



CHIRONOMUS Newsletter on Chironomidae Research

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Coelotanypus scapularis, photo © Steve Marshall, University of Guelph

CONTENTS

Editorial.....	3
A brief biography of Mary Frances Smith Sublette, June 22, 1927 - June 9, 2007.....	4
Kaare Aagaard 60 years.....	5
Sepp has turned 80!.....	7
Reports from the 16th international chironomid symposium in Funchal, Madeira, July 25-28, 2006.....	8
The 8th European subfossil chironomid workshop, Reykjavík 7-8th May, 2007.....	10
News from chironomid research in India.....	13
Current research.....	16
Short communications.....	42
New books.....	43
Regional representatives 2007.....	49
Current bibliography.....	52

CHIRONOMUS Newsletter on 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@vm.ntnu.no).

Dear colleagues

What is the future for Chironomidae taxonomy? Grand projects to document all life on earth have emerged over the last couple of years. The Encyclopedia of Life (www.eol.org) aims to provide a free online resource to high quality information on all organisms while the Barcode of Life Initiative (www.dnabarcodes.org) takes advantage of molecular characters to catalogue, identify and discover biodiversity. Both these scientific endeavours have received substantial funding and aim to be unique resources for information on biodiversity and biology – but both are dependent on expert taxonomic knowledge to be successful. The taxonomic impediment was formally recognised by the parties of the Convention on Biological Diversity as early as 1998 with the establishment of the Global Taxonomy Initiative (www.cbd.int/gti). Although some countries have initialised research programmes to meet the demand for more taxonomists in the future (e.g. the PEET program in USA), the world has so far not seen substantial increase in the number of professional taxonomists. So, who will provide the taxonomic knowledge needed for success in initiatives like BOLI and EoL? Well, for the so called charismatic mega-fauna the information needed is more or less readily available. For the truly diverse groups such as insects, however, there are substantial holes in the taxonomic knowledge. Unless more nations take documentation and description of biodiversity more seriously and develop appropriate research programs in taxonomy, we will be unable to document life on earth fast enough to properly detect the diversity loss caused by anthropogenic environmental change.

Knowledge of chironomid diversity and taxonomy is relatively advanced compared to some other insect groups, but the number of active Chironomidae taxonomists is on a steady decline. This, despite the fact that knowledge of chironomid taxonomy and distribution has numerous uses, and perhaps is more important than ever given the increased interest in documenting past and recent climate change. Chironomid taxonomists should become better at recruiting new students and assure that committed individuals are allowed further development and work in chironomid taxonomy. To do so, we should take advantage of our extensive network and create international projects that include joint field work, workshops, courses and increased student mobility – all attractive elements for graduate students as well as senior researchers. If we are successful, chironomid taxonomy will have a bright future in modern biodiversity and environmental science. Please use the *CHIRONOMUS Newsletter on Chironomidae Research*, the Chironomid Home Page (insects.ummz.lsa.umich.edu/~ethanbr/chiro/) and the chironomid mailing list (Chironomidae@lists.vm.ntnu.no) to spread your news on ongoing research projects and requests for cooperation.

In this number we present current research articles on subfossil chironomids from 18 lakes in Finland, chironomid communities in Lake Baikal, chironomids new to France, chironomids from the Yucatan peninsula in Mexico and behavioural observations of an arctic chironomid species in addition to news, short communication and the Current Bibliography. We hope you find it interesting reading!

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A BRIEF BIOGRAPHY OF MARY FRANCES SMITH SUBLETTE
JUNE 22, 1927-JUNE 9, 2007

Mary Frances was born in East Texas to Pleas and Arkie Odelphia (Arkadelphia) Wilbanks Smith. Her heritage can be traced back to the original Plymouth colony in present day Massachusetts. When Mary was a preschool child, the Smiths moved to the high plains in West Texas, where the vistas of prairie beauty fostered a love of wildflowers that remained deeply ingrained for Mary's lifetime. Her other enduring passion was needlework, beginning as a young girl when her paternal grandmother gave her a box of threads and showed her how to do simple stitches.

Her mother, who was orphaned as a child, struggled to become a school teacher; she impressed upon her four daughters the necessity of a good education. Mary and her sisters went to college, and Mary herself was later instrumental in establishing educational goals in several young persons, including her own four children, who between them hold 11 college degrees. Mary received her bachelor's degree in 1948 from Texas Tech in Lubbock. She entered intending to pursue journalism, until she took a biology course with Dr. Harold Hefley. She found it so fascinating that the professor set up a microscope for her in his lab. As she later confided, "those beautifully colored slides" motivated her switch to a biology major. When Mary was a junior, Dr. Hefley arranged for her to get a scholarship to the Rocky Mountain Biological Laboratory at Crested Butte, CO. The student body and faculty, while small, were cosmopolitan. For the first time Mary realized she had a distinct regional accent, and she was teased rather unmercifully about it, an anecdote she loved to tell in later years.

Upon completion of her baccalaureate, Mary was persuaded by Dr. Hefley to turn down an assistantship she was offered; he arranged a counteroffer from his alma mater, the University of Oklahoma, where she eventually (after taking time off for beginning family) received her Master's degree in Zoology in 1955. Meanwhile, Dr. Hefley had moved to the University of Arkansas and was thesis advisor to James (Jim) Sublette. Dr. Hefley likewise steered Jim toward OU, arranging a doctoral fellowship for him there. As Jim was leaving for Norman, Dr. Hefley said to him, "There is a nice girl at OU who was a former student of mine at Texas Tech. You should look her up." Thanks to Dr. Hefley, Jim and Mary's lives became inextricably intertwined; they were married on June 24, 1950.

Mary is survived by Jim, four married children, and eight grand-children. Their children are Ned, a classical guitarist and ethnomusicologist, author of a major book on the history of Cuban music; Elizabeth, an assistant professor and researcher in biochemistry and psychiatry at Columbia University; Mark, a former physician who now owns arts galleries in Tucson and Santa Fe; and Amy, currently a Ph.D. student at Arizona State University.



Mary F. S. Sublette, June 2001

In addition to her accomplishments as wife, mother, and grandmother, Mary always worked together with Jim on his studies in chironomid taxonomy, co-authoring several publications as well as a monograph of the Fishes of New Mexico. She has been honored by having one genus and several species of midges dedicated to her, as well as joint dedications with Jim. A Festschrift dedicated to Mary and Jim was published in the Journal of the Kansas Entomological Society in 1998. Mary's interest in flowers found expression in a botanical guide she co-authored, "Roadside Flowers of New Mexico." Mary was also a published poet, with many of her poems mentioning her beloved prairie flowers. Perhaps her most inspired heritage, however, is the collection of embroidery she created. An event which changed her life was a summer with Jim at Bergen, Norway in 1981, where she was inspired by a small freehand embroidery she saw there. Afterward, Mary began experimenting with original designs on various linen fabrics and high-quality embroidery threads. Mary's breathtaking "needle paintings," as they became known, depict biologically correct wildflowers, insects, and fish, in a naïve style of large central figures in brilliant colors, often on a solid embroidered backdrop. Mary never allowed

her works to be sold, insisting they were a legacy for her children and grandchildren.

Mary took joy in her husband and their family to the last moment of her life. Her diligence in Zoology and artistic creativity gave added beauty

and meaning to the world. I think Mary's goals in life were well satisfied.

*James E. Sublette
Scottsdale, AZ*

KAARE AAGAARD 60 YEARS

Professor Kaare Aagaard has celebrated his 60 years anniversary this year, and we would like to take this opportunity to congratulate him and recapitulate some of his academic life and scientific accomplishments.

Kaare was born in Trondheim on January 13th 1947 and went to school in the same town. Just before he started gymnasium (high school) in 1963 he collected his first butterfly, and in the following years he became increasingly interested in all kinds of insects: Butterflies, dragonflies, thrips, bugs, earwigs and beetles were all collected and identified. This general interest in various insect groups went on as Kaare started his studies at the University of Trondheim a couple of years later, and he published several papers in the Norwegian Journal of Entomology on all these groups. He actually also started working on several graduate works on thrips, aphids and bugs before he tried to encourage a friend to start working on our fascinating group, the chironomids. His friend remained unimpressed, but Kaare managed to convince himself that non-biting midges was the way forward and graduated in 1973 with a cand. real degree on the Tanypodinae of the lake Målsjøen including a study of morphological changes caused by nematode parasitism (Aagaard 1974, 1978).

After his graduation, Kaare continued working with Chironomidae and spent 3 months with Ernst Josef Fittkau and Friedrich Reiss in Plön. The major focus was still directed towards the subfamily Tanypodinae, but at the Max Planck Institute Kaare developed taxonomic expertise in other chironomid taxa as well. This knowledge undoubtedly has been useful in the many freshwater mapping and monitoring projects Kaare has been part of. About 35 scientific journal papers and book chapters has Kaare's name on them, and he has contributed to more than 100 scientific reports, some of which are referenced below.

Over the years, Kaare has focused his research on various aspects of both freshwater ecology and conservation biology. He has been an advisor on

numerous boards and also Norway's representative in the European Council's Bern Convention on the conservation of European wildlife and natural habitats. Kaare has also been a key player in the development of the Norwegian red lists. He has been curator of entomology both in Trondheim and in Tromsø, an advisor in the Norwegian Directorate for Wildlife, and head of Trondheim division of "Økoforsk" the predecessor of the Norwegian Institute for Nature Research where he later spent almost 15 years as a scientist and administrative leader. Kaare is currently curator and head of department at the Section of Natural History, Museum of Natural History and Archaeology in Trondheim.



Plön 1975: Friedrich Reiss, Declan Murray, Kaare Aagaard and Ernst Josef Fittkau.

We congratulate Kaare with his anniversary and wish him all the best for the years to come.

Torbjørn Ekrem

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SEPP HAS TURNED 80!

Professor Dr. Ernst Josef Fittkau turned 80 this year and celebrated his birthday the 22nd of July. We would like to congratulate him on this anniversary and wish him all the best on the way to 90!



Touring the ZSM: Elise and Sepp, 2002.

Much has already been written on Sepp's numerous accomplishments over the years (Anonymous 1992, Spies 2002), and we do not wish to repeat what others have done so well before us. However, Fittkau continued his involvement in Chironomidae research also after his 75 years anniversary, and has been involved in several scientific publications (see below). Angela Sanseverino, his last PhD student so far, graduated in 2006.

Prof. Fittkau has truly moved chironomid research forward, but he has also been active and well noticed in many broader fields like zoology, taxonomy, biology and limnology. If we were to elaborate on his contributions to the scientific community in all fields, we would fill many pages – pages from an impressively rich life, both professionally and socially. We would like to especially mention the latter here. His professional achievements are recognized all over the world, but his personal commitment, affectionate and charming being has been a privilege especially for those of us who have been lucky enough to spend some time with Sepp.

Fittkau was and is always in the most sincere way open and interested to get to know new people

from different cultures. With his first welcome “Grüss Sie”, “Freue mich”, “Nice to meet you” or “Muito prazer” he includes us in his world rich in experience and fascinating stories. What a privilege it is to listen to stories from his time in the Amazon, about his trips into the rainforest, his experiences and friendships with the native population and his excursions on so many streams with the canoe. Or to be entertained by stories from his work in Schlitz, his field work along the River Fulda, his time in Plön, the building of the current Zoologische Staatssammlung in Munich, and of all the interesting scientists he knew: Thienemann, Illies, Müller, Sioli, Brundin and many, many others.



Sepp and Elise in Icking, celebrating Sepp's 80th anniversary on July 22, 2007.

Fittkau is an inspiration to us all, in particular to those of us who are just starting our career. We have all had the privilege of sharing parts of our lives with Sepp and have appreciated and enjoyed his encouragement and support. Even in his hardest times, Sepp found kind and heartening words for others. His generosity became part of our lives, our work and also helped us make important personal decisions. For this we would like to thank him from the bottom of our heart and wish him a joyful time together with his family and friends.

Angela Sanseverino, Elisabeth Stur, Irene Wagensonner, Jochen Gerber, Maria Conceição Messias, Martin Spies, Nicola Reiff, Rodolfo Ospina Torres, Sofia Wiedenbrug, Torbjørn Ekrem, Wolfgang Riss

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REPORTS FROM THE 16TH INTERNATIONAL CHIRONOMID SYMPOSIUM IN FUNCHAL, MADEIRA, JULY 25-28, 2006

It is probably safe to say that the 16th International Chironomid Symposium in Funchal was a great success. *CHIRONOMUS Newsletter* has received a few detailed reports and thoughts on the conference. Thanks to all of the contributors.

The 16th International Chironomid Symposium, Funchal, Madeira, 25-28th July, 2006

My memories of the conference are of the excellent organisation including the social program of events organised by Samantha Hughes and her team that really added to the conference. I will discuss these later to do them justice, but first I will review my initial impressions of the conference as I was told to mention the fact that we did go there to do some work!

The symposium was held at the Caza da Luz Museum where we eagerly arrived on Tuesday morning to hear the Thienemann Honorary Lecture given by Ian Walker on “Chironomids: the past, present and the future.” This lecture provided a personal insight into how chironomids can be used as indicators of past environmental change. The topic offered a good introduction for the Palaeolimnology session that followed on various aspects of using chironomids as indicators of past climate and ecological change. Examples were provided by Donna Francis illustrating climate change in the Arctic, Stephan Engels in

Finnish Lapland, Aaron Potito in Sierra Nevada, California and Barbara Lang in England. Steve Brooks and Thora Hrafnisdottir presented evidence of ecological change in Scotland and Iceland. After lunch there were two sessions on the use of chironomids in Toxicology and Biomonitoring. Len Farrington compared and studied the significance of Chironomidae emergence in Pennsylvania. There was a poster session after these presentations which provided a good opportunity to present your work to a diverse audience. Topics included the use of chironomids in palaeolimnology, ecology, taxonomic studies and DNA barcoding. The first day drew to a close with a Madeira de Honra and welcome reception kindly hosted by the Mayor of Funchal in the ornate surroundings of the Town hall.

The theme of Wednesday's presentations provided an interesting perspective into the ecology and taxonomy, morphology and systematics of chironomids. Oliver Heiri provided an in depth study into the distribution of Chironomidae from surface sediments in Switzerland. An exciting new development was the DNA barcoding of Chironomidae discussed

by Torbjørn Ekrem. This technique has the potential to be a useful tool for taxonomy and freshwater biomonitoring. After lunch there was a session on Physiology and Physiological Responses that provided remarkable insights into experimental approaches. Examples included determining the respiration rates and distribution of midges in British Columbian lakes (Klaus Brodersen) and the respiration rate and temperature of cold stenotherms (Valeria Lencioni). The second poster session followed these presentations which provided another opportunity to gain further insight into the various aspects of chironomid research currently undertaken.

The symposium banquet was held on Wednesday night at Quinta Magnólia generously offered by the government of Madeira. The outdoor banquet certainly lived up to its surroundings which were set in a beautiful garden. The scenic landscape was matched by the presentation of the food which was lavishly decorated.

On Thursday the final session was on Biogeography and Biodiversity. The presentations given by Susan Gresens and Declan Murray discussed the occurrence and diversity of chironomids in various habitats and locations from as far apart as Minnesota and the Azores/Madeira. The final poster session that followed these presentations offered a last chance to discuss the various projects with the different authors. There was a debate after lunch which included an open forum discussing the various methods of accessing different databases and how to make these more accessible. Peter Cranston gave a demonstration of his new identification key and he generously provided copies to interested parties.

The conference drew to a close with a cocktail party and informal talks on Thursday evening at the Caza da Luz Museum. The first talk was given by Miguel Sequeira from the Department of Biology at the University of Madeira on "Madeira plant diversity and vegetation types." The second talk was given by Frank Zino on "The rediscovery of Zino's Petrel *Pterodroma madeira*" which was thought to be extinct on the island. These talks provided a wonderful background to the flora and fauna of the island that many of us hoped to enjoy the next day on various fieldtrips.

The fieldtrips on Friday included a Levada trek, a mountain hike and a boat trip to the Desertas Islands, a nature reserve situated south-east of Madeira. I chose the Levada trek guided by Miguel Sequeira following the Serra do Faial Levada through the Laurissilva forest which is a

world heritage site. It was amazing to see the irrigation canals (levadas) built by the first settlers to transport water to inaccessible farmland. The oldest levadas were built about 400 years ago (though not the section we went on) to transport water from the wetter north of the island to the drier southern part. This walk provided the perfect opportunity for collecting midges and as we got into the forest more nets came out. The scenery along the route was spectacular particularly as we walked further into the forest and stopped at several view points. The day ended well with dinner at a sea front restaurant for many of us.

The last day was dedicated to a taxonomy workshop held at the University of Madeira where we could bring our problem taxa to be identified. This was a very useful aspect of the trip as there were many people available to help and discuss our problems with. We were taken to a traditional restaurant for lunch where we had the local delicacy espetada (skewered beef). The next day seemed to come too soon as it was time to go home after a great week on the island. I would like to thank Samantha and the organising committee for arranging an excellent conference and their wonderful hospitality.

*Wing Wai Sung, Department of Geography,
Loughborough University.*

A mediterranean view of the Madeira symposium ...

