



INSTITUT DE SYSTÉMATIQUE, ÉVOLUTION, BIODIVERSITÉ - ISYEB

Muséum National d'Histoire Naturelle
Centre National de la Recherche Scientifique
Sorbonne Université
Ecole Pratique des Hautes Etudes - PSL
Université des Antilles

CP50, 45, rue Buffon, 75005 PARIS, France

Secrétariat : 33 (0)1 71 21 46 60
Ligne directe : 33 (0)1 40 79 33 66
Email : thomas.haevermans@mnhn.fr

Paris, 22 February 2024

Report on the Ph.D. thesis submitted by Mgr. Kristýna Hlavatá entitled "Phylogenomics, genome size evolution and repeat dynamics in the genus *Amomum* Roxb. (Zingiberaceae)"

The manuscript constituting the Ph.D. thesis comprises 222 numbered pages including appendices and is structured with an abstract in English and Czech, followed by a state-of-the-art original general chapter detailing the subject. It begins with an introduction that delves into the family Zingiberaceae, examines the problems of investigating ginger taxonomy, and introduces the genus *Amomum s.l.*, highlighting its challenging systematics status within the family and exploring the correlation between genome size and ecology. The aims of the study are perfectly outlined, followed by a detailed description of the methods employed (including plant material collection, morphological analysis, flow cytometry, comparative phylogenetic methods, chromosome counting, sequence data acquisition and

processing, and analysis of repetitive elements). The results and discussion section presents findings on the recircumscription of *Amomum* species, phylogenetic relationships, genome size, and the repeatome of *Amomum* s.s. The conclusion summarizes key findings and suggests future research directions. Additionally, the scientific contribution of the thesis is underscored. The document eventually includes a list of references cited throughout the text.

This section is followed by the four main papers presented as articles in English, 3 of them published, and one already submitted and under consideration in a peer-reviewed international journal as listed below:

Paper I. - de Boer, H., Newman, M.F., Poulsen, A.D., Fér, T., Hien, L., **Hlavatá, K.**, Lamxay, V., Richardson, J.E., Steffen, K., Leong-Škorničková, J. (2018): Convergent morphology in Alpinieae (Zingiberaceae): Recircumscribing *Amomum* as a monophyletic genus. *Taxon* 67, 6–36. <https://doi.org/10.12705/671.2> .

Paper II. - Leong-Škorničková, J., Dang, T.H., Binh, N.Q., **Hlavatá, K.**, Truong, L.H., Dat, N.Q., Trung, N.T., Newman, M. (2019): The identity of *Amomum trilobum* and *Amomum unifolium* (Zingiberaceae: Alpinioideae), and description of four new related species from Vietnam. *Phytotaxa* 401, 149. <https://doi.org/10.11646/phytotaxa.401.3.1> .

Paper III. - **Hlavatá, K.**, Leong-Škorničková, J., Závěská, E., Šída, O., Newman, M., Mandáková, T., Lysak, M.A., Marhold, K., Fér, T. (2023): Phylogenomics and genome size evolution in *Amomum* s.s. (Zingiberaceae): Comparison of traditional and modern sequencing methods. *Mol. Phylogenet. Evol.* 178, 107666.

Paper IV. - **Hlavatá, K.**, Závěská, E., Leong-Škorničková, J., Poulsen, A.D., Šída, O., Khadka, B., Mandáková, T., Fér, T. (in review): Unraveling the genomic tapestry: ancient hybridization drives repetitive element proliferation and genome expansion in the monocot plant genus *Amomum* (Zingiberaceae).

The first two papers, of which the candidate is a contributor, are covering taxonomic and systematics challenges in the genus *Amomum*, and have been published in the international peer-reviewed journals *Taxon* and *Phytotaxa*. The third paper, of which the candidate is first author, investigates the genome size evolution in *Amomum* s.s. and compares traditional and modern sequencing methods for unravelling the phylogenomics of the group. The fourth paper, of which the candidate is also first author, studies the repeatome of the genus *Amomum* and replaces the importance of this field of study within the current scientific knowledge.

The whole document is of excellent quality, comprehensive and well-balanced, and presents a highly engaging reading experience both stylistically and in terms of layout, accompanied with numerous good-quality illustrations.

Mrs. Kristýna Hlavatá has adeptly positioned the problematic of her thesis within a broad context and highlighted the current challenges facing Zingiberales and Zingiberaceae systematics. The study's scientific questions and the contributions of her work to the understanding of the diversification and evolution of this emblematic monocot group are clearly delineated and comprehensively addressed.

The provided work is outstanding, with potential biases explored and methodically examined. The quality of the manuscript is very good, both scientifically and methodologically. The most recent research has been duly considered, and each formulated hypothesis has been rigorously tested. The conclusions drawn from these four papers (2 of them as contributor, 2 others as first author in Mol. Phyl. Evol, and another journal) are robust both scientifically and methodologically.

Mrs. Hlavatá's approach encompasses various aspects of the evolutionary processes that have shaped the radiation of the genus, placed within the larger context of the family Zingiberaceae, of which her advisor is an expert. The outcome is an original piece of work in which the author depicts challenging analyses and interpretations of genome size and repeatome evolution in a broad context. The proposed avenues for future research will effectively complement the work already undertaken and serve as a model for further studies on monocot radiations and genome evolution in tropical environments.

I hereby certify that I have no bias or conflict of interest in relation of the author of the work. This is an excellent piece of work both in terms of quality and quantity, undoubtedly poised to engender a rich discussion with the jury during the oral defense, for which I unequivocally provide a highly favorable recommendation.



Paris, 22/02/2024

Dr. Thomas Haevermans, Ph.D., H.D.R.