12.88	14.6	20.29	0.017	0
N	22.42	13.87	14.41	21.81	0.003	0
Back ditch	21.07	18.66	15.9	27.81	0.025	0
G ditch	19.88	15.88	12.3	23.52	0.009	0
H ditch	13.21	17.09	6.15	no data	0.013	0
					Total *O. niloticus* =	**9,173**

TABLE 3. Fishes and decapod crustaceans collected from an aquaculture facility in coastal Mississippi that was damaged as a result of Hurricane Katrina. Organisms were collected after treatment with rotenone and identified either to species or taxonomically recognizable units (TRU).

Family	Species or TRU	Common Name	Family	Species or TRU	Common Name
Decapod crustaceans				*Fundulus grandis*	Gulf killifish
Palaemonidae	*Palaemonetes* spp.	grass shrimp		*Fundulus pulvereus*	bayou killifish
Portunidae	*Callinectes sapidus*	blue crab	Poeciliidae	*Gambusia* spp.	mosquitofish species
Fishes				*Poecilia latipinna*	sailfin molly
Lepisosteidae	*Lepisosteus oculatus*	spotted gar	Cyprinodontidae	*Cyprinodon variegatus*	sheepshead minnow
	Lepisosteus osseus	longnose gar			
Elopidae	*Megalops atlanticus*	tarpon	Centrarchidae	*Lepomis macrochirus*	bluegill
Anguillidae	*Anguilla rostrata*	American eel		*Lepomis microlophus*	redear sunfish
Ophichthidae	*Myrophis punctatus*	speckled worm eel	Cichlidae	*Oreochromis niloticus*	Nile tilapia
			Eleotridae	*Dormitator maculatus*	fat sleeper
Clupeidae	*Dorosoma cepedianum*	gizzard shad		*Eleotris amblyopsis*	largescaled spinycheek sleeper
Mugilidae	*Mugil cephalus*	striped mullet			
Atherinopsidae	*Menidia* spp.	silverside species	Gobiidae	*Evorthodus lyricus*	lyre goby
Fundulidae	*Adinia xenica*	diamond killifish		*Gobionellus oceanicus*	highfin goby
				Gobiosoma bosc	naked goby
	Fundulus chrysotus	golden topminnow			

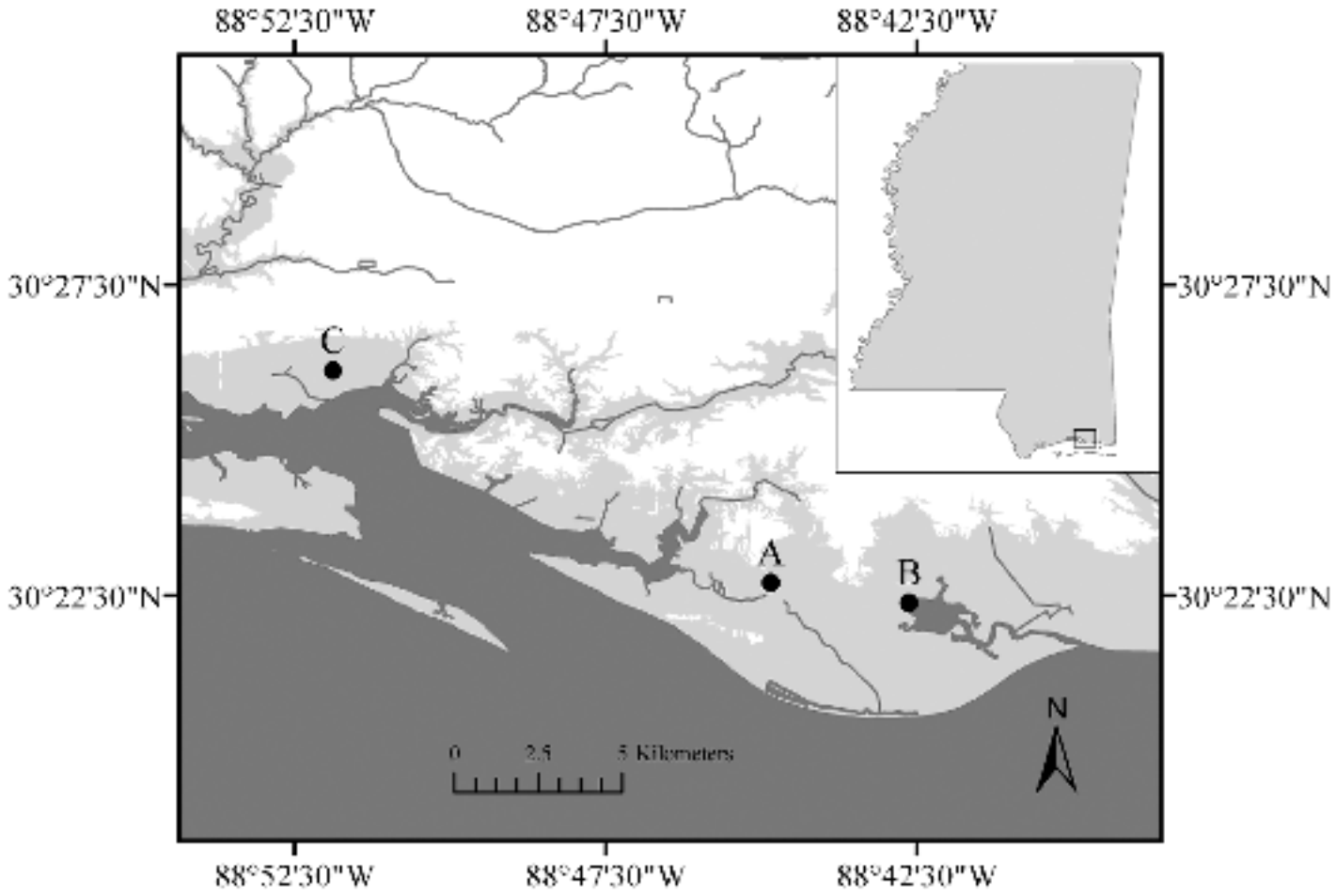

FIGURE 1. Sampling localities for *Oreochromis niloticus* in coastal Mississippi: A = aquaculture facility adjacent to Simmons Bayou; B = Graveline Bayou; and C = Biloxi Back Bay. Gray coloration indicates coverage of flooding from Hurricane Katrina as interpreted from the Federal Emergency Management Agency website (see http://www.fema.gov/hazard/flood/recoverydata/katrina/katrina_ms_mmds.shtm).

Regional Reports

REGION I—NORTHEAST

Beginning in the north, even though the drainages of West Virginia clearly show on the SFS logo map, it seems that no one is quite sure which SFC region the mountaineers fall into nor has stepped up to claim them. While, except for a bit of western North Carolina and Virginia, Region I comprises Atlantic Slope drainages, and much of West Virginia drains to the Ohio River basin, we are nevertheless happy to claim these orphan mountain people, along with Maryland, as a northern outpost of our region and their report is included herein.

Stuart Welsh and Dan Cincotta report that they have synthesized and compiled data on historic and recent fish collections in West Virginia. These data will be used to produce a spatial and temporal atlas of fish distributions (expected publication in 2008), and currently includes over 9,000 site records from fish collections during 1853 to 2005. Over 2000 of the 9,000 site records are represented at museums, and Stuart and Dan have verified species identifications of most of the individual lots of these records at Cornell University, University of Michigan Museum of Zoology, American Museum of Natural History, North Carolina State Museum, United States National Museum, and Ohio State University Museum. Additionally, the atlas will include dichotomous keys (with illustrations) for identification of families, genera, and species. The general format highlights and illustrations of this atlas will be presented in poster format at the upcoming SDAFS meeting in Memphis and the ASB meeting in Columbia.

Moving on to the "other Virginia", we have a brief dispatch from John Copeland and Brian Watson of Virginia Division of Game and Inland Fisheries who report some results of gillnetting in Claytor Lake, an impoundment of the New River. Among the catches in October, 2006 were one adult quillback (*Carpiodes cyprinus*) and three white perch (*Morone americana*), neither native nor previously reported from the New River basin. The white perch were all in the 200 to 230 mm size range. They will be doing additional sampling this fall and next spring to determine whether any reproduction has occurred. The source of the introductions likely will never be known but the potential for explosion of white perch populations in the system is a real concern. They also reported the presence of the non-native and invasive crayfish, *Orconectes virilis*, in the nets.

There is various and sundry sucker news from Bob Jenkins of Roanoke College. Bob received a major grant from the North Carolina Wildlife Resources Commission for work on the sicklefin redhorse (*Moxostoma* sp.) in 2006-07. Steve Fraley of the NCWRC initiated and solidly supported making the grant. Bob has been aiding the North Carolina State University study of sicklefin biology since it was begun in 2006 by a very enthusiastic and able graduate student, Scott Favrot, under the direction of NCSU Cooperative Unit Leader Tom Kwak and committee members Wayne Starnes and Ken Pollock. Bob perceives that folks want to see him "turn the corner" on sucker studies, from data-taking phase to completing manuscripts for publication, and he's long recognized this need. Hence the grant from the NCWRC includes page costs for a monographic treatment of systematics and much of the life history and ecology of the fish. Bob heard that some folks think he won't get the job done, but he counters that the long-term, huge project on freshwater fishes of Virginia got finished and published, and so will the sicklefin study.

Bob's determination of age from scales of the robust redhorse (*M. robustum*) from the Pee Dee River has been ongoing since 2000. Results from 2006 sampling indicate that the breeding population, although maybe small, includes a "good" percentage of recently matured fish. Bob plans to complete also in 2007 a study of the "Carolina redhorse" including formal description, distribution, and certain life history aspects.

A spin-off of the "Carolina redhorse" study by Bob and Wayne Starnes is written review and analysis of NCWRC reports and preserved specimens at the North Carolina State Museum of Natural Sciences (NCSM) from the NC Statewide Stream Survey made by the NCWRC in the 1960s, as exemplified by tidbits and sometimes more of the suckers preserved from the Cape Fear and Pee Dee drainages. This further led to description of evidence of two geographically much separated introductions of striped jumprock (*M. rupiscartes*) into the Yadkin system of the Pee Dee and their spreading in the system.

Jenkins retires from teaching at Roanoke College on May 1st, 2007 to become a fulltime suckerologist, retaining his office and fish collection there. In the possible eventual absence of an ichthyologist at the college the collection is destined for the NCSM.

Mark Cantrell (FWS—Asheville) reported the U.S. Fish and Wildlife Service completed an extensive status review of the American eel (*Anguilla rostrata*), and concluded that protecting the eel as an endangered or threatened species under the Endangered Species Act is not warranted. Mark thanks all of those who supplied data, specimens, and literature for the review. In the review, FWS examined all available information about the American eel population from Greenland south along the North American coast to Brazil in South America and as far inland as the Great Lakes and the Mississippi River drainage. While the eel population has declined in some areas, the species' overall population is not in danger of extinction or likely to become so in the foreseeable future, FWS decided.

Overfishing and hydropower turbines continue to impact eels in some regions. Several actions have been taken in an effort to conserve eel populations including installation of eel ladders for upstream passage at hydropower projects, implementation of state harvest restrictions, and dam removals that open historic eel habitat. Canadian resource agencies have closed the harvest of eels in the Canadian portion of Lake Ontario. The Committee on the Status of Endangered Wildlife in Canada is considering designating the American eel a "species of special concern." The FWS initiated the status review in 2004 at the request of the Atlantic States Marine Fisheries Commission. Following that request, they were petitioned to list the eel. The FWS determined in 2005 that substantial biological information existed to warrant a more thorough examination and began a comprehensive review of all the available scientific and commercial information. They hosted two workshops to discuss threats and vulnerabilities with eel experts from federal and state agencies, non-profit organizations, private industry, Native American tribes, academia, the ASMFC, the Great Lakes Fishery Commission, Canada, England and Japan. The "Federal Register" notice with the status review on American Eels was published Feb. 2, 2007.

