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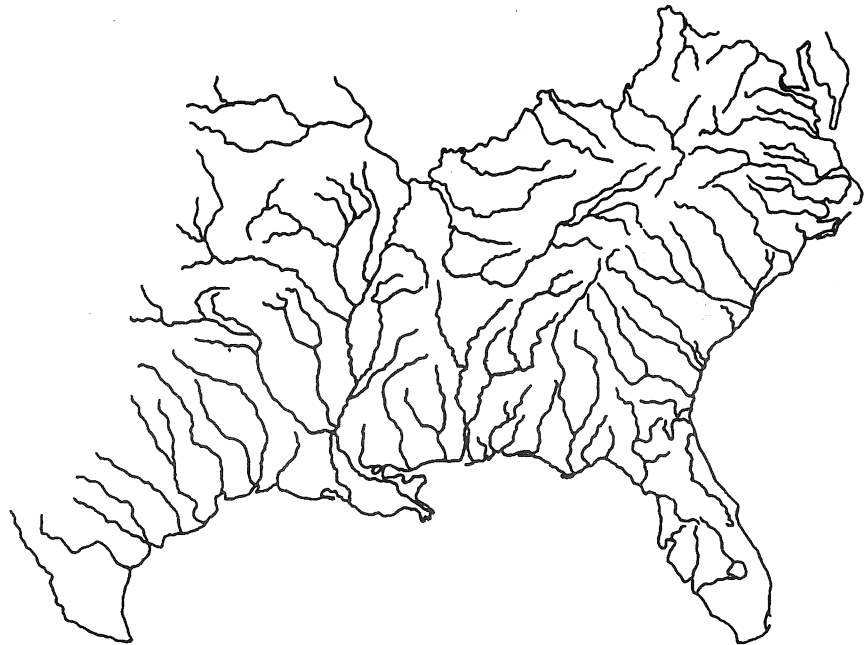
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Southeastern Fishes Council Proceedings

DEDICATED TO THE CONSERVATION OF SOUTHEASTERN FISHES



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Retention of Passive Integrated Transponder (PIT) Tags for Individual Identification of Warmwater Stream Fishes

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INTRODUCTION

The inability to recognize individual fish has hampered many ecological studies of small fish, especially studies that concern growth or movement. Tagging fishes with radio or external tags, which allow individual identification, is limited to relatively large fishes because the size of the tags are large relative to the body size of most fishes (Bergman et al., 1992). Although unique marks using subcutaneous injection of paints or dyes are relatively harmless to small fishes and can be made by varying body position and color combination (Kelly, 1967; Lotrich and Meredith, 1974; Thresher and Gronell, 1978; Thompson and Knight, 1986; Hill and Grossman, 1987), they are generally time consuming and the number of unique marks is limited. Mark retention can also be short lived, especially in fast growing fishes (Kelly, 1967). Visible implant (VI) tags are another type of externally visible mark, but require implantation in clear tissue for detection and can also be time consuming to apply (Bergman et al., 1992). Passive integrated transponder (PIT) tags are reported to have high retention rates (up to ten years), provide unique numerical codes and can be injected quickly (Prentice et al., 1990a). Unlike coded wire tags, which also have unique numerical codes, PIT tags do not require recovery from dead fishes; the tag signal can be read from live individuals through the body wall (Prentice et al., 1990b). Numeric codes from PIT tags are read with a scanner that activates the tag with a low frequency radio signal. Although PIT tags have been tested with salmonids (Braennaes et al., 1989; Prentice et al., 1990a), largemouth bass (Harvey and Campbell, 1989) and other large fishes such as sturgeons (Clugston, 1996), their use for non-game fishes has not been reported, except for a large western cyprinid, *Gila cypha* (Douglas and Marsh, 1996). The objective of this study was to evaluate the effectiveness of PIT tags for marking relatively small stream fishes. Specifically, we evaluated tag retention in several warmwater stream species in the laboratory and the field.

MATERIALS AND METHODS

Laboratory Study

Four species of fish were chosen for evaluation of PIT tags: bluntface shiner (*Cyprinella camura*; n=31 experimental and 8 controls; standard length (SL)=62-95 mm, \bar{x} =73.1, SD=7.9); creek chub (*Semotilus atromaculatus*; n=34 experimental and 8 controls; SL=73-140 mm, \bar{x} =97.8, SD=19.0); brown madtom (*Noturus phaeus*; n=31 experimental and 7 controls; SL=62-140 mm, \bar{x} =90.8, SD=19.7); and longear sunfish (*Lepomis megalotis*; n=57 experimental and 17 controls; SL=56-131, \bar{x} =85.8, SD=16.9). Fishes were collected in the spring and summer of 1995 from Goodwin Creek in Lafayette County, Mississippi (Yazoo River drainage). Study species were collected by electrofishing with a backpack shocker and dip nets. Fishes were held in 84-liter aquaria in a laboratory for one week prior to tagging.

Fishes were anesthetized in a 200 mg/l solution of tricane methanesulfonate (MS-222) and 400 mg/l sodium bicarbonate. Experimental fishes were measured (SL; mm) and PIT tags were injected with a 10-cc syringe and 5/8-cm needle into the peritoneal cavity anterior to the anus. Control fishes were anesthetized, measured, and injected, but no tag was inserted. Due to the length of the tags (approximately 14 mm) and the diameter of the needle, we found that creek chubs smaller than 70 mm, bluntface shiners smaller than 62 mm, brown madtoms smaller than 68 mm and longear sunfishes smaller than 60 mm could not be tagged effectively. Bluntface shiners, creek chubs and brown madtoms were held in 84-liter tanks located in a laboratory at the Center for Bottomland Research. They were checked for mortality and fed fish food pellets daily. Control fishes, which were indistinguishable from treated fishes that lost tags, were held in separate tanks and treated identically. Longear sunfish were held in 20 1250-liter tanks housed at the University of Mississippi Biological Field Station, and were also cared for daily. A limited number of tanks required that multiple fish were held per tank. All fish were checked daily for tag retention the first week following tag insertion and were

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checked every two weeks thereafter until the conclusion of the study. Presence of the tag was determined by passing a hand-held scanner over the live fish. Brown madtoms were held 60 days, creek chubs for 147 days, bluntface shiners for 80 days and longear sunfish for 180 days.

Field Study

As part of a study on movement patterns, individual longear sunfish, green sunfish (*Lepomis cyanellus*) and creek chub in two streams in the Ouachita Highlands, South Alum Creek (Saline River drainage), Saline Co., Arkansas and Little Glazypeau Creek (Ouachita River drainage), Garland Co., Arkansas were marked with PIT tags. Fishes were collected using the same protocol as the laboratory study. The mean SL (range and SD in parentheses) of fishes used in the field study are as follows: creek chub, 96.8 mm (70-132, 16.3); longear sunfish, 81.8 mm (64-110, 14.0); green sunfish, 90.6 mm (62-146, 21.0). Mean SL (and standard deviation) for recaptured fishes were as follows: creek chub, 98.8 mm (17.6); longear sunfish, 82.1 mm (12.7); green sunfish, 88.2 mm (18.7).

Fishes were anesthetized and PIT tags were injected using the same methods as the laboratory study. External paint marks were applied to all fishes that were injected with PIT tags to detect recapture information in event a PIT tag was lost. Using the methods of Hill and Grossman (1987), these fishes were given an external mark by injecting non-toxic paint under the skin. The color and location of the marks corresponded to the location of the pools where the fishes were collected. Upon recovery from anesthesia, tagged fishes were returned to the collection area. On subsequent field trips, all collected fishes were scanned for the presence of a PIT tag. The date of collection, tag number and collection location of tagged fishes were recorded. Untagged fishes in the samples were tagged after weight and length measurements were taken. Sampling intervals ranged from two weeks to four months, with more frequent sampling during the spring and summer months.

RESULTS

Laboratory study

The four fish species had different tag retentions. Mortality due to handling and tagging was low (Table 1). Upon termination of the experiment, all fishes were autopsied to determine whether the tags were present or absent. Due to limited tank facilities, the experiments with brown madtoms, which almost uniformly retained tags, and bluntface shiners, which almost all lost tags, were terminated sooner than the other two species. Brown madtoms had the highest tag retention (100%) and survivorship (97%) after the 60 days they were held. A group of ten tagged madtoms was held over 180 days and all still retained their tags. Bluntface shiners had very low tag retention (6%), but had a 87% survival rate. The low tag retention for this species was attributable to tag loss through the injection wound, which did not close immediately. Both creek chub and longear sunfish had high tag retention, but fairly

low survivorship (74% and 61% respectively) due to aggression with other fish. Fishes that died from jumping out of tanks or from wounds suffered from aggressive encounters with other fish all retained tags. In particular, the longear sunfish in our study appeared to have relatively low survival due to the holding conditions (47% survival of controls). This is an aggressive species in captivity, and animals were aggressive even in large holding tanks. All mortality of longear sunfish was due to fighting, and not to the tagging procedure.

