MAXIMILIAN LARTER

I am a plant ecophysiologist and an evolutionary biologist.
My primary research interest is understanding how plants adapt to their environment, in particular in the current climate crisis, with rapidly changing temperature and rainfall patterns. By examining functional trait distributions of living and extinct lineages, we gain insight into the evolution of key physiological traits and functions, as well as the genetic mechanisms enabling these adaptations.
This knowledge is critical to predict the impacts of climate change on the distributions of wild species and crop health.

RESEARCH EXPERIENCE

2024 | 2021

Postdoc - Plant hydraulics & trait trade-offs, forest ecology and biogeography

Sylvain Delzon's lab — INRAE, Bordeaux, France

- Using big trait databases and forest inventory data, we are investigating how plant functional traits (embolism resistance, frost tolerance) interact and how they shape tree species distributions and forest dynamics and ecology.

2021 | 2019

Postdoc - Herb hydraulics, positive root pressure and drought resistance in Brassicaceae

Frederic Lens's lab — Naturalis, Leiden, The Netherlands

- This project combines classical plant hydraulics adapted to non-woody species with xylem anatomy, micro-CT and modeling to obtain a holistic picture of herb hydraulics during drought. We are notably looking at positive root pressure, which has been hypothesized to aid in recovering from drought by refilling embolised xylem conduits.

2019 | 2017

Postdoc - Evolution of the anthocyanin pathway in Iochrominae

Stacey Smith's lab — University of Colorado, Boulder, USA

- In Iochrominae, several lineages have independently lost floral anthocyanin pigmentation altogether, resulting in white or yellow flowers. We found that the mechanism behind these fixed evolutionary losses is convergent down-expression in three downstream genes of the pigment biosynthetic pathway.

2016 | 2012

PhD - Evolution of cavitation resistance in conifers

Sylvain Delzon's lab — Université de Bordeaux, France

- This thesis expands our understanding of the evolution of vascular plants regarding severe drought. We show that embolism resistance varies 9-fold across over 250 conifer species, thanks to changes in bordered-pit anatomy. Combining this unprecedented database with a calibrated phylogeny, we link embolism resistance evolution to increased diversification rate. Furthermore, we describe the remarkable evolution of *Callitris* xylem during the aridification of Australia over the last 30 million years.
- *Supervisors*: Sylvain Delzon and Jean-Christophe Domec

CONTACT

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Biogeco, Bat B2,
Allée Geoffroy St Hilaire
Pessac, France
August 5th, 1987. Derby (UK)

SKILLS

Languages

- Fluent / native speaker in **English** and **French**.

Software, statistics

- SAS, R, Inkscape
- Phylogenetic comparative methods
- GIS

Plant physiology

- Plant hydraulics (Cavitron, optical technique)
- gas exchange, sapflow, dendrometry
- wood anatomy – microscopy (optical and SEM)
- anthocyanin extractions and separation (HPLC)

Molecular biology, phylogenetics

- DNA/RNA extractions
- qPCR
- Next Gen Sequencing library prep
- RAxML, BEAST, MrBayes

Last updated on 2024-10-01.

2012 — Research assistant - Evolutionary patterns of cavitation resistance in conifers (6 months)
Supervisor: Sylvain Delzon — Université de Bordeaux, France

2011 — MSc thesis - Convergent evolution of drought tolerance in conifers (6 months)
Supervisor: Sylvain Delzon — Université de Bordeaux, France

2010 — MSc thesis - Population genetics of the olive (*Olea europaea*) complex (2 months)
Supervisor: Guillaume Besnard — Imperial College London, UK

EDUCATION

2016 | 2012 — PhD in evolutionary, functional and community ecology.
Thesis: Evolution of cavitation resistance in conifers
Université de Bordeaux — Bordeaux, France
- *Supervisors*: Sylvain Delzon and Jean-Christophe Domec