Moving on southward into North Carolina, Bryn Tracy of the North Carolina Division of Water Quality reports on the following activities:

Reclassification Studies

Three reclassification studies were conducted since late 2005 – the Deep Creek watershed (Neuse River Basin, Outstanding Resource Waters) and the Fines Creek and upper Boylston Creek watersheds (French Broad River Basin, Trout Waters). A fact sheet on the DWQ methods for reclassifying a stream segment to trout waters was developed and is available form Bryn Tracy (bryn.tracy@ncmail.net).

The March 2005 proposal for the North Fork First Broad River watershed (Broad River Basin, Outstanding Resource Waters) went before a public hearing in September 2006 and is progressing through the reclassification process. Nine watersheds in the Yadkin River Basin are eligible for petitioning to High Quality Waters because of their consistently rated excellent fish assemblages. The reclassification process for these watersheds will be initiated in 2007.

Basinwide Monitoring

Between early April and early August 2006, the stream fish assemblage assessment program sampled 96 basinwide sites. Eighty-three of these sites were in the Yadkin-Pee Dee River Basin and stretched from headwaters in Watauga County to the extreme southern border of Anson County (South Carolina state line). The remaining 13 sites were in the Sand Hills region of the Lumber River Basin. The complete data, ratings, and analyses for all sites will be available on the Biological Assessment Unit's web page (http://www.esb.enr.state.nc.us/BAU.html) beginning in early 2007. Preliminary results show some lingering drought impacts in the lower part of the basin, especially in some of the smaller streams draining the Carolina Slate Belt ecoregion. Encouragingly, good and excellent biological sites still existed throughout the Yadkin River Basin.

Based upon a cursory examination of the data, unusual or new DWQ distributional records (i.e., those not shown in Menhinick, 1991, *The Freshwater Fishes of North Carolina*, and collected for the first time by DWQ staff from a particular county in the Yadkin River Basin) have been recorded for the following species in these counties:

- sea lamprey (*Petromyzon marinus*): Anson
- gizzard shad (*Dorosoma cepedianum*): Caldwell
- threadfin shad (*D. petenense*): Cabarrus and Davie (lotic populations)
- central stoneroller (*Campostoma anomalum*): Wilkes and Surry (wider distributions)
- eastern silvery minnow (*Hybognathus regius*): Forsyth
- highback chub (*Hybopsis hypsinotus*): Anson
- warpaint shiner (*Luxilus coccogenis*): Watauga
- golden shiner (*Notemigonus crysoleucas*): Surry
- sandbar shiner (*Notropis scepticus*): Union
- fathead minnow (*Pimephales promelas*): Surry, Wilkes, and Iredell
- notchlip redhorse (*Moxostoma collapsum*): Watauga
- striped jumprock (*Moxostoma rupiscartes*): most tributaries in Wilkes and Surry
- flat bullhead (*Ameiurus platycephalus*): Caldwell
- channel catfish (*Ictalurus punctatus*): Forsyth
- speckled killifish (*Fundulus rathbuni*): Caldwell
- eastern mosquitofish (*Gambusia holbrooki*): Randolph and Yadkin
- Roanoke bass (*Ambloplites cavifrons*): Richmond
- spotted sunfish, (*Lepomis punctatus*): Anson
- spotted bass, (*Micropterus punctulatus*): Davie
- fantail darter (*Etheostoma flabellare*): Yadkin
- Piedmont darter (*Percina crassa*): Stanly

Sand Hills streams, such as those in the Lumber, Cape Fear, and Yadkin River basins are ecologically and geologically unique. The waters can be very tannin-stained with low specific conductance and pH, white sand and gravel bottomed, and with an abundance of coarse woody debris. The fish assemblages are usually in low abundance, but include such species as sandhills chub (*Semotilus lumbee*), pinewoods darter (*Etheostoma mariae*), dusky shiner (*Notopris cummingsae*), dollar sunfish (*Lepomis marginatus*), and mud sunfish (*Acantharchus pomotis*). IBI type metrics and criteria

for assessing these unusual streams and communities are still under development. This fall, Ernie Hain (M.Sc. graduate student at NCSU) began developing a research project that would use DWQ's fish community data to develop an IBI method for assessing Sand Hills streams.

Miscellaneous Projects

Five Special Studies were conducted this field season– three for DENR's Ecosystem Enhancement Program (EEP) and two for the Modeling and Total Maximum Daily Load (TMDL) Unit. The EEP's mission is: "*to restore*, *enhance*, *preserve*, *and protect the functions associated with wetlands*, *streams and riparian areas*" (http://www.nceep.net/). Watersheds targeted for restoration or enhancement included those of Martin and Peachtree Creek in the Hiwassee River Basin, the Fishing Creek watershed (Granville County) in the Tar River Basin, and the upper Uwharrie River watershed in the Yadkin River Basin. The stressor studies conducted for the TMDL Unit focused on the Abbotts Creek watershed in Davidson County and several watersheds in Gaston and Lincoln counties in the Catawba River Basin.

Staff also continued to participate in the Pigeon River Fish Re-Introduction Project (French Broad River basin, Haywood County, NC and Cocke County, TN). The project was described in an article (*Pigeon River Revival*) in the December 2004 issue of *Wildlife in North Carolina*. Further information on this project may be found at: http://web.utk.edu/~mjwilson/index.php.

One of the taxonomically challenging species encountered this year included the fantail darter (*E. flabellare*). Several undescribed species, currently lumped under *E. flabellare*, may be lurking in the state. Rebecca Blanton Johansen of Tulane University (currently at Florida Museum Natural History) is attempting to unravel this mystery, the subject of a portion of her dissertation studies. As an aid to her research and working with Dr. Wayne Starnes, NCSM, 178 specimens from 42 sites were preserved for future genetic analyses along with 552 specimens from 48 sites which were preserved for morphological analyses from several key drainages within the Yadkin River Basin.

For further information on the Division's on-going fish studies, please visit the Biological Assessment Unit's web site http://www.esb.enr.state.nc.us/BAU.html or contact Bryn Tracy (bryn.tracy@ncmail.net).

In other North Carolina area news, members of the Robust Redhorse Conservation Committee, Technical Working Group for the Pee Dee River, continue to pursue knowledge of this large but rare and elusive fish. Recent participants have been personnel from the NCWRC (Ryan Heise, Rob Nichols, Brena Jones), Progress Energy (John Crutchfield, Mike Swing), NCSM (Wayne Starnes, Morgan Raley), and the South Carolina Aquarium (David Wilkins). Spring survey efforts on the Pee Dee in the reach below Blewett Falls Dam have met with much greater success in the past two years. Recent efforts have usually involved three electroshocking boats simultaneously sampling on nine days spread over three weeks in late April-early May in attempts to catch Robust Redhorse on the spawning shoals. After similar or even much greater efforts yielded on average barely more than one fish per season in previous years, the take has significantly increased. Eight redhorse were captured in 2005 of which six were not recaptures of prior years' fish. Several of these were implanted with transmitters to study movements and to possibly serve as sentinel fish to locate any aggregations of additional redhorse. In 2006 a whopping 17 individuals were captured of which 15 were first time captures. Ten of these were implanted with transmitters to add to the potential of gathering movement data. Among these were two fish over 18 lbs. that Wayne Starnes of NCSM was fortunate enough to snag. The largest, a female weighing 18.6 lbs., is the largest recorded redhorse of any species!

The above mentioned NCWRC personnel have made several tracking forays on the Pee Dee over the last two seasons to ascertain the whereabouts of transmitter-implanted redhorse and found that some are moving distances of over 50 river miles back and forth between North and South Carolina while others may be less migratory. Since the beginning of intensive spring (and a couple of fall) surveys in 2000, there have been a total of 31 captures with four recaptures (27 individuals). An additional specimen was taken in routine gill net sampling by Progress Energy in 2001 near Cheraw, SC, yielding a total of 28 known captures since the prior take of a single specimen by a consulting firm in 1985, which represented the first documented capture in the Pee Dee basin since the 19th century. Some apparent spawning shoal areas, generally associated with braided island channels, have been located, including an important one near Jones Creek a few miles southwest of Rockingham. The RRCC TWG team will be returning to the Pee Dee in a few weeks and hope to have continued success in learning more about this truly awesome fish. The Pee Dee is a greatly altered habitat with tremendous flow fluctuations due to dam releases and a huge biomass of non-native species. Included in these are highly predatory flathead catfish (*Pylodictis olivaris*), blue catfish (*Ictalurus furcatus*), and incredibly abundant smallmouth buffalo (*Ictiobus bubalus*) which very likely directly compete with redhorses for food and other resources. The future existence of the robust redhorse is doubtless in considerable jeopardy and knowledge of its habits and critical habitat will be crucial to conservation planning.

Wayne Starnes and Morgan Raley of NCSM, with the assistance of Ryan Heise, Rob Nichols, and Brena Jones of NCWRC and Bryn Tracy of NCDWQ, have continued to try to learn more of the current distribution and status of the undescribed "Carolina Redhorse" (CRH) and to study its genetic relationships to other species as well as inter-

and intrapopulation genetic structuring. Currently, the known extant range extends, in the Cape Fear basin, on the lower piedmont, from near the confluence of the Deep and Haw rivers (very rare, last collected in 1997) upstream in the Deep to at least Randolph County, NC, with the stronghold perhaps being in the, until recently, impounded reach near Carbonton (see dam removal study below) in eastern Moore County. Prior to removal of the small dam at Carbonton, this species was common in the 12-mile long impoundment above and apparently migrated to shoal areas further upstream to spawn. A survey of the former impounded reach in fall of 2006 revealed that CRH are still hunkering down in whatever deeper pools remain in the area. Plans are to survey more thoroughly in reaches below the former dam site in the coming year to determine how far down river a significant CRH population extends. Several past efforts in two limited reaches downstream of Carbonton have failed to yield any specimens. Use of tributary creeks by young of the year CRH has been documented, as well as by young of other riverine redhorse species, extending over a mile upstream in one case. This is quite surprising as, thus far, there is no knowledge of spawning migrations into these streams and it seems a very long way, through long deep pool reaches, for young of year redhorse to traverse; this phenomenon will be studied further. Elsewhere in the Cape Fear, several surveys of the Haw River, which, while much improved, has had a history of very poor water quality, have failed to demonstrate the persistence of CRH.

In the Pee Dee basin a stronghold of CRH has been located in upper Blewett Falls Reservoir on the Pee Dee River represented by both adult and juvenile specimens. These are generally taken in the shallow upper few miles of the impoundment, especially around an island complex known as Grassy Islands and the adjacent lower Mountain Creek. It is suspected that this population is associated with Little River which enters the Pee Dee upstream of this area and harbors several populations that are effectively isolated above small dams on that river. A few CRH have been captured in lower Little River in spring but thus far no spawning areas have been documented despite investigations of some very promising looking gravel shoal areas. It is hoped to learn more about the relationship of Little River and the upper Blewett population in future work. A few CRH are found in the Pee Dee each year in the course of robust redhorse surveys below Blewett Falls dam. Whether these represent trickle down from above the dam or perhaps a small amount of reproduction downstream of it is unknown. Except for a single specimen recorded from the head of Tillery Reservoir (next above Blewett Falls) on the Pee Dee, all Pee Dee basin records thus far are from the Blewett Falls Reservoir or tailwater and Little River. CRH were doubtless formerly more widespread, especially in tributaries such as Rocky River which enters the same reach of the Pee Dee, but may now be extirpated. Efforts to find new populations will continue.

