



# Caddisflies (Insecta: Trichoptera) of the Chipola River basin in Florida and southeast Alabama, USA: a faunistic survey

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**Abstract:** A field survey of caddisflies of the Chipola River basin in Florida and Alabama was carried out from 2006 through 2012. Adults were collected at 54 sites. Most were stream collections, but three were lakes. In total, 122 samples were taken. Approximately 32,000 individuals were identified, comprising 143 species, 40 genera, and 18 families. Two species represent new Florida state records. Three species are new to science. The majority of species were Leptoceridae, Hydroptilidae, Hydropsychidae, and Polycentropodidae. Most abundant families were Hydroptilidae, Leptoceridae, Hydropsychidae, and Psychomyiidae. A few species/families were largely or entirely confined to specific water body and habitat types, but most were broadly distributed. There was no apparent correlation between stream size and taxa richness. Rarer habitat-specialists were more commonly found in small tributaries than main stem sites. In general, there was a decrease in taxa richness from upstream to downstream in the river's main stem.

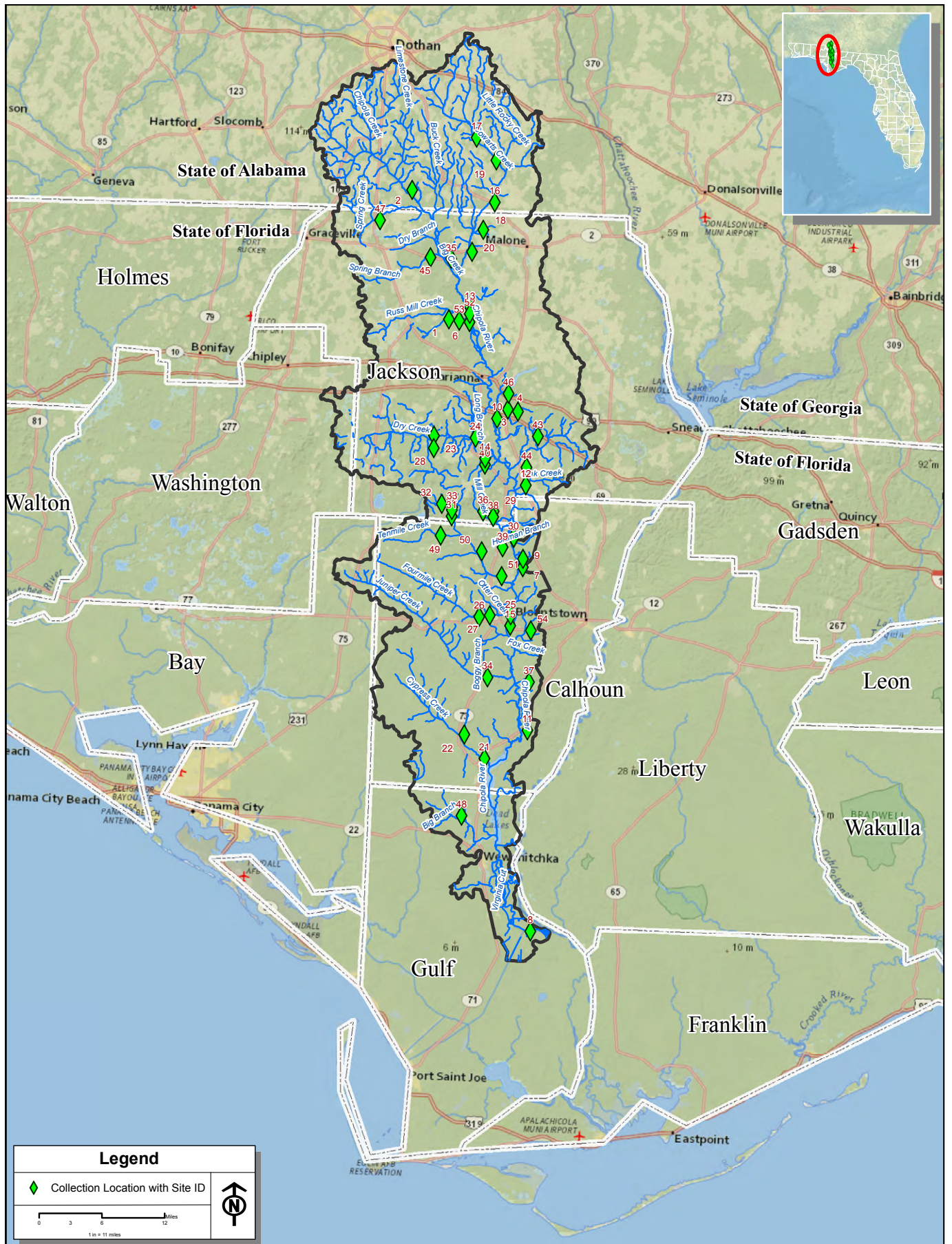
**Key words:** diversity; coastal plain; Apalachicola; UV blacklight; Leptoceridae

## INTRODUCTION

Caddisflies (Order Trichoptera) are the largest order of aquatic insects, with more than 15,000 described species known worldwide. The North America fauna currently contains 1,888 Trichoptera species, including 626 species known from the southeastern U.S. (Rasmussen and Morse 2014). More than 350 species are recorded in Alabama (see Frazer and Harris 1991; Harris et al. 1991; Harris et al. 1996) and approximately 220 species are known in Florida (Rasmussen and Morse 2014). Larval trichopterans are generally considered to be sensitive to water quality, and are frequently used as

indicator species, making up one part of the generally pollution-intolerant EPT group (Ephemeroptera, Plecoptera, Trichoptera) often enumerated as a component of aquatic bioassessments. Because of their value as pollution indicators and the importance of Trichoptera in aquatic ecosystem functioning, knowledge of their distribution, ecology, and taxonomy are important.

The Chipola River basin occupies 1,287 square miles (812,000 acres) in the southeast corner of Alabama and the central Florida panhandle (Figure 1). The headwaters of the river (whose name is Choctaw for "sweet water") arise southeast of Dothan in Houston County, Alabama. The two main tributaries, Marshall and Cowarts Creeks, converge in northern Jackson County, Florida, flowing south through Calhoun and Gulf counties before turning east to join the Apalachicola River near the town of Wewahitchka, Florida. The basin contains numerous aquatic habitat types, including small and large darkwater streams, calcareous and soft-bottom river stretches, floodplain swamps, solution lakes, cypress domes, herbaceous wetlands, and numerous springs and spring runs. Some of these springs arise in or near the Chipola River, while others emerge from the Floridan Aquifer some distance away, making their way to the river via normally clear spring runs. The watershed's only first magnitude spring, Jackson Blue Spring, flows at a rate of 462,000 m<sup>3</sup>/d, joining the Chipola near the city of Marianna. A large part of the basin (especially the middle portion) is characterized by karst geomorphology, with caves, sinkholes, and springs common. In this area, the river flows through limestone outcroppings, in some areas forming rapids more reminiscent of Appalachian streams than Coastal Plain ones (Figure 2). Land use within the Chipola basin is primarily for agriculture, silviculture, and cattle ranching. The largest city within the Chipola watershed is Marianna, Jackson County, Florida, which had a



**Figure 1.** Caddisfly sample collection locations in Chipola River basin, Alabama and Florida.



**Figure 2.** Chipola River at Look and Tremble Rapids, Calhoun County, Florida.

population of 6,100 people as of 2010. Within Florida, substantial portions of the property along the upper Chipola are preserved as public lands under the control of the Northwest Florida Water Management District or the Florida Department of Environmental Protection.

The Chipola basin, along with the Apalachicola River and its tributaries, are well known for its rich biodiversity and high rates of endemism. Such high species diversity and substantial numbers of unique taxa in this area have been noted for unionid bivalves (Williams et al. 2014), aquatic snails (Thompson 2004), fishes (Hoehn 1998; Warren et al. 2000), aquatic beetles (Epler 2010), a number of plants (Estill and Cruzan 2001), and various other groups. This is quite likely due to the unique and relatively undisturbed habitats and the biotic influence of upstream areas of the Apalachicola/Chattahoochee/Flint Rivers, which traverse not only the Coastal Plain, but also several sub-regions within the Appalachian Highlands geographical region of northern Alabama and Georgia. The Chipola River basin, as a portion of a key center of biodiversity in the southeast, was chosen as the location for this survey.

Previous collecting of caddisflies in the Chipola basin that involved light trapping adults was reported by Harris et al. (1991) from two sites in Houston County, Alabama as part of their statewide survey. In the Harris survey, a total of 53 Trichoptera species were collected from the basin, including the collection of *Hydropsyche alabama* Lago & Harris, 1991, a narrow range endemic, from Cowarts Creek (Lago and Harris 1991). In Florida, Rasmussen, Harris, and colleagues light trapped from several sites in the Chipola basin, with results being reported in Pescador et al. (2004). These collections included the discovery of an undescribed species, *Setodes chipolanus* Rasmussen & Harris, 2008, described in

Rasmussen et al. (2008). The present study is the first to systematically sample Trichoptera throughout the basin.

## MATERIALS AND METHODS

Because less than half of southeastern U.S. caddisflies can be identified to species in the larval stage, the collection of adults is preferred for species level inventories of Trichoptera. Collections of adult caddisflies were made at 54 different locations (Figure 1) within the Chipola basin, ranging from the headwater tributaries in Houston County, Alabama to just upstream of the confluence with the Apalachicola in Gulf County, Florida. Samples were collected at 11 sites on the main stem of the Chipola, 40 tributary locations, and three ponds. Site selection was based on the desire to cover the basin geographically, and to sample a variety of distinct water body types. Table 1 gives all site locations and their geographic coordinates. In all, 122 separate collections were made at these sites. Sampling took place between October 2006 and August 2012, although the large majority of collections were made between September 2009 and August 2012. Samples were collected during seven months of the year; none were collected during the months of January, April, July, November, and December. At almost all sites, at least one collection was made during both spring and fall seasons.

Adult caddisflies were collected using light traps, each consisting of a bar-shaped, 15-watt UV backlight (BioQuip 2805 DC Light) placed across a shallow white plastic pan containing 75% ethanol. The light traps, powered by 12-volt batteries, were deployed at waters' edge just before sunset, normally for a period of 2 to 4 hours. The samples were then retrieved and stored in sealed plastic jugs until processed. Samples were sorted and specimens, primarily males, were identified to species level by the authors using Olympus SZX16 and Leica MZ75 stereo dissecting microscopes, and for identification of mounted microcaddisfly specimens, a Leica LaborLux S compound microscope. The primary literature references used in identifying adult caddisflies were Armitage (1996), Armitage and Hamilton (1990), Gordon (1974), Keth and Harris (2008), Lago and Harris (1987), Manuel (2010), Morse (1975), Nimmo (1987), Ross (1944), Schmid (1998), Weaver (1988), and Wiggins (1998). Voucher specimens are deposited in the collections of Florida A&M University, Clarion University of Pennsylvania, the Illinois Natural History Survey, the U.S. National Museum of Natural History, and the authors.

## RESULTS

Approximately 32,000 individuals were identified in this study. A total of 143 caddisfly species were found in the Chipola basin. This total comprises 40 different

genera from 18 families of Trichoptera. A list of all taxa collected, as well as the number of individuals collected per site, is given in Table 2. Three undescribed species were collected in the study. A separate summary of each of the caddisfly families collected in this study is presented below.

