

Status Assessment of Five Species of Trichoptera

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SUMMARY

The following report provides conservation status assessments for 5 caddisfly (Insecta: Trichoptera) species for which the U. S. Fish and Wildlife Service is conducting 12-month Findings to determine if federal listing of these species is warranted under the U.S. Endangered Species Act. Data were compiled and updated for each species and summarized in terms of species taxonomy, habitats and biology, geographic distribution, and current conservation status. A limited field survey was conducted at selected sites where the species have been collected in the past.

Based on the results of this study, it was concluded that *Lepidostoma morsei* Weaver and *Oxyethira setosa* Denning are extant throughout most of their ranges and appear to be secure at this time. It is unclear at this time if *Agarodes logani* Keth & Harris and *Triaenodes tridonta* Ross are extant or extinct. Additional field work is needed to determine if isolated populations still persist. *Hydroptila sykorai* Harris, a microcaddisfly, has now been reported at 2 locations, but additional field surveys utilizing multiple collection techniques are needed to adequately assess its conservation status.

INTRODUCTION

The following final report assesses the conservation status of 5 species of Trichoptera (caddisflies): *Agarodes logani* Keth & Harris 1999, *Hydroptila sykorai* Harris 2002, *Lepidostoma morsei* Weaver 1988, *Oxyethira setosa* Denning 1947, and *Triaenodes tridonta* Ross 1938. The study was funded through a non-personnel services contract from the U.S. Fish and Wildlife Service's (USFWS) Panama City Ecological Services Field Office. The contract period was from February 2015 to January 2016. The overall goal of the study was to address information needs for 5 species of caddisflies included in a petition put forth in 2010 by the Center for Biological Diversity and 6 southeastern conservation groups asking the USFWS for protection of 404 aquatic species under the U.S. Endangered Species Act.

Objectives

The scope of the contract set forth the following specific objectives:

- i) Status of species (populations are: increasing, stable, decreasing across habitat range)
 - a) Historical data (public and private sources)
 - b) Current data (field surveys, public and private sources)
- ii) Distribution maps of species range
- iii) Identification of threats to species and / or habitats
- iv) Recommended conservation actions
 - a) Identification of critical lands needed for conservation of species
 - b) Inadequacy of existing regulatory mechanisms
- v) Continued research needs for data gaps identified by this contract

METHODS

Data Sources

For each of the 5 species of caddisflies addressed in the study, pertinent data were compiled from literature sources as well as unpublished sources. Data sources included collection records from primary literature on species taxonomy, as well as faunal surveys presented in journal articles and graduate theses/dissertations. Secondary literature including various government reports and conservation status reviews were also consulted.

Personal communications were used to obtain additional important specimen collection data; the unpublished collection records of Rasmussen and Harris were used to update the current knowledge of species distributions. Data sources and literature citations are presented in the individual species accounts. Data from the field survey were used to supplement the pre-existing data.

Faunal Survey (Appendix A, Appendix B)

A limited field survey using light traps was carried out to determine if the 5 species are currently extant at selected sites. The field survey was conducted as follows: 5 samples targeting *Triaenodes tridonta* were collected 23-April-2015 at 5 streams within Clarke County, Alabama; four samples targeting *Agarodes logani* and *Hydroptila sykorai* were collected 15-May-2015 along a headwater stream of Quincy Creek in Gadsden County, Florida; and 4 samples targeting *Lepidostoma morsei* were collected 21-October-2015 along 2 streams located in southern Mississippi. *Oxyethira setosa* was not specifically targeted in the field survey due to its widespread occurrence at numerous sites in coastal plain Alabama and the western Florida panhandle.

Light-trap samples were collected by attracting adult caddisflies to light at night and trapping them in pans of alcohol. Light traps consisted of 15-watt UV-blacklights (BioQuip® Item No. 2805) placed over white pans (30 cm x 25 cm) containing 80% ethyl alcohol. The lights were powered by 12-volt, sealed rechargeable batteries. Traps were placed near the water's edge and deployed for 1–3 hrs beginning at dusk. After trapping, the contents of the pans were poured into 0.5-gallon plastic containers and returned to the laboratory for processing. Field notes on weather conditions and observations regarding habitat type and condition were recorded at the time of each sampling. Photographs were taken at each of the sampling sites.

Caddisflies collected in the light-trap samples were removed and specimens, primarily males, were identified to species level. Representative specimens of each caddisfly species in the sample were placed in separate vials of alcohol along with locality and determination labels. Macro-caddisfly species were sorted and identified by A.K. Rasmussen and the micro-caddisfly specimens (Family Hydroptilidae) were sorted and identified by S.C. Harris. Collection records for all species collected in the field survey were tabulated and are presented in Appendix B. Voucher specimens were deposited in the collections maintained by the authors.

Analysis

The following species accounts provide a summary of each species taxonomic history, habitat and biology, and geographic distribution. For each species, all known collection occurrences are summarized in a data table and plotted on a map. The conservation status of each species is discussed and assessed based on all available data. Recommendations are made for additional studies to fill existing data gaps.

RESULTS AND DISCUSSION

Agarodes logani Keth & Harris, 1999 Logan's *Agarodes* Caddisfly

Taxonomic Summary

Keth and Harris (1999) provided descriptions of the adult male and female. The immature stages of this species are currently unknown. The male and female of *Agarodes logani* are most similar in appearance to *Agarodes standardi* Ross, but the 2 species can be reliably distinguished using the figures and diagnosis provided by Keth and Harris (1999). Essentially the same figures and description of *Agarodes logani* were presented later by Keth and Harris (2008) in a review of the North American species of *Agarodes*.

The collection information of the holotype was listed by Keth and Harris (1999) as follows: "Florida, Gadsden County, headwaters of Quincy Creek, 7 km. north Quincy at Florida A&M Research and Extension Center, N30°39'27", W84°36'50", 19 April 1994, Pescador and Rasmussen." The description of the male and female provided by Keth and Harris (1999) was based on 2 males and 1 female collected from 2 closely situated sites along the same stream. In addition to specimens collected using UV-blacklight pan traps, Rasmussen (2004) reported collecting 1 male specimen in 1998 using an emergence trap placed over the stream at the type locality. The Keth and Harris (2008) publication listed an additional 2 specimens collected from the same stream.

Habitat and Biology

Species in this genus are believed to have a univoltine (one year) life cycle, but unlike most Trichoptera, which have 5 larval instars, *Agarodes* species (and other members of this family) are believed to have more than 5 instars (McEwan 1980). Larvae of *Agarodes* species are considered to be burrowing detritivores, and are generally restricted to small, spring-fed streams where they inhabit sandy deposits containing organic materials in areas of moderate flow (Wiggins 1996).

