

## SUMMARY FROM THE 12<sup>TH</sup> INTERNATIONAL WORKSHOP ON SUBFOSSIL CHIRONOMIDS, NEW FOREST, UK



Figure 1. Participants at the workshop0Photo: Pgvgt Langdon.

In June 2013, 40 scientists (Figure 1) met in the New Forest to attend the 12th International workshop on subfossil chironomids. This meeting, hosted by the University of Southampton, brought together researchers from Europe, North America, South America and Asia. This workshop setting fosters coherence and cooperation within the subfossil chironomid community and provides an invaluable opportunity for introducing new researchers to the field. The workshop series began in the mid-1990s, with the most recent meetings being held in Iceland (2007), Denmark (2009) and Norway (2011). The purpose of this workshop was to exchange ideas, discuss new developments in the field and to unify subfossil chironomid larval taxonomy and methods.

The meeting was organised by **Pete Langdon** (University of Southampton) and **Steve Brooks** (Natural History Museum). The Quaternary Research Association and the PAGES (Past Global Changes) project sponsored the event, providing attendance bursaries for a number of workshop delegates.

The meeting was held over three days, and was split into seven sessions designed to cover all aspects of subfossil chironomid research, with additional practical sessions on taxonomy and statistics.

### Day 1

The workshop commenced with a social ice-

breaker pre-dinner walk, providing an opportunity to observe New Forest wetlands, heathlands and ponies. Due to the lack of sunshine, the anticipated dragonflies failed to make an appearance, much to the disappointment of Steve Brooks!

### Day 2

Session one, “*Temperature inferences*”, contained presentations on chironomid-inferred temperature records from around the world. **Nelleke van Asch** (Utrecht University) started this session with a talk entitled “Last Interglacial summer temperatures inferred from fossil midges”, and focused on the differences in chironomid and vegetation based temperature reconstructions. Nelleke discussed the possibility that these differences may reflect responses to different seasonal temperature regimes, underlining the importance of using a multiproxy approach. The following talks in this session covered progressively younger time periods, with **Julieta Massferro** (Consejo Nacional de Investigaciones Científicas y Técnicas) presenting the first chironomid-inferred temperature reconstruction from Patagonia, which indicated that a cool period occurred between 14.5 and 11 cal kyrs BP, encompassing both the Atlantic Cold Reversal and the Younger Dryas. Next, both **Angela Self** (Natural History Museum) and **Larisa Nazarova** (Alfred Wegener Institute) individually presented Holocene and Late Holocene climate records, respectively, from various sites in Kamchatka, Russia. These records show the influence of global

teleconnections driving cooling at 5.5, 3.5, 2.7 ka, but also the local influences of forest development and volcanic ash deposition. A high-resolution multi-proxy record from Sweden, covering the last millennium, was presented by **Annika Berntsson** (Stockholm University), which showed the strong influence of precipitation. The session concluded with a talk by **Steve Brooks** (Natural History Museum), who demonstrated the close similarity between a chironomid-inferred temperature record and meteorological records despite the lake being industrially impacted and eutrophicated.

The theme of the second session of the day was “*Training sets and transfer functions*”. This session began with a talk by **Stefan Engels** (University of Amsterdam) who illustrated, with a New England chironomid lake depth dataset, how training set selection, taxonomic resolution and taxa deletion can be critical in influencing model performance and reconstructions. **Alberto Arenada** (Universidad de Concepcion) presented his work on developing a chironomid-based temperature training set for Chile, and **Frazer Bird** (Open University) described preliminary results of similar work in the Bolivian and Peruvian Andes. Both studies suggest temperature is a driver of chironomid abundance and distribution in these regions, but further work is required to generate an inference model with adequate performance statistics. **Eleanor Maddison** (Durham University) spoke about her new Greenland chironomid training set, and demonstrated that it has potential for reconstructing air temperature with existing Greenland chironomid records.

The third session continued the “*Training sets and transfer functions*” theme. **Steve Juggins** (Newcastle University) presented his critical evaluation of the use of transfer functions in palaeolimnological quantitative reconstructions, which included more stringent ways in which the data should be tested to evaluate the performance of the inference model and the reliability of reconstructions by identifying the effects of confounding secondary variables. Next, **Richard Telford** (University of Bergen) spoke about his work “Identifying lakes with potential for good temperature reconstructions”. In the following talk **Oliver Heiri** (University of Bern) discussed recent criticisms of environmental reconstructions and transfer functions using chironomids and concluded that cross-validation of results from other sites or against other independent proxies is an appropriate way to validate chironomid-inferred reconstructions. This session culminated in a lively discussion on the use of chironomids in reconstructing past tem-

peratures and ways to validate reconstructions in the future.

