



**QUATERNARY
PERSPECTIVES**

The INQUA
Newsletter



Issue 39
June 2026

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QUATERNARY PERSPECTIVES
is the newsletter of



INQUA
INTERNATIONAL UNION
FOR QUATERNARY
RESEARCH

Established in 1928, INQUA is the representative body for Quaternary science world-wide. INQUA is dedicated to removing barriers and to fostering diversity and inclusivity by prioritising funding for early career and developing country researchers to enable their participation in the international scientific networks that INQUA supports. INQUA promotes – and operates according to – a philosophy of inclusivity, not discriminating against any individual on the basis of race, colour, religion, gender, gender identity or expression, sexual orientation, genetics or disability. We encourage you to join INQUA through any of its Commissions, and contribute to the development of Quaternary science worldwide.
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Meghna Agarwala¹; Betty Gimenez²; Shalini Parmar³; Zarina Bikhullina⁴

IUBS-INQUA workshop “How paleontological proxies can inform us about climate change impacts on biodiversity”

The International Union of Biological Sciences (IUBS) and the International Association of Quaternary Researchers (INQUA) jointly hosted a workshop for Early Career Researchers (ECRs) at the Centre for Ecological Sciences, Indian Institute of Science, Bangalore, from June 4 to 8, 2026. The aim of the workshop was to introduce scholars from the disciplines of ecology and evolutionary biology to researchers from the disciplines of paleo-biology to incubate cross-disciplinary research that would allow great theoretical strides in biology and earth sciences. The International Organisation of Paleobotany and the International Society of Zoological Sciences were also involved.

Participants and resource persons at the workshop represented 12 countries, including Argentina, Germany, Japan, Mongolia, Namibia, the Netherlands, Panama, Poland, Spain, Tanzania, the UK, and India. The first two days included talks by resource persons such as Dr. Carlos Jaramillo, Chair in



Figure 1: Group photo of the Workshop participants. (Ph: Renee M. Borges)

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Paleobiology at the Smithsonian Tropical Research Institute at Panama; Dr. Jason Ali, from the Museum of Senckenberg Dresden, Germany; Dr. Vandana Prasad, former Director of Birbal Sahni Institute of Palaeosciences, Lucknow, India; Dr. Lindsey Gillson, Director, Leverhulme Centre for Anthropocene Diversity, University of York, UK; Dr. Aniruddha Datta-Roy, Biological Sciences, National Institute of Science Education and Research (NISER)-Odisha, India; Dr. Meghna Agarwala, Environmental Studies, Ashoka University, India; Dr. P. Ramya Bala, School of Natural Sciences and Engineering,

National Institute of Advanced Studies (NIAS), Bangalore, India; Dr. Jahnavi Joshi, Centre for Cell and Molecular Biology (CCMB), Hyderabad, India; and Dr. Mahi Bansal, National Centre for Biological Sciences (NCBS), Bangalore, India. While Dr. Jaramillo and Dr. Prasad spoke about the paleo-history of the continent of South America and India respectively, and the role of geology and historical legacies in plant communities, Dr. Ali, Dr. Datta-Roy and Dr. Joshi spoke about using molecular techniques such as biogeography to reconstruct geological histories, speciation, extinction and broader patterns in evolution. Dr. Ali focussed on colonisation processes in Madagascar. Dr. Bansal focused on using geology to reconstruct and understand drivers of angiosperm diversity. Dr. Gillson, Dr. Agarwala and Dr. Ramya Bala spoke about their work on using insights from paleo-ecology for present-day conservation and management of ecosystems.

The second day of the workshop also consisted of presentations from the ECRs. The ECRs presented their work on a range of topics. Some used traditional methods in paleontology to understand fossil horse bones (Karol Karbowski), mammoth bones (Ningnung Jakoniao) and the diet of fossil reindeer (Oliwia Oszczepalińska) to understand extinction, adaptation and range constriction in these mammals; others used traditional methods in ecology to understand the ecology of Przewalski's horses in Mongolia (Dorj Usukhjargal) or disease ecology in rodents in Tanzania (Mwajabu Selemani), while still others combined both paleo- and ecological perspectives to study paleo-parasites in South America (Augustin Bellusci). The ECRs presented work that used a wide range of proxies and methods: geochemistry and isotopes, macro- and microfossils of plants and animals, ecology of modern animals, molecular ecology and biomarkers and ancient DNA.

The final two days of the workshop were dedicated to collaborative discussions and brainstorming sessions to foster new collaborations among ECRs participants. Renee M. Borges and Thijs van Kolfschoten, representatives of IUBS and INQUA respectively, opened the session by encouraging participants to interact with ECRs from different disciplines and continents, emphasizing the unique opportunity offered by the workshop to explore new collaborations and ideas. Participants added keywords and concepts on a white-board that reflected the diversity of perspectives within the group. Some focused on time-scales, regions, or proxies, others on

disciplines, or on more precise research project ideas. Groups of ECRs with common scientific interests and complementary expertise organically emerged around a range of research themes.

Five main working groups emerged, each with three to seven ECRs, and the proposed collaborations covered a broad range of topics. One working group emerged around the study of parasites, bringing together ecologists, paleoecologists, and specialists in parasitology from both modern and paleo perspectives. This group plans to explore the potential of parasitology and paleoparasitology, together with complementary approaches, for reconstructing past ecosystems. A second consortium brought together paleoecologists and archaeologists to investigate the distribution and habitats of mammals during the Pleistocene. Another group united modern and paleoecologists around the study of grasslands as alternative stable states through a multi-scale and multi-proxy approach. An additional initiative was launched by several participants to investigate the origins of tropical rainforest biodiversity in the Western Ghats, India, and compare them with the origin of other rainforests. Finally, a working group was established to develop a project focused on the paleoclimate history of the Bay of Bengal that examined the coupling between terrestrial and marine ecosystems.

Each working group then gathered separately to further develop their project ideas. Discussions focused on identifying the specific expertise, interests, and potential contributions of each ECR, reviewing the available literature,



Figure 2: The working group planning a collaboration on the palaeoclimatic history of the Bay of Bengal discuss their project with Dr. Carlos Jaramillo, of Smithsonian Tropical Research Institute at Panama. (Ph: Renee M. Borges)

identifying knowledge gaps, and exploring potential research directions, and complementary collaborators. To define the most appropriate next steps for each initiative, group discussions explored the possibility and relevance of organizing a hands-on training workshop, a discussion workshop to involve additional collaborators, preparing a review paper, or developing grant proposals. Several groups considered applying for seed funding to facilitate future meetings, strengthen the consortium and enhance the expertise of members, and further consolidate the project team and its objectives before pursuing larger funding opportunities. Groups were provided feedback on their ideas from resource persons regularly. Funding opportunities such as the INQUA or IUBS seed grants were specifically highlighted as promising opportunities to support the continuation of these emerging collaborations.