**Table 1.** Locations sampled in Chipola River basin using UV light traps, October 2006 through August 2012.

#	Site	State	County	Latitude (N)	Longitude (W)
1	Baker Creek at Baker Creek Road	FL	Jackson	30°51'09.10"	085°17'12.88"
2	Big Creek at State Line Road	AL	Houston	31°01'44.58"	085°21'03.06"
3	Bridge Creek at Beaver Creek Road	FL	Jackson	30°43'42.54"	085°10'38.62"
4	Bridge Creek at SR 71	FL	Jackson	30°43'50.16"	085°11'06.65"
5	Chipola River at Altha boat ramp	FL	Calhoun	30°33'07.72"	085°10'14.23"
6	Chipola River at Christoff Ferry Landing	FL	Jackson	30°50'56.68"	085°15'32.41"
7	Chipola River at Laramore Landing	FL	Calhoun	30°30'43.90"	085°09'30.78"
8	Chipola River at Lister Landing, Dalkeith	FL	Gulf	30°00'31.37"	085°07'31.19"
9	Chipola River at Look at Tremble Rapids	FL	Calhoun	30°31'28.80"	085°09'41.64"
10	Chipola River at Magnolia Road boat ramp	FL	Jackson	30°43'02.01"	085°12'01.20"
11	Chipola River at Old Hwy 71 road bed	FL	Calhoun	30°17'13.60"	085°08'42.99"
12	Chipola River at Peacock Bridge boat ramp	FL	Jackson	30°37'35.97"	085°09'55.78"
13	Chipola River at SR 162	FL	Jackson	30°52'12.11"	085°15'32.21"
14	Chipola River at SR 166 (Caverns Road)	FL	Jackson	30°47'35.84"	085°13'21.13"
15	Chipola River at SR 20	FL	Calhoun	30°25'53.29"	085°10'17.48"
16	Cowarts Creek at Cottonwood Road (SR 53)	AL	Houston	31°00'59.61"	085°13'23.78"
17	Cowart's Creek at Houston County Road 55	AL	Houston	31°06'17.70"	085°15'15.45"
18	Cowart's Creek at New Bridge Road	FL	Jackson	30°58'39.03"	085°14'58.18"
19	Cowart's Creek at S. Rocky Creek Road	AL	Houston	31°04'27.26"	085°13'05.02"
20	Cowart's Creek at SR 2	FL	Jackson	30°56'51.26"	085°15'28.50"
21	Cypress Creek at SR 71	FL	Calhoun	30°14'44.63"	085°12'22.65"
22	Cypress Creek at SR 73	FL	Calhoun	30°16'40.17"	085°14'33.92"
23	Dry Creek at SR 167/Fairview Road	FL	Jackson	30°41'24.63"	085°18'58.57"
24	Dry Creek at SR 73	FL	Jackson	30°41'21.78"	085°14'09.92"
25	Fourmile Creek at county park at SR 73	FL	Calhoun	30°26'41.50"	085°10'51.37"
26	Fourmile Creek at SR 287	FL	Calhoun	30°26'32.30"	085°13'29.39"
27	Fourmile Creek behind Pippin Cemetery	FL	Calhoun	30°26'39.37"	085°12'35.35"
28	Foxworth Branch at Dipper Road	FL	Jackson	30°40'24.20"	085°18'32.26"
29	Hasty Pond at Hasty Pond Road	FL	Calhoun	30°35'19.14"	085°12'32.30"
30	Hollis Branch upstream of Chipola River	FL	Jackson	30°33'12.62"	085°10'14.10"
31	Jack Creek at Hasty Pond Road	FL	Jackson	30°34'47.14"	085°16'01.62"
32	Jack Creek at Mayflower Road	FL	Jackson	30°35'46.70"	085°17'18.39"
33	Jack Creek at Pittman Hall Road	FL	Calhoun	30°35'30.45"	085°16'32.13"
34	Juniper Creek at SR 73	FL	Calhoun	30°21'31.65"	085°12'47.60"
35	Marshall Creek downstream of SR 2	FL	Jackson	30°56'10.01"	085°17'46.66"
36	Mill Creek at Hasty Pond Road	FL	Jackson	30°35'15.91"	085°13'33.11"
37	Mill Creek at SR 275 (Abe Springs)	FL	Calhoun	30°21'15.03"	085°04'07.66"
38	Mill Creek upstream of Maddox Road	FL	Jackson	30°34'52.88"	085°12'53.74"
39	Page Pond at Page Pond Assembly of God	FL	Calhoun	30°32'20.80"	085°11'51.17"
40	Pelt Creek at McCormick Road	FL	Jackson	30°39'09.77"	085°13'30.00"
41	Pelt Creek at SR 73	FL	Jackson	30°39'42.72"	085°13'21.29"
42	Porter Pond at Pittman Hall Road	FL	Jackson	30°35'16.85"	085°16'33.82"
43	Rocky Creek at CR 280/Rocky Creek Road	FL	Jackson	30°41'42.11"	085°08'25.05"
44	Rocky Creek at SR 71	FL	Jackson	30°39'05.43"	085°09'44.99"
45	Spring Branch at SR 2	FL	Jackson	30°56'13.91"	085°19'26.19"
46	Spring Branch at US Hwy 231	FL	Jackson	30°45'09.59"	085°11'37.50"
47	Spring Creek at US 90/Spring Creek Park	FL	Jackson	30°59'07.54"	085°24'26.83"
48	Stone Mill Creek upstream of Road 5	FL	Gulf	30°09'54.60"	085°14'57.15"
49	Tenmile Creek at Flanders Grade	FL	Calhoun	30°33'07.35"	085°17'32.14"
50	Tenmile Creek below Highway 274	FL	Calhoun	30°31'56.49"	085°13'38.10"
51	Tenmile Creek below Highway 73	FL	Calhoun	30°29'59.08"	085°11'59.61"
52	Waddell's Mill Creek at Bumpnose Road	FL	Jackson	30°51'39.93"	085°15'55.82"
53	Waddell's Mill Creek upstream of Chipola River	FL	Jackson	30°51'03.32"	085°16'44.25"
54	Wildcat Creek at SR 20	FL	Calhoun	30°25'33.51"	085°08'33.86"

**Table 2.** Caddisfly taxa collected, with location and abundance data. Species that are new state records for Florida are indicated with a (\*).

Family	Species	Sites (# individuals)	
Brachycentridae	<i>Brachycentrus chelatus</i>	27(1), 41(1), 51(2)	
	<i>Micrasema rusticum</i>	5(4), 7(1), 9(17), 12(5), 14(21), 24(2), 30(15), 36(1)	
	<i>Micrasema wataga</i>	5(12), 7(4), 9(2), 14(4), 22(2), 24(2), 25(4), 27(4), 30(11), 41(2), 44(5)	
Calamoceratidae	<i>Anisocentropus pyraloides</i>	1(1), 11(1), 12(2), 20(1), 24(3), 26(2), 32(3), 35(11), 48(7), 51(1), 52(2), 54(1)	
	<i>Heteroplectron americanum</i>	32(1) Note: collected by FDEP Pensacola	
Dipseudopsidae	<i>Phylocentropus carolinus</i>	1(6), 13(1), 22(1), 25(1), 26(3), 27(7), 35(1), 46(6), 48(3), 49(1), 52(2), 53(1), 54(1)	
	<i>Phylocentropus lucidus</i>	32(1) Note: collected by FDEP Pensacola	
	<i>Phylocentropus placidus</i>	6(22), 11(72), 13(15), 16(5), 17(2), 18(30), 19(9), 20(40), 21(33), 22(9), 25(2), 27(1), 28(3), 34(10), 35(9), 37(8), 45(3), 52(14), 53(60), 54(3)	
Helicopsychidae	<i>Helicopsyche borealis</i>	5(32), 7(92), 9(115), 10(74), 12(10), 13(1), 14(61), 24(1), 30(32), 41(31), 44(3)	
Glossosomatidae	<i>Protophila n. sp.</i>	3(2), 4(1), 5(15), 6(10), 7(191), 9(214), 10(8), 13(83), 14(139), 24(150), 41(17), 44(21), 47(3), 53(38)	
Hydropsychidae	<i>Cheumatopsyche analis</i>	1(12), 4(1), 6(1), 7(1), 17(6), 19(3), 20(1), 21(3), 29(4), 30(2), 33(3), 34(4), 35(2), 36(11), 37(1), 38(1), 40(1), 41(1), 42(4), 43(2), 45(2), 50(3), 51(5), 52(4)	
	<i>Cheumatopsyche burksi</i>	8(2)	
	<i>Cheumatopsyche campyla</i>	47(2)	
	<i>Cheumatopsyche edista</i>	1(3), 6(10), 7(56), 9(63), 11(10), 13(46), 14(51), 18(2), 19(1), 20(17), 24(39), 25(18), 34(1), 35(30), 37(19), 41(31), 51(1), 52(57), 54(22)	
	<i>Cheumatopsyche miniscula</i>	4(1), 5(56), 7(40), 9(8), 10(2), 12(58), 14(7), 29(1), 30(7), 36(1), 41(8), 44(3)	
	<i>Cheumatopsyche pasella</i>	4(8), 5(17), 6(1), 7(100), 9(32), 10(4), 12(18), 13(1), 14(17), 25(1), 29(1), 30(7), 36(3), 39(1), 41(8), 42(1), 44(24), 47(1), 50(4), 52(1), 54(2)	
	<i>Cheumatopsyche pinaca</i>	1(9), 2(3), 4(1), 5(1), 6(2), 17(45), 18(7), 19(21), 20(14), 22(1), 25(1), 29(1), 30(1), 33(3), 35(32), 36(12), 37(9), 38(9), 41(2), 43(7), 44(1), 48(9), 50(7), 51(25), 52(4), 53(1), 54(4)	
	<i>Cheumatopsyche virginica</i>	21(5), 22(7), 27(2), 29(39), 33(37), 34(1), 36(21), 37(1), 40(42), 41(42), 42(9), 48(7), 51(4), 54(7)	
	<i>Diplectrona modesta</i>	33(1), 51(5), 54(1)	
	<i>Hydropsyche alabama</i>	5(13), 6(16), 7(47), 9(115), 10(2), 11(16), 12(11), 13(68), 14(117), 20(37), 24(69), 25(81), 30(4), 34(1), 35(24), 37(39), 41(1), 44(1), 47(1), 50(1), 51(5), 52(23)	
	<i>Hydropsyche decalda</i>	36(1), 37(6), 41(2), 54(1)	
	<i>Hydropsyche elissoma</i>	22(1), 25(46), 26(5), 27(17), 34(3), 38(4), 48(4), 50(7), 51(31), 54(3)	
	<i>Hydropsyche incommoda</i>	4(2), 5(3), 6(1), 7(19), 8(31), 9(8), 11(32), 12(2), 13(1), 21(10), 22(24), 24(2), 25(8), 29(1), 34(14), 36(1), 37(6), 41(17), 42(1), 44(10), 50(11), 51(1), 54(43)	
	<i>Hydropsyche mississippiensis</i>	13(1), 24(1), 41(1), 52(1)	
	<i>Hydropsyche rossi</i>	3(1), 4(3), 5(25), 7(18), 8(5), 9(31), 10(4), 12(20), 24(2), 25(4), 30(9), 35(2), 37(6), 39(4), 41(8), 44(7), 54(4)	
	<i>Macrostemum carolina</i>	5(13), 6(1), 7(35), 8(38), 9(3), 11(33), 12(20), 13(2), 14(3), 20(1), 21(31), 22(11), 24(1), 25(21), 27(1), 29(1), 30(1), 33(1), 34(7), 35(1), 36(3), 37(1), 39(2), 41(3), 44(1), 49(1), 50(2), 51(1), 52(1), 54(1)	
	<i>Potomyia flava</i>	5(3), 7(1), 11(6), 39(1), 41(1)	
	Hydroptilidae	<i>Hydroptila acadia</i>	33(2), 36(5), 37(4), 50(1)
		<i>Hydroptila alabama</i>	4(1)
<i>Hydroptila armata</i>		9(104), 12(3), 14(2), 18(1), 20(4), 35(10), 45(9), 47(26), 52(6)	
<i>Hydroptila bernerii</i>		1(1), 4(9), 5(10), 6(11), 7(67), 8(24), 9(30), 11(5), 12(21), 13(38), 14(20), 18(2), 20(8), 24(8), 25(5), 30(13), 35(9), 36(3), 37(6), 38(7), 39(2), 41(2), 44(54), 51(1), 52(31), 53(3)	
<i>Hydroptila circangula</i>		22(3)	
<i>Hydroptila disgalera</i>		20(1), 22(24), 25(7), 27(13), 29(2), 34(18), 50(20), 51(29), 54(2)	
<i>Hydroptila gunda</i>		45(1)	
<i>Hydroptila hamata</i>		36(1)	
<i>Hydroptila latosa</i>		38(1), 48(1), 50(1)	
<i>Hydroptila metteei</i>		24(6)	
<i>Hydroptila molsonae</i>		37(9), 54(2)	
<i>Hydroptila murtlei</i>		34(10)	
<i>Hydroptila parlatosa</i>		38(1)	
<i>Hydroptila quinola</i>		1(12), 4(13), 6(43), 7(38), 9(49), 11(31), 12(11), 13(119), 14(8), 16(3), 17(2), 18(14), 20(52), 21(1), 22(8), 23(1), 24(29), 25(13), 26(1), 27(5), 29(27), 30(36), 31(10), 32(1), 35(74), 36(5), 37(8), 38(17), 39(1), 41(11), 43(7), 44(38), 45(34), 49(2), 50(21), 51(2), 52(84), 53(14), 54(19)	
<i>Hydroptila remita</i>		21(7), 36(3), 37(22), 40(1)	
<i>Hydroptila waubesiana</i>		6(3), 8(4), 16(2), 18(1), 20(3), 24(1), 35(1), 36(2), 47(8), 52(9), 53(2), 54(7)	
<i>Mayatrichia ayama</i>		4(1), 5(2), 7(84), 9(46), 12(74), 14(1), 24(8), 25(6), 27(2), 29(2), 30(17), 36(1), 38(3), 39(2), 41(10), 44(22), 51(9)	
<i>Neotrichia armitagei</i>		1(11), 22(1), 25(15), 26(24), 27(49), 34(27), 45(3), 48(13), 50(4), 51(93)	
<i>Neotrichia minutisimella</i>		6(7), 8(69), 11(1), 18(2), 24(3), 25(13), 27(78), 34(6), 38(2), 41(1), 48(2), 50(5), 51(107), 54(1)	
<i>Neotrichia vibrans</i>		1(7), 4(5), 5(118), 7(68), 8(58), 9(44), 11(81), 12(119), 13(293), 14(24), 16(21), 17(59), 18(29), 19(162), 20(270), 21(2), 22(43), 23(2), 24(26), 29(3), 30(42), 34(10), 35(343), 38(1), 41(3), 44(12), 45(2), 48(2), 50(1), 51(1), 52(561), 53(23), 54(3)	
<i>Orthotrichia aegerfasciella</i>	2(1), 5(5), 6(5), 7(6), 9(1), 11(9), 12(6), 13(41), 14(3), 16(5), 17(5), 18(1), 19(16), 20(4), 21(10), 22(3), 24(12), 25(2), 27(2), 28(1), 29(5), 30(2), 31(1), 34(6), 35(23), 36(10), 37(6), 38(23), 41(13), 43(5), 45(11), 46(5), 47(4), 50(14), 52(1), 53(7), 54(1)		

