Plant turnover in response to climate change in the Cenozoic: Palynological insights from Myanmar, Southeast Asia and beyond

Huang, H.

Publication date
2021

Citation for published version (APA):
AUTHOR CONTRIBUTIONS
Chapter 2 “At a crossroads: the late Eocene flora of central Myanmar owes its composition to plate collision and tropical climate”


Review of Palaeobotany and Palynology, in revision.

H.H., R.J.M. and C.H. conceived and designed the research; A.L., Z.W., D.W.A. and G.D.-N. led the fieldwork with contributions from D.P.-P. and H.H.; H.H. acquired and analyzed data with contribution from R.J.M.; D.P.-P. collected and analyzed Sapotaceae data with contribution from H.H.; A.P. tested methods and processed the samples; H.H. led the writing with major contributions from D.P.-P., R.J.M. and C.H.; All authors revised and approved the manuscript.

Chapter 3 “Late Eocene vegetation and environmental dynamics under monsoonal climate in central Myanmar”


In preparation.

H.H., R.J.M. and C.H. conceived and designed the research; A.L., Z.W., D.W.A. and G.D.-N. led the fieldwork with contributions from D.P.-P. and H.H.; H.H. led data acquisition and analysis with contribution from R.J.M.; E.B.L., G.N.A. and R.K.S. contributed with data on plant diversity; H.H. led the writing with major contributions from R.J.M. and C.H.; all authors revised and approved the manuscript.

Chapter 4 “Eocene palms from central Myanmar in a SE Asian and global perspective: Evidence from the palynological record”

Huasheng Huang, Robert Morley, Alexis Licht, Guillaume Dupont-Nivet, Friðgeir Grimsson, Reinhard Zetter, Jan Westerweel, Zaw Win, Day Wa Aung & Carina Hoorn


DOI: https://doi.org/10.1093/botlinnean/boaa038.
H.H., R.M. and C.H. conceived and designed the research; A.L., Z.W., D.W.A. and G.D.-N. led the fieldwork with contributions from D.P.-P. and H.H.; F.G. and R.Z. facilitated microscopy facilities for pollen identification and microphotography; H.H. led data acquisition and analysis; H.H. led the writing with major contributions from R.M. and C.H.; all authors revised and approved the manuscript.

**Chapter 5** “Climate and geological change as drivers of Mauritiinae palm biogeography”
DOI: https://doi.org/10.1111/jbi.14098.


**Chapter 6** “Diversity declines and range contraction of palms through the Cenozoic”
In preparation.

J.Y.L., H.H. and C.H. conceived and designed the research; H.H. collected fossil data; A.F. and D.J.L. contributed with paleoclimate and paleolocation data; J.Y.L. analyzed data; J.Y.L. led the writing with contributions from all authors; all authors revised and approved the manuscript; J.Y.L. and H.H. contributed equally to the manuscript.
ACKNOWLEDGEMENTS
“There is no need for a time machine in order to travel back through time – all you need is a good microscope, some patience, a little imagination, and some carefully chosen rock samples…”, said by Robert Morley in 2000. Thanks to funding from the CSC and IBED, I succeeded in traveling back throughout the Cenozoic (around 66 million years ago to present) with pollen fossil record and explore how vegetation, palm diversification and biogeography, and environment responded to climate change, particularly in the late Eocene (around 37 million years ago) of Myanmar. However, the ‘travel’ process was not always smooth, especially for a novice on palynology, who did paleobotany during his master’s. As an proverb says, “If you want to go fast, go alone; if you want to go far, go together”, I could have never completed this thesis, without the kind support from my (co)promotors, colleagues, friends, and family and relatives.

First of all, I would like to show my great appreciation and respect to my copromotores Carina Hoorn and Robert Morley, promotor Peter der Ruiter and former promotor Henry Hooghiemstra. Carina, firstly I want to announce that you have perfectly supervised your first PhD student! You are a very responsible supervisor always with very prompt replies and comments on my questions and manuscripts, which largely helped keep my PhD on track. And thanks to your extensive networking, I had opportunities to collaborate broadly. Also thank you and Alastair for driving me to Brüggen in Germany and guiding me on palynological sample collection, before my Myanmar fieldwork. It is such a great pleasure to work with you. I hope we can still work together in the future. Bob, how lucky and what a great honor I can have you as my copromotor! You are so knowledgeable in palynology and biostratigraphy of SE Asia, and are so helpful to this thesis. Also thank you, Santi, and Thomas for hosting me when I learned pollen identification from you in the lovely village Littleport, with many precious books and delicious dishes nicely cooked by Santi. I cannot express my gratitude just with a few lines. Maybe I can do that with you face to face? Peter, many thanks for being my promotor when Henry retired, having regular meetings with Carina and me on the progress and planning of my PhD, and revising the thesis. Henry, many thanks for the orientation in the early stage of my PhD, borrowing me many Chinese palynology books, helping patiently on pollen identification, and inviting me to your house with other palynologists and join a field trip. I would also like to thank my doctorate committee members for the assessment of the thesis.