The exchange sessions were productive and provided a particularly valuable platform for ECRs to establish new connections, strengthen interdisciplinary collaborations, and contributed to lay the foundations for new research initiatives. The global representation of the participants, with ECRs originating from almost all continents, and the variety of their disciplines and perspectives, supported the emergence of research questions that spanned regions, ecosystems, and timescales. Overall, the initiatives launched during these two days have the potential to grow well beyond their initial stages, by involving additional researchers and institutions to consolidate working groups, and with the potential to generate lasting scientific collaborations in the years to come.

The workshop received positive feedback from ECR participants, many of whom enthusiastically expressed their interest in sharing reflections on their workshop experience. While each participant had a unique experience engaging with researchers from diverse scientific disciplines, the workshop was widely praised as an intellectually stimulating platform that fostered new research ideas and multidisciplinary perspectives on the factors shaping biodiversity patterns and trends. The scientific sessions were praised for highlighting how palaeontological and palaeoecological evidence can be integrated with modern ecological and conservation studies to better understand



Figure 3: The working group planning a collaboration on paleo-parasitology included ECRs from multiple continents: Asia, South America, Africa and Europe. (Ph: Renee M. Borges)

biodiversity dynamics, climate change impacts, species dispersal, resilience, and extinction processes through time. The ECRs highlighted insights gained from diverse scientific themes, including tropical biome evolution, vertebrate dispersal, angiosperm palaeobiogeography, and biodiversity conservation.

The ECRs felt that a key strength of the workshop was its interdisciplinary and international character, bringing together ECRs and experts from diverse scientific backgrounds, including palaeontology, palynology, ecology, evolutionary biology, and conservation science. Participants valued the opportunity to interact with scientific experts and fellow ECRs from different countries and disciplines, gaining exposure to a wide range of paleontological proxies, methodologies, and research priorities. The ECRs also appreciated the workshop for fostering interdisciplinary thinking, potential collaborative research proposals and strengthening international research networks that may facilitate future funding opportunities through INQUA, IUBS, and related initiatives.

Participants further appreciated the welcoming atmosphere, the excellent facilities and green campus of IISc, Bengaluru, India, and field excursion to the Sericulture facility, which provided practical insights into sustainable resource management and the relationship between biological resources and human livelihoods. Overall, the workshop was regarded as a highly successful platform for scientific learning, networking, and collaboration, leaving participants with new perspectives, valuable professional connections, and renewed motivation for future research.

INQUA Fellowship Report 2026

María Macarena Zarza

Carbon and oxygen stable isotope growth records in *Pomacea canaliculata* shells: paleoenvironmental conditions in the Humid Chaco (Argentina) over the last 2000 years



This fellowship investigated carbon and oxygen stable isotope records preserved in *Pomacea canaliculata* shells to reconstruct paleoenvironmental variability in the Argentine Humid Chaco over the last 2,000 years. The project combined modern field sampling and archaeological materials to build a high resolution baseline for interpreting shell based proxies in lowland South America. During the fellowship, 39 archaeological shells were transported to the Vrije Universiteit Amsterdam for serial microdrilling, while modern shells, water, and vegetation samples collected in the Wet Chaco provided environmental reference data. Laboratory work included shell microdrilling, preparation of plant materials, and organization of carbonate powders for isotopic analysis. The fellowship generated complete modern water and plant isotope datasets and a new serial shell

dataset from both archaeological and modern specimens. Results demonstrate the value of integrating intra shell isotope profiles with zooarchaeological evidence to explore hydrological variability, seasonality, and human environmental interactions.

This fellowship focused on evaluating the potential of *Pomacea canaliculata* shells as high-resolution archives of environmental change in the Argentine Humid Chaco during the last 2,000 years. The main aims were to establish a modern isotopic baseline for shell interpretation, generate serial carbon and oxygen isotope profiles from archaeological shells, and compare these records with broader hydroclimatic variability documented for lowland South America. To achieve these goals, the project integrated field sampling, laboratory preparation, stable isotope analysis, and the comparison of archaeological and modern materials. During the fellowship, archaeological shells from several Humid Chaco sites were transported to Vrije Universiteit Amsterdam, where they were prepared for stable isotope analysis. Modern reference materials collected in the Humid Chaco included *Pomacea*

FELLOW HOME UNIVERSITY/INSTITUTION:

CONICET, Facultad de Ciencias Naturales y Museo, División de Antropología, Argentina

FELLOWSHIP DURATION:

3 months (29 April to 24 July 2025)

HOST INSTITUTION:

Vrije Universiteit Amsterdam (VU), Netherlands

HOST SUPERVISOR:

Jeroen van der Lubbe

RESEARCH KEYWORDS:

stable isotopes, Humid Chaco, paleoenvironment, seasonality, zooarchaeology



Figure 1: Live and dead *Pomacea canaliculata* shells collected at a modern sampling point in the Argentine Wet Chaco.

sp. shells, water samples for oxygen and dissolved inorganic carbon isotope measurements, and plant samples for carbon isotope characterization. At VU, the fellowship enabled shell microdrilling, plant sample preparation, carbonate powder organization, and direct training in an analytical framework designed to reconstruct hydrological and seasonal variability in lowland freshwater environments. The mobility period also strengthened collaborations with specialists in stable isotopes, Earth sciences, and malacology. The fellowship produced a substantial dataset that now supports ongoing interpretation and publication. Complete modern water and plant isotope datasets were generated, and serial shell isotope profiles were obtained for both archaeological and modern specimens. These results demonstrate that shell-based isotope records can be meaningfully integrated with zooarchaeological evidence to reconstruct microenvironmental variability, seasonality, and human interaction with wetland landscapes. In addition, the fellowship opened a complementary line of research on shell morphology and ridge development across contrasting habitats, which has already yielded promising preliminary results and expanded the interpretative scope of the project. Scientific dissemination during and after the fellowship has already begun and will continue through conference presentations and peer-reviewed publications. Preliminary results were presented in the abstracts volume of the plenary talks of JESIUM 2025 and at the XLIV Encuentro de Geohistoria Regional, contributing to broader discussions on Quaternary environmental change, paleoecology, and human-environment interactions in South America. I was also invited to submit a manuscript to *Archaeofauna*, a journal of the Universidad Autónoma de Madrid dedicated to original research on animal remains recovered from archaeological contexts. This invitation provides an important

opportunity to publish an integrated study combining the main results of my doctoral thesis with the new isotopic analyses carried out at VU. The proposed contribution will bring together archaeomalacological, morphological, and geochemical evidence to improve interpretations of past aquatic environments and the ecological responses of freshwater mollusks in the Gran Chaco region. Two main publication lines are currently in progress. The first focuses on seasonal isotope profiles from modern and archaeological shells and their potential for paleoenvironmental reconstruction in the Gran Chaco. The second integrates morphological variation and isotopic evidence to explore ecophenotypic responses in *Pomacea canaliculata* across different aquatic settings. Together, these outputs show that the fellowship successfully generated original scientific material, strengthened international collaboration, and laid the foundation for peer-reviewed publications on Quaternary environmental change, freshwater ecosystems, and archaeofaunal studies in South America.

