

Biological extinction at the Vatican

To the Editor — In 2015, Pope Francis published an impressive *tour d'horizon* of the state of the planet's biodiversity in his encyclical publication *Laudato Si'*. It deals with many global environmental issues and, of course, powerful statements on ethical concerns about our treatment of the planet. The chapter on biodiversity ends with a powerful recommendation: "If we are truly concerned to develop an ecology capable of remedying the damage we have done, no branch of the sciences and no form of wisdom can be left out, and that includes religion and the language peculiar to it." Not surprisingly, then, the study week convened at the Vatican from 27 February through 1 March 2017 involved the Pontifical Academy of Sciences and the Pontifical Academy of Social Sciences bringing together a broad range of expertise on its topic: 'Biological extinction: How to save the natural world on which we depend'.

Speakers covered the problem, its causes and solutions. Extinction rates of well-known taxa run 1,000 times the rates at which species form as deduced from divergence rates of molecular phylogenies (Stuart Pimm, Duke University) — a number broadly comparable with the rates of recovery of species after mass extinction events (Neil Shubin, University of Chicago). Simply, if current trends continue, recovery will be measured on a scale of millions of years, impoverishing the lives of countless

human generations. The fractions of species deemed threatened with extinction suggest that 20 to 30% are in trouble already and, if current trends continue, half may be on a path to extinction by the century's end (Peter Raven, Missouri Botanical Garden).

The underlying causes are clear: we have 7.4 billion people now, projected to reach 9.9 billion in 33 years, by mid-century (John Bongarts, Population Council). All of us are not equal. The richest fifth of the world consumes half its resources. Human impacts are well beyond sustainable, consuming 164% of the planet's sustainable productivity (Mathis Wakernagel, Global Footprint Network), with shrinking forests, overgrazed grasslands, overfished marine resources, climate change and pollution all obvious signs of unsustainable use.

About two-thirds of all species occur in the tropics, often concentrating in places where the world's poorest people live (Peter Raven). The loss of biodiversity, often driven directly by poor people, is massively accelerated by the wealthy countries of the world extracting resources from the tropics and elsewhere beyond the limits of whether they can be sustained (Paul Ehrlich, Stanford University and Partha Dasgupta, University of Cambridge). This is not only an ethical problem in itself, but deprives poor people and ultimately all of us of resources on which our lives depend (Charles Perrings and Ann Kinzig, Arizona

State University). Profitable monocultures, such as oil palm, mining and climate change (Timothy Lenton, University of Exeter) are among the external forces that drive species to extinction.

Attaining global sustainability will require the attainment of relative social equality on a global scale. Everywhere, though, smart solutions offer hope — better strategies for managing fisheries (Jane Lubchenco, Oregon State University), better-designed towns (John Hoal, Washington University) and villages (Brian Heap, University of Cambridge), larger areas conserved for nature, and better connections between what few natural areas remain (Stuart Pimm). So, too, does technology, especially for the agriculture that must feed the world's growing population and for energy (Calestous Juma, Harvard University). The moral imperative to address these issues and the Vatican's commitment to better understand and deal with them can only be helpful in promoting this dialogue. □

Competing interests

The author declares no competing financial interests.

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