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NEW RECORDS AND AN UPDATED CHECKLIST OF THE STONEFLIES (PLECOPTERA) FROM FLORIDA

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ABSTRACT

New state records of *Allocapnia starki* Kondratieff & Kirchner, *Isogenoides varians* (Walsh), and *Perlesta shubuta* Stark are presented for Florida. Ecological notes for Florida populations and additional new collection records for *Alloperla prognoides* Surdick & Stark and several other stonefly species are presented. Larvae and adults were collected in or along gravel stream reaches.

Keywords: *Allocapnia, Alloperla, Isogenoides, Perlesta,* gravel, hyporheic, stonefly, Southeastern Coastal Plain, streams

INTRODUCTION

Berner (1948) provided the first records of Florida Plecoptera. Stark & Gaufin (1979) gave descriptions and keys to 26 stonefly species known from Florida at that time. Ray & Stark (1981) and Stark & Ray (1983) added Perlodidae species to the state fauna before the most recent update by Pescador et al. (2000).

This study was initiated after the discovery of *Alloperla prognoides* Surdick & Stark in the hyporheic zone of western Florida Southeastern Coastal Plain streams (Ray et al. 2010). The objectives for this project were to document stoneflies from gravel stream reaches that may support hyporheic habitats and collect, rear and associate the larval and adult stages.

METHODS

Adult specimens were collected by using beating sheets on streamside vegetation and picked from leaf packs, woody material, and bridges or culverts. Larvae were collected from gravel and leaf pack substrata with a 500 micron mesh dip net and kick net, and transferred to white trays for sorting. Field collected larvae were either kept live for rearing or preserved in 80% ethanol for morphological study. Specimens were reared, sorted, labeled and identified by Florida team members; identifications were verified by B.P. Stark.

Voucher specimens are deposited in the aquatic insect collections at Florida A&M University, Florida Department of Environmental Protection biology laboratory in Tallahassee, and the personal collection of Bill P. Stark.