Continued

Table 2. Continued.

Family	Species	Sites (# individuals)
	<i>Orthotrichia cristata</i>	6(1), 9(1), 11(14), 12(24), 13(12), 17(4), 18(5), 19(1), 20(3), 24(2), 29(8), 38(16), 41(2), 42(2), 46(3), 47(1), 50(2)
	<i>Orthotrichia curta</i>	36(9), 38(10), 41(1), 42(2), 50(5)
	<i>Orthotrichia dentata</i>	9(1), 13(1), 14(1), 24(4)
	<i>Orthotrichia instabilis</i>	17(3), 29(8), 37(4), 39(15), 41(2), 42(8)
	<i>Oxyethira abacatia</i>	22(3), 42(29), 49(1), 50(3)
	<i>Oxyethira elerobi</i>	13(2), 26(2), 54(21)
	<i>Oxyethira glasa</i>	1(4), 6(5), 13(8), 21(14), 22(1), 29(156), 30(3), 33(5), 35(2), 36(48), 37(12), 38(1), 41(1), 42(83), 44(1), 50(22), 51(3)
	<i>Oxyethira janella</i>	1(11), 4(1), 5(65), 6(150), 7(109), 8(14), 9(133), 11(272), 12(61), 13(290), 14(38), 16(27), 17(9), 18(48), 19(6), 20(33), 21(24), 22(54), 23(1), 24(33), 25(22), 26(3), 27(15), 28(1), 29(12), 30(41), 34(119), 35(43), 36(19), 37(65), 38(6), 39(74), 40(3), 41(9), 42(1), 43(86), 44(22), 45(19), 46(2), 48(7), 50(8), 51(17), 52(94), 53(67), 54(12)
	<i>Oxyethira lumosa</i>	1(1), 7(4), 14(2), 21(12), 23(4), 25(1), 29(12), 33(3), 35(1), 36(15), 41(17), 50(4), 51(5), 52(4)
	<i>Oxyethira maya</i>	1(26), 3(6), 6(11), 7(3), 9(11), 11(4), 12(3), 13(22), 17(6), 18(9), 20(19), 21(4), 22(1), 23(2), 24(3), 25(4), 26(2), 29(3), 30(5), 31(3), 34(3), 35(1), 36(66), 38(5), 39(1), 42(1), 43(11), 47(19), 46(245), 52(76), 53(3), 54(1)
	<i>Oxyethira novasota</i>	12(2), 17(1), 25(1), 26(2), 30(30), 36(1), 38(1), 43(16), 51(2), 53(1), 54(4)
	<i>Oxyethira pallida</i>	4(4), 9(1), 13(51), 14(3), 18(19), 19(12), 25(1), 30(1), 35(4), 37(3), 38(1), 39(30), 44(5), 45(2), 52(5), 53(2), 54(5)
	<i>Oxyethira pescadori</i>	7(2), 11(9), 13(2), 20(4), 21(124), 22(7), 27(4), 34(9), 43(10), 53(4)
	<i>Oxyethira roberti</i>	34(1), 35(1)
	<i>Oxyethira savanniensis</i>	36(6), 37(14)
	<i>Oxyethira setosa</i>	22(1), 34(2), 36(1), 41(2), 50(4), 51(2)
	<i>Oxyethira sininsigne</i>	42(607) LAKE FORM ONLY
	<i>Oxyethira zeronia</i>	1(6), 5(4), 7(17), 8(1), 9(7), 11(25), 12(9), 13(5), 21(50), 22(19), 24(1), 25(1), 26(4), 27(1), 29(41), 30(1), 31(3), 33(5), 34(26), 35(1), 36(32), 37(27), 38(2), 40(2), 41(8), 42(89), 46(10), 49(1), 50(1), 51(1)
Lepidostomatidae	* <i>Lepidostoma carrolli</i>	27(2) <b>NEW STATE RECORD</b>
Leptoceridae	<i>Ceraclea cancellata</i>	5(13), 6(16), 7(50), 8(40), 9(18), 10(21), 11(16), 12(6), 13(12), 14(7), 17(1), 22(1), 24(75), 25(2), 29(1), 34(4), 35(2), 36(4), 37(2), 38(4), 39(38), 41(60), 42(1), 44(2), 46(1), 50(2), 52(1), 53(1), 54(4)
	<i>Ceraclea flava</i>	5(67), 6(19), 7(110), 8(46), 9(13), 10(83), 11(23), 12(37), 13(31), 14(1), 20(1), 24(5), 25(1), 34(1), 36(1), 37(4), 39(2), 41(5), 44(7), 50(4), 51(1), 52(3), 54(4)
	<i>Ceraclea limnetes</i>	7(1), 21(1), 39(1), 42(1)
	<i>Ceraclea maculata</i>	1(8), 3(2), 4(54), 5(5), 6(10), 7(30), 8(8), 9(37), 10(11), 11(3), 12(3), 13(36), 14(13), 16(2), 17(3), 18(18), 19(18), 20(30), 21(45), 22(12), 24(36), 25(3), 27(20), 30(1), 34(10), 35(25), 36(3), 37(13), 38(6), 39(6), 41(21), 43(4), 44(26), 45(3), 47(15), 48(9), 50(37), 51(4), 52(37), 54(36)
	<i>Ceraclea n. sp. (nr. maculata)</i>	39(17)
	<i>Ceraclea nepha</i>	24(1), 39(1), 44(1), 54(1)
	<i>Ceraclea ophioderus</i>	4(1), 5(5), 6(7), 7(35), 8(43), 9(12), 10(2), 11(14), 12(5), 13(3), 21(1), 22(3), 24(4), 25(1), 29(2), 34(6), 36(4), 37(1), 38(4), 39(29), 41(8), 42(2), 44(4), 50(8), 54(15)
	<i>Ceraclea protonepha</i>	6(2), 7(3), 11(2), 12(1), 13(1), 20(1), 24(2), 35(4), 39(3), 44(1), 52(1)
	<i>Ceraclea resurgens</i>	6(2), 20(1), 21(25), 27(1), 34(1), 35(11), 36(1), 42(1), 48(1)
	<i>Ceraclea tarsipunctata</i>	4(5), 5(38), 6(15), 7(55), 8(9), 9(45), 10(61), 11(24), 12(26), 13(4), 14(67), 24(44), 37(1), 39(3), 44(5), 50(1), 54(3)
	<i>Ceraclea transversa</i>	5(3), 6(4), 7(1), 8(6), 10(2), 11(1), 14(1), 18(6), 21(1), 24(1), 35(10), 41(2), 44(2)
	<i>Leptocerus americanus</i>	4(1), 5(36), 6(3), 7(19), 11(35), 12(9), 13(3), 20(1), 21(3), 22(1), 24(3), 29(2), 34(75), 36(1), 38(1), 39(15), 41(2), 42(1), 50(22), 51(1)
	<i>Nectopsyche candida</i>	4(4), 7(10), 8(12), 9(13), 10(4), 11(7), 13(6), 14(3), 20(2), 22(2), 24(7), 26(1), 35(4), 38(3), 39(2), 41(5), 48(1), 50(5), 51(6), 52(2), 53(2), 54(1)
	<i>Nectopsyche exquisita</i>	1(26), 2(1), 5(11), 7(23), 9(27), 10(36), 12(8), 13(3), 14(43), 16(1), 18(7), 20(3), 22(8), 30(1), 35(13), 41(3), 43(8), 44(13), 45(8), 46(2), 47(1), 50(1), 52(18), 53(21)
	<i>Nectopsyche pavidata</i>	1(74), 2(9), 4(1), 5(6), 6(917), 7(58), 8(37), 9(3), 10(12), 11(30), 12(5), 13(128), 14(24), 16(5), 17(28), 18(52), 19(12), 20(29), 21(9), 22(12), 24(44), 25(40), 26(7), 27(3), 29(1), 30(15), 34(16), 35(71), 36(6), 37(13), 38(2), 39(19), 41(32), 43(37), 44(25), 45(10), 46(94), 48(1), 50(31), 51(35), 52(45), 53(27), 54(4)
	<i>Nectopsyche spiloma</i>	8(11), 11(1)
	<i>Oecetis avara</i>	4(3), 5(90), 7(81), 9(109), 10(24), 12(46), 14(114), 24(4), 30(59), 37(1), 41(5), 44(3), 47(4)
	<i>Oecetis cinerascens</i>	1(1), 9(2), 11(1), 13(6), 16(3), 17(1), 19(1), 20(4), 21(15), 32(1), 33(1), 35(2), 39(1), 47(9), 46(1), 50(1), 52(3), 53(1), 54(1)
	<i>Oecetis daytona</i>	48(1)
	<i>Oecetis ditissa</i>	3(5), 4(1), 9(2), 11(1), 13(3), 14(1), 16(1), 17(6), 18(1), 19(7), 22(1), 23(1), 24(1), 25(1), 29(1), 32(2), 33(10), 38(3), 40(1), 41(7), 42(1), 43(2), 44(2), 45(1), 46(2), 51(1), 53(3)
	<i>Oecetis georgia</i>	21(3), 22(6), 25(2), 27(1), 29(1), 33(2), 36(95), 37(1), 38(1), 41(2), 48(55), 50(4), 51(10), 52(1), 54(1)
	<i>Oecetis inconspicua</i>	1(2), 2(1), 3(3), 4(6), 5(11), 6(21), 7(13), 8(12), 9(18), 10(7), 11(27), 12(13), 13(76), 14(14), 16(6), 17(19), 18(10), 19(14), 20(8), 21(9), 22(10), 23(9), 24(3), 25(1), 26(6), 27(11), 29(41), 30(6), 32(1), 33(48), 34(2), 35(12), 36(90), 37(16), 38(68), 39(6), 40(2), 41(32), 42(70), 43(16), 44(6), 45(8), 47(26), 46(16), 48(15), 50(33), 51(19), 52(19), 53(2), 54(51)
	<i>Oecetis n. sp. (nr. cinerascens)</i>	39(6), 42(1), 54(1)
	<i>Oecetis nocturna</i>	6(8), 7(1), 8(3), 9(2), 10(4), 11(4), 12(3), 13(50), 17(5), 19(1), 20(2), 38(1)
	<i>Oecetis morsei/sphyra</i>	22(1), 54(1)