Field Study

The 37 month duration of the field study provided an opportunity to monitor long-term tag retention, as well as performance, in the field (Table 2). By referring to the numeric codes of the tags in recaptured fishes, duration of tag retention was calculated. The external paint marks also enabled us to assess tag loss. Less than 1.24% (2 out of 161) of tagged fishes were recaptured with an external mark and no PIT tag. All fishes with PIT tags had external marks. Approximately 20% of the fishes recaptured in this study (all species combined) retained the PIT tags over one year post-tagging.

DISCUSSION

PIT tags are a feasible method for individually marking some species of stream fishes. Field and laboratory data indicated creek chub and sunfish retain tags for relatively long periods of time and appeared to be minimally affected by the tagging procedure. Brown madtom also had high tag retention and showed no mortality due to the tagging procedure. Bluntface shiner, however, was less successfully marked with PIT tags. Variability in retention rates require this procedure to be assessed on a species-specific basis as indicated by the results of this study and the findings of other PIT tag studies such as Prentice et. al 1990a which reported the retention rate for juvenile chinook salmon (fork length 66-100 mm) was 98% after 507 days and Harvey and Campbell 1989 which reported a 100% retention rate of largemouth bass brood fish for a duration of 24 months. In this study, the long retention times for creek chub and longear sunfish indicated that PIT tags would be useful for estimating home ranges and population sizes of these species, but would not be appropriate for these purposes in species that lost tags quickly. The size of the fish must also be considered because fishes below a certain size (e.g. longear sunfish < 60 mm) physically could not be injected with PIT tags.

The speed and effectiveness of the PIT tagging procedure gives investigators an opportunity to individually mark large numbers of fishes in a timely manner. Because the codes can be read through the body wall of fishes, tagged fishes can be released and can be monitored over their lifetime. Implantation was invasive, but left only a small injection wound that healed quickly in most of the species we studied. The internal location of the tag prevents the potential infections frequently associated with external tags large enough to carry information on

Table 1. Survival and tag retention of PIT tagged fishes held in the laboratory. Species were tested from 60 to 180 days. Percent survival is the number of fish alive at the end of the test period/the total number of fish. The numbers in parentheses are the total numbers of fish alive at that time. Percent tag retention included the number of fish that died with tags plus the number of fish with tags at the end of the test period/number of fish.

Species	Test	Control	Number of Days									% Survival		% Tag Retention
			1	4	21	35	Post Tagging		100	147	180	Test	Control	
<i>Cyprinella camura</i>	31	8	24(31)	24(31)	24(27)	24(27)	5(27)	2(27)	-	-	-	87	100	6
<i>Semotilus atromaculatus</i>	34	8	32(34)	30(34)	26(33)	24(33)	16(27)	15(26)	12(26)	11(25)	-	74	100	59
<i>Noturus phaeus</i>	31	7	31(31)	31(31)	31(31)	31(31)	31(30)	-	-	-	-	97	86	100
<i>Lepomis megalotis</i>	57	17	41(52)	41(52)	27(40)	23(38)	22(38)	18(35)	18(35)	18(35)	18(35)	61	47	70

Table 2. Pit tag recovery and retention of fishes in Ouachita Highlands streams. Values show number of recaptures. Total number of recaptured fish was: *S. atromaculatus*, n=11, plus four multiple recaptures; *L. cyanellus*, n=61 plus 16 multiple recaptures; *L. megalotis*, n=52, plus 17 multiple recaptures.

Species	Days Between Tagging and Recapture																			
	1	34	36	49	56	60	84	90	96	144	213	269	273	303	309	323	329	357	363	365
<i>Semotilus atromaculatus</i>	1	1	1	1	1	2	1	-	4	-	-	-	-	-	-	-	-	1	-	1
<i>Lepomis cyanellus</i>	-	12	2	6	4	5	3	3	5	4	3	1	1	-	1	1	4	5	2	4
<i>Lepomis megalotis</i>	-	3	5	11	2	2	4	-	4	5	4	2	2	2	5	-	2	2	1	3

individual identification. Unlike external paint marks, PIT tags provide large numbers of unique codes that are unambiguous. One drawback of PIT tags, however, is that they are more expensive than external paint marks (approximately \$500 per hundred fishes).

This technology is valuable for studies of non-game as well as game fishes. Tagging methods for small, non-game fishes that allow individual identification has hindered research into many aspects of the ecology. Ecologists may be able to use tagging techniques, such as PIT tags, to increase our understanding of these poorly known fishes. We conclude that PIT tags are an appropriate method of marking individual sunfish, catfish and some species of minnow when research questions require individual recognition without sacrifice of recaptured fish.

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Laboratory Observations of Spawning Behavior in Two Species of Snubnose Darters, *Etheostoma colorosum* and *E. tallapoosae*

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ABSTRACT

Laboratory observations of spawning behavior of the coastal darter (*Etheostoma colorosum*), and the Tallapoosa darter (*Etheostoma tallapoosae*) were made during April 1989 and April and May 1998. Spawning behavior was previously unreported for both of these relatively recently described species. Like other species of snubnose darters, both the coastal darter and the Tallapoosa darter are egg-attachers, using vegetation, rocks and logs for spawning substrate. Eggs are laid singly or in groups of two, and neither parent provides parental care. Like other species of egg-attaching darters, the two study species are non-territorial, but males are aggressive.

INTRODUCTION

The coastal darter (*Etheostoma colorosum*) and the Tallapoosa darter (*Etheostoma tallapoosae*) are both relatively recently described species of snubnose darters (Suttkus and Bailey, 1993; Suttkus and Etnier, 1991, respectively) confined to the southeastern United States. The Tallapoosa darter has a limited distribution, occurring only in the Tallapoosa River system in Alabama and Georgia above the Fall Line (Suttkus and Etnier, 1991), while the coastal darter is more widespread, occurring throughout the coastal drainages of southern Alabama and the Florida panhandle (Suttkus and Bailey, 1993). Virtually nothing is known about the biology of either of these species.

Our objective was to document the spawning behavior of these two poorly known species via observation in aquaria.

METHODS

A total of 11 (6 male and 5 female) coastal darters was collected at two localities: tributary, Spring Creek (Conecuh River drainage), 7.0 mi E Burnt Corn, Conecuh Co., AL, 11 April 1998, 5 males and 4 females, water temperature 16 C; Big Juniper Creek (Blackwater River drainage), 2.0 mi W Munson, Santa Rosa Co., FL, 12 April 1998, 1 male and 1 female, water temperature 16 C.

Two sets of spawning observations were made for the Tallapoosa darter. One set (made by HLB) was based on four

males and eight females collected from Gold Branch, county road 407, Elmore Co., AL, 27 April 1989, water temperature 19 C. The fish were placed in a refrigerated 84-liter aquarium set at 17 C with constant aeration. They were fed frozen blood worms once per day and maintained on a 12 h light schedule. The aquarium was provisioned with the following spawning substrata: large cobble piled to form cavities, vegetation-covered cobble, and patches of gravel and sand substrate. The aquarium was allowed to warm to room temperature, in order to induce spawning, prior to observation. Observations were made over a two-hour period, and several spawning bouts were photographed.

The second set of spawning observations for Tallapoosa darters was based on a total of 27 fish collected in 1998 from the following localities in the Tallapoosa River drainage: Gold Branch, county road 407, Elmore Co., AL, 27 April 1989, 4 males and 8 females; tributary, Cane Creek, 2.0 mi W Fruithurst, Cleburne Co., AL, 5 April 1998, 2 males and 3 females, water temperature 15 C; same locality, 8 April 1998, 1 male and 2 females; Elkahatchee Creek, county road 259, Tallapoosa Co., AL, 28 April 1998, 1 male and 1 female, water temperature 17 C; Jaybird Creek, county road 57, Tallapoosa Co., AL, 28 April 1998, 1 male and 4 females, water temperature 19 C.

In all 1998 observations involving coastal and Tallapoosa darters, fishes (separated by species) were introduced into 84-liter aquaria in the laboratory. Water temperature was 19-20 C, and constant aeration and filtration were maintained. Fishes were fed frozen blood worms twice a day, and maintained on a 10 h light schedule. Each aquarium was provisioned with all spawning substrates known to be used by darters, including: rock cavities (used by egg-clusterers and egg-clumpers), large rocks, a log and vegetation (used by egg-attachers) and gravel and sand substrate (used by egg buriers). Spawning was observed in *E. colorosum* every day from 13-20 April 1998. Spawning was observed in *E. tallapoosae* on 29 April 1989, and 8, 17 and 30 April 1998. Observation periods ranged from 15 min to 2 h. Most observations were videotaped, and detailed observations of behaviors were confirmed by reviewing tapes. Eggs recovered from aquaria were measured to the nearest 0.1 mm with an ocular micrometer, and placed in aerated gallon containers for incubation.

