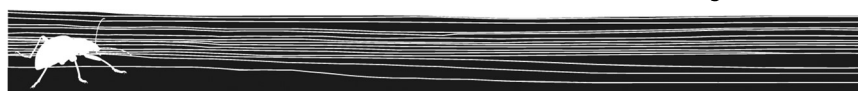


Quaternary Entomology Dispatch



Editorial

Dear colleagues,

It is my pleasure to present the next edition of QED to you!

Science-wise, it's a great year to look back on. Quaternary entomology featured at two conferences this year, at the EAA Annual meeting in Rome and the ICE meeting in Tokyo. Michael Monzon wrote a nice summary of their session at ICE for this newsletter. Recently, a lot of effort has been made to share data, methodologies and advances in methodologies. Colin Courtney-Mustaphi and his colleagues gathered a truly impressive collection of photos and identification keys for aquatic insects and has shared the link to their open access poster with picture references. Svetlana Kuzmina wrote a summary of her experiences with wet screening and her recommendations to other colleagues, and it is so engaging I wish I could have been in her classroom. Meanwhile, Ethan Kerr has found a platform in this newsletter to promote the improved flotation device that he co-developed. Myself, I am keeping up my efforts to include old and new paleoentomological data sets into Neotoma and to arrange a meeting of our European members for next year. Our community keeps growing with newly graduated Master (Coleoptera from deposits from L'Anse aux Meadows) and PhD students: Axel Hacala studied the potential of oribatid mites in palaeoecology. And last but not least, you will find the publications from the members of our community from the second half of 2024 or the beginning of 2025. I'm already looking forward to 2025, which definitely holds more exciting news in store.

Best wishes for the end of 2024 and speak to you all in the new year,

Nick Schafstall (quatentdispatch@gmail.com)

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Quaternary Entomology Dispatch



Short updates from the community

Colin Courtney-Mustaphi

Email: colin.courtney-mustaphi@unibas.ch

We wanted to add new resources for analysts of Quaternary sediments who were interested in the identification and paleoenvironmental use of chitinous aquatic invertebrate remains. We assembled reference slides and photographs of identified invertebrate remains and generated a photo catalogue as well as an A0 size poster to be freely printed and posted in your laboratory. All of the material are openly available, including the original photos as supplementary information and the publication has nearly reached 3000 views. We are interested in continued expansion of the reference and to develop new resources, such as app-based tools to further aid recognition, identification, and interpretation of Quaternary fossils. Please contact us if you are motivated to develop new tools and funding applications that may benefit from new collaborative developments!

Courtney-Mustaphi C, Steiner E, von Fumetti S, Heiri O. 2024. Aquatic invertebrate mandibles and sclerotized remains in Quaternary lake sediments. *Journal of Paleolimnology* 71(1): 45–83. <https://doi.org/10.1007/s10933-023-00302-y> [reference included in QED December 2023 edition]

Courtney Mustaphi C, Steiner E, Lapellegerie P, von Fumetti S, Heiri O. 2023. Artificially fossilized body parts of aquatic invertebrates as an identification aid for sclerotized chitin preserved in lacustrine, palustrine and deltaic sediments [A0 poster format]. Harvard Dataverse. <https://doi.org/10.7910/DVN/QM1T5M>

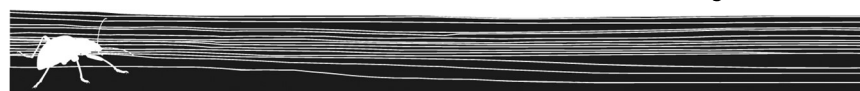
Pedro Henriquez-Valido

Email: pedrohenriquezvalido@gmail.com

We recently published a paper which investigates insect activity's impact on bone surface modifications under different environmental conditions (inland and coastal/exposed and buried). This work provides new insights for taphonomic studies in island archaeology, uncovering how island environments impact on bone preservation. Beetle-induced alterations were absent in coastal environments, suggesting post-decomposition transport when these modifications appear on bone elements from coastal sites. This insight helps to refine our understanding of the post-mortem movement of skeletal remains and highlights the importance of considering environmental factors when analyzing taphonomic processes.

DOI: 10.1016/j.jas.2024.106120 [reference included in this edition of QED]

Quaternary Entomology Dispatch



News from the community

News from the PEAT Lab, Memorial University, Canada

From Véro Forbes (veroforbes@gmail.com)

Hi everyone!

Years have passed since I left my role as editor of QED. I want to take this opportunity to thank Nick for having done such a brilliant job of keeping this newsletter going, while also continuing to encourage and create opportunities for conversations and sharing among the Quaternary Entomology community.

