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CONTENTS

Mystery midge (Orthocladiinae) from at Lake Umbagog in Maine, USA. Photo: David H. Funk.

CHIRONOMUS Journal of Chironomidae Research

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Would you like to see your picture on the front page? Please send us your favourite midge photograph or drawing (*torbjorn.ekrem@ntnu.no*).

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Front page layout: Chironomid in title from photograph by Steve Marshall, Graphic design by Kolbjørn Skarpnes, NTNU Information Division.

Front page photo: Mystery midge (Orthocladiinae) from at Lake Umbagog in Maine, USA ovipositing strains of eggs in flight. Species and genus so far unknown and adult males have not been recorded. Video of oviposition available here. Photo: David H. Funk.

Editorial

A Time to Reflect and a Look to the Future

This time of year we often take time to celebrate the work of chironomid workers that have retired from their positions or passed on over the course of the past year. While we are still, of course, taking time to celebrate these individuals in this year's issue, we thought it might also be appropriate to take time to look to the future, and think about how we are able to inspire a new generation of chironomid enthusiasts.

Before reading further, take a moment to reflect upon how you first became interested in midges. Many of us can probably identify a key person or experience (or perhaps a series of people and/or experiences) that helped to form our career paths and research passions. For example, in last year's issue of *CHIRONOMUS,* Carlos de la Rosa shared his story of how Bill Coffman first inspired him to pursue chironomid research (de la Rosa 2015).

As for me, a series of events and individuals helped me to find my path. My interest in aquatic ecology began early on when I was required to complete a science fair project as a middle school student. As a kid that loved to get her hands dirty and feet wet and the daughter of an active wildlife biologist, doing a project that involved something outside was a logical way to go. I remember thumbing through books until I found a section highlighting pictures of bugs that lived under the water – I was intrigued. Somehow, under the direction of two fantastic science teachers at the middle and high school levels, this first simple project turned into a five-year series of aquatic ecology/biomonitoring-themed science projects that took me to national and international fairs, getting me hooked on research; importantly, I was also able to easily identify chironomids (albeit to the family level!). While I continued to stay engaged in research activities as I embarked on my undergraduate degree program at St. Olaf College, my path deviated from the world of aquatic insects – instead, I worked for a couple years with a professor who had strong interests in Ornithology, which I also found to be fascinating. During my senior year, though, I had the opportunity to enroll in a limnology course with aquatic ecologist Dr. Mike Swift, who re-invigorating my interest in aquatic insects. Later that same year, I took a winter ecology course with Dr. Charles Umbanhower – I keenly remember one lab activity where we walked along the banks of the Mississippi River's headwaters searching the snow for winter-emerging chironomids. Looking back, I'm not sure which is more memorable – finding an insect that could withstand cold temperatures and walk on snow-covered stream banks, or watching one of my classmates fill her waders by taking a tumble into the cold winter waters!

At this point, I was sold on advancing my research career, but was yet unsure of the specific direction, as I had keen interests in both birds and bugs. After talking with a few potential major advisors, I was encouraged to talk with Dr. Len Ferrington, at the University of Minnesota. We formed a connection almost immediately – not only did his lab pursue research questions related to aquatic ecology and environmental change, but importantly for me, working in his lab would provide an opportunity to further explore my interests in the biology and ecology of those winter-emerging flies I became fascinated with the year before (fortunately for me, only once during my four seasons of winter work as a graduate student did I fill my waders!). Working with Len turned out to be a great fit – I was urged to explore my own interests, but also encouraged to step outside of my comfort zone and take on new challenges and opportunities. One of these involved pursuing a Fulbright Scholarship that allowed me to spend a year working with and learning from Drs. Torbjørn Ekrem and Elisabeth Stur at the Norwegian University of Science and Technology. This experience pushed me to further broaden my interest and experience with chironomids, shifting from studies with a primarily ecological focus to those based on chironomid taxonomy and systematics. As it turned out, this work turned out to be the component of my dissertation that I am proudest of, as it was an area I initially had limited knowledge and interest in, but one in which I ended up developing a very strong passion.

While my professional career is arguably still in its infancy as compared to many of you, all of these people (among many others!) and experiences played a key role in forming who I am as a researcher and an educator. The foundations and encouragement these individuals provided me with was absolutely infectious – being able to pass on an enthusiasm for research and continual learning was one of primary reasons I chose to pursue a career in higher education, particularly at a primarily undergraduate institution where I, too, can stimulate the next generation of researchers. While my time in the research lab is now quite limited because of teaching obligations, being able to kindle a keen passion for research in at least a couple of students per year who have strong potential is certainly worth it.

Since starting my faculty position at Northern State University four years ago, I've had the opportunity to work with three exceptional students, each of whom has pursued a fairly significant research project involving chironomids. Their stories are highlighted later in this issue (Anderson et al. 2016). While they may or may not continue to study chironomids as they find their future paths, they have, at minimum, gained a stronger grasp and interest in research and will undoubtedly look back fondly on what they gained via their time studying chironomids. Whenever given the chance, I'd encourage all of you to take an interested young student under your wing and share your passion with them, even if this involves only a brief but enthusiastic conversation. It does make a difference, and you never know, you may be inspiring one of the next prominent chironomid enthusiasts!

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CHIRONOMUS Journal of Chironomidae Research No. 29, 2016: 4-10. Current Research.

New combinations of Afrotropical Chironomini (Diptera: Chironomidae)

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http://zoobank.org/34577945-4965-42A4-A9D9-1AF78CE58181

Abstract

During our work on the Chironomidae chapter of the forthcoming Manual of Afrotropical Diptera we examined type material of the four Chironomini species *Chironomus* (*Endochironomus*) *hamatus*, *Chironomus* (*E.*) *pruinosus*, *Chironomus* (*E.*) *woodi* and *Chironomus* (*Cryptochironomus*) *inflexus* described by Paul Freeman. We provide photos of the types and associated material and argue for the following generic placements: *Chironomus* (*Benthalia*) *hamatus* comb.n., *Kiefferulus pruinosus* comb. n., *Synendotendipes woodi* comb. n. and *Cladopelma inflexum*.

Introduction

Paul Freeman contributed considerably to the knowledge of Afrotropical Chironomidae through his four monographs on Chironomidae south of the Sahara (Freeman 1955, Freeman 1956, Freeman 1957, Freeman 1958). These contributions from the 1950s summarized the contemporary knowledge of Afrotropical Chironomidae and provided an excellent basis for future work and revisions. A number of species new to science were described by Freeman in these and subsequent works, and Freeman still holds the authorship for almost 30% of all the currently known species from the Afrotropical Region. Later taxonomic revisions have changed the generic placement of 80 species, but more than 90 species retain Freeman's original generic assignments. It should be noted that Freeman's original descriptions were based on adult morphology only; contemporary generic assignments can be enhanced by descriptions of immature stages as well as use of molecular taxonomic techniques.

A large initiative to publish a Manual of Afrotropical Diptera was initiated by Ashley Kirk-Spriggs and officially launched at the 7th International Congress of Dipterology, San José, Costa Rica in 2010 (http://afrotropicalmanual.org). As part of our work on the chapter of Afrotropical Chironomidae (Ekrem et al. in press), type material of four Chironomini species described by Freeman were examined to re-evaluate the generic placement: *Chironomus* (*Cryptochironomus*) *inflexus* Freeman, 1957; *Chironomus* (*Endochironomus*) *hamatus* Freeman, 1957; *Chironomus* (*Endochironomus*) *pruinosus* Freeman, 1961 and *Chironomus* (*Endochironomus*) *woodi* Freeman, 1957. These species were specifically selected for evaluation as they were particuarly difficult to classify under current generic concepts.

Material and methods

Nominal types as well as other material were sought in the Natural History Museum, London, UK (NHMUK), Muséum national d'Histoire naturelle, Paris, France (MNHN), and the Department of Natural History, University Museum of Bergen, Bergen, Norway (ZMBN). Most of the specimens were already mounted on slides when we received them, but the holotype of *Chironomus* (*Endochironomus*) *pruinosus* was mounted in Euparal by us according to the procedure described by Pinder (1989).

The literature consulted to evaluate and confirm generic placements included works by Sæther (1977a), Sæther (1977b), Grodhaus (1987), Cranston et al. (1989) and Yan et al. (2008). Morphological terminology follows Sæther (1980).

Digital photographs were taken with a Leica DFC420 camera mounted on a Leica DM6000 B compound microscope using bright field or Nomarski DIC and the software Leica Application Suite.

Results and discussion

***Chironomus* (*Benthalia*) *hamatus* (Freeman, 1957) comb. n.**

http://zoobank.org/F9A669AB-EE75-4C5A-ABB5-C58DA7091109

Chironomus (*Endochironomus*) *hamatus* Freeman, 1957: 355.

Endochironomus hamatus (Freeman, 1957), Freeman and Cranston (1980).

Material examined: 1 paratype male (NHMUK), Democratic Republic of the Congo, Elisabethville, 30.iii.1939, H.-J. Brédo.

The examined male paratype shows characters typical of the *Chironomus* group of genera: antenna with 11 flagellomeres, medially fused antepronotal lobes, inferior volsella subcylindrical with dense apical setae. Unfortunately, the slide-mounted hypopygium (Figs 1a, b) is quite distorted, but the almost parallel-sided gonostylus without subapical constriction, anal tergite bands that meet medially in front of and not encircling median tergite setae, and the shape of the superior volsella resembles what is known from *Benthalia* Lipina (Shilova 1980 sub *Einfeldia carbonaria* (Meigen, 1804), Sæther 2012). Moreover, the specimen has large barrel-shaped frontal tubercles (Figs 1c, d) characteristic of *Benthalia* (Shilova 1980, fig. 8A_2). In addition there is a smaller pair of warts on the anterior part of vertex, dorsolaterally with respect to the frontal tubercles. A similar arrangement has been recorded for *Tanytarsus epleri* Ekrem et al., 2003. For this species the pupa has large frontal warts in addition to enlarged frontal tubercles (Ekrem et al. 2003), thus similar structures might be present in the unknown pupa of *Chironomus* (*B.*) *hamatus*.

Some authors regard *Benthalia* a separate genus (e.g. Sæther and Spies 2013, Yamamoto and Yamamoto 2014), while Epler et al. (2013) regard *Benthalia* as possible subgenus of *Chironomus* Meigen along with *Fleuria* Kieffer, *Baeotendipes*

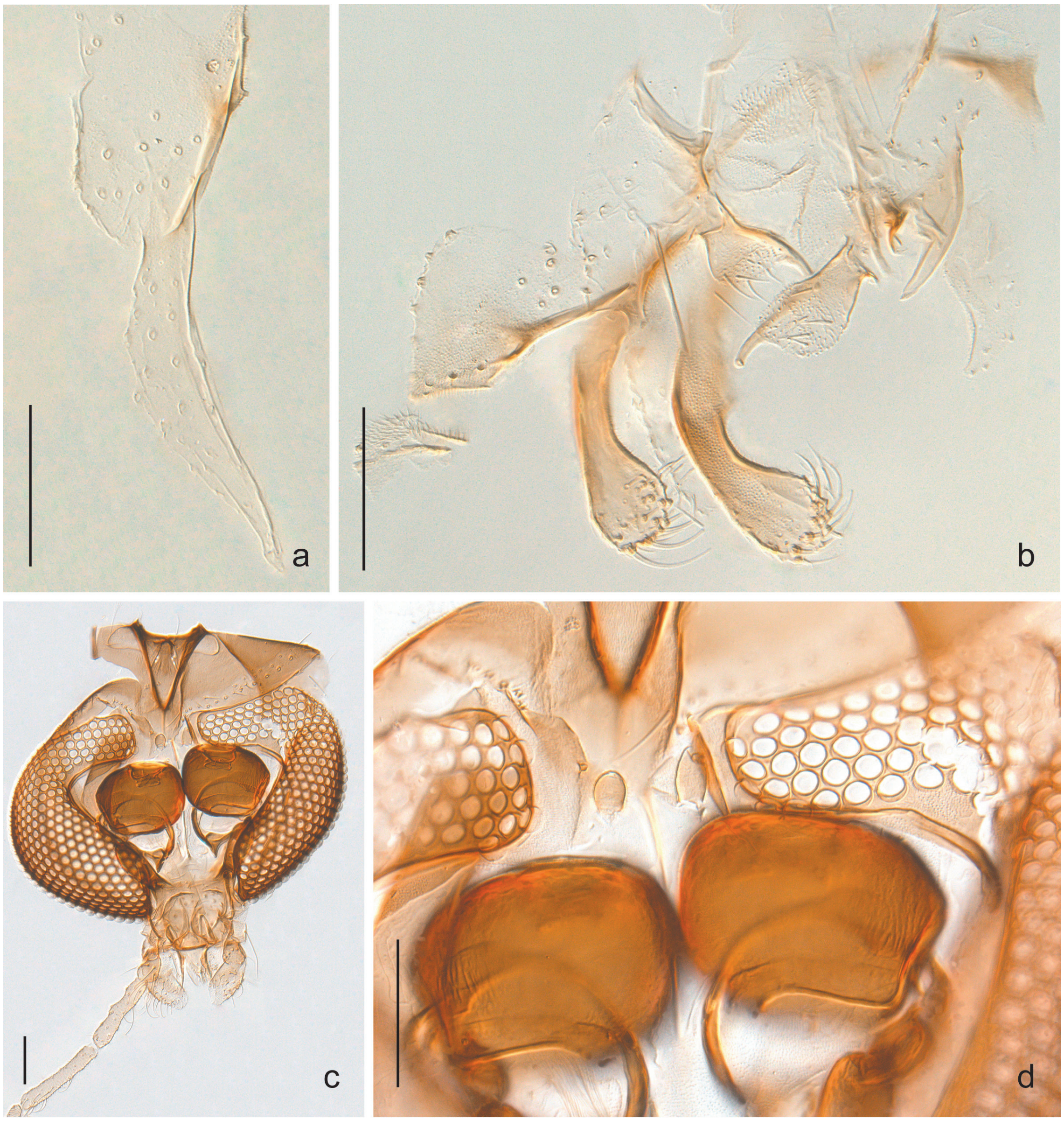

Figure 1. *Chironomus* (*Benthalia*) *hamatus*. Paratype male: a) gonocoxite and gonostylus (slightly crushed subapically); b) hypopygium remains; c) Head; d) Head section showing frontal tubercles and warts. Scale bars = 100 µm.

Kieffer, *Chaetolabis* Townes and *Lobochironomus* Ryser, Wülker & Scholl. Molecular phylogenies are inconclusive for the group placement of *Benthalia* (Martin et al. 2007 sub *Lobochironomus dissidens* = *Benthalia carbonaria*), but indicate a closer relationship to species in *Chironomus* sensu stricto. Until conclusive data that are provided, preferably through molecular systematic studies with wide sampling of *Chironomus* species and relatives, we regard *Benthalia* as a subgenus of *Chironomus*.

***Cladopelma inflexum* (Freeman, 1957)**

Chironomus (*Cryptochironomus*) *inflexus* Freeman, 1957: 403.

Cladopelma inflexum (Freeman, 1957), Freeman and Cranston (1980).

Material examined: Holotype male & 1 paratype female (NHMUK), Sudan, Khartoum, x.1951, D. J. Lewis.