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- Manuscript in preparation: Seasonal stable isotope profiles in modern and archaeological *Pomacea canaliculata* from the Gran Chaco.
- Manuscript in preparation: Shell morphology, ridge development, and ecophenotypic variation in *Pomacea canaliculata* across contrasting aquatic habitats.
- Manuscript in preparation: Dinámicas de larga duración en la zooarqueología de paisajes acuáticos chaqueños.

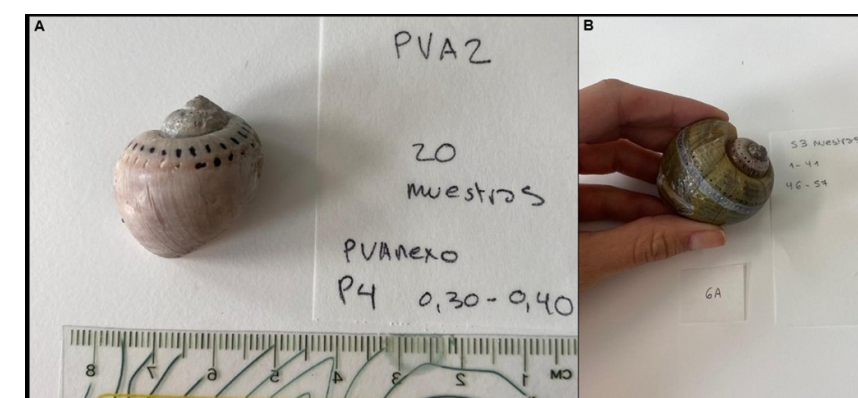


Figure 2: Archaeological and modern *Pomacea canaliculata* shells selected for serial microdrilling at Vrije Universiteit Amsterdam.

AEQUA - Spain

P.G. Silva¹, J. Jordá², T. Bardají³

AEQUA's 40th Anniversary Book: The most significant QSites in the history of Quaternary Studies in Spain



Following the trail blazed in 2022 by the IUGS with its First 100 Geological Heritage Sites and, two year later, the Second 100 Geological Heritage Sites, the Spanish Association for Quaternary Research (AEQUA), on the occasion of its 40th anniversary, has issued a volume compiling 103 significant Quaternary sites (QSites) across the Iberian Peninsula and the Balearic and Canary Islands.

An AEQUA QSite is an outcrop, site, or particular event considered a relevant milestone in the history of Quaternary studies in Spain or in adjacent areas of the Iberian Peninsula.

The number 103 refers to marine isotope stage (MIS) 103, which marks the onset of the Quaternary Period 2.58 Ma ago.

The selected QSites illustrate major milestones in diverse research fields, including paleoclimatology, glaciation, periglacial processes, sea-level changes, Quaternary tectonics and volcanism, soil sciences, coastal and continental records, fossil fauna, geoarchaeology, archaeology (Prehistory), and palaeoanthropology. Within these latter fields, many of the included sites have been, and remain, pivotal for studying human evolution, Neanderthal and pre-Neanderthal populations, cave art, Holocene cultural developments, and the onset of the Neolithic in the Iberian Peninsula.

The work highlights also key locations for emerging disciplines analysing natural hazards, such as palaeohydrology (floods), palaeoseismology, and archaeoseismology (earthquakes and tsunamis). The QEvents featured in this volume have served as benchmarks for assessing and monitoring the hazards of specific geological processes that have caused significant social and economic impacts over the last 40 years. These include the 2011 Lorca earthquake, the 2011–2012 El Hierro submarine eruption, the 2021 La Palma eruption, and the recent floods in the Valencia region caused by the October 2024 DANA. In connection with the latter, the volume addresses global warming by examining the record of the last remaining glaciers in the Pyrenees. Finally, regarding human impact on the planet and

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its geological record, this work illustrates iconic sites linked to the controversial "Anthropocene" in Spain, such as the coastal outcrops of Gorronatxe and Tunelboca in Biscay, and the Anthropocene tuffs of Lomo Morín in Tenerife.

Iconic sites that initiated Quaternary studies in Spain during the late 19th century—such as Altamira, the Gibraltar caves, and the glaciers of the Pyrenees and the Central System—are included alongside the Atapuerca sites, which have positioned Spain at the forefront of European human evolution research. Naturally, the volume also features Cova dels Cavalls (Castellón), home to the Levantine rock art archer depicted in AEQUA's logo.

This volume reflects the profound multi-disciplinarity characterizing modern Quaternary studies and its progress since AEQUA's inception 40 years ago. It provides a broad regional coverage by including sites from almost every autonomous community and province. Likewise, we have not forgotten our friends from Andorra and Gibraltar, home of key sites for the study of the Quaternary in the Iberian Peninsula. They have collaborated with AEQUA on many occasions and have even served as hosts for Iberian Quaternary Meetings (REQUI: Gibraltar, 2005) or National Quaternary Meetings (AEQUA: Andorra, 2011).

The work brings together an exclusive collection of "Quaternary pearls" that illustrates the importance of Quaternary studies in Spain, as well as the thematic richness that our territory possesses at an international level. This may help us raise public awareness regarding the significant

impact of Quaternary sciences on contemporary society. Over the last 40 years, all these disciplines have gained increasing practical application across a multitude of relevant or critical aspects of our history and prehistory, climate and environmental changes, and the analysis of hazardous geological processes. As it is well known, studying the Quaternary means continuing to learn about the 'Geological History of Prehistory' (Silva et al., 2017), while also deciphering past geological rhythms that are crucial for mitigating environmental degradation in the future.

The work remains open to future editions that expand the collection to other important QSites yet to be described, or even discovered, in our country. In this first edition, more than 150 authors have collaborated—81 of whom are lead authors—belonging to 51 universities, public institutions, CSIC research institutes, museums, foundations, and companies that have provided the texts and the excellent graphic information included in the files. Finally, we would like to express our gratitude to the numerous collaborators who have participated in the creation of this collective work, mostly members of AEQUA.

The book will be presented to the Spanish Quaternary community during the XVI National Meeting of Quaternary, hosted in Huéscar (Granada) next July. After its official "birth" the book will be available as an open-access one through the AEQUA webpage:

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CANQUA - Canada
Jennifer Korosi¹, Duane Froese², and Maria Velez³

Canadian Quaternary Scientists Gathered in Montreal, Québec, Canada



Figure 1: Attendees gather at the poster session of the Canadian Quaternary Association biennial meeting held in Montréal (Québec, Canada) on June 4, 2026.

From June 3 to 6, 2026 Quaternary scientists gathered in Montréal (Québec, Canada) for the biennial meeting of the [Canadian Quaternary Association](#) (CANQUA). CANQUA was founded in 1975 and consists of an interdisciplinary group of scientists who share a common interest in understanding the past 2.6 million years, and how it has shaped our world today. Membership is open to anyone interested in Quaternary studies in Canada.