2011 | 2010 — MSc - Terrestrial Ecosystem Functioning and Modelling
Université de Bordeaux — Bordeaux, France

2008 | 2005 — BSc - Organismal Biology
Université d'Orléans — Orléans, France

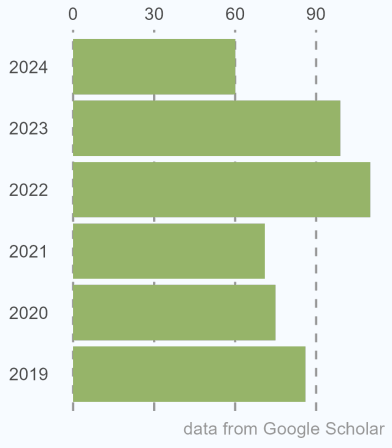
PUBLICATIONS

2024 — A Baranger, T Cordonnier, G Charrier, S Delzon, **M Larter**, N Martin-StPaul, G Kunstler (2024) Living on the edge - physiological tolerance to frost and drought explains range limits of 35 European tree species, *Ecography.* pdf

G Bortolami, TA de Werk, **M Larter**, A Thonglim, F Lens et al. (2022) Integrating Gene Expression Analysis and Ecophysiological Responses to Water Deficit in Leaves of Tomato Plants, *bioRxiv.* pdf

2023 — Y Song, XP Bouteiller, **M Larter**, C Plomion, F Sin, S Delzon, (2023) A safe breeding ground: genetically improved maritime pine for growth and stem form has more efficient but not more vulnerable xylem, *Tree Physiology* pdf

2022 — A Thonglim, G Bortolami, S Delzon, **M Larter**, R Offringa, F Lens et al. (2022) Drought response in Arabidopsis displays synergistic coordination between stems and leaves, *Journal of Experimental Botany.* pdf



2021

- A Hooft van Huysduynen, S Janssens, V Merckx, R Vos, L Valente, **M Larter** et al. (2021) Temporal and palaeoclimatic context of the evolution of insular woodiness in the Canary Islands, *Ecology and Evolution* pdf

2020

- A Thonglim, S Delzon, **M Larter**, O Karami, A Rahimi, R Offringa et al. (2020) Intervessel pit membrane thickness best explains variation in embolism resistance amongst stems of Arabidopsis thaliana accessions, *Annals of Botany.* pdf

2019

- **M Larter**, A Dunbar-Wallis, AE Berardi, SD Smith (2019) Developmental control of convergent floral pigmentation across evolutionary timescales, *Developmental dynamics*, 248 (11), 1091-1100. pdf
- R Deanna, **M Larter**, GE Barboza, SD Smith (2019) Repeated evolution of a morphological novelty: a phylogenetic analysis of the inflated fruiting calyx in the Physalideae tribe (Solanaceae), *American Journal of Botany*, 106 (2), 270-279. pdf

2018

- **M Larter**, A Dunbar-Wallis, AE Berardi, SD Smith (2018) Convergent evolution at the pathway level: predictable regulatory changes during flower color transitions, *Molecular biology and evolution*, 35 (9), 2159-2169. pdf

2017

- **M Larter**, S Pfautsch, JC Domec, S Trueba, N Nagalingum, S Delzon (2017) Aridity drove the evolution of extreme embolism resistance and the radiation of conifer genus Callitris, *New Phytologist*, 215 (1), 97-112. pdf
- C Sáenz-Romero, **M Larter**, N González-Muñoz, C Wehenkel et al. (2017) Mexican conifers differ in their capacity to face climate change, *Journal of Plant Hydraulics*, 4, e003. pdf

2016

- B Castagneyrol, H Jactel, EG Brockerhoff, N Perrette, **M Larter**, S Delzon et al. (2016) Host range expansion is density dependent, *Oecologia*, 182 (3), 779-788. pdf
- **M Larter** (2016) The evolution of cavitation resistance in conifers. *Université de Bordeaux, PhD Thesis* pdf