The species was listed as a new combination in *Cladopelma* Kieffer by Freeman and Cranston (1980), but later transferred to *Cryptotendipes* by Ashe et al. (1987) based on personal communication with P. S. Cranston. We have examined the male holotype (pinned specimen with hypopygium on separate celluloid strip) and a slide mounted female paratype (Fig. 2). The presence of small frontal tubercles (Figs 2c, d), male gonostyli with a narrow base (Fig. 2a) and setae ventrally on segment X of the female abdomen (Fig. 2b) points

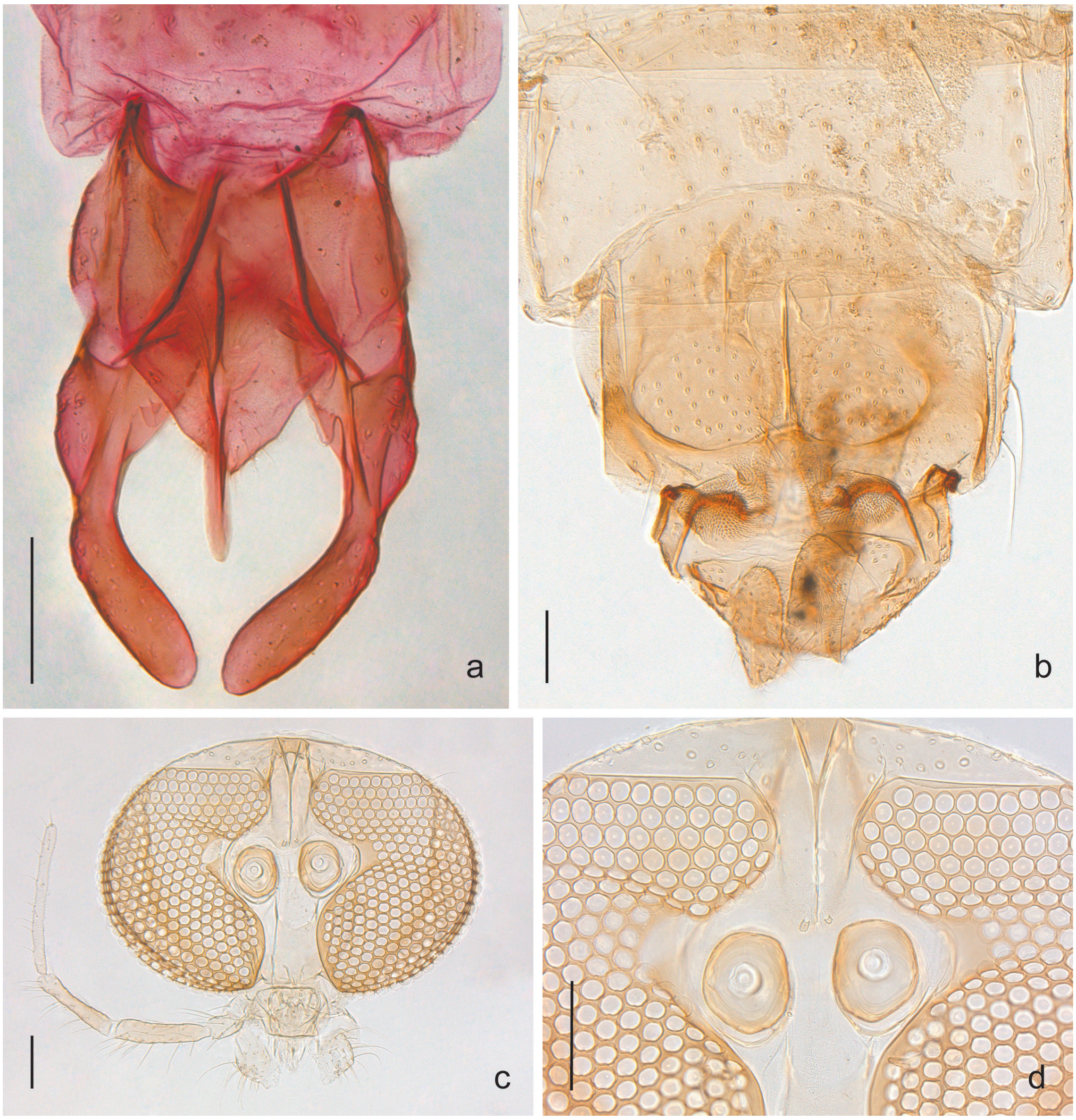

Figure 2. *Cladopelma inflexum*. a) holotype male hypopygium; b) paratype female genitalia; c) paratype female head; d) paratype female head section showing frontal tubercles. Scale bars = 100 µm.

towards placement in *Cladopelma*. The gonocoxal appendages of the holotype can be interpreted as a small wart-like superior volsella above a weak lobe-like inferior volsella (Fig. 2a), but this is not a completely clear structure on both sides. The presence of an inferior volsella is not compatible with the present diagnosis of *Cladopelma* (Cranston et al. 1989,Yan et al. 2008), but more material of *C. inflexum*, including associated immatures, should be examined before eventual emendations to diagnostic characters of *Cladopelma* are made. The species is known as adults from Chad, Malawi, Niger and Sudan (Freeman and Cranston 1980, McLachlan 1975).

Kiefferulus pruinosus **(Freeman, 1961) comb. n.**

http://zoobank.org/0A207111-3F6B-4169-A6EB-2CDDC478E839

Chironomus (*Endochironomus*) *pruinosa* [sic!] Freeman, 1961: 246.

Endochironomus pruinosus (Freeman, 1961), Freeman and Cranston (1980).

Material examined: Holotype male (MNHN), Madagascar Nord, Montagne d'Ambre 1000m, 23.xi-4.xii.1958, B. Stuckenberg.

The male holotype lacks frontal tubercles, has numerous setae on vein R in an otherwise bare wing (Fig. 3a), and has divided mid- and hind tibial combs, each with spur. Antenna with 11 flagellomeres and an AR of about 2.7. The hypopygium (Fig. 3b) lacks median tergite setae, has Y-shaped anal tergite bands, almost bare superior volsella, setose inferior volsella that is slightly expanded dorso-ventrally and gonostylus with slight subapical constriction. The species fits quite well in the definition of *Kiefferulus* Goetghebuer after the inclusion of *Nilodorum* Kieffer by Cranston et al. (1990). Indeed Freeman (1961) had discussed the similarity with *Nilodorum* in the original description, especially with regard to the appearance of the thorax (Fig. 3c). He chose not to place the species there due to the normally developed maxillary palps and the narrow inferior volsella, but these characters later have been argued not to be diagnostic at genus-level (Cranston et al. 1990). The shape of the superior volsella (Fig. 3b) is quite aberrant compared to other species in *Kiefferulus*, but we interpret this as a species-specific trait.

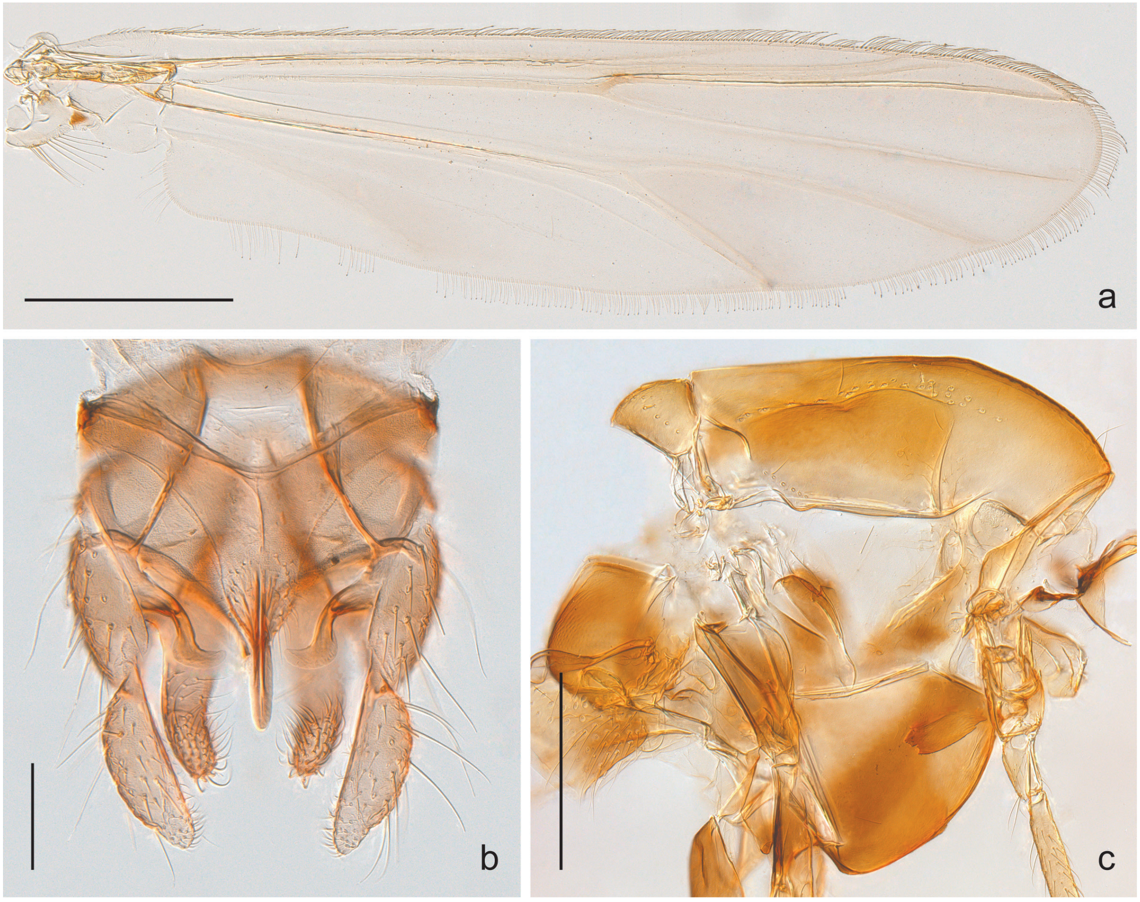

Figure 3. *Kiefferulus pruinosus*. Holotype male: a) wing, scale bar = 500 µm; b) hypopygium, scale bar = 100 µm; c) thorax, scale bar = 500 µm.

***Synendotendipes woodi* (Freeman, 1957) comb. n.**

http://zoobank.org/F6E9848E-4A3B-4A06-A2C3-44209379EA86

Chironomus (*Endochironomus*) *woodi* Freeman, 1957: 355.

Endochironomus woodi (Freeman, 1957), Freeman and Cranston (1980).

Material examined: Holotype male (NHMUK), Malawi, Ruo, 6.iv.1916, R. C. Wood; 2 males & 1 female paratype as holotype; 1 paratype male (NHMUK) Uganda, Natadgidza?, v.1937, G. L. R. Hancock; 1 paratype male (NHMUK) Nigeria, Zungeru, xi.1910, J. W. Scott-Macfie; 2 males (ZMBN) Ghana, Eastern Region, Bothi falls, at light, 14.x.1994, T. Andersen et al.; 1 male (ZMBN) Ghana, Western Region, Ankasa Game Production Reserve, Malaise trap #10, 6-12.xii.1993, T. Andersen et al.

The examined material fits well with the definitions of *Synendotendipes* Grodhaus (as opposed to *Endochironomus* Kieffer) in lacking a tarsal beard in the adult male, lacking mid- and hind tibial spurs, and by having a very slightly broadened base of the superior volsella (Figs 4a, b). The species also has a head without frontal tubercles

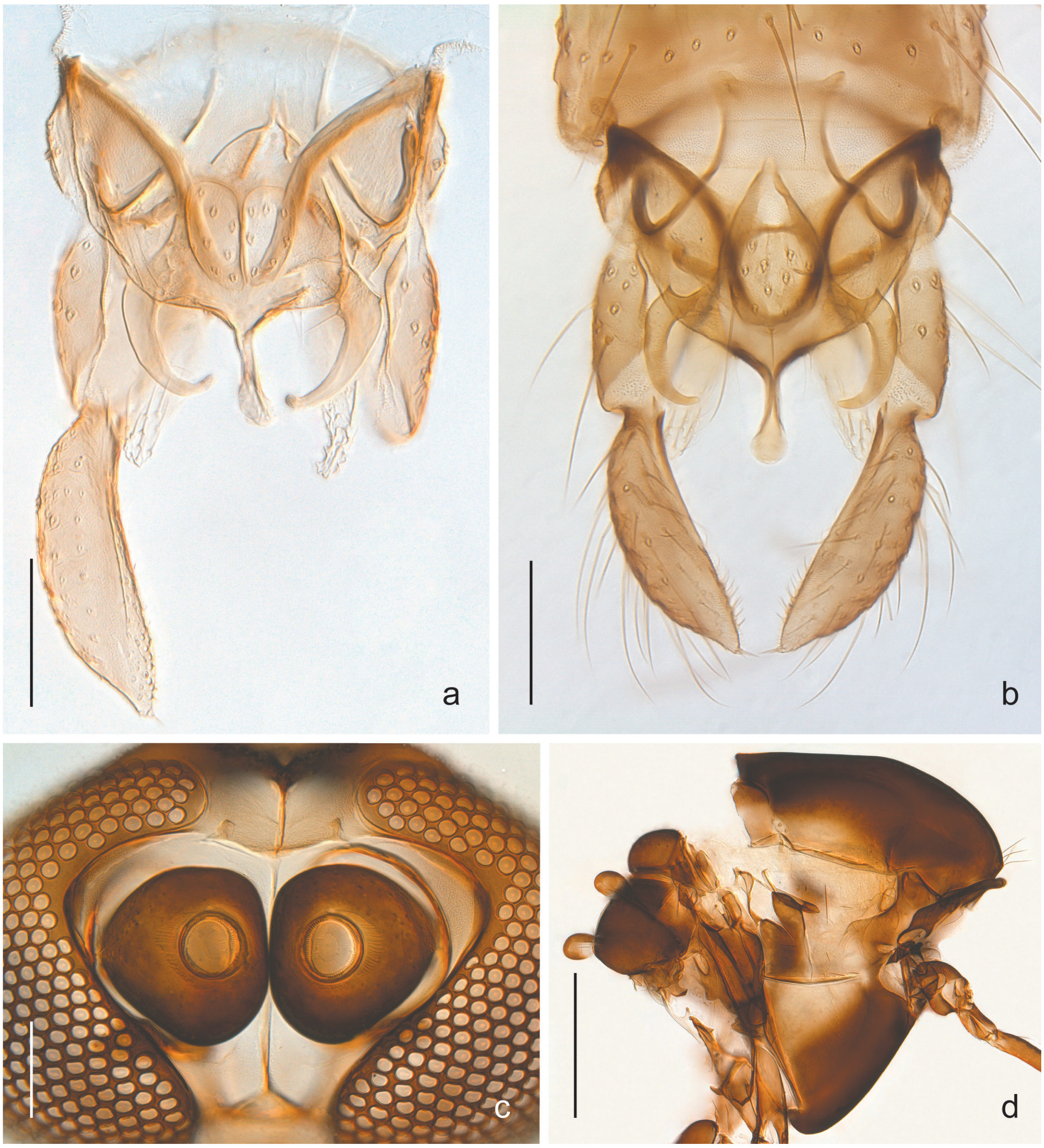

Figure 4. *Synendotendipes woodi*. a) paratype male hypopygium (Uganda); b) male hypopygium (Ghana); c) male head (Ghana); d) male thorax (Ghana). Scale bars a-c = 100 µm; scale bar d = 500 µm.

(Fig. 4c) and thorax with widely divided, but well developed antepronotal lobes (Fig. 4d) as is typical for *Synendotendipes* (Cranston et al. 1989).

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CHIRONOMUS Journal of Chironomidae Research No. 29, 2016: 11-14. Current Research.

New records of non-biting midges (Diptera: Chironomidae, Orthocladiinae) from Mallorca, Spain

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Abstract

Ten species of non-biting midges belonging to the subfamily Orthocladiinae were found in samples from predominantly madicolous habitats in Mallorca, Spain. One species, *Bryophaenocladius nidorum* (Edwards, 1929), has not previously been recorded from Spain, while *Smittia pratorum* (Goetghebuer, 1927), *Bryophaenocladius inconstans* (Brundin, 1947), *Orthocladius (O.) maius* Goetghebuer, 1942, *Paracladius conversus* (Walker, 1856) and *Paraphaenocladius impensus* (Walker, 1856) are recorded for the first time from the Balearic Islands.

Introduction

Non-biting midges (Diptera, Chironomidae) from the Mediterranean are of particular interest for taxonomists, biogeographists and ecologists due to the unique history of the region during the Paleogene and Neogene, as well as the high degree of the local endemism (Laville and Reiss 1992, Moubayed-Breil et al. 2012). Considerable attention has been given to the chironomid faunas of the Mediterranean islands in connection with studies on island biogeography and the ecology of intermittent rivers (Álvarez et al. 2010, Raposeiro et al. 2009).

However, from the Balearic Islands, the only Chironomidae studies are based on immature stages, mainly larvae and pupal exuviae (Álvarez et al. 2010, Malo and Garcia-Aviles, 1999). Here we present new records of adult Chironomidae from Mallorca.