The Montréal meeting was co-hosted by [McGill University](#) and the [Geotop Research Centre](#), led by Peter Douglas (McGill) and Natasha Roy (Geotop), and brought together ~200 participants from across Canada and abroad. Conference presentations covered a wide range of topics, including palaeoclimates, cold regions geomorphology, limnogeology, geoarchaeology, carbon cycling, glacial geology, palaeontology, and palaeoecology, among others. Six workshops were held that offered hands-on training in geochronology, biogenic calcium carbonates, quantitative reconstructions, geomatics, and geological modeling approaches. The opening reception keynote was delivered by Dr. Paulette Steeves, on the “Indigenous Paleolithic of the Western Hemisphere.” Additional keynote speakers included Dr. Sarah Finkelstein (“Tracing the Quaternary origins of wetland soil carbon stocks to assess their resilience in a warming world”), Dr. John Williams (“Studying Past Vegetation Dynamics at Continental to Global Scales Through Open Community-Curated Data Resources”), and Dr. Rob

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Figure 2: CANQUA President Jennifer Korosi presents the 2026 W.A. Johnston Award to Dr. Francine McCarthy.

DeConto (“Dynamic Ice Sheets: Past, Present and Future”).

Three field trips were organized that allowed interested participants to explore Montréal and the surrounding regions. A 3-day field trip to the Charlevoix region and the Saguenay Fjord was held before the meeting, led by Etienne Brouard (Ressources naturelles Canada, Commission géologique du Canada), Pierre-Olivier Couette (Département de géographie, Université Laval), Patrick Lajeunesse (Département de géographie, Université Laval), and Martin Roy (Département des sciences de la Terre et de l’atmosphère, Centre de recherche Geotop, Université du Québec à Montréal). The region hosts exceptional geological sites that document the events of the last glaciation and deglaciation. Two 1-day post-conference field trips were also organized, including a visit to the Saint-Léonard Cave, a unique geological site located in the heart of Montréal, as well as a walking tour that explored the urban ecology of Montréal.

Six student presentation awards were given out at the meeting, recognizing the excellence of Canada’s emerging generation of Quaternary scientists. Zoe Landry, University of Ottawa, was awarded 1st place in the poster presentation category (“New cranial material and DNA sequence data clarify phylogenetic relationships and biogeographic history of *Haringtonhippus francisci*”). Chris Hebda, University of Victoria, was awarded 2nd place (“The world beneath the waves: reconstructing submarine glacial history and late Pleistocene sea level change on the west coast of Canada”), and Isabelle Galipeau, Université de Montréal, was awarded the 3rd place prize (“Postglacial history of the northernmost population of pitch pine (*Pinus rigida*) in North America”). The award for best oral presentation was given to Kerstin Brembach, Université Laval (“Sediment records associated with environmental changes in glacier-influenced fjord environments in the Canadian High Arctic”). Sidney Crawford, Lakehead University, placed second in the oral presentation category (“History of the Giant Beaver: Indigenous Knowledge and Palaeontology”), and Lindsay Worden, University of

Victoria, received the third-place prize (“Reconstructing the glacial dynamics of the Cordilleran Ice Sheet on northern Vancouver Island, British Columbia, during the Last Glacial Maximum”).

Dr. Francine McCarthy was the 2026 recipient of the [W.A. Johnston Award](#), CANQUA’s highest honour, which was presented to her at the awards banquet. W.A. Johnston was an innovator in Quaternary studies in Canada who, in his years with the Geological Survey of Canada, developed many of the concepts of regional Quaternary studies used today. The Johnston Award recognizes outstanding professional achievement in Quaternary Science, with the first medal awarded in 1987. Francine is recognized as an outstanding ambassador in Canada and internationally on the utility of Quaternary science to understand Earth systems and the important role humans play in them, including the campaign she led to have Crawford Lake in southern Ontario as a proposed GSSP candidate site for the Anthropocene. CANQUA also presented Dr. Anne de Vernal with her 2020 Johnston Award at the banquet, taking advantage of an opportunity to publicly recognize her achievement when we were unable to do so in 2020 due to COVID. Anne was recognized for her pioneering contributions to paleoceanography, and her long record of service and mentorship in Canadian Quaternary sciences. Anne was also one of the co-organizers of the Montréal meeting.

In summary, the Montreal meeting reflected the dynamic and diverse community of Canada’s Quaternary scientists, at the forefront of Quaternary research. The next CANQUA meeting will be hosted by York University in Toronto (Ontario, Canada) in June of 2028.



Figure 3: Former CANQUA President Matthew Peros presents the 2020 W.A. Johnston Award to Dr. Anne de Vernal.

CANQUA - Canada

Jessica Z. Metcalfe¹, Robin J. Woykitka², Victoria Wanihadie³, Grant D. Zazula⁴

Indigenous Palaeontology, Archaeology and Giant Animals of the Quaternary Session at CANQUA 2026



Figure 1: Session organizers and presenters Jessica Metcalfe (far left) and Victoria Wanihadie (far right) presented on things they have learned from their collaborative research in western Canada. Presenters Edward Jolie (middle left) and Sharon Gloshey (middle right) discussed the footprints at White Sands National Park as evidence of Native American relationships with megafauna.

Mega-faunal fossil remains are the literal and metaphorical bones upon which Quaternary sciences are built. Palaeontologists and archaeologists dig them up and study them, museums display them, the media tells stories about them, and the public loves them. For most of us, it is virtually impossible to think about the Quaternary without conjuring images of woolly mammoths and other extinct animals walking across windswept ice age landscapes. But what do these animals and their bones mean to Indigenous people, and why should that matter to scientists? What role can mega-faunal research and more equitable knowledge sharing play in advancing reconciliation efforts with Indigenous people in Canada, and communities abroad?

At the recent biennial meeting of the Canadian Quaternary Association in Montreal, Quebec (June 3-6, 2026), a session entitled "Giant animals (mega-fauna) in palaeontology and archaeology: Indigenous and non-Indigenous perspectives" brought together academics, government and museum employees, and community representatives to share their knowledge, experiences,

- perspectives, and aspirations about mega-fauna. Presenters highlighted how Indigenous people and their worldviews have been historically excluded from archaeological and palaeontological work on mega-fauna, and why this is a problem. They demonstrated how, in some parts of the world, western scientists are beginning to recognize the value of Indigenous knowledge and the roles scientists can (and should) play in working towards restorative justice for Indigenous people.
- The session's presenters (in order of appearance) and their topics were as follows:
- Paulette Steeves (Algoma University): Songs our ancestors sing: Mega-fauna relations in the western hemisphere archaeological record.
 - Jessica Metcalfe (Lakehead University): Powerful mega-fauna: Palaeontological and Indigenous perspectives on giant animals in western Canada.
 - Edward Struzik (Princeton University Press/ Queen's University): How the media shaped our understanding of ice age history since the late 19th century.
 - Grant Zazula (Yukon Government): Understanding Nun Cho Ga the 'big animal baby' from the Tr'ondëk Hwëch'in Traditional Territory and comparing Indigenous-woolly mammoth relationships across the circumpolar north.
 - Ty Styner (Tr'ondëk Hwëch'in Government): Tr'ondëk Hwëch'in Relationships with Nun Dänojà' (Ancient Animals).
 - Edward Jolie (University of Arizona) and Sharon Gloshey (New Mexico State University): Tracking Native American coexistence with mega-fauna in the American Southwest.
 - Sidney Crawford (Lakehead University): History of the giant beaver: Indigenous knowledge and palaeontology.
 - Gabriel Yanicki (Canadian Museum of History): Approaching deep time through Blackfoot cultural memories of mega-fauna.
 - Robin Woywitka (MacEwan University) and Cameron

- Poole (University of Alberta): The potential for preservation of large animal kill sites in inter-dune peatland (poster).
- Zoe Landry (University of Ottawa): New cranial material and DNA sequence data clarify phylogenetic relationships and biogeographic history of Haringtonhippus francisci (poster).