Coming from Barcelona ...flying to Madeira Island. The objective was to participate in my first "International Chironomid Symposium". When I arrived, my first feeling was that all the delegates know each other, obviously a confirmation that the "world of chironomidology" is small. In a few days the entire group created a friendly atmosphere, and all new people were kindly received. It was a familiar meeting, where all the participants shared their work on Chironomidae, focusing on different aspects: paleo, ecology, taxonomy, genetics and biogeography. For me, one of the best things was to get to know the most important chironomidologists that write the taxonomic keys that we use in our identifications, and it was a privilege to participate in the workshop, sharing our doubts with students and experts.

Apart from the professional exchanges, we had the opportunity to discover a fantastic island in a Macaronesian world, searching for *Clunio* during our free-time, trekking in the deep green of Madeira and eating typical Portuguese food. A

nice experience sharing the words, doubts, questions of our research that are difficult to understand for non-chironomidologists. Thank you!

Tura Puntí, Department of ecology, University of Barcelona, Spain.

Madeira Symposium Memories

When I recall the Madeira Symposium I can't find any bad feelings about it. The Symposium was very well organised and took place in a nicely warm Madeira climate, which I really enjoyed. In my eyes, the best thing was that there came together people interested in chironomids (including the greatest specialists) from all over the world and since there were not too many people, in contrast to most international conferences, it was possible to meet everyone and have a talk with them. For me it was the best conference I have ever attended and I hope that I will be able to do so the next time as well.

Vit Syrovatka, Institute of Botany & Zoology, Masaryk University.

The Madeira Symposium

From my first contribution to Chironomid Symposiums I can review this symposium with just two words "great experience". I can only guess, like most of the students present there I presume, how much effort has gone into preparing it. It was a high quality symposium on both practical and scientific sides. The scientific themes were very diverse including all aspects of chironomid research, highly rewarding for PhD students who spend the major part of their research working on one topic. Such symposiums allow us to see the diversity of chironomidology research: taxonomy, ecology, paleolimnology, biodiversity and genetics. The other positive

element was the human scale of the symposium, making it easy to meet and chat with all the scientists and also to assist at all the oral presentations.

Not only did the symposium act as a centre for the exchange of ideas at an international level, I can say also that it's a great opportunity to meet scientists from all over the world and to weave a web of contacts for further collaboration which is very helpful for us PhD students to prepare post-doc projects for subsequent collaborations.

Alain Maasri, Université Paul Cézanne – IMEP Marseille.

The Madeira Symposium

I enjoyed many aspects of the Madeira Symposium; strolling along the sea front, sipping Madeira in the old-world elegance of the Town Hall, the delicious food at the Symposium dinner and, of course, the stimulating talks. But the 'best bit' was the enthusiasm and friendliness of the delegates. Students and experienced researchers were eager to discuss their research, share experiences and offer advice. Their enthusiasm extended beyond narrow research topics with palaeolimnologists interested in modern ecology and distribution data and modern ecologists examining the fossil assemblages. This stimulating atmosphere of mutual interest and co-operation was exemplified by the workshop where discussions ranged from identification of problem taxa to fieldwork logistics. I would like to thank everyone that offered advice or sent research material, particularly Peter Langton for sending copies of his pupae identification key. I hope I can share my research at a future Symposium.

Angela Self, Department of Entomology, Natural History Museum, London.

THE 8TH EUROPEAN SUBFOSSIL CHIRONOMID WORKSHOP, REYKJAVÍK

7-8TH MAY 2007

Since first meeting in Helsinki in 1997, European subfossil chironomid workers have held workshops every year or two to discuss progress and problems. More recently, many of these meetings have been attended by our North American colleagues (or 'dead headers'), adding greatly to the discussions. This was the first time

we had met as a community on 'neutral territory', i.e. the middle of the North Atlantic. Iceland is an exceptional place to visit, as was demonstrated on an introductory field visit for the majority of those attending the workshop. Our hosts, Jón Ólafsson and Thora Hrafnadóttir took us on a tour around the SW peninsula, noting the geothermal

geology, wildlife (fulmars, kittiwakes, and gannets for the bad birdwatchers) and a splendid crater lake of pH 2. At the end of the fieldtrip we were treated to a well earned soak in the Blue Lagoon to prepare us for the discussions over the next two days.

Palaeoenvironmental reconstructions from analyses of subfossil head capsules are now well established in mainstream and specialist literature, and are often incorporated as key proxies in scientific debates at the forefront of research agendas. However, as with any technique there is a need to constantly discuss progress and problems, and these workshops provide the ideal vehicle with which to undertake this. The discussion did not shirk from debating key, sometimes controversial issues, and while much

of the questioning/debating was critical, it was most certainly inclusive, fair and good-humoured. Workshops should be a focus on discussion and debate, and this one succeeded admirably. The theme of the workshop was on the *Cricotopus/Orthocladius* dilemma, and whether we can split these genera successfully within our subfossil taxonomy. It has been traditional within these workshops to always devote a large chunk of time to taxonomic debates, and while this workshop was no different (we all recognise that taxonomy underpins our environmental reconstructions) we also managed to debate equally important aspects of our research, especially those related to the numerical techniques we use and ecological complexity within palaeoecology.



Figure 1. Participants at the workshop

The workshop presentations were focused around 3 main themes: environmental reconstructions (mainly climate based), ecological functioning, and taxonomy. The reconstruction talks focused on a range of sites and timescales. Records from the last 1-2 millennia were discussed by Naomi Holmes, Yarrow Axford, Elizabeth Thomas (all Icelandic sites) and Nicholas Rolland (a site in Nanavut, Canada), whereas David Porinchu considered records covering the last 150 years from western USA. The Arctic was a key theme of this meeting, perhaps no surprise as this workshop followed the Arctic workshop, held in Skaftafell, SW Iceland, two days previously, and presentations from Gaute Velle, Donna Francis, Isabelle Larocque and Marie-Claude Fortin all

discussed work from projects they are currently working on in this region. It was not all Arctic science though, as Craig Woodward showed us his 'Diptera down-under', discussing his research on New Zealand sub-fossil chironomids as indicators for long-term environmental change. Many of the subfossil sequences presented were analysed in terms of quantitative temperature reconstructions. Steve Brooks assessed how reliable these chironomid-inferred temperature reconstructions are in terms of the late-glacial and Holocene in NW Europe. The main consensus was that late-glacial records seemed to agree well although some regional differences exist, whereas there is far less agreement between Holocene temperature reconstructions. This is thought to be

mainly due to the range of lake developmental pathways that exist, for example changing pH throughout the Holocene will also influence chironomid communities. Discussion focused on whether we are actually at the limit of what we can achieve regarding the magnitude of error estimates for Holocene thermal changes, and that 1-2 °C errors were actually quite good when we consider the complex ecological functioning underlying chironomid response to environmental change. These points notwithstanding, there are clearly some Holocene temperature reconstructions that appear to work well and show good agreement with other (quantitative) proxy evidence.

The workshop highlighted the need to improve our understanding of the role of chironomids in ecological functioning, as well as generating autoecological data. Klaus Brodersen illustrated this point succinctly by presenting new data on *Corynocera ambigua* ecology. He combined oxygen respiration experiments on the larvae with stable isotope data in order to try to understand the ecological mechanisms through which this taxon is governed. The results suggested that these processes are complex, and Klaus noted that while we now have good data for this taxon, we still have many other taxa for which we require experimental data. Other talks relating to ecological functioning focused on the role of macrophytes and chironomid communities in the UK (Peter Langdon), lake-climate interactions (Wing Wai Sung), and analyses of the chironomid community structure in Icelandic lakes (Thora Hrafnisdóttir). Discussion focused on the ecodynamics of Lake Myvatn (led by Árni Einarsson) and an understanding of ecological scaling and complexity in palaeoecology (led by Gaute Velle and Klaus Brodersen), where the challenge of validating and interpreting the results of inference models was discussed. One conclusion was that when using inference models, taxon optima can change depending on what other environmental factors change, as well as what other taxa are present; or in other words palaeoecological simplicity may need to be considered more carefully in the face of ecological complexity.

Taxonomic discussions did, as usual, form the brunt of much of the discussion, and were led by (in no particular order) Jón Ólafsson, Thora Hrafnisdóttir, Ian Walker and Oliver Heiri. New taxonomic guides have recently been produced, including Larocque and Rolland (2006), Brooks et al. (2007), and a Provisional Interactive key to Larval Chironomidae by Pete Cranston (available on CD from the author at:

pcranston@ucdavis.edu), which stimulated much debate. This was an important discussion, for both new and more experienced chironomid palaeoecologists, and a number of key points were identified as important to consider:

- Taxonomy provides a unique and stable name for every taxon and it underlies studies in ecology, palaeoecology, biogeography etc. Results (e.g. reconstructions) are dependent upon the correct use of taxonomy, i.e. correct identifications. We want as high a resolution in our taxonomic data as possible, however, we should be conservative in our identifications, and to guard against over-splitting.
- Correct taxonomy is especially important in terms of retrieving the correct ecological information about chironomid taxa from the literature.
- Consistent taxonomy is important for training set data and core data in order to obtain sound reconstructions.
- The term ‘morphotype’ or ‘type’ is used to refer to a taxon with a particular morphology, but there may be more than one species included and these are indistinguishable based on subfossil features.
- At present much of the fossil taxonomy is based on fossil examples, not reared/living larvae. Ways to link the larvae to the adults would be through rearing and DNA methods.
- In future identification guides we could add photos of reared larvae next to photos of fossil larvae. There are few reared specimens in collections, so these may not be representative of the species (thus we have little or no information on intra-specific variation). Also, the photos of fossil larvae are still needed because these are more representative of what palaeoecologists see under the microscope.
- In our publications it is important to cite the key used or the description of a taxon, so others can refer to this in the future as well as to prevent misconception in the future. We should also take photographs, and record (publish if possible) ‘odd’ specimens found.

One important topic of debate, and the workshop theme, was the possibility of differentiating *Cricotopus/Orthocladius/Paratrichocladius* (led by Oliver Heiri). It is impossible to do this at the generic level if we cannot make a species-level diagnosis (on fossil material), but some species

(or at least morphotypes) are distinctive. Numerous morphotypes that can be consistently distinguished are described in the new taxonomic guide by Brooks et al. (2007). The guide provides an essential standard for our community at the present time. One problem is that different instars may falsely appear to be different morphotypes (e.g. for *Pseudodiamesa*) and it is essential to keep an eye out for this. The “dilemma” is that we must choose between potentially committing “type II” errors (in which we do not recognise differences that actually exist) and “type I” errors (in which we see differences that do not actually exist). Some suggestions as how to proceed included:

1. Test existing datasets at high taxonomic resolution. Send resulting ideas, pictures, etc amongst our community.
2. Check the literature for ecological notes regarding different taxa.
3. Check for co-existence with other taxa – a source of clues regarding the ecology of morphotypes.
4. Check trophic optima vs. temperature optima.
5. Test model performance at different taxonomic resolutions. This will save time if splitting does not add information. Note that lumping may yield more precise but less accurate models. Splitting may be less worthwhile for transfer-function based reconstructions, but could be very useful for palaeoecology (studies of diversity, palaeogeography, etc.).

Overall this was an excellent meeting, and as a research group we got to grips with many of the key issues that affect our discipline, much of which is reported above. Warm thanks go to Jón Ólafsson and Thora Hrafnadóttir who organised the workshop, the Institute of Freshwater Fisheries, where the meeting was held, and to Hilmar Malmquist who organised an excellent reception at the Natural History Museum of Kopavogur where we sampled such delicacies as dried fish and rotting shark (hákarl) washed down with shots of brennivín (translation: Black Death). Delicious.

References

- Brooks, S.J., Langdon, P.G. and Heiri, O. 2007. The identification and use of Palaeartic Chironomidae Larvae in Palaeoecology. QRA Technical Guide No. 10, Quaternary Research Association, London. 276pp.
- Larocque, I. and Rolland, N. 2006. Le guide visuel des chironomids sub-fossiles, du Québec à l’île d’Ellesmere, INRS rapport de Recherche R-900.
- Peter Langdon, University of Southampton, UK.*
Naomi Holmes, University of Exeter in Cornwall, UK.
Stefán Már Stefánsson, Natural History Museum of Kopavogur, Iceland.
Elísabet Hannesdóttir, Institute of Freshwater Fisheries, Iceland.
Yarrow Axford, University of Buffalo, USA.

NEWS FROM CHIRONOMID RESEARCH IN INDIA

University of Burdwan

The research project, TAXONOMY OF DIPTERA under the aegis of the “All India Coordinated project on Insect Taxonomy” funded by the Ministry of Environment & Forests, Govt. of India under Prof. P.K. Chaudhuri & Dr. A. Mazumdar implemented in 2002 is in progress. Assistance in the form of material and literature is solicited for its successful execution.

Prof. Xinhua Wang of University of Nankai (China) paid a short visit to our laboratory in 2005. During his visit Prof. P.K. Chaudhuri and I chalked out a plan to prepare a “Directory of

chironomids of the Oriental Region” in collaboration with Prof. Wang. The directory awaits publication in Zootaxa soon. The list contains 948 species of 142 genera in 6 subfamilies of chironomids of the Oriental Region, including oriental China and Japan.

Professor Arshad Ali, University of Florida, IFAS, Apopka came to our laboratory to work with us in July, 2006. During his short stay, a program was designed to study the ecology and intraspecific relationship of the species of *Glyptotendipes* Kieffer.

Doctoral degree in 2007.

Dr. Uttaran Majumdar

Email: uttaran_majumdar@yahoo.com

Supervisor: Dr. A. Mazumdar, Department of Zoology, University of Burdwan, Burdwan 713 104, India; Email: abhijitau@rediffmail.com

Title of the thesis: "Systematics and biology of the subfamily Chironominae (Diptera: Chironomidae) of eastern India".

Summary of the Ph.D. thesis:

The thesis contains 77 species of 12 genera in the two tribes Chironomini (10 genera) and Tanytarsini (02 genera). Of the 77 species, *Chironomus mayri*, *Einfeldia arcuata*, *Glyptotendipes (Phytotendipes) crassispinus*, *G. (P.) fumilatus*, *G. (P.) sinus*, *Microtendipes semicylis*, *Paratendipes brevirusticus*, *Cladotanytarsus dividens*, and *Parapsectra firmistyla* are described as new to science and 33 species reported earlier are revised. The life cycle of 9 species are reared in the field and the laboratory and the immature stages are also described with the relevant illustrations. A brief study of habitats, food and feeding habits, construction of larval residences, silk spinning of the larvae, life cycles, emergence and sex ratios of several species are presented in the thesis. Behaviour of the larvae and pupae of the new species are also included in the thesis.

Adjudicators:

1. Dr. Martin BERG
Associate Professor
Department of Biology
Loyola University of Chicago, 6525 N
Chicago, IL 60626, USA.
2. Dr. J.KALITA
Professor of Zoology
Gauhati University, Guwahati 781014, India.
3. Dr. P.HALDAR
Professor of Zoology
Visva Bharati, Santiniketon, India.
4. Dr. A. Mazumdar (Supervisor)
Department of Zoology
University of Burdwan
Burdwan 713 104, India

M.Phil. thesis:

Ms. Soumi Nandi

Supervisor: Dr. A. Mazumdar, Department of

Zoology, University of Burdwan, Burdwan, 713 104, India.

Title of thesis: "Study of morphology and polytene chromosomes of *Glyptotendipes barbipes* (Staeger) from India (Diptera: Chironomidae)".

Summary of the M. Phil thesis:

Morphology of all life stages of *Glyptotendipes barbipes* (Staeger) is revised using recent terminology and taxonomy. The material used was based on laboratory rearing of larvae. The dissertation also includes descriptions of the polytene chromosomes of the salivary gland of the fourth instar larva of *Glyptotendipes barbipes*. In general these are noted to possess $2n=8$ with three metacentric and one acrocentric chromosomes which through comparative studies are reported to vary in different populations.

Chironomus research at University of Pune

M.Phil. thesis 2003

Mr. Anand A. Babrekar

Supervisor: Dr. B. B. Nath, Department of Zoology, University of Pune, Pune, India.

Title of thesis: "Study of photobehaviour in *Chironomus ramosus* Chaudhuri et al.".

Summary of the M. Phil thesis:

The ontogeny of photosensitivity in a holometabolous insect midge *Chironomus ramosus* was studied. Extracellular electrical activity was recorded from larval and adult photoreceptor organs. We found a progressive increase in photosensitivity, as the development proceeds from larva to adult stage. This is a first report of its kind where developmental profile of photosensitivity in any insect has been described from an ecological context. Chironomid midges have been chosen for this study since developmental stages show ecological transitions. Aquatic bottom dwelling tubicolous larvae metamorphose to a transient pupal stage and subsequently, eclose to terrestrial low-flying adult midges. Unlike larvae, adults were found to be positively phototactic.

We have fabricated special devices and designed novel assays to study photobehavioural responses in different developmental stages. We have also formulated phototactic index (P.I.) for quantitative analysis of photobehaviour. Moreover, the study aimed at finding whether response to intensity and wavelength of light varies in different developmental stages. Interestingly, our study showed a developmental shift in photobehavioural response during

metamorphosis. Early and late larval instars showed a variable pattern of photoresponse under shorter and longer wavelengths of the visible spectrum and the findings have been correlated to their ecological transitions from pelagic to benthic life style. Similarly, P.I. values shifted from positive to negative and vice-versa throughout the life-cycle of *Chironomus*. Behavioral data has been corroborated with ERG data (collaborative work with Dr. Gauri Kulkarni, Biophysics Unit, Dept. of Physics, University of Pune). Our electrophysiological data link sensitivity of developmental stage specific photoreceptor organs of larvae and adults to its ecological adaptations.