Material and Methods

Specimens were sampled at nine locations in Mallorca (Fig. 1) in February 2015 using sweep nets and aspirators and preserved in 70-100% ethanol. All material was collected by Gunnar M. Kvifte. For subsequent identification, males were slide-mounted in Euparal following the procedure in Langton and Pinder (2007).

Nomenclature is according to Ashe and O'Connor (2012); distributions follow Soriano et al. (1997), Ashe and O'Connor (2012) and Spies and Sæther (2013). Specimens were identified using the keys in Langton and Pinder (2007), Cranston et al. (1989), Brundin (1947), Du et al. (2011) and Moller Pillot (2008). Voucher specimens are deposited in the Natural History collections at the University Museum of Bergen, Bergen, Norway (ZMBN).

Figure 1. Collection sites at Mallorca.

Results

Ten species of Orthocladiinae were found. One of them - *Bryophaenocladius nidorum* (Edwards, 1929), have not previously been recorded from Spain, while five additional species, *Orthocladius (O.) maius* Goetghebuer, 1942, *Paracladius conversus* (Walker, 1856) and *Paraphaenocladius impensus* (Walker, 1856), *Smittia pratorum* (Goetghebuer, 1927), *Bryophaenocladius inconstans* (Brundin, 1947) are recorded for the first time from the Balearic Islands.

Bryophaenocladius nidorum (Edwards, 1929)

Localities: Spain, Mallorca, Campos, 1 km from city centre, 39.425695°N, 2.957022°E, 7♂♂, 06 February 2015, garden; Esporles, Torrent de San Vic, 39.670459°N, 2.569193°E, 1♂, 10 February 2015, stream edges; Esporles, Son Tria, 39.663051°N, 2.573698°E, 1♂, 09 February 2015, recreational area; Banyalbufar, 39.690612°N, 2.525107ºE, 1♂, 09 February 2015, shaded ditch between Banyalbufar and Esporles.

Distribution: Austria, Finland, France (Incl. Corsica), Germany, Great Britain, Mongolia, Norway, Novaya Zemlya (Russia), Netherlands, Romania, Russia (Nothern European part), Sweden, Switzerland (Ashe and O'Connor 2012, Spies and Sæther 2013). New to Spain inclusive the Balearic Islands.

***Bryophaenocladius* sp. cf. *scanicus* (Brundin, 1947) *sensu* Langton and Pinder 2007**

Locality: Spain, Mallorca, Puigpunyant, between Ma-1041-11 and 12, 39.614133ºN, 2.553593ºE, 1♂, 12 February 2015, waterfall and stream edges near bridge.

The species recorded here is the same as the one illustrated by Langton and Pinder (2007), which appears to be quite different from the *B. scanicus sensu stricto* redescribed and illustrated in Du et al. (2011). *Bryophaenocladius scanicus sensu stricto* is listed as occurring in Spain (Soriano et al. 1997, Ashe and O'Connor 2012), but the species must be considered as new to the fauna of the Balearic Islands. However, further studies of *Bryophaenocladius* sp. cf. *scanicus sensu* Langton and Pinder 2007 is required to clarify its status and distribution.

***Bryophaenocladius inconstans* (Brundin, 1947)**

Locality: Spain, Mallorca, Banyalbufar, 39.690612ºN, 2.525107ºE, 2♂♂, 09 February 2015, shaded ditch between Banyalbufar and Esporles.

Distribution: Finland, Germany, Great Britain, Italy, Norway, Romania, Russia (East Siberia), Sweden, Spain (Sierra Nevada) (Ashe and O'Connor 2012, Spies and Sæther 2013, Casas et al., 2013). New to Balearic Islands.

***Cricotopus* sp**

Locality: Spain, Mallorca, Puigpunyant, between Ma-1041-11 and 12, 39.614133ºN, 2.553593ºE, 1♀, 12 February 2015, waterfall and stream edges near bridge.

***Corynoneura* sp.**

Locality: Spain, Mallorca, Puigpunyant, between Ma-1041-11 and 12, 39.614133ºN, 2.553593ºE, 1♂, 12 February 2015, waterfall and stream edges near bridge.

***Limnophyes minimus* (Meigen, 1818)**

Localities: Spain, Mallorca, Puigpunyant, between Ma-1041-11 and 12, 39.614133ºN, 2.553593ºE, 10♂♂,10♀♀, 12 February 2015, waterfall and stream edges near bridge; Esporles, Torrent de San Vic, 39.670459ºN, 2.569193ºE, 3♂♂, 1♀, 10 February 2015, stream edges; Banyalbufar, 39.690612ºN, 2.525107ºE, 3♂♂, 09 February 2015, shaded ditch between Banyalbufar and Esporles; Deía, loc. 1, 39.748072ºN, 2.643385ºE, 9♂♂, 08 February 2015, water-through and stream near hygropetric surface; Deía, loc. 2, 39.750554ºN, 2.642722ºE, 1♂, 08 February 2015, rock surface with sparse vegetation and some moisture; Deía, loc. 3, 39.752634ºN, 2.642415ºE, 1♂, 08 February 2015, half-dry streambed with rocks and bryophytes.

Distribution: Cosmopolitan; previously recorded from Balearic isles (Ashe and O'Connor 2012, Malo and Garcìa-Avilès 1999, Soriano et al. 1997).

***Orthocladius (O.) maius* Goetghebuer, 1942**

Locality: Spain, Mallorca, Esporles, Torrent de San Vic, 39.670459ºN, 2.569193ºE, 2♂♂, 10 February 2015, stream edges.

Distribution: Austria, Czech Republic, Germany, Great Britain, Italy, Spain, Sweden (Ashe and O'Connor 2012, Spies and Sæther 2013). New to the Balearic Islands.

***Paracladius conversus* (Walker, 1856)**

Locality: Spain, Mallorca, Deía, loc. 2, 39.750554ºN, 2.642722ºE, 1♂, 08 February 2015, rock surface with sparse vegetation and some moisture.

Distribution: Widespread in the Holarctic region (Ashe and O'Connor 2012, Spies and Sæther 2013, Soriano et al 1997). New to the Balearic Islands.

***Paraphaenocladius impensus* (Walker, 1856)**

Locality: Spain, Mallorca, Puigpunyant, between Ma-1041-11 and 12, 39.614133ºN, 2.553593ºE, 1♂, 12 February 2015, waterfall and stream edges near bridge.

Distribution: Widespread in the Holarctic region (Ashe and O'Connor 2012, Spies and Sæther 2013, Soriano et al. 1997). New to the Balearic Islands.

***Smittia pratorum* (Goetghebuer, 1927)**

Locality: Spain, Mallorca, Esporles, Torrent de San Vic, 39.670459ºN, 2.569193ºE, 1♂, 10 February 2015, stream edges; Cala Figuera, 39.330871ºN, 3.165476ºE, 2♂♂,1♀, 10 February 2015, forest glade in front of hotel; Banyalbufar, 39.690612ºN, 2.525107ºE, 1♂, 09 February 2015, shaded ditch between Banyalbufar and Esporles.

Distribution: Widely distributed in the Holarctic region; occurring in Oriental China, and possibly also in Argentina in the Neotropical region. In Spain, the species was previously recorded in the Sierra Nevada (Ashe and O'Connor 2012, Spies and Sæther 2013). New to Balearic Islands (Ashe and O'Connor 2012, Spies and Sæther 2013, Soriano et al. 1997).

Remarks: The male collected at Banyalbufar exhibits a curious abnormality in the development of the anal point as the apex of the anal point is bifurcate and Y-shaped (Fig. 2). We have not found similar examples in the literature, but a wide variety of other developmental abnormalities resulting from parasites or gene or chromosomal mutations have been thoroughly documented (see Rempel 1940; Martin and Lee 2000).

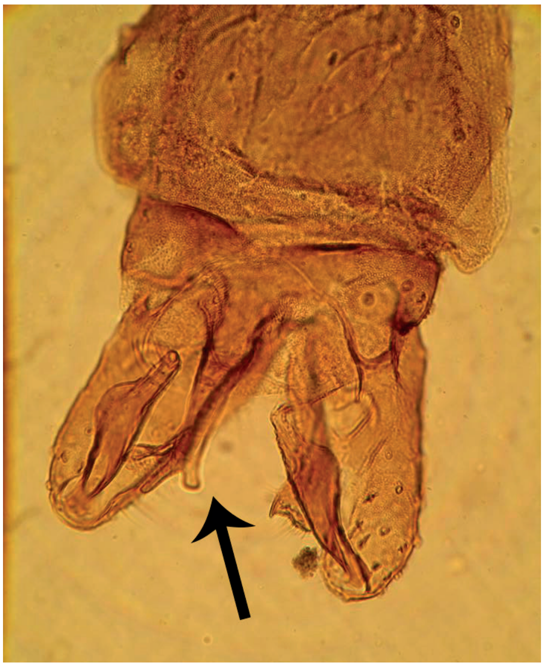

Figure 2. Hypopygium of *Smittia pratorum* (Goetghebuer, 1927) male with abnormal anal point. Black arrow pointing to the bifurcation in anal point.

Concluding remarks

The present study is based on a small sample of chironomids collected as by-catch in a study targeted at moth flies (Diptera, Psychodidae) and emphasis was thus on madicolous habitats (Kvifte et al. 2016). Chironomidae from such habitats have received a lot less attention than those of larger aquatic habitats such as lakes and rivers (Przhibroro and Baranov, 2014). The records of six new species records for the Balearic Islands from such a small sample highlights that madicolous habitats in the Mediterranean accommodate a large and still comparatively poorly understood diversity of Chironomidae.

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Madachironomus, a new genus of tribe Pseudochironomini (Diptera: Chironomidae, Chironominae) from Madagascar

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http://zoobank.org/9B1973A5-5807-48C0-8942-2AD139F91232

Abstract

Madachironomus gen. n. is described based on male and female imagines collected at two watersheds in Madagascar. Two species are included, *M. lakazana* sp. n. from Lakazana River, Antananarivo province and *M. rongaronga* sp. n. from Rongaronga River, Toamasina province. The adults have a black comb on the apex of the fore tibia, similar to the combs on mid- and hind tibiae, thus placing the new genus in the tribe Pseudochironomini Sæther. The male has a strong, moderately long, nearly parallel-sided anal point with broadly rounded apex, without microtrichia except at base, and a digitiform, apically split median volsella with strong brush-like setae, projecting medially. The female sternite VIII has a very dense posteromedial to posterolateral field of setae, the gonocoxapodeme VIII is nearly straight, the gonapophysis VIII has closely adjacent, indistinctly separable lobes; the ovoid seminal capsules have nearly straight spermathecal ducts and the labia have internal apodemes and spinose chaetulae on dorsomedial surfaces.

Introduction

The tribe Pseudochironomini within the subfamily Chironomini was established by Sæther (1977a: 154). The tribe is characterized by having a black comb on apex of fore tibia, similar to the combs on mid- and hind tibiae, and in the male the median volsella is generally present. Originally the genera *Aedokritus* Roback, 1958, *Manoa* Fittkau, 1963, *Megacentron* Freeman, 1961, *Pseudochironomus* Malloch, 1915, *Psilochironomus* Sublette, 1966, and *Riethia* Kieffer, 1917 were included in the tribe.

The genus *Aedokritus* was erected by Roback (1958); at present six described species distributed in South America are included (Trivinho-Strixino 1997). The genus *Manoa* was erected for *M. obscura* Fittkau, 1963, from the Amazon State in Brazil (Fittkau 1963). Later, *M. tangae* Andersen & Sæther, 1997, from Tanzania, East Africa and *M. pahayokeensis* Jacobsen, 2002, from Florida, U.S.A and the Dominican Republic were described and a new species has also been found in Oriental China (Andersen & Sæther 1997; Jacobsen & Perry 2002; da Silva et al. 2015; Xiaolong Lin pers. com.). The genus *Megacentron* was erected based on *M. erebeum* (Skuse, 1889) from Victoria in Australia by Freeman (1961); later *M. cuneicalcar* (Edwards, 1931) from Argentina and Chile was included. The genus *Pseudochironomus*, described by Malloch (1915), with 11 species in the Nearctic region, one species in the Palaearctic region and several, mainly undescribed species in the Neotropical region is the most species rich genus in the tribe; the Nearctic species were reviewed by Sæther (1977b). The genus *Riethia* was erected by Kieffer (1917); at present five species distributed in the Australian and Neotropical regions are included (Trivinho-Strixinho et al. 2009).

The genus *Psilochironomus* was established by Sublette (1966) based on *Chironomus fumeus* Walley, 1934, from Guyana. *Chironomus fumeus* was described by Walley (in Curran 1934) from a single, incompletely preserved adult male and the brief description and sketchy drawing (Walley *in* Curran 1934: fig. 18) give no indication of any gonocoxite appendages. Sublette (1966) examined and redescribed the pinned remains of the holotype and reported that the genitalia were missing. Nevertheless, he proposed the new genus *Psilochironomus*, with *P. fumeus* (Walley) as the only member, stating that the genus "may be distinguished ... by the genitalia lacking superior and inferior appendages." However, today both *Chironomus fumeus* and *Psilochironomus* are considered to be *nomina dubia* in Pseudochironomini (see Spies & Reiss 1996: 90).

Below two new species from Madagascar are described, figured and placed in a new genus of the tribe Pseudochironomini. Both species have a black comb on the apex of the fore tibia, similar to the combs on mid- and hind tibiae, and the male has a digitiform, apically split median volsella with strong brush-like setae.

Material and Methods

Molecular extraction for sequencing yielded no productive results, presumably due to the preservation (denatured alcohol) and age of the specimens. Prior to examination the specimens were mounted in Canada balsam following the procedure outlined by Sæther (1969). Morphological terminology follows Sæther (1980). Coloration is based on alcohol-preserved specimens. Measurements are given as ranges, followed by the mean when four or more specimens were measured, followed by the number of specimens measured in parentheses.

The holotypes and most paratypes will be deposited in the Zoologische Staatssammlung München, Munich, Germany (ZSM); the remaining paratypes will be kept in the Department of Natural History (ZMBN), Bergen University Museum, Norway.

Madachironomus new genus

http://zoobank.org/40BE526D-5658-4CEA-83C9-186057B84F12

Type species: *Madachironomus lakazana* sp. n.

Other included species: *Madachironomus ronga-ronga* sp. n.

Etymology: The name of the new genus is a combination of the first two syllables from the place name Madagascar using the suffix -*chironomus.*

Generic diagnosis

The adults have the fore tibiae with one spurred comb, mid- and hind tibiae each with two separate, spurred combs; all combs subtriangular with rather steep flanks, the 1–2 pairs of teeth flanking the spur arising from the base of the latter and farther distally than the other comb teeth. The male has a strong, moderately long, nearly parallel-sided anal point with broadly rounded apex, without microtrichia except at base, and a digitiform, apically split median volsella with strong brush-like setae. The female has sternite VIII with a very dense posteromedial to posterolateral field of setae, a nearly straight gonocoxapodeme VIII, gonapophysis VIII with closely adjacent, indistinctly separable lobes, ovoid seminal capsules with nearly straight spermathecal ducts and labium with internal apodeme and spinose chaetulae on dorsomedial surfaces.

Generic description

Adult male

Antenna. With 13 flagellomeres, AR about 2.4.

Head. Frontal tubercles absent. Temporal setae consisting of inseparably intergrading verticals and postorbitals, briefly bi- to tri-serial near transition of eye to its dorsomedial extension. Eye bare; dorsomedial eye extension parallel-sided, about 2.5 times as wide as high, mostly of 5 facets per diagonal; interocular distance in frontal view about 3 times the apical width of the extension, slightly lower dorsally than ventrally. Clypeus with numerous setae arising over nearly entire surface. Palp 5-segmented, palpomere 3 with 2–3 sensilla clavata apically.