The stream from which *Agarodes logani* adults were collected is a 1st/2nd order stream fed by seepage springs within a slope/bottomland forest of mixed hardwoods and pines with an understory of mountain laurel (*Kalmia latifolia* L.) and Florida star anise (*Illicium floridanum* Ellis). The adults were collected from late March to June, and 1 female was collected in October, suggesting that this species has an extended adult emergence period (Rasmussen 2004). At least 2 other *Agarodes* species occur in this stream (*Agarodes libalis* Ross & Scott and *Agarodes crassicornis* (Walker), with *A. crassicornis* being the most common and abundant species collected in the most recent field survey (Appendix B).

Distribution

(Table 1, Figure 1)

Agarodes logani is known from only a single stream, which is a headwater stream of Quincy Creek (Gadsden Co., FL) within the Ochlockonee River Basin located in the eastern portion of

the Florida panhandle approximately 25 miles NNW of Tallahassee. The species was collected from 2 locations, one near a ravine head and another site approximately 1000 feet farther downstream. The stream where *A. logani* was collected flows through a forested ravine that bisects an active farm comprising the Florida A&M University Research and Education Center. Collection accounts of *A. logani* were reported by Keth and Harris (1999, 2008), Rasmussen (2004), and summarized by Pescador et al. (2004)

Table 1. *Agarodes logani* – Summary of collection information.

State:County	Water Body	Date	No/Sex	Source	Lat. Long.
FL: Gadsden	FAMU Farm Stream	Jun-1993	1M, 2F	(Keth & Harris 2008)	N30.6548°, W-84.6141°
FL: Gadsden	FAMU Farm Stream	6-Oct-1993	1F	(Keth & Harris 1999)	N30.6548°, W-84.6141°
FL: Gadsden	FAMU Farm Stream	19-Apr-1994	2M	(Keth & Harris 1999)	N30.6574°, W-84.6147°
FL: Gadsden	FAMU Farm Stream	17-May-1994	1M	FAMU	N30.6574°, W-84.6147°
FL: Gadsden	FAMU Farm Stream	30-Mar-1995	5M	Harris data	N30.6574°, W-84.6147°
FL: Gadsden	FAMU Farm Stream	12-Apr-1998	1M	(Rasmussen 2004)	N30.6574°, W-84.6147°



Figure 1. Collection localities for *Agarodes logani*.

Conservation Status

Agarodes logani was designated as critically imperiled by NatureServe (2015) and ranked as G1, N1/N2 (USA), and S1 (Florida). The G1 designation is due to the rarity of this species which has been collected in small numbers from only 1 stream that is potentially impacted by agricultural activities of the surrounding Florida A&M University farm. The species is known from less than 15 specimens, and it was last collected in 1998.

In May 2015 Rasmussen re-visited the FAMU farm stream to determine if the species still occurs at this locality. During the visit, light-trap samples of adult caddisflies were collected at 4 locations (Appendix A). The field survey (Appendix B) failed to recover any specimens of *A. logani*. The fact no specimens were collected may be because the species is now extirpated or extinct. To resolve the question as to whether *A. logani* is currently extant or extinct will require additional field collection efforts.

During field reconnaissance in May 2015, Rasmussen observed that the FAMU farm stream habitat had been negatively impacted within the last 10 years due to activities at the Florida A&M University farm that included clearing the fence line which crosses sensitive ravine habitat along the North boundary of the property. However, during extensive hiking through the area Rasmussen also observed a good deal of high-quality seepage stream habitat remains in the streamshed, which should support a healthy community of aquatic organisms, including ravine habitat specialists such as *A. logani*.

The conservation status of *A. logani* remains unclear until further investigations can determine with certainty if the species is still extant. It should be noted that other species in the genus *Agarodes* are also extremely rare, as is the case with *Agarodes alabamensis* Harris and *Agarodes tuscaloosa* Keth & Harris, each of which is known from only 2 male specimens collected at single localities. Extensive follow-up light trapping by Harris and colleagues targeting both species at the type localities and nearby watersheds also failed to yield additional specimens (Harris 1987; Keth and Harris 1999).

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***Hydroptila sykorai* Harris, 2002**
Sykora's Hydroptila Caddisfly

Taxonomic Summary

Harris (2002) described the species based on the adult male. The male according to Harris (2002), is very similar in overall appearance to *Hydroptila ouachita* Holzenthal & Kelley, which was described from Schoolhouse Spring, Jackson Parish, Louisiana, but the 2 species are readily distinguished based on differences observed in the male genitalia. The female and immature stages of this species are currently unknown. *Hydroptila sykorai* was described based on 5 males all collected from an emergence trap. The collection information of the holotype specimen listed by Harris (2002) was as follows: "Florida. Gadsden County: headwaters of Quincy Creek, 7 km N Quincy at Florida A&M Research and Extension Center, 30°39'27" N, 84°36'50" W, 7 June 1999, A. Rasmussen, emergence trap." The type locality is also referred to as the "FAMU Farm Stream" in other collection accounts. The species was reported recently from a second stream by Heupel (2014).

Habitat and Biology

Hydroptila sykorai is a member of the family Hydroptilidae, which are also referred to as microcaddisflies due to their very small size (2-5mm in length). Larvae are primarily algal feeders and the last instars of *Hydroptila* spp. typically construct a larval case of 2 silken valves covered usually with a layer of fine sand (Wiggins 1996). Hydroptilids have diverse life history strategies with some species undergoing a one-year life cycle, whereas other species are known to have two or more generations per year (Wiggins 1996).

The specifics of the biology and life history of *H. sykorai* have not been studied. Of note is the fact that Rasmussen (2004) collected *H. sykorai* from an emergence trap and *not* from light traps that were deployed at the type locality, which suggests that this species is not readily attracted to UV-blacklight, as are most species of Trichoptera, including other *Hydroptila* species.

The streams near which *Hydroptila sykorai* adults were collected are 1st /2nd order streams fed by seepage springs within slope/bottomland forests of mixed hardwoods and pines with an understory of mountain laurel (*Kalmia latifolia* L.) and Florida star anise (*Illicium floridanum* Ellis). The adults that were the basis for the species description were taken from an emergence trap placed over a small springrun located about 20 meters below a ravine head (Rasmussen 2004). Single male specimens were collected on 5 dates that ranged from mid-January 1999 to late June 1999 (Table 2).

Distribution

(Table 2, Figure 2)

The species is currently known from only 2 spring-fed headwater streams, within the Ochlockonee River and Apalachicola River basins in Gadsden County, Florida. The type locality is a seepage stream that flows through a forested ravine that bisects an active farm comprising

the Florida A&M University Research and Education Center. The second locality, where the species was taken in a light-trap sample on 3 November 2012, is below an impoundment along a spring-fed ravine stream approximately 15 miles SW of the type locality (Heupel 2014). Collection accounts of *Hydroptila sykorai* were reported by Harris (2002), Rasmussen (2004), and Heupel (2014), and summarized in checklists by Pescador et al. (2004) and Harris et al. (2012).

Table 2. *Hydroptila sykorai* – Summary of collection information.

