Pollinators in complex landscapes: modelling and mapping the distribution of wild bees and hoverflies in the Netherlands

Moens, M.

IV. Curriculum vitae

Merijn Moens was born on 7 February 1994 in Leiderdorp. He studied for a bachelor's degree in biology in Wageningen from 2012 to 2015. His thesis was a biodiversity analysis in road verges with the name *Rural Gradients of Plant Biodiversity in Road Verges* and his bachelor specialisation was Ecology with a minor in Education. From 2015 to 2017 he enrolled in the International Master of Applied Ecology (IMAE) for a joint degree at the University of Poitiers (FR) and the University of Coimbra (PT). His master's thesis was on the accumulation of arsenic in rice plants and hydrogels*: Ochrobactrum tritici immobilized in Oryza sativa, Sodium Polyacrylate and Alginate as a Novel Bioremediation Tool* under supervision of Dr. Paula V. Morais. From 2017 to 2018 he stayed in Coimbra on a microbiology fellowship, continuing the study on arsenic accumulation. During this time, he immobilized a hyperaccumulator strain of *Ochrobactrum tritici* within different types of hydrogels and within rice plant tissue. From 2018 to 2019 Merijn followed an internship at Aarhus University modelling the honeybee hive dynamics under supervision of Dr. Niels Holst, developing a model estimating energy reserves in hives based on the flowering plants in the environment. In 2019 Merijn started working at Naturalis Biodiversity Center as a project employee working on the Bloeibogen project (https://www.bloeibogen.nl/). This tool aims to estimate periods with lower food sources based on the growing plants within the landscape. From 2020 to 2025 Merijn worked on his PhD in Naturalis: *Pollinators in Complex Landscapes, Modelling and Mapping the Distribution of Wild Bees and Hoverflies in the Netherlands*. His promotors were Prof. Dr. J. C. Biesmeijer and Prof. Dr. H.A.C. Runhaar and his co-promotor and daily supervisor was Dr. L. Marshall. During this PhD he aimed to address the challenges of incorporating the complexity of a landscape with both abiotic conditions and landscape features, such as hedges or other landscape elements, and biotic factors, such as the presence of different plant species, within models. He focussed on wild bees, studying the importance of plants and other bees in modelling their distribution and the difference between threatened and non-threatened bees. Additionally, he looked at the importance of landscape elements in shaping the distribution and biodiversity of wild bees and hoverflies. During this time, Merijn helped organise colloquia, gave talks within the museum such as spotlight talks and lectures for children or *kinder college*. Additionally, he worked within the biodiversity quality project with water vegetation in collaboration with the water board or *het Hoogheemraadschap van Rijnland* and published a report for the ministry of agriculture on landscape elements *Optimale inrichting van landschapselementen voor wilde bestuivers en honingbijen: een overzicht van de kennis beschikbaar in de literatuur.* Additionally, he participated in field work and data analysis in the project on Shell solarparks biodiversity. He participated in several international workshops of the international MAPPY

consortium. He presented at the Scandinavian Association for Pollination Ecology (SCAPE) conferences in 2022 and 2024.

V. Publications

Scientific articles as first author

Moens, M., Biesmeijer, J. C., Huang, E., Vereecken, N. J., & Marshall, L. (2024). The importance of biotic interactions in distribution models of wild bees depends on the type of ecological relations, spatial scale and range. *Oikos,* e10578.

Moens, M., Biesmeijer, J. C., Klumpers, S. G. T., & Marshall, L. (2023). Are threatened species special? An assessment of Dutch bees in relation to land use and climate. *Ecology and Evolution, 13*(7), e10326.

Moens, M., Branco, R., & Morais, P. V. (2020). Arsenic accumulation by a rhizosphere bacterial strain Ochrobactrum tritici reduces rice plant arsenic levels. *World Journal of Microbiology and Biotechnology, 36*, 1–11.

Moens, M., Biesmeijer, C.J., Paladini, M., Calderoni, G., Runhaar, H., Klumpers, S., Van de Ven, J., Schoon, P., Orzan, S., Marshall, L. "Linear landscape elements improve fine scale species distribution models of bees and hoverflies. *Manuscript in preparation*

Moens, M., Biesmeijer, C.J., Paladini, M., Calderoni, G., Klumpers, S., Van de Ven, J., Marshall, L. Landscape elements as pollinator sanctuaries: bee and hoverfly diversity and community composition in agricultural habitats. *Manuscript in preparation*

Other scientific articles

Pan, K., Moens, M., Marshall, L., Cieraad, E., de Snoo, G. R., & Biesmeijer, K. (2021). Importance of natural land cover for plant species' conservation: A nationwide study in The Netherlands. *Plos One, 16*(11), e0259255.

Viljanen, M., Tostrams, L., Schoffelen, N., van de Kassteele, J., Marshall, L., Moens, M., Beukema, W., & Wamelink, W. (2024). A joint model for the estimation of species distributions and environmental characteristics from point-referenced data. *Plos One, 19*(6), e0304942.

Reports and non-scientific articles

Biesmeijer, J. C., Moens, M., van't Zelfde, M., & Wit, F. (2020). De nulsituatie van biodiversiteit in het werkgebied van Hoogheemraadschap van Rijnland: inzichten en handelingsperspectief ter verbetering van biodiversiteit op basis van monitoring van bestuivers en vegetatie in AWZI-terreinen en analyse van waterplanten.

Biesmeijer, K., van Kolfschoten, L., Wit, F., & Moens, M. (2020). The effects of solar parks on plants and pollinators: The case of Shell Moerdijk. Naturalis Biodiversity Center.

Moens, M., Schoonman, M., & Biesmeijer, K. (2023). Optimale inrichting van landschapselementen voor wilde bestuivers en honingbijen: Een overzicht van de kennis beschikbaar in de literatuur. https://assets.naturetoday.com/docs/3854b5a8-5a49-49bf-9bf7-5a1e46ce7cf2.pdf

Morais, P. V, Moens, M., & Dias, S. (2019). Ensino de Microbiologia, no 3o ciclo do Ensino Básico, através do desenvolvimento de um projeto de investigação em biorremediação. *Conexão Ciência (Online), 14*(2), 37–45.