Thorax. Not projecting anterodorsally or arching overhead; scutal tubercle absent. Antepronotum visible in dorsal view, medially with relatively narrow but deep V-shaped notch, each lobe narrowest in mid-section; in lateral view with dorsal projection to anterior and with curved subsurface contour indicating the anteromedial excavation; with dorsal and ventrolateral semi-spinose, short setae. Acrostichals weak, numerous, paired or interspersed with small, light spots without alveoli or setae; setae short, semi-spinose, occurring from near antepronotum to almost as far posterior as dorsocentrals. Dorsocentrals weak, numerous, uni- to irregularly tri-serial, beginning above parapsidal suture, setae slightly longer than acrostichals. Prealars uniserial to bi-serial. Supraalars absent, exceptionally 1. Scutellum with numerous weak setae, bi- to tri-serial. Alveoli of all thoracic setae not surrounded by circles lighter in color than adjacent surfaces.

Wing. Costa weakly extended, ending proximal to wing apex. R_{2+3} ending at one third of the distance between apices of R_1 and R_{4+5}. FCu slightly proximal to RM. Brachiolum with 2–3 setae; costal extension with few non-marginal setae; R_{4+5} occasionally with single seta apically; other veins and membrane bare. Squama with numerous, partly bi- to tri-serial setae.

Legs. Fore tibia with single, dark comb, with central protruding long spur; mid- and hind tibia with two triangular combs, each with protruding central spur. Fore tarsal beard absent. Pseudospurs absent. Sensilla chaetica present in proximal 1/3 of ta_1 of mid- and hind leg. Pulvillus pad-like, ventrally covered with elongate trichia, broadly triangular, shorter than empodium, reaching beyond tip of fifth tarsomere to about mid-length of claw.

Hypopygium. Anal point tapering to apex that is tongue-shaped in dorsal view, subacute and slightly curving ventrad in lateral view, without microtrichia except at base. Tergite IX with several weak setae to each side of the base of anal point. Phallapodeme well developed, aedeagal lobe with narrow, curved oral projection. Transverse sternapodeme narrow, strongly arched, with low, rounded orolateral projections. Pars ventralis absent. Median volsella composed of elongate, digitiform main stem, split in apical 2/3, projecting posteromedially, densely covered with more or less subulate setae, and with cluster of additional, long subulate setae arising from gonocoxite next to proximal corner of volsella. Superior volsella distally sclerotized, darker than surrounding structures, projecting caudad, not reaching past anal point or distal end of gonocoxite, with broadly triangular base with 1–2 dorsolateral setae, and hooked apical part with few mesally directed setae, without microtrichia on dorsal surface. Inferior volsella broadly digitiform in dorsal view, with microtrichia and normal to strong setae along entire medial length, on distal-dorsal surface and less densely distolaterally; proximoventrally with globose, more membranous expansion. Gonocoxite with 4 ventromedial setae proximal and 3 distal to median volsella. Gonostylus weakly curved with bluntly rounded apex, with row of short, curved setae along inner margin.

Adult female

As male except antenna with 6 flagellomeres; AR about 0.6; flagellomeres 1–5 each with submedial whorl of 3–5 strong setae and with subapical ring of 2–4 sensilla chaetica; flagellomere 6 with 15–20 sensilla chaetica in apical 3/4. Dorsomedial eye extension less distinct than in male, about 1.2 times as wide as high, mostly of 5–6 facets per diagonal; eyes separated by more than three times the width of the eye extension. Wing veins darker brown than in male, with dark spot along crossvein RM and radial fork; membrane brown with stronger shading along veins. Wing vein R_{2+3} ending about half-way between apices of R_1 and R_{4+5}.

Abdomen. Tergites I, II, IV–VIII with successively increasing numbers of widely scattered, relatively short but strong setae arising in light-colored circles; tergite III with setae mostly concentrated anteriorly and posteriorly and few setae in between. Paratergites IV (except anteriorly) –VII with conspicuous longitudinal setation. Sternites II–V with (postero)lateral longitudinal rows or patches of setae, sternites VI–VII with these patches spreading to medial and anterior; in addition, sternites VI–VII with marginal rows of setae paralleling those on paratergites; sternite VII with posteromedial triangular field of more densely set setae.

Genitalia. Sternite VIII with very dense posteromedial to posterolateral field of setae; zone of transition from sternite to genital bay densely covered with medially directed trichia of various sizes, some arising from papillar but non-alveolar bases; posterior margin of sternite VIII on either side of genital bay with a more or less distinct peak to posterior. Vaginal floor conspicuous in ventral view as a pair of darkened, anteromedially narrowly fused areas; anterior and lateral margin of floor with narrow sclerotization that is posteriorly connected to the gonocoxapodeme VIII; dorsal (intra-vaginal) surface of floor with loosely spaced microtrichia. Gonocoxapodeme VIII nearly straight, extending from dorsal of anteromedial margin of floor to near posteromedial peak of sternite VIII, hardly reaching farther lateral than coxosternapodeme. Gonapophysis VIII with closely adjacent, indistinctly separable lobes. Dorsomesal lobe anteriorly parallel to inner margin of floor with greatest width near posterior end. Ventrolateral lobe arising anteromedial of posteromedial peak of sternite VIII, apparently consisting of two membranous lobes with microtrichia and fine dissections along its medial margin. Apodeme lobe with conspicuous transverse apodeme dorsal of posterior end of dorsomesal lobe, and with extensive soft membrane to medial and posterior that carries many trichia and fine striations on its margin and at least anteroventral surface. Notum extending through most of length of segment VIII, much longer than seminal capsule, free rami very short or indistinct. Seminal capsule ovoid, spermathecal duct nearly straight, carrying secretory cells, subapically narrowing, the two ducts meeting at their joint opening. Coxosternapodeme with extensive anterolateral part carrying a diagonal dorsal ridge, and with narrow anteromedial and posterior extensions. Labium with diagonal internal apodeme and fine to spinose chaetulae on dorsomedial surface.

Tergite IX shallowly hemispherical, with setae indistinctly separated in two groups, and with a posteromedial brown streak that leads towards a sclerotized external tubercle. Gonocoxite IX with dorsal, lateral and ventral setae. Segment X without setae, ventrally with large triangular postgenital plate, dorsally with even longer mediocaudal projection. Cercus long with anterior end curving to lateral where it is fused to segment X.

Systematics

The new genus is similar to the other genera of the tribe Psudochironomini in having a black comb on the apex of the fore tibia, similar to the combs on mid- and hind tibiae. The males of the genera *Manoa*, *Pseudochironomus* and *Riethia* all lack an anal point, while *Aedokritus* has a triangular anal point covered with microtrichia at least in basal one half, and *Megacentron erebus* (Skuse,

1889) has a rather narrow, spatulate anal point apparently without microtrichia except at base. The male of the new genus has a strong, moderately long, nearly parallel-sided anal point with broadly rounded apex, without microtrichia except at base. It also has a has a digitiform, apically split median volsella with strong brush-like setae, projecting medially, while both *Aedokritus* and *Megacentron* have median volsellae projecting caudally. The female genitalia are complex, differing quite strongly from the genitalia of *Pseudochironomus* and *Manoa* as described by Sæther (1977a), particularly in the shape of gonapophysis VIII.

Madachironomus lakazana **sp. n.**

http://zoobank.org/C8B38DA0-E7ED-45FF-8322-BB82A3279AA5

Type material. Holotype male, Madagascar, Antananarivo province, Analamanga region, Anjozorobe district, Anjafy high plains, Betsiboka drainage, Lakazana River at Ankondondona, approx. 47°46'E 18°05'S, evening of 20.xi.1996, light trap, leg. LRSAE/ORSTOM (ZSM). Paratypes: 1 male, 2 females, same data as holotype (ZMBN, ZSM).

Etymology. Named after Lakazana River, Antananarivo province, Madagascar, where the species was collected. The name is to be regarded as a noun in apposition.

Diagnostic characters. See diagnostic characters for the genus. The female can be separated from the female of *M. rongaronga* sp. n. as it is larger, with a wing length of 4.16–4.18 mm compared to 3.11–3.58 mm in *M. rongaronga,* has a slightly lower antennal ratio (AR = 0.58–0.66 compared to AR = 0.70–0.81) and has distinctly more setae on segment X to each side of vagina (189–231 setae compared to 53–78 setae).

Description

Adult male (n = 2–3). Total length 9.16–9.45 mm. Wing length 4.12–4.16 mm. Total length / wing length 2.23–2.27. Wing length / length of profemur 2.32–2.35.

Coloration. Head, antennae and palpi brown. Thorax mostly brown with lateral mesonotal dark brown spot. Legs medium brown, foreleg with tibia and ta_{2-5} brown, fore tibia with dark brown apex, fore ta_1 lighter brown with dark brown apex; mid- and hind legs with lighter brown tarsi. Wing membrane (Fig. 8) translucent with brownish stain and some light shaded areas e.g. proximally and distally in cell c, along most of sc, proximal in r_{4+5} and along Cu and proximal parts of M_{3+4} and Cu_1; wing veins brownish, crossvein RM and radial fork darker brown. Abdominal segment 1 pale brown, abdominal segments 2–5 light brown with narrow anterior transverse brown band; segments 6–8 and hypopygium brown.

Antenna. AR 2.37–2.49. Terminal flagellomere 1503–1560 µm long.

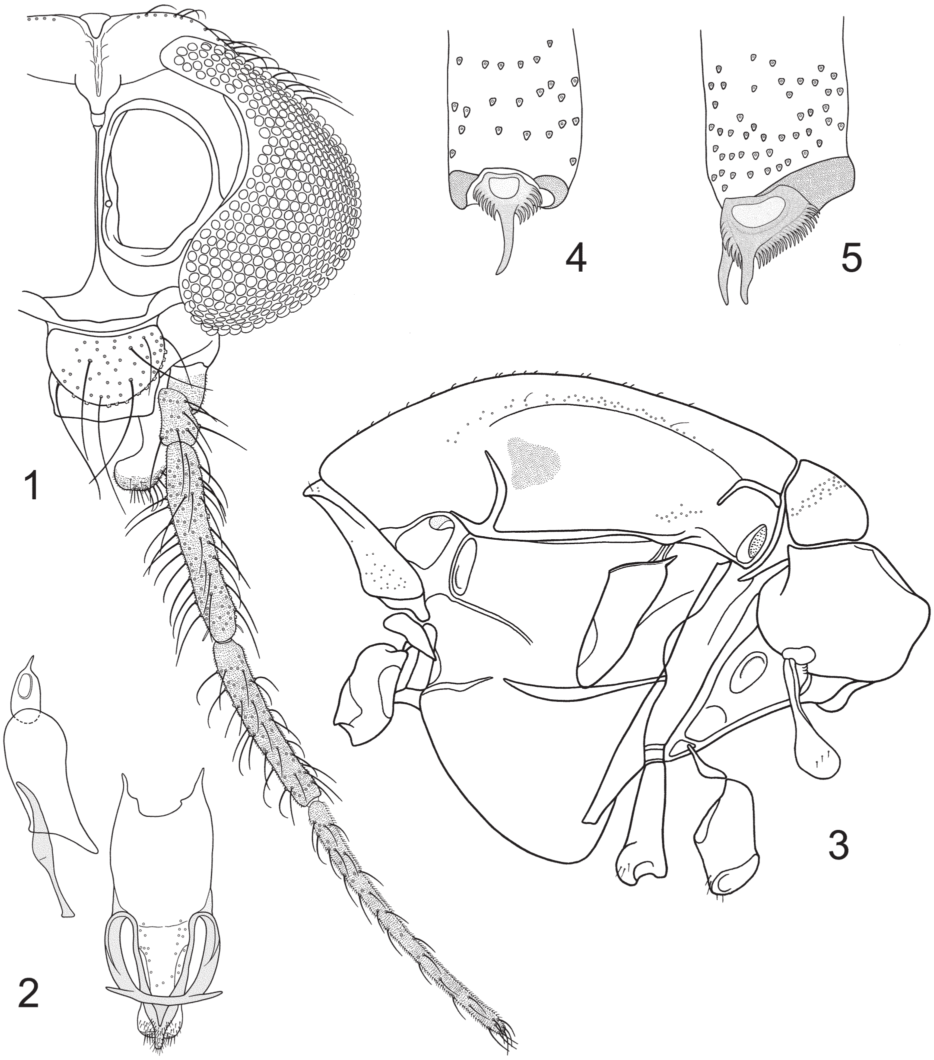
Head (Fig. 1). Temporal setae 22–25, briefly bi- to tri-serial near transition of eye to its dorsomedial extension, consisting of inseparably intergrading verticals and postorbitals. Clypeus with 62–68 setae. Tentorium, stipes and cibarial pump as in Figure 2. Tentorium 277–312 µm long, 82–90 µm wide. Stipes 242–267 µm long, 21–25 µm wide. Palpomere lengths (in µm): 76–92, 112–128, 396–412, 380–384, 640–651. Third palpomere with 2–3 sensilla clavata apically, longest 19–25 µm long.

Thorax (Fig. 3). Antepronotum with 4–6 dorsal and 15–17 ventrolateral setae. Acrostichals apparently about 40; dorsocentrals 42–45, weak; prealars 3–11; supraalars 0–1. Scutellum with 48–52 setae in 2–3 irregular rows.

Wing (Fig. 8). VR 0.98–0.99. C extension 72–109 µm long. Brachiolum with 2–3 setae; C extension with 4–6 non-marginal setae; R_{4+5} with 0–1 seta apically; other veins bare. Wing membrane bare. Squama with 28–36 setae, partly bi- to tri-serial.

Legs (Figs 4–5). Spur of fore tibia 80–89 µm long; spurs of mid tibia 100–115 µm and 103–121 µm long; spurs of hind tibia 105–121 µm and 113–127 µm long. Width at apex of fore tibia 111–113 µm; of mid tibia 127–131 µm; of hind tibia 135–139 µm. Mid ta_1 with about 15 sensilla chaetica in 3 rows in proximal 1/3, hind ta_1 with about 25 sensilla chaetica in 3 rows in proximal 1/3. Lengths and proportions of legs as in Table 1.

Hypopygium (Figs 6–7). Tergite IX with 13–17 setae along posterior margin to each side of base of anal point; laterosternite IX with 15–23 setae. Anal point tapering to tongue-shaped apex, 115–123 µm long, 66–75 µm wide at base, 29–35 µm wide subapically. Phallapodeme 316–324 µm long, including 88–96 µm long, 8–12 µm wide, curved oral projection. Transverse sternapodeme 120–128 µm long. Gonocoxite 380–404 µm long. Median volsella with main stem split medially in two digitiform projections; longest, caudal branch 72–80 µm long, 16–20 µm wide medially; shortest, oral branch 66–84 µm long; densely covered with subulate setae up to 66–85 µm in length. Superior volsella 92–108 µm long, including 34–38 µm long, hooked apical portion; with 1–2 strong, 28–30 µm long setae dorsolaterally, hooked apical portion



Figures 1-5. *Madachironomus lakazana* gen. n., sp. n., male. 1) head; 2) tentorium, stipes and cibarial pump; 3) thorax; 4) comb of foreleg; 5) combs of hind leg.

Table 1. Lengths (in µm) and proportions of legs of *Madachironomus lakazana* gen. n., sp. n., male (n = 2–3).