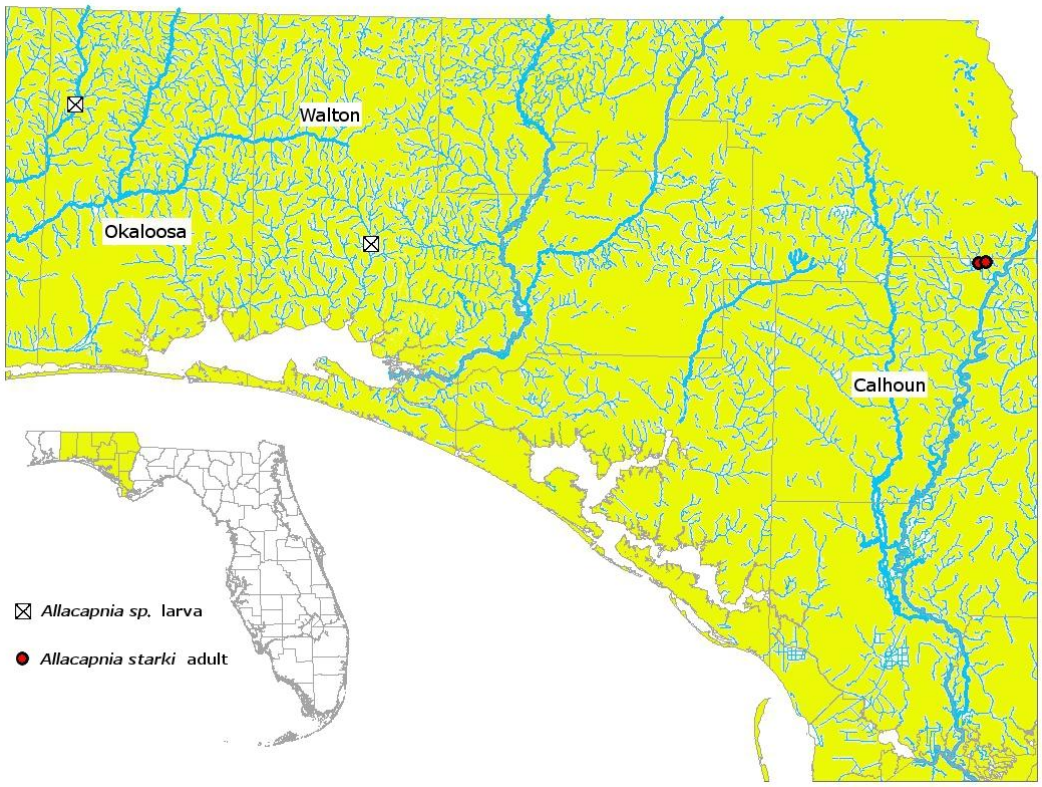


Fig. 1. Distribution of *Allocapnia starki* and *Allocapnia* in Florida.

RESULTS

New State Records

Allocapnia starki Kondratieff & Kirchner

Distribution. This species was known only from Mississippi and adjacent areas in Louisiana (Stark & Lacy 2005; Nations et al. 2007; Stark & Hicks 2009), until recently reported in the Cahaba River, Alabama (Graves & Ward 2011). Our records are the first reported for Florida (Fig. 1).

Material examined. FLORIDA: Calhoun Co., Jenkins Creek at CR 286, N 30°35′47″, W 84°59′28″, 20 January 2011, D. Ray, R. Abad, A. Rasmussen 12♂ (+1 larva ♂ reared), 12♀ (+2 larvae ♀ reared). Same site, 6 December 2005, M. Pescador, B. Richard, 8 larvae. Same site, 10 February 2005, A. Rasmussen, B. Richard, 3 larvae. Johnson Creek at CR 286, N 30° 35′45.3″, W 84° 59′27.8″, 20 January 2011, D. Ray, R. Abad, 54♂, 25♀, 36 larvae, (+4♂ & 3♀ reared). Same site, 6 December 2005, M. Pescador, B. Richard, 1 larva.

Remarks. Adult identifications were facilitated by using scanning electron microscopy (Figs. 4-9). The "hybrid flocks of ancestral and derived forms" of *A. recta* (Claassen 1924) designated by Ross & Ricker (1971) from sites along the Florida border in Escambia Co., Alabama, probably also represent *A. starki*. All larvae collected in January 2011 emerged between the 20th and 25th of January. The substrate for both Florida sites where *Allocapnia* larvae were found is gravel. Johnson Creek was gradually reduced to a series of isolated gravel substrate pools during the spring of 2011. Spring (April-June) in the Florida Panhandle is typically a dry season; this was exceptionally so during the first six months in 2011.