I haven't been able to contribute much to the newsletter lately as my search for this elusive thing called 'work-life balance' required me to let go of many things. However, I am pleased to report I survived my first few years in my dream job of university prof and been rewarded with this most wonderful thing called a sabbatical. It's been great to be able to return to the lab and work directly with insect specimens for hours and hours at a time. I was able to visit colleagues at the National Collection of Insects in Ottawa to finalize the dataset for a paper that's been five years in the making, and to go to Quebec City to catch up and plan future collaborations with my mentor extraordinaire Allison Bain. It's been incredibly inspiring and motivating, and heartwarming, too! Our insect work in the PEAT lab has been advancing mostly thanks to my graduate students. Carlos Salazar has recently completed his MA (his thesis abstract appears in this edition). He has now joined Pier-Ann Milliard in the PhD program, and both are continuing to work on insect subfossils from Newfoundland. Alyshia Reesor is getting close to submitting her MA on Human Fleas for examination, and two undergraduate students are learning the basics of archaeoentomology through small projects analyzing samples collected from L'Anse aux Meadows.

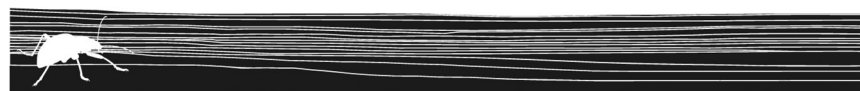
It is mostly to ensure I would be able to continue contributing to forming the next generation of Quaternary Entomologists that I have decided to slow down and pause research dissemination activities for a bit. Seeing how much my students learned, what they achieved, and how their passion for what they study continues to grow not only makes me proud - it confirms that this was the right for me to do.

Still... I dream of the day when I will publish an original research paper again... and be able to geek in person with some of you at a future conference...

Soon, my friends.

Take care until then, everyone! 😊

Quaternary Entomology Dispatch



Paleoentomology featured at the International Congress of Entomology (ICE)

From Michael Monzon (mmonzon@njaes.rutgers.edu)

This past summer in Kyoto, Japan the XXVII International Congress of Entomology (ICE2024) hosted a symposium of seven presentations focused on paleoentomology titled, “Long-term perspectives: Quaternary & Archaeological Entomology” [5 – 1]. The symposium was attended by 40 people and opened with a three-minute overview for the entomology audience. Professor Allison Bain, PhD (Laval University, Quebec, Canada) addressed the symposium as the Keynote Speaker. Dr. Bain’s 30-minute talk, titled “Archaeoentomology and the Columbian Exchange: the transformation of the North American Insect Fauna during the Colonial Period” [5 – 1 – 01], was well received by the attendees. Mr. Shigehiko Shiyake followed with a poignant presentation [5 – 1 – 02] outlining the contributions to Quaternary entomology made by Japanese researchers. Two talks highlighted the possibilities for artificial intelligence (AI) aided imaging. Specifically, “Entomological Time Travel: application imaging methods in paleoentomology” [5 – 1 – 03] provided examples of how new detailed imaging can help discern microscopic taxonomic characteristics. One presentation focused on paleoecology to study the biogeographic distribution of the pyramid ant *Dorymyrmex* Mayr 1866 (Hymenoptera: Formicidae) for reconstructing its evolutionary history.

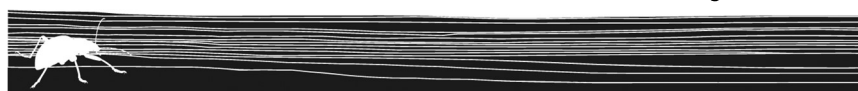
Including the keynote address, a total of four talks focused on traditional paleoentomology. Featuring the biogeography and AI presentations added richness to this symposium. All together this diverse group of research showed potential future paths for collaboration between Quaternary entomologists and modern insect scientists.

ICE2024 was held in Kyoto, Japan 25 – 30 August 2024 at the Kyoto International Conference Center. The symposium took place on Monday 26 August 2024 from 9:45 – 11:45. The co-conveners of the symposium were Dr. Philip I. Buckland (Umeå University, Umea, Sweden), Dr. Lauren M. Weidner (Arizona State University, Phoenix, Arizona), & Mr. Michael A. Monzón (Purdue University, West Lafayette, Indiana). To see the full program for the symposium and list of speakers, please go here:

https://confit.atlas.jp/guide/event/ice2024/session/21_1501-07/detail



Quaternary Entomology Dispatch



News about the Neotoma-related COST Action

From Nick Schafstall (nick.schafstall@gmail.com)

COST Action is an initiative to facilitate research networks within Europe. The PalaeOpen COST Action revolves around the inclusion of ‘missing’ paleo-data into the online database Neotoma (neotomadb.org). The working groups have been divided into a Terrestrial wg (e.g., beetles, plant macrofossils, pollen) and an Aquatic wg (e.g. chironomids, diatoms). In the upcoming year, there will only be general workshops/meetings organized by the working groups. As it looks now, Stefan Engels will be the contact person for people working with chironomids and myself at least for beetles; since I have personal contact with the Terrestrial wg leader Petr Kuneš, I’ll do my very best to involve as many terrestrial paleoentomologists (from Europe) as possible. From the few people that filled in the short survey that I sent around earlier; it became clear that we definitely could use such a workshop to organize a separate meeting as well.

Hopefully, next year I’ll finally become a Neotoma data steward and can assist in uploading old and new data sets into Neotoma.

