

Systematics, Morphology and Biogeography

Checklist of Ephemeroptera (Insecta) from São Mateus River Basin, Espírito Santo, Brazil



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ABSTRACT

In order to expand the knowledge on the composition of Ephemeroptera from large rivers, we present, herein, the first survey of mayflies from the São Mateus River Basin, Espírito Santo State. Adults were collected biannually in 2012 and 2013 with the aid of Pennsylvania light trap in eleven points distributed in the main river of the river basin, São Mateus River and its two main tributaries, Cotaxé River (Braço Norte) and Cricaré River (Braço Sul). Thirty-three species were identified (22 nominal and 11 morphospecies) in 24 genera and five families. One genus and one species are reported for the first time from Brazil, three species from Southeastern Region of Brazil, and two species from the state. Five species and one genus not previously described were also found. Moreover, around 20% of the known species of mayfly registered from the state were found. This work reinforces the need to give more attention to research on large rivers due to the high potential for diversity, not only for Ephemeroptera, but also for other aquatic insects.

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Introduction

The knowledge concerning mayflies (Ephemeroptera: Insecta) in Brazil has increased considerably in recent years. With the increase of taxonomic papers and published geographical distribution, the number of species reported from the country almost doubled in two decades (Da-Silva and Salles, 2012). Not long ago the state of Espírito Santo was considered understudied with respect to the order in the country. However, after the publication of the first survey of Ephemeroptera (Salles et al., 2010), and a series of taxonomic papers based on material from the state (Salles, 2010; De-Souza et al., 2011; Massariol and Salles, 2011; Salles and Lima, 2011), this situation has drastically changed. The number of mayfly species reported from the state in 2006 was eight, and now more than 80 species have been recorded and/or described.

Nevertheless, as in most studies conducted in Brazil, the vast majority of these records were achieved based on material collected in streams. Medium to large rivers in Brazil, as a general rule, are neglected when it comes to the study of the aquatic insects community. This situation not only hampers any attempts to uncover the

diversity of the aquatic biota, but also prevents directly applicable studies, such as biomonitoring for example.

Among the main rivers in the state of Espírito Santo, the São Mateus River is located in the north of the state and has a maximum width of approximately 310 meters (SEAMA/IEMA, 2015). The São Mateus River Basin is part of the Eastern Atlantic Hydrographic Region (MMA, 2003) and is completely inserted into the Aquatic Ecoregion of the Atlantic Forest (MMA, 2006). It is the main water supply to several towns and cities, and has been providing water to several irrigation projects, and has also been used as recipient of domestic and industrial effluents and these other places. The remaining forests that protect soil and water resources have been cut or burned over the entire basin (ANA, 2015).

Aiming to expand the knowledge on mayflies, as well as to increase the information about this group in the state of Espírito Santo, the aim of this work is to provide the first inventory of species of Ephemeroptera in the São Mateus River Basin.

Material and methods

Study area

The state of Espírito Santo is located in the Southeast Region of Brazil; it has about 46,000 km² and consists of 78 municipalities and 12 River Basin (Feitoza et al., 2001). The São Mateus River Basin

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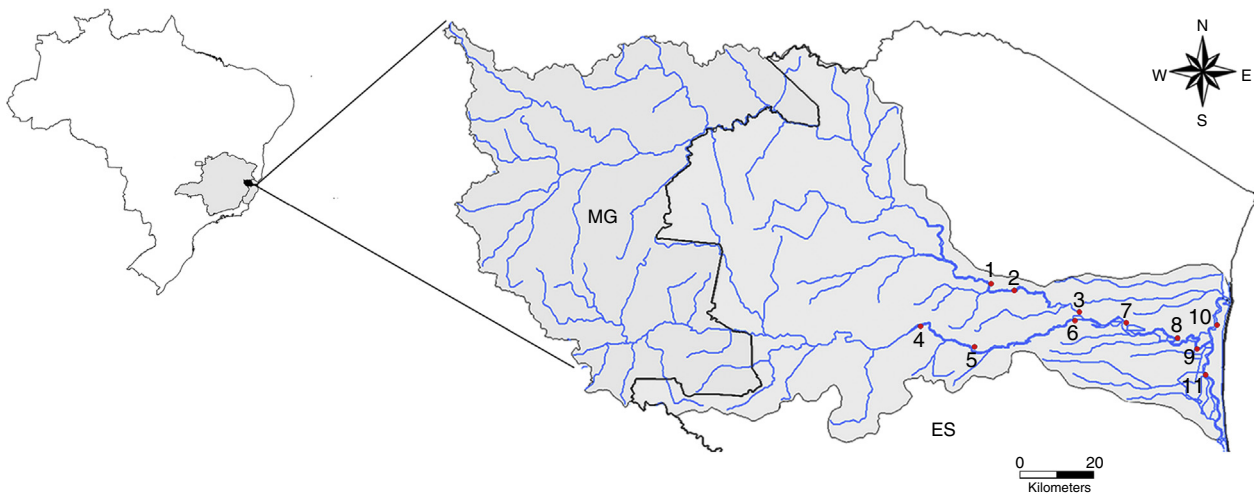