Chironomus larvae are known to be pests and adults are known for creating a nuisance in human habitats. Adult midges are also medically known for allergic reactions to humans. Therefore, we believe that our findings will help in designing a 'light-trap' as an effective pest control strategy based on developmental stage specific photosensitivity.

Anand A. Babrekar received Prof. V.C.Shah best poster presentation award for the paper entitled "Structural & functional analysis of photoreceptor cells of *Chironomus ramosus*" at the XXVII All India Cell Biology Conference & International Symposium, Jan 7-10, 2004 at Pune, India.

New Chironomidologists in India

Dr. Niladri HAZRA
Department of Zoology
Balurghat College (North Bengal University)
Balurghat, India.

Area of research: Biodiversity of Chironomids in the riverine system.

Mr. Nirmalaya DAS
Department of Zoology
Kalimpong College (North Bengal University)
Kalimpong, India.
Area of research: Systematics and Biology of Orthoclaadiid midges of the Himalayas of West Bengal, India.

Dr. T. MIDYA, Professor
Department of Zoology
Presidency College
Calcutta 700 073
Area of research: Polytene chromosomes of the Chironomid midges.

Dr. S. CHATTOPADHYAY
Department of Entomology
Faculty of Forestry
B.A.University, Ranchi, Jharkhand.
Area of research: Biology and Ethology of Chironomids.

Dr. G. K. SAHA
Department of Zoology
University of Calcutta
34 Ballyganj Circular Road, Calcutta 700 019.
Area of research: Behaviour and Limnology of Chironomids

*Abhijit Mazumdar, Department of Zoology,
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CURRENT RESEARCH

SUBFOSSIL CHIRONOMIDS FROM 18 LAKES IN SOUTHERN AND NORTHERN FINLAND

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Introduction

Midge and especially chironomid (Diptera: Chironomidae) larvae provide an excellent data source of environmental conditions in aquatic ecosystems, particularly in lakes and ponds, where they live abundantly in the bottom of littoral and pelagic zones. Chironomids are a very diverse midge family, for example Paasivirta (2007) lists over 750 species in Finland. Some species are ecologically sensitive, living only in certain types of waters. Their chitinous head capsules preserve in lake sediments as subfossil remains and have been used to interpret past environmental changes in lakes, e.g. changes in temperature, water depth, salinity, productivity, hypolimnetic oxygen and pH (Walker 2001). Subfossil chironomid analysis has also been used in contemporary ecological studies, as the chironomid assemblage in the topmost sediment layer, if not disturbed, is considered to represent the present chironomid fauna and sampling of the surface sediment is fairly easy and effective. The major disadvantage in subfossil chironomid analysis is the difficulty in identification, because it is often impossible to identify to species or even genus level. However, for example Olander et al. (1999), Larocque et al. (2001) and Nyman et al. (2005) have gathered important information on distribution of chironomids in northern Fennoscandia based on surface sediment samples. Although these studies have led to highly developed chironomid-based palaeotemperature inference models, they are restricted to subarctic regions and do not cover the southern areas of Fennoscandia.

The aim of the present study is to provide data on the distribution of chironomids in southern and northern Finland and to examine whether faunal patterns in distribution exist between these regions. Therefore, 18 lakes in Finland, 11 situated in the southernmost part of the state and 7 in the northernmost part, were studied for their subfossil chironomid fauna. This study presents preliminary results from a wider investigation of chironomid distribution in Finland.

The study area

The 18 lakes were chosen to represent different lake types in southern (60°13' to 60°26' N) and northern Finland (69°40' to 69°53' N) (Figure 1). Catchment vegetation of the lakes spans from boreal coniferous forests in the south to tundra vegetation in north. The mean annual air temperature varies between 4.5 (south, Helsinki-Vantaa airport) and -2.0 °C (north, Kevo research station), and the mean annual precipitation from 649 mm to 395 mm, respectively. The altitude of the lakes varies from 15 to 404 m a.s.l. and altitude corrected mean July air temperatures were calculated for individual lakes (Laaksonen 1976) (Table 1). The range in mean July air temperature varies from 16.8 in south to 11.0 °C in north. All northern lakes were oligotrophic and their surface areas varied from ca. 20 to 90 ha., whereas southern lakes varied more in their trophic status and were generally smaller (Table 1).

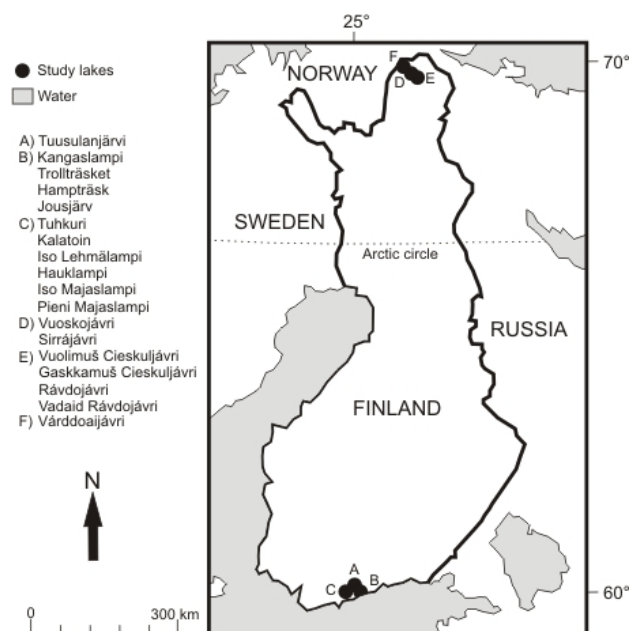


Figure 2. Location of the study sites. Lakes A-C are located in boreal forests, lakes D-E in mountain birch woodland and F in subarctic tundra.

Table 1. Location, climate and other characteristics of the examined lakes.

Lake	Latitude (°N)	Longitude (°E)	Altitude (m a.s.l.)	MeanTJul (°C)	Area (ha)	Trophic status	Vegetation zones*
Várdoaijärvi	69.53	26.31	404.0	11.01	28.5	oligotrophic	Ba
Vadaid Ravdojärvi	69.40	27.13	301.0	11.59	92.2	oligotrophic	MBW
Gaskkamuš Cieskuljärvi	69.43	27.07	282.6	11.70	15.0	oligotrophic	MBW
Ravdojärvi	69.40	27.12	275.8	11.74	62.3	oligotrophic	MBW
Vuolimus Cieskuljärvi	69.44	27.05	269.4	11.77	45.7	oligotrophic	MBW
Sirrajärvi	69.45	26.53	208.0	12.12	18.2	oligotrophic	MBW
Vuoskojärvi	69.44	26.56	145.0	12.48	19.2	oligotrophic	MBW
Pieni Majaslampi	60.19	24.35	97.3	16.35	1.1	oligotrophic	SPB
Iso Majaslampi	60.19	24.35	92.7	16.37	6.3	oligotrophic	SPB
Iso Lehmälampi	60.20	24.36	91.7	16.38	5.1	oligotrophic	SPB
Kalatoin	60.20	24.37	89.5	16.39	0.9	dystrophic	SPB
Hauklampi	60.18	24.36	75.7	16.47	2.7	oligotrophic	SPB
Tuhkuri	60.20	24.38	73.7	16.48	13.7	oligotrophic	SPB
Jousjärvi	60.20	25.11	37.3	16.69	0.5	dystrophic	SPB
Tuusulanjärvi	60.26	25.03	37.8	16.69	600.0	eutrophic	SPB
Trollträsket	60.20	25.09	24.0	16.77	1.3	mesotrophic	SPB
Hampträsk	60.17	25.15	20.3	16.79	3.8	mesotrophic	SPB
Kangaslampi	60.13	25.08	14.6	16.82	1.4	eutrophic	SPB

*Ba = barren tundra, MBW = mountain birch woodland, SPB = spruce, pine and birch forest.

Materials and methods

The surface sediment samples were obtained with a Limnos gravity corer between February and April in 2005. The sediment samples for subfossil chironomid analysis were prepared using standard methods described in Hofmann (1986) and Walker (2001). A minimum of 100 chironomid head capsules were identified from each sample. The identification was based mainly on Wiederholm (1983). Heiri et al. (2004) was used to identify the Tanytarsini, Sæther (1975, 1976) and Walker et al. (1992) for some of the Orthocladiinae and Rieradevall & Brooks (2001) for the Tanytarsini larvae. The WWW Field Guide to subfossil Midges (Walker 2007) was also very helpful. The nomenclature follows the above mentioned literature.

Detrended correspondence analysis (DCA) was performed using the program CANOCO, version 4.52 (ter Braak 2003) to explore patterns in the distribution of the chironomid taxa in Finland. The DCA was run with detrending by segments, square-root-transformation of species abundances and down weighting of rare species. DCA is an indirect ordination method that summarizes the variation of the species assemblages along the DCA axes.

Results and discussion

From the sediments of the 18 lakes, a total of 2310 chironomid head capsules were counted and identified to genus or species level. In all, 66 taxa were identified; 40 Chironominae (23 Chironomini, 16 Tanytarsini, 1 Pseudochironomini), 22 Orthocladiinae, 3 Tanytarsini and 1 Diamesinae. The most common chironomid taxa (Figure 2, Table 2) were *Tanytarsus* undif. (mean abundance in the lakes 7.8%) and *Psectrocladius sordidellus* type (7.7%). *Ablabesmyia monilis* type (6.8%), *Monopsectrocladius calcaratus* type (6.4%) and *Procladius* (6.3%) were also common. *Monopsectrocladius calcaratus* type, *Ablabesmyia monilis* type, *Dicrotendipes pulsus* type, *Tanytarsus* undif. and *Procladius* occurred in 17 lakes (Table 2) while none of the taxa occurred in all lakes. The most evenly distributed taxa in the lakes, with high effective number of occurrences (Hill's N2), were *Ablabesmyia monilis* type (13.1), *Dicrotendipes pulsus* type (11.7) and *Psectrocladius sordidellus* type (11.0) (Table 2).

Table 2. Chironomid occurrences, Hill's N2 diversity index, maximum and mean percentages and calculated optimum temperatures based on the 18 study lakes.

	Occurrences	Hill's N2	Maximum	Mean	Opt. temp. (°C)
<i>Micropsectra radialis</i> type	1	1.0	4.1	0.2	11.01
<i>Hydrobaenus pilipes</i> type	2	2.0	0.7	0.1	11.37
<i>Heterotrissocladius brundini</i> type	6	3.6	10.8	1.4	11.42
<i>Tanytarsus lugens</i> type	10	7.2	10.1	2.5	11.6
<i>Thienemannimyia</i>	5	4.6	1.4	0.2	11.68
<i>Sergentia coracina</i> type	7	5.9	8.4	2.0	11.69
<i>Zalutschia tatrlica</i> type	4	3.0	3.5	0.4	11.75
<i>Heterotrissocladius grimshawi</i> type	5	4.0	5.2	1.0	11.90
<i>Parakiefferiella nigra</i>	2	1.5	2.6	0.2	11.90
<i>Cricotopus pulchripes</i> type	6	4.9	4.7	1.0	11.93
<i>Micropsectra insignilobus</i> type	9	4.2	19.8	3.2	11.97
<i>Protanypus</i>	1	1.0	2.6	0.1	12.12
<i>Corynocera ambigua</i>	7	4.0	15.4	2.3	12.29
<i>Stempellinella</i>	1	1.0	0.7	0.0	12.48
<i>Cricotopus (I.)</i> sp.	4	2.5	5.0	0.5	12.53

	Occurrences	Hill's N2	Maximum	Mean	Opt. temp. (°C)
<i>Constempellina brevicosta</i>	5	2.3	5.1	0.5	12.85
<i>Paratanytarsus austriacus</i> type	2	1.4	3.6	0.2	13.14
<i>Paratanytarsus</i> undif.	14	8.7	16.2	4.1	13.25
<i>Micropsectra bidentata</i> type	7	4.0	4.3	0.5	13.52
<i>Monopsectrocladius calcaratus</i> type	13	6.2	36.8	6.4	13.55
<i>Microtendipes pedellus</i> type	13	7.9	7.9	2.2	13.68
<i>Paratanytarsus penicillatus</i> type	8	6.5	5.0	1.2	13.81
<i>Cricotopus (L.) sylvestris</i> type	15	9.6	5.8	1.4	14.06
<i>Pagastiella orophila</i>	8	6.0	2.7	0.5	14.13
<i>Heterotrissocladius marcidus</i> type	6	3.8	6.8	0.9	14.14
<i>Paracladopelma</i>	2	2.0	0.9	0.1	14.31
<i>Cricotopus</i> undif.	10	7.7	5.4	1.3	14.46
<i>Psectrocladius sordidellus</i> type	17	11.0	26.0	7.7	14.71
<i>Cladotanytarsus mancus</i> type	9	4.3	11.3	1.5	14.77
<i>Phaenopsectra flavipes</i> type	7	6.2	1.9	0.5	14.87
<i>Zalutschia zalutschicola</i>	10	7.9	6.0	1.9	14.87
<i>Ablabesmyia monilis</i> type	17	13.1	15.6	6.8	14.95
<i>Dicrotendipes pulsus</i> type	17	11.7	12.1	3.9	14.96
<i>Heterotanytarsus apicalis</i> type	6	3.7	9.9	1.6	15.22
<i>Psectrocladius (Mesopsectrocladius)</i>	4	2.9	2.6	0.3	15.27
<i>Cryptochironomus</i>	2	1.8	1.6	0.1	15.37
<i>Polypedilum nubeculosum</i> type	12	9.5	3.1	1.0	15.63
<i>Tanytarsus</i> undif.	17	7.4	41.9	7.8	15.64
<i>Procladius</i>	17	6.4	38.6	6.3	15.67
<i>Psectrocladius (Allopsectrocladius)</i>	12	4.3	25.0	3.5	15.74
<i>Cladopelma viridulum</i> type	13	6.5	7.7	1.3	15.91
<i>Pseudochironomus prasinatus</i> type	5	4.2	2.9	0.5	16.06
<i>Tanytarsus pallidicornis</i> type	13	7.3	12.4	3.0	16.07
<i>Tanytarsus chinyensis</i> type	6	2.7	7.3	0.7	16.31
<i>Chironomus anthracinus</i> type	11	6.5	13.6	2.9	16.31
<i>Limnophyes</i>	6	3.6	8.7	1.3	16.34
<i>Paratendipes albimanus</i> type	1	1.0	5.8	0.3	16.39
<i>Corynoneura lobata</i> type	5	1.6	29.7	2.1	16.39
<i>Chironomus plumosus</i> type	11	3.9	19.7	2.5	16.41
<i>Lauterborniella agrayloides</i> type	5	4.6	2.3	0.4	16.54
<i>Corynoneura scutellata</i> type	5	3.0	5.8	0.6	16.56
<i>Nanocladius (N.) rectinervis</i> type	4	3.0	3.0	0.4	16.56

	Occurrences	Hill's N2	Maximum	Mean	Opt. temp. (°C)
<i>Tanytarsus mendax</i> type	7	6.4	6.8	1.8	16.57
<i>Microchironomus tener</i> type	1	1.0	11.0	0.6	16.69
<i>Endochironomus impar</i> type	2	1.9	1.6	0.1	16.69
<i>Endochironomus albipennis</i> type	3	2.4	3.4	0.4	16.74
<i>Orthocladius</i> sp.	3	2.7	4.0	0.5	16.75
<i>Einfeldia pagana</i> type	3	2.5	6.8	0.7	16.75
<i>Rheotanytarsus</i>	5	3.6	4.3	0.6	16.76
<i>Polypedilum sordens</i> type	3	1.9	3.4	0.3	16.76
<i>Mesocricotopus thienemannii</i>	1	1.0	1.5	0.1	16.79
<i>Glyptotendipes pallens</i> type	4	2.3	10.3	0.9	16.79
<i>Omisus caledonicus</i>	1	1.0	0.9	0.0	16.82
<i>Parachironomus varus</i> type	1	1.0	3.4	0.2	16.82
<i>Endochironomus tendens</i> type	1	1.0	0.9	0.0	16.82
<i>Kiefferulus tendipediformis</i> type	1	1.0	1.7	0.1	16.82

Several chironomid taxa occurred mainly in the northern lakes, whereas many were found only from southern sites (Figure 2). Some taxa, e.g. *Psectrocladius sordidellus* type and *Ablabesmyia monilis* type were found abundantly in both northern and southern lakes (Figure 2). *Micropsectra radialis* type occurred only in Várddoaijávri (Figure 2, Table 2), which is the coldest of the lakes, located in the subarctic tundra of the northernmost Finland. Also *Heterotrissocladius brundini* type and *Paratanytarsus* undif., were at their highest abundance in Várddoaijávri. *Paratanytarsus* undif. occurred also in all mountain birch woodland lakes and in some boreal forest lakes. A clear northern distribution with preference to mountain birch woodland lakes (Table 1), was observed for *Tanytarsus lugens* type, *Thienemannimyia*, *Sergentia coracina* type, *Zalutschia tatica* type, *Heterotrissocladius grimshawi* type, *Parakiefferiella nigra*, *Cricotopus pulchripes* type, *Micropsectra insignilobus* type, *Protanypus*, *Corynocera ambigua*, *Cricotopus* (*I.*) sp., *Constempellina brevicosta* and *Paratanytarsus austriacus* type. A

southern distribution was observed for many taxa (Figure 2). *Polypedilum sordens* type, *Rheotanytarsus*, *Orthocladius* sp., *Endochironomus impar* type, *Tanytarsus mendax* type, *Nanocladius* (*N.*) *rectinervis* type, *Corynoneura scutellata* type, *Lauterborniella agrayloides* type, *Corynoneura lobata* type, *Paratendipes albimanus* type, *Limnophyes*, *Tanytarsus chinyensis* type, *T. pallidicornis* type, *Pseudochironomus prasinatus* type, *Cladopelma viridulum* type and *Psectrocladius* (*Allopectrocladius*) occurred mainly in southern lakes, which are situated in the boreal forest vegetation zone. *Glyptotendipes pallens* type, *Einfeldia pagana* type, *Endochironomus albipennis* type, *Microchironomus tener* type and *Chironomus plumosus* type also had southern occurrences, and they showed further preference for nutrient rich lakes (Figure 2, Table 1). Also *Chironomus anthracinus* type and *Procladius* had their maximum abundances in southern, nutrient-rich lakes. The general results of the distribution of chironomids in the present study seem to agree with other studies (e.g. Brodersen and Quinlan 2006; Brooks 2006).

