On receiving the Beverton Medal of the Fisheries Society of the British Isles

Daniel Pauly

Sea Around Us, Institute for the Oceans and Fisheries, University of British Columbia, Vancouver, V6T 1Z4, Canada

Abstract

The presents a slightly edited version of the acceptance speech given upon the acceptance, on July 7, 2021, by the author, of Beverton Medal of the Fisheries Society of the British Isles. The speech, after recalling a Roman anecdote about Ray Beverton, lauds the broad, encompassing nature of his work, much of which done jointly with Sidney Holt, which contrasts which the scattered nature of current work, where only occasional meta-analyses providing oases of understanding within arid expanses of scattered, disconnected irrelevancies. Seeking consilience between studies and disciplines appears one effective way to counter this trend which incidentally, mimics a societal trend toward people becoming separated from each other by ethnic, gender or other divisions.

Introduction

Dear Professor Carvalho, President of the Fisheries Society of the British Isles, members of the Society, conference participants....

First of all, I thank you from the bottom of my heart for awarding me the Beverton Medal for 2021. Anything named after Ray Beverton is serious, and your Society’s award of the Beverton Medal requires one to think seriously thought what it means.

Yes, I am truly humbled. I knew Ray Beverton, and thus I know what it means to have one's name associated with his. Before elaboration on this theme, I will, however, mention one anecdote. Ray and I attended in the mid-1980s a workshop in Rome at FAO, and we were housed in the same hotel. At the end of the workshop, on the way back to the hotel, Ray asked me very hesitantly - and in the extremely polite way that was his style - if I would mind accompanying him to a jeweler, where he intended to purchase a gift for his wife, Kathy. The point was that he had considered the possibility of being robbed – Rome had a bad reputation then – and having a 6'1" Black man as a bodyguard would be an excellent deterrent to any bag snatcher, and so it was. I am proud to be the only fisheries scientist to have served as a bodyguard to Ray Beverton.

What I am not proud of is to having misunderstood the instructions of the organizers of this conference. I proposed as the title for tomorrow's keynote "The need for synthetic studies in Ichthyology, or putting Humpty Dumpty together again," which it won't be, because tomorrow I will try to answer the question "Why do fish reach first maturity when they do?"

---


2 Given via Zoom on July 7, 2021, to the participants of the Online Symposium of the Fisheries Society of the British Isles "Fish, Fisheries and Ecosystems in the Anthropocene," Leuwen, Belgium.

I will now speak about Humpty Dumpty, who does indeed need to be put together again, a task that Ray would have agreed with and, in fact, contributed to.

**A fragmented discipline**

Our disciplines - Ichthyology and its applied, sister discipline, Fisheries Science – are old. Some 2350 years ago, Aristotle wrote up reasonable observations on fish and fisheries and may be considered to be the Father of it all. But let’s face it: there is not much about fish in the pre-Linnaean literature, as can be ascertained by consulting the three volumes of *Dean’s Bibliography of Fishes*, published from 1916 to 1923. The literature has exploded since, with hundreds of journals devoted to fish and fisheries.

To this 75-year-old man, who has been in fish and fisheries for 50 years - since beginning fieldwork for my Master’s thesis in a coastal lagoon in Ghana - it looks as if we are drowning in facts and factoids. However, these data are not used to perform the syntheses that we need to answer questions that society expects us to have answers for.

For example, in the 1960s to 1980s, FAO and NOAA published species synopses, each of which brought together ‘everything’ known about a given fish species. These were extremely useful not only for managing their fisheries or their aquaculture, but also because they re-assembled these species into a coherent whole, just as they are in the water.

*FishBase*, which most of you will know, attempts to do the same, but encoding the required information, which involves about 50 person-years per year worldwide, is constantly faced with a flood of data that threatens to drown this effort.

We need more meta-analyses to make sense of the multitude of studies reporting a few measurements made on single species somewhere.

Ray Beverton, sometimes with Sidney Holt, sometimes by himself, performed the kind of meta-analyses that I have in mind. Notably, these meta-analyses showed that the von Bertalanffy growth equation parameters co-vary in a reproducible fashion and are also related to natural mortality.

Theses meta-analyses were not as sophisticated as those we can read now, often with a farrago of alternative models and no firm conclusion. However, they inspired and guided subsequent research and still provide criteria for assessing the questionable validity of claims based on smaller data sets and outlandish hypotheses. We don’t do enough of such metanalyses, and this is one of the reasons why, in the onset of an age that will be dominated by nefarious effects of global warming, we are still debating, for example, how temperature affects fish.

---

4 This speech was held 1 year ago. The issue has become direr since...
Indeed, one recently published paper – which I will not cite here\(^7\) – proposed that temperature has the effect of reducing the maximum size that some fish species can reach while increasing the size that other species can reach. In chemistry, the equivalent statement would be that some burning is due to part of combusting substances becoming associated with oxygen, while the other part releases phlogiston. Or put differently: How can something be the cause for A and simultaneously for the opposite of A? Why such rot?