Continued

Table 2. Continued.

Family	Species	Sites (# individuals)
	<i>Oecetis osteni</i>	3(1), 5(3), 7(1), 13(1), 17(3), 21(113), 24(1), 26(1), 29(3), 35(2), 36(15), 37(88), 39(25), 40(13), 41(17), 42(4), 44(1), 54(2)
	<i>Oecetis parva</i>	20(2), 29(2), 38(20), 39(26)
	<i>Oecetis persimilis</i>	1(2), 4(1), 5(7), 6(27), 7(27), 8(64), 11(7), 12(15), 13(48), 14(56), 17(1), 20(24), 22(1), 24(9), 25(2), 29(1), 30(3), 34(1), 35(18), 37(1), 41(2), 50(5), 51(3), 52(11), 53(12), 54(6)
	<i>Oecetis porteri</i>	21(9), 25(1), 29(2), 33(1), 39(2), 41(2), 42(60)
	<i>Oecetis sphyra</i>	5(11), 6(80), 7(102), 9(3), 10(24), 11(22), 12(19), 13(148), 14(72), 15(1), 22(44), 24(104), 25(101), 26(3), 27(125), 34(1), 35(47), 37(3), 48(10), 50(7), 51(82), 52(4), 53(2), 54(6)
	<i>Setodes chipolanus</i>	4(3), 5(270), 6(24), 7(359), 9(50), 10(49), 11(2), 12(66), 13(59), 14(140), 24(188), 25(5), 29(1), 30(4), 37(11), 44(54), 53(3)
	<i>Setodes guttatus</i>	5(10), 7(5), 10(3), 12(9), 13(47), 44(1)
	<i>Triaenodes aba</i>	35(1)
	<i>Triaenodes florida</i>	39(25), 42(108) LAKE FORM ONLY
	<i>Triaenodes ignitus</i>	6(8), 9(1), 12(1), 13(11), 14(1), 17(3), 19(2), 20(4), 22(14), 24(8), 25(11), 27(8), 35(11), 36(5), 37(2), 38(6), 41(5), 44(4), 48(11), 50(3), 51(16), 52(8)
	<i>Triaenodes injustus</i>	14(1), 24(1), 36(1), 41(2)
	<i>Triaenodes marginatus</i>	19(1)
	<i>Triaenodes milnei</i>	5(1), 6(3), 7(2), 8(7), 11(1), 12(3), 13(2), 14(1), 16(2), 17(7), 19(5), 24(1), 25(1), 35(3), 37(9), 47(2), 51(1), 52(4), 53(1), 54(1)
	<i>Triaenodes ochraceus</i>	37(3), 54(3)
	<i>Triaenodes perna</i>	22(2), 25(1), 33(9), 34(2), 37(1), 48(2)
	<i>Triaenodes smithi</i>	35(1)
	<i>Triaenodes tardus</i>	17(1)
Limnephilidae	<i>*Iroquoia kaskaskia</i>	13(1) <b>NEW STATE RECORD</b>
	<i>Iroquoia punctatissima</i>	13(8), 20(25), 35(2), 45(1), 52(1) all in vicinity of Hwy 2
	<i>Pycnopsyche antica</i>	1(5), 13(45), 14(21), 18(30), 20(8), 21(1), 22(5), 25(1), 27(7), 34(6), 35(69), 36(6), 45(18), 48(11), 49(1), 51(5), 52(47), 53(79)
Molannidae	<i>Molanna blenda</i>	32(2), 51(1), 54(2)
	<i>Molanna tryphena</i>	21(2), 22(3), 26(1), 28(1), 32(3), 33(5), 36(5), 50(1)
	<i>Molanna ulmerina</i>	6(1), 9(2), 11(4), 12(1), 13(11), 14(3), 20(92), 21(2), 26(1), 35(3), 37(92), 52(1), 53(1), 54(6)
Odontoceridae	<i>Psilotreta frontalis</i>	32(1)
Philopotamidae	<i>Chimarra aterrima</i>	5(1), 11(1), 17(2), 19(9), 21(2), 24(1), 25(4), 33(2), 36(4), 37(7), 40(3), 41(2), 43(5), 51(9), 54(30)
	<i>Chimarra falculata</i>	21(1), 22(3), 25(3), 27(6), 36(4), 38(1), 42(1), 50(1)
	<i>Chimarra florida</i>	21(1), 22(85), 25(20), 27(14), 29(4), 31(1), 33(11), 34(18), 36(26), 37(6), 38(27), 41(39), 42(5), 48(37), 50(64), 51(119), 54(30)
	<i>Chimarra moselyi</i>	5(19), 6(4), 7(7), 8(3), 9(42), 11(3), 12(7), 13(2), 14(7), 20(1), 24(1), 29(2), 30(3), 35(2), 41(1), 52(1)
	<i>Chimarra obscura</i>	8(1), 13(3), 22(1), 25(1), 52(1)
Phryganeidae	<i>Agrypnia vestita</i>	13(2), 38(1), 52(1)
	<i>Ptilostomis ocellifera</i>	29(3), 33(12), 36(3), 48(3)
	<i>Ptilostomis postica</i>	8(1), 13(1), 24(7), 29(2), 30(1), 36(1), 38(4), 41(15), 42(3), 50(1), 54(2)
Polycentropodidae	<i>Cernotina calcea</i>	1(3), 2(15), 5(11), 6(27), 7(19), 8(1), 10(2), 11(36), 12(11), 13(157), 14(2), 16(56), 17(36), 18(7), 19(26), 20(3), 21(3), 22(6), 24(3), 34(3), 35(15), 39(3), 43(3), 45(2), 46(10), 52(54), 53(7)
	<i>Cernotina spicata</i>	6(1), 11(5), 12(5), 13(2), 20(3), 21(2), 22(3), 24(1), 26(11), 29(2), 34(1), 35(1), 37(2), 41(2), 43(1), 46(1), 51(1), 52(1)
	<i>Cernotina truncona</i>	39(54), 42(51)
	<i>Cynellus fraternus</i>	2(3), 6(1), 7(6), 8(26), 11(19), 13(1), 19(3), 20(2), 21(20), 22(11), 25(3), 34(2), 38(1), 43(1), 47(27)
	<i>Neureclipsis crepuscularis</i>	8(9), 9(1), 11(3), 13(1), 25(1), 29(1), 50(1), 52(2)
	<i>Neureclipsis melco</i>	25(1), 44(1), 52(1)
	<i>Nyctiophylax affinis</i>	25(1), 44(1), 52(1)
	<i>Nyctiophylax celta</i>	5(7), 7(1), 9(6), 10(14), 12(46), 30(3)
	<i>Nyctiophylax morsei</i>	50(1)
	<i>Nyctiophylax serratus</i>	6(1), 11(2), 13(1), 14(1), 16(1), 18(3), 20(6), 21(1), 22(3), 33(1), 35(9), 36(4), 37(15), 39(11), 45(2), 48(18), 51(1), 52(5), 54(13)
	<i>Plectrocnemia cinerea</i>	11(1), 14(12), 30(8), 34(1), 37(2), 48(1), 51(2), 52(1), 54(1)
	<i>Plectrocnemia crassicornis</i>	23(2)
	<i>Plectrocnemia nascotia</i>	33(1), 37(2), 41(1), 42(10)
	<i>Polycentropus blicklei</i>	11(1), 33(4), 37(1)
Psychomyiidae	<i>Lype diversa</i>	1(175), 5(2), 6(18), 7(4), 11(66), 12(1), 13(36), 14(43), 16(6), 18(182), 20(200), 21(11), 22(1), 23(1), 24(7), 25(5), 26(1), 27(6), 34(2), 35(64), 41(1), 43(1), 44(11), 45(111), 46(8), 48(3), 51(1), 52(102)
	<i>Psychomyia flavida</i>	1(4), 5(253), 6(1), 7(228), 9(47), 10(19), 12(50), 13(1), 14(190), 20(3), 24(95), 30(15), 36(8), 38(3), 41(3), 44(84), 51(1)
Rhyacophilidae	<i>Rhyacophila carolina</i>	27(1), 51(1), 54(4)
Sericostomatidae	<i>Agarodes crassicornis</i>	22(1), 25(1), 26(1), 27(1), 34(1)
	<i>Agarodes libalis</i>	15(1), 22(3), 25(3), 27(5), 34(1), 36(4)

### Family Brachycentridae

Within North America, the family Brachycentridae includes five genera, comprised of 36 species. In Florida and Alabama, only two genera are present: *Brachycentrus* Curtis, 1834 and *Micrasema* McLachlan, 1876. Both genera were found in the Chipola basin, the latter being much more common. *Brachycentrus chelatus* Ross, 1947, the sole representative of the genus collected in this survey, was found at three locations, each of them small, rapidly flowing ravine or headwater streams. Individuals of this species were rare, a total of only four specimens being collected. Much more abundant were the two species in the genus *Micrasema*. *Micrasema rusticum* (Hagen, 1868) was found at eight sites, and *M. wataga* Ross, 1938 was collected at 11. Neither species was collected in large numbers, with no more than 15 being found at any single occasion. *Brachycentrus* appears to be an early spring-flying genus, with adult collection records from the southeast being chiefly in late February and March (Harris et al. 1991; Holzenthal et al. 1982). *Micrasema* has a substantially longer flight season. Collections of both *Micrasema* species were made in this survey from March through October.