Fig. 1. Sampling points in the São Mateus River Basin, state of Espírito Santo.

(Fig. 1) has an area of approximately 13,482 km², with 5806 km² in the state of Minas Gerais, covering 12 municipalities and 7676 km² in the state of Espírito Santo, which passes through 11 municipalities (SEAMA/IEMA, 2015).

The São Mateus River is formed by two main tributaries: the Cotaxé and Cricaré rivers, with 244 km and 188 km length, respectively. (SEAMA/IEMA, 2015). From the springheads in state of Minas Gerais to the towns of Nova Venécia and Boa Esperança, both these watercourses as its tributaries have many rapids and small waterfalls. The lower course of the São Mateus River consists mainly of flooded piemontes and a small strip of coastal plain, having soft and wavy relief, which in addition to easy access allows the use of motomechanization in many stretches. Probably, these are some reasons for indiscriminate process of deforestation in this area along the last fifty years. Today the entire region is almost devoid of native vegetation and features many erosional areas. Moreover, the river is also receptor of domestic and industrial effluents from several cities through which it passes (ANA, 2015).

Collection, identification and deposition

Samples were collected at the main river of São Mateus River Basin, in 11 sites distributed as follows: three in the Cricaré River, three in the Cotaxé River, four in the São Mateus River and one in the Mariricu River (Fig. 1). Samples were collected in four campaigns, between 2012 and 2013. Figs. 2–5 correspond to images of some of the collection points. In Table 1 these points are presented with their respective geographic coordinates. Samples were gathered through a Pennsylvania light trap (Frost, 1957), equipped with a 12 Volts inspection lamp and a plastic container completely filled with alcohol 92.6%. The traps were placed in trees along the riverbank, and the lamp was lit no later than five o'clock, staying on until dawn of the next day.

For the identification of the material, a series of books, theses and papers have been consulted, among them: Molineri (1999), Domínguez et al. (2006), Salles (2006), Molineri (2010), Gonçalves et al. (2011), Nascimento et al. (2011), Lima et al. (2012), Cruz et al. (2014). The specimens are deposited at Coleção Zoológica Norte Capixaba (CZNC) of Universidade Federal do Espírito Santo, stored at around –20 °C in 80% ethanol.

Material examined and geographical distribution

The geographical distribution presented for the taxa was extracted from Domínguez et al. (2006) and Salles et al. (2015).

The examined material is organized so that PT refers to the collection point (Table 1), in brackets is the number of individuals, and then the date of collection. New records of the species are marked with an asterisk (*).

Results

Altogether 33 species are listed, with 23 nominal and 10 morphospecies, 24 genera and five families. Figures 6–9 represent some of the collected species. The species and morphospecies found in the São Mateus River Basin are listed below.

For each species, their geographical distribution is presented as well as the points at which it was collected (more information about the collection points are presented in Table 1). Comments are addressed when pertinent.

Baetidae

Americabaetis alphus Lugo-Ortiz and McCafferty, 1996

Geographical distribution: Argentina, Bolívia, Chile, Paraguai and Brazil: Alagoas, Amazonas, Bahia, Ceará, Espírito Santo (Alto Caparaó, Ibitirama, Santa Teresa, São Mateus* and Nova Venécia*), Goiás, Mato Grosso, Minas Gerais, Paraná, Pernambuco, Piauí, Rio de Janeiro, Rio Grande do Sul, Roraima, Santa Catarina, São Paulo and Sergipe.

Comments: Previously recorded for the state of Espírito Santo (Salles et al., 2010), but for the first time in the municipalities of São Mateus and Nova Venécia.

Material examined: PT01: (1) 16–17/iv/2012; PT01: (1) 20–21/xi/2012; PT02: (1) 23–24/v/2012; PT02: (1) 22–23/xi/2012; PT03: (1) 26–27/vii/2012; PT03: (1) 20–21/xi/2012; PT04: (1) 21–22/xi/2012; PT05: (1) 21–22/xi/2012.