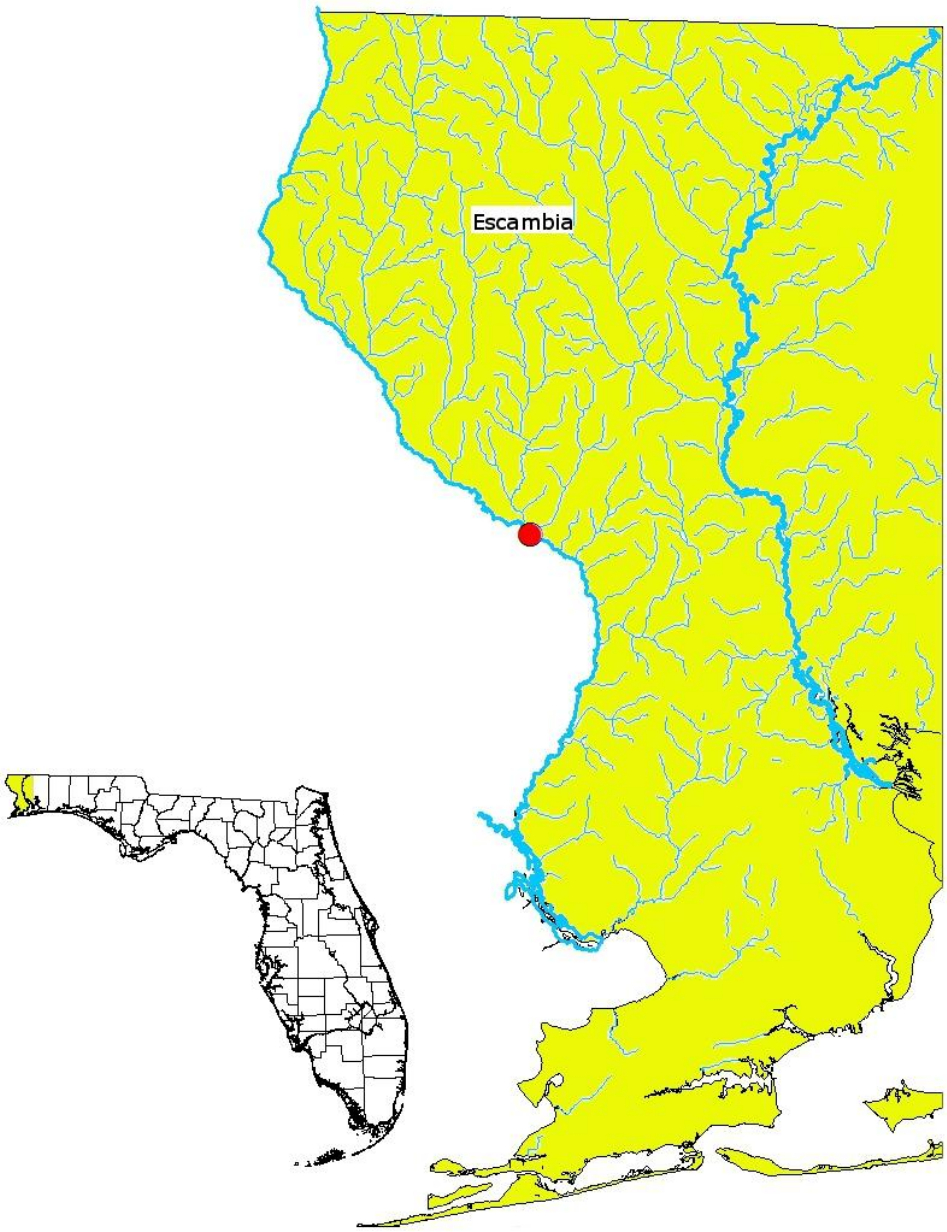


Fig. 2. Distribution of *Isogenoides varians* in Florida.

Isogenoides varians (Walsh)

Distribution. This species was previously known from Illinois, Indiana, Mississippi, North Carolina, South Carolina, Tennessee and Virginia (Stark & Stewart 2002; Sandberg 2005; Stark et al. 2009) but doubtful from Kansas, Michigan and Minnesota (Sandberg 2005). Our records from the Perdido River, which forms the boundary between Alabama and Florida (Fig. 2), are the first reports *Isogenoides varians* from these two states.

Material examined. FLORIDA: Escambia Co., Perdido River Barrineau Bridge off CR 97, N 30°41′25″, W 87 °26′25″, 14 December 2010, D. Ray,

R. Abad, 4 larvae, (1♀ penultimate instar exuviae molted on 2 February with exuviae reared 23 March 2011). Same site, 8 January 2011, D. Ray, R. Abad, 9 larvae (4♂ & 2♀ with exuviae reared 17 February-9 April). Same site, January 2011, D. Ray, R. Abad, B. Albrecht 9 larvae (2♂ & 2♀ penultimate instar ♀ exuviae molted on 5 February & ♂ exuviae molted on 7 February with exuviae reared ♀ 28 February - ♂ 9 April). Same site, 23 March 2011, D. Ray, R. Abad, M. King, 1 larva (♀ with exuviae reared 28 March).