### Family Calamoceratidae

This is a primarily tropical family, with three genera and five species occurring in North America. Within Florida and Alabama, there are two genera, each represented by only one species. Both species have been collected in the Chipola basin.

*Anisocentropus pyraloides* (Walker, 1852), which is known to occur throughout the southeast U.S. as far south as north Florida and as far north as Delaware and New Jersey, was fairly commonly captured during this survey. This relatively large adult caddisfly was collected at 12 sites, ranging from very small to very large streams, in May and October, though never in large numbers.

The other calamoceratid that occurs in this region is *Heteroplectron americanum* (Walker, 1852). Although we did not collect this species in this field survey, a single larva was recently found by biologists with the Florida Department of Environmental Protection at Jack Branch, one of the streams sampled as a part of this study. This collection occurred in December 2008, which is bracketed by the sample dates of this project (2006–2012), and is thus included herein as a component of this survey of the caddisflies of the Chipola basin. The identification of the larval specimen collected was verified by the authors.

### Family Dipseudopsidae

In North America, the dipseudopsid fauna is limited to the genus *Phyloctenopus* Banks, 1907. Four species occur in Alabama (Harris et al. 1991); three of these occur in Florida. All three species known from Florida were collected in the Chipola basin. *Phyloctenopus*

*carolinus* Carpenter, 1933 was found at 13 large and small stream locations throughout the Chipola watershed. One to several adults were collected at these sites between March and October. *Phyloctenopus placidus* (Banks, 1905) was more common than the previous species. It was captured at 20 small and large stream sites throughout the basin between March and October. This species was substantially more abundant than *P. carolinus*, with as many as 72 individuals collected at one site. We did not collect the third species, *P. lucidus* (Hagen, 1861), in this survey, but a larval specimen was collected by Florida Department of Environmental Protection biologists at Jack Branch, one of the streams we sampled during this survey, on 4 December 2008. Because this date falls within the collection period for our samples (2006–2012), we include this record as a part of the listing of caddisflies from the Chipola River basin. The identification of the larval specimen was verified by the authors.

### Family Glossosomatidae

Although Harris et al. (1991) reported 16 species of glossosomatids from Alabama (primarily of the genus *Agapetus* Curtis, 1834), most records are from the northern part of the state. The only genus known to occur in southern Alabama, and in Florida only within the Chipola basin, is *Protoptila* Banks, 1904. This genus of small caddisflies (similar in size to hydroptilids) was found to be quite abundant in the Chipola, with 1,235 individuals counted, representing 3.9% of all specimens identified. The specimens collected in this survey represent an undescribed species, which will be described separately. Harris et al. (1991) noted that the species *P. palina* Ross, 1941, which occurs nearby in several south Alabama counties, was collected from a number of stream habitats, ranging from spring runs to large rivers. Similarly, *Protoptila* n. sp. was collected from a variety of stream habitats, but substantially larger numbers (> 200 individuals in some cases) were found at large river and stream sites than at small systems. Adults were collected in May, August, and September.

### Family Helicopsychidae

In North America, this family is represented by the single genus *Helicopsyche* von Siebold, 1856. Although there are eight North American species, the most common and widely distributed species is *H. borealis* Hagen, 1861, which is known to occur throughout much of North America, but in Florida is restricted to calcareous rivers and spring runs in the northern half of the state. The larval case of this genus is unique in that it very strongly resembles a coiled snail shell made of sand grains. The case functions to protect the larva from predation as it grazes on rock surfaces (Wiggins 1996). *Helicopsyche borealis* adults were collected May through October at 11 locations throughout the middle



Chipola basin, mostly in the main stem of the river, or in larger tributaries. All of these sites are associated with the limestone outcroppings common in the middle part of the Chipola watershed. Harris et al. (1991) noted that *H. borealis* within Coastal Plain Alabama was restricted to areas characterized by rugged terrain and limestone outcroppings in the Lime Hills and Southern Red Hills regions.

### Family Hydropsychidae

This family of caddisflies is well represented in the Chipola basin. In all, there were 17 species of hydropsychids collected, including all five genera presently known from Florida. This family was the third most abundant in the survey, with 3,994 individuals identified, accounting for 12.5% of the total. Two species, *Cheumatopsyche miniscula* (Banks, 1907) and *Hydropsyche alabama*, have thus far been reported in Florida only within the Chipola basin, the latter being precinctive to this basin. Both species were commonly collected in this survey: *C. miniscula* at 12 sites and *H. alabama* at 22 sites. A number of Hydropsychidae found in this study are rare in Florida, though not found exclusively within the Chipola. Within the species-rich genus *Cheumatopsyche* Wallengren, 1891, two male *C. campyla* Ross, 1938, a species previously known in Florida from only the Apalachicola River basin, was collected at Spring Creek at US 90 in Marianna, at the impoundment which forms Merritt Mill Pond upstream. *Cheumatopsyche burksi* Ross, 1941, while common in the Florida peninsula, is uncommon in the Panhandle. Two males were collected from the Chipola River at Lister Landing, near its confluence with the Apalachicola in Gulf County. *Diplectrona modesta* Banks, 1908 is a headwater stream specialist which has been found inhabiting a number of such habitats across the Panhandle. This species was collected, not unexpectedly, from several low-order streams in Jackson and Calhoun Counties. Six species in the genus *Hydropsyche* Pictet, 1834 were found in the Chipola basin, including the endemic *H. alabama* noted above. This species, though unknown elsewhere, is common in the Chipola basin, having been found in 40 different large and small stream collections throughout the sample period, with as many as 77 males taken in a single sample. *Hydropsyche decalda* Ross, 1947 is known from coastal plain streams from Delaware south and west to Texas. Harris et al. (1991) indicated that the species is known in Alabama only from two small streams in Baldwin County in the southwestern part of the state. In Florida, *H. decalda* is known as far south as the south-central peninsula. In the Chipola basin, we found a total of 10 specimens from four different small, darkwater streams. *Hydropsyche elissoma* Ross, 1947, another coastal plain species, is widely distributed from North Carolina to Louisiana. In

Florida, it is mostly limited to the western Panhandle. Like *H. decalda*, we found *H. elissoma* only in smaller darkwater streams. These were all collected during the spring months. Both *Hydropsyche incommoda* Hagen, 1861 and *H. rossi* Flint, Voshell & Parker, 1979 were well-represented in Chipola basin samples, occurring in both stream and lake samples throughout the basin and sample period. Harris et al. (1991) noted a similar wide distribution and commonness in these two species. The rarest *Hydropsyche* encountered in this survey was *Hydropsyche mississippiensis* Flint, 1972, which, although abundant in larger coastal plain streams from Virginia through Louisiana, is restricted in Florida to the northern panhandle. We collected only one male from each of four different streams in the upper and middle basin. Prior to this study, *Potamyia flava* (Hagen, 1861) was known in Florida from only the Apalachicola River basin. In the present study we collected several individuals of this species from five locations in the middle basin, including one rural pond in extreme southern Jackson County. Other than the locally rare species mentioned above, most hydropsychids found in this survey exhibited extended flight seasons, adults having been collected in early spring, late spring, and fall light trap samples. In the case of the rarely collected species (*C. burksi*, *C. campyla*, *D. modesta*, *H. mississippiensis*, and *P. flava*), temporally limited collection records most likely reflect species rarity within the basin rather than abbreviated flight seasons.

### Family Hydroptilidae

The Hydroptilidae were exceeded only by the Lepto- ceridae in this study in terms of the number of species collected. Forty different hydroptilid species, representing five genera, were collected in this field survey. Some of these species were extremely abundant, whereas others were represented by just a few individuals. The microcaddisflies were the most abundant family in this study. A total of 10,673 individuals were counted, making up 33.5% of all specimens identified.

The most species-rich microcaddisfly genus in this survey was *Hydroptila* Dalman, 1819, with 16 different species collected. The most ubiquitous member of this genus in the Chipola was *H. quinola* Ross, 1947, which was found at 39 of the 54 sites sampled, totaling 854 individuals identified. Also very common was *H. bernerii* Ross, 1941, with 26 occurrences totaling 390 individuals. By contrast, some species were very infrequently collected, including seven which were collected at only a single location (*H. alabama* Harris & Kelley, 1984, *H. circumgula* Harris, 1985, *H. gunda* Milne, 1936, *H. hamata* Morton, 1905, *H. metteei* Harris, 1991, *H. murtlei* Harris, Rasmussen & Denson, 2012, and *H. paralatosa* Harris, 1985). The flight season for most *Hydroptila* appears to be fairly broad, with most species in this study being

collected from March through October. Collections of the rare taxa mentioned above seem to suggest a more abbreviated emergence pattern, but this is likely related to low populations, rather than actual narrow flight season, especially given the multivoltinism characteristic of members of this family. Two of the *Hydroptila* species collected (*H. gunda* and *H. metteei*) represented new state records for Florida and were recorded by Harris et al. (2012). *Hydroptila gunda* is common and widespread in Alabama, while *H. metteei* appears to be narrowly endemic to extreme southeastern Alabama and the Chipola River basin. One male specimen of *Hydroptila murtlei* was collected at Juniper Creek in the lower part of the middle basin; this specimen was designated as a paratype by Harris et al. (2012).

The genus *Oxyethira* Eaton, 1873 was also species-rich in this survey, with 14 species collected. Two of these species were especially commonly collected. *Oxyethira janella* Denning, 1948, was one of the most abundant caddisflies collected in the entire survey, occurring at 45 sites, and totaling 2,113 individuals identified. In a statewide survey targeting Florida caddisflies identified as Species of Greatest Conservation Need (SGCN), Rasmussen et al. (2008b) found similar results, with this species distributed widely across the state and occurring in large numbers. The same was true in the Alabama survey conducted by Harris et al. (1991). Another very common species of this genus found in the Chipola survey was *O. maya* Denning, 1947a. This species is widespread and common throughout Florida, but far less so in Alabama (Harris et al. 1991). Most other species in the genus were also widely distributed, but *O. sininsigne* Kelley, 1981 was collected at only one location in the study, Porter Pond, a natural oligotrophic lake in southern Jackson County, Florida. Even though limited to just this site in the present study, it was very abundant there, with 607 individuals identified. Most Florida collections of *O. sininsigne* have also been at oligotrophic lakes and ponds. However, Harris et al. (1991) indicated that the three occurrences of *O. sininsigne* in Alabama were from large rivers or streams of the Southern Pine Hills region. An additional *Oxyethira* species (*O. verna* Ross, 1938) was not collected in the present field survey but was recorded from the Chipola basin in Alabama by (Harris et al. 1991).