Aturbina beatrixae Gillies, 2001

Geographical distribution: Argentina, Uruguai and Brazil: Bahia, Espírito Santo (Município Alto Caparaó, São Mateus), Mato Grosso, Minas Gerais, Paraná, Pernambuco, Santa Catarina, São Paulo.

Comments: Previously recorded for the state of Espírito Santo (Salles et al., 2010), but for the first time in the municipality of Nova Venécia.

Material examined: PT03: (2) 20–21/xi/2012; PT04: (10) 21–22/xi/2012.



Figs. 2–5. Some of collection points. 2. Cotaxé River, Patrimônio do Bis. 3. Cricaré River, Fazenda Liberdade. 4. São Mateus River, Sítio Santa Maria. 5. São Mateus River, Guriri.

Table 1

Localities sampled in the São Mateus River and their coordinates.

Points	Municipality	Locality	Coordinates
PT 01	Nova Venécia	Patrimônio do Bis, Rio Cotaxé	S 18° 33' 27.5", W 40° 20' 6.5"
PT 02	São Mateus	Cachoeira Japira, Rio Cotaxé	S 18° 34' 26.6", W 40° 16' 35.27"
PT 03	São Mateus	Propriedade do Sr. Fábio Gama, Rio Cotaxé	S 18° 37' 41.1", W 40° 6' 41.6"
PT 04	Nova Venécia	Santa Rita do PipNuck, Propriedade do Sr. Puppim, Rio Cricaré	S 18° 39' 51.4", W 40° 30' 44.9"
PT 05	Nova Venécia	Casa da Dona Ana, Rio Cricaré	S 18° 42' 54.91", W 40° 22' 33.33"
PT 06	São Mateus	Fazenda Liberdade, Rio Cricaré	S 18° 39' 2.2", W 40° 7' 23.4"
PT 07	São Mateus	Sítio Santa Maria, Rio São Mateus	S 18° 39' 17.1", W 39° 59' 36"
PT 08	São Mateus	Bairro Jambreiro, Rio São Mateus	S 18° 41' 40.3", W 39° 51' 51.5"
PT 09	São Mateus	Bairro Pedra d'água, Rio São Mateus	S 18° 43' 15.2", W 39° 48' 50.8"
PT 10	São Mateus	Estrada para Barra Nova, Rio Mariricu	S 18° 47' 11", W 39° 47' 31.6"
PT 11	São Mateus	Meleiras, Rio São Mateus	S 18° 39' 39.5", W 39° 45' 48"

Callibaetis guttatus Navás, 1915

Geographical distribution: Argentina and Brazil: Ceará, Pernambuco, Rio de Janeiro e Espírito Santo (São Mateus e Nova Venécia*).

Comments: Previously recorded for the state of Espírito Santo (Salles et al., 2010), but for the first time in the municipality of Nova Venécia.

Material examined: PT01: (1) 16–17/iv/2012; PT05: (1) 23–24/v/2012.

Camelobaetidius sp.

Occurrence in the studied area: Espírito Santo, municipality of São Mateus.

Comments: Identification at species level was not possible, because only one adult was analyzed and the association with nymphs is essential for the recognition of the species.

Material examined: PT02: (1) 23–24/v/2012.

Paracloeodes cf. *waimiri*

Occurrence in the studied area: Espírito Santo, municipality of Nova Venécia.

Comments: Probably it is *Paracloeodes waimiri* Nieto and Salles based on abdominal color pattern; however it is necessary association with nymphs for confirmation, since only adult individuals were analyzed.

Material examined: PT01: (3) 16–17/iv/2012; PT04: (2) 18–19/iv/2012.

Paracloeodes sp. 1

Occurrence in the studied area: Espírito Santo, municipality of Nova Venécia.

Comments: Identification at species level was not possible, because only one adult was analyzed, and the association with nymphs is essential for recognition of the species.



Figs. 6–9. Adults of Ephemeroptera. 6. *Ulmeritoides* sp. 7. *Traverella insolita*. 8. *Aturbina beatrixae*. 9. *Hydrosmilodon plagatus*.

Material examined: PT01: (4) 20–21/xi/2012; PT02: (1) 22–23/xi/2012; PT03: (4) 20–21/xi/2012; PT04: (1) 18–19/iv/2012; PT04: (215) 21–22/xi/2012; PT05: (155) 21–22/xi/2012.

Caenidae

Caenis sp. nov.