RESULTS

Spawning in *E. colorosum* was promiscuous, and males were aggressive but not territorial. Three females and four males participated in various spawning events. On at least three occasions females switched partners. During courtship and aggressive encounters with other males, the orange and blue breeding coloration of the male(s) intensified, and a dark black vertical bar developed that ran through the eye. Males often exhibited lateral displays to other males with the body held rigid and the dorsal fins extended. Males courted females by following them and occasionally making contact by rubbing the backs of females with their chins, breasts and pelvic fins. Females engaged in the substrate searching behavior described by Porterfield (1998); females would move slowly about the tank, occasionally stopping to inspect an area of substrate. When ready to spawn, females usually exhibited head jabs, where the female appeared to bite at the substrate. Immediately following a head jab (1-4 jabs, mean=2.35, SD=1.08), the female would be mounted by the male and the pair would vibrate (mean duration of vibration=1.23 s, SD=0.31), presumably depositing 1-2 fertilized eggs. Eggs were abandoned after spawning. A total of 17 spawning events was observed, and in every case eggs were attached to objects in the tank or the glass aquarium wall. Five eggs (mean diameter=1.0 mm, SD= 0.07) were recovered from the tank; two from the log (two together), one from a large rock and two (separate) from the outside of a nest tile. Attempts to raise eggs to hatching were unsuccessful.

In 1989 observations of *E. tallapoosae*, males appeared to be past peak spawning coloration when collected. In the field, males released milt and females expressed eggs on slight pressure, suggesting that they were actively spawning. In the aquarium, only the largest of the four males spawned. In the 1998 observations, large and small males spawned (three males and four females). In both sets of observations, males displayed intensified coloration during courtship and aggressive encounters with other males. Spawning was promiscuous, and no territoriality was observed. Courtship and spawning were as described above for *E. colorosum*: females displayed 2-4 head jabs (mean=2.6, SD=0.64) and the mean duration of spawning vibration=1.18 s, SD=0.23. Twelve spawning events were observed for four pairs; ten eggs were recovered from the aquarium walls, and three were deposited on ceramic tiles (mean diameter=1.2 mm, SD=0.08). Two larvae were raised to post-hatching (5 mm TL), preserved, and vouchered in the Auburn University Fish Collection.

DISCUSSION

Our observations demonstrate that both *E. colorosum* and *E. tallapoosae* are egg-attaching species. Other modes of spawning in darters include egg-burying, egg-clumping and egg-clustering (Page, 1985). Egg-attaching behavior has been described for numerous species of darters, including other species of snubnose darters (Winn, 1958; O'Neil, 1981; Page and Mayden, 1981; Page et al., 1982; Carney and Burr, 1989; Keevin et al., 1989; Bauer et al. 1995; Johnston and Haag, 1996; Johnston and Shute 1997; Porterfield, 1998), and darters in other subgenera, including: *Belophlox* (Collette and Yerger, 1962); *Boleichthys* (Fletcher, 1957; Braasch and Smith, 1967; Schenck and Whiteside, 1977; Burr and Page, 1978, 1979); *Etheostoma* (Fahy, 1954); *Fuscatelum* (Johnston, 1994); *Ioia* (Winn and Picciolo, 1960); *Oligocephalus* (Strawn, 1956; Seesock et al., 1978; Page et al., 1982); *Ozarka* (Boschung, 1979; Johnston, 1995); *Vaillantia* (Page et al., 1982; Bart, 1992); and *Villora* (Williams, 1976). As discussed by Page (1985), the attachment of small eggs over a wide area may reduce egg predation, because the eggs may be difficult for predators to locate.

Although egg-attaching is a widespread spawning mode in darters, there appears to be very little variation in behavior among species. Our results suggest that the spawning behavior of *E. colorosum* and *E. tallapoosae* is superficially similar, and is also similar to the spawning behavior of other snubnose darters. Similarities include the lack of territoriality, male following behavior, number and small size of eggs laid, and female behavior (head jabs and substrate searching) as described by Porterfield (1998). It is possible, however, that a detailed assessment of courtship behavior, habitat selection and spawning substrate selection may reveal differences among species of egg attachers, including *E. colorosum* and *E. tallapoosae*. Although we did not have enough data for statistical tests, the number of head jabs and duration of spawning vibration may differ between our two study species. Porterfield (1997) found differences in spawning microhabitat for two sympatric species of snubnose darters, *Etheostoma flavum* and *Etheostoma simoterum*. Such differences may be important clues to the evolutionary histories of these diverse fishes, and may also assist conservationists in habitat protection efforts.

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MINUTES

Business Meeting 24th Annual Meeting Southeastern Fishes Council

The 24th annual meeting of the Southeastern Fishes Council was held at Northeast Louisiana University in Monroe, Louisiana on 16 April 1998, site of the 1998 meeting of the Association of Southeastern Biologists (ASB). Executive Committee members attending were Melvin L. Warren, Jr. (Chair) and Gerald R. Dinkins (Secretary). Mary C. Freeman (Treasurer) was unable to attend. Mel called the meeting to order at 4:32 PM.

Mel stated the 1997 SFC meeting minutes were published in the most recent issue of the Proceedings. In the interest of time, Mel asked that the reading of the minutes be waived. Those in attendance were asked to quickly review the minutes and, if necessary, provide input or corrections to Gerry. A motion was made to accept the 1997 meeting minutes, and was carried by voice vote.

Mel recognized Gerry Dinkins and Steve Walsh for their efforts putting together the 1998 SFC button depicting the recently described Cherokee darter, *Etheostoma scotti*. Gerry stated he would be taking suggestions for next year's button, which would mark the 25th anniversary of SFC. Hank Bart responded that the snail darter would be an appropriate subject, and he has a rendition by Mark Sabaj that could be used. Gerry agreed to coordinate with Hank for next year's button.

Mel then yielded the floor to Steve Walsh for the reading of last year's Treasurer's report (the financial statement is at the end of the minutes). Before the meeting, Steve circulated copies of the Treasurer's report, and summarized expenditures as presented in the report. A motion was made to accept the Treasurer's report, seconded, and passed unanimously by voice vote.

Mel stated that in conjunction with the 1997 meeting in Greenville, South Carolina, he, Steve Walsh, Mary Freeman, Bernie Kuhajda, and Gerry Dinkins met to discuss ways to increase distribution of the Southeastern Fishes Council Proceedings. An outcome of that meeting was the formation of an ad hoc Editorial Committee. Bob Cashner was then given the floor and provided a report of the editorial committee's most recent meeting. Bob discussed changes which have been suggested to the SFC bylaws pertaining to editorial review of the Proceedings.

Mel brought up the subject of changes to SFC bylaws relative to the Editorial Board, and opened the floor for discussion of the proposed changes. Following a discussion of appointing versus electing editorial board members, and whether the editor and associate editor should serve synchronous terms, a motion was made and carried by voice vote to change the SFC bylaws relative to the Editorial Board. Mel stated that the SFC would publish changes to the bylaws in a future issue of the Proceedings.

Turning to committee reports, Mel asked for a report from

the Resolutions Committee. Dave Etnier reported on the need for a consensus to modify the SFC resolution to the US Forest Service pertaining to the stocking of hatchery trout in smoky and yellowfin madtom habitat in Citico Creek. It was agreed that the resolution would ask the Forest Service to stock trout where they historically have been stocked, and to no longer stock trout within madtom habitat. Steve Walsh reminded everyone that SFC had submitted a resolution to DuPont stating our opposition to their proposed titanium mine near the Okefenokee Swamp. Steve provided an update on the proposed mine and DuPont's efforts to push ahead with the project using a conflict resolution group. Mel spoke about his efforts last year to develop a resolution urging ASIH to accept a representative from the SFC on the Environmental Quality Committee and AFS's Endangered Species Committee. Mel also spoke of the SFC's resolution supporting his initiative to develop a list of imperiled fish species emphasizing the southeast. To that end, a committee has been formed, comprised of Wayne Starnes, Dave Etnier, Rick Mayden, Steve Walsh, Bob Cashner, Brooks Burr, Bernie Kuhajda, Henry Robison, Dean Hendrickson, and Gary Garrett. Mel and Brooks Burr are co-chairs. Mel provided a schedule for completing the project, and said the committee thus far has considered 640 taxa, including 49 undescribed species. When the project is complete, outside reviewers will be asked to review and comment on the list prior to publication. Mel informed the group that the US Forest Service has verbally committed to match money for color plates. Mel plans to go to various funding sources for donations. The floor was opened for discussion whether SFC should donate money out of its treasury to support the publication in general and color photography in particular. A motion was made for SFC to provide \$500 and was carried by voice vote.

Turning to old business Mel turned the floor over to Hank Bart, who informed the meeting that SFC now has tax exempt status. Hank discussed what has to happen to keep this status, and said for now he will be in charge of SFC's tax file. A round of applause was given for Hank's diligent efforts to finally resolve SFC's nagging problem of tax status.

Regarding updating SFC's web site, Steve Walsh had no recent information.

Turning to new business, Mel stated that the Executive Committee wishes to advertise in the North American Native Fish Association (NANFA) that SFC buttons are available. Dave Etnier mentioned that NANFA will be meeting at the Tennessee Aquarium in Chattanooga within the next month. A motion was asked for and carried by voice vote to place an announcement in the NANFA newsletter about the availability of SFC buttons for \$3.00 each, with group discounts for multi-button purchases.

Mel said that Steve Stevenson had spoken to him about combining the Northwest and Southwest Regions. In support of combining these regions, Frank Pezold said the regions in question are on the outside edge of SFC's stated area of concern (according to SFC's constitution), and have never been well represented at the annual meeting. Mel responded by saying the Executive Committee would prefer to see a change such as this be carried out by referendum in an official SFC newsletter. Hank Bart suggested it might help if one person reported for both regions. Hank's suggestion was well received, and Mel stated that in the future, one person will be allowed to report for both Region V and VI.