Microsatellite primers are currently being developed to further probe the genetic structuring of CRH populations as, thus far, investigations of large samples using cytochrome-b and S7 intron sequence data have yielded amazingly invariant results, not only within populations but between the Cape Fear and Pee Dee basins populations. It is assumed that this species, not recognized until 1995, has occupied both of these basins for a very long time and thus the lack of differentiation is remarkable minus any translocation scenarios. Perhaps the most significant findings thus far are strong implications of introgressive hybridization of CRH ancestral stock with the sympatric but morphologically very different notchlip redhorse (*M. collapsum*). Hopefully further investigations utilizing microsatellites will provide some resolution and enable estimates of effective population size and other information critical to conservation.

In SFC Proceedings 48 the impending removal of Carbonton Dam on Deep River in North Carolina was reported along with the initiation of a before/after study of fish communities. This is a combined effort by NCWRC, NCSU Coop Unit, NCSM, and NCDWQ. Pre-removal seasonal (spring/fall) sampling was conducted for two years in the impoundment and tailwater of the dam as well as control sites well above and below this reach. The ~7 m high dam was removed in late fall of 2005 and spring and fall sampling of these sites continues. A tremendous amount of fish data, generated from both backpack and boat electroshocking efforts, has been garnered, including species and size composition. A couple more years of data will be gathered before analyses begin to assess short term effects of the removal and hopefully the current investigators and some successors can conduct periodic sampling in the future to look at longer term trends. The removal of the dam revealed a number of beautiful gravel shoal areas, as well as an intact Native American or European settler rock fish weir, which had been inundated for the better part of a century. The shoal areas have reconstituted themselves into clean swept gravel reaches with surprising rapidity. One major curiosity is what effect the removal of the impoundment will have on the overall population levels of "Carolina redhorse" which were relatively common in this reach to the exclusion of all others. The species appears to have a definite affinity for the deeper portions of rivers for most of the year and the impoundment may have bolstered available habitat. As mentioned above, the remaining CRH were found sequestered in some deep pools post dam removal. Unfortunately, they are sharing these pools with large numbers of large flathead catfish (*P. olivaris*) which may take a toll. Only time will tell. Theoretically, returning this reach to riverine conditions will reestablish connectivity between populations of the endangered Cape Fear shiner (*Notropis mekistocholas*) which may have been effectively fragmented by this impoundment for much of a century.

The Scientific Council on Fishes, advisory group to the NCWRC's Non-game Committee, has made several recommendations for status changes of listed species in North Carolina. The Council is chaired by Wayne Starnes and several biologists with connections to SFC, including Gabriela Hogue (NCSM), Fritz Rohde (NCDMF), Bryn Tracy (NCDWQ), Steve Fraley and Ryan Heise (WRC) and Tom Kwak (NCSU) sit on the council; other members are Angeline Rodgers and Sarah McRae (NC Natural Heritage), and Gerald Pottern (Goldstein & Associates). Two species, the robust redhorse (*M. robustum*) and the rediscovered bridle shiner (*Notropis bifrenatus*), were recommended for state Endangered status. The turqoise darter (*Etheostoma inscriptum*), the undescribed "Carolina" and "sicklefin" redhorses, Carolina madtom (*Noturus furiosus*), and blackbanded darter (*Percina nigrofasciata*)were recommended as Threatened due to both limited overall ranges and impending threats or have peripheral occurrences in North Carolina that are effectively cut off from recolonization due to downstream impoundments. The freshwater drum (*Aplodinotus grunniens*), cutlip minnow (*Exoglossum maxillingua*), and striped shiner (*Luxilus chrysocephalus*) were downlisted from higher categories to Special Concern; these are peripheral species but may have ample opportunity for recolonization from populations in adjacent states. The recently described Blue Ridge sculpin (*Cottus caeruleomentum*), which occurs in a few miles of the Dan River in North Carolina, was also added to this category. All of the Council's recommendations were adopted by the Non-game Committee and currently are undergoing the Commission and legislative approval process.

At NCSM the great push to database and provide online access to the collections continues. The fishes and aquatic invertebrate efforts are much aided by an NSF grant awarded in 2004 which will hopefully be extended until at least mid 2008. Collection manager Gabriela Hogue has directed a diverse and ever evolving team of technicians and data entry personnel over the last 2.5 or more years and has accomplished much toward the goal of databasing the entire fish collection. Currently, nearly 40,000 of the estimated 100,000-110,000 lots on hand are fully databased and locale information sufficient to support the rapid databasing of several thousand more is fully upgraded, GIS-linked, and entered. Wayne Starnes has tried to assure that species identifications and current taxonomy and nomenclature are up to standards as data are entered. Lots databased thus far mostly represent the original core NCSM collection plus most routine accessions over the past five years, including great numbers of NCDWQ IBI voucher series, a large collection of West Virginia material stemming from WVDNR and NAWQA surveys, and several deep water marine collections from off North Carolina, including a valuable collection of 630 lots of fully identified eel larvae. Other large collections assimilated at NCSM, such as the UNC IMS, Duke University, NCSU, Stockton State (NJ), some of the NCWRC 1960s basins surveys collections, W.C. Starnes collection, and a variety of other U.S. and foreign collections remain. A contractor is currently in the latter stages of development of the NCSM collections website and it is expected that a significant portion of holdings of the fishes, aquatic invertebrates, and reptile and amphibian units will be accessible on-line before the end of 2007 (available as a link from NCSM's main website: http://www.naturalsciences.org/). Gabriela Hogue and Jonathan Raine recently published a detailed article on the evolution of the databasing effort at NCSM entitled "From the Ledger to the Web: Setting 21st Century Documentation Standards for the Collections of the North Carolina State Museum of Natural Sciences" published in the journal of the Society for the Preservation of Natural History Collections (Collection Forum 2006; 21(1):175-191). They also presented this information at the annual SPNHC meeting in London in 2005.

Some proud accomplishments at NCSM involved special collections. The entire collection of 1,829 larger tank and vat specimens was completely renovated in 2006 with all specimens inventoried, cleaned up, reidentified, databased, and transferred to new 70% ethanol in stainless steel tanks and vats. Many of the largest specimens were inherited from the UNC IMS collection amassed by Frank Schwartz over several decades. Much of the material, including many sharks, sturgeons, and other larger species, had been in rusted steel vats and required extensive cleaning. Also databased were all holdings of smaller tank materials, such as clupeids, catostomids, catfishes, and various percoid groups. Complete locale and size data, thermal printed on resilient plastic tags, is attached to each specimen in addition to the catalog. This has greatly increased the utility of this collection by facilitating quick location and assessment of specimens. The collection of ~800+ dry fish skeletons has been recently curated in new boxes and renovated museum cases and databasing has begun. And the vouchered DNA tissue collection, preserved in 95% ethanol, has expanded in taxonomic and geographic scope and now numbers over 1750 lots.

NCSM is currently undergoing an expansion and is in later planning stages for the construction of a "nature research center" to adjoin the main museum located in downtown Raleigh. This large facility, yet to be formally named, will be modeled somewhat on the new Darwin Center at the British Museum and will provide a forum whereby the public is brought up close and personal to interact with researchers in a variety of environmental/natural science fields, including collection based research on biodiversity and conservation genetics, regional and global environmental issues, and others. Hopefully it will garner an increased appreciation and support by the public and political establishment (conveniently located just across the street) for the kinds and importance of research conducted at institutions such as NCSM, biologists from companion agencies, nearby uni-

versities, and further afield. Also, hopefully, the planning and manning of this facility will not dominate the remainder of the careers of the curatorial staff! In addition to the nature research center, as part of the expansion, the Research and Collections facility hopes to construct a companion building to the present facility which is located several miles from the main museum and houses all alcoholic collections and associated curatorial staff. Attempts are currently being made to gain approval of this expansion from the legislature and, if funded, it would double the current fish collection range space to over 10,000 square feet and that of aquatic invertebrates to 7,000.

Moving finally to South Carolina, Mark Scott reports that biologists with SCDNR and Clemson University have been steadily working on stream assessments across the state. Efforts in 2006 concentrated in the coastal plain of the Santee and Pee Dee River drainages, with the Ashepoo-Combahee-Edisto River drainages next on the list. Sites are surveyed for fish and invertebrate assemblage structure, water quality and contaminants, and habitat measures including channel geomorphology, bed particle size distributions, depth, and flow heterogeneity. Land use and point source discharges are tabulated for each watershed. The information from the program will help SCDNR understand status and trends of stream resources in the state, evaluate threats to resource integrity, and guide design of management actions under the Comprehensive Wildlife Conservation Strategy. The goal is to establish the environmental conditions necessary to sustain the species listed as sensitive in the Strategy so actions can be taken to ensure those conditions are not degraded.

Mark also reports that baseline data were collected in 2006 on fishes, invertebrates, water quality, and channel geomorphology on Twelve-Mile Creek, an upper Savannah River tributary slated for removal of a series of dams. Plans are to follow ecological changes in the creek associated with dam removal for a period of five years, longer if support is forthcoming.

And last but not least, Fritz Rohde, Rudy Arndt, Joe Quattro, and Jeff Foltz are frantically trying to get the manuscript for the new fishes of South Carolina book to press within the next month or so. When completed this will be a much needed and welcome regional faunal guide to an area that has been lacking in such for a very long time and will fill in one of the last gaps that remains for such books in the Southeast (but Georgia and Florida better get busy, not to mention a certain someone needs to get started on a more comprehensive reference to North Carolina!).

– Wayne Starnes

REGION II—SOUTHEAST

In cooperation with Jim Peterson, Deb Weiler, Bud Freeman and many field hands, Brett Albanese of the Georgia Department of Natural Resources just finished up a survey and sampling efficiency study for the bluenose shiner (*Pteronotropis welaka*). This species is currently known from nine sites within the Flint River system of southwest Georgia. Compared to other coastal plain minnow species, the probability of detecting *P. welaka* during a seining survey is very low. Carrie Straight, Bud, and Brett are still working on an Atlas of Freshwater Fishes for Georgia. Most of the progress to date has involved the compilation of fish distribution records from many sources. Brett recently coordinated the first update of Georgia's Protected Species list since 1992. Nine fish species were added to the list, seven were deleted, and the status of 20 species already listed was changed. For the first time ever, crayfishes and dragonflies were added to the state list and the freshwater mussel list now reflects true imperilment of this group rather than a mirroring of the federal list. Finally, Chris Skelton and Brett just completed a *Field Guide to Fishes of the Conasauga River*. This guide should be a handy field reference for biologists, but is also being used as an outreach tool targeted toward citizens within the watershed. Jason Wisniewski, the state mussel biologist, has been conducting and coordinating surveys and research on mussels throughout the state. One of his biggest projects right now is a collaborative effort with Jim Peterson and Jason Meador to develop a long-term monitoring program for Altamaha basin mussels. Chris Skelton at Georgia College & State University has two new graduate students working in the Oconee River system. Hank Forehand is working on a "fishes of" the Oconee River system from Sinclair dam downstream to its confluence with the Ocmulgee River. Thanks to those of you that have already provided historical records. Judit Varga is working on the distribution and life history of the state threatened Oconee burrowing crayfish. This rare primary burrower is currently known from about 10 locations in the Oconee system north of Dublin, GA.