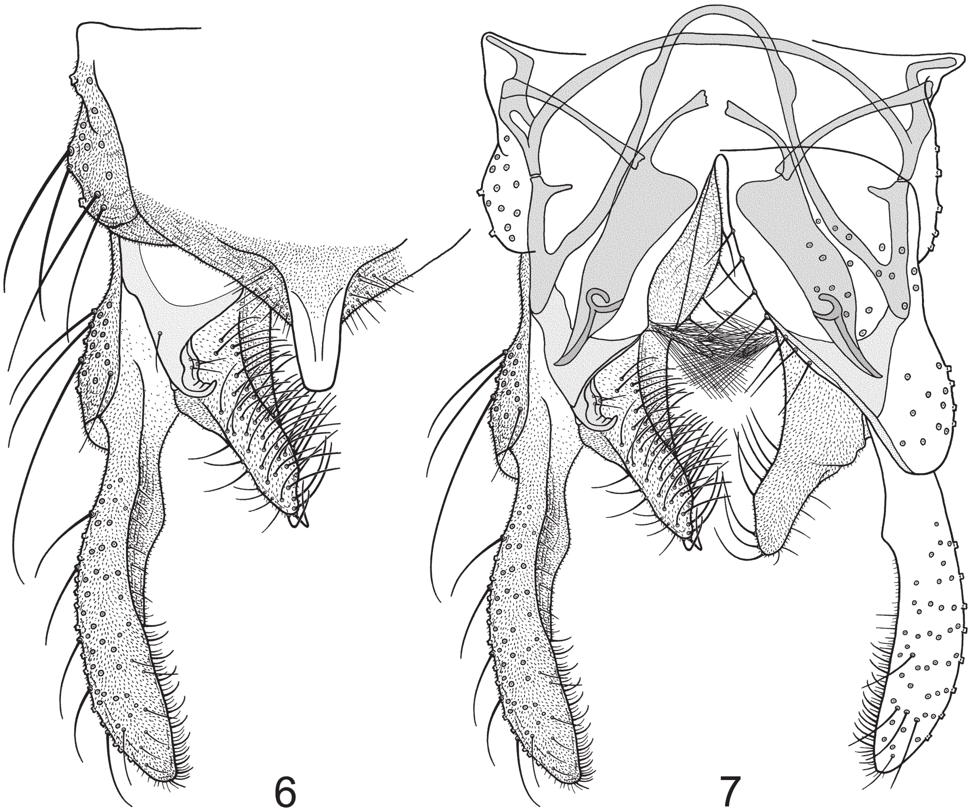
	fe	**ti**	**ta_1**	**ta_2**	**ta_3**	**ta_4**
p_1	1730–1812	2368–2410	1854–1957	741–824	597–698	494–556
p_2	2266–2307	2575–2657	1009–1092	556–577	494–536	309–330
p_3	2369–2410	2822–2843	1215–1318	638–701	577–639	330–391

	ta_5	**LR**	**BV**	**SV**	**BR**
p_1	206–247	0.769–0.826	2.661–2.949	2.137–2.244	1.813–1.866
p_2	144–165	0.380–0.424	3.753–3.959	4.434–4.898	2.125–2.166
p_3	154–165	0.431–0.467	3.467–3.747	3.938–4.271	2.211–2.500

with 3–6 medial to ventral setae. Inferior volsella broadly digitiform, 208–212 µm long, 80–100 µm wide at base, 48–56 µm wide medially, with 63–82 normal to strong setae. Gonostylus 328–344 µm long. HR 1.11–1.20. HV 2.74–2.80.

Adult female (n = 2). Total length 9.83–9.93 mm. Wing length 4.16–4.18 mm. Total length / wing length 2.36–2.39. Wing length / length of profemur 2.39–2.43.

Coloration. Generally distinctly darker than male. Head, antennae and palpi brown. Thorax mostly brown, lateral mesonotal dark spot less contrasting than in male, indistinct in some specimens. Legs medium brown; foreleg with tibia and $ta_{2–5}$ darker brown, fore tibia with dark brown apex, fore ta_1 lighter brown with dark brown apex; mid- and



Figures 6-7. *Madachironomus lakazana* gen. n., sp. n., male. 6) hypopygium, dorsal view; 7) hypopygium with anal point and tergite IX removed, dorsal aspect to the left and ventral aspect to the right.

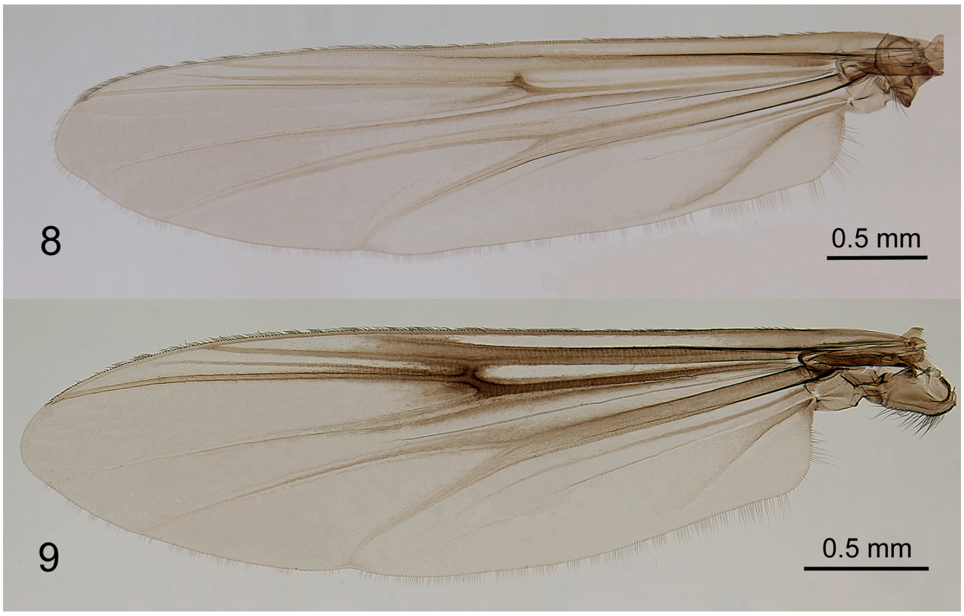
hind legs with lighter brown femoral apices and tarsi. Wing membrane translucent with brownish stain and some more darkly shaded areas, e.g. proximally and distally in cell c, along most of sc, proximally in r_1 and r_{4+5}, along Cu and proximal parts of M_{3+4} and Cu_1; veins brown, crossvein RM and radial fork darker brown. Abdominal tergites and posterior sternites brown, anterior sternites light brown, anterior transverse segment bands indicated in some specimens; hypopygium medium brown.

Antenna (Fig. 12). With 6 flagellomeres; AR = 0.58–0.66. Length and width of pedicel and flagellomeres 1–6 (in µm) as: 80–92 / 128–132, 100–104 / 56–60, 84–88 / 40–44, 92–104 / 40–44, 96–104 / 38–42, 88–92 / 36–40, 272–300 / 28–32. Flagellomeres 1–5 with ring of sensilla chaetica subapically, flagellomere 6 with sensilla chaetica in apical 2/3. Flagellomere 6 with 1–2 strong setae subapically, longest 118–148, 133 µm long.

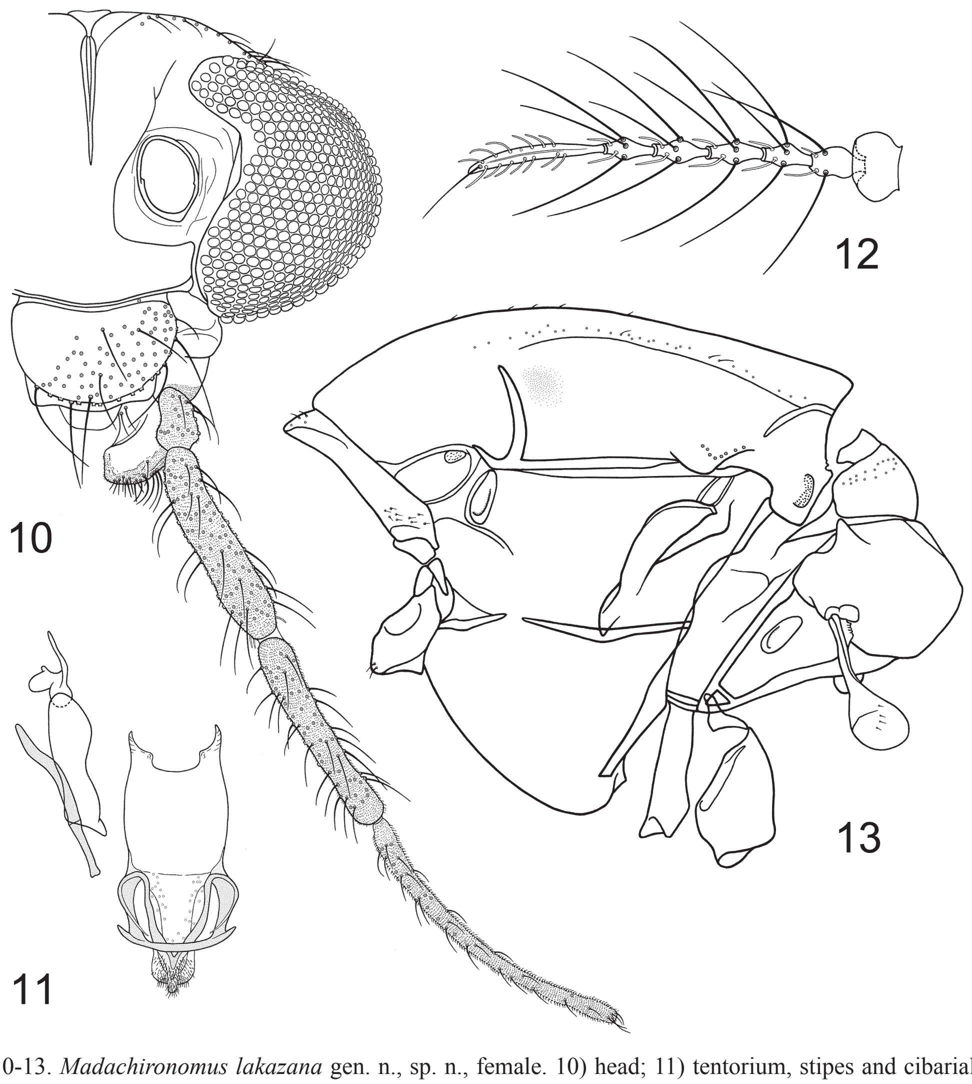
Head (Fig. 10). Temporal setae 22–24, briefly bi- to tri-serial near transition of eye to its dorsomedial extension, consisting of inseparably intergrading verticals and postorbitals. Clypeus with 105–112 setae. Tentorium, stipes and cibarial pump as in Figure 11. Tentorium 304–316 µm long, 76–80 µm wide. Stipes 272–312 µm long, 24–28 µm wide. Palp segment lengths (in µm): 87–98, 108–114, 376–380, 380–388, 556–588. Third palpomere with 2–3 sensilla clavata apically, longest 21–25 µm long.

Thorax (Fig. 13). Antepronotum with 6–9 dorsal and 14–15 ventrolateral setae. Acrostichals apparently about 40; dorsocentrals 36–41 weak, in 1–3 irregular rows; prealars 7–8. Scutellum with 44–48 setae in 2–3 rows.

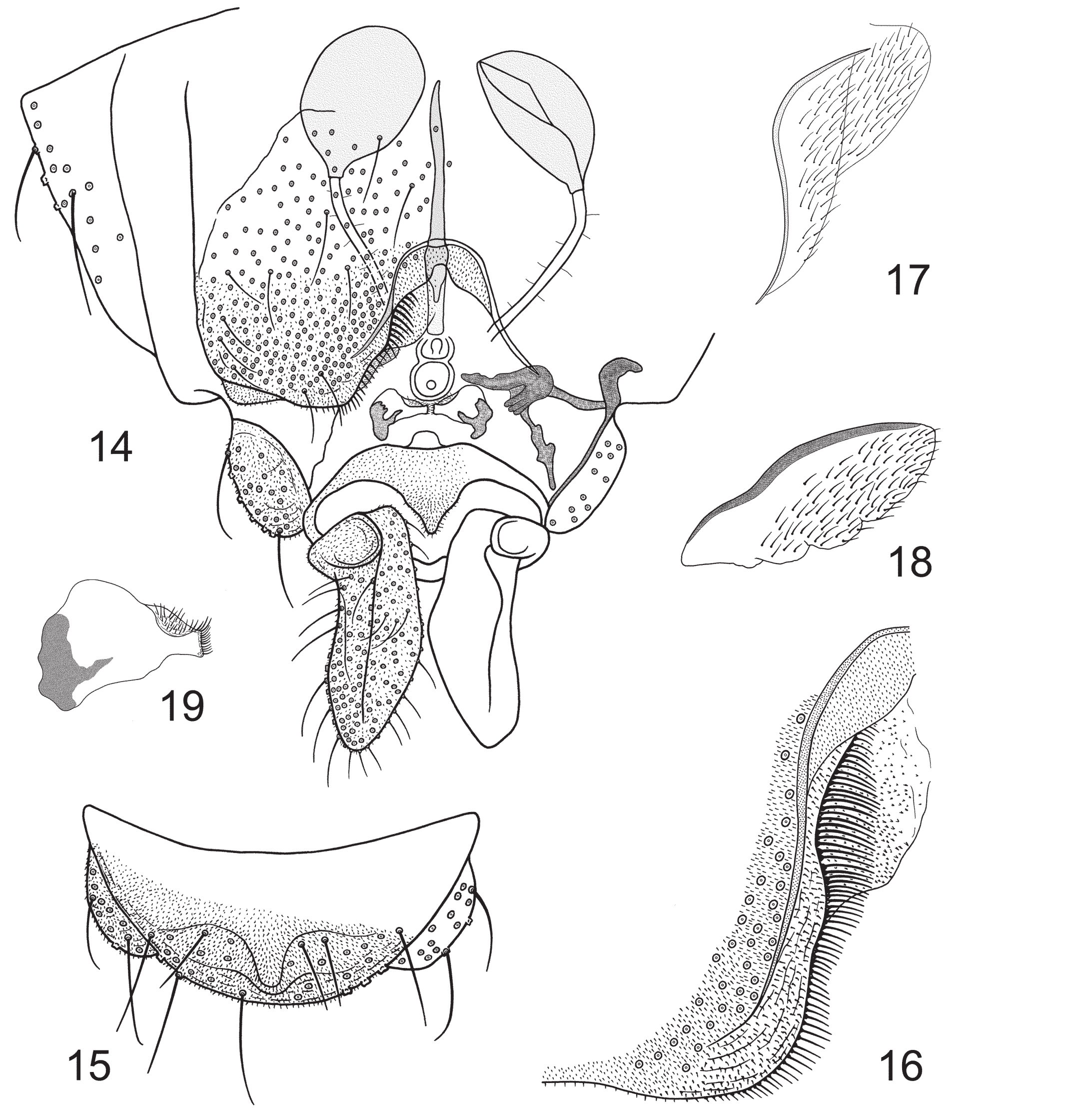
Wing. VR 1.01–1.07. C extension about 60 µm long. Brachiolum with 2 setae, C extension with 2–5 non-marginal setae, R_1 with 8–12 setae in apical 1/3, R_{4+5} with 2–5 seta apically, other veins bare. Wing membrane bare. Squama with 31–35 setae, partly bi- to triserial.



Figures 8-9. *Madachironomus* gen. n., wings. 8) *M. lakazana* sp. n., male; 9) *M. rongaronga* sp. n., female (photo Torbjørn Ekrem).



Figures 10-13. *Madachironomus lakazana* gen. n., sp. n., female. 10) head; 11) tentorium, stipes and cibarial pump; 12) antenna; 13) thorax.



Figures 14-19. *Madachironomus lakazana* gen. n., sp. n., female. 14) genitalia, ventral view; 15) tergite IX; 16) dorsomesal lobe; 17) ventrolateral lobe; 18) apodeme lobe; 19) labium.

Table 2. Lengths (in µm) and proportions of legs of *Madachironomus lakazana* gen. n., sp. n., female (n = 2).

	fe	**ti**	**ta$_1$**	**ta$_2$**	**ta$_3$**	**ta$_4$**
p$_1$	1710–1751	2348–2410	1710–1812	700–721	618–639	494–515
p$_2$	2245–2266	2554–2698	948–1009	515–556	453–474	288–330
p$_3$	2369–2390	2760–2946	1195–1257	597–700	556–618	350–371

	ta$_5$	**LR**	**BV**	**SV**	**BR**
p$_1$	226–247	0.728–0.752	2.800–2.843	2.295–2.373	1.733–1.750
p$_2$	144–165	0.371–0.374	3.905–4.118	4.898–5.087	1.750–1.888
p$_3$	144–165	0.427–0.433	3.556–3.837	4.293–4.246	1.600–1.700

Legs. Spur of fore tibia 76–80 µm long, spurs of mid tibia 100–104 µm and 112–116 µm long, of hind tibia 100–108 µm and 116–120 µm long. Width at apex of fore tibia 116–124 µm, of mid tibia 128–136 µm, of hind tibia 136–144 µm. Mid ta$_1$ with about 50 sensilla chaetica in 2–3 rows in proximal 1/3, hind ta$_1$ with about 35 sensilla chaetica in 2–3 rows in proximal 1/3. Lengths and proportions of legs as in Table 2.