Moving to the Regional Reports, Steve Walsh noted Noel Burkhead was unable to attend and present the report for Region II (Southeast) due to health reasons.

Dave Etnier provided an update for the Region III (North-Central) report, and began by reporting *Noturus hildebrandi* was collected by a TVA survey crew in Birdsong Creek (western tributary to the lower Tennessee River). For this species to occur there naturally would mean it jumped over the Big Sandy River, indicating a bait-bucket introduction. Dave also reported that Pat Rakes and J.R. Shute of Conservation Fisheries, Inc. are attempting to propagate *Percina copelandi* as a surrogate for *P. aurora*. However, much difficulty is being encountered.

Frank Pezold (Region VI) had no new news to report for the Southwest Region. Neil Douglas (Region V) reported he has live pallid sturgeons in his laboratory.

Mel Warren asked for any other items of interest; none were forthcoming, and a motion for adjournment was made, seconded, and the meeting concluded.

Southeastern Fishes Council Treasurer's Report, April 1998

Checking Account Balance, 16 April 1997 \$1,794.02

Dues and Contributions, 16 April 1997 through 8 April 1998:

Past dues	\$20.00
1997 dues	\$2,060.00
1998 dues	\$320.00
1999 dues	\$20.00
Proceeds from Button sales	\$172.00
Contributions	\$15.00

TOTAL: \$2,607.00

Expenditures, 16 April 1997 through 8 April 1998:

Proceedings # 35, printing cost	\$823.62
TN Secretary of State (annual report)	\$20.00
1998-edition Buttons, production cost	\$215.80
Proceedings # 36, printing cost	\$1,154.34
Proceedings # 36, reprint charge, pp. 7-9	\$47.70
Proceedings # 36, postage	\$154.53

TOTAL: \$2,415.99

Checking Account Balance as of 8 April 1998: \$1,985.03

Paine Webber Cash Fund as of

31 December 1997:	\$2,786.10
Reported Fund, 31 December 1996	\$2,650.53
Earned interest and adjustments, 1997	\$135.57

Total Assets \$4,771.13

Current paid membership stands at 117 individuals and institutions. Complimentary copies of Proceedings #36 were sent to Zoological Record and the American Museum of Natural History. Members as of 1996 who did not renew in 1997 was 35 (however, 1997 dues were still coming in as late as February 1998).

in south Florida to determine the distributional limits of the Asian swamp eel (*Monopterus albus*). The discovery of the south Florida population garnered national press interest, in which Jim Williams was quoted as saying, "The best way to get rid of them is to club them to death." Perhaps Jim has been working on mussels too long, which is the segue to announcing that Jayne Brim-Box and Jim have a monograph in press in the *Bulletin of the Alabama Museum of Natural History* on the mussels of the Apalachicola, Chattahoochee, and Flint Rivers. Denouement??

Steve Walsh (with Mike Meador, USGS) published a report entitled "Guidelines for Quality Assurance and Quality Control of Fish Taxonomic Data Collected as Part of the National Water-Quality Assessment Program." This paper is a good reference for beginning students of fishes. It also has much useful information such as summarized collection permit requirements for all states, and sources of collecting gear (nets, jars, waders, label paper, etc.). Steve's email address is: Steve_Walsh@USGS.gov. Howard Jelks and myself recently completed a report to the U.S. Fish and Wildlife Service on the effects of suspended sediment on the reproductive success of the tricolor shiner, an experimental surrogate for the threatened blue shiner. Suspended sediment significantly curtailed reproductive success, but not as anticipated. Instead of high egg mortality, fishes spawned less or failed to spawn with increasing suspended sediment concentrations. This report is being condensed for journal publication. Howard Jelks and Frank Jordan (Loyola University, New Orleans) have completed five years of monitoring of Okaloosa darters on Eglin Air Force Base, northwestern Florida. The remarkable finding is the populations of this endangered darter are very stable. Howard is also in the second year of an aquatic faunal surveys of Eglin AFB in areas extralimital to Okaloosa darters. These findings will be published as a handbook of the fishes of Eglin AFB.

Of general interest, a symposium will be held in Chicago on 6 - 8 December 1999 on removing dams. Yes, the time really has come to start figuring out how to take down large dams without wiping out the river system below the dam. May be this millennia thing is real. Those wishing more information may contact Paul Kanehl, 608/221-6332; FAX 608/221-6353; email Kanehp@dnr.state.wi.us. Interest in this symposium seems very high and it may be a genuine opportunity to get our fields of expertise at the table when initial exploration of the topic is being considered. Also, the Asheville Office, U.S. Fish and Wildlife Service is hosting a symposium on restoration of North Carolina streams on 18 - 19 August 1999. For more information, contact Dick Biggins at 828/258-3939, ex 228, FAX 828/258-5330; email Richard_Biggins@fws.gov. Clearly, momentum is gathering on river restoration, dam removal, and on addressing river and southeastern faunal conservation issues. I encourage SFC members to alert the general membership when such topics are announced.

Noel Burkhead

REGION III - North-Central

Status surveys and other interesting finds

John Fridell (U.S. Fish & Wildlife Service) reported that the Service will be proposing to elevate one fish and two mussels to candidate status. These include the Cumberland johnny darter (*Etheostoma susanae*), the slabside pearlymussel (*Lexingtonia dolabelloides*), and fluted kidneyshell (*Ptychobranhus subtentum*). At present, these species have no official federal status. The Cumberland johnny darter and slabside pearlymussel were formerly category 2 Candidates, which no longer exist; the fluted kidneyshell has never had federal candidate status. The current elevation package will recommend all three as "Candidates", equivalent to the former Category 1 candidate for federal protection. These were taxa for which enough information existed to list as endangered or threatened. The elevation package will be submitted to the Atlanta regional office of FWS in early March.

Ed Scott (TVA) reported snail darter (*Percina tanasi*) distribution and abundance is apparently keeping up with the continued improvement of the Douglas and Cherokee tailwaters in the lower French Broad and Holston rivers. In addition, snail darters, presumably from the Hiwassee River population, have also been found in the lower end of the Ocoee River. Charlie Saylor (TVA) has a few additions to the lower Pigeon River fish fauna that support the continued improvement of that area: *Phenacobius crassilabrum* and *E. swannanoa*. The *E. swannanoa* populations probably recruited from local tributaries. Also, in 1997, *Nocomis micropogon* and *E. zonale* (both present in the adjacent French Broad River) were new fish records for the Pigeon.

Brooks Burr (Southern Illinois University) reported finding five duskytail darter (*E. percunurum*) nests, in the Big South Fork in May 1998. This is the first time nesting has been observed in this population. Burr and students have also been surveying fishes in the Little South Fork, with particular emphasis on ecology of palezone shiner, *Notropis albizonatus*.

J. R. Shute, Pat Rakes, Bo Baxter (CFI), and Peggy Shute (TVA) surveyed the historical yellowfin madtom (*Noturus flavipinnis*) locality at Buchanan Ford on the Powell River in fall 1998, and uncovered three young-of-year madtoms. This is the first time the species has been reported from the Powell River since fall 1983, when one young of year yellowfin was also observed at Buchanan Ford.

Bernie Kuhajda (University of Alabama) reported that Rick Mayden's lab will be surveying caves with aquatic habitat in the area surrounding Key Cave (Tennessee River drainage) for new populations of Alabama cavefish, *Speoplatyrhinus poulsoni*.

Kevin Hamed, of Tennessee State Parks, reported a robust population of Tennessee dace (*Phoxinus tennesseensis*) in the Beaver Creek system (of the Holston) within Steele Creek Park. He and a local high school student are initiating a project to study this population in more detail.

Etnier's Regional Faunas class collected some additional species in the rip-rap areas with fast current in the Tennessee portion of the Mississippi River. These include: *Elassoma zonatum*, *Gambusia affinis*, *Lepomis cyanellus*, *L. megalotis*, and *Percina sciera*.

Scott Mettee, Geological Survey of Alabama (GSA), reported that GSA will be doing all of the level one fish bioassessments in the Alabama part of the Tennessee system in 1999 and 2000. A complete report on the fish of the Alabama section of the Tennessee River should be published by the GSA Fall 1999. The database for this report includes information from 1,188 samples collected at 761 stations between 1954 and 1998. GSA are also planning to release a new color poster on Alabama fishes in early March.

Exotic species

Steve Fraley (American Aquatics) and Charlie Saylor (TVA) reported a large adult grass carp (*Ctenopharygodon idella*) from Melton Hill Reservoir (Clinch system) in fall 1998, and that pumpkinseeds (*Lepomis gibbosus*) have moved downstream of Boone Reservoir (Holston system); they were collected in Horse Creek (South Fork Holston tributary in Sullivan Co., TN).