– Brett Albanese and Chris Skelton

REGION III—NORTH CENTRAL

David Eisenhour at Morehead State University reports that the taillight shiner (*Notropis maculatus*) seems to be more common in Kentucky than previously thought. David and Ron Cicerello independently collected large series from separate locations in the Obion Creek drainage in 2003, which represented the first collections from this system since 1890. In July 2004 Brooks Burr and David collected an additional series from Clarks River, Kentucky, representing the first record of this species from the Tennessee River drainage. David wants all to know that Matt Thomas and Brooks Burr recently published the description of *Noturus gladiator*, the piebald madtom (Ichthyological Explorations of Freshwaters 15:351-368). *Noturus gladiator* includes populations from eastern tributaries to the Mississippi River in Tennessee and

Mississippi that were formerly assigned to the northern madtom (*N. stigmosus*). The range of this species has declined, primarily because of channelization, and stable populations only remain in the upper Hatchie, Obion, and Wolf River drainages. Lastly, David indicates that Paul Rister reported that gill netting efforts in the Mississippi River at Wolf Island (RM 935) by KDFWR and a collaborating commercial fisherman yielded 341 shovelnose sturgeon (*Scaphirhynchus platorynchus*) and 7 pallid sturgeon (*S. albus*). One of the shovelnose sturgeon recovered was originally tagged at RM 71.

Mark Cantrell (FWS) reported the Tallassee Fund awarded several grants for rare fishes work in the Lower Little Tennessee River area. The Tallassee Fund was established as part of a settlement agreement and a requirement of the new hydroelectric license issued to Alcoa Power Generating, Inc., and will provide for conservation activities in the Lower Little Tennessee River Valley in the vicinity of the Chilhowee and Calderwood reservoir developments.

In December 2006, the Tallassee Fund agreed to support six (6) projects, including three that will further the purposes of the Fund by helping to recover imperiled aquatic fish and mussel species:

1. Calderwood Bypass mussel reintroduction and fish host community description ($29,360 to Jim Layzer, Tennessee Tech);
2. Recovery status of 2 federally protected extirpated fish species in Abrams Creek, Great Smoky Mountains National Park ($38,869 to Matt Kulp, GSMNP); and
3. Re-establishment of blotchside logperch (*Percina burtoni*) into Tellico River and Citico Creek ($20,000 to Rakes and Shute, CFI).

Other projects will restore extirpated plant and animal populations, protect riparian corridors and habitat, and control invasive exotic species.

The Tallassee Fund provides $100,000 annually for the 40 year term of the FERC license. The geographic scope of Tallassee Fund includes the Lower Little Tennessee Valley in the vicinity of the Calderwood and Chilhowee developments. For information about how to apply for a grant, contact Mark Cantrell (mark_a_cantrell@fws.gov), currently the Chair of the Board. The Tallassee Fund is maintained in an account administered by David McKinney of the Tennessee Wildlife Resources Agency.

Joyce Coombs and J. Larry Wilson report the release of the first propagated tangerine darters (*Percina aurantiaca*) into the Pigeon River as part of an attempt by Conservation Fisheries, Inc. (CFI) to propagate the species for the Pigeon River Recovery Project. *Percina aurantiaca* was one of the species missing from the Pigeon River that cannot be found in large enough numbers to collect and release. CFI and a graduate student at UT conducted the research and their efforts spawned the first captive propagation of *P. aurantiaca*.

– Mark Cantrell

REGION IV—SOUTH CENTRAL

Noel Burkhead of the US Geological Survey in Gainesville, Florida has been studying the behavior of spawning *Cyprinella*, primarily related to hybrid swarms precipitated by introduced populations of the red shiner (*C. lutrensis*). Noel has worked the past two years with EPA scientists Dave Walters (fish ecologist) and Mike Blum (geneticist), focusing on the swarm in the upper Coosa River with blacktail shiners *C. venusta stigmatura*. Noel's part of this collaborative effort was to conduct multiple controlled crosses in the lab between the two species, plus conduct female mate selection experiments. Unfortunately, the experiments did not go as planned because Noel failed to appreciate how important interactions were relative to experimental design. The genetics protocol required single parent mating (one of each sex). Although it was possible to produce replicate broods of the super generalist red shiner, the blacktail shiner intraspecific crosses were much less successful, even with varying tank sizes, lighting, and introducing turbidity. On the positive note, work on data from prior interaction experiments between red shiners and blue shiners (*C. caerulea*) stimulated by observations of other *Cyprinella* species spawning, plus information about other red shiner hybrid swarms (with different *venusta* "subspecies" and *C. spiloptera*), helped Noel formulate a testable hypothesis that may explain the behavioral component underlying hybrid swarms precipitated by red shiners. Noel is open to suggestions as how one might obtain funding for an anonymous hypothesis. Noel is also busy with efforts of the American Fisheries Society Endangered Species Committee (AFS ESC). They are currently revising and updating the AFS list of imperiled North American freshwater fishes, last published in 1989. Noel is chairing a 16 member committee of ichthyologists from Canada, Mexico, and the US, with Howard Jelks and Steve Walsh, USGS colleagues in Gainesville, as Committee Vice-Chairs. The near finalized list, expected to be completed later in 2007, more than doubles the taxa in the 1989 list, with the final number close to 750 taxa. For the first time, following relatively recent listings of western anadromous salmonids populations under the Endangered Species Act, Noel and colleagues have similarly apply status to declining populations. Taxa include nominate species, infraspecific taxa (nominate and undescribed subspecies; discrete populations of nominate species), and undescribed taxa. Analyses will dissect changes in the list and differentiate

between process-related increases and actual trends in faunal decline. Two other subcommittees of the ESC are also revising their lists (crayfishes and mussels) and one subcommittee is preparing the first AFS list of imperiled freshwater snails for Canada and the US. The provisional findings of these committees also disclose trends of biodiversity loss and decline in these groups.

George Burgess at the University of Florida in Gainesville has been busy with the federally endangered smalltooth sawfish *Pristis pectinata*. He has served on the Smalltooth Sawfish Listing and Recovery teams, and will be on the upcoming monitoring/implementation team. The last US stronghold for the smalltooth sawfish is in southern Florida; its former distribution ranged from New York to Texas. It is also disappearing throughout its natural range in Central and South America and Africa.

Frank Parauka reports that USFWS biologists at the Panama City Field Office along with 39 very enthusiastic volunteers conducted a Gulf sturgeon (*Acipenser oxyrinchus desotoi*) survey in the Escambia River from 10 October through 5 November 2006 to coincide with the sturgeons fall migration from freshwater to the marine environment. Four to six stationary gill nets of various sizes, covering about 80% of the river from bank to bank, were fished from daylight to early evening. One hundred and thirty fish were collected during the study. Over forty of the fish had been previously tagged, with some of these fish coming from the Blackwater, Yellow and Choctawhatchee rivers. The fish ranged in weight from 0.5 to 66.5 kg (mean 17.6 kg) and measured in total length from 61 to 221 cm (mean 137 cm). Large fish (>45.3 kg) accounted for 10% of the catch. In 2003, fish in excess of 45.3 kg represented 19% of the catch. The Gulf sturgeon population (2006) in the Escambia River is estimated at 451 fish (338-656 fish at 95% confidence interval) using a modified Schnabel mark-recapture program. The numbers are down from the 2003 survey which estimated the population at 554 fish (373-735 fish) using the same methods. The decrease in the Gulf sturgeon population and lack of larger fish collected during the 2006 could be a consequence of the degraded water quality caused by Hurricane Ivan in 2004 which led to massive fish kills in the lower Escambia River.

Anna George at the Tennessee Aquarium Research Institute in Chattanooga is finishing her population genetics study on the endangered *Percina jenkinsi* in the Conasauga watershed. She is also wrapping up a genetics project on the threatened *Cyprinella caerulea*. Anna is leading efforts to expand the current Research Institute into the Tennessee Aquarium Freshwater Institute for Conservation, Research, and Education Leadership, with the objective to conserve and recover freshwater species through research, restoration, education, and outreach.

Scott Mettee reports that sampling by Geological Survey of Alabama (GSA) biologists for Gulf sturgeon in Mobile and Perdido bays began in December 2006 and will continue until mid-March 2007. Sampling has been adversely affected by a brown tide outbreak that began near Weeks Bay Sanctuary in early February and extended northward to near the southern end of the Mobile-Tensaw River Delta. Expected numbers of marine and freshwater species were collected in the area prior to the brown tide, but almost no fishes have been collected in mid- to late-February. Sampling for sturgeon eggs and inland gill netting for adult fish will begin in the Alabama and Tombigbee Rivers in late March. This study is funded by the State Wildlife Grants (SWG) program of the Alabama DCNR.

Stuart McGregor (GSA) reports snorkeling at 21 stations in selected tributaries of the Chattahoochee River in Alabama in the spring and summer of 2006 for mussels, with 523 specimens and 15 species collected, including 6 species of highest or high conservation concern in Alabama and one endangered species (*Hamiota subangulata*). Most stations had poor habitat and very few mussels, but one station in Uchee Creek yielded a diverse and abundant mussel fauna. Mussel sampling by diving with a boat-mounted air source was conducted at 19 stations in the tailwaters of Claiborne Lock and Dam (about 33 river miles) on the Alabama River in August and September 2006 (14.4 hours of bottom time yielded 3,054 mussels among 19 species.) No federally-listed species were encountered and only one species of highest conservation concern in Alabama was collected (*Elliptio arctata*). These studies were funded by the Wildlife and Freshwater Fisheries Division (WFFD) of the ADCNR.

Pat O'Neil (GSA) reports completion of a three-year survey for species of conservation concern in selected Alabama coastal drainages which resulted in updated information for several species of high and highest conservation concern in the state. This project was funded by WFFD. One small individual of the Gulf sturgeon was captured in the Perdido River in 2004, a river system not listed as critical habitat for the species. Alabama shad (*Alosa alabamae*) were collected in the Conecuh River near Brewton in 2006. The ironcolor shiner (*Notropis chalybaeus*), not collected in Alabama since 1983, was rediscovered in 2006 at Franklin Creek (34 individuals) in southwest Mobile County; sampling at 13 other historical locations failed to produce individuals. The blackmouth shiner (*N. melanostomus*) was unknown in Alabama until its discovery in 2003 by Jim Williams in Bay Minette Creek. It was found at three locations in this system with 132 individuals taken over a three-year period in 2004-06. New records for other species whose distributions are poorly known in coastal Alabama were also documented in 2004-06 including paddlefish (*Polyodon spathula*), coastal shiner (*N. petersoni*), taillight shiner (*N. maculatus*), flathead catfish (*Pylodictis olivaris*), freckled madtom (*Noturus nocturnus*), golden topminnow (*Fundulus chrysotus*), banded topminnow (*F. cingulatus*), banded sculpin (*Cottus carolinae*), least killifish *(Heterandria formosa)*, bluespotted sunfish (*Enneacanthus gloriosus*), and yel-

low perch (*Perca flavescens*). Pat also reports completion of a study in 2006 to standardize a sampling methodology for wadeable streams for use with the index of biotic integrity (IBI) funded by WFFD. Biologists from three State agencies involved in stream monitoring and assessment work (The Alabama Department of Environmental Management-ADEM, WFFD, and GSA) will use this methodology for future stream assessments. The IBI metrics and scoring criteria were calibrated for the Coosa and Tallapoosa River systems upstream of the Fall Line as part of this study.