With the talks concluded for the day, two practical sessions ran simultaneously: an informal sub-fossil taxonomy session and an R-tutorial, run by Richard Telford (University of Bergen) and Steve Juggins (Newcastle University). The final task for the day was to look at a range of interesting research posters, accompanied with a glass of something from the bar.

### Day 3

With a move away from training sets, transfer functions and temperature reconstructions, the theme of the fourth session was titled “*Crossing environmental gradients*”. The session opened with a talk by **Andrew Medeiros** (Wilfred Laurier University) which explored nutrient and productivity gradients in Arctic lakes using chironomids and geochemistry, and demonstrated responses of certain chironomid taxa to climate-driven changes in carbon and nitrogen, which lagged direct temperature responses by other chironomid taxa. Next, **Guillermo de Mendoza** (University of Barcelona) showed that temperature is the ultimate environmental driver of chironomid species distributions in the mountain lakes of the Pyrenees, although temperature may act indirectly through other environmental and physical variables. **Petr Paril** (Masaryk University) presented preliminary chironomid results from a palaeolake in the Vihorlat Mountains, the first study of its kind in Slovakia, covering the late-glacial to Holocene transition. Next, **Christopher Luszczek** (York University, Canada) presented a study of chironomid communities from south-western Hudson Bay, the southernmost treeline in the world, which showed trends towards species typical of warmer, more productive conditions over the last 30 years. To close this session **Enlou Zhang** (Chinese Academy of Sciences) spoke on his extensive work compiling a huge database of modern chironomid communities from northern China and central Mongolia.

The fifth session, “*Trophic changes and human impacts*”, began with a fascinating talk by **Roberto Quinlan** (York University, Canada) on the most polluted lake in America (Onondaga Lake, New York State), describing the widespread human disturbance of the lake’s watershed and related changes in the chironomid assemblages. **Wing Wai Sung** (Natural History Museum) spoke on differentiating the effects of drought, temperature and nutrient enrichment on the biota of a Danish lake using a multiproxy approach and meteorological records, and **Pete Langdon** (University of Sout-

hampton) demonstrated how time-series analysis of palaeolimnological data from a nutrient-enriched lake in China could be used to test ecological theories on the mechanisms driving alternative stable states and provide early warnings of critical ecological transitions. This was followed by a talk by **Katherine Hesketh** (University of Southampton) who is using a multiproxy approach to assess sediment and nutrient accumulation in order to establish baseline conditions in sub-catchment lakes of the River Itchen, Hampshire. **Assia Fernane** (Université Bretagne Occidentale) spoke on how chironomids are being utilised to determine past positions of coastlines in Brittany, France, by their response to salinity changes in river estuaries. This session was concluded with a talk by **Subodh Sharma** (Kathmandu University) on the challenges of sampling high altitude Himalayan lakes in Nepal and their potential for chironomid studies to investigate environmental change in this poorly studied region.

A session on “*Stable isotopes*” started with a presentation by **Kimberley Davies** (University of Southampton) who discussed the potential of chironomids as indicators of lake methane production in Arctic thermokarst lakes through the analyses of stable carbon isotopes from chironomid head capsules. **Maarten van Hardenbroeck** (University of Bern) followed with a talk on taxon-specific stable carbon isotope values in chironomid larvae and head capsules, and showed that in general profundal chironomids were typically more depleted in  $\delta^{13}\text{C}$  than littoral taxa. **Ladislav Hamerlik** (Matias Belius University) concluded the session by discussing microhabitat influence on chironomid community structure and  $\delta^{13}\text{C}$  signatures in the low Arctic (West Greenland).

**Gaute Velle** (University of Bergen) opened the final themed session, “*Biodiversity and lake restoration*”, with a talk discussing biodiversity changes in European freshwaters over the last 30 years. The talk focused on the recovery of lakes and rivers post-acidification from the 1980s onwards, with preliminary results indicating a general trend of increasing biodiversity. The last presentation of the meeting was given by **Isabelle Larocque-Tobler** (The LAKES Institute) on restoration of Lake Muzzano in Switzerland, which suffered significant fish kills in 1967 and 1994 due to *Microcystis* blooms. Isabelle discussed a holistic approach to the problem.

The last day of the conference concluded with a further taxonomy session and R-tutorial, and was swiftly followed by speciality drinks for all from China, Chile and Canada. The workshop finished in style with an impromptu ‘disco’, with a variety of music provided by members of the gathering.

On behalf of everyone that took part, I would like to thank Pete Langdon and Steve Brooks for arranging this invaluable workshop. The location and date of the 13<sup>th</sup> international workshop on sub-fossil Chironomids is still to be decided upon, but may be linked to the next International Palaeolimnology Symposium to be held in China in 2015.

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