Sergio Balzano

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Summary

Researcher in marine microbiology and biogeochemistry focusing in the use of microalgae for biotech-relevant applications. I have a broad research experience in phytoplankton culturing, taxonomy and physiology as well as in microbial ecology and I'm currently focusing on the (1) diversity of microbial eukaryotes in polluted environments, the (2) production of secondary metabolites from marine microalgae (*Nannochloropsis* spp.) and the (3) use of microalgae for water and sediment bioremediation (phycoremediation).
Modern sequencing techniques are shedding light on the genetic, metabolic, and chemical diversity of marine microbes as well as their ability to degrade or uptake pollutants. Reconstructing such biosynthetic pathways is the challenge of the coming decade.

Education

1998-2004: Universitá degli studi Parthenope (NA, Italy). Bachelor and master degree in environmental science. 110/110 cum laude (first class degree). Master in phytoplankton taxonomy.

2005-2009: University of Southampton (UK). PhD in Marine Biogeochemistry: the role of microbial populations in the cycling of iron and manganese within marine aggregates.

Professional Experience

2009-2012: Postdoctoral Researcher – Station Biologique de Roscoff (France) - Phytoplankton ecology and taxonomy
We characterised Arctic phytoplankton using both culture-dependent and culture-independent approaches: *Micromonas* is almost the only small sized phytoplankter present in the Beaufort Sea driving most primary production while a wide range larger species mostly diatoms were also isolated and described.
2012: Postdoctoral Researcher- Station Biologique de Roscoff (France)- Transcriptomic
We analysed the transcriptomes of four Radiolaria specimens, identified a wide range of smaller microbes living inside Radiolaria cells and identified proteins likely involved in host/symbiont interactions.
2012-2014: Research Associate- Flinders University (Adelaide, Australia)-

1) Desalination: identified the biological sources of biofouling within Reverse Osmosis membranes of Penneshaw Desalination plant (South Australia).
2) Microbial ecology: I analysed microbial eukaryotes across a broad salinity gradient in a coastal lagoon and found that the geographic distance mostly shapes protist diversity

2014-2018: Postdoctoral Scientist- NIOZ, Netherlands-Biogeochemistry
I investigated the biological sources of long chain alkyl diols (LCDs) as well as the cellular concentration and the compositional changes of these lipids in a known LCD-producer, *Nannochloropsis* spp.. I combined stable-isotope and transcriptome analyses to identify the genes potentially involved in the biosynthesis of LCDs.
Jan-April 2019: Postdoctoral scientist at SZN, Naples. Microalgal adaptation to heavy metal pollution.

May 2019: Permanent researcher in the department of marine biotechnology at SZN.

Laboratory and bioinformatic skills

- Lipid extraction and analyses (GCMS, IRMS, NRM)
- Isolation, culturing, and identification of phytoplankton, aerobic and anaerobic bacteria
- DNA/RNA extraction, amplification, genomic and transcriptomic analyses
- Automated cell counting using flow cytometry
- Bioinformatics: metabarcoding, transcriptome and genome assembly, gene expression analyses (unix, Qiime, Muscle, Deseq)

Languages

- Native Italian speaker
- Fluent in spoken and written English (IELTS 8.0, Sept 2013) and French.
- Ability to communicate in Spanish, basic communication skills in Dutch and Portuguese.

Projects

Participation on projects as PhD, postdoctoral or permanent researcher

- 2005-2008: Bio-transformation of trace elements in aquatic systems (BIOTRACS). https://cordis.europa.eu/project/id/514262. Participation as PhD student.
- 2009-2012: MALINA. How do changes in ice cover, permafrost, and UV radiation impact biodiversity and biogeochemical fluxes in the Arctic Ocean. http://www.obs-vlfr.fr/malina/. Participation as postdoctoral researcher.
- 2012: MicroB3 project, Marine Biodiversity, bioinformatics, biotechnology. Participation as postdoctoral researcher. https://www.microb3.eu
- 2012-2014. National Centre of Excellence in Desalination Australia (NCEDA). Assessing the biofouling role of microbes in the desalination system; from the intake pipe to the reverse osmosis membranes. Participation as postdoctoral researcher.
- 2014-2018. Long chain diols as novel organic proxies for paleoclimate reconstructions. https://cordis.europa.eu/project/id/339206/results/it. Participation as postdoctoral researcher.
- 2021-present. Bioremediation of contaminated sediments in coastal areas of ex-industrial sites. Participation as researcher.