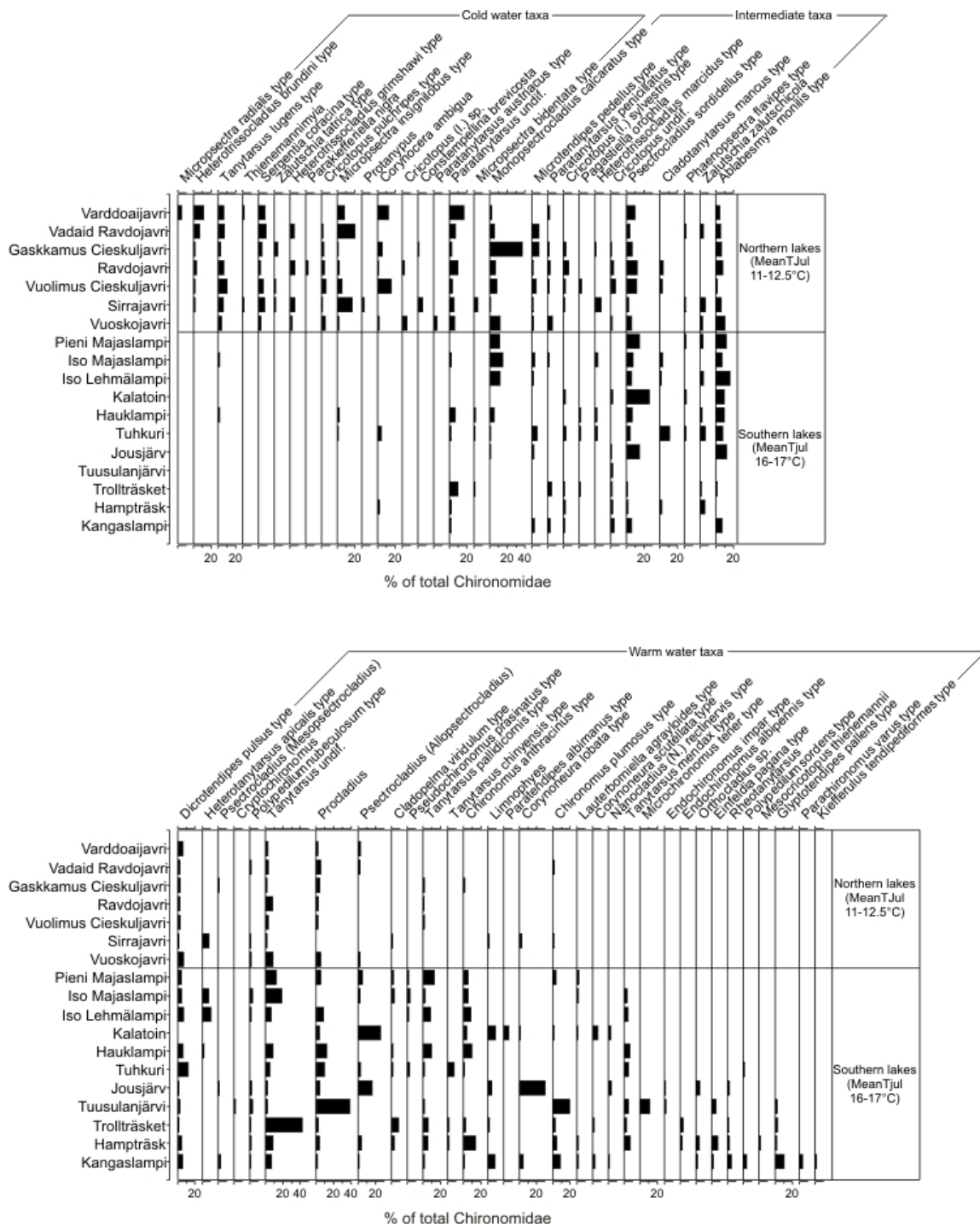


Figure 3. Distribution of the most common Chironomidae. The taxa are ordered based on their optimum temperatures from the coldest (left) to the warmest (right) and the lakes are ordered based on their mean July air temperatures from the coldest (top) to the warmest (bottom).

The DCA ordination diagram (Figure 3) indicates that the samples (i.e. lakes) are clearly clustered into several groups according to their chironomid fauna. The scores for the southern and northern lakes are distinctly different from each other; the southern lakes having low or intermediate values

for DCA axis 1 and northern lakes having high values. The northern lakes had very similar scores along both DCA axes suggesting that their chironomid assemblages were very similar. There was also clustering among the southern lakes. The meso-eutrophic southern lakes had rather low

values along both DCA axis and the most eutrophic lake (Tuusulanjärvi) had distinctly low values for both axes. The dystrophic, macrophyte-rich lakes had highest scores for the DCA axis 2 values and low axis 1 values and the oligotrophic southern lakes had scores in the center of the ordination diagram.

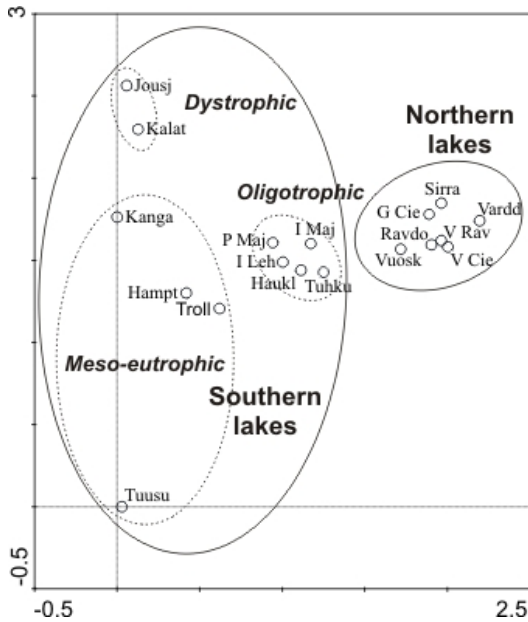


Figure 4. Figure 3. DCA plot for samples based on the chironomid assemblages in the 18 lakes.

According to the current results, it appears that the occurrences of some chironomid taxa are restricted to either southern or northern lakes and some were found in both regions (Figure 2). This suggests that faunal patterns exist in distribution of chironomids in Finland. It is possible that climatic factors are behind this geographical distribution of chironomids, since climate differs considerably between southern and northern Finland (Table 1) and temperature is known to affect the occurrence of chironomids (Brooks 2006). Because such differences in distribution were found, optimum temperatures, based on lake specific July air temperatures (meanTJul) were calculated for each taxon (Table 2) and the chironomids were grouped to cold, intermediate and warm water inhabitants (Figure 2). However, it is likely that many other chemical, physical or ecological factors besides climate affect their distribution and are influencing these faunal patterns. For example the northern lakes in the present study were much larger than the southern ones and this may be one contributing factor

causing the differences in northern and southern chironomid assemblages. Olander *et al.* (1999) found the organic content of the sediment (measured as loss on ignition: LOI) and lake water temperature to be the key factors and Nyman *et al.* (2005) showed that LOI, total organic carbon (TOC), pH and lake specific July air temperature were the most significant factors affecting chironomid distributions in western Finnish Lapland. Larocque *et al.* (2001) concluded that mean July air temperature, LOI and maximum lake depth were the most important environmental variables in subarctic northern Sweden. The present study provided data only on chironomids in southern and northern lakes and therefore presents no information on distribution in the geographical region in between. For more detailed information on distribution patterns of chironomids more research is needed from a wider spatial range.

Conclusions

The southern lakes were generally dissimilar in their chironomid assemblages compared to northern lakes, and furthermore showed some clear faunal patterns. Chironomid assemblages were similar within the 5 oligotrophic lakes, 2 dystrophic lakes and 4 meso-eutrophic lakes (Figure 3). It is probable that the limnological diversity in lake ecosystems in southern Finland, e.g. variation in the trophic status, water color and macrophyte-cover, provided suitable habitats for different chironomid taxa, resulting in different faunal assemblages in certain types of lakes and that similar conditions does not exist in northern Finland.

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CHIRONOMID COMMUNITIES IN THE LITTORAL ZONE ON THE WESTERN COAST OF THE SOUTHERN BAIKAL BASIN (STRUCTURE, DISTRIBUTION, SEASONAL DYNAMICS)

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Abstract

The spatial distribution of chironomid communities in the littoral zone (0-20 m) of the western coast of the southern Baikal basin is investigated. The fauna is composed of 16 species and forms of chironomid larvae, comprising 10 communities. It has been found that the communities are characterized by rather poor species diversity; Shannon's index varies from 0.7 to 2.1 bit. Their distribution is affected by hydro-lithodynamic conditions, type of bottom sediments and macrophyte development. The peak of maximal biomass of chironomid larvae on the facies of non-rounded rock debris near Berezovy Cape is recorded in spring.

Introduction

The fauna of Baikalian Chironomidae is diverse; according to our and references data (Linevich 1981, Kozhova et al., 2000, etc.), it includes 166 species and forms of Chironomidae larvae from 5 subfamilies Tanypodinae (11), Prodiamesinae (2), Diamesinae (10), Orthocladiinae (59), Chironominae (84). The species diversity of Chironomidae larvae affects the structure of their communities. At present, Chironomidae distribution and diversity at different Baikalian biotops is known. In open Baikal, chironomid larvae are most abundant and rich in species on rocky ground at 0 to 5 m depth (Shapovalova 1969, Samburova 1982, Kravtsova 2005). In deeper water (more 20 m) they are few in species and only occasionally encountered (Linevich 1981, Kozhova and Kravtsova 1998). The structure of Chironomidae communities found out on the base of species domination principle by biomass is poorly studied. The number of publications on Baikal chironomid communities and their structural peculiarities is extremely limited (Kravtsova and Yerbayeva 1990, Kravtsova 1991, Kravtsova et al. 1999). Chironomidae play a considerable role in water bodies functioning (Lang 2000, Crozet et al.

2001, Scrimgeour et al. 2001, Verneaux and Verneaux, 2002, Brodersen and Anderson 2002, etc.), but papers concerning α -diversity of Chironomidae communities are either not numerous (Pastukhova 1983). Studies of structural organization of communities of Chironomidae plays an important role from the point of view of interspecies interactions, especially in population of water bodies bottom with a complex geological and geomorphological structure, in particular, on Lake Baikal. This work focuses on the structure of chironomid communities, their distribution and seasonal dynamics in the littoral zone of the western coast of the Southern Baikal basin.

Materials and Methods

Research material for this study consisted of 67 quantitative benthos samples with Chironomidae collected in Bolshye Koty Bay, 18 km northeast of the Angara River outflow of the lake, in September 1988. Division into bottom underwater complexes (BUCs): beach (B), shallow water terrace (SWT), underwater slope (US) and underwater canyon (UC) was based on physical-geographical and geomorphological characteristics of the bottom. Subdivision into facies was according to predominant type of bottom deposits. The samples were collected at 0-20 m depth along transects perpendicular to the shoreline. The benthos was sampled by divers using 0.09 m² frames, repeated three times. Boulders were placed in bags and lifted on board where animals and plants were picked or washed off into a basin.

Seasonal dynamics of the chironomid communities were studied from 155 quantitative benthos samples, collected near Berezovy Cape. From August 2000 until August 2001, samples were taken from a 0.1 m² count frame 5-10 times by divers at site N 1 (3 m depth, facies on non-rounded rock debris, total bottom area under study 60 m²). All samples were filtered through

sieves of mill-gauze № 35 and fixed with 4% formalin.

‘Communities’ were defined as populations of different species co-existing in space and time (Begon et al. 1996). The “dominance approach” to the definition was used (Vorobjov 1949). Sub-dominant species of each community were diagnosed using the density index \sqrt{PB} (Brotskaya and Zenkevich 1939), modified by Konstantinov (1986): where P is the frequency of a given species in samples belonging to the community (in %), and B is percentage of a species biomass in the total biomass of the community. Communities were designated by their dominant species, which usually had the highest density index. Species with density index values higher than ten percent were treated as sub-dominant, and species with less than 10% called secondary. When only a single sample was dominated by a set of species, this sample was designated a “coenotic assemblage”. This was typical when sampling took place at the edge of a community. Coenotic assemblages represented by one sample were not examined further, because it is not known if dominance in these cases was due to random fluctuation or not. The community structure characterization was based on: Shannon's species diversity index - $H = -\sum n_i / N \log_2 (n_i / N)$; Simpson dominance index - $c = \Sigma(n_i/N)^2$; equitability by Pielou - $e = H/\log S$, where n_i is the estimate of importance (biomass, mg m⁻²) of each of species in the community, N is the sum of n_i , S is species number (Odum 1971).

Results

Sixteen species and forms of chironomid larvae comprising 10 communities were recorded (Table 1, 2). Chironomid communities are rather poor in species number varying from 3 to 13, the fraction of dominating species makes from 40% to 87% of total biomass. Shannon's index varies from 0.7 to 2.1 bit. In Bol'shiye Koty Bay, the communities of Chironomidae studied occur on facies of gravel, pebble, brick, boulders, non-grained rock debris, silt, mixed silt and pure sand, and near Berezovy Cape – on the facies of non-rounded rock debris. On biotops relatively homogenous by bottom sediments composition, species number in the major part of communities is not great, and Shannon's index, respectively, is not high (see Table 2). In widely distributed Chironomidae communities (Bol'shiye Koty Bay), the concentration of domination of one species is high, and the equitability is low, whereas in spatially localized communities (Berezovy Cape), the concentration of domination of one species is low, and the equitability is high. As a rule, locally distributed communities are formed by species with similar requirements to the environment, and their contribution in total biomass is approximately equal.

Table 1. Characteristics of chironomid communities in Bolshye Koty Bay, Southern Baikal (September, 1988)

Communities	Number of taxa	B±m, mg m ⁻²	%	H, bit	C	e	n
<i>Orthocladius gr. thienemanni</i>	6	28±9	52	1.9	0.35	0.72	4
<i>Orthocladius gr. olivaceus</i>	4	10±5	68	1.4	0.50	0.70	5
<i>Orthocladius frigidus</i>	6	12±11	40	2.1	0.27	0.82	3
<i>Cricotopus bicinctus</i>	6	183±176	84	0.9	0.71	0.37	2
<i>Paratanytarsus baicalensis</i>	6	13±3	82	1.1	0.67	0.42	11
<i>Sergentia baicalensis</i>	13	93±22	87	0.9	0.76	0.24	28
<i>Sergentia nebulosa</i>	3	68±41	83	0.7	0.72	0.44	2
<i>Sergentia sp.</i>	5	130±56	85	0.8	0.74	0.33	5

Note. B+m - mean community biomass; m – mistake of averages; % - part of dominant species in total community biomass; parameters: H – Shannon's species diversity, C - dominance by Simpson, e - equitability by Pielou; n – number of samples.

Table 2. Characteristics of three chironomid communities at the experimental site near Berezovy Cape (Southern Baikal, 2000-2001)

Date	Communities													
	<i>Orthocladius nitidoscutellatus</i>							<i>Paratanytarsus baicalensis</i>						
	N	B±m, mg m ⁻²	%	H, bit	C	e	n	N	B±m, mg m ⁻²	%	H, bit	C	e	n
29.08.00	7	6.7±2.0	60	1.2	0.48	0.61	5	-	-	-	-	-	-	-
19.09.00	-	-	-	-	-	-	-	3	13.4±4.9	46	1.1	0.67	0.97	2
02.11.00	3	1.1±0.3	61	0.8	0.46	0.77	9	2	3.8±2.3	67	0.7	0.51	0.95	2
21.12.00	-	-	-	-	-	-	-	4	5.4±1.6	57	1.0	0.65	0.73	4
29.01.01	4	36.3±16.9	54	1.0	0.62	0.73	4	4	18.4±4.1	44	1.1	0.62	0.77	6
27.02.01	3	94.5±20.1	73	0.7	0.43	0.70	6	-	-	-	-	-	-	
27.03.01	4	153.7±31.8	68	0.8	0.47	0.60	9	-	-	-	-	-	-	
10.04.01	3	23.5±4.8	60	0.9	0.54	0.85	8	-	-	-	-	-	-	
31.05.01	4	609.1±148.2	69	0.8	0.44	0.56	10	-	-	-	-	-	-	
03.07.01	4	27.4±1.9	55	1.0	0.60	0.71	4	4	47.7±14	61	0.9	0.52	0.64	6
30.07.01	4	29.4±7.3	72	0.9	0.43	0.62	4	3	11.8±3.8	74	0.8	0.52	0.70	2
27.08.01	3	3.7±0.6	74	0.8	0.51	0.68	8	-	-	-	-	-	-	

Table 2 continued

Date	Communities						
	<i>Orthocladius</i> sp.						
	N	B±m, mg m ⁻²	%	H, bit	C	e	n
29.08.00	-	-	-	-	-	-	-
19.09.00	5	12.6±2.5	61	0.9	0.56	0.58	5
02.11.00	-	-	-	-	-	-	-
21.12.00	3	5.4±1.4	67	0.9	0.59	0.79	2
29.01.01	-	-	-	-	-	-	-
27.02.01	-	-	-	-	-	-	-
27.03.01	-	-	-	-	-	-	-
10.04.01	-	-	-	-	-	-	-
31.05.01	-	-	-	-	-	-	-
03.07.01	-	-	-	-	-	-	-
30.07.01	4	15.5±5.2	54	1.2	0.61	0.85	3
27.08.01	-	-	-	-	-	-	-

Note. N – number of taxa in community; B+m - mean community biomass; m – mistake of averages; % - part of dominant species in total community biomass; parameters: H – Shannon's species diversity, C - dominance by Simpson, e - equitability by Pielou; n – number of samples.