State:County	Water Body	Date	No/Sex	Source	Lat. Long.
FL: Gadsden	FAMU Farm Stream	17-Jan-1999	1M	(Harris 2002)	N30.6574°, W-84.6147°
FL: Gadsden	FAMU Farm Stream	20-Mar-1999	1M	(Harris 2002)	N30.6574°, W-84.6147°
FL: Gadsden	FAMU Farm Stream	4-May-1999	1M	(Harris 2002)	N30.6574°, W-84.6147°
FL: Gadsden	FAMU Farm Stream	7-Jun-1999	1M	(Harris 2002)	N30.6574°, W-84.6147°
FL: Gadsden	FAMU Farm Stream	21-Jun-1999	1M	(Harris 2002)	N30.6574°, W-84.6147°
FL: Gadsden	Spring Canyon Ck.	3-Nov-2012	3M	(Heupel 2014)	N30.5612°, W-84.8451°

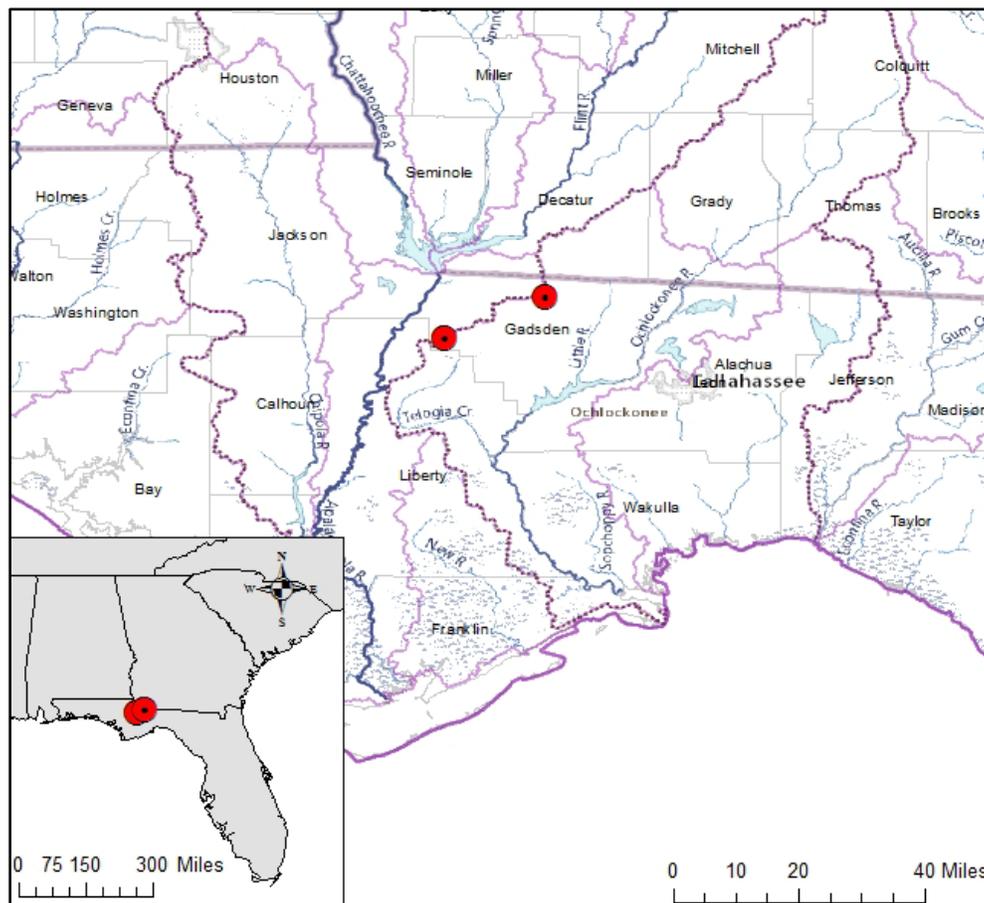


Figure 2. Collection localities for *Hydroptila sykorai*.

Conservation Status

Hydroptila sykorai was designated as critically imperiled by NatureServe (2015) and ranked as G1, N1(USA), and S1 (Florida). The G1 designation is because of the rarity of this species,

which was previously known from only 1 stream within an area that is potentially impacted by agricultural activities of the surrounding Florida A&M University farm. Because the species was recovered in 2012 from a second stream, this suggests that the species is still extant and more widespread than previously thought.

During field reconnaissance in May 2015, Rasmussen observed that the FAMU farm stream habitat had been negatively impacted within the last 10 years due to activities at the Florida A&M University farm that included clearing the fence line which crosses sensitive ravine habitat along the North boundary of the property. However, during extensive hiking through the area Rasmussen also observed a good deal of high-quality seepage stream habitat remains in the streamshed, which should support a healthy community of aquatic organisms, including ravine habitat specialists such as *H. sykurai*.

It should be noted that there are numerous hydroptilid species known based on only one, or a few specimens, collected at single localities. This is likely in large part a function of the enormous species diversity of the family, small size of the insect, cryptic habits, and difficult taxonomy. Because of the inadequate knowledge of this species' geographic distribution and population health, the conservation status of *H. sykurai* is unclear at this time.

To fill in critical information gaps, additional field collection methods utilizing emergence traps and sweep netting are needed to better understand the species current geographic distribution. Additionally, field collections and rearing of *Hydroptila* larvae at the type locality are needed to associate the larva and pupa with the adult stage.

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***Lepidostoma morsei* Weaver, 1988**
Morse's Little Plain Brown Sedge

Taxonomic Information

Lepidostoma morsei was described by Weaver (1988) based on 2 adult male specimens collected in Mississippi and Florida. The female and immature stages remain unknown. This species is a member of the *vernale* Group (Weaver 2002); males and females of other species within the *vernale* Group were described by both Weaver (1988) and Flint and Wiggins (1961).

The species is most closely related to *Lepidostoma griseum* (Banks). Males of the 2 species can be reliably distinguished based on differences in Segment X of the male genitalia (Weaver 1988). Collection information of the holotype listed by Weaver (1988) was as follows: "MISSISSIPPI: Stone Co: U.S. Forest Lands, male, 19 October 1984, PK Lago." The single male paratype was recorded as follows, "FLORIDA: Walton Co: Portland, Little Alaqua Cr, male, 18 October 1970, PHC." with the annotation, "some of the locality information as labeled is questionable (pers. comm. K. L. Manuel)."

Habitat and Biology

Lepidostoma larvae are typically associated with small, cool spring-fed streams where they live in areas of slow current and feed on detritus (Wiggins 1996). Early instars may construct cylindrical cases of sand grains, whereas late instars of most species construct a case, square in cross-section, of quadrate panels of leaf or bark material (Wiggins 1996).

Lepidostoma morsei appears to be restricted to cool-water refugia of the lower Gulf Coastal Plain. The recent adult collections from spring-fed ravine streams within the Apalachicola Bluffs and Ravines Preserve and the recent captures of this species from small spring-fed streams on Eglin Air Force Base and in southern Mississippi, suggest that *L. morsei* requires intact deciduous forest drained by spring-fed headwater streams.