After the oral presentations there was a 1-hour question-and-answer period in which all the presenters interacted with the audience. This allowed the presenters to elaborate on their perspectives and work with Indigenous communities, giving the audience a better sense of their personal relationships and the stories behind the research. At the same time, the audience members were able to ask about and make connections with their own related experiences. This format was chosen to promote reciprocal learning and relationality, which are critical pedagogical elements for many Indigenous groups.



Figure 2: Presenter Grant Zazula contrasted the process of recovering and caring for the baby mammoth, Nun Cho Ga, with the collection and treatment of previously-discovered frozen mammoths in northern areas.

benefits science and gives space for Indigenous communities to voice their knowledge. Several presentations discussed the strong cultural connections some Indigenous communities share with mega-fauna, including deep respect and the belief that giant animals (and their remains) are other-than-human kin. Stories of mega-fauna live on in Indigenous oral histories and in the archaeological record of lands where Indigenous ancestors lived alongside giant animals. These understandings are the impetus for changes in how archaeologists and palaeontologists study and speak about mega-fauna, including more culturally-respectful ways of treating fossil animal remains.

The Quaternary sciences examine geological, climatological, environmental and cultural changes during the time period that includes the addition of our own species to the sedimentary record. Much of this research occurs on lands that are home to and have been cared for by Indigenous people for generations. We hope this session serves as a catalyst for other Quaternary scientists and organizations like INQUA and CANQUA to ask how their work could be done in more equitable ways by meaningfully including Indigenous communities and perspectives. Bringing Indigenous people and worldviews together with western science and scientists is an ethical imperative in places where Indigenous people have been (and continue to be) disadvantaged due to colonialism, as well as in nations that were responsible for colonial expansion.



Figure 3: Presenter Ty Styner and the Tr'ondëk Hwëch'in Nun Cho Ga Stewardship Committee participated via Zoom link. They shared Tr'ondëk Hwëch'in worldviews related to ancient animals and the land they come from.

Conference attendees from a variety of backgrounds and academic levels approached the convenors afterwards with appreciation for both the topic and approach of the session. We observed that many non-Indigenous scientists at the conference recognized the role of colonialism and historical injustices in keeping Indigenous knowledge out of Quaternary research, and agreed on the importance of including Indigenous perspectives as a step toward reconciliation with Indigenous people. However, many scientists don't know how to contribute or where to start.

The presentations in this session demonstrated that there are many pathways to community-based research. Indigenous Quaternary sciences is not simple, but the process produces meaningful and relevant research that

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Project: PalCoproSA 2605 sy

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Integrating tools for investigating palaeoecosystems through multiproxy analysis of coprolites

16-20 November 2026, Antofagasta de la Sierra, Catamarca, Argentina

The INQUA-funded workshop entitled PalCoproSA: “Integrating tools for investigating palaeoecosystems through multiproxy analysis of coprolites” will bring together participants from different countries in order to create a multi-disciplinary network of researchers and advance palaeoecological investigations and practices in South America.

Although the PalCoproSA workshop is primarily aimed at Early Career Researchers (ECRs), it will also host leading scientists, PhD students and postgraduates with the objective of providing practical and theoretical training in methodologies for multiproxy analysis of coprolites and sediments. The primary focus is the enhancement of technical skills related to:

- 1. the recovery of coprolites and cave sediments during archaeological excavations;
- 2. the preservation of samples in collections; and
- 3. the application of multiproxy analysis.

Specifically, the PalCoproSA workshop aims to enhance technical skills in sample collection during archaeological excavation and preservation with a focus on education and gaining experience in:

- 1. macroscopic analysis: morphology description and classification of coprolites;
- 2. microscopic analysis of coprolites and sediments (e.g., pollen, phytoliths, plant remains), biomolecular analysis (aDNA, proteins, lipids) and biogeochemical analysis (stable isotopes);
- 3. methods for subsampling and processing coprolites (biomolecular, macroscopic, and microscopic remains extractions) (Figure 1).

- 4. Practical application, modeling and interpretation of stable isotope data into regional datasets and contexts.

The reconstruction of palaeoecosystems based on palaeoecological proxies (e.g. plant waxes, faecal biomarkers, stables isotopes, pollen, aDNA, phytoliths) of coprolites requires the integration of specialists in diverse methodologies and the fostering of critical analysis of new data to promote collaboration among researchers at various levels of their career and their interdisciplinary research.

In this regard, this workshop aims: 1. To increase the knowledge of these methodologies from a place based perspective by performing this workshop in South America. 2. To ensure equitable participation across diverse disciplines, genders, and countries promoting inclusivity and diversity within the scientific community. 3. To promote engagement between academics and local community groups with overlapping interests.

The meeting will be held in Antofagasta de la Sierra locality, Catamarca province, Argentina between the 16th and 20th November, 2026. It will feature two days of oral presentations about practical and theoretical training in methodologies, followed by a field trip of two days to examine archaeological sites at Antofagasta de la Sierra locality, where