Occurrence in the studied area: Espírito Santo, municipality of Nova Venécia and São Mateus.

Comments: This species is being described by Lima et al. (Pers. Comm., 2015).

Material examined: PT04: (1) 18–19/iv/2012; PT04: (1) 21–22/xi/2012; PT04: (1) 18–19/ii/2013; PT05: (1) 23–24/v/2012; PT05: (4) 26–27/vii/2012; PT07: (1) 07–08/ix/2012.

Alloretochus sigillatus Molineri, 2014

Geographical distribution: Bolivia, Equator and Brazil*: Espírito Santo (Nova Venécia).

Comments: First record of the genus and species from Brazil.

Material examined: PT01: (2) 16–17/iv/2012; PT01: (4) 20–21/xi/2012; PT02: (6) 22–23/xi/2012; PT03: (112) 20–21/xi/2012; PT03: (80) 05–6/ii/2013; PT04: (19) 18–19/iv/2012; PT04: (22) 21–22/xi/2012; PT04: (2) 18–19/ii/2013; PT06: (3) 22–23/xi/2012; PT06: (1) 07–08/ii/2013.

Leptohyphidae

Gen. nov. sp. nov.

Occurrence in the studied area: Espírito Santo, municipality of Nova Venécia.

Comments: This is a new genus apparently related to *Trichorythodes*. A species belonging to the same genus has also been found in Serra do Aracá, Amazonas State.

Material examined: PT04: (1) 25–26/vii/2012.

Macunahyphes australis (Banks, 1913)

Geographical distribution: Argentina, Guiana and Brazil: Mato Grosso, Pará, Paraná, Roraima and Espírito Santo* (São Mateus and Nova Venécia).

Comments: First record for Southeast Region.

Material examined: PT01: (2) 16–17/iv/2012; PT02: (9) 23–24/v/2012; PT02: (2) 07–08/ix/2012; PT04: (2) 18–19/iv/2012; PT05: (2) 23–24/v/2012; PT07: (1) 07–08/ix/2012; PT09: (1) 19–20/iv/2012.

Traverhyphes (Mocoihyphes) yuati Molineri, 2004

Geographical distribution: Argentina and Brazil: Rio de Janeiro, São Paulo, Maranhão, Piauí, Goiás and Espírito Santo (São Mateus* and Nova Venécia*).

Comments: Previously registered for state of Espírito Santo (Salles et al., 2010), but for the first time in municipalities of São Mateus and Nova Venécia.

Material examined: PT01: (444) 16–17/iv/2012; PT01: (11) 25–26/vii/2012; PT02: (70) 23–24/v/2012; PT01: (57) 21–22/xi/2012; PT01 (224) 05–06/ii/2013; PT02: (14) 07–08/ix/2012; PT03: (331) 16–17/iv/2012; PT03: (212) 26–27/vii/2012; PT03: (1308) 20–21/xi/2012; PT03: (2392) 05–06/ii/2013; PT04: (1449) 18–19/iv/2012; PT04: (787) 25–26/vii/2012; PT04: (2276) 21–22/xi/2012; PT04: (213) 18–19/ii/2013; PT04: (484) 15–16/iv/2013; PT05: (110) 21–22/xi/2012; PT05: (15) 23–24/v/2012; PT05: (1) 26–27/vii/2012; PT06: (945) 22–23/v/2012;

PT06: (102) 08–09/ix/2012; PT06: (114) 22–23–06/xi/2012; PT06: (682) 05–06/ii/2013; PT06: (315) 07–08/ii/2013; PT07: (826) 07–08/ix/2012; PT07: (250) 13–14/vi/2012; PT07: (1984) 05–06/ii/2013; PT08: (4) 22–23/v/2012.

Traverhyphes (Traverhyphes) pirai Molineri, 2001

Geographical distribution: Brazil: Rio de Janeiro, Pernambuco and Espírito Santo* (São Mateus and Nova Venécia).

Comments: First record of state of Espírito Santo.

Material examined: PT01: (1) 16–17/iv/2012; PT01: (31) 20–21/xi/2012; PT02: (170) 06–07/ii/2013; PT03: (2) 20–21/xi/2012; PT04: (143) 18–19/iv/2012; PT04: (17) 25–26/vii/2012; PT04: (31) 21–22/xi/2012; PT04: (11) 18–19/ii/2013; PT05: (3) 23–24/v/2012; PT05: (5) 21–22/xi/2012; PT06: (1) 08–09/ix/2012; PT06: (1) 07–08/ii/2013; PT07: (1) 13–14/vi/2012; PT07: (2) 05–06/ii/2013.