Genitalia (Figs 14–19). Segment X with 189–231 setae to each side of vagina. Seminal capsule ovoid, 176–184 µm long, not including 18–20 µm long neck, 120–132 µm wide. Notum 204–228 µm long. Dorsomesal lobe 218–224 µm long from base of vagina to apex. Gonocoxite IX with 28–30 setae. Tergite IX with 31–37 setae. Cercus 284–292 µm long.

Larva and pupa. Unknown.

Madachironomus rongaronga **sp. n.**

http://zoobank.org/378E3CFF-4AF5-408A-956A-0C99A71F295B

Type material. Holotype female, Madagascar, Toamasina province, Atsinanana region, Vohibinany district; Rianila drainage, Rongaronga River at Ambinaninony-Sahavalaina, approx. 49°07'E 18°34'S, evening of 19.ix.1995, light trap, leg. LRSAE/ORSTOM (ZSM). Paratypes: 3 females, same data as holotype (ZMBN, ZSM).

Etymology. Named after Rongaronga River, Toamasina province, Madagascar, where the species was collected. The name is to be regarded as a noun in apposition.

Diagnostic characters. See diagnostic characters for *M. lakazana* sp. n.

Description

Adult female (n = 4). Total length 7.07–7.83, 7.49 mm. Wing length 3.11–3.58, 3.28 mm. Total length / wing length 2.08–2.45, 2.26. Wing length / length of profemur 2.22–2.43, 2.35.

Coloration. Head, antennae and palpi brown. Thorax mostly brown, without lateral mesonotal dark spot. Legs brown; foreleg with lighter brown ta_1; mid- and hind legs with lighter brown tarsi. Wing membrane (Fig. 9) translucent with brownish stain and more darkly shaded areas, e.g. proximally and distally in cell c, along most of sc, proximally in r_1 and r_{4+5}, along Cu and proximal parts of M_{3+4} and Cu_1; veins brown, crossvein RM and radial fork darker brown. Abdomen and hypopygium brown, first abdominal segment lighter brown.

Antenna. With 6 flagellomeres; AR = 0.70–0.81, 0.78. Length and width of pedicel and flagellomeres 1–6 (in µm) as: 72–84, 80 / 112–120, 117; 80–88, 85 / 44–48, 46; 60–64, 61 / 34–40, 36; 68–80, 72 / 32–40, 36; 64–76, 71 / 32–38, 36; 64–80, 74 / 32–36, 34; 276–296, 288 / 24–30, 28. Flagellomeres 1–5 with ring of sensilla chaetica subapically, flagellomere 6 with sensilla chaetica in apical 3/4. Flagellomere 6 with 1–2 strong setae subapically, longest 121–160, 138 µm long.

Head. Temporal setae 14–18, 16, briefly bi-serial near transition of eye to its dorsomedial extension, consisting of inseparably intergrading verticals and postorbitals. Clypeus with 79–108, 93 setae. Tentorium 180–256, 220 µm long; 56–64, 61 µm wide. Stipes 220–240, 230 µm long; 18–23, 21 µm wide. Palp segment lengths (in µm): 80–88, 85; 92–112, 99; 332–420, 362; 356–436, 389; 560–648, 590. Third palpomere with 1–2 sensilla clavata apically, longest 17–22 µm long.

Thorax. Antepronotum with 4–7, 5 dorsal and 7–12, 10 ventrolateral setae. Acrostichals apparently about 35; dorsocentrals 24–34, 30 weak, in 1–2 irregular rows; prealars 4–6, 5. Scutellum with 41–44, 42 setae in 2–3 rows.

Wing (Fig. 9). VR 0.94–1.00, 0.97. C extension 47–75, 65 µm long. Brachiolum with 2–3, 2 setae; C extension with 2–4, 3 non-marginal setae; R_1 with 5–14, 11 setae in apical 1/3; R_{4+5} with 1–3, 2 setae apically; other veins bare. Wing membrane bare. Squama with 27–33, 31 setae, partly bi- to tri-serial.

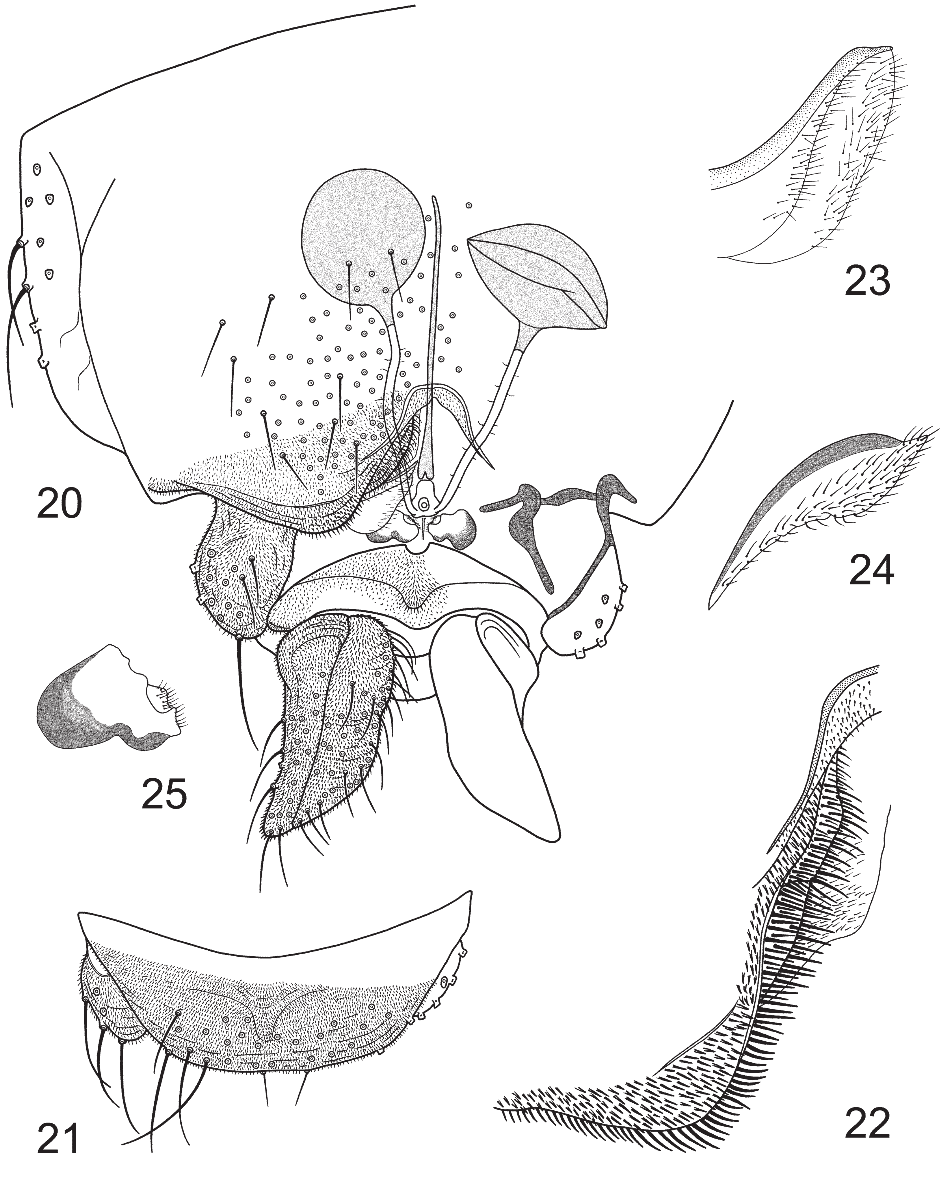
Legs. Spur of fore tibia 60–64, 62 µm long; spurs of mid tibia 68–84 (3) µm and 80–100, 94 µm long; of hind tibia 80–96, 90 µm and 96–108, 103 µm long. Width at apex of fore tibia 96–100, 99 µm; of mid tibia 100–108, 104 µm; of hind tibia 104–116, 113 µm. Mid ta_1 with about 35 sensilla chaetica in 2–3 rows in proximal 1/3, hind ta_1 with about 40 sensilla chaetica in 2–3 rows in proximal 1/3. Lengths and proportions of legs as in Table 3.

Genitalia (Figs 20–25). Segment X with 53–78, 63 setae to each side of vagina. Tergite IX with 22–28, 24 setae. Seminal capsule ovoid, 133 (1) µm long, not including 31 (1) µm long neck, 121 (1) µm wide. Notum 184–193 (3) µm long. Dorsome-

Table 3. Lengths (in µm) and proportions of legs of *Madachironomus rongaronga* gen. n., sp. n., female (n = 3, except when otherwise stated).

	fe	ti	ta_1	ta_2	ta_3	ta_4
p_1	1318–1524	1772–2081	1318–1483	618–701	536–577	433–474
p_2	1751–2019	2225–2534	803–927	433–494	350–391	206–247
p_3	1895–2163	2431–2699	1009–1154	536–618	433–474	247–288

	ta_5	LR	BV	SV	BR
p_1	196–227	0.970–1.000	2.446–2.573	2.344–2.453	1.471 (1)
p_2	103–124	0.358–0.366	4.315–4.434	4.911–5.026	1.643 (1)
p_3	103–124	0.415–0.427	3.912–4.047	4.214–4.286	2.125–2.500



Figures 20-25. *Madachironomus rongaronga* gen. n., sp. n., female. 20) genitalia, ventral view; 21) tergite IX; 22) dorsomesal lobe; 23) ventrolateral lobe; 24) apodeme lobe; 25) labium.

sal lobe 156–176, 165 μm long from base of vagina to apex. Gonocoxite IX with 16–23, 18 setae. Tergite IX with 21–27, 24 setae. Cercus 208–240, 225 μm long.

Adult male, larva and pupa. Unknown.

Discussion

Cranston (2003: 184) described Pseudochironomini as "almost certainly a paraphyletic grade", and according to Epler et al. (2013: 433) the "validity and characteristics of a tribe Pseudochironomini are uncertain". As reflected in these statements, considerable evidence needs to be gathered and evaluated before this opinion could become a widely accepted systematic result. In any case, note that these doubts address the relatively wide concept of the tribe drawn up by Sæther (1977a: 154). If Pseudochironomini proves untenable in the traditional sense, the name might still be applied to any monophylum that includes the type genus, *Pseudochironomus*, but excludes one or more of the other currently included genera, provided that the resulting smaller clade still warrants the status of a tribe. Andersen et al. (2011: 48) indicated one such possibility, but also found the available data to be insufficient for a meaningful conclusion.

Polukonova et al. (2013) analyzed amino acid proportions in the barcoding section of the COI gene from various Chironominae species, and reported the observed divergences among taxa to increase significantly with each higher systematic rank. They proposed that corresponding divergence observed in any pair of species or genera indicates whether or not the two taxa belong to the respective same genus, tribe or subfamily. Applying this to the Chironominae, they found support for the distinction of three major subdivisions, one of these 'tribes' being Tanytarsini in the traditional sense. However, another 'tribe' combined *Pseudochironomus* ("*P.* sp." from GenBank; the genus might be misidentified) with *Polypedilum* Kieffer and *Sergentia* Kieffer, *Endochironomus* Kieffer and *Synendotendipes* Grodhaus, whereas in the third 'tribe' *Riethia* ("*R. stictoptera*" from GenBank) clustered with the remainder of Chironomini.

The latter association is fundamentally different from the results of Cranston et al. (2012; *Pseudochironomus* not included), whose multi-gene analysis had *Riethia* so far removed from Polukonova et al.'s 'remaining' Chironomini that the two are not even part of the same larger monophylum. However, the two sets of results agree in suggesting that the tribes Chironomini and Pseudochironomini look untenable in their traditional definitions. More research is thus needed to clarify the status of the tribe Pseudochironomini.

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Chironomids also favour fermented products: an observation of chironomids dwelling in rotten apples

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Chironomids are known to be extremely versatile in utilizing food sources and colonizing diverse habitats. This is probably one of the reasons for their extreme distribution. They often occupy surprising habitats and feed on unexpected sources. Such an uncommon food source for aquatic Chironomidae is fallen fruits in streams and lakes. To the best of our knowledge such feeding habits have only been reported from South America, where larvae of the genus *Endotribelos* are widespread and common dwellers of fruit tissues of several tree species in forested streams (Roque et al. 2008).

In the present short communication we report chironomids dwelling in fallen rotten apples floating on the surface of an urban pond in Slovakia. The study pond (Fig. 1a) is situated in the urban area of Banská Bystrica (central Slovakia, 48°44'29.03'' N, 19°07'26.30'' E, 401 m a.s.l.) and it has an area of ~ 15 m^2 with a max depth of 1 m. The pond harbours aquatic plants (*Myriophyllum*, *Nymphaea*, *Typha*) and a population of Koi carp (*Cyprinus carpio haematopterus*). There are several apple trees close by the pond from were apples fall into the water (Fig. 1b). During a standard limnological investigation of the pond in August 2016 we noticed the presence of chironomid larvae inside an apple floating on the surface. Therefore we collected, sectioned and investigated 11 apples to see whether it is a common food/habitat for chironomid larvae (Fig. 1c).

In the apples examined, a total of 21 larvae of three taxa were found: *Endochironomus tendens* (12 individuals; Fig. 1d), *Cricotopus* cf. *sylvestris* (5 ind.) and *Polypedilum* sp. (4 ind.). Moreover, a pupa of *E. tendens* was recorded inside one of the fruits. Nine out of 11 apples contained chironomid larvae and their number varied from 1 to 4 with an average of 1.9 larvae per apple. Some specimens, however, could have been overlooked during the sectioning of the fruits. Apples that were previously undisturbed by birds did

Figure 1. Pictures of the study pond (a), rotten apples floating on the surface (b), some of the apples before sectioning (c), and a larva of *Endochironomus* cf. *tendens* found inside the apple (d). Photo L. Hamerlik.

not contain larvae, while disturbed apples at a high stage of putrefaction seem to contain more individuals. In general, all the larvae were found in the parts with softer tissues of the fruits.

It is questionable, if the larvae use the apples as food source or shelter from predators. Nevertheless, the current knowledge of the ecology of the recorded taxa and the gut content of the larvae suggest that they are likely to feed on the soft tissues of the fruit. Due to their high and balanced nutrition value some fruits can represent a valuable food resource for chironomid larvae (Roque et al. 2008). Moreover, microbial decomposition probably makes the fruits easier to colonize and digest for chironomid larvae, which is in accordance with our findings. In the Neotropical region only larvae of one genus (*Endotribelos*) are known to dwell in fallen fruits. According to Roque et al. (2005) the reason for that are poor aerobic conditions inside the fruits during decomposition and the presence of allelopathic substances in many Neotropical plants (Roque et al. 2008). In our study, larvae of as much as three taxa were found in the fallen apples. However, more research is needed to figure out, whether this is a consequence of the lack of specific allelopathic ingredients in the fruit or simply the generalist life strategy of chironomids of the temperate zone (as opposed to the specialists in the tropics).

Except for its common habitat, such as surface of leaves, Moller Pillot (2009) observed larvae of *Endochironomus tendens* penetrating into soft plant tissues or damaged plants and other authors (see Moller Pillot 2009 and references therein) found the larvae in or on decaying plant material. Larvae of *Cricotopus sylvestris* are opportunists feeding on available food, be it green algae, diatoms, detritus or living and dead animals, even though they are not active predators (Moller Pillot 2003). Larvae are also considered a pest of rice damaging roots and leaves of rice seedlings in China (Wang 2000) but also in Europe (Ferrarese 1992).

Our findings underline the notorious feeding flexibility of chironomid larvae. The high frequency of occurrence indicates that rotten fruits may play an important food source for some opportunistic aquatic chironomids. Moreover, such a habitat probably also serves as shelter from fish predators.

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New records and a review of the Chironomidae (Diptera) of Kuwait and the United Arab Emirates

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The Chironomidae of the western Arabian Peninsula were reviewed with keys, collection sites, and minor descriptions of 53 species by Cranston (1989) and Cranston and Judd (1989), with additional records and new species described by Al-Houty (1997), Andersen and Mendes (2010), and Giłka (2009). Despite the large land area, the number of reported species is small, most likely because the land is extremely arid and freshwater habitats are rare. Kuwait and the United Arab Emirates are hot, dry, desert countries in the Arabian Peninsula and aquatic habitats are of great interest to people living in these desert countries. In Kuwait agricultural practices produce the majority of temporary aquatic habitats that support aquatic insects (Salit et al. 1996) as there are very few natural surface freshwater sources. The United Arab Emirates likewise has very little natural freshwater. We present new records and review the past publications to produce lists of Chironomidae for Kuwait and the United Arab Emirates.