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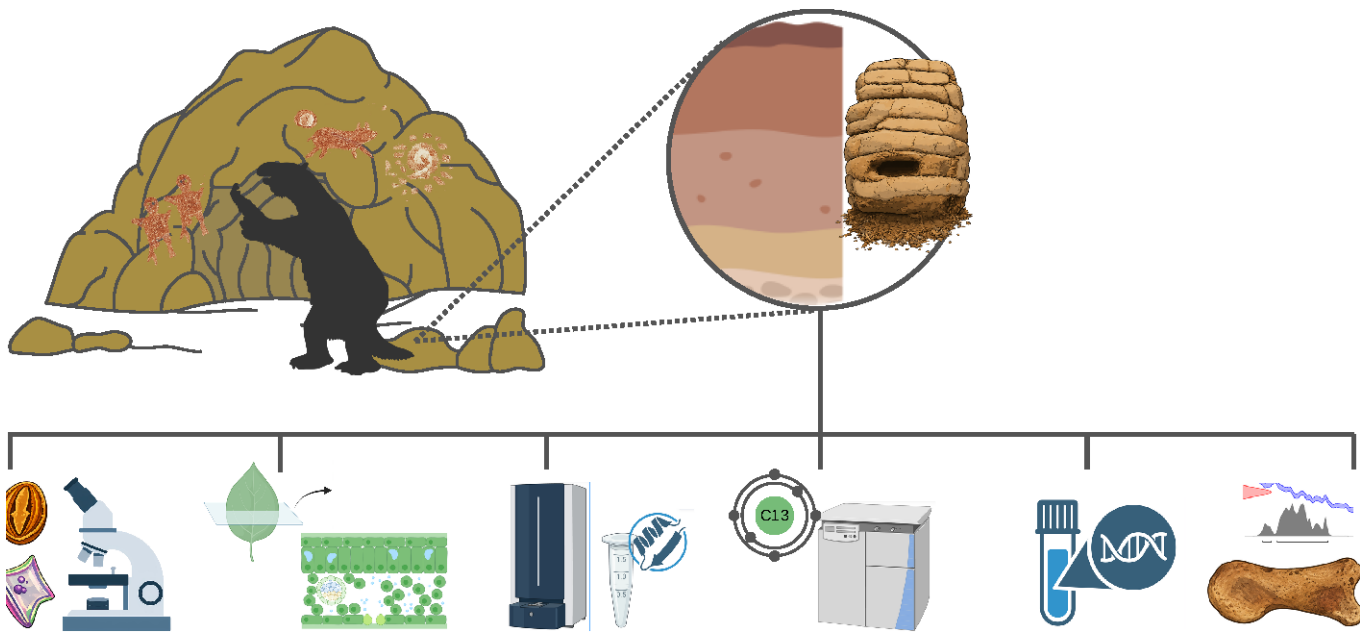


Figure 1: Multiproxy analysis of megafaunal coprolite deposits, associated bone remains and cave sediments (from left to right): pollen and phytolith microscopy, leaf wax biomarker, palaeoproteomics via mass spectrometry, stable isotopes, ancient DNA and radiocarbon dating.

different materials associated with extinct megafauna were found (Figure 2). At the end of the workshop, there will be a designated workday carried out to outline future research, as well as documentation and writeup of the project.

Beyond scientific exchange, PalCoproSA will promote dialogue with local communities through outreach activities involving students, tourism professionals, and local stakeholders (Figure 3).

PRELIMINARY PROGRAM

Day 1. 16th of November, 2026

Topic: Sample collection during archaeological excavation and preservation. Documenting coprolites prior to sampling; subsampling and processing coprolites and

sediments.

- Opening Remarks & Workshop Overview
- aDNA analysis and macroscopic analysis (Dr. Petrigh)
- Palaeoparasitological collection (Dr. Meneses Nunes, Fundação Oswaldo Cruz, FIOCRUZ, Brasil)
- Group Activity: discussion session. Workshop team
- Workshop for the local community. Workshop Team (Dr. Zuccarelli, Instituto Regional de Estudios Socio-culturales, Consejo Nacional de Investigaciones Científicas y Técnicas, Universidad Nacional de Catamarca, (IRES-CONICET/UNCA, Catamarca, Argentina) and Max Planck Institute of Geoanthropology, Germany. Daniela Arango Ruda (Fundación Universitaria Juan N. Corpas, Colombia).



Figure 2: Field trip of two days to examine archaeological sites at Antofagasta de la Sierra locality.



Figure 3: Activities with local students, professionals related to tourism, mining and paleontology in the area will be performed.

- Day 2. 17th of November, 2026
- Topic: Microscopic analysis of coprolites and sediments.
- Protocol for sequential extraction from coprolites
- Palynological analysis (Dr. Velázquez, Dr. Burry), Microhistological analysis (Dr. Mosca Torres, Dr. Martínez Tosto) Phytoliths analysis (Dr. Benvenuto)
 - Topic: Biomolecular analysis and chemical analysis
 - Stable isotope analyses Ziegler, PhD researcher; Prof. Dr. Patrick Roberts (Max Planck Institute of Geoanthropology, Germany)
 - Zooarchaeology by Mass Spectrometry, Dr. Mariya Antonosyan (Max Planck Institute of Geoanthropology, Germany)
 - Leaf wax biomarkers. Jha Deepak (Indian Institute of Technology, India), Gopesh Jha (Max Planck Institute of Geoanthropology, Germany)
 - Group Activity: discussion session. Workshop Team

- Day 3 and 4 18th and 19th of November, 2026
- Fieldwork Topic: Methodologies to recover coprolites and sediments during archaeological excavations.
- Fieldwork: Peñas de las Trampas 1.1 Site, Cacao 1.A site
 - Green Antofagasta: a history spanning more than 20,000 years. Dr. Martínez. Discussion activities
 - Ways of dwelling of hunter-gatherer populations, Dr. Bobillo (Argentina)
 - Discussion activities Dr. Velázquez (Argentina), PhD researcher Ziegler (Germany) Dr. Petrigh (Argentina)

- Day 5. 20th of November, 2026
- Fieldwork Topic: Workday on research outline for writing the project.
- Group Activity: discussion session. Workshop team
 - Activities for writing a project and oral presentation to the local community.

- ORGANIZING COMMITTEE LEADERS
- Dr. Nadia Jimena Velázquez (IIPROSAM, CONICET, CIC, UNMdP, Argentina)
 - Michael Joseph Ziegler, PhD Researcher (Max Planck Institute of Geoanthropology, Germany)

- LOCAL ORGANIZING COMMITTEE
- Dr. Romina Petrigh (Argentina)
 - Dr. María Laura Benvenuto (Argentina)
 - Dr. Ana Cecilia Martínez Tosto (Argentina)
 - Dr. Federico Bobillo (Argentina)
 - Dr. Jorge Martínez (Argentina)
 - Dr. Susana Burry (Argentina)

- COLLABORATORS
- Dr. María Eugenia Mosca Torres (Argentina)
 - Lic. Eliana Marisol Soriano (Argentina)
 - Joaquín Dávalos (Argentina)

For further information, please contact [Nadia J. Velázquez](#) or [Michael Ziegler](#).

Andrea Zerboni¹, Petra Štěpančíková², Carlos H. Costa³, Christoph Grützner⁴, Paula Marques Figueiredo⁵, Damian Moskalewicz⁶

News from TERPRO

Over the past few months, the TERPRO community has once again demonstrated its remarkable scientific vitality and its commitment to organizing international activities. The call for session proposals for the 2027 INQUA Congress in Lucknow has now closed, and the broad range of TERPRO research themes is well represented, spanning palaeoseismology, geomorphology, continental sedimentary sequences, palaeopedology, and many other topics. As always, the INQUA Congress will provide an invaluable opportunity to meet colleagues, exchange ideas, and launch new collaborations for the next inter-congress period.

Speaking of new initiatives, we are delighted that eight projects proposed by members of the TERPRO community have been approved and funded by the INQUA Executive Committee. These projects are already underway, and several have held their first meetings, many of which, true to the spirit of TERPRO, have taken place in the field. Recent examples include the Palaeoseismology community, which met during the PATA Days in Guatemala; the Peribaltic Working Group, which organized a field excursion in Poland; and the Palaeopedology Working Group, which held a workshop in the spectacular setting of the archaeological site of Palenque, Mexico.

