Jury report
East-West Seed Thesis Award for Plant Sciences 2019

J. (Julia) López Delgado MSc, Leiden University

History or demography? Determining the drivers of genetic variation in North American plants

Julia López Delgado was borne in Spain in 1994 and defended her MSc thesis in Biology, with a specialization in Evolutionary Biology, *cum laude* at Leiden University in September of 2019. She took a variety of courses with grades 8.5 – 9.0 and received the grade 9.0 for her research projects. The grade point average was 8.9.

For her MSc research she did two internships, one at the Institute for Biodiversity and Ecosystems Dynamics at the University of Amsterdam and one at Naturalis Biodiversity Centre in Leiden. The research in Amsterdam is expected to result in three scientific publications. Her supervisor in Amsterdam, Dr. Patrick Meirmans, submitted one of these publications to be considered for the East-West MSc Graduation Prize for Plant Sciences. The title of the submitted manuscript is: "History or Demography? Determining the drivers of genetic variation in North American Plants".

Dr. Meirmans (University of Amsterdam) and Dr. Klaas Vrieling (Leiden University) wrote highly laudatory letters of recommendation. According to Dr. Vrieling, Julia "wrote two excellent MS reports". In Amsterdam, "she collected a large data base on genetic variation in 106 plant species, and the corresponding climate data. For the analysis of these data, she used complicated modelling software. The thesis was written succinctly with scientific depth." Dr. Meirmans was "very satisfied with challenging research project, combining population genetics and environmental niche modelling."

The jury members of the 'East-West Seed MSc Graduation Prize for Plant Sciences' read Julia's thesis with much interest and admiration. The abstract is clear and concise, including a justification for the research, methodology, results, conclusions and contribution to theory. The outstanding introduction focused on theoretical aspects of the spatial distribution of plant genetic variation. Relationships between phylogenetic analyses of plant species and physical processes (like climate shifts) as well as ecological factors (like demographic changes) were pointed out. An important biogeographic paradigm, namely the central-marginal hypothesis of suitable habitats was described, and the consequences for species and genetic variation in space were indicated. Thus, the stage was set for expected relationships between spatial climate distribution over time and the geographic distribution of genetic diversity. A comparison of spatial microsatellite data and climate data had never been carried out before. Therefore, a novel phylogeographic framework was developed and used to test contributions of climate shifts (past and future) and the central-marginal hypothesis to population genetic diversity.

In the introduction, a brief description was given of the published genetic data used (86 studies). When available, the original microsatellite data were analyzed to calculate summary statistics for genetic diversity. Altogether, 106 plant species were included. The ecological data were also described properly. The description of the species distribution modeling was truly excellent! All required steps were taken during the modeling process, including an ensemble model. The development of an innovative, quantitative measure of population centrality and periphery was, of course, excellent for an MSc student. In the results section, a general description was given of the number of species, the number of populations with microsatellite data and heterozygosity. A map was included of the populations studied in North America. Graphs were presented of diversity measures versus predicted suitable areas, distance to suitable areas and to range edges. These relations were significant for one of the diversity measures. There was a very

clear and logical discussion of important results in comparison with the literature. Implications for evolution and spatial distributions were discussed in detail. Some of the caveats of the study were also pointed out, as desirable for peer-reviewed scientific publications.

According to the jury, the only point of consideration would be clarification of the structure of the discussion. Nevertheless, Julia López Delgado was clearly the best candidate for the East-West Seed Prize. She developed an ingenious way to collect plant population genetics data as well as the associated climate data. She analyzed these data using programs written by herself in R, including niche modelling programs. She is highly motivated to do independent research and has a strong passion for science. She is already an excellent researcher and is expected to become a top scientist in her field (population genetics, not only of plants but in the future also of animals).

The jury and members of the Koninklijke Hollandsche Maatschappij der Wetenschappen (KHMW) congratulate Julia López Delgado with getting the East-West Seed MSc Graduation Prize for Plant Sciences. This achievement is well-deserved! Congratulations!