The Myanmar Paleoclimate and Geodynamics Research group found in 2016 and led by Alexis Licht is the “base camp” of my PhD. Alexis, I am very much appreciated that
you let me join this group, and your geological contribution on my three Myanmar papers is very valuable. I hope we will have opportunity to drink Myanmar beer together again. I really enjoyed the two unforgettable expeditions in central Myanmar. Thank you for the support in the field, Zaw Win, Day Wa Aung, Pierrick Roperch, Jan Westerweel, Hnin Hnin Swe, Myat Kay Thi, Virginia Littell, and many other Myanmar colleagues and local people. I will never forget the sound of generator in the night of Kalewa hotel. I would also like to thank the magic MAGIC team led by Guillaume Dupont-Nivet including many geologists, climate modelers, and palynologists for the very helpful and full discussions. Guillaume, it is a great pleasure to collaborate with you, and thanks a lot for your support.

Lab support is also very important for my PhD. I would like to thank Annemarie Philip and Malcolm Jones for processing samples excellently for morphology investigation and quantitative analysis; Jan van Arkel for outstanding microphotography for Myanmar palm and sapindaceous pollen grains; Merijn Schuurmans for help related to light microscope issues; Friðgeir Grímsson and Reinhard Zetter for providing exceptional facilities at the University of Vienna and identification advices on the light and scanning electron microscopy investigations of palynomorphs with single grain analysis. I would also like to thank Tao Su and his Paleoecology Research Group for the great support on my scanning electron microscopy research on palynomorphs at the XTBG.

Thanks to the company of the pollen/phytolith/charcoal folks in the microscope room, particularly Natasha Barbolini, Donya Danesh, Adele Julier, Alvaro Castilla-Beltrán, Jixiao Zhang, Yunan Zhang, Britte Heijink, Nina Witteveen, and Simon Scholz, my pollen counting was not tedious. I would also like to thank my kind officemates, particularly Milan Teunissen van Manen and Marian Cabrera for many nice talks making such a cozy workspace. Thanks to the Virtual Tea organized by Carina, I had opportunity to talk with these amazing persons, Phillip Jardine, Natasha Barbolini, Giovanni Bogotá-Ángel, Caixia Wei, Amber Woutersen, Kathleen Gersie, Matteo Sciumbata, Daniel Pérez-Pinedo, Taylor Craft, and Eva Visser, and the late stage of my PhD during the COVID-19 era was not alone.

Thanks to the great efforts from all collaborators, particularly Giovanni Bogotá-Ángel, Daniel Pérez-Pinedo, and Jun Ying Lim, we present our papers in a very good form, which have drawn lots of attention. I would also like to thank Shufeng Li and He Tang for the help on bioclimatic analysis; Phillip Jardine for the help on rarefaction analysis; William Baker and Rodrigo Bernal González for allowing me to use the palm tree photos; Eric Grimm for the guidance in Tilia workshop; Achyut Tiwari for keeping in touch and the collaboration
on treeline paper; Amber Woutersen for the translation into Dutch summary in this thesis; Limi Mao, for the great assistance on cover and bookmark design, and other support. May Eric rest in peace. I will always remember the field trip with you, Henry, and Marian.

Then I would like to thank the IBED management and secretariat team, particularly Frank Hammacher, Tanya Noorlander, Mary Parra Tasayco, Saskia Heijboer, Monique van Wordragen, Maria Dolorita, Pascale Thiery-van der Bij, and Amber Heijboer, for their kind support. I also want to thank the IBED colleagues for their support and nice talks, William Gosling, Crystal McMichael, Bas van Geel, Keith Ricards, Erik de Boer, Catalina Giraldo, Marco Raczka, Yoshi Maezumi, Nicholas Loughlin, Jippe Kreuning, Judith Kirschner, Majoi de Novaes Nascimento, Erik Cameraat, Antonia Praetorius, Jiajia Gao, Tamara Jonkman, Ke Gao, Hongjie Qin, Xing Ji, Shixiu Zhang, Yan Dong, Thijs de Boer, Emiel van Loon, Kenneth Rijsdijk, Zsófia Koma, and Jip de Vries.