It is also worth emphasizing that TERPRO has a strong mission to contribute to society through research on environmental processes and natural hazards. In this regard, the initiatives presented in this issue of Quaternary Perspectives by Christoph Grützner, Luca Guerrieri, and Francesca Ferrario are particularly significant. The update of the Environmental Seismic Intensity (ESI) Scale represents not only an important scientific advance in documenting and interpreting earthquake effects, but also a powerful tool with great potential for hazard assessment, land-use planning, and risk reduction.

Finally, I invite you to enjoy the latest edition of Pictures from the Field, featuring Damian Moskalewicz, who recently joined Paula Figueiredo as one of TERPRO's Early Career Researcher representatives.

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 - ⁶ University of Gdańsk, Poland

TERPRO News

Damian Moskalewicz is an Assistant Professor at the University of Gdańsk, working in the Department of Geomorphology and Quaternary Geology, where his research focuses on sedimentology, coastal evolution, terrestrial Quaternary geology, and provenance studies. His research tools combine classical sedimentological techniques, heavy mineral analysis, geochemistry (µXRF, LA-ICP-MS), and remote sensing. He is actively involved in the international Quaternary research community; within INQUA TERPRO, he serves as an Early Career Researcher Officer, supporting younger colleagues in scientific networking, collaboration, and the development of their research profiles by e.g., organizing workshops under the INQUA auspice. He is a member of the Peribaltic Working Group, which gathers Quaternary researchers from countries around the Baltic Sea. He is also an Associate Editor of *Progress in Physical Geography*, where he contributes to the manuscript evaluation process, acting as a bridge between authors and the journal. Currently (besides coastal studies), he focuses on reconstructing the movement patterns of the Scandinavian Ice Sheet using geochemical, mineralogical, and petrographic indicators preserved in tills and associated glacial deposits.

Figure: Sampling of a till section in Danish cliffs, assisted by Prof. Jan Piotrowski, and a microscope view of a single zircon grain extracted from the till.



Christoph Gruetzner¹; Luca Guerrieri²; Francesca Ferrario³

ESI2.0: Towards an update of the Environmental Seismic Intensity Scale

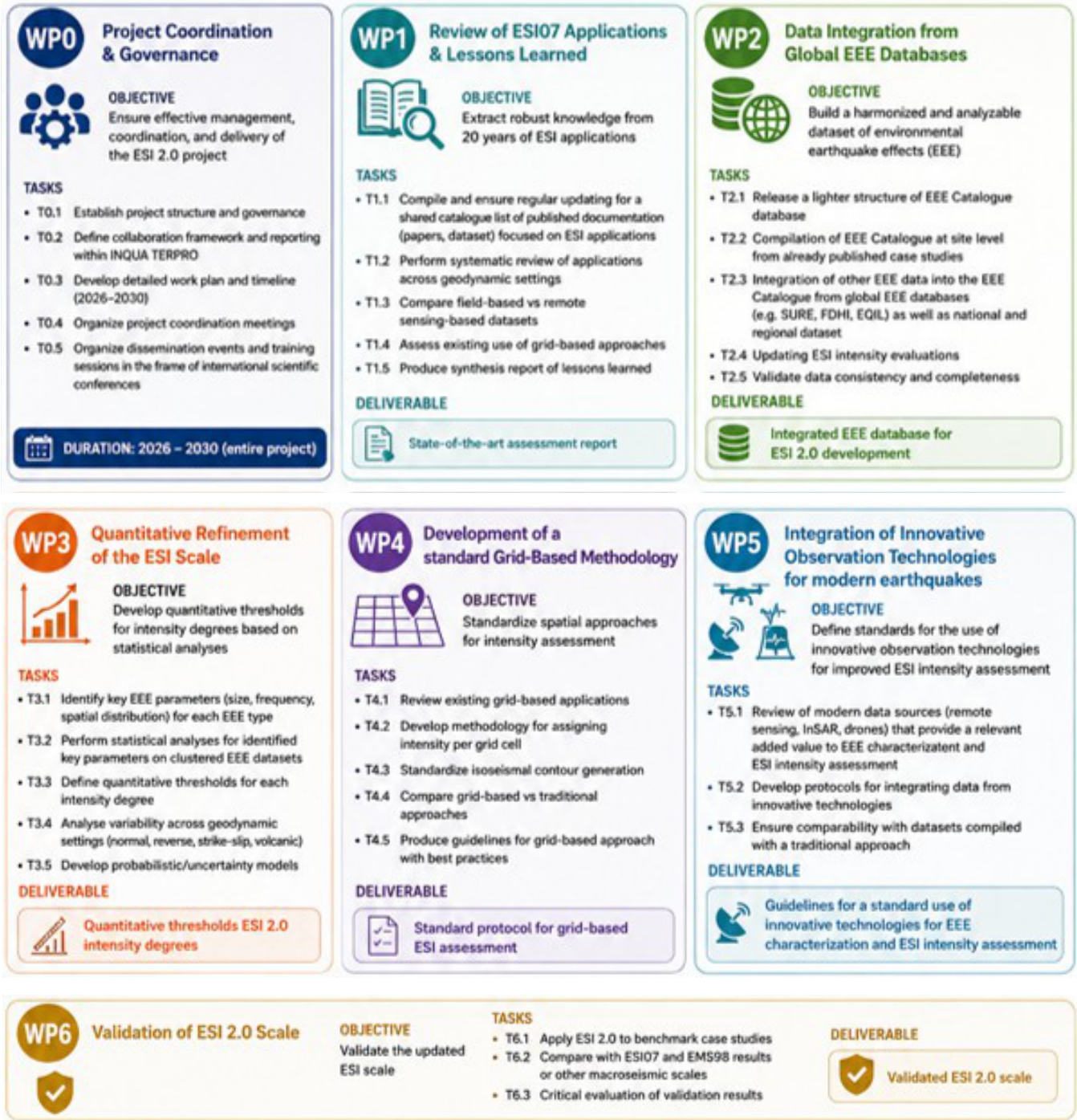


Figure 1: Tentative work plan for the ESI2.0 project.

Most earthquake intensity scales like MMI or EMS98 rely on building damage and the human perception of seismic shaking. These scales run into problems when intensities are very high, when effects on the built environment are lacking and in areas with low population density. They are also not useful in characterizing pre-historic earthquakes. To overcome these problems, an intensity scale was created that only uses environmental effects such as surface ruptures, landslides, ground deformation, or liquefaction – the Environmental Seismic Intensity (ESI07) scale (Guerrieri et al., 2007; Michetti et al., 2007; Audemard et al., 2015). The first version of this scale was presented at the 17th INQUA Congress in Cairns in 2007. By now it has been applied to hundreds of historical and modern earthquakes worldwide, expanding our understanding of earthquake effects (Ferrario et al., 2022).

