

Georgina Mace (1953-2020)

Pioneering conservation biologist and sustainability scientist

Georgina Mace, Professor of Biodiversity and Ecosystems at University College London (UCL), died on 19th September at the age of 67. Georgina did groundbreaking research on assessing the state of biodiversity, on how human actions have driven biodiversity loss, and on how society might change to deliver a sustainable future for people and nature. Intellectually fearless and with absolute integrity, Georgina was also remarkably selfless: she supported and empowered countless researchers and practitioners. One of the first generation of conservation biologists, and then a pioneer for uniting disciplines to deliver evidence-based change, her work underpins conservation laws and policies worldwide, and her influence continues to grow. Nature has never had a better or more committed friend and champion.

Georgina was born in Lewisham, London in 1953 to a medical illustrator mother and a rheumatologist father along with her two brothers Peter and Edward. An early fascination for biology led to a BSc in Zoology from the University of Liverpool in 1975 and then a PhD from the University of Sussex in 1979 on mammalian evolutionary ecology. Georgina joined the Zoological Society of London (ZSL) in the mid-1980s, where she used her quantitative skills to understand the genetic and ecological processes that can drive small populations extinct. This led to a remarkable career trajectory, in which she always tackled the next obstacle on the critical path to better nature conservation, whatever field that took her into.

The first step was her work on the IUCN Red List of Threatened Species. Against advice, but seeing its importance, Georgina accepted the challenge of making the Red List more useful for conservation. Because it was compiled informally, some listings reflecting force of personality more than weight of evidence. By analyzing population ecological models, she and Russell Lande derived five quantitative criteria that could be applied transparently and repeatably to any species to assess its risk of extinction. In piloting these revolutionary criteria through the approval process, Georgina's characteristic respectful, patient, logical and focused arguments convinced those that were previously skeptical, bringing a rigor to Red List assessments which provided a robust basis to the legal protection of species. This facilitated comprehensive assessments of all species across major taxonomic groups and led to analyses of which features of species' ecology and life history made them more susceptible to human impacts and of which threatening processes were most important.

The first comprehensive Red List assessments found that 12% of birds and 24% of mammals were threatened with extinction. These were key pieces of evidence that, in 2002, prompted the global signatories to the United Nations' Convention on Biological Diversity (CBD), to commit to significantly reduce the rate of biodiversity loss by 2010. But what *was* the rate of biodiversity loss? Not enough was known. In response, Georgina led the biodiversity component of the UN's Millennium Ecosystem Assessment (MEA) in 2005, which marshalled all available evidence on the question to show how rapidly and severely ecosystems around the world were being degraded.

Over subsequent years, Georgina went on to influence the design of many of the science-based indicators of the global status and trends of biodiversity used to track progress towards internationally agreed targets; she also helped to set up ZSL's Indicators and Assessments Unit (IAU) in 2006 as a hub for such work.

The CBD 2010 target was missed: biodiversity was in free fall despite increasing efforts to conserve it. Seeing that the main problem lay in nature being undervalued, Georgina increasingly transcended disciplinary and science-policy boundaries. Her work on the groundbreaking UK National Ecosystem Assessment (2009-2011) established a 'natural capital' framework for decision-making, which viewed the state of nature as an asset. This and the 2010 Lawton Report ('Making Space for Nature') on which she also worked, started a snowball effect on UK policy as the government explicitly acknowledged that addressing the decline in nature was first and foremost an economic problem with consequences for health and wellbeing. An Environment White Paper followed in 2011 with an astonishing key commitment not just to halt the decline in nature but to reverse the trends of the past century. The world's first Natural Capital Committee (NCC) was established in 2012 with Georgina as a founding member answering directly to the heart of UK government. On the NCC's recommendation, an innovative national 25-Year Environment Plan was published in 2018. The same principles underpin the Agriculture and Environment Bills currently passing through UK Parliament. It is hard to think of another individual having such an impact on national and global environmental policies.

Georgina had a profound impact on our own careers too, as she did on countless others across all the disciplines that study the interdependencies between people and nature. She lured us, one after the other, into conservation biology, with analysis of patterns in Red List status being our gateway drug. Our first collaborations with her were such great experiences – so fascinating, so inspiring and so funny (Georgina had a mischievous sense of humor and a signature twinkle in her eye) – that we soon became hooked on the same challenges that absorbed her. At around this time, she became ZSL's Director of Science and Head of its Institute of Zoology and showed herself to be an inspirational and transformative leader and amazing role model for many, empowering those around her with a renewed sense of purpose. Her style, whether as collaborator or leader, was unique: she brought and encouraged crystal-clear strategic thinking; she listened to and supported everyone equally; and she never dominated the discussion or raised her voice (though keen observers could spot a raised eyebrow).

Despite Georgina's aversion to the limelight, she received countless awards, honors and appointments from around the globe. She became a Fellow of the Royal Society in 2002, won Japan's International Cosmos Prize in 2007, became the first female President of the British Ecological Society in 2011, and was made a Dame Commander of the British Empire in 2015 (but those who called her Dame Commander did so at their peril). After leading the Centre for Population Biology at Imperial College from 2006, Georgina set up her own institute, the Centre for Biodiversity and Environment Research at UCL in 2012, only stepping down as Director in

2018 to concentrate on research and policy. She continued working until a few days before her death.

Among her research papers in 2020, a year like no other, are an analysis showing that it may not be too late to bend the curve of biodiversity and restore some of what has been lost, and a framework to ensure that decisions about using nature do not short-change future generations. As the links between how we use nature and the current pandemic become clearer, and the momentum from world leaders to address biodiversity loss grows, Georgina has left as her legacy the tools people need in order to live together with nature. There is much still to do, and we wish beyond words that she could lead this next stage too, but she also left us with hope: as she said, *'All the evidence to date is that when societies put their minds to solving a problem, in this case biodiversity loss, they can generally do it'*.

Georgina is survived by her husband Rod, her children Kate, Emma and Ben and granddaughter Harriet Georgina.

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