Experience in projects and grant writing

- 2013: Microbial diversity in South Australia hypersaline environments (2013). Grant not awarded.
- 2013: National Centre of Excellence in Desalination Australia (NCEDA). Dynamics of biofouling formation in RO membrane; Characterisation of the main precursors, microbial succession, inhibition, and sustainability. Grant not awarded.
- 2019. Application for a Norma J Lang Early Career Fellowship. Grant not awarded
- 2019: Biosynthesis of long chain aliphatic compounds from Nannochloropsis spp.. Grant awarded, PhD project funded by SZN.
- 2020: Bando progetti di ricerca Centro Ricerche ed Infrastrutture marine avanzate in Calabria (CRIMAC). Microalgae based products for aquaculture feed (MICROPRO). Participation as principal investigator. Grant not awarded.
- 2020: Bando progetti di ricerca Centro Ricerche ed Infrastrutture marine avanzate in Calabria (CRIMAC). MICROalgae-heavy METal Interaction and potential for phycoremediation (MICROMET). Grant not awarded.

- 2020: inNovatIve strateGy for High-performing CO_2 capTure and biocompound production. Grant not awarded
- 2021: Search for plastic-degrading enzymes in plastisphere microbial communities from the Gulf on Naples (PLAZY). Grant not awarded
- 2022: Search for plastic-degrading enzymes in plastisphere microbial communities from the Gulf on Naples (PLAZY). Re-submitted as a PRIN
- 2022: Pollution-adapted microalgae and potential for heavy metal phycoremediation. Submitted to National Geographic Project.

Publications

Master thesis: Taxonomy, biogeography and physiology of the diatom *Skeletonema*. October 2004.

PhD thesis: The role of microbial populations in the release of reduced iron and manganese from marine aggregates. December 2009.

Total publications	40
Peer reviewed publication	36
Of which as first/last author	17
H index	17
Total citations	1246

Full publication list:
https://scholar.google.com/citations?hl=it&user=dl4QFXgAAAAJ&view_op=list_works&authuser=1&sortby=pubdate

Most recent publications:

- Jamieson T, **Balzano S**, Kildea T, Ellis AV, Brown MH, Leterme S. (in press). Eukaryotic diversity within a seawater reverse osmosis desalination plant and its impact on fouling. *Desalination*
- **Balzano S.,** Sardo A., Bioinformatic prediction of putative metallothioneins and phytochelatins in non-ciliate protists (https://doi.org/10.1098/rsbl.2022.0039). Biology Letters.
- Blasio M, **Balzano S.** (2021). Fatty Acids Derivatives From Eukaryotic Microalgae, Pathways and Potential Applications. *Frontiers in Microbiology* (https://doi.org/10.3389/fmicb.2021.718933)
- Santin A, Russo MT, Ferrante MI, **Balzano S,** Orefice I, Sardo A. (2021). Highly Valuable Polyunsaturated Fatty Acids from Microalgae: Strategies to Improve Their Yields and Their Potential Exploitation in Aquaculture. Molecules 26 (24): 7697
- Jamieson T, **Balzano S**, Le Lan C, Kildea T, Ellis AV, Brown MH, Leterme SC (2021). Survival of the fittest: prokaryotic communities within a SWRO desalination plant. *Desalination* (in press).
- Sardo A, Orefice I, **Balzano S**, Barra L, Romano G (2021). Mini-Review: Potential of Diatom-Derived Silica for Biomedical Applications. *Applied Sciences* 11: 4533 (https://doi.org/10.3390/app11104533).
- Lattaud J, **Balzano S**, van der Meer MTJ, Villanueva L, Hopmans EC, Sinninghe Damsté JS, Schouten S. (2021). Sources and seasonality of long-chain diols in a temperate lake (Lake Geneva). Organic Geochemistry 156: 104223 (https://doi.org/10.1016/j.orggeochem.2021.104223).
- **Balzano S**., Jamieson T, Leterme SC. (2021). Changes in microbial communities during seawater pre- treatment within a desalination plant. Aquatic Microbial Ecology https://doi.org/10.3354/ame01958.