Tricorythodes mirca Molineri, 2002

Geographical distribution: Bolivia and Brazil: Maranhão, Piauí, Pernambuco and Espírito Santo (São Mateus, Sooretama and Nova Venécia*).

Comments: Previously registered for the state of Espírito Santo (Salles et al., 2010), but first recorded for the municipality of Nova Venécia.

Material examined: PT01: (11) 16–17/iv/2012; PT01: (13) 25–26/vii/2012; PT01: (6) 20–21/xi/2012; PT03: (1) 06–07/ii/2013; PT03: (7) 20–21/xi/2012; PT03: (3) 05–06/ii/2013; PT04: (2) 18–19/iv/2012; PT04: (1) 25–26/vii/2012; PT04: (17) 21–22/xi/2012; PT05: (5) 23–24/v/2012; PT05: (1) 26–27/vii/2012; PT05: (10) 21–22/xi/2012; PT05: (4) 18–19/ii/2013; PT06: (1) 22–23/v/2012; PT06: (1) 08–09/ix/2012; PT06: (26) 22–23/xi/2012; PT07: (5) 07–08/ix/2012; PT08: (1) 10–11/v/2012; PT09: (5) 19–20/iv/2012; PT10: (1) 04–05/ii/2013.

Tricorythodes santarita Traver, 1959

Geographical distribution: Brazil: Rio de Janeiro e Espírito Santo*, municipalities of Nova Venécia and São Mateus.

Comments: First record for the state of Espírito Santo.

Material examined: PT01: (2) 16–17/iv/2012; PT02: (4) 23–24/v/2012; PT03: (1) 26–27/vii/2012; PT04: (5) 18–19/iv/2012; PT 04: (2) 25–26/vii/2012; PT05: (17) 23–24/v/2012; PT06: (1) 08–09/ix/2012; PT06: (1) 07–08/ii/2013; PT07: (2) 13–14/vi/2012; PT07: (3) 07–08/ix/2012.

Tricorythopsis artigas Traver, 1958

Geographical distribution: Argentina, Uruguai and Brazil: Rio Grande do Sul, Rio de Janeiro and Espírito Santo (Alfredo Chaves, Santa Teresa, São Mateus* and Nova Venécia*).

Comments: Previously recorded for the state of Espírito Santo (Salles et al., 2010), but first registered in municipalities of São Mateus and Nova Venécia.

Material examined: PT01: (2) 25–26/vii/2012; PT01: (159) 25–26/vii/2012; PT02: (4) 23–24/v/2012; PT02: (2) 06–07/ii/2013; PT04: (19) 25–26/vii/2012.

Tricorythopsis minimus (Allen, 1973)

Geographical distribution: Argentina, Uruguai, Brazil: Rio Grande do Sul and Espírito Santo (Sooretama, São Mateus* and Nova Venécia*).

Comments: Previously recorded for the state of Espírito Santo (Salles et al., 2010), but first registered in municipalities of São Mateus and Nova Venécia.

Material examined: PT01: (4) 16–17/v/2012; PT01: (809) 25–26/vii/2012; PT02: (43) 23–24/v/2012; PT03: (1) 20–21/xi/2012; PT03: (2) 05–06/ii/2013; PT04: (14) 25–26/vii/2012;

PT05: (54) 23–24/v/2012; PT05: (1) 26–27/vii/2012; PT05: (4) 21–22/xi/2012; PT07: (1) 07–08/ix/2012; PT07: (16) 05–06/ii/2013.

Tricorythopsis yacutinga Molineri, 2001

Geographical distribution: Argentina and Brazil: Rio Grande do Sul and Espírito Santo* (São Mateus and Nova Venécia).

Comments: First recorded for the Southeast Region.

Material examined: PT01: (2) 16–17/iv/2012; PT01: (102) 25–26/vii/2012; PT02: (50) 23–24/v/2012; PT03: (1) 26–27/vii/2012; PT03: (1) 20–21/xi/2012; PT04: (4) 18–19/iv/2012; PT04: (77) 25–26/vii/2012; PT04: (2) 21–22/xi/2012; PT05: (2) 23–24/v/2012; PT05: (1) 21–22/xi/2012; PT07: (1) 13–14/vi/2012.

Leptophlebiidae

Farrodes carioca Domínguez, Molineri and Peters, 1996

Geographical distribution: Brazil: Rio de Janeiro and Espírito Santo (Ibitirama, Santa Teresa, Sooretama, São Mateus* and Nova Venécia*).