Five species of *Orthotrichia* Eaton, 1873 were collected. *Orthotrichia aegerfasciella* (Chambers, 1873) was by far the most common species of this genus collected, being found at 37 sites, and totaling 275 individuals. *Orthotrichia cristata* Morton, 1905 was also relatively common, 100 individuals being collected from 16 different locations. The other members of the genus were less common, being found at only a few sites.

*Neotrichia* Morton, 1905 was represented in this survey by three species: *N. armitagei* Harris, 1991, *N. minutisimella* (Chambers, 1873), and *N. vibrans* Ross,

1938. The most common of these taxa, by far, was the very small *N. vibrans*, which was collected from 33 different locations, and totaled 2,438 individuals. The other two species, though not infrequent, were much less common. All three species exhibited extended flight seasons, specimens having been collected from early spring through fall.

Only one species of *Mayatrichia* Mosely, 1937, *M. ayama* Mosely, 1937, is known to occur in Florida, though one additional species, *M. tuscaloosa* Harris & Sykora, 1996, is known from Alabama. A total of 290 *M. ayama* individuals were collected from 17 locations, including both lentic and lotic water bodies. In most cases, the collection sites were those where there was at least a partial rock substrate, which seems to be preferred by the larvae (Pescador et al. 2004).

One additional genus represented by the species *Ithytrichia clavata* Morton, 1905, has been recorded from the Chipola basin. Moulton et al. (1999) reported two males collected 4 May 1970 from Florida Caverns State Park near Marianna in Jackson County. No additional specimens have been collected since then, and it is unknown whether or not this taxon is extant in the Chipola River basin.

#### Family Lepidostomatidae

Weaver (1988) provided a synopsis of the North American members of the family Lepidostomatidae. There is much variability within this group, especially in regards to sexual dimorphism, leading McLachlan (1876) to refer to them as the “curiosity shop” of the caddisfly fauna. Two genera are known from North America: *Lepidostoma* Rambur, 1842 and *Theliopsyche* Banks, 1911. Seven species of *Lepidostoma* and two of *Theliopsyche* occur in Alabama. Only the former genus is recorded from Florida, with four species known from the state prior to the present study, though none of these species was collected in this survey. However, two adult male *Lepidostoma carrolli* Flint, 1958 (Figure 3) were collected from Fourmile Creek, a ravine stream located in northern Calhoun County, Florida, in October 2010. This was a surprise, as the previous southernmost record of this species was from South Carolina. The specimens were sent to Oliver Flint, the author of the species. He verified the identifications, and the specimens were deposited in the collection of the U.S. National Museum of Natural History.

#### Family Leptoceridae

More species from this family than any other were collected in this survey. Leptoceridae, also referred to as “long-horned caddisflies” due to the long antennae compared to those of other families, are very common inhabitants of virtually any type of water body in the southeast, especially certain species within the large



**Figure 3.** Adult male *Lepidostoma carrolli* Flint, 1958 collected at Fourmile Creek, Calhoun County, Florida, 20-X-2010.

genus *Oecetis* McLachlan, 1877. Members of six lepto- cerid genera were found in this study: *Ceraclea* Stephens, 1829, *Leptocerus* Leach, 1815, *Nectopsyche* Mueller, 1879, *Oecetis*, *Setodes* Rambur, 1842, and *Triaenodes* McLach- lan, 1865. There were 42 different leptocerid species collected, including two undescribed species, making this the most species-rich family in the Chipola survey. The Leptoceridae rivaled the Hydroptilidae in terms of abundance, with 9,757 individuals identified, represent- ing 30.7% of the total count.

The larvae of the genus *Ceraclea* are difficult to collect, but adults of the genus are often collected in abundance from large streams, rivers, ponds and lakes, with numerous species often present. The apparent scarcity of the larvae is most likely due to their cryptic habitat and behavior, some species of which burrow into and consume freshwater sponges, and others that inhabit crevices in logs and other difficult to sample microhabitats. An extensive revision of this species- rich genus was done by Morse (1975). In the present survey, 11 species were found. The most common was *C. maculata* (Banks, 1899), a species known to occur throughout almost all the continental U.S., including most of Florida. Harris et al. (1991) recorded it from all 67 Alabama counties, from virtually all aquatic habitats sampled. In the Chipola, we collected *C. maculata* from 39 different lotic and lentic sites, with a total of 657 individuals identified. A much less common species, *C. limnetes* Rasmussen & Harris, 2008, was recently described from north Florida. Prior to the completion of this survey, *C. limnetes* was known only from two clear

ponds in Leon County, within Florida's Apalachicola National Forest (Rasmussen et al. 2008a). We collected the species from four additional locations in the Chipola basin, including two larger stream sites. In the course of this survey, we discovered an undescribed species of *Ceraclea* at Page Pond in northern Calhoun County, Florida. Seventeen males of this species, which is similar to *C. maculata*, were collected in May 2011. Additional specimens were subsequently collected by Rasmussen approximately 45 km due west of Page Pond at Lucas Lake, Washington County. This new species will be described in a future publication. Most of the *Ceraclea* species were collected in both spring and fall light trap samples, but one species, *C. resurgens* (Walker, 1852), was collected only in March. An early spring flight season seems to be the rule for this species. Harris et al. (1991) collected it only in March and April in Alabama, as did Holzenthal et al. (1982) in Mississippi and southeast Louisiana.

Only one species of the genus *Leptocerus* is known in all of North America. *Leptocerus americanus* (Banks, 1899) is widely distributed in the eastern two-thirds of the continental United States, in both still and flowing waters. In the Chipola, we found this species at 22 different lotic and lentic sites, only in May. Harris et al. (1991) observed adults of the species in Alabama from April through June in small numbers at scattered locations throughout most of the state. Similarly, Holzenthal et al. (1982) collected them in Mississippi and Louisiana in April and May.

Within the Chipola basin, we recorded four species of *Nectopsyche*. Three species (*N. candida* [Hagen, 1861], *N. exquisita* [Walker, 1852], and especially *N. pavidata* [Hagen, 1861]) were quite commonly collected, but the fourth species, *N. spiloma* (Ross, 1944), was found only at two locations in the main stem of the river. Apparently, *N. spiloma* is restricted to larger stream sites in the southeastern U.S., as our other Florida collections are from rivers in the northern part of the state. Harris et al. (1991) noted that in Alabama this species was most abundant in the Mobile River, and Holzenthal et al. (1982) noted its occurrence at only one unspecified site in Jackson, Mississippi (which most likely refers to the Pearl River). Both of our Chipola collections occurred in May 2010, but Harris et al. (1991) reported collections from May until October, and the Mississippi record was from July. *Nectopsyche pavidata* was one of the most frequently collected caddisflies in this survey, having been found at 43 of the 54 sites sampled, and during most months when sampling took place. Outside of the Chipola, we have collected this species, often quite abundantly, from March through December from both lotic and lentic water bodies. The other two sister species *N. exquisita* and *N. candida* were fairly commonly collected from a variety of water bodies in this survey.

The genus *Oecetis* was well-represented in the Chipola basin, with 13 different species present. One of these, *O. inconspicua* (Walker, 1852), was the most commonly collected caddisfly species in the survey, being found at 50 of the 54 sample sites. In addition to *O. inconspicua*, eight other species were frequently collected and widely distributed in a variety of habitats throughout the Chipola basin. These include *O. avara* (Banks, 1895), *O. cinerascens* (Hagen, 1861), *O. ditissa* Ross, 1966, *O. georgia* Ross, 1941, *O. nocturna* Ross, 1966, *O. osteni* Milne, 1934, *O. persimilis* (Banks, 1907), and *O. sphyra* Ross, 1941. Four other species, however, were more limited in occurrence. The least common member of this genus collected was the southeastern coastal plain species *O. daytona* Ross, 1947. In the Chipola, we collected one male from a single site (Stone Mill Creek in Gulf County) in May 2010. Other collections in Florida are also rare and were summarized in Rasmussen et al. 2008b. Harris et al. (1991) noted the occurrence of a few specimens at several locations in southwest Alabama, collected between April and August. The species *O. parva* (Banks, 1907) was found at four locations in the Chipola, two of them streams, and two lakes. Earlier thought to be quite rare, Rasmussen et al. (2008) found it to be not uncommon in a number of locations throughout the state, most of them oligotrophic ponds. Although initially considered exclusively a lake species (Floyd 1995), *O. porteri* Ross, 1947 was found at several stream sites in the Chipola, as well as at lakes. Though collected in May and October in the present survey, we have collected adults as early as March in other Florida locations. Some doubt exists as to the taxonomic identity of this species (M. Floyd, pers.comm.). Rasmussen et al. (2008) reported an undescribed species of *Oecetis* from two clear lakes in Florida's Ocala National Forest. We collected this species at three locations in the Chipola basin — two clear lakes and one small darkwater stream. This new species, similar to *O. cinerascens*, will be described in a separate publication. Two specimens similar to *O. morsei* Bueno-Soria, 1981 could not be identified with certainty. It is possible that they are variants of *O. sphyra* or *O. morsei*. The specimens were collected at two darkwater stream locations.

Two species of *Setodes* were found in this study: *S. chipolanus* and *S. guttatus* (Banks, 1900). Both species are known in Florida from only the Chipola basin, the former species being precinctive to this basin (Rasmussen et al. 2008). A third species, *S. dixiensis* Holzenthal, 1982, was tentatively reported by Pescador et al. (2004) based on larvae collected in the Chipola River basin, but adults of this species were not recovered in the present survey, and the occurrence of this species in the basin is doubtful. Though unknown outside the Chipola basin, *S. chipolanus* was quite commonly captured in this survey, specimens being collected at 17 different large

and small stream locations, and often in large numbers, with more than 350 specimens being identified from the Chipola River at Laramore Landing. *Setodes guttatus* was less common, being found at six sites, most of them on the main stem of the river. Both species were collected between the months of May and October.