The last news that I heard through the grapevine, is that the Terrestrial wg conference will take place in Prague between 2-4 July 2025. If I hear anything else in the meantime, I’ll share it over email.

A Low-Input Archaeology Flotation Device

From Ethan Kerr, The Catholic University of America (emkerr20@gmail.com)

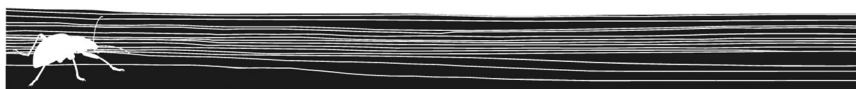
To improve the experience of archaeological water flotation, this research project created a flotation system that built upon current professional devices with the addition of water filtration, the usage of easily sourceable materials, and other minor design modifications. Water filtration allows for lower water consumption, making it ideal for sites with limited water availability; as well as producing less water waste. Easily sourced materials combined with simpler, yet efficient designs allow for quicker maintenance with minimal mechanical experience or access to specialized tools. Both of these improvements also contribute to lower costs for both the device itself and the use of the device. A working flotation system prototype was designed and built at The Catholic University of America for a 2024 mechanical engineering senior design project. For more details, see the poster that was presented at the Council of Northeast Historical Archaeology (CNEHA) 2024 annual meeting.

Continued improvements are being made as part of personal research with plans to conduct field tests. The ultimate goal of the project is to develop a working system that is capable of industry-standard efficiency while being economically accessible for all archaeologists. Modification options to the filter system are being tested for paleoentomologists specifically performing paraffin kerosene flotation. Please help contribute to this research project by sharing your experiences, interests, and comments by completing the survey here:










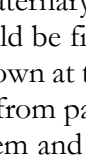
<https://forms.gle/7jJ6vo3D5mQZ48nY7>

Anyone with direct questions or feedback can reach me via email at: emkerr20@gmail.com

Quaternary Entomology Dispatch



Archaeology Macro Botanic Flotation Device
 By: Ethan Kerr

<p>Project Objective: To design and build a system that separates macrobotanical samples from soil and recycles the water.</p> <p>What is Flotation? Separation and collection of seeds, grass, charcoal and other organic materials from soil collected at archaeological sites.</p> <p>Current Methods</p> <p>DIY</p> <ul style="list-style-type: none"> • Efficiency ranges  <p>Flote-Tech™</p> <ul style="list-style-type: none"> • 50%+ recovery • No filtration <p>Bucket Flotation</p> <ul style="list-style-type: none"> • Slow • 80%+ recovery • high water usage 	<p style="text-align: center;">Progress</p> <div style="border: 1px solid red; background-color: red; color: white; padding: 2px; text-align: center; margin-bottom: 5px;"> 1) Structure </div> <ul style="list-style-type: none"> • 50 gallon water capacity • ~3.5'x2' • Round design reduces corners    <div style="border: 1px solid red; background-color: red; color: white; padding: 2px; text-align: center; margin-bottom: 5px;"> 2) Filtration </div> <ul style="list-style-type: none"> • Two stage filtration <ul style="list-style-type: none"> ◦ > 10 micron sediment removed by centrifuge filter ◦ < 10 micron sediment removed by cartridge filter • Recycled   <div style="border: 1px solid red; background-color: red; color: white; padding: 2px; text-align: center; margin-bottom: 5px;"> 3) Collection </div> <ul style="list-style-type: none"> • 86% recovery rate • Light fraction collection ~1 mm <ul style="list-style-type: none"> ◦ Poppy seeds and tobacco seeds • Window screen- heavy fraction mesh • Kitchen stock mesh- light fraction mesh <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Light Fraction</p>  </div> <div style="text-align: center;"> <p>Heavy Fraction</p>  </div> </div>	<p style="text-align: center;">Goals</p> <ul style="list-style-type: none"> • 5 gallons of sample soil in 30 minutes • Under 5' x 4' structure size • Uses <55 gallons of water • Recycles water and expels waste sediment <p style="text-align: center;">Future Work</p> <ul style="list-style-type: none"> • Improve system components <ul style="list-style-type: none"> ◦ simplify plumbing ◦ Reduce to a single tank ◦ Find alternative centrifuge filter • Design an interchangeable collection mesh • Wider overflow spout • Field test <p style="text-align: center;">Contributors</p> <p>Dr. Laura Masur (CUA Anthropology) CUA Dept. of Mechanical Engineering</p> <p style="text-align: center;">Get Involved</p> <p>Contact: emkerr20@gmail.com</p> <p style="text-align: center;">Fill out the flotation survey</p> 
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Evolution of sieves for wet screening

From Svetlana Kuzmina (kuzmina.alberta@gmail.com)

When I went on my first expedition as a 3rd year student, I knew nothing about the Quaternary insect excavation. My supervisor Sergey Kiselev gave me a piece of metal net one square meter with a mesh of 0.4 mm and instructed to take it with me. He stayed at home, while I flew to fieldwork far away to the North-East with the group of scientists from Moscow University. The Kolyma expedition was studying the Quaternary deposits and permafrost of the Kolyma lowlands. Members of the expedition had experience in screening as they were obliged to search for rodent teeth, on which the local stratigraphy of Quaternary was based. The rodents were washed through a sieve with a mesh of 1 mm; my sieve should be finer.

