

Sergio Balzano

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Summary

Researcher in marine biotechnologies with a broad research experience in phytoplankton culturing, taxonomy, and physiology as well as marine biogeochemistry and microbial ecology. My current research focuses on the use of microalgae for biotechnological applications. I'm focusing on the diversity and adaptation of microalgae and other microbial eukaryotes to polluted environments and their potential use for bioremediation and water treatment. In the last 5 years we have been (1) investigating specialty compounds and toxic metal uptake potential from the biotech microalga *Nannochloropsis oceanica* and (2) isolating and culturing several microalgal strains from marine and riverine sediments highly contaminated by toxic metals and hydrocarbons and exploring their potential use in bioremediation and water treatment. In addition, we are currently investigating means to improve aquaculture sustainability using microalgae, for both aquafeed production and wastewater treatment.

Microalgae and microbes in general encompass a huge genetic, metabolic, and chemical diversity, they are able to uptake contaminants from polluted environments and synthesise, under selected conditions, biotech-relevant compounds. I'm generally interested in (1) isolating microalgae from polluted environments, for their (2) genetic and biochemical characterisation and (3) to setting novel strategies to combine wastewater treatment with specialty compound production using microalgae.

Education

1998-2004: Università 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: we identified the biological sources of biofouling within Reverse Osmosis membranes of Penneshaw Desalination plant (South Australia).
- 2) Microbial ecology: we 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 ecosustainable marine biotechnology at SZN. I'm currently investigating the use of microalgae for biotech-related purposes such as wastewater treatment and specialty compound production.

Laboratory and bioinformatic skills

- Lipid extraction and analyses (GCMS, IRMS, NRM, HPLC)
- Isolation, culturing, and identification of microalgae, 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

Role as project participant:

- 2005-2008: Bio-transformation of trace elements in aquatic systems (BIOTRACS). <https://cordis.europa.eu/project/id/514262>.
- 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/>
- 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.
- 2014-2018. Long chain diols as novel organic proxies for paleoclimate reconstructions. <https://cordis.europa.eu/project/id/339206/results/it>
- 2021-2025. Bioremediation of contaminated sediments in coastal areas of ex-industrial sites. Participation as researcher (<https://life-sedremed.eu/it/homepage/>).
- 2022-2025. Marine microbiome-driven bioremediation of organic and inorganic pollutants. This short project is part of a PNRR project assigned to SZN.

Projects and grant writing

- 2013: Microbial diversity in South Australia hypersaline environments (2013).
- 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
- 2019-2023. PhD project, the Open University XXI cycle. Production and biosynthesis of secondary metabolites from *Nannochloropsis oceanica* (Eustigmatophyceae); role as

Director of Studies (PhD coordinator). Student: Martina Blasio. Grant awarded and PhD successfully defended in April 2024.

- 2019: sviluppo di sistemi innovative integrati per lo studio della diversità microbica ed il suo potenziale biotecnologico in ecosistemi marini ad elevato impatto antropico.
- 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.
- 2020: Bando progetti di ricerca Centro Ricerche ed Infrastrutture marine avanzate in Calabria (CRIMAC). MICROalgae-heavy METal Interaction and potential for phycoremediation (MICROMET)
- 2020: inNovative strateGy for High-performing CO₂ capTure and biocompound production.
- 2021: PRIN. Search for plastic-degrading enzymes in plastisphere microbial communities from the Gulf on Naples (PLAZY).
- 2022: PRIN. Search for plastic-degrading enzymes in plastisphere microbial communities from the Gulf on Naples (PLAZY).
- 2022: FISA – A phycoremediation-based approach in ore mining for economically efficient and environmentally acceptable secondary resource supply (PHYCORES)
- 2022: National Geographic Grant Level I. Pollution-adapted microalgae and potential for heavy metal phycoremediation. Project submitted as PI.
- 2023: National Geographic Grant Level I. Integrating Microbial Diversity and Multitrophic Aquaculture by introducing Ecomimicry in Blue Food Production. Project submitted as PI.
- 2023: National Geographic Grant Level II. “From Sensing the sea change to transformative initiatives of networked sustainability in the medcoastal periphery”. Project submitted by Dr Domenico D’Alelio, S. Balzano contributed as participant.
- 2023: Horizon Europe. “Innovative biomass biorefinery process for high quality and low cost advanced cosmetic and agrotechnology products”. Contribution to grant writing as participant.
- 2023: European Cooperation in Science and Technology. Exploiting biodiversity of microALgae and their microBIOME for biotechnological applications- Contribution to grant writing as a participant.
- 2024: Horizon EIC 2024 Pathfinderopen-01. Bio-based production, upgrading and storage of hydrogen by means of an innovative and sustainable value chain.
- 2024: National Geographic Grant Level I. Wastewater treatment and blue food production in aquaculture (WATA). Project submitted as PI
- 2024: Role as local (SZN) PI in writing a project within the Sustainability Blue Economy Partnership (SBEP). Aquasus: towards sustainable and circular aquaculture.
- 2025: Role as participant in writing a project within the HORIZON-CL6-2025-01-ZEROPOLLUTION: Biorewise, use of microalgae and bacteria for hydrocarbon bioremediation
- 2025: Role as local (SZN) PI in writing a project within HORIZON-CL6-2025-02-FARM2FORK-10Diversifying aquaculture production with emphasis on low-trophic species : Aliaqua Advancing Low Impact Aquaculture for a Sustainable Blue Economy.
- 2025: Role as local (SZN) PI in writing a project within the Sustainability Blue Economy Partnership (SBEP). Aquacirc: Aquaculture Circularity for Nutrient Recovery and Sustainability.