*Triaenodes* was well represented, species-wise, in the Chipola basin. This genus of caddisflies is widely distributed in North America, with many species being only occasional in occurrence. Based on the recent revision of the genus by Manuel (2010), there are 30 North American species, with 18 species recorded from Florida, and 20 from Alabama. In the Chipola basin, we found 10 different species, some quite rare in Florida. *Triaenodes smithi* Ross, 1959 was previously known in Florida only from Liberty County (Manuel 2010); the present study adds a second record from Marshall Creek in northern Jackson County in May 2010. Harris et al. (1991) reported very small numbers of the species in widely scattered locations in Alabama, including from Buck Creek in the Chipola basin. *Triaenodes aba* Milne, 1935 is another rare species in Florida, as well as in Alabama. Like *T. smithi*, we captured a single male *T. aba* at Marshall Creek in northern Jackson County, Florida in May 2010. *Triaenodes florida* Ross, 1941 is restricted to lakes within Florida, parts of south Georgia, and extreme south Alabama. This species is sometimes abundant in clear-water ponds and lakes, including ephemeral ones. Not unexpectedly, in this survey we collected substantial numbers of *T. florida* from two undeveloped ponds in southern Jackson and northern Calhoun counties in Florida. Although widely distributed and common in eastern North America, *T. injustus* (Hagen, 1861) is quite rare in Florida. The only previous records of this species in Florida were from Gulf County in the Panhandle and Orange County in central Florida (Manuel 2010). We collected one or two individuals of this species at each of four stream sites within the mid and upper Chipola basin in May and October. *Triaenodes marginatus* Sibley, 1926, like the previous species, is uncommon on the southeastern coastal plain, but has not yet been found in Florida. Harris et al. (1991) collected this species as far south as Henry County in Alabama, the next county north of our Chipola collection location, Cowarts Creek at Rocky Creek Road in Houston County, where we collected one male in June 2012. In his revision, Ken Manuel (2010) described a new species, *T. milnei* Manuel, 2010, which is very similar to *T. perna* Ross, 1938 and *T. helo* Milne, 1934. He considered *T. helo* to be a hybrid between the other two species. Manuel stated that *T. milnei* appears to be confined to cool blackwater streams, and noted that it has been collected infrequently in scattered sites in Alabama, Florida, Georgia, and South Carolina. In the Chipola, *T. milnei* was frequently collected, though not in large numbers. The species was found at 20 stream sites in the upper and middle basin,

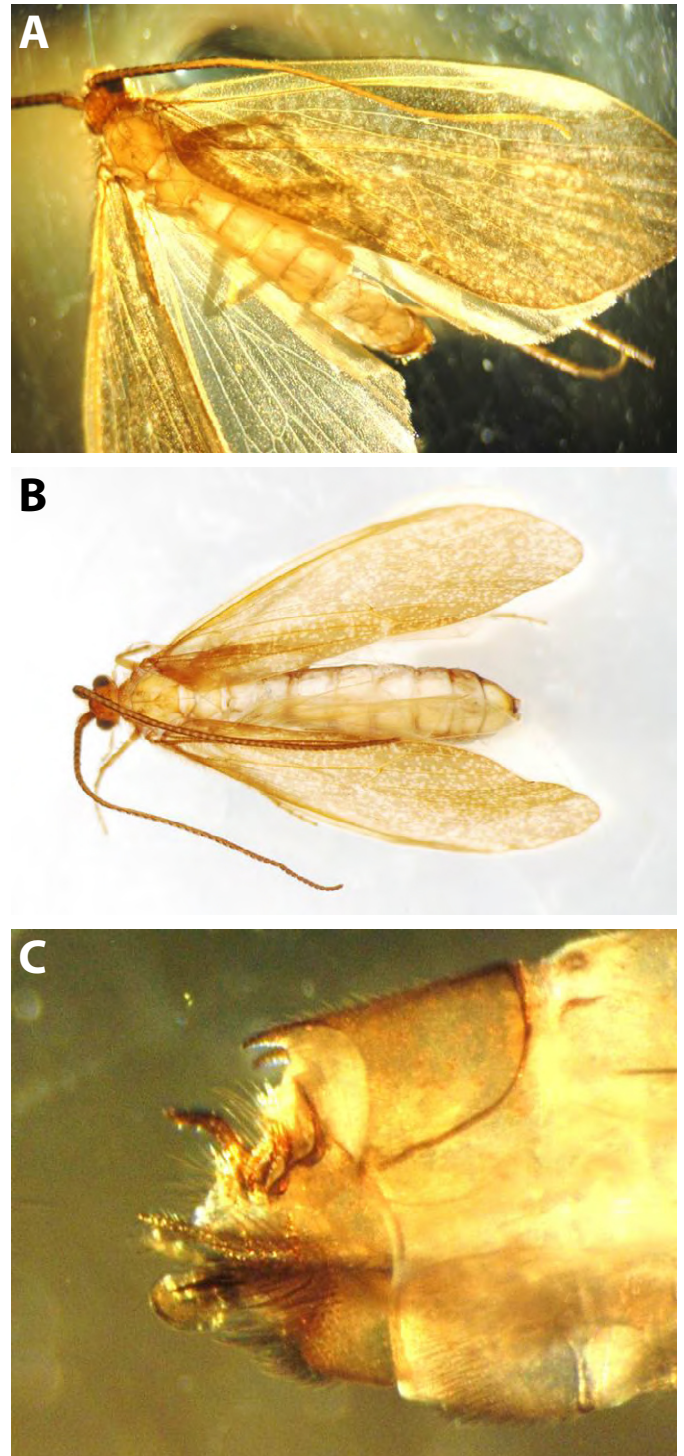
collected between May and October. *Triaenodes perna* is broadly distributed in the eastern part of the U.S. from New Hampshire south to northern Florida. In the Chipola, it was found in low numbers at six different sites, all darkwater streams, in May. Another uncommon *Triaenodes* collected in the Chipola is *T. ochraceus* (Betten & Mosely, 1940). We found this species at only two small Chipola tributaries, both located in southern Calhoun County. Glover (1996) suggested that larval *T. ochraceus* are confined to cypress (*Taxodium* sp.) root habitat. Both of the Chipola sites, and each of the other Florida sites where we have collected this species, are characterized by this habitat. All of our collections of adults were made in the month of May. *Triaenodes tardus* Milne, 1934, a primarily northern species sparsely distributed in Alabama and northern Florida, was collected from Cowarts Creek in Houston County, Alabama in June 2012. *Triaenodes ignitus* (Walker, 1852), the most widespread and common *Triaenodes* species in both Alabama and Florida, was similarly widely distributed (both temporally and spatially) in the Chipola basin. We collected this species at 22 different lotic locations within the basin, ranging from small streams to large rivers, from March through October.

#### Family Limnephilidae

Although ubiquitous and abundant in many parts of North America, Limnephilidae are substantially less common in the Deep South, and are particularly scarce in Florida, where only two genera and three species (prior to this study) were reported, namely *Ironoquia punctatissima* (Walker, 1852), *Pycnopsyche antica* (Walker, 1852), and *P. indiana* (Ross, 1938). In the Chipola basin, we captured three species of limnephilids, one of which constitutes a new record for Florida. *Ironoquia kaskaskia* (Ross, 1944), previously unknown in Florida, was collected from the Chipola River at Highway 162 (Figure 4), where a single male was collected along with several individuals of *I. punctatissima*. *Ironoquia punctatissima* was collected at five different sites in the northern part of Jackson County, Florida, all in the vicinity of state Highway 2, in quantities ranging from 1 to 25 individuals. *Pycnopsyche antica* was quite common in the Chipola, adults being collected from 18 different stream sites mainly in the upper and middle basin, though one collection record is from Gulf County near the confluence with the Apalachicola River. In some cases, large numbers of *P. antica* were attracted to the lights, as many 79 individuals being collected at Waddell's Mill Creek just upstream of the Chipola River. All of our Chipola limnephilid collections were in October. *Pycnopsyche indiana*, although not collected in this survey, was previously recorded from the Chipola River (Calhoun County at Highway 20) by Rasmussen and Denson (2000) based on the collection of a single female taken in November 1972.

#### Family Molannidae

In both Florida and Alabama, this family is represented by three species within the genus *Molanna* Curtis, 1834: *M. blenda* Sibley, 1926, *M. tryphena* Betten, 1934, and *M. ulmerina* Navas, 1934. All three species were collected in the Chipola survey. *Molanna blenda* is the rarest of the three, both in the Chipola specifically, and within the states of Alabama and Florida. Sherberger and Wallace (1971) indicated that larval *M. blenda* are limited to



**Figure 4.** Adult *Ironoquia kaskaskia* Ross, 1944 collected at Chipola River at SR 162, Jackson County, Florida, 20-X-2009. **A.** Male. **B.** Female. **C.** Male terminalia (right lateral view).

spring-fed streams and spring seeps. Rasmussen (2004) also found the species only in small spring-fed ravine streams in northern Florida. Similarly, we collected *M. blenda* from small ravine and spring-fed streams in the Chipola, in March and May. *Molanna tryphena* was fairly common in the Chipola, with individuals collected at eight mostly darkwater stream sites throughout much of the basin. Adults were collected between March and October. The most commonly collected species in the Chipola was *M. ulmerina*. This species was captured at 14 different lotic sites scattered throughout the upper and middle basin from March through October. All *Molanna* were collected from stream sites.

### Family Odontoceridae

A single individual from this family was collected in this survey. One male of *Psilotreta frontalis* Banks, 1899 was collected from Jack Creek, a small spring-fed stream in southern Jackson County, Florida in May 2012. This is the only species of this genus known from Florida (Pescador et al. 2004), where it is restricted to small spring-fed streams in the Panhandle. Two additional species are known from Alabama (Harris et al. 1991).

### Family Philopotamidae

Two genera within this family occur in Florida: *Chimarra* Stephens, 1829 and *Wormaldia* McLachlan, 1865. A third genus, *Dolophilodes* McLachlan 1909, also occurs in Alabama, but only in the northern part of the state. *Chimarra* is the largest genus of the family, with 21 species known from North America (Armitage 1996). Within Florida, five species are known (Pescador et al. 2004), all five of which were collected in this survey. Alabama has records of four additional species (Harris et al. 1991), but none of these were found in the Chipola basin. *Chimarra florida* Ross, 1944 was the species most commonly captured, having been collected at 17 sites in the Chipola basin, often in fairly large numbers, from May through October. *Chimarra ferculata* Lago & Harris, 1987 is endemic to the Florida Panhandle and in nearby areas within Alabama, Mississippi, and Georgia. It was collected in small numbers (one to six individuals) from eight small stream sites in the Chipola basin between March and September. This and the preceding species appear to be small stream dwellers. Neither species was collected at any site within the main stem of the river, but only from smaller tributary locations. Another common species in the Chipola basin, and in both states of which it is a part, is *C. moselyi* Denning, 1947. Adults were collected in moderate numbers between March and October from 16 sites in the Chipola basin. Unlike *C. florida* and *C. ferculata*, however, this species appears to be more common in larger river sites, in almost all cases having been collected either from the main stem of the Chipola River or from larger tributaries. *Chimarra*

*aterrima* Hagen, 1861 was also common in the Chipola. We collected it from 15 large and small stream sites throughout the basin between May and September. Unlike the species noted above, *C. obscura* (Walker, 1852) was infrequently found in the Chipola basin. We collected it from five widespread sites throughout the basin in very small numbers (1–3 individuals). Although somewhat rare in Florida, *C. obscura* is the most widespread and common species of the genus in Alabama (Harris et al. 1991). Though not collected as a part of this field survey, *Wormaldia moesta* (Banks, 1914) is known from the Chipola basin. It was collected in 1993 from Bridge Creek near Marianna by biologists with Florida's Department of Environmental Protection. We made several collections from this stream, but no *Wormaldia* were captured. It has recently been collected from other locations within the Florida Panhandle, but it is unknown whether or not this genus is still extant within the Chipola basin.

### Family Phryganeidae

Caddisflies in this family are relatively uncommon in the Southeast. Although nearly 30 species are known from North America, only six are recorded from Alabama (Harris et al. 1991), and four of those are known from Florida (Pescador et al. 2004). In the Chipola survey, we captured three of these species. *Agrypnia vestita* (Walker, 1852) was collected at only three dissimilar stream sites, and only one individual was taken at each location. Harris et al. (1991) found similar results, one or two individuals being collected from several sites scattered throughout the northern part of the state. Our Chipola collections were made only in the fall, but Pescador et al. (2004) and Harris et al. (1991) recorded adults being collected during the springtime as well. Two species of *Ptilostomis* Kolenati, 1859 were found in this survey. Several individuals of *P. ocellifera* (Walker, 1852) were taken at four small stream sites in May. *Ptilostomis postica* (Walker, 1852) was more commonly collected, with as many as 15 adults being taken at 11 different stream and pond locations throughout the basin in the spring and fall.