After twenty years, it is time for an update. Lessons learned from previous applications will be implemented and technological advances in surveying and data collection will be considered. A wealth of new data can be statistically analysed to provide quantitative measures for the different intensity degrees.

A group within INQUA's TERPRO commission has formed to lead the ESI2.0 initiative as an update of the original version. More than 40 people gathered the group. As a first milestone, we will present the concept and first results at the 22nd INQUA Congress in India. This activity is organized by Piyal Halder. The subsequent inter-congress period (2027–2030) will be used to finalize the updated version.

The project is coordinated by Luca Guerrieri and Francesca Ferrario. Please get in touch if you want to contribute to this project.

This international effort will focus on the statistical analysis of all ESI-related datasets collected to date, and on a



Figure 2: The two main phases of the ESI2.0 project.



Figure 3: The two reference volumes for the first version of the ESI07 scale.

more effective integration of modern geodetic and remote sensing technologies for ESI intensity characterization. The project structure and Work Packages are illustrated in Figures 1 and 2.

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Pierluigi Pieruccini¹, Liping Zhou², Andrea Zerboni³
News from QI and QEH



NEWS FROM QI

New metrics for Quaternary International

Pierluigi Pieruccini and Liping Zhou, Editors-in-Chief, are pleased to share that the new metrics released by Clarivate show an increase in the Impact Factor of QI from 1.8 to 2.2 for 2025.

We believe this is excellent news for the entire INQUA community, who have contributed through the submission of high-quality research and through the Special Issues associated with INQUA-funded Projects and Working Groups, as well as for all members of the Editorial Team, who have dedicated their time to ensure professional, constructive and speedy reviews of the submissions covering all aspects of Quaternary science.

We invite you to continue supporting QI by [submitting manuscripts and proposals for Special Issues](#). At the INQUA 2027 Congress, *Quaternary International* will be present, and the Editorial Team will be available to provide information and collect suggestions.

Pierluigi and Liping

List of Special Issues in Quaternary International with portal open for submissions

- Quaternary Dynamics: Western Pacific & SE Asia
- Tropical and Subtropical transitional environments
- Quaternary Coasts
- Archaeology and Soil Heritage
- Quaternary MED Seafloor

- Of People and Trees
- Quaternary Stratigraphy in the Northern Hemisphere
- The Quaternary Records of India: Reviews and Perspectives

List of Special Issue with portal closed and pending publication

- Proceedings of the 30th Pacific Climate Workshop (PACLIM)
- Quaternary Climate Reconstruction Using Multiproxy Approach and Mathematical Techniques
- Pleistocene history of the Balkan region: Environment, hominins and geo-heritage
- Mapping ancient Africa: Climate, vegetation & humans
- Eurasia's one continent one common past: Quaternary cross-continental stratigraphic correlations
- Recent advances in Quaternary Sciences in Croatia
- The contribution of Polish research to the advance of Quaternary Science
- Late Quaternary desertification, landscape changes, paleoclimate, and human adaptation in Eurasian drylands
- Quaternary Science Advances in the Baltic Sea Region - highlights from the INQUA Peribaltic Finland 2023 excursion and symposium
- American Foragers: Advances in Archaeological Studies of Human-Environment Interactions in the Western Hemisphere
- Sea level rise and extreme events vulnerability evaluation: the path towards sustainable coastal management in a changing climate
- Exploring Human ecodynamics in valley ecotones: from niche formation to circulation and dispersal areas
- Warm Intervals in the Southern Hemisphere: Time, Space, Environments, Proxies and Processes - A contribution to the INQUA WiSH project

NEWS FROM QEH

The third year of Quaternary Environments and Humans (QEH) has come to a close, once again bringing many reasons for satisfaction. The journal continues to grow in both visibility and scientific recognition. Although it has not yet received its first Impact Factor, QEH has been indexed in Scopus since December 2025, as well as in several other online databases, ensuring broad international visibility. The number of submitted manuscripts continues to increase, and we are also receiving a growing number of proposals for Special Issues.

With the INQUA Congress in Lucknow approaching, we would like to invite all session conveners to consider Quaternary Environments and Humans as a venue for publishing Special Issues arising from their sessions. If you are interested in submitting a proposal, please follow the instructions available at this [link](#).

Looking ahead to the INQUA Congress 2030, we also plan to expand the QEH Editorial Board by welcoming colleagues from the INQUA community whose expertise complements disciplines that are currently underrepresented on the Board. We therefore invite interested candidates to submit, by 30 September 2026, an email to the Editor-in-Chief (andrea.zerboni@unimi.it) including a two-page CV and a one-page personal statement outlining their motivation and previous editorial experience. During the autumn, the Associate Editors will review all applications, and selected candidates will be contacted by the end of the year.

Actively contributing to the editorial boards of scientific journals is another valuable way to support the INQUA community.

Andrea, Fumie, Jan, Silvia

Quaternary Environments and Humans
Editor's Choice Corner

Modern human origins: Do we know what we're looking for?

By J.D. Speth - Vol. 6

This thought-provoking paper challenges the archaeological criteria traditionally used to identify the emergence of modern human behaviour. Drawing on ethnographic evidence, the author argues that symbolic thought was likely expressed through many aspects of daily life, not only through ornaments or art, and proposes a broader anthropological framework for investigating the origins of human cognitive modernity.

Life and death in Upper Palaeolithic Mongolia: Drought, dzuds and animal fat

By R. Dennell, M. Izuho and L. Hurcombe - Vol. 6

This paper examines how Upper Palaeolithic hunter-gatherers successfully occupied the harsh environments of Mongolia despite extreme climatic conditions and limited food resources. The authors argue that seasonal mobility, access to animal fat, and adaptation to recurrent droughts and severe winters (dzuds) were key factors shaping human settlement patterns and interactions across the forest-steppe and grassland landscapes.

Language, ecology and climate change: First principles and worldwide perspectives

By M. Robbeets and P. Heggarty - Vol. 6

This paper explores the long-term relationships between language, ecology and climate change, highlighting how environmental shifts have influenced language dispersal and diversification throughout the Holocene. Bringing together evidence from linguistics, archaeology and environmental sciences, the authors propose an interdisciplinary framework to investigate how changing climates have shaped human societies and their languages on a global scale.

Gender inequality in Ancient Rome through archaeometric studies of wine in funerary contexts

By J.R. Ruiz Arrebola - Vol. 5

This paper combines archaeometry, funerary archaeology and gender studies to investigate how social inequalities were reproduced in Roman burial practices. Using chemical analyses of funerary offerings, the author shows that wine functioned as a powerful symbol of masculine identity and authority, providing new insights into the material expression of gender roles in Ancient Rome.

A geoarchaeological timeline of India

By D.K. Jha, S. Dasgupta and R. Sanyal - Vol. 5

This paper presents the first comprehensive geoarchaeological timeline for India, integrating archaeological milestones with the international geological timescale. By linking environmental, climatic and cultural changes over the long term, the authors provide a valuable framework for investigating human-environment interactions and understanding the deep roots of the Anthropocene in South Asia.