Remarks. The collection site is on the middle reach of the Perdido River that forms the border between Florida and Baldwin County, Alabama. *Isogenoides varians* had not been recorded from Alabama (Grubbs 2011). *Isogenoides* larvae were collected in December 2010 through March 2011 and emerged beginning February 2011 through March 2011. Reared specimens were fed larval chironomids, simuliids, tipulids and mayflies from the collection site. The substrate where the *I. varians* larvae were collected consisted of gravel in riffles and high velocity (0.5-1.1 m/s) in the thalweg. *Isogenoides varians* larvae were not found in the slower reaches containing sand and fine silt deposits. The riparian forest at the collection site is an Atlantic white-cedar (*Chamaecyparis thyoides* (Linnaeus) Britton, et al.) community. Other stoneflies collected at this site include *Acroneuria* sp., *Hydroperla phormidia* Ray & Stark, *Helopicus bogaloosa* Stark & Ray, *Isoperla* sp B, *Neoperla* sp., *Nemocapnia carolina* Banks, *Paragnetina fumosa* (Banks), *Perlinella drymo* (Newman), *Pteronarcys dorsata* (Say), and *Taeniopteryx lonicera/lita*. *Hydroperla phormidia* had also not previously been recorded from Alabama (Grubbs 2011).

Perlesta Shubuta Stark

Distribution. Previously known from Arkansas, Illinois, Mississippi, Missouri, and Oklahoma (Stark 2004) and recently reported from North Carolina (Kondratieff et al. 2011). Our records are the first from Florida.

Material examined. FLORIDA: Gadsden Co., Crooked Creek below CR 270, N 30°35′1.3″, W 84°52′51.4, June 2011, R. Abad, D. Ray, & A. Rasmussen, 1 adult with exuviae reared 9 June 2011, 1 ♂ and 1 larva.

Remarks. The dark wingpad larva was collected in a leaf pack near a mountain laurel (*Kalmia latifolia*) growing on a limestone rock. The specimen was fed chironomid larvae during rearing. Pescador et al. (2000) reported a male specimen from Blue Springs Creek in Jackson County (adjacent to Gadsden Co.) originally identified as *P. placida* by Frison in 1940 from the Illinois Natural History Survey collection that is probably *P. shubuta*. However, the specimen has slightly shriveled paraprocts making a definitive determination not possible. Both Crooked Creek and Blue Springs Creek are tributaries of the Apalachicola River which has its headwaters located north of Atlanta, Georgia in the southern Appalachians.

Additional Records

***Allocapnia* sp.**

Material examined. FLORIDA: Okaloosa Co., Blackwater River, State Road 4, N 30°50′0.02″, W 86°44′2.0″, 7 December 2010, D. Ray, R. Abad, 1♀ larva. **Walton Co.**, Alaqua Creek at Eglin Air Force Base Road 201, N 30°37′00″, W 86°09′52″, 13 January 2006, A. Rasmussen, B. Richard, 1 larva. (Fig. 1)

Remarks. The Okaloosa County *Allocapnia* larva is a female which cannot be reliably identified, but it is likely to be *A. starki*. Ross & Ricker (1971) also show plots of *A. virginiana* Frison 1929 in southern Alabama near the Florida border, possibly within the Blackwater and Yellow river basins that extend into Florida.

Alloperla prognoides Surdick & Stark

Material Examined. FLORIDA: Escambia Co., Boggy Creek upper wood bridge, N 30°44′59.3″, W 87°30′45.9″, 5 April 2011, D. Ray, R. Abad, J. Daigle, 16 larvae. Perdido River above Boggy Creek confluence, N 30°43′23.2″, W 87°30′10.0″, 14 April 2011, D. Ray, R. Abad. 6 larvae.

Remarks. New collections from these sites (Fig. 3), in addition to those reported by Ray *et al*. (2010),

