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# In Memoriam: Maria Rieradevall (1960-2015)

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On October 15th 2015, our friend, colleague, and mentor Maria Rieradevall passed away. She was born in Barcelona (February 23th 1960), where she grew up combining her studies with outdoor activities related to nature.

Maria finished the Degree in Biology at the University of Barcelona in 1983. She was initially fascinated by marine ecology but soon after started to discover the beauties of freshwaters ("bentos dolç" or "sweet benthos" as she used to call it in the lab). She graduated in 1991 with a PhD thesis on the benthos of the Banyoles Lake and under the supervision of Prof. Dr. Narcís Prat.

Maria was a very versatile researcher who helped to advance the knowledge of Iberian limnology. She studied a wide variety of ecosystems, from rivers to lakes to coastal lagoons, focusing on macroinvertebrates (specially Chironomidae) as model organisms. Her contributions on these topics have been acknowledged by many national and international researchers. In the following sections, we aim to pay tribute to Maria by reviewing her contribution to research, and highlighting her past passion for teaching, mentoring, and her strong commitment with scientific outreach.

## Chironomidae

Maria was fascinated by Chironomidae and was one of the worldwide specialists on this group. She combined morphological with caryological characters to describe larvae and pupa (Michailova *et al*., 1994), and described several new species records for the Iberian Peninsula and for several South American countries (Rieradevall *et al*., 2007; Prat *et al*., 2013). In addition to the taxonomic notes, Maria also contributed to understand the ecology and, in particular, the environmental factors determining Chironomidae communities in Mediterranean Iberian rivers and coastal lagoons (e.g., Sahuquillo *et al*., 2008; Puntí *et al*., 2009). Her interests for Chironomidae extended also to the study of the fossil record of Chironomidae in lakes, contributing also with a taxonomic key of Tanypodinae based on cephalic setation that has been used by many researchers (Rieradevall & Brooks, 2001). She was so excited by Chironomidae that she seemed to see them in many places in her life. For example, we all remember how often she identified the contour of the north side of the Montserrat Mountain with a mentum of Chironomidae larvae (Figure 1).

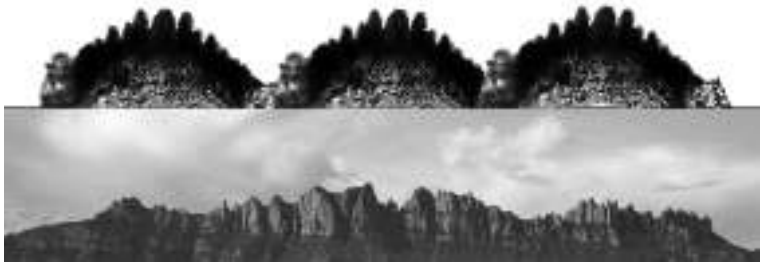

**Figure 1.** Parallelism between the contour of the north side of the Montserrat Mountain (Barcelona) with a mentum of Chironomidae larvae. *Paralelismo entre la silueta de la cara norte de Montserrat (Barcelona) y el méntum de una larva de Quironómido.*

## Paleolimnology of lakes

Maria's passion for Chironomidae was also very useful for understanding how past events have shaped the present. By studying the ecological preferences of the present Chironomidae communities, she used the fossil records of Chironomidae in lake sediments to infer past climate and habitat conditions. Using this technique she took an amazing journey from the Holocene period in Ordesa Natural Park (Valero-Garcés *et al*., 2013) to the Medieval times in Lake Estanya (Morellón *et al*., 2009). During that journey she was able to reveal the traces of past agricultural expansion in Bassa de la Mora (Pérez-Sanz *et al*., 2013), understand how climate has changed in the past (Valero *et al*., 2010), and how aquatic ecosystems have reacted to global warming during the last decades (Catalán *et al*., 2015).

## Costal lagoons and wetlands

Maria devoted part of her research to studying one of the most endangered ecosystems in the planet: coastal lagoons and wetlands. She was very concerned about how human action was rapidly and profoundly transforming coastal ecosystems, and she particularly worried about the situation of the Llobregat Delta Maria understood urban deltas as mosaics, little islands of water and life surrounded by human-made structures. She found that freshwater effluents rich in nutrients were leading to the eutrophication of most coastal lagoons (Cañedo-Argüelles *et al*., 2012a), and that the hydrology of the lagoons was a key driver of the biochemical processes (Roselli *et al*., 2013), the organization of the invertebrate communities (Cañedo-Argüelles & Rieradevall, 2010), and the colonization of new habitats (Cañedo-Argüelles & Rieradevall, 2011). Finally, she participated in the design and implementation of a new biotic index that used Chironomidae pupal exuviae to assess the ecological status of coastal lagoons and wetlands in the context of the European Water Framework Directive (Cañedo-Argüelles *et al*., 2012b).

