

Report on publications on New Guinea gingers



Overall aim: In order to elucidate the diversity of gingers (the family Zingiberaceae) in New Guinea, the project is taking advantage of collections made by the applicant during previous expeditions to synthesize publications. These will include aspects of botanical history, taxonomy, nomenclature, typification, ethnobotany and evolution.

Contribution from Peter Davis Expedition Fund	£18,550.38
Stipends: 6 months' part-time salary	£14,974.20
Lab costs: NGS work of 96 samples.	£12,064.00
Own contribution	£8,487.82
Total costs	£27,038.20

Work place: Herbarium, Royal Botanic Garden Edinburgh.

Lab work: was conducted by lab assistant at Charles University in Czech Republic.

Material: Collections made in New Guinea during eight expeditions 2006–2019 form the basis of the work. One of the expeditions was sponsored by Davis Expedition Fund.

Timetable: 10 July 2021–10 March 2022 interrupted by teaching RBGE / UIO MSc students October–November 2021.

Expected outputs: Four papers were outlined in the original proposal:

A. In the footsteps of Schlechter in the lowlands of Madang Province

This paper to be published in *Willdenowia* 22 June 2022.

<https://bioone.org/journals/willdenowia/current>

B. In the footsteps of Gilli in the highlands of Madang Province

A closer inspection of the type made by Gilli and the material collected by myself revealed that they may not be of the same species. Instead the paper focused on Gilli's

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new species, *Phaeomeria anthokophinos* and the three other species in the New Guinea Region places in *Phaeomeria*. In conclusion, these four should all be combined in *Etlingera*. A manuscript submitted to *Blumea* has been accepted and is currently being revised.

C. An overview of the genus *Etlingera* in New Guinea.

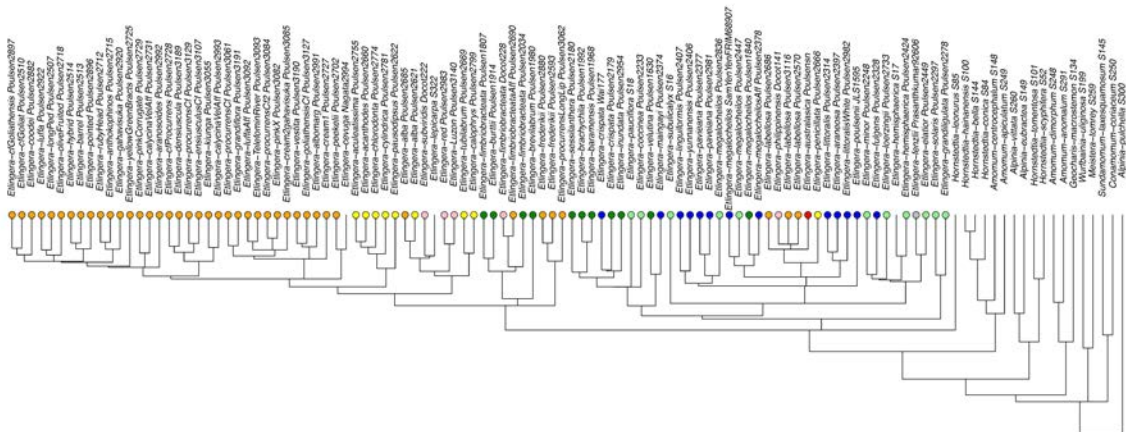
This planned synopsis is still in the writing phase. Currently, 20 species are placed in the genus and the paper will include a key to these but not a full description of each species.

D. The evolution of *Etlingera* and radiation in New Guinea

Currently, 98 samples of *Etlingera* have been successfully sequenced using the HybSeq method, which will include about 100 regions for each sample.

Because *Hornstedtia* (43 species) the sister genus to *Etlingera*, is likely not monophyletic, I decided to include as many species as possible. We have managed to sample about 30 species and as predicted, *Hornstedtia cyathifera*, is nested within *Etlingera* and a new combination is required. Thus supported by the new molecular results, this species needs to be included in the Output C.

A preliminary analysis shows that most (but not all) species of *Etlingera* endemic in New Guinea (orange in figure below) result from a recent radiation.



I am planning to spend 1–2 weeks in at Charles University in August with my collaborators there to improve my bioinformatics skills. It is, however, already clear at this stage that the massive data set achieved will reveal a great insight into the evolution of the ginger genus *Etlingera* in New Guinea and that the results will be publishable.

Problems encountered Due to the pandemic, the herbarium work and selection of samples for extraction could only start in July 2021 and the access was at times limited to only two days per week. The Herbarium also suffered flooding and other construction hazards that put restrictions on access. Initially, some challenges were encountered in the lab but once the extraction method had been refined, the product was sufficient to result in sufficient sequence data.

Significance: The papers produced are important contributions to the understanding of the ginger flora of New Guinea and their evolution and will serve as stepping stones towards my full revision of the genus *Etlingera* in New Guinea.

Axel Dalberg Poulsen

Axel Dalberg Poulsen, 22 June 2022