Al Brown (TVA) reported that blueback herring (*Alosa aestivalis*) were documented in the upper reaches of Melton Hill reservoir (high numbers) by TVA reservoir sampling crews in Fall 1998. Reproducing populations are being tracked in both Chatuge and Nottely reservoirs and their tailwaters. Multi-age classes were sampled in Fall 1998 by biologists from Georgia Department of Natural Resources and North Carolina Wildlife Resources Division. Brown says we have little knowledge concerning the effect of this introduction on native fish populations, but the GDNR biologists suspect a negative impact on resident largemouth bass and yellow perch in Nottely. Bluebacks are considered riverine spawners but have apparently adapted to reservoir spawning conditions. They prefer cooler oxygenated refuge areas in the reservoirs but apparently do very well in dam tailwaters. At this point we have no idea, if, or how quickly they will distribute themselves further down the TVA system. State biologists have been alerted and, at this point, identification is the major problem. We intend to distribute lab specimens to district fishery biologists to help with this problem.

Gerry Dinkins (3D-Environmental) turned up a population of *Gambusia holbrooki* from the Holly Creek portion of the Conasauga system in northern Georgia.

Mussels

J.R. Shute and Pat Rakes (Conservation Fisheries, Inc.) found an apparently very old muskrat midden with 22 mussel taxa (identifications verified by Dr. Paul Parmalee and Steve Ahlstedt), several of which are now federally endangered and a few extinct. This find will help provide documentation of historical French Broad River mussel fauna, which is important for mussel reintroductions that are currently being considered for this river reach.

Steve Fraley (American Aquatics) and Steve Ahlstedt

(USGS), were contracted by FWS to survey Copper Creek (Clinch River tributary) for mussels. Twenty sites within a 50 mile reach were surveyed. Nine of 19 mussel species collected in 1980 were not found in 1998, including the federally endangered oyster mussel (*Epioblasma capsaeformis*) and rough rabbit's foot (*Quadrula cylindrica strigillata*). Densities of remaining mussel species (10) were low.

Fraley and Ahlstedt were contracted by TVA to survey Tellico River (Little Tennessee system) for mussels. Two sites in the Nar's Ford area were surveyed in 1998. Only four of 13 species collected in 1983-84 were found. Densities were very low (8 individuals compared to 1125 in 1983-84).

Ron Cicerello of the Kentucky State Nature Preserves Commission, reported that KSNPC has completed a study of freshwater mussels in the Green River from Mammoth Cave National Park (MCNP) upstream to Green River Lake Dam under contract with FWS Asheville office. Thirty-four species were found alive and 10 others were found only as old shells. When combined with other recent records, 53 mussel taxa, including rarities such as the fanshell (*Cyprogenia stegaria*), northern riffleshell (*Epioblasma torulosa rangiana*), pink mucket (*Lampsilis abrupta*), ring pink (*Obovaria retusa*), clubshell (*Pleurobema clava*), and rough pigtoe (*P. plenum*), persist in the study segment and MCNP. More than 100 species of fishes are known from the area, as well as rare and endemic crustaceans. Efforts are underway to increase protection of this highly significant area. Sensitive areas (e.g., riparian zones, sinkholes, groundwater drainage basins for subterranean communities) are being identified throughout the watershed. The Kentucky Chapter of The Nature Conservancy has begun fund raising and has hired ichthyologist Dr. Richie Kessler, Campbellsville University, as Green River Bioreserve manager. Numerous state and federal agencies are cooperating to access big dollars from the Conservation Reserve Enhancement Program (CREP), a federal effort to address agriculture-related pollution problems impacting high quality or sensitive areas.

Mark Hughes (private consultant) reported the following mussel finds for a stretch of the upper Conasauga River. From 1995 through 1998, fresh dead specimens of *Pleurobema chattanoogaense* are still being located by a monitoring team from Golder Associates, Inc. in the Conasauga River of Georgia upstream from Dalton to the GA Hwy. 2 bridge at Beaverdale. This species was thought to be extinct. There are some questions about the true taxonomic status of this animal—whether it's an upstream form of the federally endangered *Pleurobema decisum*, or a distinct taxon. Yet, between 1996 and 1998, specimens have been found that appear to be good *P. decisum* in the same stretch of river as the *P. chattanoogaense*. Eventually, genetic analysis will add to our knowledge of these two species and assist in their comparison. No matter which of the two species survives in the river, both forms are limited in distribution. Based on fresh dead specimens, there might be another two or three additional species of *Pleurobema* in the river as well, the endangered *P.*

georgianum, and another two thought to be extinct, *P. hanleyianum* and *P. troschelium*. Also, the federally endangered *Ptychobranchus greeni* and threatened *Lampsilis altilis* still survive here, as well as another undetermined species - a *Fusconaia* or *Lexingtonia* look-alike.

Captive propagation, reintroduction, and other management activities

Captive populations are being maintained at CFI for the following species: *Cyprinella caerulea*; *C. monacha*; *Erimystax dissimilis*; *E. insignis*; *Notropis mekistocholas*; *N. cahabae*; *Phoxinus Cumberlandensis*; *Phoxinus* sp. (Laurel dace); *Fundulus julisia*; *Noturus baileyi*; *N. miurus*; *N. flavipinnis*; *Elassoma alabamiae*; *Etheostoma wapiti*; *E. percunum*; *E. luteovinctum*; *Percina copeland*; and *P. aurolineata*. In addition to those reported last year, recent successful captive spawnings include *E. dissimilis* and/or *E. insignis*, and *P. aurolineata*.

As previously reported, *C. monacha*, *N. baileyi*, *N. flavipinnis*, and *E. percunum*, were again captively propagated. Individuals produced in 1997 were stocked in late spring 1998, and individuals produced in 1998 will be stocked in spring 1999. To date, a cumulative total of more than 6000 *C. monacha*, nearly 1600 *N. baileyi*, 560 *N. flavipinnis*, and more than 1500 *E. percunum* have been reintroduced into Abrams Creek in the Great Smoky Mountains National Park, (Blount County, TN). For the fourth consecutive year, reproduction was documented for *E. percunum* and *N. baileyi*.

Pat Rakes and J.R. Shute (Conservation Fisheries, Inc., CFI) report that the current status of *Fundulus julisia*, Barrens topminnow, is still extremely tenuous. During a recent drought, the type locality population was stressed to the point that a rescue operation was necessary. This species continues to be the focus of cooperative conservation efforts that will, hopefully, preclude the necessity for federal listing. George Benz, Chris Coco (Tennessee Aquarium) and CFI have secured a grant from the American Zoos and Aquarium (AZA) Conservation Endowment Fund to maintain captive populations Barrens topminnow, *Fundulus julisia*. In addition, they are working on a proposal to the AZA to assess the genetic variation within and among wild and captive populations. Further, they propose to develop a formal species conservation and management plan.

Peggy W. Shute and David A. Etnier

REGION IV - South-Central

Jan Hoover at the Corps of Engineers Waterways Experiment Station in Vicksburg, Mississippi reports that fellow staff members Jack Killgore, Steven George, and Bradley Lewis are studying the colonization of a constructed gravel bar by fishes in a diversion canal receiving water from

the Tenn-Tom Waterway in Mississippi (Tombigbee River drainage). The gravel bar was created 10 years ago and was rapidly colonized by minnows and darters; including a single *Crystallaria asprella*. Today, crystal darters are present in substantially high numbers. Jan and Jack are conducting baseline studies of east Mississippi streams to forecast fishery benefits of planned habitat restoration projects. Lake George, a backwater of the Big Sunflower River (Yazoo River drainage) is an important spawning area for fishes, but is dewatered during low river stages in the summer. Models relating river stage to larval fish densities indicated that substantial benefits would result from a fixed-crest weir that would pool water during this critical period. They also are examining dewatering in the upper Little Tallahatchie River (Yazoo River drainage) along with staff from the USDA Forest Service in Oxford (see below for details). Swimming performance studies of several fishes in laboratory streams were conducted this summer by Jan, Jack, and former University of Mississippi student Reid Adams (now at SIUC). Swimming endurance models were developed and station-holding behaviors described for the endangered *Scaphirhynchus albus* and the Eurasian round goby, *Neogobius melanostomus*. Studies provided insights into microhabitats likely to be inhabited by pallid sturgeon and the possible containment of round goby dispersal (low water velocities provided nearly 100% short-term containment of the goby). In a recently completed study, Steven described ontogenetic variation in rostrum dimensions of paddlefish from the Big Sunflower River (Yazoo River drainage). Steven is also examining ontogenetic and interspecific variation in lower Mississippi River Basin shovelnose and pallid sturgeons. Recent acquisition of some juvenile pallid sturgeons from Upper Missouri-Yellowstone, Lower Missouri, and Lower Mississippi-Achafalaya hatcheries will allow some evaluation of intraspecific variation among populations. Lastly, Jan wanted to credit Neil Douglas of Northeast Louisiana University for participation in fieldwork with the team and cataloging and curating all specimens collected (NLU Museum of Zoology).