The base of the expedition was in Chersky town at the mouth of the Kolyma River. Near the town (as everywhere in the north) a lot of planks from packing were lying in the garbage. We made two sieves of the simplest construction from them and the net: a box 45 cm long, 35 cm wide, 10 cm high. The size of the sieve was determined by the size of the brought net and the boards found at the dump. The net was nailed to the frame through the slats. In addition, we fixed two wires under the net to make it sag less (fig. 1).

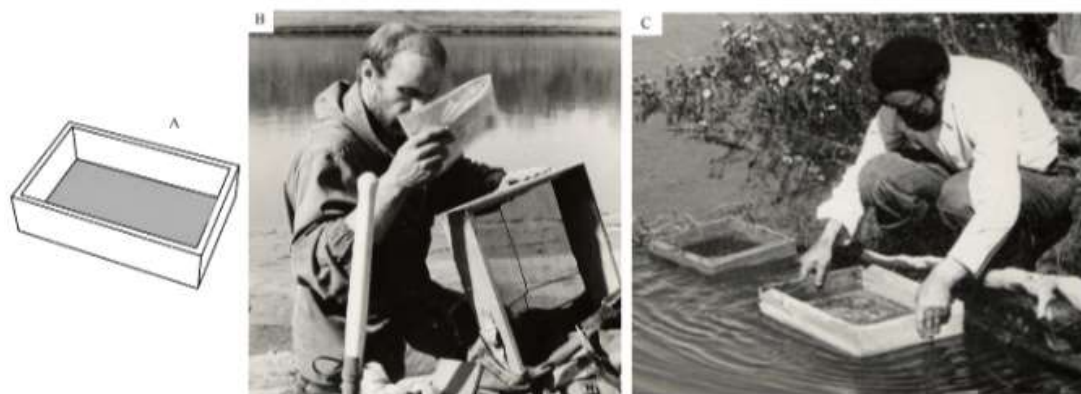
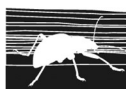


Fig. 1. First woody sieve. (A) Scheme of the sieve. (B) Sergey Kolesnikov carrying the sieve in his backpack. (C) Andrei Sher is using a self-made sieve from a desk drawer, Alazea River.

I made a mistake when I folded the net to fit in the backpack. The wrinkles did not straighten out completely, and the net could not be stretched well. The metallic net should be transported in a roll. The sieves were loaded with other equipment into the helicopter. I had to sit nearby and make sure no one stepped on them or put a heavy or sharp object on them.

The first use of the sieve took place at the Alazea River. Team leader Sergey Kolesnikov showed the washing technique. Water comes through the bottom through the mesh. The user should make sure that the river water does not flow over the side otherwise the sample can be contaminated with modern chitin. I tried it and got stuck in the sticky mud. Sergey filled a rubber boat with water and I began to work on a hard bank screening in this peculiar bathtub. The boat very quickly filled with sediment; we spent more time cleaning the boat than doing the job. As a result, I made a platform on the muddy river edge from fragments of mammoth bones (there was no other hard material there, but bones as many as I wanted). The screening in the river was much more convenient and faster. We took a sieve from a set of factory-made sand sieves (fig. 2) to the next expedition. The bottom size of this sieve was 30 by 30 cm, and its height was only 6 cm. It was too low and less convenient than the old homemade sieve. The summer of the Kolyma Lowland is warm enough, so hands did not freeze in the water. Screening in the Laptev Sea is another matter. To work on the Bykovsky Peninsula we made sieves at home from good boards with attached handles (fig. 3).

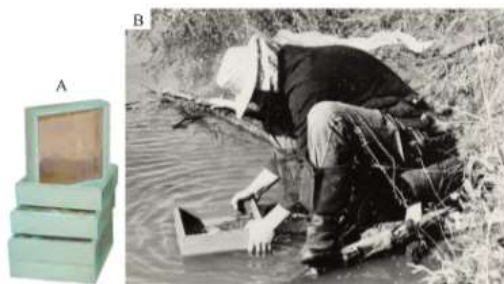


Fig. 2. Manufactured sand sieves. (A) Set of sieves. (B) A field assistant is using this sieve, Alazea River.

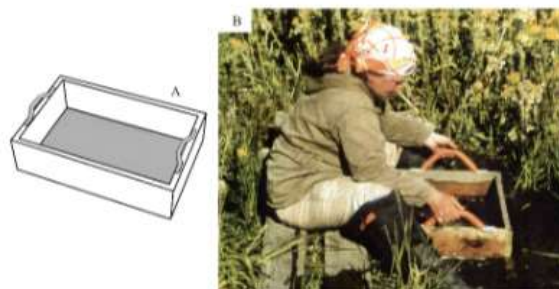


Fig. 3. Woody sieve with handles (A) Scheme of the sieve. (B) Svetlana Kuzmina is using this sieve in the polygonal pool, Bykovsky Peninsula.