Tom Shepard (GSA) reports that in the past year GSA completed a DVD-based geographic information system (GIS) presentation of biological, habitat, water-quality, and other natural resource information compiled for use in management activities in the Locust, Mulberry, and Sipsey Forks of the Black Warrior River drainage. Interactive watershed visualizations are also presented on the DVD. The visualizations allow the user to explore conditions throughout the watersheds with natural resource maps, accounts and photographs of sampling stations, fish distribution maps, and color photographs of the fish species found in these river systems. A limited watershed information library is also included which provides recent reports on Locust, and Mulberry Forks by GSA. Sandy Ebersole designed and created the interactive project, the GIS products were developed by Anne Wynn and Sandy Ebersole, and Ruth Collier designed the DVD layout. The project was funded through the Alabama SWG program. A limited number of the DVD reports are available through the GSA Publication Sales Office (pubsales@gsa.state.al.us).

Todd Slack and Mark Dugo from the Mississippi Museum of Natural Science completed their 26-month project on movement of Nile tilapia in coastal waterways of Mississippi in 2006. MMNS collaborated with Mark Peterson at the Gulf Coast Research Lab and Pam Schofield, USGS-Gainesville, to conduct a post-Hurricane Katrina assessment of Nile tilapia populations in coastal Mississippi. As part of that scope of work, the group facilitated eradication efforts of Nile tilapia at an aquaculture facility abandoned after Hurricane Katrina resulting in over 9,000 Nile tilapia removed during a 3-day period. Brian Kreiser, Mark Dugo, and Todd continue to make progress in the systematic project addressing the *Fundulus notatus* species group in Mississippi. In addition, Mark has been reexamining museum material of *F. blairae*, *F. dispar* and *F. nottii* from Mississippi, Louisiana and Alabama in order to more fully resolve the distributional aspect of these species in Mississippi. Mark has generated a preliminary cytochrome *b* phylogeny for *F. dispar* and *F. blairae* to aid in resolving longstanding taxonomic issues between these species. The history of these species appears complex and may involve secondary contact, as previously reported by Bob Casher and students. Future molecular work will include sequence and microsatellite datasets to address patterns and processes at the population level. Progress towards phylogenetic resolution of *Cottogaster* to aid biologists working on this endangered clade of darters has begun with funding through 2007. Todd and Mark Peterson will also begin a Gulf sturgeon project during 2007 focusing on movement and habitat association of juvenile Gulf sturgeon within coastal areas of Mississippi. Lastly, the Museum is currently developing plans for additions to the Research and Collections Wing, a larger hall for traveling exhibits, and additional classrooms for the on-site Education Program. Plans for the Research and Collections Wing include a new Wet Collection Range, a new Wet Collection Laboratory, a dedicated Molecular Laboratory along with 11 additional offices and cubicle work spaces. The existing collection area will be reconfigured to provide space for the growing Mussel and Paleontology Collections. The MMNS Ichthyology Collection continues to grow and now contains over 49,500 catalogued lots. Nearly 90% of the records have been computerized and the database can be searched online through the Museum's webpage (http://www.mdwfp.com/museum/html/research/index.html).

Mark Peterson at the Gulf Coast Research Lab in Ocean Springs, Mississippi, is starting an acoustic tagging study on juvenile Gulf Sturgeon this year in Mississippi Sound with Todd Slack. Mark, Todd, and Pam Schofield just completed an eradication project of Nile tilapia in aquaculture ponds in coastal MS and have a paper in construction on their efforts and results for SFC. They effectively eliminated a vector for future introductions into the Pascagoula River. Mark and Rich Fulford have been funded to continue work on mapping water quality and habitat in the lower Pascagoula and model nursery habitat for estuarine-dependent fishes. Mark and colleagues at the Grand Bay National Estuarine Research Reserve are initiating a five year study on *Fundulus jenkinsi* across the north-central Gulf of Mexico from Louisiana thru Florida and are continuing work on comparing natural and constructed intertidal oyster reefs in terms of community dynamics and food web (stable isotopes) development over two years. Research on mapping estuary reed habitat, reducing effects of dredged material levees on estuaries, and life history aspects of sciaenids and tilapia have recently been published.

Steve Rider and Travis Powell of the Alabama DCNR captured a male Alabama sturgeon (*Scaphirhynchus suttkusi*) below Claiborne Lock and Dam on the Alabama River on 3 April 2007. Steve and Travis were capturing paddlefish with a 200x12 ft 3-6 inch mesh multifilament gillnet when they found the sturgeon entangled in 5 inch mesh. Depth was 10.5 ft and water temperature was 69.5 F. Internal examination of the gonads at the Marion Fish Hatchery indicated that the 3.7 lb, 31 inch male was not in reproductive condition this year. The specimen was implanted with a four-year sonic tag and released on 17 April 2007. He traveled downstream 6 miles the first three

days, then 25 miles downstream over the next two days. Boat monitoring and use of stationary receivers will continue to determine preferred habitat and movement, which may lead to the capture of additional specimens. This was the first Alabama sturgeon captured by biologists in eight years.

Phil Harris at the University of Alabama continues his research in an international project examining the relationships of Cypriniformes, which will include North American minnows and suckers. Graduate students are using microsatellite data to examine population genetics of the endangered *Etheostoma chermocki* and its surrogate species *E. bellator* (Jenjit Khudamrongsawat), *Elassoma zonatum* and *E. alabamae* (Mike Sandel), *Pteronotropis* species (Gray Hubbard), and the endangered *E. nuchale* (Brook Fluker). Projects by undergraduates include life histories of *Noturus f*unebris, *N. munitus* (Micah Bennett), *Notropis chrosomus*, and *E. ramseyi* (Heath Howell), and a project recording the use of new habitat by riffle fishes in the Cahaba River after the removal of a low-head dam (Heath and Micah).

– Bernie Kuhajda

REGION V AND VI— NORTHWEST AND SOUTHWEST

In the Northwest and Southwest regions conservation-oriented research is being conducted on a wide variety of large, imperiled (and charismatic) species, including cooperative and collaborative studies with alligator gar (*Atractosteus spatula*) and pallid sturgeon (*Scaphirhynchus albus*). Also, several groups are working to describe and quantify effects of Hurricanes Katrina and Rita on aquatic ecosystems. Agencies and contributors have provided the following reports.

Ricky Campbell reports that the Private John Allen National Fish Hatchery continues to create recreational fishing opportunities by producing and stocking: i) walleye (*Sander vitreus*) in the Tennessee-Tombigbee Waterway; ii) striped bass (*Morone saxatilis*) in Mississippi, Alabama, Florida, Georgia, and Louisiana; iii) bluegill (*Lepomis macrochirus*), redear sunfish (*L. microlophus*), largemouth bass (*Micropterus salmoides*), and channel catfish (*Ictalurus punctatus*)in National Wildlife Refuges and tribal lands throughout the southeast United States. The hatchery is also involved in Hurricane Katrina fishery recovery throughout affected areas of Mississippi. Private John Allen NFH continues to develop strong partnerships with state natural resource agencies, academic institutions, and other non-governmental organizations to restore paddlefish (*Polyodon spathula*), lake sturgeon (*Acipenser fulvescens*), and alligator gar (*Atractosteus spatula*) populations.

Alligator gar production has been a particularly important focus of the hatchery in recent years. Primary objective of this work now is to restore populations in the Mississippi drainages of western Tennessee. Collaborating with other agencies and with support from the Bowfishing Association of America, hatchery personnel collected broodstock from waters managed by the USFWS in the lower Mississippi River. Fish were transported to the hatchery, induced to spawn, and the young raised for subsequent release. During the 2006 production season a total of three females and eight male fish were spawned, producing 251,598 eggs, yielding 140,565 fry. These fry were sent to five partner hatcheries for grow out and research. Additional fry were also sent to universities for research purposes. The Private John Allen NFH produced 2,056 fish weighing 330 pounds for stocking for 2006. When alligator gar were approximately 10 inches in length, they were given a health screening, tagged, and released in preselected management areas. Private John Allen NFH is also collaborating with Warm Springs Regional Fishery Center staff on cryopreservation of gar sperm.

As a result of the successful propagation of this species, in Feb 2007, a planning session was held for an alligator gar working group. Meeting was organized by Ricky and hosted by the hatchery. Participants included representatives from USFWS, Tennessee Wildlife Resource Agency, Warm Springs Regional Fishery Center, Arkansas Game and Fish Commission, Missouri Department of Conservation, Nichols State University, and the University of Southern Mississippi. Topics included propagation techniques, ecology, and management of gar species, and public perception of alligator gar reintroduction programs.

Bob Hrabik of the Missouri Department of Conservation reports that staff members from the Open Rivers and Wetlands Field Station (ORWFS, Missouri Department of Conservation) in cooperation with the USFWS Mingo NWR, and Southeast Missouri State University, have received approval to reintroduce alligator gar to the refuge. The gar will be stocked in May 2007 at a rate of 1 fish/3 acres of surface water. They will be radio tagged and movements monitored for one year. Two graduate students from the University will conduct the telemetry work, as well as studies on habitat use and food habits. In addition to the tracking and habitat studies, staff will also monitor fish assemblage changes, crappie (*Pomoxis* spp.) population dynamics, and creel surveys to evaluate possible impacts of alligator gar in Mingo NWR. This is a long-term study led by Chris Kennedy, MDC Fisheries Division, with scientific support by the Resource Science Division and ORWFS staff. Alligator gar are already being stocked in Tennessee and Arkansas and recently the Illinois DNR has announced that they will also investigate the feasibility of stocking this species in southern Illinois.

Through a cooperative effort between the U.S. Army Corps of Engineers (St. Louis District), Southern Illinois University-Carbondale (SIUC), and the ORWFS, a series of

remote ultrasonic telemetry receivers (Vemco VR-2) are being established in the entire Upper Mississippi River bordering Missouri (from the Iowa state line to the confluence of the Ohio River). Future plans are to expand the telemetry array into the Lower Missouri River (in cooperation with the USGS-Columbia), the Lower Ohio River (USFWS-Marion,IL), and the Lower Mississippi River (various agencies). The VR-2 array is now being used to track movement of lake (*A. fulvescens*), pallid (*Scaphirhynchus albus*), and shovelnose (*S. platorynchus*) sturgeons in the Mississippi River. In addition to remote receivers, crews from SIUC and the ORWFS are tracking male and female pallid sturgeons in an attempt to document reproduction sites. At present, four black-egged female pallid sturgeon have been tagged in the Middle Mississippi River (MMR) and crews are engaged in tracking these fish 24 hours a day using multiple crews, seven days a week. As of this writing, pallid sturgeon are now beginning to move after being sedentary throughout much of April. In the past, sturgeon have spawned in mid-April to mid-May in the MMR and larval sturgeons (including pallid sturgeon) have been collected from mid-May to mid-June, with peak periods of collection during the last week of May and first week of June.

Ron Nassar of the Lower Mississippi River Conservation Committee reports that from 2001 to 2004 the LMRCC conducted state-level planning meetings that resulted in the identification of 239 projects designed to increase productivity in the LMR leveed floodplain ecosystem and provide outdoor recreation opportunities. One project identified as a high priority was restoration of flow in the Chute of Island 63 at River Mile 639 (Coahoma County, Mississippi) by notching a rock dike installed in 1973. Aquatic habitat upstream of the dike had been lost due to more than 20' of accretion that had occurred since the dike was built and dissolved oxygen levels downstream of the dike were poor during periods of low river flow. Personnel of the U. S. Army Corps of Engineers Memphis District and Mississippi Valley Division designed a dike notch with top and bottom width dimensions of 300' and 200', respectively, and ranging in depth from 14 - 19' that would restore flow within the channel. The project was constructed in December 2006 at a cost of $36,000 by using a barge-mounted dragline to pull 10,000 tons of stone downstream. The project was made possible by a partnership consisting of the U. S. Fish and Wildlife Service Southeast Region (Fish Passage Project Program), U. S. Army Corps of Engineers, Mississippi Wildlife, Fisheries & Parks (LMRCC), Wildlife Mississippi, American Land Conservancy, Quapaw Canoe Company, and Wildlife Forever. The Island 63 project is important to the local economy because the channel has an all-weather, public boat launch that provides access not only to the 5.47 mile long Island 63 Chute but to the Mississippi River via its downstream connection at all but the lowest river stages. The permanent regional forum provided by the LMRCC supports a critical federal-state-nongovernmental organization partnership that ensures restoration of the LMR's nationally significant natural resources as well as consistently providing benefits to the outdoor recreational community.