Mel Warren and Wendell Haag at the USDA Forest Service, Southern Research Station in Oxford, Mississippi, conducted a survey of a 21 mile segment of the old channel of the Little Tallahatchie River (above Sardis Reservoir) and an adjacent drainage canal this fall in north-central Mississippi. The old channel is being considered for a flow restoration project by the Corps, which would return flow to the channel from a tributary stream. The upper reaches of this segment of the old channel consist of small isolated pools in the summer; downstream the channel retains water all year but ceases to flow by mid-summer. Mel and Wendell found remnants of a bottomland river and wetland fish fauna still hanging on in the old channel. They took four large *Hybognathus hayi* in a gillnet, but failed to capture any other specimens using seines or backpack electroshockers. With Jan Hoover's Waterways Experiment Station crew, they took a single specimen of *Notropis maculatus* in an isolated pool in the old channel. This

find represents a considerable upstream range extension for this species in the Yazoo River basin. They also collected *Elassoma zonatum* and *Fundulus crysotus*. Despite years without sustained flow, the old channel generally maintains a more diverse fish fauna (about 26 species/collection) than the drainage canal (about 23 species). They will return to the field this spring or early summer to re-sample both the canal and old channel (a bantam sunfish lurks out there somewhere). Mel and Wendell also report work in press on a study documenting the effectiveness of freshwater mussel mantle displays in eliciting attacks from fishes (bass and darters). They are also working on a manuscript looking at diurnal and nocturnal displays of gravid female mussels and their response to the presence of fishes. Additionally, Mel and Brooks Burr at Southern Illinois University at Carbondale are completing a manuscript entitled "A history of ichthyology in Kentucky" and hope to submit that soon for publication.

Brooks Burr continues to get young of the year bighead carp, silver carp, and grass carp from the lower Ohio and Mississippi Rivers and their tributaries. All three species appear to be established in this region. Brooks, along with Ken Cook, David Eisenhour, Donovan Henry, James Ladonski, and Jeff Stewart had a successful snorkeling trip in the Big South Fork during May 1998 and found nests of *Etheostoma percnurum* at two separate sites in the Kentucky portion of Big South Fork. Their only concern was the high incidence of black-spot disease that was present on every individual observed. Donovan Henry, a masters student at SIUC, completed a study of the nesting and reproductive biology of *Nocomis effusus* in Little South Fork, Kentucky, and obtained data on nest density throughout the entire stream system.

Todd Slack was recently hired by the Mississippi Museum of Natural Science in Jackson as a non-game research biologist. His primary responsibilities are to curate the state ichthyological collection and to conduct research on the ecology, conservation and management of non-game fishes and their communities. The ichthyology collection, presently 23,005 catalogued lots, has received minimal attention during the past decade. Efforts are being devoted to verifying identifications and databasing all catalogued lots and working through an enormous amount of backlogged material. Additionally, all Museum staff are preparing for the move to their new museum facility (scheduled for April 1999) located along the Pearl River at LeFleur Bluff State Park, approximately three miles north of the present museum. The new 73,500 square foot facility will include three separate collection ranges (paleontology, wet (fishes, herps) and dry (mussels, birds, mammals, herbarium)) and associated laboratories, an aquarium system containing 70,000 gallons of water, a 200 seat auditorium, and classrooms. The outside facilities will include a bird watching area, 2.5 miles of nature trails, pathways with interpretive stations, and 300 acres of cypress swamps, sandy creek bottoms, native gardens, and steep wooded bluffs. Additionally, Todd is still involved with the Gulf sturgeon project that he worked on as a post-doc at

USM (see below). You may contact Todd at the Museum via e-mail (todd.slack@mmns.state.ms.us) or phone (601-354-7303).

Stephen T. Ross at the University of Southern Mississippi in Hattiesburg reports that he, along with Ryan Heise, Mollie Cashner, and Todd Slack, are studying movement and habitat use of *Acipenser oxyrinchus desotoi* in the Pascagoula River drainage. The US Fish and Wildlife Service and the Mississippi Department of Wildlife, Fisheries and Parks are funding the project. In April 1998, seven Gulf sturgeon were captured near a potential spawning area in the Bouie River near Hattiesburg. Sturgeon were equipped with external dangle or floy tags, PIT tags, and external radio transmitters. Downstream migration began at the end of April and ended at a summering area in the vicinity of Big Black Creek in the lower Pascagoula River, about 56 km upstream from the Gulf of Mexico. Additional summer sampling in these areas yielded 23 additional Gulf sturgeon ranging from 116 to 204 cm FL. All fish were equipped with external and PIT tags, and nine were equipped with external radio tags. Radio tagged individuals move extensively along Big Black Creek from the confluence of Red and Black creeks downstream to its confluence with the Pascagoula. Movement also occurs in the main channel of the Pascagoula, mostly from the area of Big Black Creek downstream 1.5 km to the vicinity of Brewton Lake. By 10 November, all fish in the lower Pascagoula-Black Creek area had moved downstream into the estuary. Work this year includes monitoring tagged sturgeon moving into the Pascagoula River during the spring migration and efforts to verify spawning sites by deploying egg samplers in the presumed spawning areas. Gill nets will be used to capture additional sturgeon as they enter the Pascagoula River and at holding sites later in the year. Captured sturgeon will be equipped with both external radio and sonic tags to track sturgeon in salt and freshwater. A point for concern is that a proposed dam threatens the presumed spawning habitat on the Bouie River. Stephen also reports that he and Pam Schofield are using artificial streams to study meso- and micro-habitat selection of *Percina aurora* and *P. copelandi*. The distribution of *P. aurora* historically included both the Pearl and Pascagoula drainages. However, the Pearl darter is now thought to be extirpated from the Pearl River and is very rare in the Pascagoula River drainage. Because of its rarity, they have used channel darters as a surrogate species to investigate habitat selection. Larval rearing techniques for both species are being developed by Patrick Rakes at Conservation Fisheries, Inc. Other ongoing research at the USM includes ecological studies of blennioid fishes on offshore petroleum platforms in the northern Gulf of Mexico by Tommy Rauch; completion of dissertation research on use of fringing floodplains by fishes of a southeastern blackwater stream by Martin O'Connell; dissertation research on the comparative ecology and behavior of two gobioid species in Florida Bay, Florida by Pamela Schofield; completion of a masters thesis on habitat use and demographics of the bisexual and unisexual silversides

(*Menidia*) on Horn Island, Mississippi by John Ewing; and a masters thesis on the functional significance of alarm substances in cypriniform fishes by Mollie Cashner. Lastly, Stephen and Stuart Poss of the Gulf Coast Research Lab in Ocean Springs, Mississippi have received NSF support for the combined ichthyological collections at the University of Southern Mississippi. These include the fish collection at Gulf Coast Research Lab and the fish museum on the main campus in Hattiesburg. Funding is for three years and provides support for processing backlogged collections. These backlogged collections include large larval holdings from the Gulf of Mexico, as well as various freshwater and marine collections of juvenile and adult fishes. Two doctoral research assistantships are included in the project.

Mark Peterson at the Gulf Coast Research Lab in Ocean Springs, Mississippi has some US Fish & Wildlife and Nature Conservancy funds to survey for *Fundulus jenkinsi* in coastal Mississippi and Alabama from the Pascagoula River to Mobile Bay this summer. Mark and others are also continuing their MS-AL Sea Grant project on recruitment variability in estuarine fishes and have some new funds to address Essential Fish Habitat along an anthropogenic gradient in the Pascagoula River. Mark, along with others, has five papers in press: the affect of salinity on growth in juvenile Atlantic croaker, *Micropogonias undulatus*; life history of a peripheral population of bluespotted sunfish, *Enneacanthus gloriosus*, with comments on geographic variation; comparison of Breder traps and seines used to sample marsh nekton; growth, spawning preparedness and diet of the southeastern blue sucker, *Cycleptus* sp. cf. *elongatus*; and laboratory growth responses of juvenile *Mugil* sp. to temperature and salinity, delineating optimal field growth conditions.

Daniel J. Drennen recently joined the staff at the US Fish and Wildlife Service field office in Jackson, Mississippi. Daniel announced the 90-day finding (Substantial) for a petition to list the vermilion darter, *Etheostoma chermocki*, from Jefferson County, Alabama as Endangered. The finding was published in the Federal Register on Tuesday, 26 January 1999. Additionally, the Pearl darter, *Percina aurora*, is being considered for elevation to candidate status. Anyone with additional information about this species can contact Daniel at USFWS, 6578 Dogwood View Parkway, Jackson, Mississippi, 39157, (601) 965-4900, ext. 27.

Hank Bart at Tulane University reports continued work on the conservation status of *Percina aurora* and *P. brevicauda*, as well as the undescribed rush darter, *Etheostoma* sp. cf. *parvipinne*. Working with students Kyle Piller, Jason Tipton, and Nakia Jackson, and Steve Ross and students from University of Southern Mississippi, Hank resurveyed parts of the Leaf River and Bouie and Okatoma creeks in 1998 looking for Pearl darters. Specimens (very few, in breeding condition) were taken only in the Leaf River. Hank and Kyle surveyed sites on the Blackburn Fork of the Little Warrior River and the Cahaba River in Alabama in September 1998, looking for *Percina brevicauda*. A single specimen was taken from

Blackburn Fork. More status work is planned in 1999 for this species as well. Now that the manuscript describing the rush darter is in review, Hank is planning to start assessing the status of known populations of this species. The aim of this work will be to confirm the continued presence of the species in the two areas where it has been recently collected (spring-fed streams in Bankhead National Forest and Pinson AL), and to try to locate additional populations. This species is also being recommended for Federal Candidate Status.