Theses and publications

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

Total publications	56
Peer reviewed publication	52
Of which as first author	16
H index	24
Total citations	2493

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

Full publication list:

https://scholar.google.it/citations?hl=en&user=dl4QFXgAAAAJ&view_op=list_works&sortby=pubdate

Most recent publications:

- Blasio, M.; Cutignano, A.; Sardo, A.; Schouten, S.; **Balzano, S.** (2026) Further Insights into Influence of Light Intensities on the Production of Long-Chain Hydroxy Fatty Acids, Fatty Diols and Fatty Alcohols in *Nannochloropsis oceanica*. *Phycology* **2026**, 6, 11. <https://doi.org/10.3390/phycolgy6010011>
- Plakolm L, **Balzano S**, Nagy M, Heinz P, Gruber D, Schmidt K, Stockhausen M, Hofmann T, Lintner M (2025). Assessment of anthropogenic metal pollution in Bagnoli (Gulf of Naples) through changes in foraminiferal assemblages and shell chemistry. *Journal of Micropalaeontology*, 44 (2); 343-363
- Vitale L, Tedesco P, Galasso C, Vitale GA, Varola G, Della Sala G, Palma Esposito F, **Balzano S**, Ghani J, de Pascale D, Dinelli E, Meisel TC, Coppola D, Funari V (2025). Biotechnological valorisation of Spent Automotive Catalytic Converters: Marine microorganisms in PGE leaching and recovery. *Journal of Environmental Chemical Engineering*. 13: 118729. <https://doi.org/10.1016/j.jece.2025.118729>
- Lintner M, **Balzano S**, Keul N, Heinz P, Maneckie M, Klimek A, Wanek W, Cyran N, Gruber D, Schmidt K, Holzmann M, Golen J, Tyszka J (2025). Biosorption of heavy metals by microalgae: hazardous side effects for marine organisms. *Chemosphere* 372: 144080.
- Tedesco, P., **S. Balzano**, D. Coppola, F. P. Esposito, D. de Pascale and R. Denaro (2024). "Bioremediation for the recovery of oil polluted marine environment, opportunities and challenges approaching the Blue Growth." *Mar Pollut Bull* 200: 116157.
- Barra L, Sardo A, Moros M, Smerilli A, Chiaiese P, Percopo I, Cavalletti E, Castro-Hinojosa C, **Balzano S.** (2022). Identification of a Green Algal Strain Collected from the Sarno River Mouth (Gulf of Naples, Italy) and Its Exploitation for Heavy Metal Remediation. *Microorganisms*: 10 (12): 2445 <https://doi.org/10.3390/microorganisms10122445>

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)
- AISAM workshop on the study and biotechnological applications from microalgae (Naples, October 2022)

- 1st International Summer School in Bioremediation of Aquatic Environments (Naples, October 2025), organiser, chair and speaker.