### Family Polycentropodidae

Pescador et al. (2004) listed 19 different polycentropodid species for the state of Florida (including two which are doubtful in occurrence in the state), occupying what are now considered five different genera. (Based on the recent phylogenetic revision done by Chamorro and Holzenthal (2011), several species formerly moved to the genus *Polycentropus* Curtis, 1835 have returned to the genera *Plectrocnemia* Stephens, 1836 and *Holocentropus* McLachlan, 1878, and North American *Polycentropus* described since 1944 have been reassigned into those two genera.) From Alabama, Harris et al. (1991) noted

30 members of the Polycentropodidae (excluding the four species of *Phylocentropus* Banks, now considered part of the Dipseudopsidae). In the Chipola, we collected 14 polycentropodid species, representing six genera, as set forth in Chamorro and Holzenthal. Polycentropodidae was one of the more common families collected, accounting for 3.9% of all the caddisflies enumerated in the study. In all, 1,235 polycentropodids were identified.

All three species of *Cernotina* Ross, 1838 known from Alabama and Florida were collected in the Chipola. *Cernotina calcea* Ross, 1938 was the most common, being found at 27 different sites scattered throughout the basin, including large and small streams and one pond, from May through October. *Cernotina spicata* Ross, 1938 was less frequently found. We collected it from 18 locations, and usually in very small numbers. It is mainly a lotic species, but we do have scattered lake and pond records from this and other surveys. In the Chipola, we collected this species only in the spring and summer, but we have records of collections into the fall months, as is the case described in Harris et al. (1991). *Cernotina truncona* Ross, 1947 appears to be almost exclusively a lake and pond species. We found it abundantly (> 50 individuals) at two sites, both lentic locations, in the Chipola basin. Harris et al. (1991) noted that it is found in lakes and sinkhole ponds in the Coastal Plain. Almost all of our records from other parts of Florida are from lakes and ponds, slow stretches of streams, or streams closely associated with lakes.

The genus *Cyrnellus* Banks, 1913 contains a single Nearctic species, *C. fraternus* (Banks, 1905). This species is common throughout Florida and Alabama, and the rest of the eastern United States. It was collected at 15 lotic sites throughout the Chipola River basin between the months of May and October. *Cyrnellus fraternus* was fairly common in Chipola samples, with as many as 27 males identified from a single site.

Two species from the genus *Neureclipsis* MachLachlan, 1864 were found in the Chipola basin: *N. crepuscularis* (Walker, 1852) and *N. melco* Ross, 1947. Florida *Neureclipsis* fauna is limited to only these two species. Alabama has records of a third species (*N. piersoni* Frazer & Harris, 1991), but it was not collected in this survey. *Neureclipsis crepuscularis* was the more common of the two, having been collected at sites throughout most of the Chipola basin between the months of March and October. Numbers collected per site were low, with no more than seven males taken at any location. One individual was collected at a lentic site, but all the rest were taken at flowing water locations. *Neureclipsis melco* was substantially less commonly collected, with a few specimens taken from four stream sites in the middle and lower basin. Most individuals were collected in May, though one specimen was taken in October.

Four species within the genus *Nyctiophylax* Brauer, 1865 were found in the Chipola basin. These represent all *Nyctiophylax* species known to occur in Florida, although several additional species are known from Alabama, most of which have been collected only above the Fall Line (Harris et al. 1991). *Nyctiophylax affinis* (Banks, 1897) was uncommon in our samples. Only one male was collected at each of three stream sites in different parts of the basin in May and October. *Nyctiophylax celta* Denning, 1947 was considerably more commonly encountered, but in our samples it was limited to calcareous systems with limestone outcroppings. Harris et al. (1991) noted that the species was common in Alabama, but was most abundant in the Cahaba River system. Specimens of *N. celta* were collected in this survey between the months of May and October, with as many as 42 males identified from a single location. The rarest *Nyctiophylax* we collected in the Chipola was *N. morsei* Lago & Harris, 1983. This species is endemic to southern Alabama and the Florida panhandle, where it is known from small, cool streams. Our one male was collected at Tenmile Creek in Calhoun County in May 2010. The most widespread *Nyctiophylax* species in this survey was *N. serratus* Lago & Harris, 1985. We found this species mostly at stream sites, but did collect 11 males from a clear-water lake. *Nyctiophylax serratus* was collected between May and August, with 1 to 18 specimens identified per site.

Within the genus *Plectrocnemia*, three different species were found in the Chipola basin. The most common of these was *Plectrocnemia cinerea* (Hagen, 1861). This species was collected exclusively at lotic sites throughout the basin between May and October, though generally in low numbers. *Plectrocnemia crassicornis* (Walker, 1852) was much less common in Chipola samples. We collected two females at Dry Creek in southern Jackson County in May 2012. Although widespread and often common in much of the eastern part of North America, it is rare in Florida, with a very few scattered collections in the middle panhandle. *Plectrocnemia nascotia* (Ross, 1941) was uncommon in Chipola samples. All collections were made in May, and included three stream sites and one pond. Sample size ranged from 1 to 10 specimens identified.

One species from the genus *Polycentropus* (s.s.) was collected in this survey. *Polycentropus blicklei* Ross & Yamamoto, 1965 was also uncommon, with 1–3 males collected at one of three large or small stream sites in March and May.

### Family Psychomiidae

This family of net-spinning caddisflies consists of four North American genera, but only two genera (*Lype* McLachlan, 1878 and *Psychomyia* Latreille, 1829) are

known from both Alabama and Florida. The Florida fauna comprises *Lype diversa* (Banks, 1914) and *Psychomyia flavida* Hagen, 1861. The Alabama fauna contains one additional species, *Psychomyia nomada* (Ross, 1938), which is known from a single collection in the northwest corner of the state. Both of the Florida species, which are widely distributed throughout the eastern U.S., were commonly and often abundantly collected in the Chipola. *Lype diversa* was found at 27 different large and small stream sites throughout the Chipola basin, whereas *P. flavida* was somewhat less widely distributed, being collected at 17 stream locations. Both species were collected between March and October, which is consistent with the findings of Harris et al. (1991) in Alabama. Although widely distributed in the eastern part of the continent, *P. flavida* is known only from the Chipola basin within Florida. Corbet (1966) noted that populations of this species were often made up largely of females, leading him to suggest that the species might be facultatively parthenogenetic. We did not find this to be the case in our samples, with males just as often as not outnumbering females. Although low in species richness, Psychomyiidae was the fourth most common family in the samples, with 2,054 individuals enumerated, accounting for 6.5% of all caddisflies identified.

#### Family Rhyacophilidae

Caddisflies in this family are infrequently found in Florida, with only two species, one of which is presently undescribed (Pescador et al. 2004), known from the state. Comparatively, Alabama has records of 14 different species of *Rhyacophila* Pictet, 1834. In the Chipola, *R. carolina* Banks, 1911 was found only at three spring-fed streams in the middle and lower parts of the basin. Numbers were low in these collections (1–4 individuals), and adults were collected only in May, although the Florida flight season for this species is known to extend from March to December (Pescador et al. 2004). This species occurs throughout most of Alabama (Harris et al. 1991), but is restricted to the Panhandle within Florida.

#### Family Sericostomatidae

Although the family Sericostomatidae contains three genera in North America, only *Agarodes* Banks, 1899 is known from Alabama and Florida. Keth and Harris (2008) listed six members of this genus from both Alabama and Florida. In the Chipola basin, we found two of the relatively widespread and common species: *A. crassicornis* (Walker, 1852) and *A. libalis* Ross & Scott, 1974. The former species was found at five different small to medium-sized darkwater stream sites in the middle basin, only one specimen being collected at each location. The latter species was slightly more common,

collected from six such stream sites (including four of the same ones where *A. crassicornis* was found), 1–5 individuals taken per sample. Both species were collected only in May in the Chipola basin, but both Harris et al. (1991) and Pescador et al. (2004) indicate broader flight seasons for Alabama and Florida, respectively.

#### DISCUSSION

The families Leptoceridae, Hydroptilidae, Hydropsychidae, and Polycentropodidae accounted for 77% of the diversity of all species collected. The first three of these families were also the most abundant, in terms of numbers of individuals identified. The Psychomyiidae, although made up of only two species in the Chipola basin, were more abundant than the Polycentropodidae, with 2,054 individuals identified, compared to only 1,235 polycentropodids. The families Brachycentridae, Philopotamidae, and Phryganeidae were fairly common as well, each accounting for 3% of the total species richness. The other 11 families each made up 2% or less of the total species count.

Overall, the results did not suggest substantial variability in species composition between the different types of water bodies or stream reaches sampled. There were, however, a few apparent differences. Although most of the caddisfly species collected from lentic locations were also found at lotic ones, six species were entirely or almost entirely confined to standing water habitats. These included four leptocerids, *Ceraclea limnetes*, *Ceraclea* n. sp., *Oecetis porteri*, and *Triaenodes florida*, all of which are known only from Florida and in some cases closely adjacent areas of neighboring states. The hydroptilid *Oxyethira sininsigne* and the polycentropodid *Cernotina truncona* were collected only from two ponds in the middle Chipola basin. These two species have wider ranges, being known for several southeastern states (Harris et al., 1991). Most of the caddisfly species collected from areas with limestone outcroppings were also present at other habitats, but there were seven taxa that were found exclusively or almost exclusively at calcareous sites, namely *Helicopsyche borealis*, *Micrasema rusticum*, *Psychomyia flavida*, *Nyctiophylax celta*, *Oecetis avara*, *Setodes chipolanus*, and *Setodes guttatus*. In the main stem of the river, taxa richness ranged from a high of 62 species at the most upstream site at SR 162 to a low of 23 species at the site at Magnolia Road in the middle portion of the basin. In general, taxa richness decreased from upstream to downstream.

Within the Chipola River basin, family distribution varied substantially. Whereas the more common families (Hydropsychidae, Polycentropodidae, Hydroptilidae, Leptoceridae, and Philopotamidae) occurred throughout the basin, others were more limited in distribution. The family Dipseudopsidae (genus *Phylocentropus*) ranged throughout most of the basin, but was not collected



at the southernmost site, which is a large, wide river location unlike the smaller sandy streams characteristic of these species. Several caddisfly families were found only in the middle, more calcareous, portion of the basin. These included Limnephilidae, Phryganeidae, Calamoceratidae, Molannidae, Helicopsychidae, Sericosomatidae, Brachycentridae, and Glossosomatidae. The Rhyacophilidae (in this case *Rhyacophila carolina*) were collected only from three small streams in the lower part of the middle basin. The families most limited in distribution were the Odontoceridae (*Psilotreta frontalis*) and Lepidostomatidae (*Lepidostoma carrolli*), each of which was collected from only one small ravine stream near the Jackson/Calhoun county border in Florida.

As noted, the Chipola River basin has long been identified as a center of both biodiversity and endemism in the Florida panhandle. This observation is additionally substantiated by the results of this survey. Ten of the species collected have been reported nowhere else in the state of Florida, namely *Cheumatopsyche miniscula*, *Hydropsyche alabama*, *Hydroptila gunda*, *Hydroptila metteei*, *Ironoquia kaskaskia*, *Lepidostoma carrolli*, *Psychomyia flavida*, *Protoptila* n. sp., *Setodes chipolanus*, and *S. guttatus*. In addition, three of these (*H. alabama*, *Protoptila* n. sp., and *Setodes chipolanus*) are only known from the Chipola River basin. These results further make the case that protection and preservation of the Chipola River watershed and its distinct and substantial biodiversity should be a priority for Florida and Alabama environmental regulatory agencies and other government entities, as well as anyone who lives, works, or plays in this unique watershed.

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