Lepidostoma latipenne (Banks) was found to co-occur with *L. morsei* at streams within the Apalachicola Bluffs and Ravines Preserve, but adults of *L. latipenne* were collected throughout much of the year, unlike *L. morsei* (previously reported as *L. griseum*) which emerges only in the fall season (Rasmussen 2004). Larval cases of *Lepidostoma*, presumably *L. latipenne* and/or *L. morsei*, collected from these streams were four-sided panel cases of quadrate pieces of bark or leaf. Adults of *L. morsei* have been captured only in the fall season and the species most likely has a one-year life cycle.

Distribution

(Table 3, Figure 3)

Lepidostoma morsei has been reported in the literature from Mississippi, Florida, and Texas (Rasmussen and Morse 2014). NatureServe (2015) listed the species also from New Jersey. However the report from New Jersey could not be confirmed, hence it is not included in the

collection summary. The species appears to be restricted to the lower Gulf Coastal Plain in isolated populations in East Texas, southern Mississippi, and in parts of the Florida panhandle.

Besides the holotype from Mississippi and 1 paratype specimen from Florida (Weaver 1988), the only other published records of this species were presented by Abbott et al. (1997) in a checklist of the aquatic insects of the Big Thicket Region of East Texas, and by Moulton and Stewart (1997) in a preliminary checklist of Texas caddisflies. Neither of these publications provided specific collection information. It was determined that the Texas specimens were deposited in the Elm Fork Natural Heritage Museum (EFNHM) at the University of North Texas in Denton. The 2 specimens (see Table 3) in the EFNHM were placed on loan to Rasmussen, and after careful examination their taxonomic identity was verified.

During the course of examining the Texas specimens, Rasmussen re-examined specimens from Florida that were previously recorded as *L. griseum* in Pescador et al. (1995, 2004) and Rasmussen (2004). After careful reexamination, and comparison of the specimens with actual *L. griseum* from northern Alabama, it was concluded that all Florida specimens previously identified as *L. griseum* are actually *L. morsei*. The discovery of the misidentifications adds 7 new occurrences of *L. morsei* from Florida, including 1 new occurrence in Walton County and 6 occurrences in Liberty County (Table 3).

The locality record of the holotype provided by Weaver (1988) only stated the species was collected from U.S. Forest lands in Stone County, Mississippi. The collector of the holotype specimen, Dr. Paul K. Lago (University of Mississippi), was contacted to learn more regarding the collection event. Dr. Lago consulted his field notes and provided very useful additional information regarding the site where the specimen was collected.

On October 21-22, 2015 Rasmussen traveled to type locality, as described by Dr. Lago, in southern Mississippi and collected 4 light-trap samples (Appendix A) from in-and-around the type locality in the Red Creek Wildlife Management Area. *Lepidostoma morsei* (1 male at Site M1) was recovered (Appendix B) from a stream (see photo on page 14) very near where the holotype specimen was collected in 1984. In addition, 8 female *Lepidostoma* were collected in this sample, which are likely to be *L. morsei*, but because females of *Lepidostoma* species are difficult to distinguish, it is possible the females represent another species. No male *L. morsei* were collected at the 3 other sites where samples were collected, although several female *Lepidostoma*, which may be *L. morsei*, were collected at 2 other sampling sites.



Collection site of *Lepidostoma morsei* along Little Creek (Site M1) in Stone County, Mississippi.

Lepidostoma morsei has been collected on Eglin Air Force Base in the western Florida panhandle from 2 headwater streams within the Alaquia Creek watershed, namely the paratype specimen collected (October 1970) from Little Alaquia Creek (exact locality unknown) and more recently in October 2006 from Bear Bay Branch. The other Florida specimens of *L. morsei* were all collected in the eastern portion of the panhandle in Liberty County from streams within The Nature Conservancy's Apalachicola Bluffs and Ravines Preserve.

The geographic range of *Lepidostoma morsei* extends as far West as eastern Texas. The western-most specimen was captured in October 1992 from Big Creek (6 miles South of Coldspring) within the Big Creek Scenic Area of the Sam Houston National Forest. The other Texas specimen was taken from Big Cow Creek (2 miles South of Newton). The 2 collection sites are approximately an 80-mile straight line distance from each other.

Table 3. *Lepidostoma morsei* – Summary of collection information.

State:County	Water Body	Date	No/Sex	Source	Lat. Long.
FL: Liberty	Beaver Dam Ck.	26-Oct-1995	2M	FAMU	N30.4869°, W-84.9844°
FL: Liberty	Kelley Branch	26-Oct-1995	3M, 2F	FAMU	N30.4689°, W-84.9642°
FL: Liberty	Kelley Branch	2-Nov-2012	9M	FAMU	N30.4683°, W-84.9656°
FL: Liberty	Little Sweetwater Ck.	26-Oct-1995	2M, 1F	FAMU	N30.4725°, W-84.9856°
FL: Liberty	Little Sweetwater Ck.	26-Oct-1995	2M, 1F	FAMU	N30.4797°, W-84.9503°
FL: Liberty	Little Sweetwater Ck.	2-Nov-2012	9M, 1F	(Heupel 2014)	N30.4761°, W-84.9731°

FL: Walton	Bear Bay Branch	17-Oct-2006	1M	FAMU	N30.6867°, W-86.2719°
FL: Walton	Little Alaqua Ck.	18-Oct-1970	1M	(Weaver 1988)	N30.6387°, W-86.2583°
MS: Stone		19-Oct-1984	1M	(Weaver 1988)	N30.7333°, W-88.9277°
MS: Stone	Little Ck.	21-Oct-2015	1M	FAMU	N30.7411°, W-88.9228°
TX: Newton	Big Cow Ck.	24-Oct-1992	1M	EFNHM	N30.8188°, W-93.7859°
TX: San Jacinto	Big Ck.	27-Oct-1995	1M	EFNHM	N30.5064°, W-95.0879°