My PhD could have been less enjoyable without my Chinese friends in The Netherlands sharing lots of great experience. I would like to thank Xia Meng, Songyu Yang, Caixia Wei, Tianchi Zhang, Shu Liu, Yang Liu, Mengru Jia, Jixiao Zhang, Yunan Zhang, Yumei Wang, Yuan Xie, Wenyang Wu, Zulin Mei, Weiwei Chen, Cong Feng, Chao Ding, Chong Wang, Muhe Diao, Jiming Li, Shunan He, Gang Huang, Yue Guan, Shuo Chen, and Jiao Wu. Songyu, thank you for everything. I knew you from Emiel on my second day in Science Park, and realized that we lived in the same apartment in the lovely Bos en Lommerplein. Since then, you gave me tons of support and we did many impressive travels, especially bicycle trips. Xia, Caixia, and Shu, many thanks for sharing so many wonderful moments. We visited the GLOW Eindhoven, experienced thermal spring in Valkenburg, walked in the National Park Veluwezoon and seaside of Zandvoort, and cycled in the countryside of Amsterdam Noord…

Finally, I would like to specially thank Xia, a very smart girl, for your support, encouragement, constructive suggestions, and amazing cooking; and Mayday and the Teens in Time (TNT, particularly Yaowen Liu), for enriching Xia’s life. I am also very grateful to my loving family, and relatives particularly Neng Chen, Qiuyue Huang, and Muyang Mai, for their continuous support.

May 16th, 2021
Bos en Lommerplein, Amsterdam
CURRICULUM VITAE
Huasheng Huang (黄华生) was born on December 26th, 1990 in Zhanjiang City, Guangdong Province, People's Republic of China. He grew up in Lemin, a seaside town of Leizhou Peninsula, along the Beibu Gulf (also termed “Gulf of Tonkin”), which is located off the coasts of North Vietnam and South China. In June 2013, he obtained his bachelor’s degree in horticulture advised by Prof. Zhenxian Wu from the South China Agriculture University in Guangzhou, with a thesis focusing on the effect of sulphur dioxide fumigation on post-harvest physiology and quality of longan fruit (*Dimocarpus longan* in the soapberry family Sapindaceae) stored at low temperature. Subsequently he joined the Paleoecology Research Group at the Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, supervised by Prof. Zhekun Zhou (the first year by Dr. Frédéric Jacques), and worked on cuticles of fossil leaves to identify taxa and reconstruct paleo-CO$_2$ levels. In June 2016, he got his master's degree in paleobotany, and published two papers (with two new species: *Quercus heqingensis* and *Buxus pliosinica*) on fossil leaves found in the upper Pliocene sediments from Heqing County, Yunnan Province, Southwest China. Afterwards in October, he was granted a scholarship from the China Scholarship Council (CSC, No. 201604910677) and started his PhD project at the Department of Ecosystem & Landscape Dynamics (ELD), Institute for Biodiversity and Ecosystem Dynamics (IBED), University of Amsterdam (UvA), mainly under the supervisions of Drs. Carina Hoorn (UvA) and Robert Morley (Palynova Ltd, Littleport, UK). Since then, he is a member of the Myanmar Paleoclimate and Geodynamics Research (MyaPGR) group, founded in 2016 winter and led by Dr. Alexis Licht (CEREGE, France), which focuses on the evolution of central Myanmar. He also has membership of the Botanical Society of America, International Biogeography Society, the European Palm Society, and Palynologische Kring. He has extensive paleobotanical and palynological fieldwork experience in the areas including Southwest China, Tibet, and Myanmar. He is interested in unravelling the relation between vegetation, environment and climate in the deep time of Southeast Asia and China, and evolutionary history and global biogeography of plants, particularly palms. Read more at his personal website: https://huashenghuang.weebly.com.
contributed equally, *corresponding author


Lim, J.Y.†*, Huang, H.†*, Farnsworth, A., Lunt, D.J., Baker, W.J., Morley, R.J., Kissling, W.D., Hoorn, C. Diversity declines and range contraction of palms through the Cenozoic. In preparation.