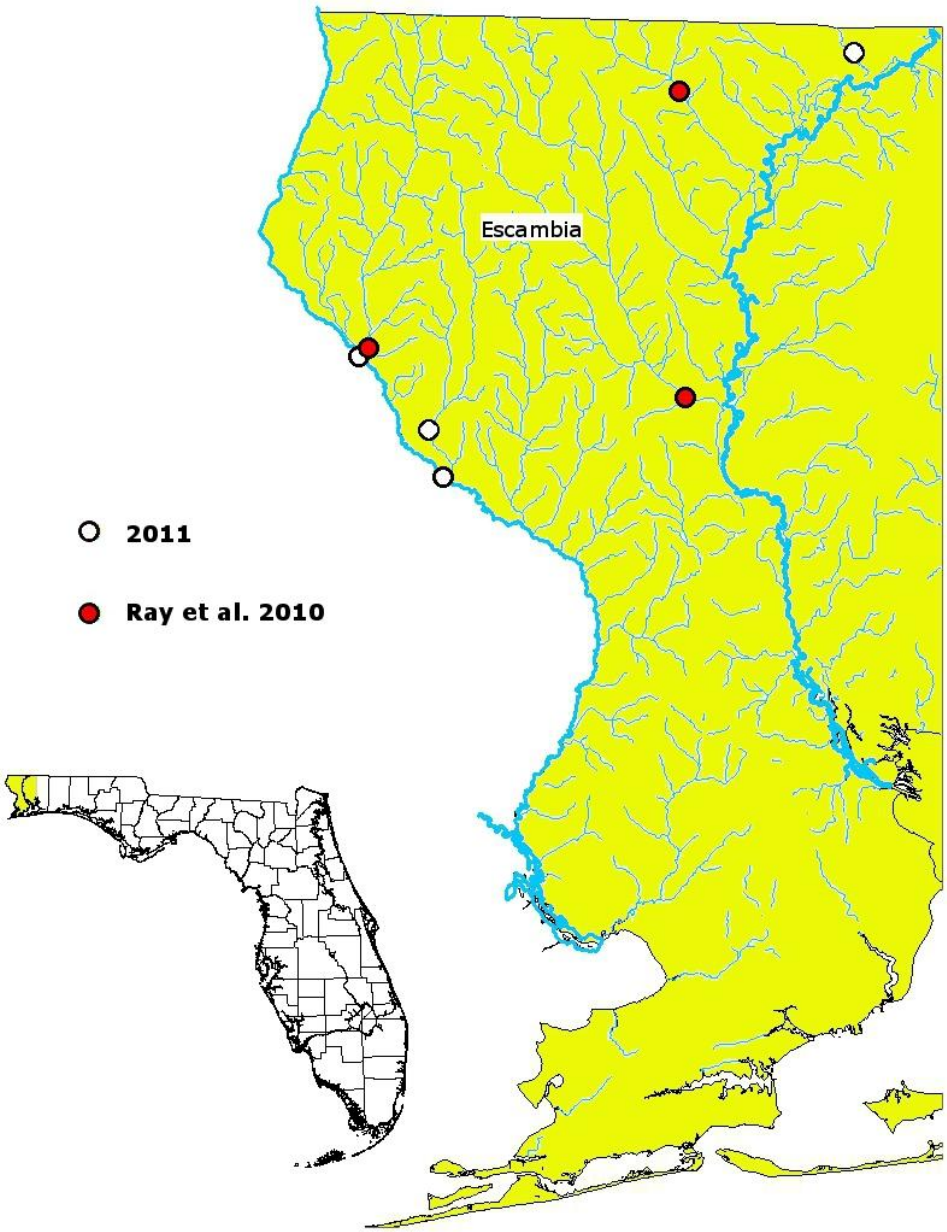