Seminars and courses

- December 2020. Lecture to PhD students of SZN within the course of Marine Biotechnology: Phytoremediation: current knowledge and future perspectives.
- March 2022: Two lectures provided within the course organised by the “Universidad Interamericana de Puerto Rico“ titled Bioprospeccion de microalgas nativas para la economia azul: (1) Microalgae: diversity, ecology, and analyses methods, and (2) Potential of microalgae for bioremediation.
- October 2022. Seminar within the course of Ecotoxicology, held at Federico II University, (Naples): utilizzo delle microalghe per il trattamento delle acque
- March 2023. Lecture to PhD students of SZN within the course of Marine Biotechnology: Microalgae for bioremediation and water treatment
- July 2023. Dissemination seminar at the event “Acquacoltura, sistemi a confronto e sfide future” titled: “utilizzo delle microalghe per il trattamento delle acque reflue d’acquacoltura
- November 2023. Seminar within the course of Biotechnology and animal productions, held at Federico II University, (Naples): potenziale utilizzo delle microalghe per il trattamento delle acque e il biorisanamento
- May 2024. Dissemination seminar at Ecorcore day organized by Ecorcore. “Microplastiche a mare e meccanismi microbici di degradazione”.
- June 2024. Seminar in Helsinki (Finland) as part of the project Sedremed: Enhanced bioremediation of contaminated sediments in coastal areas of ex-industrial sites
- July 2024. Seminar at Sant’Anna Institute (Sorrento) as part of the course in marine biology. Potential of microalgae for bioremediation
- November 2024. Seminar at the course of environmental conservation (Biology Department, University Federico II, Naples). Potential of microalgae for bioremediation
- January-June 2025. ORIENTALIFE. Eight dissemination lectures directed to high school students titled “Biotecnologie microalgali: composti di interesse, tolleranza agli inquinanti e trattamento reflui”
- January-May 2025. Lecturer at Sant’Anna Institute, a private institute in Sorrento affiliated with Jacksonville University (Florida, US) for the course “Introduction to Scientific Research”
- April 2025. Seminar at Sant’Anna Institute for the course of marine conservation titled: microalgal diversity and ecology.
- May 2025. Dissemination seminar within the conference organized by Primaurora association, “Cosa minaccia i nostri mari”. “Inquinamento marino, microalghe e biorisanamento”.
- June 2025. Seminar within the Instytut Nauk Geologicznych Polskiej Akademii Nauk. Use of microalgae for bioremediation and water treatment
- October 2026. Lecture within the summer school in bioremediation of the Aquatic Environments (SZN, molosiglio). Use of microalgae for bioremediation and water treatment
- November 2025. Seminar at the course of zoology (Biology Department, University Federico II, Naples). Potential of microalgae for bioremediation
- January-May 2026. Lecturer at Sant’Anna Institute, a private institute in Sorrento affiliated with Jacksonville University (Florida, US) for the course “General Chemistry”

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 Thiot, 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 April 2024: Martina Blasio, PhD student. Production and biosynthesis of secondary metabolites from *Nannochloropsis oceanica* (Eustigmatophyceae)
- April 2022-June 2022: Gioia Vanessa de Klerk, IMBRSea undergraduate student (<http://www.imbrsea.eu/>). 2 month internship about the use of *Nannochloropsis oceanica* for metal removal in polluted waters
- April 2022-June 2022: Guillaume Dupont, IMBRSea undergraduate student (<http://www.imbrsea.eu/>). 2 month internship about the use of *Tetraselmis convolutae* for metal removal in polluted waters
- January 2023-June 2023: Alexandra Bettinelli, IMBRSea master thesis (http://www.imbrsea.eu). Master thesis titles “Use of microalgae for heavy metal bioremediation”
- October 2023-present: Renato Schettino, undergraduate student from Naples University (Federico II): microalgae for water treatment.
- March-June 2024. Mohsina Siddika. AquaH master thesis (<https://aquah.co.uk/>). Testing microalgae extracts against human oral cancer.
- April-June 2024. Evangelia Gara, undergraduate student in biology from Aristotle University of Thessaloniki. Microalgae for water treatment
- April-June 2024. Iason-Panagis Savvaoglou, undergraduate student in biology from Aristotle University of Thessaloniki. Microalgae for water treatment
- January to June 2025. Marianna Morra. Master thesis student at Federico II University, Naples
- March to May 2025. Maria Nicoletti, intern undergraduate student in biology from Federico II University, Naples
- December 2025 to July 2026. Karla Paola Lopez Martinez, IMBRSea master thesis (http://www.imbrsea.eu). Master thesis titles “Suitability of strains for combined use in aquaculture wastewater treatment and feed development”
- January to July 2026. Marta Mazurkiewicz, IMBRSea master thesis (http://www.imbrsea.eu). Master thesis title “The use of microalgae in the bioremediation of toxins: A study investigating the synergistic capability of microalgae and bacteria”