Comments: Previously recorded for the state of Espírito Santo (Salles et al., 2010), but first registered in municipalities of São Mateus and Nova Venécia.

Material examined: PT01: (3) 20–21/xi/2012; PT01: (1) 05–06/ii/2013; PT02: (2) 07–08/ix/2012; PT03: (1) 26–27/vii/2012; PT04: (23) 18–19/iv/2012; PT04: (102) 25–26/vii/2012; PT04: (2) 18–19/ii/2013; PT06: (1) 08–09/2012; PT07: (1) 07–08/ix/2012.

Hylister obliquus Nascimento and Salles, 2013

Geographical distribution: Brazil: Espírito Santo (Pinheiros, São Mateus* and Nova Venécia*).

Comments: Species recently described and recorded for the state of Espírito Santo (Nascimento and Salles, 2013), but for the first time in municipalities of São Mateus and Nova Venécia.

Material examined: PT01: (2) 16–17/iv/2012; PT01: (2) 25–26/vii/2012; PT01: (53) 20–21/xi/2012; PT01: (2) 05–06/ii/2013; PT02: (2) 07–08/ix/2012; PT04: (6) 18–19/iv/2012; PT04: (6) 25–26/vii/2012; PT04: (8) 20–21/xi/2012; PT04: (5) 15–16/iv/2013.

Hermanella nigra Nascimento and Salles, 2013

Geographical distribution: Brazil: Espírito Santo (Nova Venécia, Rio Bananal, São Mateus).

Comments: Species recently described and recorded for the state of Espírito Santo (Nascimento and Salles, 2013).

Material examined: P1: (3) 20–21/xi/2012.

Hydrosmilodon plagatus Lima, Nascimento and Salles, 2012

Geographical distribution: Brazil: Pernambuco and Espírito Santo (Sooretama and Nova Venécia*).

Comments: Previously recorded for the state of Espírito Santo (Lima et al., 2012), but for the first time in the municipality of Nova Venécia.

Material examined: PT04: (21) 18–19/iv/2012; PT04: (7) 25–26/vii/2012; PT04: (53) 21–22/xi/2012; PT04: (3) 15–16/iv/2013; PT04: (8) 18–19/ii/2013.

Simothraulopsis sp. nov. 1

Occurrence in the studied area: Espírito Santo, municipality of Nova Venécia and São Mateus.

Comments: This species is being described by Nascimento et al. (Pers. Comm., 2015).

Material examined: PT01: (13) 16–17/iv/2012; PT01: (1) 25–26/vii/2012; PT03: (1) 16–17/iv/2012; PT03: (1) 26–27/vii/2012; PT04: (69) 18–19/iv/2012; PT04: (17) 25–26/vii/2012.

Simothraulopsis sp. nov. 2

Occurrence in the studied area: Espírito Santo, municipality of Nova Venécia.

Comments: This species is being described by Nascimento et al. (Pers. Comm., 2015).

Material examined: PT01: (5) 16–17/iv/2012; PT01: (1) 25–26/vii/2012; PT04: (34) 18–19/iv/2012; PT04: (5) 25–26/vii/2012.

Thraulodes sp.

Occurrence in the studied area: Brazil: Espírito Santo (São Mateus*).

Comments: Identification at species level was not possible, because the single specimen was collected at the subimago stage. First record of the genus for the municipality of São Mateus.

Material examined: PT03: (1) 05–06/ii/2013; PT06: (1) 22–23/v/2012; PT06: (1) 08–09/ix/2012.

Terpides sooretamae Boldrini and Salles, 2009

Geographical distribution: Brazil: Mato Grosso, Pernambuco and Espírito Santo (Alfredo Chaves, Barra Seca, Sooretama, Nova Venécia* and São Mateus*).

Comments: Previously recorded for the state of Espírito Santo (Boldrini and Salles, 2009), but for the first time in the municipalities of Nova Venécia and São Mateus.

Material examined: PT02: (2) 22–23/xi/2012; PT04: (7) 21–22/xi/2012.

Tikuna bilineata (Needham and Murphy, 1924)

Geographical distribution: Colombia, Ecuador, Peru, Suriname, Venezuela and Brazil: Mato Grosso, Pará and Espírito Santo* (Nova Venécia).

Comments: First record for the Southeastern Region.

Material examined: PT01: (1) 16–17/v/2012; PT04: (1) 18–19/iv/2012.