Jan Hoover of the U.S. Army Engineer Research and Development Center reports that the ERDC Fish Team continues its 10-year program of pallid sturgeon (*S. albus*) and shovelnose sturgeon (*S. platorynchus*) research in the free-flowing Mississippi River. Recently completed field studies include geographic variation in relative abundance and size, morphological variation, relative frequency of injuries and anomalies, diet, and age structure and mortality. Also completed recently was an assessment of entrainment risk for pallid sturgeon in the vicinity of the proposed water diversion structure that would restore flow to the wetlands surrounding Lake Maurepas. Ongoing projects include: determination of sex ratios and delineation of spawning season based on gonadal condition; refinement of laparoscopic technique to determine sex and reproductive stage; implantation of telemetry tags as part of the system-wide tracking effort by state agencies and USFWS; identification and monitoring of pallid sturgeon spawning and rearing grounds (larvae were collected and identifications confirmed last year). Sturgeon populations are also monitored in conjunction with studies of fish assemblages occupying habitats created by notched dikes (including habitats created by the notched dike at Island 63).

ERDC students completed several laboratory studies designed to assess the risk of entrainment for juvenile sturgeon. Heather Smith (St. Andrews Episcopal School) compared swimming performance of lake sturgeon (*A. fulvescens*) from the Wisconsin River with those from Lake Winnebago (fish were provided by Ricky Campbell at Private John Allen NFH). Heather was one of three finalists in the national Stockholm Junior Water Prize competition. Krista Varble (Mississippi College) compared swimming performance of naïve and flow-trained white sturgeon (*A. transmontanus*) from the Sacramento-San Joaquin River system as part of her thesis research. Joseph Beard (University of Louisiana at Monroe) conducted a comparative study of responses to environmental noise by pallid sturgeon, lake sturgeon, and white sturgeon. Ellen Wakeley (Bowling Green University) developed swimming endurance models and Kate McGrath (North Carolina State University) studied responses to noise by Atlantic sturgeon (*A. oxyrinchus*).

In addition to their work with sturgeon, ERDC biologists are conducting other studies of native and introduced species. Fish assemblages and physical habitat in Mississippi delta streams are being surveyed to establish sensitivity of a delta-specific Index of Biotic Integrity (IBI) to various stressors and to establish thresholds for listing (or de-listing) impaired water bodies. Paddlefish (*P. spathula*) size and abundance were described for portions of the White River, AR. Collections of silver carp

(*Hypophthalmichthys molitrix*) and bighead carp (*H. nobilis*) in floodplain wetlands of the Mississippi River were used to develop an empirically based conceptual model describing movements of the invasive fishes to and from floodplain habitats. ERDC also sponsored and participated in a workshop in Gainesville, Florida on suckermouth catfishes (Loricariidae) in North America and is preparing a report summarizing the environmental impacts of these tropical invaders. ERDC also re-sampled some historically sampled sites in the Mississippi delta to determine effects of hurricanes on stream fishes. Despite pervasive "black water" and fish kills immediately following Hurricane Rita, and short term reductions in species diversity, commercial fishing had resumed and high species diversity was documented just ten months later.

Jim Franks of the Gulf Coast Research Laboratory reports that GCRL was hard hit by Hurricane Katrina. According to Executive Director William E. Hawkins, buildings, contents, collections, and intellectual property sustained approximately $50 million in damage from the 20-ft storm surge and accompanying winds. Some research was shut down for several months during clean-up and recovery, but due to the heroic efforts of researchers, some fieldwork continued on schedule. Boats were undamaged and Harriet Perry reports that a line of stations extending from Bayou Bernard to Horn Island, monitored regularly since the early 1970s, were sampled on schedule in Sep 2005 and that the samples were successfully processed in makeshift open-air labs. This long-term database will enable GCRL biologists to identify and measure effects of the storm on the coastal ecosystem.

Work at GCRL continues to focus on age, growth, reproduction, and habitat requirements of coastal and large pelagic fishes in the northern Gulf of Mexico. Current research includes studies on the biology and life history of cobia (*Rachycentron canadum*), Atlantic tripletail (*Lobotes surinamensis*), wahoo (*Acanthocybium solandri*), and various shark species. Jim is currently the primary investigator on a study to document the timing and location of blue marlin (*Makaira nigricans*) spawning in the north-central Gulf of Mexico, as well as identify possible nursery areas through investigations of adult and larval specimens. He and colleagues recently completed a six-year study of larval and juvenile pelagic fishes, with particular emphasis on billfishes, tunas, amberjacks, and dolphinfishes. These fishes are associated with pelagic Sargassum in the Gulf of Mexico and the team documented this unique pelagic alga as essential fish habitat, providing shelter and food resources for early life stages of more than 135 species of fishes. Current research also includes investigations of the occurrence and movements of whale sharks (*Rhinocodon typus*) in the northern Gulf, as well as assessment of pelagic fishes as potential aquaculture candidates. Jim was a member of the organizing committee for the *Symposium on Large Pelagic Fishes in the Caribbean Sea and Gulf of Mexico: Status and Integrated Management* which was convened in conjunction with the November 2006 annual meeting of the Gulf and Caribbean Fisheries Institute, Belize C.A.

Bobby Reed of the Louisiana Department of Wildlife and Fisheries reports that the LDWF Inland Fish Division, District 5, has been monitoring the streams and rivers of SW Louisiana for water quality and fisheries resources since Hurricane Rita impacted the area. Massive fish kills were widespread in the coastal plain marshes and in local rivers from three to five days following the storm. Water quality stations were set up on the Calcasieu, Mermentau, and Sabine rivers and standard parameters measured weekly from 12 October 2005 through January 2006. Some stations were slower to return to "normal" than others, however, all of the 21 stations were reporting good values by January 2006.

Twelve fisheries sampling stations (all heavily impacted) had been established in area rivers some 20 years before and baseline data existed that described fisheries resources before the storm. Initial post-hurricane samples were dismal with October and November 2005 samples exhibiting impacts that were far worse than originally expected. There were no centrarchids, clupeids, or cyprinids collected in more than three hours of electrofishing for the three local rivers. Water quality samples indicated that streams were less impacted further inland than reaches closer to the coast. April 2006 samples brought a little good news — one 11 inch largemouth bass (*M. salmoides*), one 5 inch bluegill (*L. macrochirus*), and one 12 inch channel catfish (*I. punctatus*), all from the Calcasieu River. A few gar (various species) and bowfin (*Amia calva*) were observed but there were still no centrarchids found in either the Mermentau or the Sabine rivers. October 2006 samples, however, demonstrated the resiliency of these aquatic ecosystems. Fisheries were expected to rebound but LDWF biologists were not prepared for what was found just one short year later. The summer spawn of surviving centrarchids was extraordinary: largemouth bass production on the Calcasieu and Sabine rivers not only exceeded records for the 20 previous years, but were twice the catch-per-unit-effort of the "best" years. The Mermentau River samples also indicated a good rebound. So far this spring fishermen are reporting good catches of 8 - 12" bass that are in excellent condition. Most of the smaller fishes are being released, according to LDWF creel survey clerks that are monitoring the river fisheries this year.

Bob Curry of the Southern Division of the American Fisheries Society reports that the organization was instrumental in assisting Louisiana and Mississippi Chapter members impacted by the hurricanes. Hurricane relief efforts by the SDAFS included dispersal of books and journals, replacement of field and laboratory gear, deferral of membership dues, implementation of complimentary subscriptions to AFS journals, and funding travel to AFS meet-

ings. It also included financial support to the Louisiana and Mississippi Chapters for their annual meetings in 2006 and in 2007. The generous and timely assistance of SDAFS helped many members maintain connections to the society and re-establish their research programs.

Henry Robison reports that he and Tom Buchanan are working hard to finish a draft of the manuscript for the second edition of the *Fishes of Arkansas* which will be published by the University of Arkansas Press. They have been hard at work updating species accounts and keys. Henry and Tom are also developing a computerized database of the fishes which will produce updated distribution maps for all Arkansas species. If all goes well, they are hopeful of going to the Press this fall with a final manuscript.

Marty O'Connell at the University of New Orleans reports that despite hurricanes and levee failures that destroyed homes, offices, and sampling equipment, members of the Nekton Research Laboratory (NRL) at the Pontchartrain Institute for Environmental Sciences have continued on with their research in fish conservation research in southeastern Louisiana. Marty along with Bob Cashner, continues to manage a team of expert fish biologists, ecologists, and graduate students to address numerous fish and fishery issues in the valuable aquatic environments of coastal Louisiana. O'Connell, Cashner, and senior biologist Chris S. Schieble recently (December 2006) published a book chapter on fish assemblage instability and hydrologic influences in Lake Pontchartrain. One of the interesting relationships identified by this research was how assemblage instability was associated with the presence of an artificial waterway (the Mississippi River Gulf Outlet). This artificial waterway was also one of the leading causes of the levee failures and the subsequent flooding of New Orleans. Schieble also continues to lead a team of NRL biologists working on the Chandeleur Islands, Louisiana's oldest barrier island chain. These unique islands were severely impacted by Hurricane Katrina. Another storm of similar magnitude could destroy them altogether. One of the goals of Schieble's team is to catalog the fish species found on the island using multiple gear types (gillnets, beach seines, trawls, light traps) such that conservation efforts can focus on those species most at risk. Senior biologist and database manager Meg Uzee O'Connell has teamed with Canadian scientists from Dalhousie University (and Marty) to analyze long-term declines in two apex predators, bull sharks (*Carcharhinus leucas*) and alligator gar (*A. spatula*), in Lake Pontchartrain. A manuscript is currently in review and the findings provide insights on how the two species (one freshwater, one marine) have both been impacted by their use of degraded estuarine habitats over the last half-century. Both O'Connells have also begun a status survey for the rare blackmouth shiner (*Notropis melanostomus*) in southern Mississippi. This effort will be the first complete survey for the species in Mississippi since 1995.

Much of the research conducted by the NRL is carried out by graduate students who have remained with their studies in spite of the recent disasters. Tom Lorenz (Ph.D. student) is continuing his work on the invasive Rio Grande cichlid (*Herichthys cyanoguttatus*). Lorenz has conducted extensive behavioral trials to measure aggressive behavior between *H. cyanoguttatus* and native bluegill (*L. macrochirus*). Preliminary data show that both species exhibit aggression as residents, but only *H. cyanoguttatus* exhibits aggression as an invader. These results fall into clear game theory categories of "bourgeois" (only defending territory) and "hawk" (attacking for and defending territory) and may help explain the current invasive success of *H. cyanoguttatus* in southeastern Louisiana. Jeff Van Vrancken (M.Sc.) has worked extensively on freshwater fish assemblage dynamics in streams and rivers of the Pontchartrain Basin. His research recently confirmed the extirpation of the once common blacktail shiner (*Cyprinella venusta*) from Bayou Lacombe, a small stream that flows into Lake Pontchartrain. Currently Van Vrancken is leading a team to survey these same rivers and streams to determine the conservation status of four rare anadromous species. Molly Dillender (M.Sc.) is completing her research on potential differences in feeding habits of spotted seatrout (*Cynoscion nebulosus*) among Louisiana coastal region. Preliminary results suggest that *C. nebulosus* from the Barataria Basin may not be eating the same prey items as individuals from Lake Pontchartrain or Calcasieu Lake. Chad Ellinwood (M.Sc.) is assisting Chris Schieble with the Chandeleur Islands research and plans to assess how fishes use wash-over channels. These corridors were created by recent hurricanes and may allow large fish predators from high-energy beach habitats to access previously protected back-bay habitats. Scott Eustis (M.Sc.) is studying the trophic impacts of bycatch on coastal fish assemblages. He is especially interested in recent changes in gear types by commercial fishermen and the increased exploitation of shallower habitats.