Seasonal dynamics of chironomid larvae biomass near Berezovy Cape is shown in Figure 1. Maximal Chironomidae larvae biomass is registered in spring, and minimal one – in autumn. In spring, large elder (age groups III- IV) larvae dominate in Lake Baikal. By autumn, imago of major part of species fly out, and Chironomidae populations become rarefied. At that time, small younger larvae (age groups I and II) of new generations widely occur.

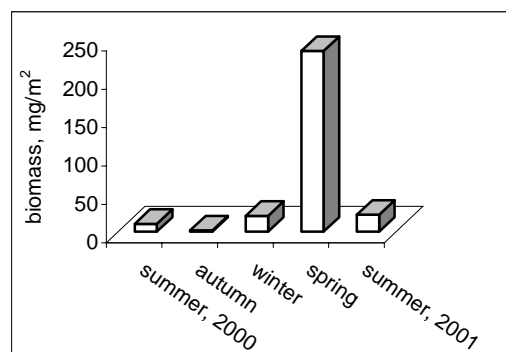


Figure 1. Seasonal dynamics of chironomid larvae biomass near Berezovy Cape (Southern Baikal, 2000-2001)

Discussion

The structure of the communities in some taxocenes, chironomids in particular, differs from that of zoobenthos as a whole.

The species diversity of chironomid communities, assessed according to Shannon's index is much lower, but it exhibits higher dominance concentration indices, according to Simpson, and equitability, according to Pielou, compared to macroinvertebrate communities (Kravtsova et al. 2004). Despite this, the spatial distribution of chironomid communities is governed by the same regularities as the zoobenthos.

Spatial fauna and flora distribution is determined by the character of bottom sediments formed under different sedimentation conditions. The inhabitants of the bottom at 0-1.5 m depth (BUC B) are rather scanty due to intense hydrodynamic activity and wave breaking, where the rates of near-bottom flows reach 5 m/s sometimes (Karabanov and Kulishenko 1990). We can see algal associations *Didymosphenia geminata*, *Tetrasporopsis* sp.+ *D. geminata* with chironomid communities *Orthocladius* gr. *thienemanni*, *O. gr. olivaceus*.

Below 1.5 m, according to hydro- and lithodynamical situations there appear to be two zones different in vegetation composition and community diversity. In the first zone, the bottom consists of coarse-grained material (gravel, pebble, brick, boulders, non-grained rock debris); near-bottom currents are strong and waves break there. There are associations of algae *D. geminata*, *Tetrasporopsis* sp. + *D. geminata*, *Draparnaldioides baicalensis*, *D. pumila*. All the chironomidae communities (Table 1) are found in this area. Nearer to the external edge of SWT (to the bend line in US at 4-5 m depth) algal associations characteristic of the second zone appear.

In the second zone (depth 8-20 m), bottom sediments are fine-grained (silt, mixed silt and pure sand). Lithodynamics are determined by decrease in strength of hydrodynamical processes and increase in gravitation ones, by sediment transit and accumulation (BUCs US, UC). The velocities of near-bottom currents are less than 0.6 sm/s (Slugina et al. 1995). The algal association *Cladophora compacta*, *C. floccosa*, *C. kursanovi*, *Myriophyllum spicatum*, *Fontinalis* sp. and *Stratonostoc verrucosum* is widespread. *Draparnaldioides* associations are absent. Communities of Chironomidae *Sergentia* sp., *S. baicalensis*, *S. nebulosa*, *Paratanytarsus baicalensis* inhabit this zone.

In general, the distribution of chironomid communities at the site studied is patchy. Belt distribution is observed in communities dominated by chironomids of the genus *Orthocladius* (BUCs B, SWT). Analogous

regularities are observed in the shallow zone on the eastern side of southern Lake Baikal. Associations occur of the algae *Ulothrix zonata*, *Tetraspora cylindrica* var. *bullosa*, *D. pilosa*, as well as chironomid communities indicated in Table 1. They are characterized by similar structure. Thus, morphological heterogeneity of bottom, and variability of environmental factors determine the "mosaic" distribution of macroinvertebrates communities in the shallows of Lake Baikal. This is also typical in shallow marine ecosystems (Kusakin et al. 1974).

Chironomid larval biomass varies with the biology of species forming the communities. It seems most likely that the flight time of the species is different.

We found that a fairly small area of bottom near Berezovy Cape is inhabited by three chironomid larval communities existing on relatively homogeneous bottom sediments: *Orthocladius nitidoscutellatus*, *Orthocladius* sp., *Paratanytarsus baicalensis*. An *O. nitidoscutellatus* community becomes abundant in spring but by autumn its biomass is reduced by one order, while the occurrence of the communities with *P. baicalensis* and *Orthocladius* sp. grows. All communities considered have characteristics similar to the chironomid communities inhabiting Bolshye Koty Bay, and also the waters near the east coast of the southern Baikal basin in the region of Utulik-Khara-Murin Rivers (Kravtsova 1991).

Conclusions

Spatial distribution of chironomid communities depends upon hydro-lithodynamic conditions of their habitat, type of bottom sediments and macrophyte development. The community structure of the chironomids is significantly simpler than in Baikal zoobenthic communities in general. Communities are characterized by higher indices of Simpson dominance and Pielou equitability. Seasonal dynamics of chironomid larvae biomass are defined by the life cycles of the species.

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DIAHELIOTAXIS AND OMBROPHOBIA IN AN ANTHOPHILOUS HIGH ARCTIC MIDGE, *SMITTIA VELUTINA* (LUNDBECK, 1898) (CHIRONOMIDAE)

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Records of Chironomidae as flower visitors are few (Larson et al. 2001), and explanations of their anthophilous activities even fewer. In the Arctic, several species are known as flower visitors and nectariphages (McApline, 1965; Oliver, 1968; Hocking, 1968; Kevan, 1970; 1973; Larson et al. 2001), but none so abundant and conspicuous as *Smittia velutina*.

Smittia velutina is a common, early emerging species of Chironomidae in the High Arctic (Danks 1981). It seems to be parthenogenetic. Males are so far not recorded and females I kept in vials oviposited on the inside walls. One of the interesting features of this insect is its anthophily, or flower visiting habits. Oliver (1968) also recorded this species (of only two Chironomidae in the High Arctic) as nectariphagous. Large numbers can be found on the first summer blooms of *Saxifraga oppositifolia* L. (Saxifragaceae) and of *Salix arctica* Pall. (Salicaceae). I found them with their mouthparts at the nectaries of flowers of both species of plants, and few on a few others (Kevan 1970). My observations were almost exclusively from staminate catkins *S. arctica*, but both McApline (1965) and Hocking (1968) recorded them from pistillate catkins.

During my studies in insect and flower relations in the Canadian High Arctic (Kevan 1970; 1972; 1973), I was able to collect large numbers of *S. velutina* from flowers and made the following discoveries. All findings reported herein are from

Hazen Camp, Ellesmere Island, Nunavut (89° 49' N., 71° 18' W).

Between 31 May and 23 July, 1967 I collected 337 females from flowers. They were dissected to examine their gut contents and the state of their ovarian development (Harlow 1956). Almost all had guts distended with clear, syrupy liquid. None had ingested pollen grains. Two thirds (65%) of those dissected had well developed ovaries, with ovarioles at Stage 3 of development. Ten percent had ovaries at Stage 2, and 16% at Stage 4. Those with Stage 1 and spent ovaries numbered only 3 and 4% respectively.

Oliver (1968) noted that 9 of the species he studied emerged with ovaries almost mature (Stage 3) or mature. He did not report on *S. velutina*, but indicated that in the species he studies that ovarian maturation from almost to fully mature (Stage 4) takes about 3 days. Given the duration of anthophily I recorded, with a peak from 1 to 15 June, I postulate that the cohorts of midges I observed in the flowers were constantly changing. That idea was strengthened by observations on the daily pattern of abundances of *S. velutina* on the flowers of *S. oppositifolia*.

From combined observations from 1966 and 1968, I determined that about 64% of the midges were in flowers on the insolated sides of clumps of *S. oppositifolia* (Figure 1). That observation suggests strongly that the insects were continually

changing their orientation and following the warmth of the sun (i.e. were exhibiting diheliotaxis). I did not make precise measurements of the shapes of the clumps of flowers, nor of the insolated proportion of the clumps from which the observation came. Thus, a complete statistical analysis can not be made to test the hypothesis implied in the above. I leave that to someone else.

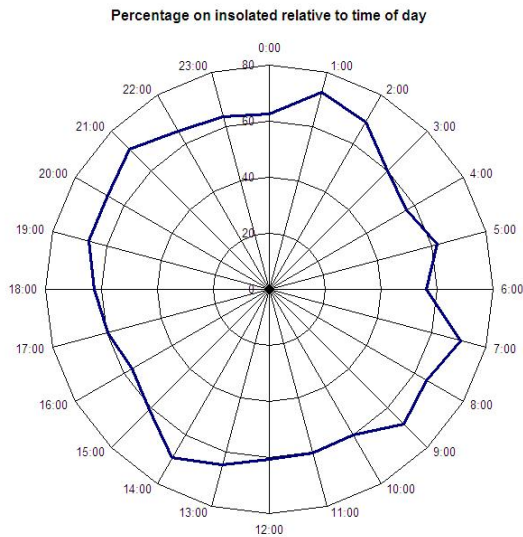
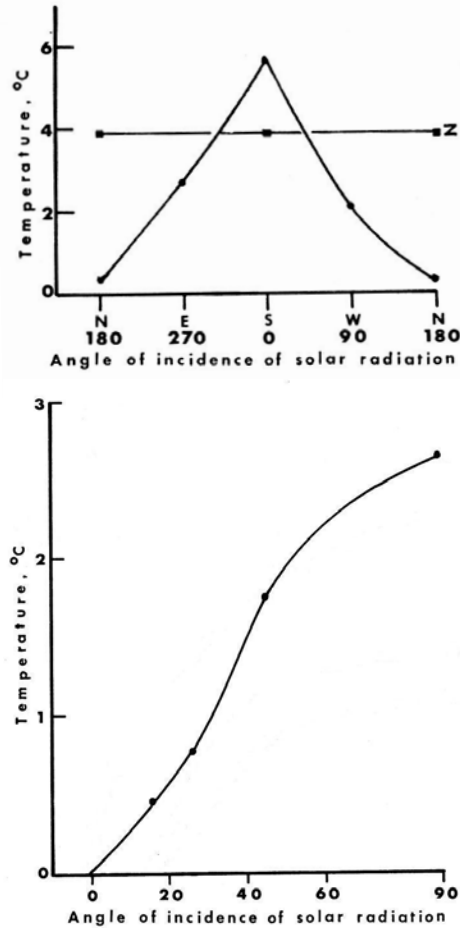


Figure 1. The percentage of the observed population of *Smittia velutina* within fully insolated flowers of *Saxifraga oppositifolia* throughout a composite day of 24 hours of sunshine (Data summarized from summers 1966 to 1968 at Hazen Camp, Ellesmere Island, Nunavut)

In respect of the benefits of arctic insects' basking in flowers, the most studies have been made on temperature regimes in the diheliotropic flowers of *Dryas integrifolia* (Vahl.) (Rosaceae) and *Papaver radicum* Rottb. (Papaveraceae) (Hocking and Sharplin, 1965; Kevan 1975). Those studies indicate two-fold benefits, one to the insects (warmth and protection) and the other to the plants (pollinator attraction, increased speed of pollen tube growth following pollination, more rapid fertilization of the ovules and growth of the seeds and fruits). Although *S. oppositifolia* is not diheliotropic, its flowers become warmed by insolation. Figure 2 shows the amount of warmth (temperature above ambient air in the vicinity of the flowers) within its flowers according to the angle of insolation. Small insects, such as *S. velutina*, would assume the temperature of the environment within the flowers in which they rested. Thus, the two-fold benefit of insolation warming of the flowers of *S. oppositifolia* would be the same as for *D.*

integrifolia and *P. radicum*, but for shorter durations. The insects could extend the duration of their benefit by circumnavigating the clumps and so remaining insolated and warm. Using the same approach as in Kevan (1975) one can calculate roughly that the adult midges might gain as much as 25% more heat units by this



behaviour. Such thermally advantageous circumnavigation (Kevan 1989) is known for mosquito larvae in tundra ponds (Haufe, 1957), woolly bear caterpillars on hummocks of vegetation (Kevan et al. 1981; Kukul et al. 1988) and diheliotropic flowers (Kevan 1975).

Figure 2. Top: Temperature within and at the bases of the flowers of *Saxifraga oppositifolia* (where *Smittia velutina* was observed feeding on nectar) above ambient air temperature with respect to the direction of the sun on a still sunny day at solar noon. Flowers at S (0°) were open directly to incoming insolation, at N (180°) open directly away from the sun, Z is for temperatures of flowers open directly to the Zenith.

Bottom: Temperature within and at the base of flowers of *Saxifraga oppositifolia* (where *Smittia velutina* was observed feeding on nectar) above

ambient air temperature with respect to the direction of the sun as they were tipped from facing directly into the sun (90° equivalent to 0° in the left-hand graph) to a position so that the sun's rays glanced across the top of the open flowers.

Although rain is uncommon around Lake Hazen, from 22 to 24 June, 1966 light rains fell and observations on the insects in *S. oppositifolia* were made. At each observation between 104 and 127 midges were counted. Close inspection revealed that *S. velutina* used the flowers as umbrellas. Only one hour after the rain had started, many flowers were empty, but 65% of the midges had taken refuge beneath the flowers. Thirteen hours later, 80% of the midges associated with the flowers were underneath them. Thus, the midges were exhibiting avoidance of rain, or ombrophobia. After the rain ceased and the sun had shone, the midges slowly resumed their positions in the flowers, so that after 14 hours of sunshine 89% of the midges were within the corollas, and only 11% still beneath them.

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CHIRONOMIDS OF THE YUCATÁN PENINSULA

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Introduction

One of the many areas of the globe, where the chironomid fauna has practically not been studied yet, is the Yucatán peninsula. It is vast and mostly plain lowland marking the southern border of the Mexican Gulf. The geological history of Yucatán is linked in many ways with that of the Caribbean and Central America (Iturralde-Vinent and MacPhee 1999). In biogeographical terms, Yucatán belongs to the Neotropical region and the Caribbean subregion (Morrone 2006). Occurrence of endemisms seems to justify a subdivision in three more areas (Espadas et al. 2003). To date, studies of chironomid communities in Central America concentrated mainly on the mountainous reaches along the cordillera ridges and volcano foothills (e.g. Coffman et al. 1992; Watson and Heyn 1992; Sublette and Sasa 1994).

The study presented here is part of a major research project. Its purpose is to estimate the importance of climatic and geogene factors for the taxonomic composition of chironomid communities in lakes of the peninsula. A preliminary overview on the chironomid diversity of this region is given in this article.

Sampling sites and methods

18 lowland lakes, differing in basin morphometry, anthropogenous impact, and chemical properties, were studied in the lowland (up to 150 m a.s.l.) of Yucatán. The lake basins are embedded in limestone and gypsum karst and scattered across a NE-SW precipitation gradient from 600 to 1900 mm a⁻¹. Some of the lakes communicate hydrologically with the mangrove belt of the coastline through a diffuse net of canals. Immature chironomids were sampled from the sediment surface layer at maximum lake depth (SMD) and in the littoral from surface drift and various firm substrates. Adults were caught with an insect net from emerging plants and in a light trap after sunset. So far, larval head capsules, given in individuals per gram dry sediment (g⁻¹), and male adults were analyzed. Littoral samples await processing. Environmental predictors

include 31 parameters for lake morphometry, lithology, physico-chemical analyses, littoral morphology, hinterland use, and anthropogenic disturbance.