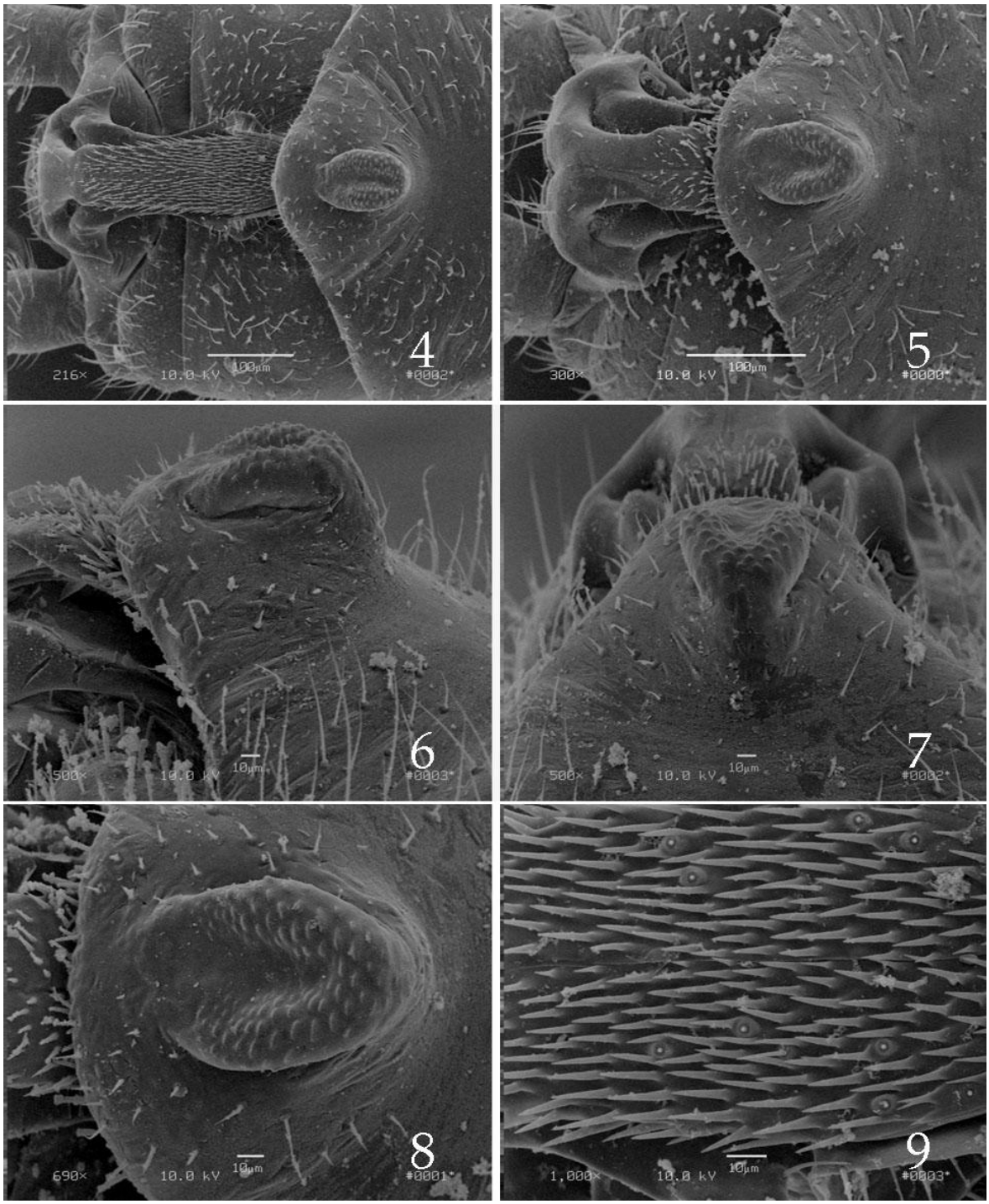