The US Air Force maintains several military bases in Kuwait and the United Arab Emirates. These bases often treat wastewater and dispose of it in retention ponds handling over 600 000 litres of water per day. The ponds support extensive vegetation including several species of *Phragmites* and flowering Asteraceae. They produce thousands of mosquitoes and other aquatic Diptera. Base personnel survey for mosquitoes using miniature light traps and all of the insects trapped on bases are killed by freezing and shipped dry to the US Air Force School of Aerospace Medicine at Wright-Patterson AFB, OH for identification. Mosquitoes are the surveillance target and represent more than 99% of the total catch. Collection sites in Kuwait were at Ali Al Salem Air Base near Kuwait City at 29.36° N, 47.52° E, Ahmed Al Jaber Air Base near Kaba at 28.95° N, 47.79° E, and in the United Arab Emirates at Al Dhafra Air Base near Abu Dhabi at 24.26° N, 54.56° E. Chironomidae were stored for later study because they are not of immediate medical significance. Several species can be pests and to the untrained resemble mosquitoes. An assessment was made in May 2016 of possible predatory Diptera in the water treatment ponds and of the non-target organisms for pesticide treatments. All of the adult Chironomidae stored in collections from two bases in Kuwait and one from the United Arab Emirates were sorted and identified. Material that had been dried, and material that had been dried and then placed in alcohol, was less than satisfactory, with few specimens with antennae and all legs intact. Specimens were dissected (or re-assembled) and either mounted directly in Euparal or cleared in lactic acid and then mounted in Euparal. Keys and descriptions for species in the region were used for identification (Andersen and Mendes 2010, Cranston 1989, Cranston and Judd 1989, Ekrem 1999, 2001, Fittkau 1962, Freeman 1955, 1956, 1957, 1959, Giłka 2009, Saether 1990). Specimens are in the J.H. Epler Collection and will be deposited in the Florida State Collection of Arthropods.

Historic Records

Previously reported species by Al-Houty (1997), Cranston (1989), Cranston and Judd (1989), Andersen and Mendes (2010), and Giłka (2009) and these along with the new records are presented in Table 1.

Al-Houty (1997) listed three species for Kuwait, but it is extremely doubtful that *Chironomus dorsalis* occurs in Kuwait. She listed many taxonomists that identified the insects listed in the paper; among them was P.S. Cranston, the only midge specialist. Upon checking with Cranston, he could not recall any details but did not think that he would have identified *C. dorsalis* from Kuwait (Cranston pers. comm., 28.vii.2016). Thus we do not consider this species in our list. The other two species she listed have been recorded from Saudi Arabia (Cranston & Judd 1989) and are included here.

With the exception of *Polypedilum (Polypedilum) nubifer* and *Zavrelimyia vaillanti* from the United Arab Emirates, our records represent new country level reports. Based on published reports and our collections the known chironomid fauna of Kuwait contains seven species and the United Arab Emirates is represented by 31 species.

Two species identified in the collections represent undescribed species. There were not enough specimens and the condition of the material was not good enough to describe them. The *Cricotopus* sp. “Kuwait” is most similar to *Cricotopus flavozonatus* Freeman, 1953. *Cricotopus* larvae are usually associated with aquatic plants and algae, where they feed on plant material, algae and diatoms. The *Tanytarsus* sp. “UAE” was most similar to *Tanytarsus minutipalpus* Ekrem & Harrison, 1999. The genitalia of T. sp. “UAE” are very similar to those of *T. minutipalpus*, but the palps are basically normal. It has an AR of 1.36, scutal tubercle, wing with setae in cells r 4+5, m 1+2. *Tanytarsus* larvae are detritus/plant feeders. Further collections could produce enough material to describe these species.

New records

Kuwait

Ali Al Salem Air Base

Cricotopus sp. “Kuwait” 17 March 2016, 27 Feb. 2016

Chironomus calipterus 27 Feb. 2016

Chironomus pulcher 17 February 2014, 27 February 2016, 17 March 2016

Polypedilum (Polypedilum) nubifer 17 March 2016

Ahmed Al Jaber Air Base

Limnophyes natalensis 7-27 April 2016

Chironomus calipterus 7-27 April 2016

Polypedilum (Polypedilum) nubifer 7-27 April 2016

United Arab Emirates

Al Dhafra Air Base

Zavrelimyia vaillanti 23 February 2014

Polypedilum (Tripodura) aegyptium 23 February 2014

Polypedilum (Polypedilum) nubifer 23 February 2014

Tanytarsus sp. “UAE” 23 February 2014

Table 1: Checklist of historical records of Chironomidae reported in Kuwait and the United Arab Emirates (UAE) along with newly reported species from 2014-2016.

Species	Country	Reported by
Tanypodinae		
Ablabesmyia (Ablabesmyia) longistyla Fittkau, 1962	UAE	Andersen and Mendes (2010)
Djalmabatista reidi (Freeman, 1955)	UAE	Andersen and Mendes (2010)
Procladius (*Holotanypus*) *apicalis* (Kieffer, 1918)	UAE	Andersen and Mendes (2010)
Procladius (Holotanypus) brevipetiolatus (Goetghebuer, 1935)	Kuwait	Al-Houty (1997)
Paramerina vaillanti Fittkau, 1962	UAE	Andersen and Mendes (2010)
Zavrelimyia vaillanti (Fittkau, 1962)	UAE	This study

Orthocladiinae		
Bryophaenocladius clavatus Andersen & Mendes, 2010	UAE	Andersen and Mendes (2010)
Bryophaenocladius rostratus Andersen & Mendes, 2010	UAE	Andersen and Mendes (2010)
Cricotopus sp. "Kuwait"	Kuwait	This study
Limnophyes natalensis (Kieffer, 1914)	Kuwait	This study
Psectrocladius (*Psectrocladius*) *limbatellus* (Holmgren, 1869)	UAE	Andersen and Mendes (2010)
Pseudosmittia danconai Marcuzzi, 1947	UAE	Andersen and Mendes (2010)
Chironominae		
Baeotendipes ovazzai (Freeman, 1957)	UAE	Andersen and Mendes (2010)
Chironomu dorsalis Meigen, 1818	Kuwait (Dubious record)	Al-Houty (1997)
Chironomus calipterus Kieffer, 1908	Kuwait, UAE	Cranston and Judd (1989), Andersen and Mendes (2010), This study
Chironomus ovazzai (Freeman, 1957)	UAE	Andersen and Mendes (2010)
Chironomus pulcher Wiedemann, 1930	Kuwait	This study
Cladotanytarsus pseudomancus (Goetghebuer, 1934)	UAE	Giłka (2009)
Cladotanytarsus sagittifer Giłka, 2009	UAE	Giłka (2009)
Cryptochironomus rostratus Kieffer, 1921	UAE	Andersen and Mendes (2010)
Dicrotendipes gilkai Andersen & Mendes, 2010	UAE	Andersen and Mendes (2010)
Dicrotendipes pallidicornis (Goetghebuer, 1934)	UAE	Andersen and Mendes (2010)
Dicrotendipes peringueyanus Kieffer, 1924	UAE	Andersen and Mendes (2010)
Kiefferulus disparilis (Goetghebuer, 1936)	UAE	Andersen and Mendes (2010)
Microchironomus tener (Kieffer, 1918)	UAE	Andersen and Mendes (2010)
Paratanytarsus praecellens Giłka, 2009	UAE	Giłka (2009)
Paratendipes nudisquama (Edwards, 1929)	UAE	Andersen and Mendes (2010)
Polypedilum (*Polypedilum*) *alticola* Kieffer, 1913	UAE	Andersen and Mendes (2010)
Polypedilum (*Polypedilum*) *nubifer* (Skuse, 1889)	Kuwait, UAE	Andersen and Mendes (2010), This study
Polypedilum nubeculosum (Meigen, 1804)	Kuwait	Al-Houty (1997)
Polypedilum (Tripodura) aegyptium Kieffer, 1925	UAE	This study
Polypedilum (*Tripodura*) *bifurcatum* Cranston, 1989	UAE	Andersen and Mendes (2010)
Polypedilum (*Tripodura*) *harteni* Andersen & Mendes, 2010	UAE	Andersen and Mendes (2010)

Polypedilum (*Tripodura*) *malickianum* Cranston, 1989	UAE	Andersen and Mendes (2010)
Tanytarsus formosanus Kieffer, 1912	UAE	Giłka (2009)
Tanytarsus mcmillani Freeman, 1958	UAE	Giłka (2009)
Tanytarsus trifidus Freeman, 1958	UAE	Giłka (2009)
Tanytarsus sp. "UAE"	UAE	This study
Virgatanytarsus arduennensis (Goetghebuer, 1922)	UAE	Giłka (2009)

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First record of *Phaenopsectra flavipes* (Meigen, 1818) in Slovakia with notes on its ecology

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Phaenopsectra flavipes (Meigen, 1818) is a chironomid with a Holarctic distribution and is commonly found throughout Europe (Sæther and Spies 2013). Larvae are widespread in slowly flowing or stagnant waters but are never numerous (Moller Pillot 2009). They prefer to inhabit stems and leaves of aquatic plants; findings from sandy and stony bottoms are scarce (Moller Pillot 2009). The larvae are most likely primarily detritivores, however, they can feed as grazers and perhaps also as active filter feeders (Moog 2002). In Slovakia, only larvae of the *Phaenopsectra* genus have been reported to date, thus Bitušík and Brabec (2009) did not include *P. flavipes* in the check list of the Slovak Chironomidae and Sæther and Spies (2013) list the presence of the species as doubtful. During our large-scale survey of the Slovakian ponds (BIOPOND, for details see Novikmec et al. 2016), pupal exuvia of *P. flavipes* were found, resulting in the first official record of this species in Slovakia. In the present paper we bring details of the finding with information on the environmental conditions of the habitats of occurrence.

Diptera: Chironomidae: Chironominae: Chironomini: *Phaenopsectra flavipes* (Meigen, 1818)

Material examined: a pond close to Moškovec village (Fig. 1a), C Slovakia, 48.9492222 N, 18.8475556 E, 440 m a. s. l., 1 pupal exuvia, 29. 8. 2013, leg. L. Hamerlík, det. et coll. V. Štillová. Larvae of *Phaenopsectra* most likely belonging to the same species were collected from two other sites: a pond near Holiša

Figure 1. Pictures of the sites of the first record of *Phaenopsectra flavipes*: a pond near Moškovec with the occurrence of the pupal exuvia (a) and the ponds near Holiša (b) and Stráňany (c) where larvae of *Phaenopsectra* sp. were recorded. Photo M. Svitok.

(Fig. 1b), C Slovakia, 48.3068611 N, 19.7512222 E, 175 m a. s. l., 10. 7. 2013 (1 larva), and a pond next to Stráňany (Fig. 1c), E Slovakia, 48.3430667 N, 20.5265528 E, 824 m a. s. l., 16. 7. 2013 (2 larvae).

The material was collected using a combination of drift sampling (to obtain pupal exuviae) and the PLOCH method (Oertli et al. 2005) to collect larvae. Preimaginal stages were picked, mounted as permanent slides and identified using keys by Langton and Visser (2003) and Wiederholm (1983). The material is deposited at the Department of Biology and Ecology, Matej Bel University, Banská Bystrica, Slovakia.

In our study, all three sampling sites (ponds) with the occurrence of *Phaenopsectra* harboured fish and macrophytes with *Berula erecta*, *Equisetum fluviatile*, *Eriophorum angustifolium*, and *Potamogeton berchtoldii* being the most dominant (R. Hrivnák, pers. comm). Fine sediment constituted the bottom of ponds near Holiša and Stráňany, while the bottom of the Moškovec pond was more heterogeneous, consisting of coarse mineral substrate, gravel and fine sediment (50%, 30%, and 20%, respectively). The catchment area of the Moškovec pond was dominated primarily by grassland, while that of Stráňany and Holiša were dominated by forested and urbanized land, respectively. Other specific hydromorphological and physio-chemical data for each pond can be found in Table 1.

Table 1. Hydromorphological and physio-chemical characteristics of the studied ponds and land use in the catchment.

Variable/ site name	Unit	Moškovec	Holiša	Stráňany
Altitude	m a. s. l.	440	175	824
Area	m^2	117	78	7,612
Depth	cm	143	78	178
Substrate				
Fine	%	20	100	100
Sand	%	0	0	0
Gravel	%	30	0	0
Coarse	%	50	0	0
Water chemistry				
pH		7.3	7.6	8.1
Conductivity	$\mu S\ cm^{-1}$	668	596	239
Ca	$mg\ L^{-1}$	31.88	18.85	14.36
Fe	$\mu g\ L^{-1}$	0.5	17	32
Mg	$\mu g\ L^{-1}$	26.42	12.92	7.12
Mn	$\mu g\ L^{-1}$	1.25	219.74	11.97
P	$\mu g\ L^{-1}$	15	172	0.5
NH_4	$mg\ L^{-1}$	0.16	0.84	0.63
NO_3	$mg\ L^{-1}$	1.09	0.35	0.9
NO_2	$mg\ L^{-1}$	0.03	0.06	0
PO_4	$mg\ L^{-1}$	0.3	0.39	0.05
Land use				
Arable land	%	0	0	0
Forests/shrubs	%	0	8	87
Grassland	%	67	22	12
Urbanized	%	33	70	0
Waterbodies	%	0	0	1

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Albania: another European country with the occurrence of *Buchonomyia thienemanni* Fittkau, 1955

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Buchonomyia thienemanni is the only species within the subfamily Buchonomyiinae known from the western Palaearctic. Sæther & Spies (2013) document the presence of this species in nine western and central European countries, as well as the Britain Islands and Corsica. Perhaps in part due to the unique and distinctive pupal exuviae, other recent studies have served to broaden the geographical distribution of this species. Specifically, recent reportings of *B. thienemanni* in the Czech Republic (Ashe et al. 2014) as well as Russia (Ashe et al. 2015) indicate that this species has a much broader distribution eastward and northward than previously anticipated.

Larvae and pupae of *B. thienemanni* are considered to be ectoparasites on Trichoptera (Ashe et al. 2015); however, other details on the ecology are not yet known. Therefore, *B. thienemanni* remains somewhat of a mysterious chironomid, leaving much room for continued study.

During our short stay in Albania in the summer of 2012, we collected floating chironomid pupal exuviae, pupae and drowned adults with a 250 μm mesh hand net along the shores of several flowing and stagnant waterbodies. In the samples taken from the Shkumbin River in the central part of the country, two pupal exuviae (1 male, 1 female) of *Buchonomyia thienemanni* were found.

Full details of the record are as follows:

Locality: Albania, prefecture Elbasan, county Librazhd, 13 July, 2012, upper stretch of the Shkumbin River, ~ 1.8 km downstream of Qukës, 413 m a. s. l.; 41°05´17.0´´ N, 20°26´ 48.6´´ E; leg. P. Bitušík & K. Trnková. The sampling site can be characterised by swift turbulent flow, and stony bottom consisting of cobbles and boulders overgrown with considerable proportion of filamentous algae that could be indicative of high nutrient loading. The width of the river was on average 15 m and maximum water depth reached 70 cm during time of the sampling (Fig. 1).

Figure 1. Shkumbin River, view of the sampling site of *B. thienemanni*. Photo: K. Trnková

Voucher specimens have been mounted on microscopic slides using Berlese fluid and deposited in the collection of the Department of Biology and Ecology, Faculty of Science, Matthias Belius University in Banská Bystrica.

The finding of *B. thienemanni* in Albania is significant as it is the first record of the species in the Balkans. Characteristics of the sampling site partly support the findings of other authors (e.g. Marziali et al. 2009, Ashe et al. 2014) that the species inhabits shallow, well-oxygenated streams with firm substrate in lower parts of the rhithral zone, and is able to tolerate moderate levels of pollution.