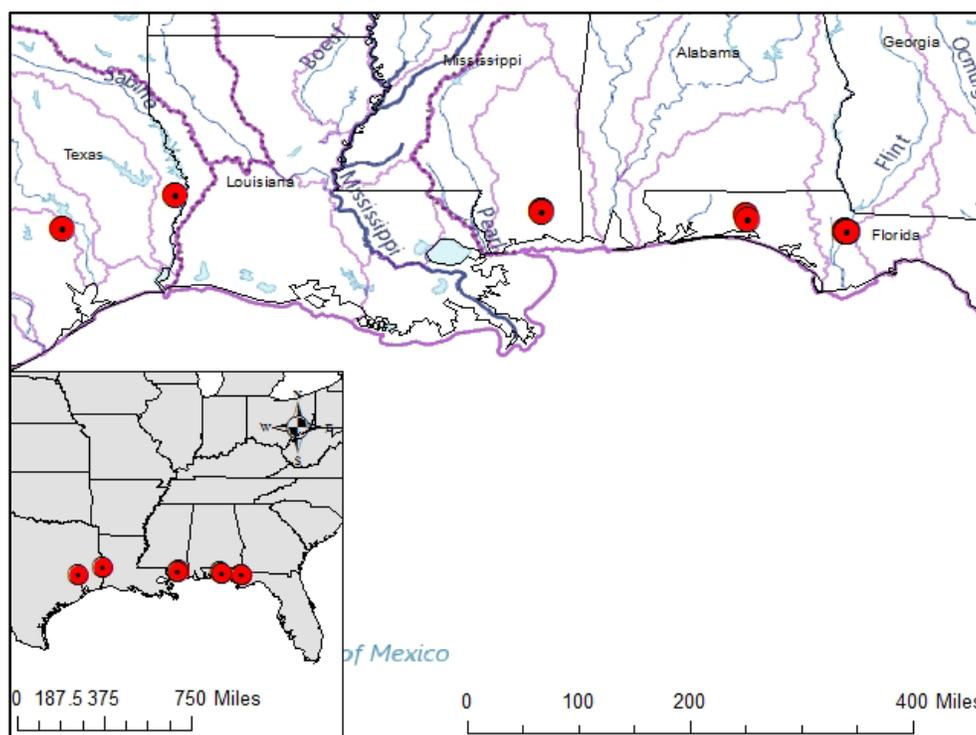


Figure 3. Collection localities for *Lepidostoma morsei*.

Conservation Status

Lepidostoma morsei was designated as imperiled by NatureServe (2015) and ranked as G2G3, N2N3(USA), and S1 (Florida). The conservation status of this species was previously reviewed by Morse (1994) and designated as “Threatened” in Florida because at the time the species was known only from the type locality in Mississippi and the paratype locality in Walton County, Florida. Morse (2015) went on to note that the species is at the southeastern limits of the genus and thus may experience ecologically stressful conditions within its range. Rasmussen et al. (2008) also reviewed the conservation status of the *L. morsei* in Florida and concluded that the species should remain as a “species of greatest conservation need” in Florida due to the rarity of the species and uncertainty (at the time) if the species was still extant in Florida.

Lepidostoma morsei appears to be extant in localized areas within eastern Texas, southern Mississippi, and the Florida panhandle. Most of the stream habitat supporting known populations within Mississippi, Florida, and Texas lie within National Forests of Texas (Sam Houston NF) and Mississippi (De Soto NF), and in Florida within a large military reservation (Eglin Air Force

Base) and The Nature Conservancy Apalachicola Bluffs and Ravines Preserve. As long as the headwater stream habitat remains protected in these areas, the species should be secure.

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***Oxyethira setosa* Denning, 1947**
Setose Cream and Brown Mottled Microcaddisfly

Taxonomic Information

Oxyethira setosa was described originally by Denning (1947) based on 2 male specimens collected from an unspecified location in Macon, Georgia. The female and immature stages remain unknown. Collection information of the holotype and single paratype was listed as follows: “Macon, Georgia, June, 1944, H. R. Dodge.” Blickle (1979) included *O. setosa* in an illustrated key to the males of *Oxyethira* in North America and reported the species from an unspecified location in Florida. A key to females of *Oxyethira* species [not including *O. setosa*] from the southern United States was provided by Kelley and Morse (1982). Kelley (1984) presented an overview of the morphology and phylogeny of *Oxyethira* and placed *O. setosa* within a new subgenus, *Holarctotrichia*.

Habitat and Biology

Oxyethira setosa is a member of the family Hydroptilidae, also referred to as microcaddisflies due to their very small size (2-5mm in length). Larvae of the genus inhabit lakes and streams often in association with aquatic macrophytes and filamentous algae (Wiggins 1996). Final instar *Oxyethira* construct a unique, flask-shaped case composed entirely of silk. Hydroptilids have diverse life history strategies with some species undergoing a one-year life cycle, whereas other species, including species of *Oxyethira*, are known to have two or more generations per year (Wiggins 1996).

Because the immature stages of *O. setosa* are unknown, little can be said about its life-history other than what little can be inferred from adult collection data. Adults of *Oxyethira setosa* have been collected primarily along small to medium-sized sand-bottomed streams. Adults were most often taken in May and June, indicating adult emergence occurs primarily in the spring.

Distribution

(Table 4, Figure 4)

Oxyethira setosa has been recorded from Alabama, Florida, and Georgia (Rasmussen and Morse 2014). NatureServe (2015) also reported the species from New Jersey. However, the report from New Jersey could not be confirmed, hence it is not included in the collection summary.

Oxyethira setosa has been collected from streams scattered across much of the coastal plain of Alabama and the western Florida panhandle. The sole record from Georgia is the type collection from 1944 in central Georgia. The lack of collecting efforts in Georgia is probably why the species has not since been recorded in Georgia. Based on collections in southeastern Alabama, this species is likely to occur in streams of southwestern and central Georgia that have similar stream habitat as the collection sites in Alabama.

Field surveys of the Trichoptera of Alabama by Steve Harris, Pat O'Neil, and colleagues resulted in about 20 collection records across 13 counties (Autauga, Bibb, Clarke, Covington, Henry, Lauderdale, Lowndes, Marion, Mobile, Monroe, Russell, Tuscaloosa, Washington). Harris et al. (1991) summarized most of those records in a publication on the Caddisflies of Alabama. Prior to that, Harris (1986) reported *O. setosa* from unspecified locations in 8 of the aforementioned counties and indicated the species was uncommon in Alabama. The species was most recently reported in Alabama by Harris and O'Neil (2015) from 3 creeks in the lower coastal plain within the Mobile-Tensaw River Delta.

Oxyethira setosa is restricted in Florida to the western panhandle. Extensive light trapping throughout the region has resulted in only 13 collection records spread across 6 Florida counties. Harris et al. (1982) recorded the species from below a small impoundment on Rocky Creek on Eglin Air Force base, and Rasmussen (2004) reported the species from Beaver Dam Creek, a steephead ravine stream within The Nature Conservancy Bluffs and Ravines Preserve. Harris et al. (2012) in an annotated checklist of the Hydroptilidae of Florida reported the species from unspecified locations in 6 counties (from West to East): Santa Rosa, Walton, Washington, Jackson, Calhoun, and Liberty. The most recent Florida collections of *O. setosa* were collected during a field survey of the Trichoptera of the Chipola River Basin (Denson et al. in review).

Table 4. *Oxyethira setosa* – Summary of collection information.