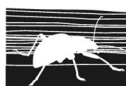
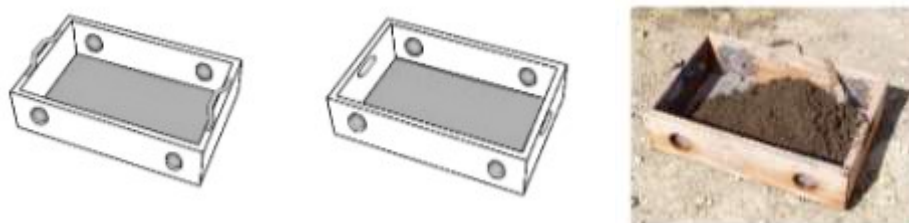


Fig. 4. Rope or belt help to change working position. (A) Sieves with ropes. (B) S. Kuzmina is screening at the Lena River Delta.

The handles kept hands dry. I added a belt to the handles, which made it possible to work not only sitting but also standing (fig. 4). Another important improving of the design was made in Alaska. We were going to the Titaluk River (North Slope). The sieve (fig. 5) was made in the garage of a local paleontologist and handyman Paul Mathews. He cut holes in the side boards and covered them with mesh using a stapler. The side holes were very helpful in washing the clay out. It is common for the clay to clog the bottom of the sieve, which slows the process. The side holes allow the water to move through the

sieve and to break the clay plate. So, my ideal sieve is this: a rectangular box about 40 by 50 by 10, open at the top, with net on the bottom and covered by mesh holes in the long sides, with handles and belt. A technician at the University of Alberta made me a nice sturdy sieve, but the handles were sawn into the boards themselves (fig. 6). Such handles reduced the working height of the sieve by 4 cm, I had to cover them with pieces of cloth. The handle on the top is much more convenient for work, although it gets in the way during transportation. Any woody sieve with metallic net is strong enough to hold a large volume of sediment (fig. 7).



Figures 5-7. The best woody screen box with top handles and side holes; Sieve with inner handles; Wooden sieve allows to screen big volume of sediment.

Sometimes it is necessary to replace the woody sieve with something else. For example, during an expedition to the Unduliung River (northern Yakutia) we were strongly limited in the cargo. We had to sail for a month in a deserted area on motor boats and carry a ton of fuel in addition to expedition and camping equipment. The woody sieves with fragile netting, which cannot be stepped on, were very much in the way in the boat. We didn't know whether there would be suitable sediment for screening in the sections at all, as nobody had worked there before us. We had to take devices for testing a small volume of sediment: 30 pairs of women's nylon socks and three fabric sieves on a metal spring which I found in a Dollar Store as "pop-up-food-cover-set" (fig. 8). The mesh of "pop-up-food-cover" net is about 0.4 mm, the mesh of nylon is 0.1-0.15 mm. To my surprise, the pop-up-food-cover sieves worked well, they held less sediment than

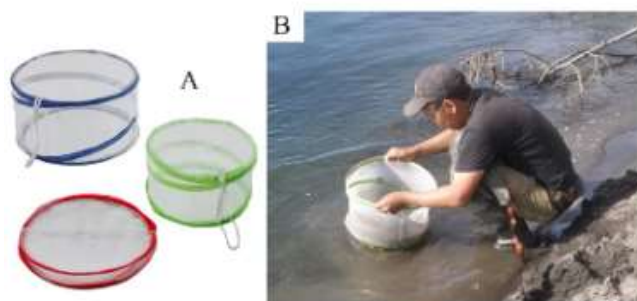


Fig. 8. The pop-up-food-cover set. (A) An image of the set. (B) A field assistant is using this sieve, Unduliung River.

the wooden sieve, but the screening was fast as the water came from all sides. These sieves helped us to make not only test samples, but also big complete samples. The sieve holds up 1-2 kg of sediment. Nylon socks were useful for sampling of small invertebrates and seeds, as the mesh of nylon fabric is small. Socks holds up about 200 grammes of sediment. After this experience, I began to recommend the pop-up-food-cover sieves to all colleagues who do not have extensive screening planned, but who would like to bring some insect samples. These sieves are not very durable, after two weeks of intensive use the fabric tears, but they are light, compact, easily fit in a backpack, and cheap, sold in the low-price stores, you can also order them on Amazon. Several of my colleagues have already tried such sieves and are happy with them.



Fig. 9. A field assistant at the self-made pool in the permafrost.

The best place to screening is a river with a hard sandy bank. There you can put a folding chair and sit comfortably; the current helps to do the washing. A lake or a large pool are also good. Screening in the sea is more difficult, waves, tide interfere, and sea water quickly corrodes the metallic net. On the Bykovsky Peninsula I started screening in the sea, but soon began to look for fresh water (fig. 3a) such as polygonal pools. A few samples in the upper part of the section would have been very difficult to get both to the sea and to the lowland where the polygons were available. We had to dig a hole in the permafrost and wait for two warm days. The pit was filled with water suitable for screening (fig. 9).