Traverella insolita Nascimento and Salles, 2013

Geographical distribution: Brazil: Espírito Santo (Pedro Canário, Sooretama, Nova Venécia*).

Comments: First record for the municipality of Nova Venécia.

Material examined: PT01: (3) 16–17/iv/2012; PT01: (1) 25–26/vii/2012; PT01: (2) 05–06/ii/2013; PT03: (12) 16–17/iv/2012; PT03: (8) 05–06/ii/2013; PT04: (1) 18–19/ii/2013; PT04: (5) 15–16/iv/2013; PT07: (1) 13–14/vi/2012; PT07: (1) 07–08/ix/2012.

Ulmeritoides sp. 1

Occurrence in the studied areas: Espírito Santo, municipality of Nova Venécia and São Mateus.

Comments: Identification at species level was not possible, because individuals were collected only at subimago stage.

Material examined: PT01: (1) 16–17/iv/2012; PT01: (1) 05–06/ii/2013; PT02: (2) 23–24/v/2012; PT02: (1) 07–08/ix/2012; PT02: (1) 06–07/ii/2013; PT03: (2) 16–17/iv/2012; PT03: (59) 20–21/xi/2012; PT03: (2) 05–06/ii/2013; PT04: (1) 18–19/iv/2012; PT04: (2) 18–19/ii/2013; PT05: (3) 18–19/ii/2013; PT06: (1) 21–22/xi/2012; PT07: (2) 13–14/vi/2012; PT07: (11) 07–08/ix/2012; PT07: (3) 05–06/ii/2013.

Polymitarcyidae

Asthenopodes chumuco Molineri, Salles and Peters, 2015

Geographical distribution: Colombia, Guyana and Brazil: Amazonas and Espírito Santo (São Mateus).

Comments: Previously recorded for the state of Espírito Santo (Molineri et al., 2015).

Material examined: PT02: (2) 23–24/v/2012; PT02: (1) 07–08/ix/2012; PT03: (2) 05–06/ii/2013; PT07: (4) 07–08/ix/2012.

Campsurus truncatus Ulmer, 1920

Geographical distribution: Bolívia and Brazil: Espírito Santo (Santa Teresa, Nova Venécia* and São Mateus*).

Comments: Registered in Brazil, only in the state of Espírito Santo. First record for the municipalities of São Mateus and Nova Venécia.

Material examined: PT04: (1) 18–19/iv/2012; PT04: (1) 21–22/xi/2012; PT06: (1) 08–09/ix/2012; PT07: (4) 13–14/vi/2012; PT07: (3) 07–08/ix/2012; PT10: (1) 20–21/xi/2012.

Campsurus sp. nov.

Occurrence in the studied area: Espírito Santo, municipalities of Nova Venécia and São Mateus.

Comments: This new species is apparently related to *Campsurus segnisi* Needham and Murphy, 1924.

Material examined: PT01: (91) 16–17/iv/2012; PT01: (89) 25–26/vii/2012; PT01: (2) 05–06/ii/2013; PT02: (10) 23–24/v/2012; PT02: (16) 06–07/iii/2013; PT03: (16) 16–17/iv/2012; PT03: (9) 26–27/vii/2012; PT03: (43) 05–06/ii/2013; PT04: (139) 18–19/iv/2012; PT05: (1) 18–19/ii/2013; PT06: (16) 22–23/v/2012; PT06: (34) 08–09/ix/2012; PT07: (26) 13–14/vi/2012; PT07: (27) 07–08/ix/2012; PT07: (66) 05–06/ii/2013.

Tortopsis canum Gonçalves, Da-Silva and Nessimian, 2011

Geographical distribution: Brazil: Rio de Janeiro and Espírito Santo.

Comments: Previously recorded for the state of Espírito Santo (Molineri et al., 2012).

Material examined: PT01: (1) 16–17/iv/2012; PT01: (1) 05–06/ii/2013; PT03: (1) 16–17/iv/2012; PT03: (1) 26–27/vii/2012; PT03: (3) 05–06/ii/2013; PT06: (1) 22–23/v/2012; PT06: (3) 08–09/ix/2012; PT06: (4) 07–08/ii/2013; PT07: (5) 13–14/vi/2012; PT07: (1) 07–08/ix/2012; PT07: (30) 05–06/ii/2013.

Tortopus harrisi Traver, 1950

Geographical distribution: Paraguai and Brazil: Mato Grosso, Mato Grosso do Sul and Espírito Santo (São Mateus and Nova Venécia).

