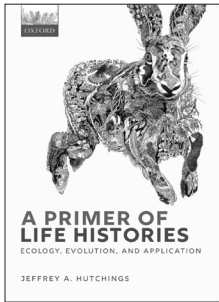


BOOK REVIEW

A Primer of Life Histories. Ecology, Evolution, and Application.
J.A. Hutchings. 2021. Oxford University Press, Oxford, UK:
226 pp. ISBN 978-0-19-883987-3 (hbk.)¹



“Embryo to egg to larvae to adult. Seed to seedling to later vegetative, flowering and pollination stages.”

The concept of *life cycle* was once interchangeable with that of *life history*. But as author Jeffrey A. Hutchings² explains in *A Primer of Life Histories: Ecology, Evolution, and Application*, at the turn of the twentieth century, the life history of species took on a broader meaning. Nineteenth century learnings from Charles Darwin’s and Ernst Haeckel’s theories of evolution and Georg Mendel’s work in genetics catapulted the concept of life history into bold new territory, extending eighteenth-century understandings of life history as descriptive summaries of species development.

Hutchings says it was Ronald Fisher’s work in 1930 that “marked a pivotal turning point in the development and application of life-history theory.” (p 3) Fisher combined existing concepts of evolution and *natural selection* (from Darwin’s *On the Origin of Species*, the evolutionary process whereby organisms better adapted to their environment survive and produce more offspring) to further deepen understandings of life histories as “probabilities of survival and the rates of reproduction at each age in a lifespan.” (p. 4).

But Fisher’s work was mathematical in nature and while it was ground-breaking, its focus on probabilities likely delayed ecological perspectives informing how we now define life history. *Ecology* is the branch of biology that considers how organisms relate to one another and their environment. This is where Hutchings’s book

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² Dr. Jeffrey A. Hutchings, a highly distinguished fisheries biologist and Professor at Dalhousie University, Halifax, NS, sadly passed away in January, 2022, at his home in Halifax, NS at the age of 63.

becomes particularly poignant, providing an overview of ways to understand the vulnerability of species to extinction, exploitation, and climate change.

If extinction assessments can be dated from the 1960s... and fishing vulnerability assessments from the 1990s... the twenty-first century has borne witness to vulnerability assessments of species to climate change. (p. 163).

Hutchings' work draws heavily on *fisheries conservation biology*, a field which he says emerged during the decade of globally prominent population collapses in the 1990s. Hutchings credits marine biologist Daniel Pauly for coining the name of the field in an obituary of one of the field's founders (and Hutchings' close colleague), Ransom Myers. Pauly defined the discipline as "devoted to identifying exploited fish populations and species threatened with extinction, and suggesting measures for rebuilding them, along with the ecosystems in which they are embedded" (Pauly, 2007 as cited in Hutchings, 2021 p. 161).

Hutchings made his mark in this field becoming prominently known for his influential research on Northern cod (a critically depleted population of Atlantic Cod in the North Atlantic Ocean). His work on the evolutionary ecology of fish has influenced sustainable fisheries policies, sourcing of sustainable seafood and recovery of species at risk and led to his recognition as the recipient of the 2017 A.G. Huntsman Medal for Research Excellence in Marine Sciences.

Over his career, Hutchings held many titles and earned many accolades, but in summary, he was a Professor of Biology and Killam Memorial Chair at Dalhousie University and held appointments at the University of Oslo, Norwegian Institute of Marine Research, University of Agder, and University of Jyväskylä. Hutchings was also a Fellow of the Royal Society of Canada and the Norwegian Academy of Science and Letters, and co-founder of the Canadian Society for Ecology and Evolution.

In *A Primer of Life Histories*, Hutchings recounts how the International Union for Conservation of Nature (IUCN) led efforts to rectify the low number of assessed marine species. At the time, plants and animals at risk were gaining recognition, but marine fish were left behind.

Why? "The fly in the ointment was that many of these fish species were commercially valuable. Disagreement was inevitable.

It often is when conservation and commercial interests collide,” writes Hutchings. (p. 154).

The IUCN, created in 1964, today remains at the global forefront of species risk assessments and protection writes Hutchings (he points to the iucnredlist.org, the world’s most comprehensive information source on the global extinction risk status of animal, fungus and plant species). As Hutchings writes, the IUCN’s work to assess marine fishes came at a time when “the world had recently borne witness to several biologically, ecologically, and socio-economically devastating fishery collapses” (p. 154).

The most prominent example, says Hutchings, was the collapse of Atlantic cod in the North Atlantic Ocean in the early 1990s. To describe the magnitude of the cod collapse, Hutchings writes:

[T]he collapse of Atlantic cod represents the greatest numerical loss of a vertebrate in Canada... [having] declined more than 90 per cent between the early 1960s and the early 1990s and, for all intents and purposes, remains at the same depressed level today. Numerically, this was a reduction of between 1.5 and 2.5 billion breeding individuals. By weight, this is roughly equivalent to 27 million humans. (p. 175).

As Hutchings explains, historical catch estimates show cod was sustainably fished for centuries at levels of less than 250,000 tonnes annually. Hutchings and Myers would show that catches exceeded 800,000 tonnes in 1968, mostly spurred by new and unregulated technology (*factory-freezer trawlers*, massive fishing vessels that haul trawls or nets along the ocean floor, then process and freeze ‘cod blocks’ on board the vessel).

The Canadian government began enforcing annual fishing quotas in the late 1970s, but much of the damage to cod was, by then, already done. In 1992, the Canadian government shuttered the commercial cod fishery. While a small commercial (‘stewardship’) cod fishery reopened in 2006, the *cod moratorium* remains in effect today.

“The most sustainable harvests today tend to be those blessed with the greatest amount of data,” writes Hutchings (p. 176), arguing the “gold standard” of data would include: information on the numbers of individuals at each age, the natural and harvest-induced probabilities of surviving from one age to the next, and the numbers of offspring produced by the average individual at each age.

Not surprisingly, this gold standard exists for few species or populations... [and] this makes it challenging to determine harvest or catch levels that are sustainable, i.e., able to be maintained at the same levels for the foreseeable future (p. 176).

Hutchings didn't know it, but once again, cod would prove to be the best of the worst examples to make his point. In March 2022, the Canadian government announced it would not undertake this year's annual cod stock assessment due to its aging marine research fleet. That's despite the federal government's commitment to rebuild the imperilled species, which today remains in the critical zone.

Globally, the aspiration of *sustainable development* was spearheaded by a 1987 UN report produced by the World Commission on Environment and Development, writes Hutchings, and today, concepts of sustainability permeate government policies, regulatory frameworks and laws. Sustainable fishing practices are further embedded in jurisdictional tools and espoused in the UN's Sustainable Development Goals (SDG 14: Life Below Water). As Hutchings notes, these tools and policies will require continued adaptation to better understand and respond to climate change – for example, through combining information related to sensitivity, exposure, and capacity for species to adapt to climate via applying climate-change vulnerability assessments).

A Primer of Life Histories was published in December 2021 by Oxford University Press and is available in hardcopy and paperback. The primer is designed for readers from a broad range of academic backgrounds and experience including graduate students and researchers of ecology and evolutionary biology. It will also be useful to a more applied audience of academic or government researchers in fields such as wildlife biology, conservation biology, fisheries science, and the environmental sciences. The primer offers hundreds of examples from every kind of species, as outlined in the book's Taxonomic Index, as well as fittingly signalled by the book's cover, which features a species-infused hare by Cornwall, UK artist Jon Tremain.

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