State:County	Water Body	Date	No/Sex	Source	Lat. Long.
AL: Autauga	Autauga Ck.		1M	(Harris et al. 1991)	N32.6553°, W-86.5852°
AL: Bibb	Little Schultz Ck.	21-Jun-1991	1M	Harris data	N33.0313°, W-87.1000°
AL: Clarke	Fishers Ck.	30-Apr-1986	1M	Harris data	N31.6398°, W-87.7196°
AL: Covington	Blue Spring	12-Jun-1982	1M	Harris data	N31.0890°, W-86.5150°
AL: Covington	Five Runs Ck.	12-Jun-1982	1M	Harris data	N31.1070°, W-86.5174°
AL: Henry	Omusee Ck.	25-May-1989	1M	Harris data	N31.3323°, W-85.2304°
AL: Henry	Thomas Mill Ck. Trib.	25-May-1989	1M	Harris data	N31.6939°, W-85.1881°
AL: Lauderdale	Threet Ck.		1M	(Harris et al. 1991)	N34.9558°, W-87.8249°
AL: Lowndes	Dry Cedar Ck.		1M	(Harris et al. 1991)	N32.0766°, W-86.8301°
AL: Marion	Buttahatchee R.	28-Jun-1983	1M	Harris data	N34.1135°, W-87.7194°
AL: Mobile	Cedar Ck.		1M	(Harris et al. 1991)	N31.0566°, W-88.0741°
AL: Mobile	Grog Hall Ck.	24-Jun-1982	2M	Harris data	N31.0259°, W-88.0283°
AL: Mobile	Cedar Ck.	30-Apr-2003	3M	(Harris & O'Neil 2015)	N31.0629°, W-88.0886°
AL: Mobile	Grog Hall Ck.	30-Apr-2003	10M	(Harris & O'Neil 2015)	N31.0259°, W-88.0283°
AL: Monroe	Little River	11-May-1982	1M	Harris data	N31.2552°, W-87.4935°
AL: Russell	Uchee Ck.	17-May-1989	1M	Harris data	N32.3912°, W-85.2364°
AL: Tuscaloosa	Beatty Branch		1M	(Harris et al. 1991)	N33.1726°, W-87.3493°
AL: Tuscaloosa	Cripple Ck.	11-Aug-1981	1M	Harris data	N33.4788°, W-87.5658°
AL: Tuscaloosa	Mud Ck.	20-Jun-1991	1M	Harris data	N33.2495°, W-87.0685°
AL: Washington	Birch Branch	29-Apr-2003	1M	(Harris & O'Neil 2015)	N31.2626°, W-88.0385°
FL: Calhoun	Cypress Ck.	19-May-10	1M	(Denson pers. comm.)	N30.2778°, W-85.2428°
FL: Calhoun	Juniper Ck.	19-May-10	2M	(Denson pers. comm.)	N30.3589°, W-85.2133°
FL: Calhoun	Tenmile Ck.	19-May-10	4M	(Denson pers. comm.)	N30.5325°, W-85.2272°
FL: Calhoun	Tenmile Ck.	19-May-10	2M	(Denson pers. comm.)	N30.4997°, W-85.2000°
FL: Jackson	Mill Ck.	20-May-10	1M	(Denson pers. comm.)	N30.5878°, W-85.2258°
FL: Jackson	Pelt Ck.	6-May-10	2M	(Denson pers. comm.)	N30.6619°, W-85.2225°
FL: Liberty	Beaver Dam Ck.	22-Mar-95	1M	(Rasmussen 2004)	N30.4869°, W-84.9844°

FL: Santa Rosa	Weaver Ck.	26-May-04	1M	FAMU	N30.5131°, W-86.9142°
FL: Walton	Rocky Ck.	8-Jun-79	1M	(Harris et al. 1982)	N30.6596°, W-86.3306°
FL: Walton	unnamed stream	24-May-04	1M	FAMU	N30.6500°, W-86.1897°
FL: Washington	Whitewater Lake	6-Jun-09	1M	FAMU	N30.4803°, W-85.5547°
FL: Washington	unnamed ravine stream	6-Jun-09	1M	FAMU	N30.4794°, W-85.5539°
FL: Washington	unnamed ravine stream	6-Jun-09	1M	FAMU	N30.4728°, W-85.5497°
GA: Macon-Bibb		Jun 1944	2M	(Denning 1947)	N32.8408°, W-83.6674°

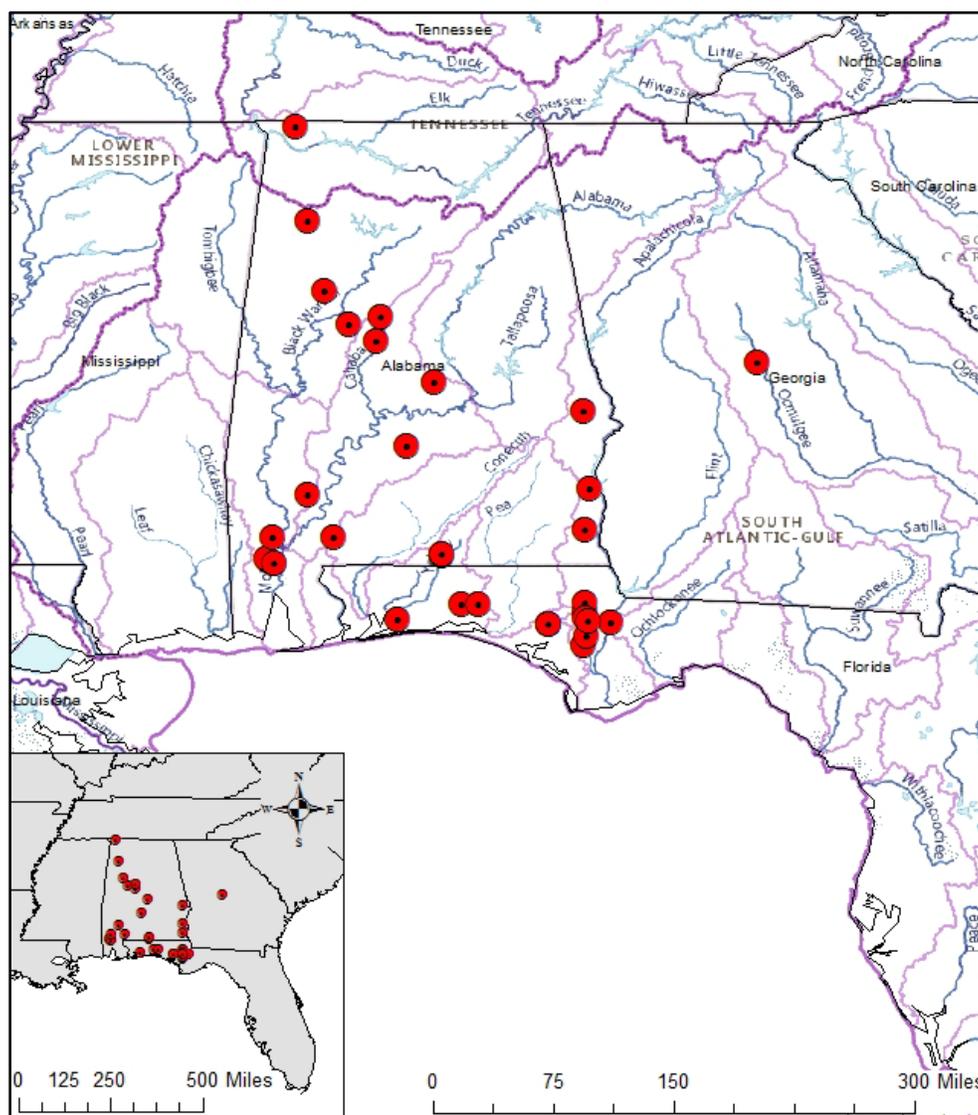


Figure 4. Collection localities for *Oxyethira setosa*.