Fig. 3. Distribution of *Alloperla prognoides* in Florida.

were made for *A. prognoides* from gravel reaches on Boggy Creek and the Perdido River above the Boggy Creek confluence. Last instar *A. prognoides* were found near the surface in gravel riffles using a dip net while collecting for the dragonfly *Ophiogomphus australis* Carle during 2011 (Daigle 2011). Previous collections of immature *A. prognoides* larvae were found much deeper in the hyporheic zone (Ray et al. 2010).

Nemocapnia carolina Banks

Material Examined. FLORIDA: Escambia Co., Big Escambia Creek below Fannie Rd, N 30°59′0.09″,



Figs. 4-9. *Allocapnia starki* male genitalic structures for Florida specimens. 4. Epiproct and dorsal process, dorsal aspect. 5. Dorsal process and epiproct base, dorsal aspect. 6. Dorsal process, lateral aspect. 7. Dorsal process, anterior aspect. 8. Dorsal process detail, dorsal aspect. 9. Epiproct detail, dorsal aspect.

W 87°13'59", 3 March 2011, D. Ray, 4♂, 4♀. Canoe Creek above RR trestle, N 30°54'42.2", W 87°17'55.7", 3 March 2011, D. Ray, 2♂, 6♀. Perdido River, Barrineau Park, N 30°41'25", W 87°26'25", 3 March 2011, D. Ray, 2♂, 8♀. **Holmes Co.**, Choctawhatchee River, Hwy 2, N 30°56'50.01", W 85°50'38.1", 14 March 2011, D. Ray & R. Abad, 14♂ 7♀. **Liberty Co.,** Sweetwater Creek above CR 270, N 30°31'30.7", W 84°58'10", 6 December 2011, D. Ray & R. Abad 13♂ 8♀.

Pteronarcys dorsata (Say)

Material examined. FLORIDA: Escambia Co., Canoe Creek above RR trestle, 3 March 2011, D. Ray, 1 larva. Perdido River, Barrineau Park, N 30°41'25", W 87°26'25", 3 March 2011, D. Ray, 1♂ + exuviae.

Clioperla clio (Newman)

Material examined. FLORIDA: Calhoun Co., Johnson Creek, CR 286, N 30°35'45.3", W 84°59'27.8", 20 January 2011, D. Ray & R. Abad, 1 reared ♂ emerged on 24 February 2011.

Updated Checklist of the Plecoptera of Florida

The total number of stonefly species recorded from Florida currently stands at 39. This includes the three new state records listed above and a fourth species, *A. prognoides*, documented last year (Ray et al. 2010). The revised list does not include 7 of the 42 species listed by Pescador et al. (2000). Those excluded were unnamed species of *Leuctra* (sp. A), *Perlesta* (spp. A, B), *Isoperla* (spp. A, B. C), and the tentative identification of *Perlesta nitida* Banks, for which additional specimens are needed to verify its occurrence in Florida (Pescador et.al 2000). The Florida species list will likely grow with more collecting and advances in stonefly systematics. For example, several species of *Isoperla* will likely be added to the Florida fauna after the completion of a study of the Isoperlinae of eastern North America by Szczytko & Kondratieff (In preparation). Additional new state records and undescribed species are also likely to occur in the genera *Leuctra*, *Perlesta*, *Neoperla*, and *Amphinemura*. New state records for Florida are denoted with an asterisk (*).

Group Euholognatha
- Family Capniidae
  - *Nemocapnia carolina* Banks
  - **Allocapnia starki* Kondratieff & Kirchner
- Family Leuctridae
  - *Leuctra cottaquilla* James
  - *L. ferruginea* (Walker)
  - *L. rickeri* James
  - *L. triloba* Claassen
- Family Nemouridae
  - *Amphinemura nigritta* (Provancher)
- Family Taeniopterygidae
  - *Taeniopteryx burksi* Ricker & Ross
  - *T. lita* Frison
  - *T. lonicera* Ricker & Ross

Group Systellognatha
- Family Chloroperlidae
  - *Alloperla prognoides* Surdick & Stark
  - *Haploperla brevis* (Banks)
- Family Perlidae
  - *Acroneuria abnormis* (Newman)
  - *A. arenosa* (Pictet)
  - *A. evoluta* Klapálek
  - *A. lycorias* (Newman)
  - *Attaneuria ruralis* (Hagen)
  - *Eccoptura xanthenes* (Newman)
  - *Perlesta placida* (Hagen)
  - **P. shubuta* Stark
  - *Perlinella drymo* (Newman)
  - *P. ephyre* (Newman)
  - *P. zwicki* Kondratieff et al.
  - *Neoperla carlsoni* Stark & Baumann
  - *N. clymene* (Newman)
  - *Agnetina annulipes* (Hagen)
  - *Paragnetina fumosa* (Banks)
  - *P. kansensis* (Banks)
- Family Perlodidae
  - *Clioperla clio* (Newman)
  - *Helopicus bogaloosa* Stark & Ray
  - *H. subvarians* (Banks)
  - *Hydroperla phormidia* Ray & Stark
  - **Isogenoides varians* (Walsh)
  - *Isoperla bilineata* (Say)
  - *I. davisi* James

I. dicala Frison
I. orata Frison
Family Peltoperlidae
Tallaperla cornelia (Needham & Smith)
Family Pteronarcyidae
Pteronarcys dorsata (Say)

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