Sometimes it happens that there is no water for wet screening in the field at all. Then it is necessary to take the sediment to the expedition base or even to the laboratory. Washing indoors is much more difficult than in a natural water body. A person works in warmth and comfortable conditions, but the speed slows down several times. In the Royal Holloway University laboratory, washing 10 kg of sediment took me several days, while in the field by the river I do it in half an hour. In the laboratory it is impossible to use a large sieve, we have to use a standard soil sieve (fig. 10A). The greatest problem is the sediment remnants. In the field it remained on the place but in the lab, it must be removed. The only advantage of the lab is the clear water. It allows washing not only through the bottom of the sieve, but also from above. The sample is placed in a bowl, filled with water, stirred and the suspension is poured into the sieve in portions. Of course, you can't do this in a simple sink so as not to clog the sewer system. In a sink with a sediment trap it is not possible to wash a lot of sediment either. The trap fills up very quickly and you have to wait for the lab technician to clean it. I put the sieve in an additional dish and collect the sediment there (fig. 10B).

Quaternary Entomology

Dispatch

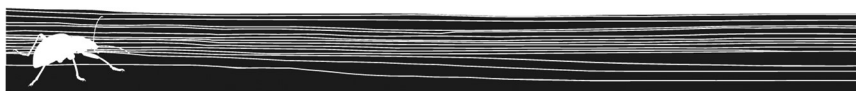


Fig. 10. Washing in the lab. (A) Laboratory soil sieves are good for the lab but too small for the field. (B) Protecting sink from the sediment. (C) Washing barrel. (D) Small sieve with removable nylon net.

After a day the mud settles, the clean water can be removed with a pipette and the mud left to dry in a warm place. After a few days, the mud could be thrown in the garbage (or used by kids for play or ceramic making). I like the wet screening system at the University of Ottawa. They use a barrel similar to a garbage can with a faucet at the bottom, and place the sieve on two boards (fig. 10C).

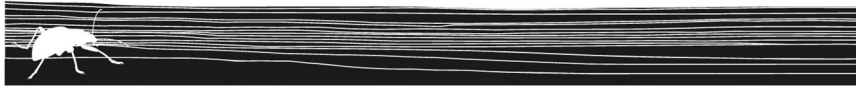
The core samples are better washed in the laboratory. The small volume of samples allows not to fill the sediment trap for a long time. A small sieve is easy to make from a scrap of plastic pipe, a rim and a piece of nylon net (fig. 10D). We made similar sieves from disposable cups with lids; the bottom of the cup is cut off; the middle is cut out in the lid and a piece of nylon is fixed with the remaining rim. The nylon mesh allows us to

find small metallic spherules of cosmic origin, which can stick to metallic mesh of common soil sieve. It is useful to soak the clay, adding a few drops of hydrogen peroxide or detergent (shampoo, dishwashing liquid) to the water. Clay from such treatment stops clumping. In the field, the clay can be soaked in water filtered through a thick fabric. Insects from permafrost usually have very good preservation. Round parts such as weevil heads or even weevil bodies are often filled with sediment. I tried to use the floatation in water to separate light organic and heavy mineral parts. Numerous heavy insect fragments remained in the mineral part. Taking into account this I have never applied the kerosine floatation.

Conclusion

Nowadays, in the age of high technology, it seems strange to discuss how handles and a belt have made fieldwork more efficient. However, we must remember that paleontology is a special science whose methods have not changed for centuries. Even the very idea that sediment can be washed did not come immediately. Insects were once searched like macrofossils by simple visual inspection. In this way we can find very beautiful remains of almost whole beetles, such as *Donacia* in the peat, or insects in the La Brea Tar Pits. But it was only by washing the sediment that Quaternary insects could be collected almost everywhere. Thanks to washing, the study of Quaternary insects takes place not only near unique sections, but wherever an entomologist who is interested in this field appears. Everyone invents his own method of washing and makes his own tools. Here I wanted to share my experience and warn my colleagues from possible mistakes.

Quaternary Entomology



Dispatch

Master thesis by Carlos Salazar Guerra (Memorial University of Newfoundland and Labrador)

Email: cesalazargue@mun.ca

Supervisor: Dr. Véronique Forbes

The UNESCO World Heritage site of L'Anse aux Meadows has been the home of many cultures, such as the Maritime Archaic, Pre-Inuit Dorset, Norse, and groups ancestral to the Beothuk/Innu. It is commonly agreed that the presence of these cultures at the site were seasonal and/or short-lived. Therefore, any attempt to provide meaningful insights into past human-environment interactions at L'Anse aux Meadows using palaeoenvironmental analysis requires a high-temporal resolution sampling method. This thesis has designed a methodology to address this challenge, by building on the 'standard' archaeoentomological methodology and drawing lessons from other methods deployed in Human Paleoecology, most specifically palynology. A custom-made sampling tin was used to collect a 40-cm thick peat monolith located within a 20-m distance from the nearest Norse building at the site. Within the monolith, vertically thin (0.5 cm-thick) and volumetrically small (c. 5 mL) subsamples were analyzed for palaeoecological data (beetle and charcoal concentrations as well as loss-on-ignition organic content estimates).