Conservation Status

Oxyethira setosa was designated as imperiled by NatureServe (2015) and ranked as G2G3, N2N3(USA), and S1S2 (Florida). The conservation status of this species was previously reviewed by Morse (1994) and designated as “Rare” in Florida because at the time the species

was known from only 1 specified locality in Florida and considered uncommon or very rare elsewhere. In Alabama, Harris (1986) indicated the species was uncommon.

The capture of this species in light-trap samples from widespread localities over the past several decades suggests that the species is extant and secure throughout its range in Alabama and Florida. The lack of occurrences in Georgia is due most likely to the lack of collecting efforts in Georgia, rather than the species being extirpated in Georgia. Field surveys are needed in southwestern and central Georgia to determine if the species is extant in that part of its range.

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***Triaenodes tridonta* Ross, 1938**
Three Toothed Triaenodes Caddisfly

Taxonomic Information

Triaenodes tridonta was originally described by Ross (1938) based on a single male specimen collected from an unspecified location in Pushmataha County, Oklahoma. The collection information associated with the holotype was listed by Ross (1938) as follows: “Pushmataha County, Oklahoma: May 28, 1934, C.A. Soeler.” Subsequent evaluation of the holotype by Moulton and Stewart (1996) and Manuel (2010) indicated the holotype was collected April 28, 1934 *not* May 28, 1934.

Moulton and Stewart (1996) examined the holotype and illustrated the male genitalia, which has a distinctive trifid apex of the segment X when viewed in lateral aspect. Moulton and Stewart (1996) also described unsuccessful efforts to locate extant populations in the Kiamichi drainage in Pushmataha County. Moulton and Stewart (1996) and NatureServe (2015) spelled the species epithet as “tridontus”, however the correct and currently accepted spelling is the original “tridonta”.

The most recent and thorough taxonomic account of *T. tridonta* was presented by Manuel (2010) in his revision of the North American species of *Triaenodes*, wherein he described both the male and female of the species, based on the holotype, as well as specimens collected from coastal plain Alabama and the Florida panhandle. The immature stages remain unknown.

Habitat and Biology

Triaenodes is a member of the family Leptoceridae, also referred to as the long-horned caddisflies because of their long antennae. Larvae of *Triaenodes* can be found in both streams and standing water habitats depending on the species. In ponds and lakes they are often associated with aquatic macrophytes upon which they feed (Wiggins 1996). Larvae of *Triaenodes* construct a slender, tapered case of short lengths of plant materials which are arranged in a spiral pattern. Species of *Triaenodes* found in streams are often associated with root mats of riparian trees that have been exposed by the current (Glover 1996).

Because the immature stages of *T. tridonta* are unknown, little can be said about its life-history other than what can be inferred from adult collection data. The largest number of adults (16 specimens) was collected along a cool, sand-gravel bottom stream within intact forest of mixed hardwoods and pines. Rasmussen collected samples at the site in April 2015 but was unable to collect *T. tridonta*; however, he did collect *Triaenodes ignitus* (Walker) (a common widespread species) and *Triaenodes taenia* Ross, which is primarily a species of the southern Appalachians with disjunct populations found in cool-water refugia such as spring-fed streams on the lower coastal plain (Rasmussen 2004). All adult specimens of *T. tridonta* were collected in the month of April, indicating the adult emergence is limited to the spring season.

Distribution

(Table 5, Figure 5)

Triaenodes tridonta has been recorded from Alabama, Florida, and Oklahoma (Rasmussen and Morse 2014). The sole record from Oklahoma was the holotype captured in 1934 (Ross 1938; Bowles and Mathis 1992). The sole record from Florida was from Gulf County (Manuel 2010) and was based on a single male taken from Chipola Lake [now known as Dead Lakes] in Gulf County on 8-April-1927 by C. Betten (Manuel pers. comm.).

The Alabama specimens were collected by Harris and Pat O’Neil during their field surveys of the caddisflies of Alabama. Harris and Lago (1990) and Harris et al. (1991) reported 2 collections of the species from 2 cool, gravel-bottom streams within Clarke County, Alabama. Additionally, Manuel (2010) reported the species from an unspecified location in Perry County, Alabama. Manuel (pers. comm.) and O’Neil (pers comm.) provided specific collection data for the Alabama specimens, which were collected in 1985 and 1991.

In order to learn if the species is currently extant in Alabama, Rasmussen collected light-trap samples in Clarke County, Alabama on 23-April-2015 (Appendix A, B). Light-trap samples were collected from 5 streams, including the 2 streams sites (Little Bassett Creek and Stave Creek) where Harris collected the species in 1985. No additional specimens of *T. tridonta* were captured in any of the samples; however several other *Triaenodes* species were captured, including *T. aba* Milne, *T. ignitus*, *T. ochraceus* (Betten & Mosely) from the Little Bassett Creek sample, and *T. ignitus* and *T. taenia* from the Stave Creek sample.

Table 5. *Triaenodes tridonta* – Summary of collection information.

State:County	Water Body	Date	No/Sex	Source	Lat. Long.
AL: Clarke	Little Bassett Ck	27-Apr-85	1M	(Manuel pers. comm.)	N31.7667°, W-87.6927°
AL: Clarke	Little Stave Ck	27-Apr-85	2M, 14F	(Manuel pers. comm.)	N31.5508°, W-87.9302°
AL: Perry	Cahaba River	24-Apr-91	2M	(O’Neil pers. comm.)	N32.6690°, W-87.2415°
FL: Gulf	Dead Lakes	8-Apr-27	1M	(Manuel pers. comm.)	N30.1439°, W-85.1797°
OK: Pushmataha		28-Apr-34	1M	(Ross 1938)	N34.5287°, W-95.3252°