First results and considerations

To date, 84 taxa (mainly morpho-species) out of 48 chironomid genera have been identified on the basis of head capsules from SMD and adult males from all 18 lakes (Tab. 1). Eight genera belonged to the Tanypodinae, only two genera to the Orthocladiinae, and the majority, i.e. 38, to the Chironominae (29 Chironomini, 9 Tanytarsini). The dominant taxa that occurred in all lakes were *Cladopelma lateralis* and *Tanytarsus* species (this genus probably comprises a greater number of morpho-species than separated here). Further on, *Chironomus*, *Goeldichironomus*, *Polypedilum*, *Cladotanytarsus*, *Labrundinia*, *Natarsia*, *Procladius* were present in more than 70% of the lakes. The most abundant genera, reaching abundances of 4 to 10 g⁻¹, were *Labrundinia*, *Natarsia*, *Cladopelma*, *Microtendipes*, *Xenochironomus*, *Cladotanytarsus*, and *Tanytarsus*. Mean taxa number from SMD was 14.4, whereat greatest diversity was found in Lake Yaxha (20) and Gravel Pond (19), lowest in Honey Camp Lagoon (7) and Lake Chichancanab (9). Median total abundance of head capsules from SMD was 53.5 g⁻¹. Density was exceptionally high in Punta Laguna (1033 g⁻¹), moderate in Honey Camp Lagoon (174 g⁻¹), Cenote (172 g⁻¹) and extremely low, however, in Lake Izabal (0.81 g⁻¹).

The slope of the species-area relationship indicated that about 50 to 60 % of the estimated chironomid diversity of Yucatán lowland lakes was covered by the list above. For most of the taxa, marked out as morpho-species, no taxonomic descriptions exist. The number of taxa is expected to rise further when data from littoral immatures and all adults are included. However, a certain drawback is the fact that explicit combinations of the metamorphic stages can be attained only under reserve.

Relatively low SMD head capsule abundance in Yucatán lakes, in comparison to temperate lakes, may have several reasons: 1) The lakes studied, like most shallow lakes of the (Sub-)Tropics, are holomictic and thus sedimentation is disturbed by turbulence, which causes head capsules to disaggregate more likely. 2) Sedimentation rates are increased owing to both inflow of allochthonous inorganic suspended matter from affluents, mainly during the rain periods, and/or high autochthonous production conditioned by lake morphometry and/or anthropogenic alterations. 3) Durability of the sediment may be reduced due to precipitation and redilution processes of the geogene gypsum. Consequently, time-consuming analysis of low-density material did not help promoting the taxonomic gain.

A view on numerical attributes revealed that both, number of taxa and equitability (evenness) of the communities tended to decrease towards higher latitudes, at which SMD abundances, however, increased significantly with the probability of drought events occurring. Number of taxa was highest in eutrophic conditions. Correspondence analyses showed that the most important environmental predictors, besides trophic state of the lakes and mean annual precipitation, were concentration of gypsum (CaSO₄) and salinity (predominantly NaCl), the latter occurring in

lakes subject to aperiodical seawater infiltration. Surprisingly, morphometric properties, such as littoral formation, lake surface area, and average lake depth were of subordinate explanatory value for the community structure.

Expectations of finding a high ratio of species versus genera were supported by assumptions from biogeography and evolutionary history. Central America is a relatively young land bridge, which gave way to a radiation from both Americas (Bănărescu 1995). Colonization of aquatic habitats and ecological niching in process is assumed to be reflected in a relatively great taxonomic depth (Coffman et al. 1992).

The biogeographic position of chironomids of the Yucatán peninsula can be determined with some certainty. Studies of taxa assemblages, including descriptions of new species, exist for Costa Rica (Coffman et al. 1992; Watson and Heyn 1992; Andersen 1996; Epler 1996a, b), Nicaragua (Palomaki 1987; Ráudez Reyes 2004), Guatemala (Sublette and Sasa 1994), and Mexico (Epler 1987; Contreras-Ramos and Andersen 1999; Andersen et al. 2000, Andersen and Mendes 2002; Kyerematen and Andersen 2002). Other works (e.g. Borkent 1984; Spies and Reiss 1996; Mendes et al. 2004) refer to entire Central America and beyond.

Table 1. Chironomid taxa recorded from lakes of Yucatán peninsula (l: larva, a: adult)

Taxon	Stage	Taxon	Stage
<i>Ablabesmyia</i> sp.	l	<i>Nilothauma</i> sp.	l
<i>Ablabesmyia cinctipes</i>	a	<i>Oukuriella</i> c.f. <i>simulatrix</i>	a
<i>Coelotanypus</i> sp.1	l	<i>Paracladopelma</i> sp.	l
<i>Coelotanypus</i> sp.2	l	<i>Paralauterborniella</i> sp.	l
<i>Fittkauimyia</i> sp.	l	<i>Paratendipes</i> sp.1	l
<i>Labrundinia</i> sp.	l	<i>Paratendipes</i> c.f. <i>subaequalis</i>	l
<i>Labrundinia fosteri</i>	a	<i>Parachironomus</i> sp.	l
<i>Natarsia</i> sp.	l	<i>Parachironomus directus</i>	a
<i>Nilotanypus</i> sp.	l	<i>Pedionomus</i> sp.	l
<i>Procladius</i> sp.	l	<i>Pedionomus curticaudatus</i>	a
<i>Tanypus</i> c.f. <i>mopunctipens</i>	l	<i>Phaenopsectra</i> sp.	l
c.f. <i>Tanypus</i> sp.A	l	<i>Polypedilum</i> sp.	l
<i>Nanocladius</i> sp.	l	<i>Polypedilum purus</i>	a
<i>Cricotopus</i> sp.	a	<i>Polypedilum</i> sp.A	a
<i>Apedilum</i> sp.	l	<i>Polypedilum</i> sp.B	a
<i>Apedilum subcinctum</i>	a	<i>Polypedilum</i> sp.C	a
<i>Apedilum elachisto</i>	a	<i>Polypedilum</i> sp.D	a
<i>Asheum curticaudatus</i>	a	<i>Polypedilum</i> sp.E	a
<i>Axarus</i> sp.	l	<i>Polypedilum</i> sp.F	a
<i>Beardius</i> sp.	l	<i>Pseudochironomus</i> sp.	a
<i>Beardius aciculatus</i>	a	<i>Saetheria</i> sp.	l
<i>Fissimentum</i> sp.	l	<i>Xenochironomus</i> sp.	l
<i>Chironomus</i> sp.1	l	<i>Zavreliella</i> sp.	l
<i>Chironomus</i> sp.2	l	<i>Zavreliella longiseta</i>	a

Taxon	Stage	Taxon	Stage
<i>Cladopelma</i> sp.1	1	<i>Caladomyia pistra</i> sp.	a
<i>Cladopelma</i> sp.2	1	<i>Cladotanytarsus</i> sp.1	1
<i>Cladopelma forcipis</i>	a	<i>Cladotanytarsus</i> sp.A	a
<i>Cryptochironomus</i> sp.	1	<i>Micropsectra</i> sp.	1
<i>Cryptochironomus</i> sp.A	a	<i>Nimbocera</i> sp.	1
<i>Cryptochironomus</i> sp.B	a	<i>Paratanytarsus</i> sp.	1
<i>Dicrotendipes</i> sp.	1	<i>Stempellina</i> sp.	1
<i>Dicrotendipes</i> c.f. <i>sinoposus</i>	a	<i>Stempellinella</i> sp.1	1
<i>Einfeldia</i> sp.	1	<i>Stempellinella</i> sp.2	1
<i>Glyptotendipes</i> sp.	1	<i>Stempellinella</i> sp.3	1
<i>Goeldichironomus</i> sp.1	1	<i>Sublettea</i> sp.	1
<i>Goeldichironomus</i> sp.2	1	<i>Tanytarsus</i> sp.1	1
<i>Goeldichironomus amazonicus</i>	a	<i>Tanytarsus</i> sp.2	1
<i>Goeldichironomus carus</i>	a	<i>Tanytarsus</i> sp.3	1
<i>Goeldichironomus holoprasinus</i>	a	<i>Tanytarsus</i> sp.4	1
<i>Hyporhygma</i> sp.	1	<i>Tanytarsus hastatus</i>	a
c.f. <i>Lipinella</i> sp.	1	<i>Tanytarsus</i> sp.A	a
<i>Microchironomus</i> sp.	1	<i>Tanytarsus</i> sp.B	a
<i>Microtendipes</i> sp.	1	<i>Tanytarsus</i> sp.C	a

However, comparability of the aforementioned studies with ours suffered from certain limitations. On the one hand, those studies were carried out at different geographic altitudes, thus covering the range from tropical to temperate fauna. On the other, only rough descriptions of the habitat types, samples were taken from, were given, often mingling captures from running and still waters. The occurrence of Orthoclaadiinae, being well represented in those other studies, entailed low taxonomic overlap with our data, not exceeding 50 percent on the generic level. Consequently, the chironomid fauna from a nearby site in Guatemala (Sublette and Sasa 1994) most closely resembled that from the northern Andes of Colombia (Riss and Ospina 2000). And the so far only record from the central lowlands of Yucatán (Contreras-Ramos and Andersen 1999) displayed a generic correspondence with our data of 64 percent – not more than comparison with the chironomid list for northern Colombia (Nazarova et al. 2004). Latter findings indicate that the chironomids of the entire Yucatán lowland can be regarded as a circum-Caribbean element.

Comparative analyses of existing record lists were limited due to ambiguity or absence of pertinent complementary information about sample habitats in most of the chironomid field studies referred to here. Generally spoken, better comparability of study results would allow for means and goals to an advanced level, such as ecological meta-analyses or biogeographic diagnoses. This conclusion also may be understood as a plea for stronger consideration of simple but useful ecological specifications of

sample habitats to be given along with future chironomid field records.

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NEW RECORDS OF CHIRONOMIDAE (DIPTERA) FROM CONTINENTAL FRANCE

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Abstract

Material recently collected in Continental France has allowed me to generate a list of 83 taxa of chironomids, including 37 new records to the fauna of France. According to published data on the chironomid fauna of France 718 chironomid species are hitherto known from the French territories. The nomenclature and taxonomy of the species listed are based on the last version of the Chironomidae data in Fauna Europaea, on recent revisions of genera and other recent publications relevant to taxonomy and nomenclature.

Introduction

French territories represent almost the largest variety of aquatic ecosystems in Europe with respect to both physiographic and hydrographic aspects. According to literature on the chironomid fauna of France, some regions still are better sampled than others, and the best sampled areas are: The northern and southern parts of the Alps (regions 5a and 5b in figure 1); western, central and eastern parts of the Pyrenees (regions 6, 7, 8), and South-Central France, including inland and coastal rivers (regions 9a and 9b). The remaining regions located in the North, the Middle and the South-East of France have received little attention and are still only partially explored and need to be prospected more in the years to come.

According to published data accumulated since 1991 there are 681 registered species from France (Serra-Tosio and Laville 1991, Laville and Serra-Tosio 1996, Moubayed et al. 2000, Garcia and Laville 2000, Delettre 2001, Sæther and Spies 2004). In the current paper, I give a complementary checklist of new records on the basis of recent field work throughout Continental France over the last two decades. The habitats sampled include high altitude peat pits, springs and streams, mountain lakes and reservoirs, temporary streams and pools. Fully developed pharates, adults, pupae, pupal exuviae and larvae were sampled from chironomid populations throughout the various geographic regions.

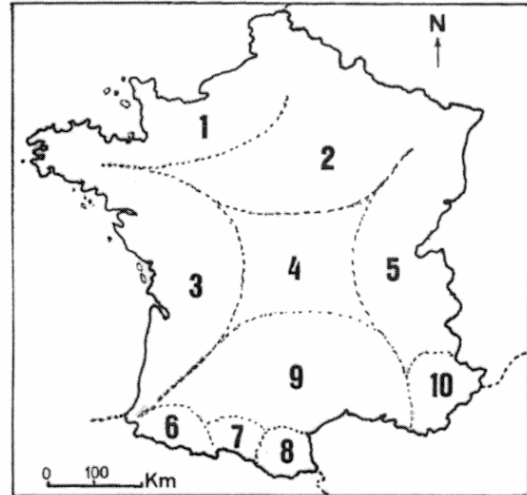


Figure 1. Major biogeographic regions and subregions of France

Sites and methodology

The identification of slide mounted specimens was aided by recent taxonomic revisions and keys to adults or pupal exuviae (Reiss and Säwedal 1981; Tuiskunen 1986; Serra-Tosio 1989; Sæther 1990; Soponis 1990; Langton 1991; Sæther and Wang 1995; Kyerematen and Sæther 2000; Michiels and Spies 2002; Vårdal et al. 2002; Langton and Visser 2003; Sæther and Spies 2004; Stur and Ekrem 2006; Ekrem 2006; Ekrem 2007) as well as of recent general recommendations on taxonomy and nomenclature (Sæther and Ferrington 2003; Spies and Sæther 2004). Previous geographical distribution of the species was based on the last version of the Chironomidae data in Fauna Europaea (Sæther and Spies 2004), on the latest unpublished data for Fauna Europaea (Sæther and Spies pers comm.), as well as on the taxonomic publications listed above.

The collection sites were located in the ten major physiographic and biogeographic regions and subregions of France (Corsica not included, Figure 1). The habitats sampled include springs, permanent and temporary streams and pools, peat pits, rhithral and potamal of rivers, estuaries, lakes and ponds. An informative map on the biogeographic regions of France is also given by

Serra-Tosio and Laville (1991). Within the ten prospected regions, two are located in northern France (1 and 2), three in central-south and central France (3, 5 and 4) and five (6, 7, 8, 9 and 10) in southern France. The geographic delimitation of the ten regions and subregions is:

- **1**, North-West France, including both the Channel and the North Sea coastal streams (1a) and potamic parts of the Seine river basin (1b).
- **2**, North-East France, rivers located in the plain and piedmont including the upper stream of the Seine river basin.
- **3**, Central-South-West France, including both the Atlantic coastal rivers from the northern part (3a) to the southern part (3b).
- **4**, Central-France, including the upper stream and rhithral of the Sioule river basin located in the volcanic region of Auvergne (4a); the upper stream of both Allier river and Loire river basin and surrounding piedmont and lowland wetland areas below 1000 m (4b).
- **5**, Central-East France, including the upper stream of the Rhone river basin (5a) and the Alps (especially located in high and middle mountain areas, 5b).
- **6, 7 and 8**, French part of the Pyrenees and Pre-Pyrenees, including Western-Pyrenees (6), Central-Pyrenees (7) and Eastern-Pyrenees (8). Pyrenees consist of both mountain and high

mountain rivers (6a, 7a, 8a), Pre-Pyrenees consist only of piedmont and mountain rivers (6b, 7b, 8b).

- **9**, South-Central France, including both the inland rivers of the northern part (9a) and the coastal Mediterranean rivers of the southern part (9b). Nevertheless, with respect to chironomid fauna, three geographical zones of biogeographical significance have been identified in the Mediterranean region between the Spanish and the Italian borders (Moubayed et al. 2000).

- **10**, South-East France, including the Var and Maritime Alp departments.

Sampling methods mainly used were: Surber net for benthos; Brundin drift net for pharates, pupae and pupal exuviae; Troubleau net for individuals floating on the surface of the water; sweep net for adults.