This data paired with radiocarbon date age-depth modelling identified the section of the whole monolith worthwhile examining for human-mediated beetle biodiversity changes as being located between 40.5 and 30 cm deep, which covered a period of time when the Pre-Inuit Dorset, Norse, and groups ancestral to the Beothuk/Innu occupied the site. Volumetrically small subsamples permitted to test and select a weak alkaline chemical treatment ideal to ease the sorting of clean beetle sclerites. From this 10-cm thick section, a total of 21 subsamples (each 0.5-cm thick) yielded a total of 621 individual beetles, with a recovery rate of 6 MNI/mL, much higher in contrast to the 'standard' archaeoentomological method (anywhere between 5 and 50 MNI/L). The designed methodology successfully localized a section containing a ca. 1,000-years record of local beetle assemblage change, representing a palaeoecological reconstruction resolved at a time scale close to 34 years (on average) per subsample. The beetle assemblages reported for the Indigenous hunter-gatherers and the Norse presented high concentration of Omaliinae and Aleocharinae subfamilies, joined by Ptiliidae, Elateridae, Cryptophagidae, and Latridiidae families, all of which benefit from nutrient-rich microhabitats. The Norse assemblage also included members of the Micropeplinae, Pselaphinae, Paederinae, and Staphylininae subfamilies and Nitidulidae family, all of which thrive in microhabitats found in forest litter or similar habitats that could have been maintained inside the Norse buildings.



PhD thesis by Axel Hacala (L'université de Rennes)

Oribatid mites in paleoecology, a recent PhD project studying the peat bogs of the archipelago of Saint-Pierre and Miquelon.

By Axel Hacala (axel.hacala@gmail.com)

The subject of oribatid mites as model taxa in paleoecology was raised in a PhD thesis defended earlier this year and supervised by Dominique Marguerie, Allison Bain and Julien Pétillon (Hacala 2024). Indeed, the specialists working on this fauna are scarce, and this trend is even stronger in paleoecology despite the potential the mites have as a proxy. In this PhD project, the mites were studied under two lights: (1) Are oribatid mites a good proxy for climate reconstructions (The Mutual Climate Range methods)? (2) What can we learn about environmental dynamics through the combined use of oribatid mites and plant remains in paleoecology?

The first approach used an already published dataset of oribatid mite assemblages ranging throughout the Northern Hemisphere (Mumladze et al. 2013). The method used the model taxa's geographical ranges (here extracted from GBIF dataset) and the climate associated with those localizations (here Minimum, Maximum, and Mean temperatures based on recent climate data from WorldClim). Lastly, an MCR method was used to estimate the temperature of the 46 sampling sites through a climate reconstruction analysis which was compared with the actual temperatures associated with the sampling sites in WorldClim.

The results were encouraging but highlighted how the lack of knowledge of oribatid biogeography was an issue for robust reconstruction. Indeed, the results of the reconstruction were sometimes faithful to the site climates, while other tests showed poor reconstructions (Fig. 1).