– Jan Hoover

MINUTES
Business Meeting
31st Annual Meeting (2005) • Southeastern Fishes Council

The 2005 meeting of the Southeastern Fishes Council was called to order by chairperson Hank Bart at 4:15 PM on 8 July 2005 at the Marriott Tampa Waterside Hotel and Marina in Tampa, Florida. The meeting was held in conjunction with the 85th annual meeting of the American Society of Ichthyologists and Herpetologists. Twenty-eight people attended the meeting, including 20 current members, 3 members of the executive committee (Hank-Bair-chair elect, Frank Pezold-Treasurer, and Brett Albanese-Secretary), and 5 other people interested in the conservation of Southeastern Fishes. Hank urged the members to check the SFC website often and to respond to SFC emails quickly. He also discussed the possibility of creating an SFC listserve.

SECRETARY'S REPORT

Brett indicated that last years minutes were approved electronically and announced that he had SFC buttons and SFC membership forms for anyone interested.

TREASURER'S REPORT

In Kyle Piller's absence, Hank Bart read the Treasurers report aloud. There is a balance of $10, 718 in the checking account. We currently have 55 members paid in full, but only 2 members are students. There are many additional members on the roles who have not paid dues in a long time. Hank requested that these delinquent members either pay up or ask Kyle to cancel their membership. Hank urged everyone to encourage students to join SFC (see discussion on meeting venue under old business).

NOMINATING COMMITTEE

Bernie Kuhajda accepted his nomination for the chair-elect position. Marty O'Connell agreed to serve as editor and will take over as soon as Frank Pezold completes the latest edition of the *Proceedings*. Brett Albanese, Kyle Piller, and Chris Skelton agreed to continue on in the secretary, treasurer, and associate editor positions, respectively.

EDITORIAL COMMITTEE

Frank Pezold reported that one issue of the *Proceedings* came out last year and another issue will be coming out very soon. Frank suggested that all back issues be kept by the Treasurer, since the treasurer is required to collect payment before mailing out back issues. Back issues were not scanned into searchable text PDFs for webposting, as discussed at last year's business meeting. Hank suggested that Kyle Piller may be able to assist Marty O'Connell with scanning. Hank noted that some of the most recent issues of the *Proceedings* have not yet been posted on the website.

TECHNICAL ADVISORY COMMITTEE

Noel Burkhead announced that he is coordinating a status revision of all North American freshwater fishes for the AFS endangered species committee. A display describing the revision and providing an opportunity for written comments was posted in the hotel. Noel urged all SFC members to comment on any species for which they have expertise.

RESOLUTIONS COMMITTEE

Mollie Cashner reported that no resolutions were suggested by the membership during the past year. Bernie Kuhajda then described a proposed subdivision near Birmingham, Alabama that could negatively impact both the rush darter and the vermillion darter. The Jefferson County planning and zoning commission will discuss the proposal during the second week of July. Bernie agreed to draft a resolution immediately, with the hope that a quorum of SFC members could officially pass the resolution before the end of the ASIH meeting. It was later decided that the letter should be emailed to the entire membership.

Someone suggested that the SFC look into a proposed interstate through the Georgia mountains. Following a brief discussion, this person suggested that members from Georgia research the issue further and report back to the SFC.

Whereas Jim Williams is a down to earth fellow due to his affinity for clams and other benthos, he suggested that future resolutions not be phrased in such formal language. Instead, future resolutions will be written in letter format and should contain all of the facts needed to justify an advocacy position approved by the membership. Therefore, be it further resolved, that future resolutions approved by the SFC not be phrased in arcane, legalese language, except in cases where such language would convey a stronger meaning to the target audience.

In order to eliminate an extra step in the resolution process, Hank Bart suggested that the responsibility of creating a resolution should rest with the person who proposed the resolution or an ad-hoc committee comprised of members with expertise in the particular issue. This requires that the resolutions committee be changed to an ad-hoc committee in the SFC constitution. All members in attendance voted.

ELECTIONS

Bernie Kuhajda was elected to the chair-elect position by a unanimous show of hands. Martin O'Connell was then elected to the editor position by a unanimous show of hands.

OLD BUSINESS

Hank Bark was not able to receive funding for the SFC education initiative he discussed at last year's business meeting. The goal of the initiative is to integrate rare fishes into educational programs for elementary and high-school students. Hank will continue to pursue funding for the initiative, possibly in joint cooperation with the Southeast Aquatic Resource Partnership (SARP).

Several members expressed that our highly variable meeting venue has prevented us from meeting our goal of engaging students and agency personnel in the SFC. One solution to this problem is to meet with the Southern Division American Fisheries Society each year, regardless of where ASIH is meeting. If we stick to our regular schedule of alternating between ASB and SDAFS, except when ASIH meets in the South, five years will elapse between SFC-SDAFS meetings. The next meeting of the SDAFS will be in San Antonio Texas. Hank noted that there is nothing to prevent us from attending both ASIH and SDAFS, since the SDAFS meeting occurs in the spring and the ASIH meeting occurs in the summer. Brett Albanese offered that we should sponsor some sort of visible event at the SDAFS meeting every year, which may include a social event, a symposium, or at the very least, a business meeting. Steve Ross requested that we pass any changes to the meeting venue by the entire membership via email, because of the strongly held views on the subject. Hank agreed to draft a proposal and circulate it to the membership.

Steve Walsh proposed that SFC help support student lodging costs to the SDAFS meeting next year. Frank Pezold added that any award programs for students be published in *Copeia* and *Fisheries*, among other outlets. After several minutes of meandering diatribes, Mollie Cashner silenced the room with a clear-cut and economically viable proposal for student travel awards. Mollie proposed that $250.00 travel awards be offered to students traveling to the Southern Division American Fisheries Society meeting. Winners will be selected by random draw, to avoid the need for judging papers. Non-members would be required to purchase a student membership in order to get their name in the raffle, which would insure growth in student membership and offset the cost of the award program. Everyone thought Mollie's proposal should be pursued. Since we voted on a similar proposal at last year's meeting, Hank indicated that we did not need to vote on it again. Hank indicated that he would ask Kyle to identify the number of awards that we can offer next year.

Finally, Hank indicated that he and Kyle are investigating the feasibility of using Paypal to collect membership fees. This would cut down on Kyle Piller's time traveling back and forth to the bank.

NEW BUSINESS

Noel Burkhead, incoming chair, discussed his goal of increasing interactions between the Southeastern Fishes Council and southeastern DNR agencies. He proposed an alliance with the Southeast Aquatic Resources Partnership (SARP) as one strategy for achieving this goal, as many southeastern DNR agencies have appointed high-level decision makers to the SARP initiative. Noel believes that we can offer SARP our expertise on southeastern fishes. In return, we may have important influence on the type of projects pursued by SARP. As an additional step, Brett Albanese suggested that we get at least one person from each state agency to appoint a representative to the Southeastern Fishes Council.

At the conclusion of the meeting, outgoing chair Hank Bart urged everyone to attend the next meeting of the SDAFS, whether or not we decide to hold our official business meeting there. The meeting was officially adjourned shortly after 6:00 pm.

Respectfully submitted,
Brett Albanese, *Secretary*

MINUTES
Business Meeting
32nd Annual Meeting (2006) • Southeastern Fishes Council

The 2006 meeting of the Southeastern Fishes Council was called to order by Chair-elect Bernard Kuhajda at 4:05 PM on 14 July 2006 at the Sheraton Hotel in New Orleans, LA. The meeting was held in conjunction with the 86th annual meeting of the American Society of Ichthyologists and Herpetologists. Twenty members were in attendance, plus at least three others who came in late.

SECRETARY'S REPORT

Secretary Brett Albanese was not able to attend but sent hard-copies of the minutes from the 2005 meeting. Motion was made and seconded to approve minutes and minutes were approved by voice-vote.

TREASURER'S REPORT

Kyle Piller distributed and explained financial report. SFC expended more funds than received over the past year. Checking account balance is $10425.85 as of 15 June 2006. As of the meeting, SFC had 51 members with current dues paid, including 6 student members.

EDITORS REPORT

Marty O'Connell reported he had now recovered from Katrina sufficiently to move ahead as new Editor of the Proceedings. Regional reports for 2006 had not yet been called for; there was one paper in the review process for the next Proceedings volume.

OLD BUSINESS

Bernie Kuhajda reported on his trip to Washington DC as a representative of SFC and ASIH to meet with Senate Aids regarding proposed revisions to the Endangered Species Act (ESA). SFC signed on to a joint statement by several scientific societies opposing moves by Congress to alter the ESA. On short notice, Bernie went to DC with representatives from two other organizations (World Wildlife Fund and Environmental Defense Council) and met with about 40 Senate Aids regarding issues with ESA legislation. In addition to giving SFC a voice in legislation that could weaken species conservation, the trip provided Bernie the opportunity to buy a suit jacket (not charged to SFC), and Bernie reported that he is ready to serve again in this capacity as necessary.

NEW BUSINESS

Changes to Constitution and Bylaws Article VI. Chair Noel Burkhead has proposed changing Article VI to allow changes to Constitution and Bylaws at the annual business meeting or by email. Noel's proposed change to text of the Article was discussed and modified to stipulate a 10-day period for accepting votes by email and that proposed changes voted on by email would require approval by a two-thirds majority of the members responding. The revised text for Article VI read as follows:

"Changes to the Constitution and Bylaws can be made at annual business meeting or by email. Proposed changes to the constitution at the annual business meeting must be voted on by members, and passed if two-thirds of the members present at the meeting support the change. Changes made by email must be voted on by the current membership of the society at the time of the vote, and passed by two-thirds majority vote of the members voting by email. Notification and proposed changes to the Constitution and Bylaws should be submitted for consideration by the Constitution Committee during the normal nine month school year (members may be out of the country for extended periods during the summer). The announced voting time will be a 10-day period stipulated in a 30-day notification of a proposed change to the Constitution and Bylaws, which will be sent by the Constitution Committee to the membership."

Motion to accept these changes was made and seconded, and approved by a voice vote.