## Biomonitoring of rivers

Maria's research career also stands out for her contributions to several tools to assess the ecological status rivers. For example, she cofounded the ECOBILL team who was pioneer in the study of the ecological status of Iberian rivers and was also an active member of the GUADALMED project. Her creative ideas and her large field experiences were very valuable to adapt the BMWP' index to Mediterranean rivers (IBMWP, Alba-Tercedor *et al*., 2002), or to design the QBR index to assess the quality of riparian vegetation (Munné *et al*., 2003) and the IHF for instream habitat diversity (Prat *et al*., 2009). Her research in this field also extended to other regions, contributing to develop biomonitoring tools for South

American rivers (the CERA protocol, www.ub.edu/fem). In addition, more recently she was involved in the European project MIRAGE (www.mirage.eu) and the Life project TRivers (www.lifetrivers.eu) to design tools for the biological quality assessment of intermittent rivers (e.g., see Prat *et al*., 2014; Cid *et al*., 2016).

**Drought and fire in Mediterranean streams and rivers**

Within her research on river ecosystems, she was one of the first to consider two important natural disturbances affecting Mediterranean ecosystems that commonly co-occur: drought and fire. She notably contributed to the study of intermittent streams and rivers (e.g., Rieradevall *et al*., 1999; Chaves *et al*., 2008; García-Roger *et al*., 2011; Cid *et al*., 2016), and inspired the work of others following this topic. For instance, she used the ratio EPT/OCH to assess the level of flow intermittency in Mediterranean rivers (Bonada *et al*., 2006).

Regarding fire, she was a pioneer beginning the studies of the effects of fire in streams in 1993 and received an award to visit Australia to compare her data with those collected in Australia. She led two consecutive and complementary projects (FURIMED and FURIMED 2) that contributed to understand the effects of fire in Mediterranean rivers (Vila-Escalé, 2007; Verkaik *et al*., 2013a; Rodríguez-Lozano *et al*., 2015a). She demonstrated that extreme seasonal drought may override wildfire effects in stream macroinvertebrate communities (Verkaik *et al*., 2013b) and that past wildfires can also modify key ecosystem processes such as leaf litter breakdown (Rodríguez-Lozano *et al*., 2015b).

**Passion for teaching**

Maria was a true university professor. Her passionate and demanding understanding of the role a professor plays in the University influenced her colleagues and students. She taught a wide variety of courses, from general community ecology to limnology and paleoecology, and covered both applied and fundamental perspectives at graduate and postgraduate levels. She devotedly prepared her classes and participated actively in any aspect of teaching and student management. Her efficient organizational skills were recognised by her academic colleagues in any coordination activity she was involved. Her students' motivation and performance increased as a result of her ability to translate difficult issues into accessible things. In her classes, full of art and history, Calder's mobiles represented the interconnectivity of ecosystems, and paleo proxies (i.e. fossil Chironomidae, tree rings) were the Rosetta Stone to read the past climate.

Maria enjoyed her classes, and her true belief to go towards the highest quality in university teaching brought her to lead and participate on different teaching innovation projects. As a result, Maria's teaching heritage includes conference presentations, lab manuals, and publications on innovative teaching methodologies such as Problem Based Learning (Mauri et al., 2009; Llorente *et al*., 2011).

**Scientific outreach**

Along her research career, Maria put lots of efforts on bringing her research to the general public. Her creativity, imagination, and her passion for teaching were very valuable to design tools that are being used by many social groups. Her drawing of the health status of Mr. River linked to the biological quality of a river is an example of her original ideas to share her research. No one who saw her dancing with her hands on the head to reproduce Simuliidae antennae will ever forget how these larvae catch their food.

Among all her contributions, her main highlight was probably the design and implementation of the "Projecte Rius" program (www.projecterius.org), an environmental education program that aims to

bring biomonitoring of river ecosystems to the society. Following this, she was a key member in the development of the cell phone application Riu.net to assess the ecological status of a study site.

**Maria as mentor**

Along her research career, Maria supervised 23 Bachelor/Master, 5 PhD, and 2 ongoing PhD theses and trained a generation of very enthusiastic researchers who are following her paths.

She was a very demanding mentor. She not only demanded scientific excellence, she also demanded integrity, teamwork, creativity, enthusiasm and, above all, independent thinking. She demanded all that because she had those qualities, and she knew that they were extremely important to be successful in the scientific career. Her way to the top was not easy, and she wanted her students to be ready for healthy competition. Maria always had time for a meeting with her students and she took the meetings very seriously. Proof of this is that they were efficient and long at the same time. No matter what she had, all could wait. She enjoyed talking to students, explaining new concepts, opening their minds to innovative ideas. She asked for reports and manuscripts on a regular basis. When you delivered a report or a paper to her you knew that it would come back to you full of changes and comments (it was mostly black when you had written it, it was mostly red when it came back to you). She looked into every detail, nothing escaped her strict scrutiny. She could be hard sometimes, but that is because she knew that science (as a professional career) is hard, and we needed to be ready for criticism. However, in the end, she was the person you could always count on. She put all her energy and time on her students. She expected a lot from them because she gave them all she had.

Nevertheless, and above all these research contributions, Maria was a caring wife to her husband Narcís and their family. She could easily end a meeting with nice, proud, and fascinated words about her beloved son Ernest. Now that her river of life has reached the sea, we are all feeling honoured for taking part in her journey and we are grateful for her ideas and creativity, which will remain among us. Maria Rieradevall... what a nice family name for a woman who worked so devotedly in understanding and preserving rivers!

More information about the personal and scientific biography of Maria can be found at www.ub.edu/fem or at www.mariarieradevall.name.

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