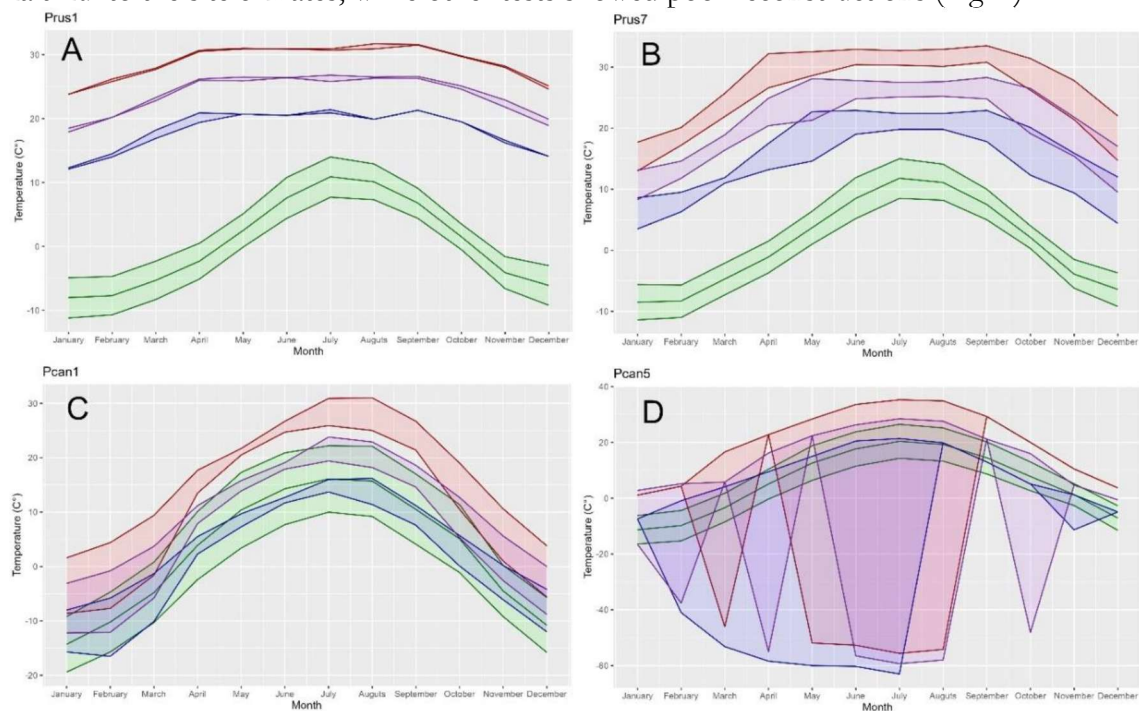


Figure 1: Climatic reconstructions based on oribatid mite's assemblages for each month. In green the known temperature of the studied site, the upper and lower line being maximum and minimum temperatures while the middle line being the median temperature. In red, the reconstructed intervals of maximum temperature. In purple, the intervals of reconstructed median

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temperature. In blue, the intervals of reconstructed minimal temperatures. A: an example of poor temperature reconstruction; B: an example of intermediate temperature reconstruction; C: an example of improved temperature; C: an example of miscellaneous temperature reconstruction.

The second paleoecological analysis involving oribatid mites within this PhD project used the macro-remains of oribatid mites in peat cores from the archipelago of Saint-Pierre and Miquelon (a French island on the Atlantic coast of Canada with an arcto-boreal climate). Three proxies were used jointly: the mites, the pollen, and the vegetation macro-remains. Overall, the usage of the three proxies together strengthened the analysis by displaying robust patterns, as they were shared by the proxies (Fig. 2).

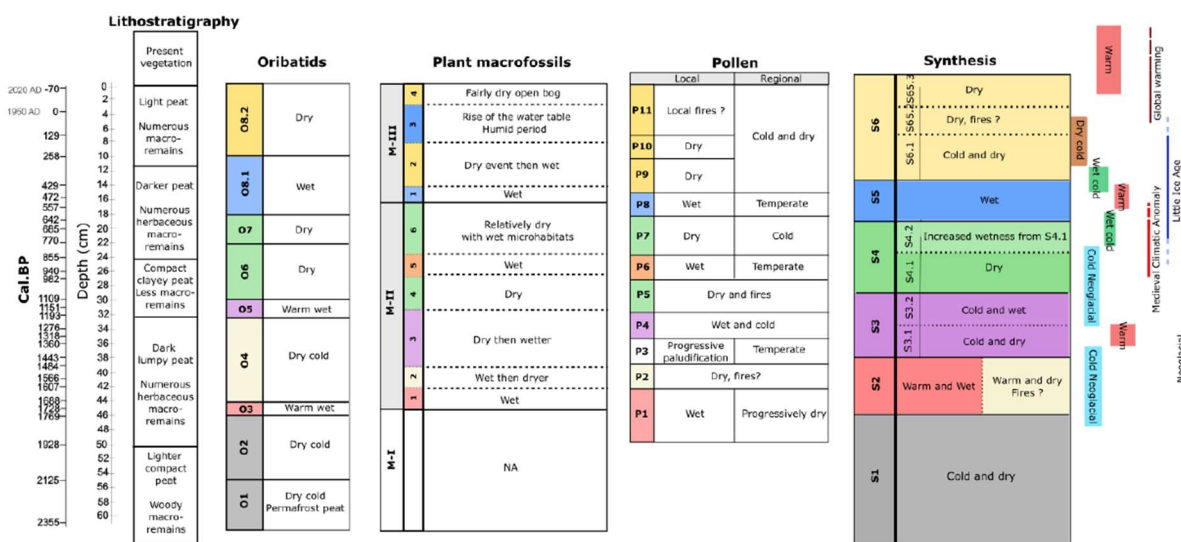


Figure 2: Synthesis of interpretations from the three proxies.

If we focus on the mites here, we observed some robust patterns as there were several observed species with consistent patterns of abundance and ecological coherence in their presence. What we could learn here through the study of oribatid mite assemblages were patterns of cold or warm climates with wet and drier periods. As pointed out in past publications, oribatid mites hold strong potential as proxies in paleoecological studies, as they are found in abundant quantities in paleoecological contexts and are preserved well enough that over 80% of them can be identified to the species level (Schelvis, 2020). Those qualities associated to numerous species with various ecology makes for a good proxy.

The last obstacle between oribatid mites and their bright future as a common proxy in paleoecology remains the difficulty of identifying the specimens. On that note, some help appeared through the 2023 book *Oribatid Mites: Biodiversity, Taxonomy, and Ecology* by Valerie Behan-Pelletier and Zoë Lindo. This book is a precious and well-illustrated tool for North American oribatid identification.

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Back in 2011, Scott Elias and Véronique Forbes set up a mailing list to facilitate communication amongst researchers in Quaternary Entomology. The list allows subscribers, including experienced workers in the field but also students, to exchange news and ideas and to query their colleagues about any questions, problems or requests they may have. Our mailing list is hosted by Jiscmail, a national academic service based in the UK.

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