

BIOGRAPHICAL SKETCH

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NAME: Francesco Petruzzellis

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POSITION TITLE: Research Fellow

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
University of Trieste, Trieste (Italy)	Bachelor	01/10/2010	14/03/2014	Biology
University of Trieste, Trieste (Italy)	Master	17/03/2014	10/07/2015	Environmental Biology
University of Trieste, Trieste (Italy)	PhD	01/11/2015	22/03/2019	Plant Ecophysiology
University of Padova, Padova (Italy)	Tenure-Track Research fellow	01/10/2024	Present	Plant Ecophysiology

A. Personal Statement

My research career has been driven by a longstanding interest in understanding how plants interact with their environment and how their functional traits mediate survival under stress. As a plant ecophysiologicalist, I am particularly fascinated by the processes that determine plant responses to drought, a stressor that is rapidly intensifying with climate change and increasingly shaping ecosystem dynamics worldwide.

During my doctoral training and subsequent postdoctoral experiences, I focused on plant hydraulics and water relations, exploring how these traits contribute to the maintenance of turgor, water transport, and gas exchange under water limitation. I on the quantification of key traits such as turgor loss point, osmotic potential, cell wall elasticity, and hydraulic capacitance, linking these parameters to species' drought tolerance strategies from the individual to the community level.

Over the past years, I have expanded my research toward integrating trait-based ecophysiology with other techniques, such as molecular and remote sensing ones to answer to ecologically sound questions. For example, I have contributed to projects that combine spectral data with functional trait measurements to upscale drought-related traits from the leaf to the canopy level, offering novel avenues for biodiversity monitoring and ecosystem stress detection. At the same time, I have been investigating less explored aspects of plant ecophysiology, such as the role of stem photosynthesis in buffering internal hypoxia and sustaining metabolism when leaf photosynthesis is impaired by drought. These lines of research converge on a central question: how do plants sustain life under environmental stress, and what mechanisms confer resilience at both the organismal and ecosystem level?

My current position as a research fellow at the University of Padova allows me to further pursue these questions within an interdisciplinary network. I am involved in projects that span from controlled drought experiments in greenhouse conditions to field campaigns in diverse ecosystems, from Mediterranean forests to tropical environments. Looking ahead, my goal is to advance a research program that bridges mechanistic ecophysiology with predictive frameworks for climate resilience. By dissecting how traits such as hydraulic thresholds, tissue capacitance, and stem photosynthetic capacity contribute to drought survival, I aim to inform models that forecast vegetation dynamics under climate change and support conservation strategies for vulnerable ecosystems.

B. Positions, Scientific Appointments and Honors

Position and Scientific Appointments

2018 – 2020: Postdoctoral researcher at the University of Trieste
2021 – 2021: Postdoctoral researcher at the University of Udine
2022 – 2024: Postdoctoral fellow at University of Trieste
2023: National Scientific Qualification (ASN) as Associate Professor in Botany (05/A1), Italy
2024 – present: Research fellow at University of Padova

Honors

2018: 1st Prize Young Scientist Oral Presentation Award at International Association for Vegetation Science (IAVS) 2018 61st Annual Symposium

2018: Premio Giovani Biologi Vegetali at X Congresso Sociale della Società Italiana di Biologia Vegetale (SIBV) 2018

2017: 1st Prize Young Scientist Oral Presentation Award at International Association for Vegetation Science (IAVS) 2017 60th Annual Symposium

C. Contributions to Science

1. **Early career:** In the initial phase of my career, I focused on plant physiology and ecology, gaining experience in water relations and measurements. This training provided the basis for my later specialization in plant hydraulics and plant responses to drought.

Major outputs:

Savi T., Marin M., Luglio J., **Petrizzellis F.**, Mayr S., Nardini A. 2016. Leaf hydraulic vulnerability protects stem functionality under drought stress in *Salvia officinalis*. *Functional Plant Biology* 43, 370–379.

Petrizzellis F., Savi T., Bertuzzi S., Montagner A., Tretiach M., Nardini A. 2018. Relationships between water status and photosystem functionality in a chlorolichen and its isolated photobiont. *Planta* 247, 705-714. IF: 4.3.

2. **Graduate career:** During my PhD, I investigated the role of hydraulic and water-relation traits in mediating plant responses to drought. Using pressure–volume curves, I quantified turgor loss point, osmotic potential, cell wall elasticity, and tissue hydraulic capacitance across woody species. I optimized a framework for measuring hydraulic traits, especially turgor loss point, in a simplified a faster way than the previously used methods. This allowed me to include hydraulic traits for addressing ecologically sound question. For example, I was able to link hydraulic traits to ecological strategies such as the Leaf Economics Spectrum, contributing to trait-based frameworks for predicting species vulnerability to climate change.

Major outputs:

Petrizzellis F., Savi T., Bacaro G., Nardini A. 2019. A simplified framework for fast and reliable measurement of leaf turgor loss point. *Plant Physiology and Biochemistry* 139, 395-399.

Petrizzellis F., Nardini A., Savi T., Tonet V., Castello M., Bacaro G. 2019. Less safety for more efficiency: water relations and hydraulics of the invasive tree *Ailanthus altissima* (Mill.) Swingle compared with native *Fraxinus ornus* L.

Petrizzellis F., Tordoni E., Tomasella M., Savi T., Tonet V., Palandrani C., Castello M., Nardini A., Bacaro G. 2021. Functional differentiation of invasive and native plants along a leaf efficiency/safety trade-off. *Environmental and Experimental Botany*. 188, 104518.