- Abdala Asbun A, Besseling MA, **Balzano S**, van Bleiswijk J, Witte H, Villanueva L, Engelmann JC. Cascabel: a flexible, scalable and easy-to-use amplicon sequence data analysis pipeline (2020). Frontiers in Genetics: doi: 10.3389/fgene.2020.489357

- Massicotte P, Amon R, Antoine D, Archambault P, **Balzano S** … Babin M. (2020). The Malina oceanographic expedition: How do changes in ice cover, permafrost and UV radiation impact biodiversity and biogeochemical fluxes in the Arctic Ocean?. Earth System Science Data https://doi.org/10.5194/essd-2020-252

- **Balzano S**, Sardo A, Blasio M, Chahine TB, Dell'Anno F, Sansone C, Brunet C. Microalgal metallothioneins and phytochelatins and their potential use in bioremediation (2020). Frontiers in Microbiology: 10.3389/fmicb.2020.00517

- Lattaud J, Erdem Z, Weiss G, Rush D, **Balzano S**, Chivall D, van der Meer M, , Hopmans EC, Sinnighe Damsté JS, Scouten S. Hydrogen isotopic ratios of long-chain diols reflect salinity (2019). Organic Geochemistry: 10.1016/j.orggeochem.2019.103904

- **Balzano S**, Villanueva L, de Bar M, Sahonero Canavesi D, Yildiz Ç, Engelmann J, Sinninghe Damsté J, Schouten S. (2019) *Biosynthesis of long chain alkyl diols (LCDs) in Eustigmatophyceae*. Plant and Cell Physiology: DOI: 10.1093/pcp/pcz078

Workshops, conferences and fieldwork

- Oceanography cruise on the Baltic Sea (May 2016)
- Seasonal sampling of water on the Coorong Lagoon (South Australia): 2013-2014
- RNA-seq data analyses workshop (Leiden ,September 2016)
- Gordon research conference: Microbiology (Boston July 2015. Girona, Spain June 2016)
- Marine microbiome discovery and innovation (Berlin, July 2016)
- International conference for Algal Biomass, Biofuel, and Bioproducts (Miami, June 2017)
- International conference for Algal Biomass, Biofuel, and Bioproducts (Seattle, June 2018)
- AISAM workshop on the study and biotechnological applications from microalgae (Florence, November 2019)
- Sampling of coastal seawater and sediment in the Gulf of Naples (June 2020).
- Sampling of surface sediment in the gulf of Naples (March 2022)
- Sampling of sponges in Ischia (March 2022)

Student supervision

- April to June 2011. Melanie Chanoine, internship: Intraspecific variability of the dominant Arctic algae by ITS sequencing
- October 2012 to January 2013: Camille Moreau, internship: chemical and biological changes during seawater pre-treatment for reverse osmosis.
- March to August 2013: Xavier Denis, internship: production of Transparent Exopolymer Particles from phytoplankton.
- March to July 2013: Hugo Compas, internship: evolution of chemical and biological parameters in Penneshaw desalination plant.
- April to July 2013: Elsa Abs, internship: microbial communities in the Coorong Lagoon.
- February to August 2013: Tamar Jamieson, Honours: Bacterial colonisation and Transparent Exopolymer Particles production from reverse osmosis membrane.
- January to June 2014: Louis Thirot, Honours. Development of molecular fingerprinting techniques for screening eukaryotic diversity

- May to September 2019: Martina Blasio, scholarship. Microbial community composition in heavy metal contaminated sediments.
- October 2019 to present: Martina Blasio, PhD student: Aliphatic polymers from *Nannochloropsis* spp., biosynthesis and biotechnological application
- September 2020 to September 2021: Lucia Barra, postdoctoral researcher. Use of microalgae for heavy metal bioremediation
- April 2022 June 2022: Guillaume Dupont, IMBRSea student, internship
- April 2022 June 2022: Gioia Vanessa de Klerk, IMBRSea student, internship