List of species

In total, material of 83 chironomid taxa was collected throughout the ten biogeographical areas in Continental France since 1980 (Table 1). Among these taxa there were 8 Tanypodinae, 5 Diamesinae, 35 Orthoclaadiinae and 35 Chironominae (14 Chironomini and 21 Tanytarsini). Based on recent published data on French chironomid communities (Serra-Tosio and

Table 1. List and geographical distribution of species. * = new record for France; ** = undescribed species; P = present; Im = imago; N = nymph or pharate; Pe = pupal exuviae; L = larva

List of species	Record	Stage	Distribution
Tanypodinae (8 species)			
<i>Arctopelopia barbataris</i> (Zetterstedt)	P	Pe	9b
<i>Arctopelopia griseipennis</i> (van der Wulp)	P	Pe	7b,8b,9b
<i>Arctopelopia</i> sp.1	**	Pe	7b,9a
<i>Conchapelopia hittmairorum</i> Michiels & Spies	P	Pe	2,5a,8b,9,10
<i>Procladius crassinervis</i> (Zetterstedt)	P	N,Pe	1b,2
<i>Procladius lugens</i> Kieffer	*	Im,N,Pe	2,5,9
<i>Procladius rufovittatus</i> van der Wulp	*	Pe	2,8a,8b,9
<i>Procladius</i> sp.1 (nr <i>Procladius</i> sp, from Norway)	**	Pe	8a
Diamesinae (5 species)			
<i>Boreoheptagyia rugosa</i> Saunders	P	Im,Pe	8b,10
<i>Boreoheptagyia</i> sp.1 (near <i>B. rotunda</i> Serra-Tosio)	**	Im	10
<i>Diamesa thomasi</i> Serra-Tosio	P	Im,N,Pe,L	7a,8a
<i>Diamesa veletensis</i> Serra-Tosio	*	Im,N,Pe,L	8a
<i>Potthastia</i> sp.1	**	Pe	4b
Orthoclaadiinae (35 species)			
<i>Brillia pudorosa</i> Cobo, Gonzales & Vieira-Lanero	*	Im,N,Pe	3b
<i>Bryophaenocladus scanicus</i> Brundin	*	Im	4,8b,9
<i>Bryophaenocladus</i> sp.1	**	Im	9b
<i>Corynoneura gratias</i> Schlee	P	N,Pe	1a,3a,3b,8a,8b
<i>Cricotopus algarum</i> (Kieffer)	P	Im,N,Pe	1a,1b,2,3
<i>Cricotopus caducus</i> Hirvenoja	P	Im,N,Pe	1a,3a,3b,9b

List of species	Record	Stage	Distribution
<i>Cricotopus</i> sp.1 (nr <i>C. levantinus</i> Moubayed & Hirvenoja)	**	N,Pe	9b,10
<i>Eukiefferiella bedmari</i> Vilchez-Quero & Laville	*	Im,Pe	1a,3a,3b
<i>Eukiefferiella brehmi</i> Gowin	*	Pe	8a,8b,9a,10
<i>Euryhopsis fuscipropes</i> Sæther & Wang	*	N,Pe	6b,9b
<i>Georthocladius</i> sp.1	**	Pe	8a
<i>Heterotrissocladius grimshawi</i> Edwards	*	N,Pe	2,5a,10
<i>Heterotrissocladius</i> sp.1	**	Pe	9b
<i>Krenosmittia hispanica</i> Wüelker	*	Im,N,Pe	8a,8b
<i>Limnophyes bidumus</i> Sæther	*	Im,N,Pe	5b,8a,9,10
<i>Limnophyes gelasinus</i> Sæther	*	Im,N,Pe	9b,10
<i>Limnophyes spinigus</i> Sæther	*	Im,Pe	7a,8a
<i>Orthocladius holsatus</i> Goetghebuer	*	Pe	7b,8b
<i>Parachaetocladus</i> sp.1	**	Im	8a
<i>Parakiefferiella</i> sp.1	**	Im,N,Pe	9a
<i>Paralimnophyes longiseta</i> Thienemann	P	Im,Pe	2,3,4b,5a
<i>Paraphaenocladus intercidens</i> Brundin	*	Pe	8a
<i>Paratrichocladus lanzavecchia</i> Rossaro	*	Im,N,Pe	9a,9b,8b,10
<i>Paratrichocladus veronicae</i> Rossaro	*	Im	8b,9b
<i>Pseudorthocladus</i> sp.1	**	Pe	8a,8b
<i>Pseudosmittia angusta</i> (Edwards)	P	Im	1a,1b,2,3a,5a
<i>Smittia aquatilis</i> Goetghebuer	*	Im	1b,2
<i>Smittia betuletorum</i> Edwards	*	Im	2
<i>Smittia foliacea</i> (Kieffer)	P	Im	1a,2,3a,5,9,10
<i>Smittia longitibia</i> Goetghebuer	*	Im	3b,6b
<i>Smittia paranudipennis</i> Brundin	*	Im	7a,8a
<i>Smittia reissi</i> Rossaro & Orendt	*	Im	9b
<i>Smittia scutellosaetosa</i> Caspers	P	Im	1,2,8b,9b
<i>Smittia</i> sp.1	**	Im	1b,2
<i>Thienemannia libanica</i> Laville & Moubayed	P	Pe	5b,10
Chironominae (35 species)			
Chironomini (14 species)			
<i>Chironomus</i> sp.1	**	Im,N,Pe,L	1b,2
<i>Cryptotendipes nigronitens</i> (Edwards)	*	Im,N,Pe	2,3b,9a
<i>Cryptotendipes usmaensis</i> (Pagast)	P	N,Pe	1b,2,4b,9b
<i>Dicotendipes pallidicornis</i> Goetghebuer	*	Im,Pe	1b, 2
<i>Glyptotendipes signatus</i> Kieffer	P	Im,N,Pe	1b,2,5a
<i>Microchironomus deribae</i> (Freeman)	P	Im,N,Pe	1b,2,3
<i>Parachironomus digitalis</i> Edwards	*	Im,N,Pe	9a,9b
<i>Parachironomus</i> sp.1	**	Im,N,Pe,L	1b,2
<i>Polypedilum bicrenatum</i> Kieffer	P	Im,N,Pe	3a,3b,9b,10
<i>Polypedilum tetracrenatum</i> Hirvenoja	*	Im,N,Pe	1b,2
<i>Polypedilum (Cerobregma) lotensis</i> Moubayed-Breil	P	Im,N,Pe	9a
<i>Polypedilum (C.) sætheri</i> Moubayed-Breil	P	Im,N,Pe	4a,4b,9a
<i>Polypedilum (Tripodura) sp.1</i>	**	Pe	8b,9b
<i>Sergentia coracina</i> (Zetterstedt)	*	Im,Pe	1b,2,4b,9
Tanytarsini (21 species)			
<i>Cladotanytarsus conversus</i> Johannsen	P	Im,N,Pe,L	1b,2
<i>Cladotanytarsus nigrovittatus</i> Goetghebuer	P	Im,Pe	1b,2,8a,8b
<i>Constempellina brevicosta</i> (Edwards)	*	Im,N,Pe	5b,9a
<i>Constempellina</i> sp.1	**	Pe	1b,2
<i>Micropsectra aristata</i> Pinder	*	Im,N,Pe	1a,3a,3b,8b
<i>Micropsectra bavarica</i> Stur & Ekrem	*	Im,N,Pe	4a,4b,5,8,9,10
<i>Micropsectra schrankelae</i> Stur & Ekrem	*	Im,N,Pe	1,2,3,4,5a,8b,9,10
<i>Micropsectra sofiae</i> Stur & Ekrem	*	Im,N,Pe	2,4,5a,8a,8b,9,10
<i>Micropsectra</i> sp.1	**	Im,N,Pe,L	8a
<i>Neozavrelia cuneipennis</i> (Edwards)	*	Im,N,Pe	1a,2,8a,9a
<i>Neozavrelia luteola</i> Goetghebuer	*	Im,N,Pe	9a,9b

List of species	Record	Stage	Distribution
<i>Parapsectra uliginosa</i> Reiss	*	Im,N,Pe	8a
<i>Rheotanytarsus</i> sp.1	**	Im,N,Pe,L	8a,8b
<i>Stempellina almi</i> Brundin	P	Im,N,Pe,L	1b,2,5b,9b,10
<i>Stempellina subglabripennis</i> (Brundin)	P	N,Pe	9a,9b,10
<i>Stempellinella brevis</i> (Edwards)	P	Im,N,Pe,L	2,3,4,5a,8b,9,10
<i>Stempellinella reissi</i> Casas & Vilchez-Quero	P	Im,N,Pe,L	8a,8b,4b,9a
<i>Tanytarsus longitarsis</i> Kieffer,	*	N,Pe	1b,2
<i>Tanytarsus multipunctatus</i> Brundin	*	Im,N,Pe	1b,2
<i>Virgatanytarsus</i> sp.1	**	Pe	8b,9a,9b
<i>Virgatanytarsus</i> sp.2	**	Pe	1b,2

Laville 1991, Laville and Serra-Tosio 1996, Moubayed et al. 2000, Deletre 2001, Sæther and Spies 2004; Garcia and Laville 2000), 37 species are new records for France (*) and 20 species belong to new undescribed species (**). The remaining species (P) are considered to be new records for some regions or subregions of France. Thus, including the 37 new records which represent 5% of the French chironomid fauna, 718 chironomid species are now known from France. Of the 1237 European species listed in the last version of Fauna Europaea for Chironomidae by Sæther and Spies (2004), 58% are recorded from France. In the current study, the highest diversity (37 and 34 species) was encountered in two areas located in southern France: south-central France (region 9, 45.6%), eastern Pyrenees (subregion 8, 42%).

Distribution of some species and remarks

- *Procladius* sp.1. Pupal material of *Procladius* sp.1 is collected in a high altitude lake in Eastern Pyrenees. It fits the description of *Procladius* sp reported from Norway by Fittkau and Murray (1985: 96, Fig. 5.31, C). This undescribed species can be easily recognized on the basis of the following thoracic horn characters: elliptic plastron; rim weakly represented, almost absent; respiratory atrium oval, elongated and larger at apex.
- *Procladius crassinervis* (Zetterstedt) was first reported by Serra-Tosio and Laville (1991) as a probable species from South Eastern France. The present record is based on mature male adults, pharates and pupal exuviae collected in lakes, ponds and large reservoirs located in northern areas at low altitude (1b, 2).
- *Boreoheptagyia* sp.1. Only one male adult was collected in a spring located in south eastern France (region 10). The species is morphologically similar to *Boreoheptagyia*

rotunda Serra-Tosio but can be distinguished from this species by the following combination of characters: antenna 715 µm long; AR=0.67; last flagellomere 185 µm long, elongated, longer than preceding 4 segments combined; presence of anal point on tergite IX; absence of notch on gonostylus.

- *Diamesa thomasi* Serra-Tosio. In France, *D. thomasi* has been recorded only from the two type localities located in the Central Pyrenees (7a, 4 adults) by Serra-Tosio (1970). I have found it in the Eastern Pyrenees (subregion 8a) where very large populations (adults, pharates, pupae and larvae) were collected, inhabiting high altitude peat pits located at 2250 m; examples of associated species are *D. aberrata* Lundeberg, *D. bohemani* Goetghebuer, *D. bertrami* Edwards, *D. veletensis* Serra-Tosio, *D. zernyi* Edwards, *Pseudodiamesa nivosa* (Goetghebuer), *P. branickii* (Nowicki), *Chaetocladius suecicus* (Kieffer), *Krenoposectra nohedensis* Moubayed and Langton, *Micropsectra auvergnensis* Reiss.
- *Cricotopus* sp.1 is morphologically similar to *C. levantinus* Moubayed and Hirvenoja known from the lotic part of the Orontes River in Lebanon. Recently this species has been recorded from South-West Europe including France, Spain, Corsica (Fauna Europaea, Sæther and Spies 2004). Associated material including male adults, pharates, pupae and pupal exuviae of *Cricotopus* sp.1 was recently reported also from Algeria by Moubayed-Breil and Lounaci (2007) and shows that it belongs to a new species or new subspecies different from *C. levantinus*: the male imago lacks a notch on the gonocoxite lobe, the distribution of anterior armament on tergites III-VI of the pupal exuviae are not crescent-like and the size of spines on the pupal abdominal tergites are stronger in *levantinus*. Comparison of

material from both Algeria and France with type material from Lebanon allowed us to consider that *Cricotopus* sp.1 from France, belongs to the same new species or subspecies as reported from Algeria. In addition, despite several lists of species reported from intense investigations in Syrian and Turkish territories along the extended basin of the Orontes River (Reiss 1985, 1986; Caspers and Reiss 1989) populations of *C. levantinus* are not recorded from these two neighboring countries.

- *Eukiefferiella bedmari* Vilchez-Quero & Laville is reported as a circum-mediterranean element well known from both Atlanto-Mediterranean (Spain, Morocco) and Ponto-Mediterranean (Greece, Lebanon, Turkey) regions (Vilchez-Quero and Laville 1987; Laville and Reiss 1992). *Eukiefferiella bedmari* shows an unexpectedly large geographical distribution northward along both the South-West and Central-West Atlantic coastal streams (3a, 3b), and even reaches the Channel coastal streams (1a). However, despite thorough investigations in Southern France including Mediterranean coastal streams and rivers, this is the first record for this species in France. The material examined consists of a few pupal exuviae collected in some small Atlantic coastal rivers located in subregions 1a, 3a and 3b.
- *Limnophyes gelasinus* Sæther has been known only from 1 single male adult from Korea (Sæther 1990). Here, *L. gelasinus* is for the first time recorded from the European continent (France), but it was also recently recorded from the North African region (Algeria) by Moubayed and Lounaci (2007). The material consists of a few male pharates and pupal exuviae, and the species seems to be well represented in south eastern France (region10) and the Aissi oued basin in Algeria.
- *Paralimnophyes longiseta* Thienemann has been exclusively encountered in both central and northern parts of Continental France (Serra-Tosio and Laville 1991, Delettre 2001). Male adults of *P. longiseta*, are rather well represented in wetland areas near marshes and ponds located eastward and westward of Central-France.
- *Pseudosmittia angusta* (Edwards), *Smittia foliacea* (Kieffer) and *S. contingens* (Walker) were first reported from France by Delettre (2001), but was overlooked in Fauna

Europaea. Only male imagines of *P. angusta* and *S. foliacea* were found in this study, and were collected along wetland and river basins in both the western and the eastern part of France: Atlantic and Channel coastal streams in the west (1a, 3a) and inland rivers in the east (5). In addition, only a few populations of *S. foliacea* are recorded from wetland areas located in the Mediterranean region (9a, 9b, 10).

- *Micropsectra schrankelae* Stur and Ekrem and *M. sofiae* Stur and Ekrem were recently described from Europe (Stur and Ekrem 2006). The identification of these two species in the male adult or pupal stage must be done with care as they are morphologically very similar to *M. atrofasciata*. I have recorded these two species from many regions throughout France, and will expect to see more records throughout the Holarctic region as the species' descriptions become more well known. Undoubtedly, many specimens previously believed to be *M. atrofasciata* probably are different species in the *atrofasciata* group and *M. atrofasciata* might be less widespread than it has been regarded in previous literature.
- *Stempellinella reissi* Casas & Vilchez-Quero was until recently only known from its type locality in Sierra Nevada, Andalucia, Spain (Casas and Vilchez-Quero 1991). Material collected by me in the French Eastern Pyrenees was included in a recently published revision on *Stempellinella* (Ekrem 2007). Large populations of *S. reissi* have been captured from middle and high altitude springs and streams located in Eastern Pyrenees (8a) and Central France (region 4b). Larvae of *S. reissi* inhabit sandy and gravelly habitats of cold waters near springs, peat pits and streams located at variable altitudes. Dense populations appear to be more common in streams located in high altitude areas.

Acknowledgements

Thanks are due to my colleague Torbjørn Ekrem (Trondheim, Norway) for helpful comments on the manuscript.

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SHORT COMMUNICATIONS

The Sublette Collection to University of Minnesota

The Sublette Collection of Chironomidae has been given to the University of Minnesota, Department of Entomology, St. Paul/Minneapolis. Most of the collection has been transported back to the main campus by Len Ferrington and three graduate students. However, I have retained a skeleton reference collection, mostly of material from NM and CO, and hope to continue a modest research program. Prior to making the gift, a bulk of the Tanytarsini was loaned to Dr. Torbjørn Ekrem/Dr. Elisabeth Stur, Museum of Natural History and Archaeology, Norwegian University of Science and Technology, NO-7491 Trondheim, Norway, except the *Cladotanytasus* which were loaned to Dr. Wojciech Gilka, Department of Invertebrate Zoology, University of Gdansk, Al. Pilsudskiego 46, 81-378 Gdynia, Poland. Additionally, the *Bryophaenocladius* (Orthoclaadiinae) are on loan to Dr. Xinhua Wang, Life Science College, Nankai University, Tianjin, 300071 China. These loans will be returned to UMN. The collection contains extensive salivary gland squashes of polytene chromosomes, most with associated reared adults and immatures, from the genus *Chironomus*. These squash slides, most prepared by Mary Sublette, have the dissected larval head capsule and the terminal abdominal segments mounted on the same slide.

James E. Sublette

New Chironomidae Mailing List

Cardiff University has generously run the chironomid listserv for about 10 years now. David Pascoe, who has done a wonderful job in administrating it since 2000, recently decided that it was time to pass this task on to someone else. The Museum of Natural History and Archaeology gladly accepted to take on the job, and I will try to keep the list up and running. Members of the old mailing list have automatically become subscribers of the new one, and should already have received a welcome message. If you have not become one, you are not yet registered as a subscriber, and can do so at this web page: <http://lists.vm.ntnu.no/mailman/listinfo/chironomidae>. From this site you can also administer your subscription and view the mailinglist archive. To post a message to subscribers of the mailinglist, write an email to Chironomidae@lists.vm.ntnu.no. I look forward to see fruitful discussions and good flow of information in the new Chironomidae listserv!

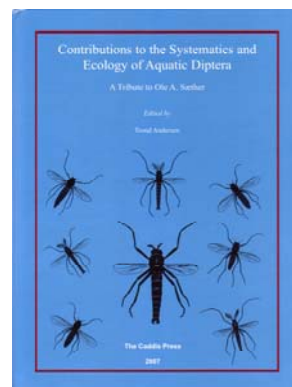
Torbjørn Ekrem

New Books

“Contributions to the Systematics and Ecology of Aquatic Diptera: A Tribute to Ole A. Sæther”

Edited by Trond Andersen

In order to congratulate Ole A. Sæther on his 70th birthday and for 46 prosperous years of scientific studies in freshwater biology and insect systematics, colleagues from around the world contributed 35 papers on the ecology and systematics of Ceratopogonidae, Chaoboridae, Chironomidae, and Psychodidae. Eight new genera and nearly 50 new species are described in this book which comprises more than 350 pages. All articles were peer-reviewed before publication.