Jonathan W. Armbruster is the new Curator of Fishes at the Auburn University Museum Fish Collection, which has extensive holdings of fishes from throughout the southeastern United States and the Gulf of Mexico. For loans and locality records, please contact Jon at armbrjw@mail.auburn.edu or (334) 844-9261.

Carol Johnston at the Department of Fisheries and Allied Aquacultures, Auburn University, is currently working on the behavioral ecology of *Cottus pygmaeus*, development of habitat models for *Cyprinella caerulea*, and continues with her work on sound production in fishes. Carol's student, Bryan Phillips, is conducting a survey of fishes and mussels of Bear Creek (Tennessee River drainage). Bryan will compare his data to Ben Wall's 1968 survey, which was done before most of the reservoirs on the system were in place.

Jim Godwin of the Alabama Natural Heritage Program in Montgomery, Alabama reports that he just finished an examination of two springs on the Fort McClellan Military Reservation for the feasibility of transplanting specimens of *Cottus pygmaeus* from Coldwater Spring. Based on numerous factors, including aquatic vegetation and aquatic invertebrate fauna present in these springs relative to Coldwater Spring, Jim concluded that these springs were inadequate to support pygmy sculpins.

Malcolm Pierson at Alabama Power Company reports that he will begin a status survey of *Etheostoma chuckwachatte* in the Tallapoosa River system in Alabama and Georgia. He requests that anyone with recent records of the lipstick darter contact him. Malcolm will also be searching the Tallapoosa River system for the muscadine darter. Additionally, Malcolm reports the rediscovery of populations of two federally Endangered mussels, *Pleurobema decisum* and *P. perovatum*, in July 1998 in a section of the original Coosa River channel that had been cut off by the Weiss Reservoir diversion dam. Natural flows in the old river channel have been greatly reduced and are affected by reverse flows during hydroelectric operations. The density and total range of these mussel populations are not yet known.

Greg Lein with the State Lands Division of the Alabama Department of Conservation and Natural Resources Natural Heritage Section reports the recent acquisition of several tracts of land through Alabama's Forever Wild Program, which will assist in the conservation of some of the state's aquatic resources. These include the 60 acre Blowing Spring Cave Nature Preserve within the interior low plateau, which comprises cave, field, forest and riparian habitats adjacent to

Second Creek in Lauderdale County. This aquatic cave may support several rare species, in addition to a maternity colony of gray bats. Another acquisition is the 3,924 acre Doug Ghee Nature Preserve and Recreation Area, consisting of wooded terrain at Coldwater Mountain, located between Oxford and Anniston. This area secures a natural landscape which comprises the majority of the recharge basin for Coldwater Spring, which contains the only populations of *Cottus pygmaeus* and a genetically distinct population of *Etheostoma ditrema*. Greg also reports the planned acquisition of the Sipsey River Swamp Nature Preserve and Recreation Area, a 2,998 acre expanse of mostly bottomland hardwood swamp and riverine habitats in Tuscaloosa County (Tombigbee River drainage). The swamp contains excellent habitat for waterfowl and neotropical migrants, while the river historically supported six federally listed mussel species, four of which are extant. The river also supports spring runs of the genetically distinct southern walleye. This acquisition is intended to be the first of several projects targeting the conservation of this system's aquatic fauna and flora.

Scott Mettee of the Geological Survey of Alabama in Tuscaloosa reports that a recent study in the Locust Fork of the Black Warrior River by Tom Shepard, Pat O'Neil, Scott, and Stuart McGregor uncovered a heretofore unknown population of *Notropis cahabae*. The Cahaba shiner is presently known to occupy 64 miles of the Locust Fork main channel and its abundance at some localities appears greater than found in recent Cahaba River surveys. Ranges for *Percina brevicauda* and *Etheostoma douglasi* were also expanded throughout the Locust Fork drainage. *Etheostoma nigripinne*, a Tennessee River drainage endemic, was also discovered for the first time in the Mobile Basin, from Graves Creek, located in the extreme upper reaches of the Locust Fork. Likewise, *Ichthyomyzon castaneus* and *Strongylura marina* were collected at several locations in Locust Fork for the first time. Scott is continuing studies on population size, spawning activity, and post-spawning movements of blue suckers in the lower Alabama River. Results of last year's sonic tracking efforts confirmed that following spawning, blue suckers move from 70 to 156 miles downstream into the lower Alabama and Mobile River systems where they spend the summer months. At least four sonic-tagged fish have moved upstream into the Claiborne pool and Millers Ferry tailwater area in the spring, presumably to spawn, and then they returned to their same individual downstream habitats, even to the same treetop, for two successive summers. In May 1998, Scott and Pat collected a single, healthy *Alosa alabamiae* at the base of Selden Lock and Dam in Greene County. This is the first known record of an Alabama shad taken from the Black Warrior River system this century.

William Nichols of the Marion State Fish Hatchery in Alabama reports the capture of a third Alabama sturgeon (*Scaphirhynchus suttkusi*), a male in non-reproductive condition, in November of 1998. This fish joins the male and female that were captured in 1997; the female was surgically

examined in December 1998 and appears to be developing eggs. Modifications to the existing hatchery facilities and the construction of a new sturgeon holding and culture facility was initiated in 1998 and is continuing. These facilities will be utilized to increase brood stock holding capacity and to provide space for future sturgeon fingerling culture.

Frank Parauka of the US Fish and Wildlife Service, Panama City, Florida reports that his office has been studying the movement and habitat use of sub-adult *Acipenser oxyrinchus desotoi* overwintering in Choctawhatchee Bay, Florida. Twenty fish, weighing from 2 to 19 kg, were equipped with external ultrasonic tags in 1996-97. A total of 263 observations were recorded for sub-adults from November 1996 through May 1998. Ninety-one percent of the sub-adults tagged remained in Choctawhatchee Bay the entire winter or ventured into Santa Rosa Sound. Sub-adults showed a preference to shoreline habitats (100 m to 2.0 km from shore) with sandy substrates and water depths less than 4 m. Frank also reports that Gulf sturgeon were collected in 1998 in the Apalachicola River below the Jim Woodruff Lock and Dam and were compared to population size and year class distribution data from the last survey conducted in 1993. The 1998 Gulf sturgeon population estimate at 95% CI was 270 fish (135-1719) compared to 95 fish (75-196) in 1993. Sub-adults represented 69.5% of the sample in 1998 and 59.0% in 1993. Fish in excess of 45.0 kg decreased in occurrence, from 24.0% in 1993 to 6.5% in 1998. The study is to be duplicated in 1999. Lastly, Frank reports that the lower Apalachicola River was stocked with 111,000 Phase II *Morone saxatilis*. This was the first year that the goal of 100,000 Phase II fish had been achieved. The program is part of a cooperative agreement between the US Fish and Wildlife Service and the states of Florida, Georgia and Alabama to restore striped bass in the Apalachicola-Chattahoochee-Flint river system.

Rick Mayden and Herb Boschung at the University of Alabama continue to work on the Freshwater Fishes of Alabama. Rick reports that his lab is working on several status surveys, including *Etheostoma ditrema* throughout its range in the Coosa River drainage in Alabama, Georgia, and Tennessee; *Etheostoma trisella* in the Coosa drainage in Alabama; the undescribed blueface darter, *Etheostoma* sp. cf. *zonistium*, in the upper Sipsey Fork of the Black Warrior River and Bear Creek in the Tennessee River drainage; and *Speoplatyrhinus poulsoni* in the Tennessee drainage. Rick also reports that graduate student Cesar Blanco is completing a study on using habitat variables to predict abundance and presence/absence of *Etheostoma chermocki* in Turkey Creek, Jefferson County, Alabama, and student Dave Neely is examining several undescribed species of *Cottus* in the Mobile Basin, as well as looking at variation in *Noturus munitus*.

Bernie Kuhajda

REGION V - Northwest

Arkansas

The White River Navigation Project was reauthorized by the Water Resources Development Act of 1996 and proposes to construct and maintain a 200 foot wide by nine foot deep navigation channel from the mouth upstream to Batesville, AR (approximately 255 river miles). A notice of intent to prepare a Supplemental Environmental Impact Statement was published by the Corps of Engineers in the Federal Register (Volume 64, No. 5, p. 1181) on January 8, 1999. Corps Waterways Experiment Station personnel spent several weeks in the field in late 1998 gathering data to assess the possible impacts of the navigation project on littoral and demersal fishes, including paddlefish and sturgeon. A preliminary report regarding this field work is expected in the near future. In October 1998, a group of regional biologists was hosted by the Arkansas office of The Nature Conservancy at a working session to review the proposed navigation project, outline concerns, and formulate research needed to adequately address the impacts of the proposed navigation project.

Entergy, Inc. is in undergoing FERC relicensing of its Rammel Dam/Lake Catherine hydroelectric facility on the Ouachita River in central Arkansas. Field surveys were conducted by consultants in summer and fall 1998 to gather information on faunal components and hydrologic conditions in a 25 mile reach of the river downstream of Rammel Dam. A Technical Advisory Group is working with Entergy and FERC to assess historic impacts of the facility to the river and recommend "conditions" for the relicensing. Re-regulating pools (weirs) and altered flow regimes are being considered. This reach of the Ouachita River provides habitat for *Crystallaria asprella* and the undescribed longnose darter form which inhabits the Ouachita River drainage. Also, Alabama shad (*Alosa alabamae*) have recently been discovered in good numbers in this reach of river.