2015

- **M Larter**, TJ Brodribb, S Pfautsch, R Burlett, H Cochard, S Delzon (2015) Extreme aridity pushes trees to their physical limits, *Plant Physiology*, 168 (3), 804-807. pdf

2014

- PS Bouche, **M Larter**, JC Domec, R Burlett, P Gasson, S Jansen, S Delzon (2014) A broad survey of hydraulic and mechanical safety in the xylem of conifers, *Journal of Experimental Botany*, 65 (15), 4419-4431. pdf

- G Besnard, J Dupuy, **M Larter**, P Cuneo, D Cooke, L Chikhi. (2014) History of the invasive African olive tree in Australia and Hawaii: evidence for sequential bottlenecks and hybridization with the Mediterranean olive, *Evolutionary Applications*, 7 (2), 195-211. pdf

GRANTS AND FUNDING

2020 — Alberta Mennega Stichting fieldwork grant
1,250€ — Leiden (The Netherlands)

2014 — External mobility grant from the COTE Cluster of Excellence
3,000€ — Bordeaux (France)

Research Exchange Program (Inbound)
AU$3350 — Western Sydney University, NSW (Australia)

OUTREACH AND PRESS (BY ME)

2016 — Three minute thesis - MT180 Final Université de Bordeaux - view on Youtube

2013 — **M Larter**, Le Pinetum de Bedgebury: la plus belle collection de conifères du monde, *Jardins de France*. pdf

M Larter, P Bouche, Les conifères, une famille à évolution complexe, *Jardins de France*. pdf

TEACHING EXPERIENCE

2023 | 2021 — Lecture (1h) - The evolution of secondary woodiness
MSc course Plant Physiology — Université de Bordeaux

2022 — Supervision of student project (shared, 6 months)
Climatic tolerance of city trees
Research assistant P. Colombet — Université de Bordeaux

Supervision of part time student project (6 months)
Embolism resistance of Mediterranean trees
BSc student C Payne — Université de Bordeaux

2021 — Supervision of student project (6 months)
Xylem anatomy of embolism resistant Conifer species
MBO student H Hereijgers — Hogeschool Inholland Delft

2020 Lecture (30 min) - Functional traits case study
MSc course Methods in Biodiversity Analysis — Leiden University

Supervision of student project (6 months)
Response to drought of a giant woody cabbage cross
MSc student J van Haasteren — Leiden University

Supervision of student project (6 months)
Xylem anatomy in relation to embolism resistance in Cupressaceae
BSc student C van Kessel — Leiden University

2012 Practical - plant physiology "lab day"
MSc course Plant Physiology — Université de Bordeaux

CONFERENCES AND PRESENTATIONS

2024 Poster - "Global variation and trade-off of drought and frost resistance in trees"
13th International Plant Cold Hardiness Seminar — Clermont-Ferrand (France)

2022 Talk - "Trade off in cold and drought tolerance in trees"
Xylem International Meeting XIM5 — Wurzburg (Germany)

2019 Poster - "Genetic basis of convergent evolution of the anthocyanin pathway and floral pigmentation in Iochrominae"
Society for Integrative and Comparative Biology — Tampa, Florida

2017 Talk - "Linking changes in gene expression to the macroevolution of flower color in Iochrominae (Solanaceae)"
Evolution Meeting — Portland, Oregon

2015 Talk - "Evolution of drought tolerance in conifers - *Callitris* in Australia"
LabEx Day (LabEx COTE) — Bordeaux (France)

Talk - "The evolution of cavitation resistance in conifers and the case of world-record *Callitris*"
Xylem International Meeting XIM2 — Bordeaux (France)

2014 Talk - "The evolution of cavitation resistance in Conifers"
HIE Seminar Series - UWS — Richmond, NSW (Australia)

2012 Poster - "Global variation and evolution of drought tolerance in Conifers"
Journées de la Société Française de Systématique — Paris (France)