3. **Postdoctoral career:** In my postdoctoral work, I broadened my focus from organ-level studies to community level ones. In addition, using integrative approaches, I contributed to projects coupling ecophysiology with remote sensing, demonstrating how hyperspectral and multispectral data can upscale leaf functional traits to canopy and landscape scales, and how spectral diversity can serve as a proxy for functional diversity and stress detection. In parallel, I started investigating processes with unresolved biological functional role, such as stem photosynthesis. Overall, my contribution at this stage aims at deepening mechanistic understanding of plant resilience and informing predictive models for ecosystem responses to climate change.

Major outputs:

Nardini A., **Petrizzellis F.**, Marusig D., Tomasella M., Natale S., Altobelli A., Calligaris C., Floriddia G., Cucchi F., Forte E., Zini L. 2020. Water 'on the rocks': a summer drink for thirsty trees? *New Phytologist*. 229, 199-212.

Petrizzellis F., Tordoni E., Di Bonaventura A., Tomasella M., Natale S., Panepinto F., Bacaro G., Nardini A. 2021. Turgor loss point and vulnerability to xylem embolism predict species-specific risk of drought-induced decline of urban trees. *Plant Biology*

Tordoni E., **Petrizzellis F.**, Di Bonaventura A., Pavanetto N., Tomasella M., Nardini A., Boscutti F., Martini F., Bacaro G. 2022. Projections of leaf turgor loss point shifts under future climate change scenarios. *Global Change Biology*, 28, 6640-6652.

Tomasella M., Casolo V., Natale S., **Petrizzellis F.**, Kofler W., Beikircher B., Mayr S., Nardini A. 2021. Shade-induced reduction of stem nonstructural carbohydrates increases xylem vulnerability to embolism and impedes hydraulic recovery in *Populus nigra*. *New Phytologist*. 231, 108-121.

Natale S., Tomasella M., Gargiulo S., **Petrizzellis F.**, Tromba G., Boccato E., Casolo V., Nardini A. 2023. Stem photosynthesis contributes to non-structural carbohydrate pool and modulates xylem vulnerability to embolism in *Fraxinus ornus* L. *Environmental and Experimental Botany*, 210, 105315.

Research activities

01/04/2023-31/12/2024: LR 2/2011 - Finanziamenti al sistema universitario regionale – “Microgrants”. Project: “Non-destructive estimation of leaf morphological and physiological traits using remote sensing techniques” (PI: Dr. Francesco Petrizzellis) - Conception of the project, data collection and statistical analysis.

01/01/2023-31/12/2024: PON “Ricerca e Innovazione” 2014-2020, D.M n. 1062 del 10 agosto 2021. Finanziamento MUR- FSE REACT EU - PON R&I 2014-2020. Project: “Towards the definition of Essential Biodiversity Variables by remote sensing for biodiversity monitoring” (PI Prof. Giovanni Bacaro) - Data collection and statistical analysis.

01/03/2021 – 21/12/2021: Project: “Bioirr: Root hydraulic redistribution as a tool for bio-irrigation in agriculture and forestry” (PI Prof. Giorgio Alberti) – Conception of the project, data collection and statistical analysis.

02/01/2019 – 31/05/2021: FRA2018: “Plant water relations and hydraulic traits for mechanistic modelling of the impact of climate change on plant distribution” (PI Prof. Andrea Nardini) - Data collection and statistical analysis.

05/11/2019 – 04/11/2020: Interreg project V-A Italia-Slovenia “SECAP Project – Support for energy and climate adaptation policies”. CUP J92C18000570006. Research program: “Assessing the impact of climate change on plant distribution on the basis of physiological traits”.

01/11/2018 – 31/10/2019: Interreg project V-A Italia-Slovenia “AgroTurII – Sustainable agriculture and tourism development in the cross-border Karst region”. CUP J92F17000870002. Research program: “Monitoring water status of vineyards in the Karst area”.

11/03/2016 – 30/06/2018: FRA2015: “Functional traits as a tool to predict invasive potential by alien species in different native communities” (PI Prof. Giovanni Bacaro) – Data collection and statistical analysis.

In total, I published 63 papers in peer-reviewed scientific journals, accounting for 1300 citation and H-index equal to 21 (Scopus, updated on 29/09/2025). The complete list of published work can be found here: <https://scholar.google.it/citations?user=D0W5hxsAAAAJ&hl=it>

Editorial activity

From September 2024: Associate Editor for *BMC Plant Biology*

From September 2022: Review Editor for *Frontiers in Plant Science*, section: Crop and Product Physiology

From November 2020: Topic Editor for *Plants*

Guest Editor of the Special Issue “Remote Sensing of Ecosystem Diversity” in *Remote Sensing* (deadline: 30/06/2022)

Guest Editor of the Special Issue “Advances in Functional Ecology: from Plant Functional Traits and Functional Diversity to Ecosystem Processes” in *Diversity* (deadline 30/04/2022)

Referee/Reviewer

Plant Ecology, Journal of Ecology, Scientific Reports, New Phytologist, Trees, Annals of Botany, Functional Ecology, Planta, Biological Invasions, Physiologia Plantarum, European Plant Phenotyping Network (EPPN 2020), Flora, Biodiversity and Conservation, Nature Communications, Water Resource Research, Plants, Forests, Annals of Forest Sciences, Plant Methods, Plant Biology, Journal of Experimental Botany, Ecological Informatics, Urban Forestry and Urban Greening, Frontiers in Plant Science, International Journal of Digital Earth, Journal of Vegetation Science, Global Ecology and Biogeography, Remote Sensing, Nature Ecology and Evolution, Applications in Plant Sciences