Content

- Ekrem, T. and T. Andersen: Professor Ole Anton Sæther 70 years: four decades of chironomid research.
- Andersen, T. and H. F. Mendes: Five enigmatic new orthoclad genera from Brazil (Diptera: Chironomidae, Orthocladiinae).
- Ashe, P. and J. P. O'Connor: A new genus and species of Orthocladiinae (Diptera: Chironomidae) from Sulawesi, Indonesia.
- Brodersen, K. P.: Chironomids (Diptera) from sub-saline lakes in West Greenland: diversity, assemblage structure and respiratory adaptation.
- Caldwell, B. A.: Morphological variation, additional distribution records, and notes on ecology of *Pagastia orthogonia* Oliver (Diptera: Chironomidae).
- Cranston, P. S., G. M. Benigno and M. C. Dominguez: *Hydrobaenus saetheri* Cranston, new species, an aestivating, winter-emerging chironomid (Diptera: Chironomidae) from California.
- Ekrem, T. and G. A. Halvorsen: Taxonomy of *Tanytarsus lapponicus* Lindeberg, 1970, a species with larval mandible of 'lugens-type' (Diptera: Chironomidae).
- Ekrem, T. and E. Stur: Description of *Tanytarsus hjulorum*, new species, with notes and DNA barcodes of some South African Tanytarsus (Diptera: Chironomidae).
- Endo, K., E. A. Makarchenko and E. Willassen: On the systematics of *Linevitshia* Makarchenko, 1987 (Diptera: Chironomidae, Diamesinae), with the description of *L. yezoensis* Endo, new species.
- Ferrington, L. C. Jr.: Hibernation emergence patterns of Chironomidae in lotic habitats of Kansas versus substrate composition.
- Gilka, W. and L. Paasivirta: Two new species of the genus *Tanytarsus* van der Wulp (Diptera: Chironomidae) from Fennoscandia.
- Goddeeris, B., K. Hermans and H. Hampel: Experimental termination of diapause in three *Chaoborus* species (Diptera: Chaoboridae) from a Belgian lowland pond.

- Hirabayashi, K., G. Kimura, Y. Fukunaga and M. Yamamoto: Distribution pattern of chironomid midges (Diptera: Chironomidae) in the upper and middle reaches of the Shinano River in Central Japan.
- Jacobsen, R. E.: *Orthocladius (Orthocladius) saetheri* new species, from the Appalachian Mountains (Diptera: Chironomidae).
- Jacobsen, R. E. and B. Bilyj: An unusual new *Cladotanytarsus* from oligotrophic Florida Everglades marshes (Diptera: Chironomidae).
- Kobayashi, T., R. Nakazato and M. Higo: The identity of Japanese *Lipiniella* Shilova species (Diptera: Chironomidae).
- Lencioni, V., B. Rossaro and B. Maiolini: Alpine chironomid distribution: a mere question of altitude?
- Makarchenko, E. A. and M. A. Makarchenko: A review of *Tokunagaia* Sæther (Diptera: Chironomidae) from the Russian Far East, with the description of four new species.
- Martin, J., A. Blinov, E. Alieva and K. Hirabayashi: A molecular phylogenetic investigation of the genera closely related to *Chironomus* Meigen (Diptera: Chironomidae).
- Moubayed-Breil, J.: *Polypedilum (Cerobregma) lotensis* new species, and *P. (C.) saetheri* new species, from lowland streams and rivers in France (Diptera: Chironomidae).
- Murray, D. A.: *Limnophyes platystylus* new species (Diptera: Chironomidae, Orthoclaadiinae) from Ireland.
- Niitsuma, H.: *Saetheromyia*, a new genus of Tanypodinae from Japan (Diptera: Chironomidae).
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- Sanseverino, A. M. and E. J. Fittkau: Taxonomy of *Caladomyia alata* (Paggi, 1992) comb. n. and *Caladomyia tuberculata* (Reiss, 1972) comb. n. (Diptera: Chironomidae).
- Szadziewski, R., W. Gilka and P. Dominiak: A redescription of *Forcipomyia squamigera* Kieffer, 1916 in all stages (Diptera: Ceratopogonidae).
- Trivinho-Strixino, S. and T. Siqueira: New species of *Beardius* Reiss and Sublette, 1985 (Diptera: Chironomidae) from Southeastern Brazil.
- Wagner, R. and T. Andersen: Psychodidae (Diptera: Nematocera) from the West Usambara Mountains, Tanzania.
- Wang, X., Y. Liu and L. Paasivirta: A new species of *Prosilocerus* Kieffer from Finland (Diptera: Chironomidae, Orthoclaadiinae).
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- Wülker, W. F.: Two new *Chironomus* species with fluviatilis-type larvae from the near-shore sandy sediments of Lake Michigan (Diptera: Chironomidae).
- Yamamoto, M., K. Hirabayashi and M. Matsuzawa: The Korean species *Hanochironomus tumerestylus* Ree, 1992 taken on Ishigaki Island, Japan (Diptera: Chironomidae).
- Zorina, O. V.: *Olecryptotendipes*, a new genus in the *Harnischia* complex (Diptera: Chironomidae) from the Russian Far East.

Trond Andersen

Book reference

Andersen, Trond (editor). 2007. *Contributions to the Systematics and Ecology of Aquatic Diptera: A Tribute to Ole A. Sæther*. The Caddis Press. Columbus, Ohio. vi + 358 pp. ISBN 0-9667982-3-6

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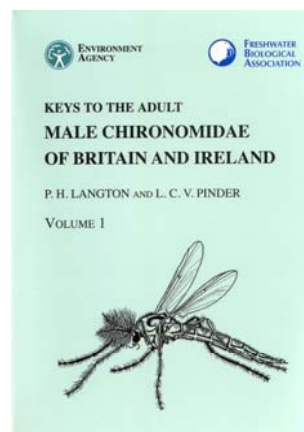
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New Key to Chironomidae adult males

It is finally here – a new edition of the probably most widely used key to species-level identification of chironomid adult males.

The 1978 key by Clive Pinder has been out of print for some time, but instead of merely reprinting the old version, Peter Langton and Clive Pinder have done a marvellous job in adding species and update the taxonomy and nomenclature. In fact, the number of included species is increased by 35% in the 2007 edition. Thus, it will most certainly be a welcomed addition to the library of many chironomidologists, not only in Great Britain. This is hardly the only reason why the books are worth buying though. The introduction includes facts and details on Chironomidae morphology, taxonomy, phylogeny and methodology, and will therefore be an excellent starting point for students and other beginners in midge identification. The only key references I was missing in this part of the publication was Sæther's most recent works on nematoceran and chironomid phylogenies (Sæther 2000a, b) and the significant nomenclatorial remarks by Spies and Sæther (2004).



Like the 1978 edition, the separate keys subfamilies, genera and species are enriched with drawings of diagnostic characters directly in the text. This is particularly useful as you do not need to search for the clarifying drawing in a plate at the end or in a different volume. Still, Langton and Pinder have chosen to keep the volume with hypopygial drawings for additional identification confirmation, a very wise decision in my opinion. The drawings are of good quality artistically, but I was somewhat disappointed to see that the print was poorer than the 1978 edition despite that the paper used is of better quality. Although, perhaps not always necessary to display diagnostic features properly, those of us who appreciate fine details will be less satisfied with the plates now than we were for the 1978 edition. I also think that plates numbered with letters are easier to navigate in than unnumbered figures, although the pattern repeats itself and is properly explained in the beginning of volume 2.

The publication of this key has been delayed for some time after the manuscript was finalised, and the reader should be aware that there are publications on chironomid taxonomy and nomenclature from 2006-2007 that are not allowed for (e.g. Stur and Ekrem 2006), and some inconsistencies in name use with that recommended by Spies and Sæther (2004). Moreover, a key supplement diagnosing 16 additional species was added to volume two at a later stage and is therefore not incorporated directly in the major key but in the end of volume 2. This could have been problematic, but the authors have made sure that the supplement is referred to in the major key whenever this is relevant. Thus, although not optimal, I think their solution is considerably better than leaving out the additional 16 species all together. The index at the end of volume 1 is also worth commenting on since it is organised by genus and works as a checklist as well as an index to all treated species. It is easy to navigate in and directs the reader both to the relevant key and the hypopygium drawing.

In general, the new key by Langton and Pinder is well written, taxonomically comprehensive and will be an extremely valuable tool for European chironomid species identification in the future. If you haven't ordered it yet, you should.

Torbjørn Ekrem, Torbjorn.Ekrem@vm.ntnu.no

Book reference

Langton, P.H. & Pinder, L.C.V. 2007. *Keys to the adult male Chironomidae of Britain and Ireland. Vols 1 & 2*. Freshwater Biological Association, Scientific Publication 64, pp. 239 + 168. ISBN 0-900386-75-6

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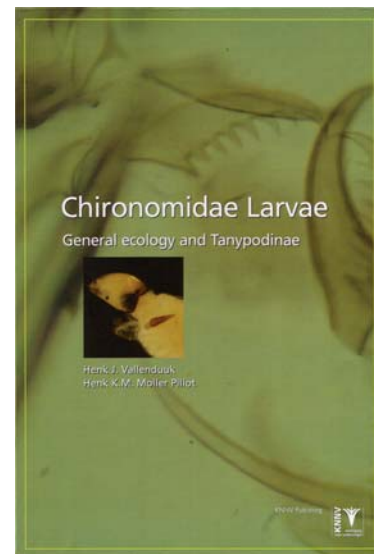
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New key to Tanypodinae larvae

The *Chironomidae Larvae of the Netherlands and Adjacent Lowlands* is the first volume of a new series of practical keys to chironomid larvae. Its subtitle *General ecology and Tanypodinae* describes what authors Henk Vallenduuk and Henk Moller Pilot have found room for in the almost 150 pages of this volume.

The first part of the book is devoted to a chapter on general ecology of Chironomidae and includes facts on behaviour, life history and responses to abiotic environmental factors. It is quite interesting reading and gives a nice, compact view of the most important areas of chironomid ecology. The remaining part of the book is dedicated to keys, descriptions, ecological notes and numerous figures of Tanypodinae larvae. The major key is made for both third and fourth instar larvae, is mostly dichotomous, and is accompanied by line drawings of characteristic features. It includes 56 taxa and is so constructed that most of the characters used can be observed using a decent stereo microscope, facilitating rapid identification without the need for slide preparations. Although clearly an advantage for ecologists, it takes some practice to get used to. The larval key is followed by a "key to prepupa". This pictorial guide to genera and species using thoracic horns is a very useful addition to the larval key and is certainly a valuable tool to identify prepupa. The fact that this key is not dichotomous is not disturbing since the seven pages of drawings and key features are easy to navigate. The remaining part of chapter five includes morphological comments, identification matrices and more illuminating drawings. Although the authors clearly state that the book does not include complete descriptions of the larva, and perhaps best is viewed as a supplement to existing taxonomical literature, key characters are treated both in keys, taxonomic comments and matrices. Moreover, chapter six treats each and every taxonomical entity included in the keys (either species of genus) in detail with comments on systematics, distribution and numerous ecological aspects. This part of the book is very well referenced and a good source for additional literature on the Tanypodinae. Even reports and theses are cited. There is, however, at least one major work that remains unmentioned. Fauna Europaea (Sæther & Spies 2004) has become one of the major references for taxonomical and distributional data on European Chironomidae, and it would be useful for the reader to know how the Fauna Europaea data relate to the information given in the book. Also, I think the book would have benefited from and found a broader audience if all European genera were included in the key. As an example, the genus *Larsia* is not uncommon in Europe, and has among other countries also been found in Belgium, France, Luxembourg and Germany. The key in *Chironomidae Larvae of the Netherlands and Adjacent Lowlands* does not include *Larsia* and chances are high that sampled *Larsia* larvae will be identified to morphologically similar genera (and thus remain undetected) if this book is the only tool



used for identification. There are only five European genera which are not treated in the book (*Pentaneurella*, *Larsia*, *Derotanypus*, *Hayesomyia*, *Meropelopia*), thus reference to these could easily have been included. The final pages of the book contain numerous diagnostic microphotographs and tables of biological and ecological properties of Tanypodinae larvae.

In general, the *Chironomidae Larvae of the Netherlands and Adjacent Lowlands* should be useful to all chironomid ecologists and palaeolimnologists, and also to most taxonomists working with tanypodines. However, due to the geographical limitation, the book might be best suited for those working in the Netherlands. The price of EUR 69.50 for the nicely bound hardcover book is in the higher end of the scale, and will perhaps make many potential buyers think twice before ordering – especially if working outside of the European Lowlands.

Elisabeth Stur, Elisabeth.Stur@vm.ntnu.no

Book reference

Vallenduuk, H.J, Moller Pillot, H.K.M. 2007. *Chironomidae larvae of the Netherlands and adjacent lowlands – General ecology and the Tanypodinae*. KNNV Pubilshing, Zeist, the Netherlands, pp. 144. ISBN 978-90-5011-259-8.

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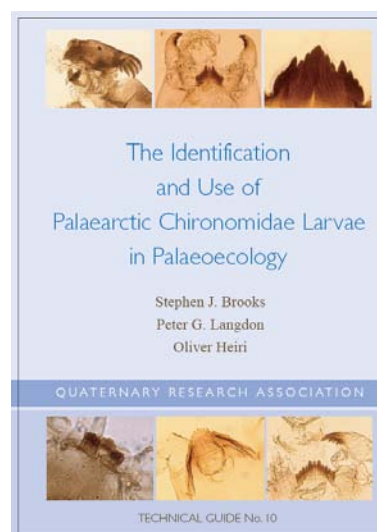
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The identification and use of Palaearctic Chironomidae larvae in palaeoecology

The guide describes and illustrates 198 sub-fossil chironomid types and categories that can be found in European lake sediments and includes ca. 280 colour photographs of fossil chironomid specimens. Furthermore, it contains an introduction to chironomid palaeoecology, chironomid ecology, and preparation methods for sub-fossil chironomid remains.

This is a practical guide for both the skilled and the novice researcher on sub-fossil chironomids. The book contains adequate background information to get started from scratch. The first chapters include a brief review on practical laboratory- and field techniques, the life history of chironomids, the use of chironomids as proxies of past environmental conditions, identification of sub-fossil head capsules, and importantly for the palaeoecologist, on the influence of key environmental variables on chironomids. In the latter section, the authors discuss the influence of temperature, pH, substrate morphology, water depth, food, and salinity. The only relevant information on chironomids that I feel deserves more mentioning in the introductory chapters is a section on species interactions, such as competition and predation. It may be hard to quantify the impact of species interaction on any palaeoenvironmental inference based on chironomids, however predation and competition certainly exert some influence on the species community structure, and hence may also influence any inference.



In the introduction, I especially appreciate that the authors also discuss some weaknesses that must be borne in mind during interpretation of chironomid data. These shortcomings include the taxonomy of sub-fossil head capsules, but in this respect, the taxonomic contribution in this book is a milestone. This manual is by far the most up to date and elaborate identification guide on sub-fossil chironomid head capsules that exists. The taxonomic keys and images compose the main body of the book. All genera include a diagnostic section of the genus and of head capsule morphotypes within the genus. In addition, information on how to separate morphological similar taxa is given and the authors have amalgamated information on the environmental preferences of the taxa. The taxonomic knowledge presented in the book is the culmination of years of experience among the authors and among leading scientists sharing information at international workshops.

Many of the images provided are composed of multi layered stacked digital pictures. The quality of the images is generally high and the specimens reflect the wide array of preservation status for sub-fossil head capsules. Most researchers will find themselves flipping the pages and comparing the particular specimen in the microscope against the images provided in the book. In the foreword, Ian Walker fittingly remarks that, "The authors' greatest reward will find this book not on library shelves, but lying next to the microscope, among an active midden of microscope slides." While many researchers on sub-fossil head capsules up to now have been flipping through worn copies of Wiederholm's (1983) manual on chironomids of the Holarctic region, I am certain most of us will replace Wiederholm by Brooks et al. This is not to say that the book is the final contribution to sub-fossil chironomid analysis. We should seek for higher taxonomic resolution and correct neotaxonomical nomenclature. For sub-fossil head capsules with worn or lacking critical characters, the outcome of the identification can rarely be confident at species level. However, the taxonomy for many groups in the manual approaches that of neotaxonomy apart from the use of types, i.e. *Endochironomis tendens* – type, or *Cladotanytarsus mancus* types 1 and 2. For other groups, the taxonomic resolution may still be refined as we search the wealth of already existing information and information in progress on reared and DNA-barcoded larval specimens. This is important in order to close the gap between researchers working on past and on present chironomids. The key to understanding past chironomid assemblages lies in the present. There is room for many future editions of this book with refined taxonomy and ecological information. In these editions to come, I have one plea; please provide larger images! Squeezing figure captions and six images, many of which contain minute details, on one A5 sized page does not make sense in a practical laboratory manual meant for countless hours of picture-surfing. One gets a good general introduction into sub-fossil chironomid analysis by reading the first three chapters. However, such methodological literature already exists. If space was limiting when the book was produced, I would rather have the introductory sections shortened and spent more space on larger images. Most of us will perhaps only read the introductory chapters once, while the rest will be explored on a daily basis. Still, this manual is a must-have for all researchers even minutely involved with sub-fossil chironomid analysis.

Gaute Velle, Gaute.Velle@bio.uib.no

Book reference

Brooks, S.J., P.G. Langdon, O. Heiri (2007). The identification and use of Palaearctic Chironomidae larvae in palaeoecology, Quaternary Research Association Technical Guide 10, 276 pp. ISBN: 0907 780 717.

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This listing is different from what has been presented in earlier issues: In order to justify the epithet "current", and due to the fact that nearly 300 titles for 2007 are already saved, all of the most actual titles hitherto collected are listed, preceded by the - hopefully almost complete - year 2006 and by supplements to the two preceding years. The compilation was achieved, as usual, from many sources: databases, tables of contents of journals, references and citations of papers, autopsy of many periodicals, lists provided by authors (thanks to you!). In particular, publisher issued search alerts proved to be rich in results. Only printed titles are reported here with the occasional exception of online-only journals (PLoS or BioMed journals e.g.). Titles announced, even with available DOI numbers, are not considered before printing. In general, online publications should be retrieved elsewhere, best check the chironomid home page for eventual references regularly.

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