Henry Robison completed a status review of the Strawberry River orangethroat darter (*Etheostoma spectabile fragi*) funded by the Fish and Wildlife Service, and he reports that the subspecies is doing well in the headwater tributaries to the Strawberry River.

Personnel from the Ouachita National Forest, Arkansas Game and Fish Commission, and Fish and Wildlife Service conducted two weeks of visual population assessments for *Percina pantherina* in the Mountain Fork and Cossatot rivers during 1998. Numbers were down and were attributed to recent drought conditions in Arkansas.

Missouri

The Topeka shiner (*Notropis topeka*) has been listed as a federally protected endangered species. In Missouri, the species occurs within three, 4th order drainages including the Moniteau Creek drainage, Turkey Creek drainage, and Sugar Creek drainage. The Missouri stronghold for the species is Moniteau Creek, and a significant portion of the drainage is in public ownership. The Turkey Creek population is in a more

urbanized area between Columbia and Jefferson City and is threatened by airport expansion and urban development. Confined animal feeding operations and non-point siltation problems are considered the primary threats to recovery of the species.

The goldstripe darter (*Etheostoma parvipinne*) is at the northern extent of its range along Crowley's Ridge in Missouri, and it is relatively rare within the state. Missouri Department of Conservation biologists have been working with a railroad which parallels the ridge to modify culverts to allow fish passage. Upstream migration of *E. parvipinne* to spawning habitat in many streams is currently blocked by improperly constructed culverts.

As reported last year, the Corps of Engineers has proposed the New Madrid Floodway project to reduce flooding in Mississippi River tributaries in the bootheel of Missouri. The project has two components to reduce the magnitude and duration of floodwaters behind the levees: 1) construction of pumping stations and 2) dredging of Mississippi River tributaries such as St. John's Bayou. Surveys to assess impacts rediscovered the golden topminnow (*Fundulus chrysotus*) which was thought to be extirpated in Missouri. Concerns regarding de-watering of riverine fishes spring spawning sites in bottomland hardwood wetlands are being discussed between the Fish and Wildlife Service and Corps of Engineers. Mitigation proposals from the Corps have been elevated to the FWS Region 3 director for reviewed and negotiation.

The Missouri River "benthic fishes" project continues. This cooperative research project involving six U.S. Fish and Wildlife Service coop units and numerous other state and federal cooperators includes surveys for benthic fishes and analysis of age/growth and population structures along 2300 miles of the Missouri River. Five doctoral candidates are involved with the project, and annual reports are available by request from Galat at David_Galat@muccmail.missouri.ed.

A Mississippi River "benthic fishes" project was initiated during 1997 and continued during 1998. One hundred five sites were sampled in a 20 mile reach of the river during June and November 1998. Sampling methodology included primarily trawling in water from 2-12 meters deep. Significant numbers of sicklefin chub (67 individuals) and sturgeon chub (54 individuals) were encountered as well as a young of year pallid sturgeon (79 mm TL). For specific information, contact Dave Herzog, Missouri Department of Conservation (573-243-2659; David_Herzog@usgs.gov).

There has been a recent report of an unidentified taxon of cavefish near Columbia, MO which is a range extension of approximately 100 miles to the north for cavefish in Missouri. Doug Noltie, U. of Missouri, is attempting to isolate and identify the cavefish. As of this writing, no additional information is available.

Missouri Department of Conservation biologists are working with Missouri Department of Natural Resources personnel to strengthen guidelines and regulations regarding sand and gravel operations in the state. Recent court decisions

regarding the "Tulloch Rule" involving Section 404 of the Clean Water Act have weakened the regulatory position of agencies monitoring instream sand and gravel operations.

John L. Harris

REGION VI - Southwest

The Fish Team at the Waterways Experiment Station - Jack Killgore, Jan Hoover, Phil Kirk, Steven George, and Bradley Lewis have been active as usual. Neil Douglas, Northeast Louisiana University, conducts fieldwork with the team, and catalogs and curates all specimens collected (NLU Museum of Zoology). Two student team members, Reid Adams and Jim Morrow, recently graduated from the University of Mississippi. Reid is now studying at Southern Illinois University and Jim has started his own consulting firm. Experimental habitat restoration techniques are under study by Jack, Steven, and Bradley. At Cypress Bayou, TX (Red River Drainage), effects of controlled water releases on spawning are being evaluated. Spring-summer hydrographs are varied each year; abundance, diversity, and chronology of larval fishes are documented so that water releases providing maximum benefits to fishes may be identified. Swimming performance studies of several fishes in laboratory streams were conducted this summer by Reid, Jan, and Jack. These included the endangered pallid sturgeon (*Scaphirhynchus albus*) and the Eurasian round goby (*Neogobius melanostomus*). Swimming endurance models were developed, and station-holding behaviors described, for both species. Studies provided insights into microhabitats likely to be inhabited by pallid sturgeon and of the possible containment of round goby dispersal. Model hydraulic barriers were created and installed in a circular laboratory racetrack by Bradley, and effects on containment of goby monitored by videography. Results indicated that low water velocities provided nearly 100% short-term containment of the goby. Morphological variation in chondrosteans is being studied by Steven. Ontogenetic variation in rostrum dimensions of paddlefish from the Big Sunflower River (Yazoo River Drainage) is described in a recently completed study. Ontogenetic and interspecific variation in morphometrics are being evaluated for lower Mississippi River Basin shovelnose and pallid sturgeons. Recent acquisition of some juvenile pallid sturgeons from Upper Missouri-Yellowstone, Lower Missouri, and Lower Mississippi-Atchafalaya hatcheries will allow some evaluation of intraspecific variation among populations.

Christine Davis (Northeast Louisiana University) is studying age, growth and reproduction of the scaly sand darter, *Etheostoma vivax* in a Gulf coastal plain watershed. Brian Hooper (NLU) is examining proportional stock density of largemouth bass *Micropterus salmoides* in Black Bayou Lake, an urban NWR. Continuing studies on gobioid fishes at NLU are fast making it the Sleeper Center of the Southeast. Taking

a cue from his student, Bryan Cage, who is finishing his thesis reviewing *Eleotris* from the eastern Pacific, F. Pezold is pushing his work on the Atlantic *Eleotris* to completion, typing the final draft of a revision of *Gobionellus* that includes a key to all the species being removed to *Ctenogobius* (most of them), finishing a revision of *Oxyurichthys* this summer with visiting scholar and gobiologist, Helen Larson of the Northern Territory Museum, Australia (one species occurs in marine waters off the SE US- *Oxyurichthys stigmaphius*) and starting a revision of *Dormitator* with Mike Taylor of Tulane.

Frank Pezold

Changes to Bylaws of the SFC Constitution

The following change has been made to the SFC By Laws. The entire SFC Constitution and Bylaws can be viewed at: <http://www.flmnh.ufl.edu/fish/sfc/sfcconstitution.htm>.

Article II. Section 5. Editorial Board.--The Editorial Board shall be comprised of the Editor, Associate Editor, and three Subject Editors. The Editor shall be responsible for managing all aspects of publication of the Proceedings of the Southeastern Fishes Council and other publications of the Council. The Associate Editor shall assist the Editor as needed in her/his duties and additionally shall be responsible for the budget and production of the Proceedings of the Southeastern Fishes Council and other publications of the Council. The Subject Editors, appointed by the Chair to four year terms, shall be responsible for obtaining reviews of manuscripts forwarded to them by the Editor, overseeing final revisions of manuscripts, and returning revised manuscripts to the Managing Editor for final processing. Subject Editors also would be responsible for soliciting high-quality manuscripts for publication in Proceedings of the Southeastern Fishes Council, including, but not limited to, reviews, syntheses, or papers to form series on specific topics.

25th Annual SFC Meeting

The Southeastern Fishes Council will meet with the Association of Southeastern Biologists at the University of North Carolina at Wilmington (UNCW), 14 - 17, April 1999. All ASB activities except the Thursday evening social and field trips will be held at the Wilmington Hilton Hotel and at the adjacent Coastal Convention Center in downtown Wilmington. For additional information, visit the ASB Meeting web site:

www.uncwil.edu/bio/asb/asbprog.htm

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 should be submitted in duplicate. A good guide for manuscript preparation is the Sixth Edition of the *CBE Style Manual* available from 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 ed.* 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.

Manuscripts will be subject to editing and will be reviewed by at least two anonymous persons knowledgeable in the subject matter. The edited manuscript and page proofs will be furnished to the author. Upon returning the reviewed and corrected manuscript to the editor, a PC disk copy of the final form of the text, tables and computer-generated graphics is also requested. Specific formatting information for the disk will be sent to the author with the edited manuscript. Reprints can be ordered at the time of printing, and will be supplied to the author at the cost of printing.

Regional reports, news notes and other short communications will also be edited and included when possible in the next number.

Only manuscripts from members of The Southeastern Fishes Council will be considered for publication. There is no charge for publishing in the *Proceedings*. All manuscripts and short communications should be sent to the editor:

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Southeastern Fishes Council Web Site:

<http://www.flmnh.ufl.edu/fish/sfc/sfchomepage.htm>

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