Comments: Previously recorded for the state of Espírito Santo (Molineri et al., 2012).

Material examined: PT01: (14) 16–17/iv/2012; PT01: (6) 05–06/ii/2013; PT02: (8) 05–06/ii/2013; PT02: (269) 06–07/ii/2013; PT03: (1) 16–17/iv/2012; PT03: (300) 05–06/ii/2013; PT04: (4) 18–19/ii/2013; PT06: (16) 22–23/v/2012; PT06: (1) 08–09/ix/2012; PT06: (140) 07–08/ii/2013; PT07: (7) 13–14/vi/2012; PT07: (13) 07–08/ix/2012; PT07: (283) 05–06/ii/2013.

Discussion

The present study gives the first record of *Alloretocus sigillatus* Molineri, 2014 for Brazil. The genus and species were previously recorded only from Bolivia and Ecuador. Three species are registered for the first time from the Southeastern region [*Macunahyphes australis* (Banks, 1913), *Tricorythopsis yacutinga* Molineri, 2001 and *Tikuna bilineata* (Needham and Murphy, 1924)]. Five species (*M. australis*, *Traverhyphes* (*Traverhyphes*) *pirai*, Molineri 2001, *Ti. yacutinga*, *Tricorythodes santarita* Traver, 1959, *Tk. bilineata*) and one genus (*Tikuna* Savage, Flowers and Porras, 2005) are reported for the first time from the state of Espírito Santo. Furthermore, some species previously registered for state of Espírito Santo had their distribution slightly expanded: *Americabaetis alphas* Lugo-Ortiz and McCafferty, 1996, *Traverhyphes* (*Mocoihyphes*) *yuati* Molineri,

2004, *Tricorythopsis minimus* (Allen, 1973), *Tricorythopsis artigas* Traver, 1958, *Farrodes carioca* Domínguez, Molineri and Peters, 1996, *Hylister obliquus* Nascimento and Salles, 2013 were recorded for São Mateus and Nova Venécia, *Callibaetis guttatus* Navás 1915 and *Hydrosmilodon plagatus* Lima, Nascimento and Salles, 2012 for Nova Venécia.

Three undescribed species were found, one of *Caenis* Stephens, 1835 (Caenidae) and two of *Simothraulopsis* Demoulin, 1966 (Leptophlebiidae), besides one undescribed genus and species of the family Leptohiphidae. Taking into account the species previously reported for the state, around 20% were found during this project.

Two morphospecies of Leptophlebiidae (*Thraulodes* sp. and *Ulmeritoides* sp.) and three of Baetidae (*Camelobaetidius* sp., *Paracloeodes* cf. *waimiri* and *Paracloeodes* sp.) could not be identified, because their diagnostic characters cannot be seen based on the specimens collected (Leptophlebiidae) or because the association with nymphs is essential for the recognition of the species (Baetidae).

With respect to the families, Leptophlebiidae was the most representative with 11 species (33.3%), followed by Leptohiphidae with nine species (27.2%), and Baetidae with six species (18.2%). The lowest number of species was recorded for Polymitarciidae and Caenidae with five (15.1%) and two (6.1%) species, respectively. Generally, in studies developed in South America (or Brazil), Baetidae is the most representative family, closely followed by Leptophlebiidae and then Leptohiphidae (Salles et al., 2004, 2010a; Francischetti, 2007; Shimano et al., 2011; Lima et al., 2012). However, the composition of the mayfly fauna was distinct from those found in studies performed in Southeastern Region and state of Espírito Santo (e.g. Boldrini et al., 2009; Salles and Nascimento, 2009; Moreira et al., 2010; Salles et al., 2010; Salles, 2010; Lima et al., 2012; Barcelos-Silva et al., 2012). The difference of proportion of families and composition of species can be attributed to two uncommon approaches. First, we captured adults instead of nymphs. This fact favored not only the finding of families where nymphs have cryptic habitats, such as Polymitarciidae and Caenidae, but also the identification at the species level of most of the families except for Baetidae (the only group among mayflies in which taxonomy is based almost exclusively on nymphal stage). The second approach, certainly, is due to the size and characteristics of the water body. Rivers, given the amount of fine sediment and the existence of semi-lentic areas, are much more suitable for Caenidae and Polymitarciidae (Domínguez et al., 2006, 2009; Da-Silva and Salles, 2012). The high diversity of species and the amount of new records and taxa undescribed demonstrate the relevance of large rivers in researches on aquatic insects fauna.

Conflicts of interest

The authors declare no conflicts of interest.

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