The Meeting Venue Issue and Noel's Plan X (APPENDED). Bernie reviewed the perennially recurring issue of the most effective venue for holding the SFC annual meeting (i.e., this really belongs under "Old business") and the reasoning behind last year's business meeting decision to meet with the Southern Division of the American Fisheries Society (SDAFS). Bernie then outlined a proposal by Chair Noel Burkhead, Plan X: adopt the Desert Fishes Council (DFC) model and hold the SFC annual meeting independently of other organizations. Considerable discussion ensued addressing questions such as whether SFC would attract members and partners (agencies, NGO's) to yet another annual meeting. Bernie also presented Brian Wagner's email response "Why go to Plan X when we haven't even given Plan W a chance?" (APPENDED), which passionately argued that SFC should adopt a broad view of what constitutes the "southeast" and continue with its decision to meet with SDAFS. Jim Williams presented some of the history of DFC, including how DFC decided to meet independently in Death Valley at NPS facilities on the cheap (no catering, minimal registration fee). Jim discussed the format of DFC meetings consisting of State reports, federal agency reports, and technical reports and suggested that if SFC followed this model, we might similarly devote the 1st day of the meeting to reports from states and agencies and the 2nd day to technical papers. Jim stressed his belief that a key to DFC's success has been always holding the meeting at the same time each year (e.g., the Thursday and Friday in the week before Thanksgiving), so no one has to think about when or where the meeting will be – simple scheduling that even fish-heads can handle.

Additional discussion addressed the phenomenon of diluted SFC attendance when we meet with national organizations and the need to focus on the southeast. Bernie noted that ASIH will not meet in the Southeast (according to common definitions) for the next 5 years; SDAFS will meet in Memphis, TN 2007 and Wheeling WV in 2008, raising again the question of what constitutes the Southeast and whether it includes WV. Other issues raised included: out-of-state travel problems for State biologists, and whether going to a meeting other than SDAFS would be more difficult; whether we collectively have the time to attend another meeting; the fact that considerably more funding is available for endangered fish research and conservation in the SW than in the SE; whether we have a group of dedicated individuals that can attend an independent SFC meeting; and the effect on graduate student involvement. Throughout, Jim continued with impassioned pleas for Plan X. Mary Freeman noted that Jim is retired and might have a more expansive view of time availability, and suggestively asked who is going to organize this meeting? Jim noted that if we do move to our own independent meeting, maybe some of the NGO's and agencies that have become interested in Southeastern aquatics

would help support the meeting. For example, a location like Chattanooga could be good, and we might seek with from TN Aquarium Research folks.

It was noted that meeting with SDAFS will only work well if SFC folks are on the AFS Planning Committee to set up a symposium; it will not work if we just have a business meeting because we will be overshadowed by the larger meeting (as at ASIH).

It was agreed that to follow-up on Plan X, we need a Committee to make a decision as to meeting site within 90 days. We also need a Program Committee. It was asked whether we were tied to Spring meetings, and Jim suggested late October, or November timing. Mel Warren proposed that the Executive Committee should appoint a committee to consider all issues and make a recommendation to the membership. Bernie called for a show of hands to see how members in attendance felt about options. Steve Ross, who has defected to the west, opined that it would be a major change for SFC to move to DFC model. Steve noted that DFC has strong graduate student participation (in what is now a 3-day meeting) and SFC could use some of our funds to support student participation in our meetings. Steve noted that the DFC model allows for strong interactions, and that it takes awhile to get to that point; DFC was helped along with crisis over the Devil's Hole pupfish. More discussion revolved around whether we can do a lot of work (as needed to interact effectively with SDAFS), or a lot more work (as needed to have our own meeting); the costs of meeting with SDAFS; the value of small meetings; where our decision to meet independently might leave the SE Division-ASIH; the possibility of providing some sort of support for graduate students; and whether we should go back to meeting with ASB.

A show of hands gave the following counts of those who:
Preferred to meet with SDAFS or some other large organization :1
Favored SFC meeting on our own : 8
Were confused: about 12.

Jim Williams moved the discussion forward by volunteering to organize and make all arrangements for first two SFC meetings if we decide to go it on our own. A motion was made to table details until the Executive Committee can consider the issues, report back to the membership and ask for a decision. Motion was 2nd, and approved. It was noted that the Committee should review whether we can have a symposium at SDAFS in 2007.

Web-page revisions: Noel has provided a detailed proposal (In Plan X, Appended) for making fish images, underwater videos and an updated, downloadable list of Southeastern fishes, organized by drainage available on the website and Joe Tomelleri offered to provide lo-resolution images also. Meeting attendants broadly agreed that these are great ideas and Steve Ross noted he would be willing to post his images. Bernie asked for volunteers to begin forming a Committee to make this happen (and need to move forward with getting .pdfs of all Proceedings on the website). Jake Schaefer volunteered to start the process of revising the web-page; Bernie will advise Noel to contact Jake directly at Jake.Schaefer@usm.edu.

New membership issue: SFC needs a membership committee that will harass members to get their graduate students and colleagues to join. Discussion included: that we need to make it very clear what one gets by joining; that we could roll membership dues into registration if we meet independently; that a better website will improve our visibility; that a list-serve could be helpful in engaging members. Pam Schofield raised the issue of the Wild Turkey – perhaps we need to use alcohol to reward those who bring in members/students? Hank Bart volunteered to chair a Membership Committee.

Other new business: what to do with checking account funds? After some discussion on possible restrictions imposed by our non-profit status, Kyle agreed to bug Steve Ross and Mel Warren for advice on managing SFC funds to return some interest.

The meeting was adjourned at 5:30 PM.

Respectfully submitted,
Mary Freeman (standing in for
Secretary Brett Albanese).

News Bulletin

The Southeastern Fishes Council is undergoing revitalization—to help us better fulfill our goals of transmitting information on the biology and conservation of southeastern freshwater fishes. Our plan includes attracting new members, expanding the role of the SFC in the conservation of southeastern fishes, and increasing our interaction with southeastern state and federal natural resource agencies. In an effort to become more effective we have moved our annual meeting to the month of November and to a location that is somewhat central to the southeastern region of the U.S.

Our next meeting will be in Chattanooga, Tennessee on Thursday and Friday, the 8th and 9th of November 2007, with possible field trips on Saturday, the 10th. Our meeting host, the Tennessee Aquarium, will open the Aquarium after hours on Thursday evening for a SFC social. The tentative program consists of two days of contributed oral and poster presentations. A portion of the program will be devoted to presentations in a workshop on the subject of *Captive Propagation for Reintroduction and Translocation of Imperiled Southeastern Freshwater Fishes*. Information from the workshop will provide the basis for a publication on guidelines for reintroduction/translocation of nongame imperiled southeastern fishes. A limited number of travel subsidies will be available for students who contribute presentations. The finalized program and call for abstracts will be posted on our website <sefishescouncil.org> and distributed to colleges and universities, state and federal agencies, and NGOs. The meeting is being conducted with support from The World Wildlife Fund, Southeast Rivers and Streams Program. Noel Burkhead, Chair, Southeastern Fishes Council.

Editor's Note

I would like to apologize to the members of Southeastern Fishes Council for not publishing an issue of *Proceedings* in 2006, the year after hurricanes Katrina and Rita impacted the Gulf Coast. When I agreed to serve as Managing Editor, the 2005 hurricane season was only just beginning. It was truly bad luck that the editorial transition (from Frank Pezold to me) took place in Louisiana, the state most devastated by the storms. An example of the chaotic transfer occurred when Stephanie McCormick, then Frank's graduate student at the University of Louisiana at Monroe, single-handedly delivered all the back issues of *Proceedings* to me here in New Orleans. Stephanie drove her over-loaded small car from Monroe into a still-damaged city with few working traffic lights and dropped off numerous boxes filled with the old issues. My wife, Meg, and I then temporarily stored the boxes in our FEMA trailer because our home and offices had been destroyed by the hurricanes. Fortunately, all of the back issues are now safely in a third-floor room at the University of New Orleans. The campus, though, is still being repaired and rebuilt almost two years after the storms and levee failures. While we have been through a lot, we want to assure SFC members that beginning with this current issue, *Proceedings* will once again be published on a regular basis.

With this new beginning SFC members will notice some changes. All past issues of *Proceedings* were digitally scanned here at UNO and are now available as PDFs on the SFC website:

http://www.flmnh.ufl.edu/fish/organizations/sfc/SfcProceeding2.htm.

By posting these files our goal was to not only help bring SFC into the computer age but to also make these valuable documents more readily available. Fish biologists and managers who work on conserving Southeastern fishes can now quickly access important past issues just by visiting our website. To encourage both new and ongoing membership, though, electronic versions of current *Proceedings* issues will only be made available to those SFC members who have paid annual dues. As we continue to publish research findings relevant to the conservation of Southeastern fishes, we also plan to more thoroughly cover two closely related subtopics: invasive species and freshwater mussel conservation. After habitat loss, the largest threat to species diversity is the impact of invasive species. In the next century, understanding and controlling alien fishes will be critical for protecting many Southeastern fish species. The conservation of freshwater mussels is also closely linked to saving the fishes we study. Because many fishes serve as specific hosts to larval mussels (glochidia), the continued survival of numerous mussel species depends on the presence of particular fishes in their habitats. Likewise in protecting freshwater mussel habitats, valuable fish habitats are also preserved. By more closely covering these two important aquatic conservation topics we hope to better provide useful information that will help save Southeastern fishes. Finally, as SFC begins a new era of conducting stand-alone annual meetings (see meeting update from Jim Williams in this issue), we encourage all members to attend and present their research findings. We also hope that the information in these presentations and posters can ultimately be submitted for publication in *Proceedings*.

I look forward to working with all of you over the next few years as SFC changes and advances as an organization. Feel free to contact me if you have any questions about submitting manuscripts to *Proceedings* or if you need more information about our organization as a whole.

Martin O'Connell
Managing Editor

Southeastern Fishes Council Proceedings

Information For Contributors

The primary purpose of the *Proceedings* is to publish peer-reviewed research papers and critical reviews of activities; regional reports and notes; and other pertinent information pertaining to the biology and conservation of southeastern fishes. The *Proceedings* is also an outlet for range extensions, distributions, and status papers, covering ecology and conservation ichthyology. Life history studies, faunal surveys, management issues, behavior, genetics and taxonomy of southeastern fishes are appropriate topics for papers in the *Proceedings*. Review papers or information on imperiled waters or fishes are particularly appropriate.

Manuscripts can be submitted electronically via email (send to: moconnel@uno.edu) or mailed as hard copies to the address below. Mailed hard copies should be submitted in triplicate. A good guide for manuscript preparation is the Sixth Edition of the *CBE Style Manual* available form the Council of Biology Editors, One Illinois Center, Suite 200, 111 East Wacker Drive, Chicago, IL 60601-4298.

The entire manuscript including the Abstract (required for longer articles), Introduction, Methods, Results, Discussion, Acknowledgments, Literature Cited, Appendices, Tables, and Figure Legends must be double-spaced. The title, author's name and author's address (including fax number and email address for corresponding author) should be centered on the first page. Indicate a suggested running head of less than ten words at the bottom of the first page. An Abstract (if necessary) will be placed at the beginning of the text. Acknowledgments will be cited in the text immediately before the Literature Cited. All references cited in the paper will follow the standard format of using the last name of the author(s) followed by the year of publication of the paper. In the Literature Cited, the references will be alphabetical by the author's last name and chronological under a single authorship. Literature cited should be standardized and abbreviated, using the *World List of Aquatic Sciences And Fisheries Serial Titles* or guidelines in *CBE Manual for Authors*, *Editors*, *and Publishers*, *6th edition* for journals not included in the World List.

Tables should be typed on a separate page, consecutively numbered and should have a short descriptive heading. Figures (to include maps, graphs, charts, drawings and photographs) should be consecutively numbered and if grouped as one figure each part block lettered in the lower left corner. Computer-generated graphics should be high quality prints; for drawings, high quality prints or photocopies are preferred to the original line art. Legends for figures must be on a separate sheet and each figure must be identified on the back. The desired location of each table or figure should be indicated in the margin of the manuscript. When possible, tables and figures will be reduced to one column width (3.5 in), so lettering on figures should be of appropriate size. Color figures can be printed at the author's expense.

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