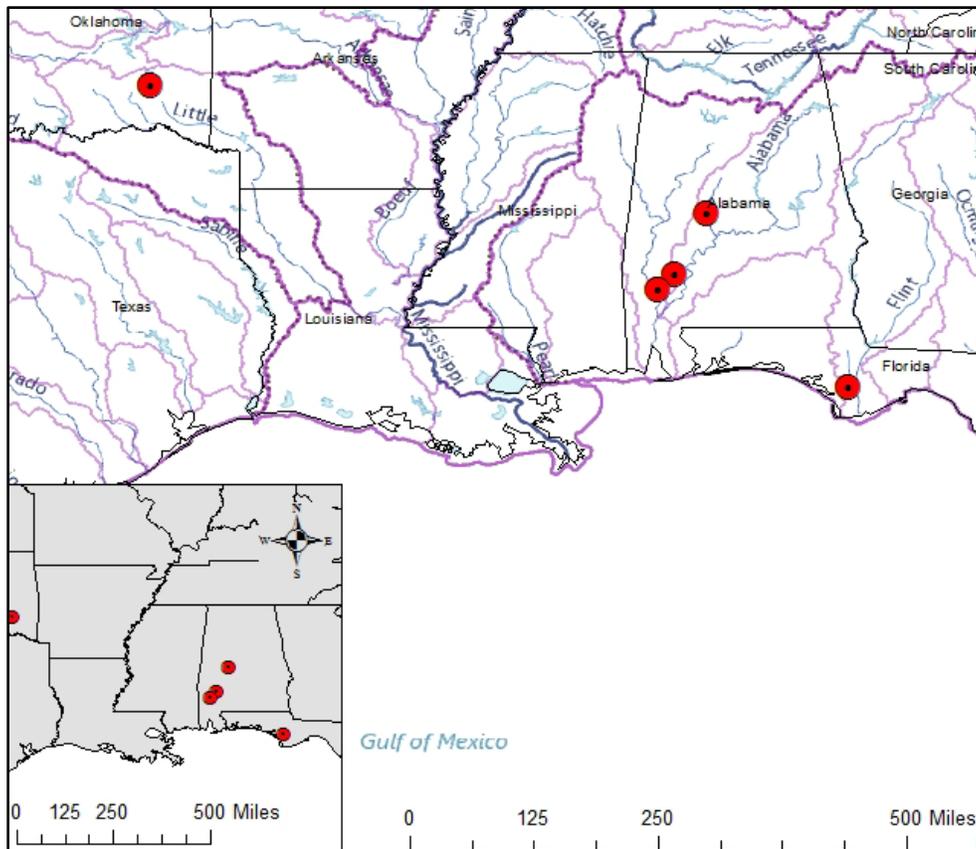


Figure 5. Collection localities for *Triaenodes tridonta*.

Conservation Status

Triaenodes tridonta was designated as imperiled by NatureServe (2015) and ranked as G1G3, N1N3(USA), S1 (Alabama), and SH [possibly extirpated] in Oklahoma. Harris (1990) reported that *T. tridonta* was rare and restricted in distribution based on the occurrence of this species from 2 sandy streams in Clarke County, Alabama.

The absence of *Triaenodes tridonta* in light-trap collections from streams in Florida and Oklahoma where the species was collected in 1927 and 1934, respectively, is strong evidence that the species no longer occurs across those parts of its range. The 3 collections taken from the Alabama streams in 1985 and 1991 suggest that the species may be extant within central and southern Alabama. However the lack of recent occurrences is cause for concern. Additional field surveys of Trichoptera from cool sand-gravel bottom streams in southwestern Alabama are needed to clarify the conservation status of *T. tridonta*. Stream habitat required by *T. tridonta* is potentially threatened by land-use practices associated with the extensive logging activities that are conducted throughout the region.

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APPENDIX A. Field site locations and dates when UV blacklight pan-trap samples were collected in the field survey. A complete listing of all species of Trichoptera identified from the light-trap samples is presented in Appendix B.

Site ID	State:County	Water Body	Date	Sampling Location	Latitude Longitude	Collectors
A1	AL: Clarke	unnamed stream	23-Apr-2015	Sugar Creek Drive	N31°46'30.8", W-87°41'16.8"	A. Rasmussen, R. Abad
A2	AL: Clarke	Little Bassett Creek	23-Apr-2015	County Road 30	N31°46'00.5", W-87°41'36.6"	A. Rasmussen, R. Abad
A3	AL: Clarke	Tattilaba Creek	23-Apr-2015	Bethlehem Road	N31°36'48.1", W-87°58'46.0"	A. Rasmussen, R. Abad
A4	AL: Clarke	Salt Creek	23-Apr-2015	Bolen Town Road	N31°33'51.1", W-87°57'05.8"	A. Rasmussen, R. Abad
A5	AL: Clarke	Stave Creek	23-Apr-2015	County Road 69	N31°33'30.7", W-87°41'16.8"	A. Rasmussen, R. Abad
F1	FL: Gadsden	FAMU Farm Stream	15-May-2015	near upper head	N30°39'26.9", W-84°36'55.6"	A. Rasmussen, W. Hawkins
F2	FL: Gadsden	FAMU Farm Stream	15-May-2015	middle section	N30°39'17.6", W-84°36'51.3"	A. Rasmussen, W. Hawkins
F3	FL: Gadsden	FAMU Farm Stream	15-May-2015	near South boundary	N30°39'09.2", W-84°36'50.3"	A. Rasmussen, W. Hawkins
F4	FL: Gadsden	Quincy Creek	15-May-2015	Shade Farm Road	N30°38'58.8", W-84°36'48.8"	A. Rasmussen, W. Hawkins
M1	MS: Stone	Little Creek	21-Oct-2015	headwaters, Red Creek Wildlife Management Area	N30°44'27.8", W-88°55'22.2"	A. Rasmussen
M2	MS: Stone	Little Creek	21-Oct-2015	lower section, Red Creek Wildlife Management Area	N30°45'58.5", W-88°55'16.7"	A. Rasmussen
M3	MS: Stone	Sandy Creek	21-Oct-2015	Cable Bridge Road	N30°44'59.0", W-88°57'15.3"	A. Rasmussen
M4	MS: Stone	Sandy Creek	21-Oct-2015	TV Tower Road	N30°45'13.5", W-88°57'13.3"	A. Rasmussen

Species	Alabama Sites					Florida Sites				Mississippi Sites			
	A1	A2	A3	A4	A5	F1	F2	F3	F4	M1	M2	M3	M4
<i>Triaenodes ignitus</i>		6	3		7		2	2	1				
<i>Triaenodes marginatus</i>			2										
<i>Triaenodes milnei</i>			3										
<i>Triaenodes ochraceus</i>	1	5											
<i>Triaenodes taenia</i>					1		2	1					
Limnephilidae													
<i>Pycnopsyche antica</i>										21	17	29	40
<i>Pycnopsyche lepida</i>										1		1	1
Molannidae													
<i>Molanna blenda</i>						72	15	2	2				
<i>Molanna tryphena</i>										5			1
Odontoceridae													
<i>Psilotreta frontalis</i>						60	32	2	26				
Phyganeidae													
<i>Ptilostomis postica</i>	1	1								1			
Sericostomatidae													
<i>Agarodes crassicornis</i>						6	6	4	1				
? <i>Agarodes griseus</i>						1							
<i>Agarodes libalis</i>									11				