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An additional larval type in the genus *Chironomus* – the yama-type

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Currently there are nine larval types in the genus *Chironomus* based on the presence, absence or structure of the lateral and ventral tubules (Proulx et al. 2013). We are now proposing a tenth type based on the posterior prolegs and the arrangement of the anal tubules – the yama-type.

The reason for adding this type and the basis of the name is as follows:

In 1980, Sublette and Martin described a new genus *Yama*, closely related to *Chironomus*, An unusual feature of the larva of *Yama*, not specifically mentioned in the description but illustrated in their figure 5a is the relatively long, rather tanypodine-like posterior prolegs, along with a 'star' arrangement of the anal tubules.

Recently, one of us (DSC) collected very similar larvae from Manipur, India. While the full details of this Indian species have yet to be clarified, it is clear that it is not in the genus *Yama*, but in *Chironomus,* although possibly a new subgenus. Under the current classification, this larva would be a salinarius-type, since it lacks lateral and ventral tubules. However, it is recognizably different from all other salinarius-type larvae, and indeed all other larval-types, in the greater length of the posterior prolegs (about 4 times longer than wide cf. about 2 times longer than wide) and the star-like arrangement of the anal tubules (Fig. 1).

Since it is possible other similar larvae may be found, we suggest that a separate larval type, the yama-type be created for such larvae. If anyone knows of a species with such a larva, we would appreciate the information.

Figure 1. Photograph (left) and drawing (right) of the posterior prolegs and anal tubules of a yama-type larva.

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Benefits of Chironomid Research: Perspectives from Undergraduate Researchers

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Shifting from the research-intensive environment of graduate school to a tenure-track gig at a primarily undergraduate institution (PUI) required a bit of a change in mindset. No longer could I (Anderson) spend day after day at in the microscope or hour after hour thinking about how to analyze, interpret or present a certain data set. Instead, my time began to fill with lecture and syllabi prep and brainstorming sessions on how to best relay difficult scientific concepts to groups of naïve undergraduate students. My personal research time was suddenly shoved into tight 1-2 hour pockets of time, often at the end of the week, or restricted to summer months, when teaching obligations are limited.

While I often miss the chance to spend hours engrossed in my own research activities, I, along with many other individuals who have pursued careers at PUIs, have found ways to stay at least somewhat engaged and active in research pursuits. This happens most easily by working with and 'grooming' undergraduates who have strong potential for pursuing careers in research. Viewing research questions through the eyes of energetic and enthusiastic undergraduates who are just beginning to develop their passion for research is completely worth the tradeoff, in my mind. Helping them to develop and carry out research questions, build a passion for field and lab work, struggle through the challenges of data analysis, and confidently present their hard work (often surrounded by advanced graduate students!) at scientific conferences is incredibly rewarding, not only for them, but also for me.

Below are the 'stories' from three exceptional undergraduates I've had the honor of working with since starting my professional career at Northern State University four years ago. While these students are still exploring their ultimate career directions and may not continue their work with chironomids, I think you'll agree that it seems that they've learned an immense amount from their time spent working with midges. And, stay tuned for some future publications with their names on!

Alyssa

Nathan Roberts – Environmental Science Major, graduated from Northern State University Spring 2015

What is a Chironomid? Before my undergraduate research project, I had limited ability of how to describe this very interesting insect. During the summer of 2014 I conducted a research project involving the collection of chironomid surface floating pupal exuviae (SFPE) on the Elm and James Rivers near Aberdeen, South Dakota, USA (Fig. 1). The goal of my research was to associate chironomid diversity with the water quality of these two river systems. The land cover throughout Brown County and in particular around the Elm and James Rivers is dominated by row crops and cattle feedlots which have been shown to produce inputs detrimental to water systems. However, interestingly the Sand Lake National Wild Refuge, a 498-acre area of restored grasslands which serves as habitat for migratory birds, is also located in the study area. Sand Lake is managed by the United States Fish and Wildlife Service. The James River is impounded into a reservoir at Sand Lake and the water released from the reservoir comprises the downstream flow of the James River. So, a secondary goal of my research was to examine any significant differences in chironomid diversity between areas dominated by row crops and feed lots and areas immediately downstream of the refuge.

SFPE were collected from six sites along the Elm and James Rivers monthly from June to September 2014. In addition, to correlate water conditions to chironomid diversity, water temperature and pH readings were collected weekly during the same time frame using a YSI Multi Parameter Tool and water clarity (turbidity) readings were also collected using a turbidity tube. SFPE were preserved in 70% ethanol, sorted, slide mounted in the laboratory and identified to genus. To date 18 samples of SFPE have been identified to genus. A total of 24 genera representing three subfamilies have been identified. Generic breakdown within

Figure 1. Nathan Roberts collecting chironomid pupal exuviae on the Elm River, South Dakota, USA, 2014.

each subfamily include 5 Tanypodinae, 3 Orthocladiinae and 16 Chironominae. This equates to a range of 11 to 18 genera present at each location.

Currently, there are 12 SFPE samples left to slide mount and identity. Also water chemistry and turbidity data still needs to be analyzed. However, I was able to present preliminary results of the project at the Society for Freshwater Science Annual Meeting in May 2015. Working with chironomids has proven to be to be a valuable experience for undergraduate research. First, working with chironomids has allowed me to appreciate that there is an abundance of biological diversity in river systems and that these organisms are very intertwined and dependent upon each other. Second, this project has taught me valuable laboratory and field skills which I hope to utilize in my future career. Third, this experience has been very helpful in my educational pursuits. Currently, I am pursing a Masters of Geographic Information Systems at Penn State University. The writing, communication, and analysis skills that I acquired through this project have been very valuable. Last, undertaking undergraduate research very much helps instill a go with the flow attitude. When I look back on my initial proposal and where my project is to this point it has changed almost 360 degrees. Also, the hypothesized results formulated at the beginning of the study appear to be very different from what we have found thus far. Therefore, I've learned to expect the unexpected. My experience working with chironomids as an undergraduate researcher has opened many doors for me and been unbelievably rewarding. Who knew all of this could be a result of something that looks like a mosquito that doesn't bite?

Tessa Durnin – Biology/Environmental Science double major, graduating from Northern State University with a B.S. in December 2017

This past summer (2016) I was able to be a part of a stream assessment that took place roughly 75 miles east of Aberdeen, South Dakota, USA at Blue Cloud Abbey (BCA) stream. This pristine woodland stream is surrounded by areas of land that is thriving with native prairie grasses and other plants—and grazed upon by cattle downstream on a pasture as well as at the upper most region of the stream in the preserved boundaries of the abbey. My partner and I, with the help of Dr. Alyssa Anderson, completed field work over the course of a four-month period (May-August). A prescribed burn took place within a region of this sampling area in late May 2016, after our initial sampling event, and three more groups of samples were gathered monthly

Figure 2. Tessa Durnin collecting chironomid pupal exuviae from the Blue Cloud Abbey stream, South Dakota, USA, 2016.

throughout the summer, allowing us to determine any potential consequences of the burn. Our lab work is still in progress, however completing the field experience has made me realize how much hard work and dedication is put into field work, along with how fun field work truly is.

In early May, 2016, we set up data-loggers that track temperature at four designated sites of the BCA stream. This was the hottest day of the entire experience and was also the toughest as we carried cylinder blocks (while wearing waders) and a heavy cooler filled with essential field equipment: 70% ethanol, jars, trays, sieves, marking flags, forceps, paper, and pencils. To obtain my samples of chironomid surface floating pupal exuviae (SFPE), I would wade throughout the stream site for ten minute increments, scraping the surface of the water with a tray and straining it through a sieve (keeping in mind to look for crevices and "foamy" areas where the midge pupal exuviae may be hiding) (Fig. 2). After the ten-minute mark, I would gather a jar and ethanol, pour the sample into the jar, and place a label with the date, the site and its location, and the given time at that moment. Samples were taken back to the lab where I sorted all of the SFPE out of the initial samples, sorted the exuviae into like-groups and slide-mounted them using a dissecting microscope, and then identified them with a compound microscope and dichotomous key (slide mounting and identification is still in progress!) I've found that this process is quite difficult, time consuming, and each exuviae varies in length, color, and amount of "hairs" throughout the cephalothorax and abdomen. Dr. Anderson once told me that you basically need the patience and steady hands of a "brain surgeon" to properly get this technique down.

Even though I have yet to completely finish out this research, I have gathered extensive knowledge in field and lab work. Thanks to previous courses such as Invertebrate Zoology, Entomology, Aquatic Ecology and Watershed Management, I was able to utilize my newly acquired knowledge in the field and laboratory as an environmental research scientist. I see myself completing this research in the coming months and possibly gathering more samples this winter at BCA, as long as the stream isn't completely frozen over (one may think that insects completely "die off" in the winter, but on the contrary, certain midges thrive!).

As an undergraduate partaking in research, I look forward to my future in graduate school and am thankful for all the help I've obtained along the way. Research is basically coming up with a question that is worth finding an answer to and learning how to essentially go with the flow while making any necessary adjustments along the way. A scientist doesn't set out to prove anything, but to rather gain knowledge and to share it with others. Completing this research is one more step in helping me become a well-rounded biologist.

Katherine Wollman – Biology and Environmental Science Double Major, graduated from Northern State University in December 2016

During my time at Northern State University I participated in various research projects involving chironomids. My first experience with chironomids involved slide mounting chironomid exuviae that were

Figure 3. Katherine Wollman collecting macroinvertebrates from the Blue Cloud Abbey stream, South Dakota, USA, 2016.

collected from San Salvador Island, Bahamas. The goal of this study was to increase the number of species known from the Neotropical region. This project gave me the opportunity to become familiar with the slide mounting process and also gave me experience in identifying pupal exuviae. I was also given the opportunity to present the results of this work at the annual meeting of the South Dakota Academy of Sciences (Wollman et al. 2016).

I also elected to incorporate chironomid work into a short-term research project for my genetics class. Here, I assessed various methods to extract DNA from Chironomidae. I found that phenol chloroform extraction techniques worked better at extracting DNA from older chironomid samples than the Qiangen DNeasy Blood and Tissue Kit; we also found that samples of adult chironomids yielded more DNA as compared to larval samples regardless of age.

Lastly, chironomid research was indirectly incorporated into my Honor's Thesis. Here, I sampled not only chironomids, but the entire macroinvertebrate community. The ultimate goal of this work was to determine whether a controlled burn had any negative impacts on the in-stream invertebrate community. I used a Hess sampler to sample the stream community upstream of the burn, within the burned region, and downstream of the burn and sampled both before and several times after the burn to determine whether there were any changes to the community over the course of the sampling period (Fig. 3). Results of this work were somewhat inconclusive, as other land use factors came into play, but I did see that the overall diversity of the macroinvertebrate community declined over the course of the sampling period.

Cumulatively, these research experiences helped me learn the steps necessary to create a sound research project. Also, another important lesson I learned was how one needs to be flexible and occasionally change protocols or seek additional or alternative methods when out in the field sampling or when completing laboratory work. I was also able to gain skills in various protocols in the field and laboratory and have gained extensive experience in identification. Finally, learning how to thoroughly analyze my results broadened my understanding of factors affecting stream diversity, which made the end results of my work more rewarding.

Each of these research projects helped to solidify my decision to continue my studies in graduate school; without these experiences, I would not have even considered graduate education. Ultimately, these projects made my undergraduate experience feel more valuable because I was able to take charge of a project and do things on my own and apply skills learned about in lecture in the field and lab. Research gives a you a challenge and makes you stretch your mind.

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A new record of *Metriocnemus* (*Inermipupa*) *carmencitabertarum* (Orthocladiinae) from England.

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Metriocnemus (*Inermipupa*) *carmencitabertarum* Langton and Cobo, 1997 was described from specimens collected by Fernando Cobo in 1989 and 1994 in Spain and Portugal (Langton and Cobo, 1997) and was subsequently reported from the Azorean islands of Terceira (Murray *et al*., 2004) and Santa Maria (Ramos *et al.* 2010). On mainland Europe, north of the Iberian Peninsula, the species was reported from the Netherlands by Kuper *et al.* (2012) and Kuper (2015). It is cited as being present in Estonia and Poland in Fauna Europaea, (Spies and Sæther, 2013) but these records are unconfirmed. The species was first reported in the British Isles from Somerset, England by Langton and Wilson (2012) and from County Meath in Ireland by Murray (2012). That record from England is thus far unique. However, *M. carmencitabertarum* is now known from nine locations in Ireland, eight, including one in Northern Ireland cited in Murray *et al*. (2014) and a ninth location recently reported by Murray (2016).

On a brief visit to Rufford, near Southport, Lancashire, England (53.634ºN, 2.823ºW) on 3 November 2016, chironomid pupal exuviae were observed floating on the water surface of two outdoor disused stainless steel dog feeding/drinking bowels containing rainwater to a depth of 5.0-7.0cm, algae, debris and leaf litter (Fig. 1). On further examination nine exuviae and one pharate adult male were collected. The exuviae were determined as *M.* (*I.*) *carmencitabertarum* from Langton and Visser (2003) while the pharate adult was determined from the key in Langton (2015) to adults of the known British and Irish species of *Metriocnemus*. This new record from Rufford, extends the known distribution northwards in mainland Britain. All recent records are predominantly from rainwater accumulations in wheelbarrows, water butts, buckets, bird baths, dishes, discarded motor tyres etc. The species appears to be an opportunistic occupant of ephemeral habitats and because the pupal exuviae are so characteristic and easily recognisable, investigation of such anthropogenic habitats would likely lead to additional distribution records.

Figure1. Disused outdoor dog feeding containers with rainwater and leaf-litter from which pupal exuviae and a pharate male of *Metriocnemus carmencitabertarum* were collected.

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Books on Chironomidae Larvae at reduced price during Chironomidae Symposium

The publisher of *Chironomidae Larvae* (KNNV Publishing) has offered to sell these books during the Chironomidae Symposium in Trento with a 50% discount. The prices of available volumes during the symposium will be: part 1 (Tanypodinae) 40 euro, part 2 (Chironomini) 40 euro, part 3 (aquatic Orthocladiiinae etc.) 45 euro.

Henk Moller Pillot would like to know how many books to bring to the symposium (and if it will be possible for him to bring them all). Therefore, please write to him before March 1, 2017 if you intend to buy copies of any of these volumes. Email: henkmollerpillot@hetnet.nl

CHIRONOMUS Journal of Chironomidae Research, No. 29, 2016: XX-XX. In memoriam.

In Memoriam: Hiroshi Hashimoto (1924–2015)

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Dr Hiroshi Hashimoto, Emeritus Professor of Shizuoka University, passed away quietly on 26 February 2015 in Kanagawa, Japan, at the age of 90. He was a distinguished entomologist and authority of Japanese dipterology, and produced many conspicuous achievements, especially on chironomids. He was also an excellent taxonomist of freshwater hydroids.

Dr Hiroshi Hashimoto (1924–2015), photograph taken on 26 August 2006 in Shizuoka City.

Dr Hashimoto was born on 20 April 1924 in Tokyo, and received doctoral degree from his alma mater, Tokyo University of Education (Tsukuba University) in 1961. He started his career as a scientist in Shimoda Marine Biological Station, belonged to the Faculty of Science, Tokyo University of Education. His important papers were written at the station. These focused on the taxonomy and the ecology of marine chironomids. His studies on the emergence related to the tidal rhythm and the mating behavior of *Clunio* midges are well known to chironomids researchers.

When transferred to Shizuoka University in 1968, he began to study chironomids living in lakes and rivers. The achievements considerably contributed to the progress of limnology in Japan. The taxonomy of freshwater hydroids was his concern, too, around that time. He (1981) described the polyp and the frustule stages of *Astrohydra japonica* collected from ponds in Japan as a new genus and species in Microhydridae, and reared the minute polyps in the laboratory for ten years. Fortunately, the medusa appeared from it. He gave it Japanese name, *yumenokurage*, derived from Japanese *yume* (dream) and *kurage* (medusa). Then I really felt his passion for science.

He developed many students for teachers in primary and middle schools as a professor of the Faculty of Education. I heard that since retired from Shizuoka University in 1988, he had cared for his sick wife, who died in 2014. His students and I pray that their souls may rest in peace.

Hiromi Niitsuma

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