

Challenges and opportunities for research and management in Mediterranean-climate rivers

Núria Bonada: Department of Ecology, University of Barcelona, Barcelona, Spain

Rivers in Mediterranean climates (med-rivers) are unique ecosystems because of their predictable winter flooding and summer drought regimes. These characteristics are key drivers of aquatic and riparian organisms, and the ecosystem functions and services they provide. Med-rivers are hotspots of biodiversity, supporting species adapted to both floods and droughts or using them for part of their life histories. At the same time, flow seasonality drives fluxes of nutrients and organic matter and, consequently, food web dynamics. Med-rivers have been affected for centuries, in some cases millennia, by multiple human activities that increasingly threaten these ecosystems worldwide. These threats include changes in land use, nutrient loads, heavy metal concentrations, salinity, water withdrawals, invasive species and, more recently, xenobiotics or emerging organic pollutants. In addition, future climate change scenarios predict increases in drought conditions and in the occurrence of extreme events, such as floods, heat waves, and wildfires. The diversity of aquatic organisms is declining more rapidly in med-rivers than in rivers anywhere else in the world and, for some taxonomic groups, Mediterranean regions have more introduced than native species. River management in med-rivers requires innovative approaches to account for both natural and human disturbances. Most research conducted in med-rivers has focused on the effects of flow seasonality and human pressures on biodiversity and ecosystem processes; however, there is a still large gap in linking basic and applied research knowledge to improve bioassessment, conservation, and restoration practices. Little ecological and biological information is also available in several Mediterranean regions, and consequently these regions are being slow on implementing sustainable river management policies and species conservation programs.

Co-authors:

Stefano Amalfitano: Water Research Institute, National Research Council (IRSA-CNR), Rome, Italy

Joan Artigas: Laboratory Microorganisms: Genome and Environment, University Blaise Pascal, Clermont-Ferrand, France

Susana Bernal: Integrative Freshwater Ecology Group, Center for Advanced Studies of Blanes (CEAB-CSIC), Blanes, Spain

Scott D. Cooper: Department of Ecology, Evolution, and Marine Biology and Marine Science Institute, University of California, Santa Barbara, USA

Helen Dallas: Freshwater Research Centre and Nelson Mandela Metropolitan University, Port Elizabeth, South Africa

Peter Davies: Centre of Excellence in Natural Resource Management, The University of Western Australia, Albany, Australia

Jenny Day: Zoology Department, University of Cape Town, Rhodes Gift, South Africa

Ferdie de Moor: Department of Freshwater Invertebrates, Albany Museum and Department of Zoology and Entomology Rhodes University, Grahamstown, South Africa

Tom L. Dudley: Marine Science Institute, University of California, Santa Barbara, USA

Stefano Fazi: Water Research Institute, National Research Council (IRSA-CNR), Rome, Italy

Ana Filipa Filipe: CIBIO/InBio, University of Porto, Vairão, Portugal; CEABN/InBio, University of Lisboa. Lisboa, Portugal

Ricardo Figueroa: Faculty of Environmental Sciences and CHRIAM Center, University of Concepción, Concepción, Chile

Avital Gasith: Department of Zoology, Tel-Aviv University, Tel-Aviv, Israel

Antoni Ginebreda: Department of Environmental Chemistry, IDAEA-CSIC, Barcelona, Spain

Yaron Hershkovitz: The Steinhardt Museum of Natural History and National Research Center, Department of Zoology, Tel Aviv University, Tel-Aviv, Israel

Matt Kondolf: Department of Landscape Architecture & Environmental Planning, University of California, Berkeley, USA

P. Sam Lake: School of Biological Sciences, Monash University, Melbourne, Australia

Julio López-Doval Department of Ecology, University of Sao Paulo, Sao Paulo, Brazil

Sean Marr Department of Biodiversity, University of Limpopo, Sovenga, South Africa

John Melack: Department of Ecology, Evolution, and Marine Biology and Marine Science Institute, University of California, Santa Barbara, USA

Isabel Muñoz: Department of Ecology, University of Barcelona, Barcelona, Spain

Mira Petrovic: Catalan Institute for Water Research (ICRA), Girona and Catalan Institution for Research and Advanced Studies (ICREA), Barcelona, Spain

Mary Power: Department of Integrative Biology, University of California, Berkeley, USA

Narcís Prat: Department of Ecology, University of Barcelona, Barcelona, Spain

Vincent H. Resh: Department of Environmental Science, Policy & Management, University of California, Berkeley, USA

Maria Rieradevall: Department of Ecology, University of Barcelona, Barcelona, Spain

Belinda Robson: School of Environmental Science, Murdoch University, Murdoch, Australia

Patricia M. Rodríguez-González: Centro de Estudos Florestais, Instituto Superior de Agronomia, Universidade de Lisboa, Lisboa, Portugal

Anna M^a Romaní: Department of Ecology. University of Girona, Girona, Spain

Sergi Sabater: Department of Ecology. University of Girona, Girona, Spain

John Sabo: School of Life Sciences, Arizona State University, Tempe, USA

John Stella: State University of New York, College of Environmental Science and Forestry, Syracuse, New York, USA

J. Manuel Tierno de Figueroa: Department of Zoology, University of Granada, Granada, Spain

Xisca Timoner: Department of Ecology. University of Girona, Girona, Spain

Iraima Verkaik: Department of Ecology, University of Barcelona, Barcelona, Spain

Irene Ylla. Department of Ecology. University of Girona, Girona, Spain

Annamaria Zoppini: Water Research Institute, National Research Council (IRSA-CNR), Rome, Italy