**Accuracy vs Precision**

I believe that much of what I criticize here is because we have lost track of the need for accuracy, and instead concentrate on precision (note that I couldn’t make the point in French, which doesn’t distinguish between the two terms). Indeed, I think we allow in what a friend of mine called ‘precisionism.’

Let me illustrate this point by recalling a figure I saw in *Scientific American* many decades ago, and in which the various historic methods to estimate the speed of light were compared.

What was fascinating to me is that the results of these different methods not only differed, but that their confidence intervals did not overlap. That’s when I finally, really, understood the difference between accuracy and precision. Precision, I realized, had little to do with the process one studies, i.e., the actual speed of light in this case, but only with the fiddly part of the method that was supposed to measure it.

The reason why we can now assume that we know the speed of light accurately is because different methods give the same result, not because they have narrow confidence intervals.

Consilience between the results of different methods, and even between those of different disciplines is what we need to obtain reliable results, not ‘p-hacking’! Incidentally, as very well-known German physicist described some of his contemporaries as ‘Dünnbrettbohrer’, i.e., driller of thin boards;’ we don’t want to do that.

The word ‘consilience’, referring to the ‘jumping together’ of ideas, was coined by William Whewell in the early 19\(^\text{th}\) century, but it is E.O. Wilson, who, in a widely misunderstood book\(^8\), revived and relaunched the concept.

Essentially, the notion of consilience, in the sciences, implies that every statement of a given discipline should be downward compatible with more fundamental disciplines and upward compatible with more derived disciplines.

Thus, physics must be compatible not only with its own experiments, but also needs to be downward compatible with mathematics (though sometimes, new mathematics must be invented to accommodate new physics…) and must be able to link upward with chemistry. And any new discovery in chemistry must fit connect with physics and be able to link upward with geology and biochemistry, etc.

---

7 Because I still hope that its authors may recant.
For ichthyology, this obviously implies that all our biological considerations must be not only be currently compatible with evolutionary biology, but refer to entities or processes that can have evolved – which is the reason why we don’t have fish with propellers driven by electric motors, though they would be quite efficient, especially since they have already evolved stunningly good batteries.

However, it also means that it is not sufficient, when describing something that fish do, to demonstrate, even with beautiful math and neat graphs, that what they do leads to an evolutionary stable strategy. Rather, we must also be able to demonstrate how an individual fish decide to do that thing so it - or its genes - benefit from what that decision. My presentation at this conference dealt with a problem of this sort⁹.

Doing science is working on ‘why’ – for the ‘what,’ we have artists and entertainers. When we know why something is, we have made it a particular case of something more general. In that sense, we have simplified the world. Look at the Ancient Greeks: they needed a huge array of hyperactive Gods, assisted by armies of Nymphs and Fauns constantly intervening in our lives to ‘explain’ natural phenomena. Now, we simply have the Earth turning around the Sun, geology, evolution... et voilà, all the previously supernatural phenomena are explained.

Fungi and viruses

For my part, I have always been better at joining ideas – making them jump together – than at digging deep into any one topic. This has to do with the fact that I not particularly good at math in a field that is strongly quantitative. Another constraint is that I am quite impatient, and I never saw myself generating the primary data that I needed to test the ideas I had.

Thus, following 2 years of inspiring boat-based surveys of the marine biodiversity of Indonesia, I wrote a doctoral thesis on fish growth without having read a single otolith¹⁰. Indeed, I never returned to field sampling of primary data. In effect, I became a big fungus, turning the primary production that other generates into a wide-ranging network of mycelia. You need decomposers in a healthy ecosystem...

The present times, finally, call for some reflecting on one’s position vis-à-vis current societal challenges of our time, which perhaps unexpectedly, given our advances in science and technology, is shaped by a resurgence of nationalism and virulent racism, two viruses far worse than that which has ruined our lives since early 2020.

I have tried to avoid dealing with these viruses throughout much of my life and career, because thinking about things that make people go insane is not really good for one’s scientific productivity. However, I am a Black, or as they say in Canada, a ‘visible minority’, and the massive protests in the US and in Europe as well, asserting that Black Lives Matter, have made me think, as it has many others.

---


I was reminded that, as Frantz Fanon noted, as a biracial person – yet another term – I am often forced to understand two positions, or to navigate between two sides. Throughout my life and career, this has been a tremendous advantage, and not the burden that many ‘mono-chromatics’ think it is.

However, since people cannot choose their parents, and thus their ethnicity, I would say that they should be open to ‘others’, whatever they are. And in science, this is a must: we need the ferment that a diversity of points of views, generated by people of different ethnicities, cultures, backgrounds, and yes, races and genders will generate. Because if our ideas can ‘jump together’, then they will also elevate us, and our science, and put back together the pieces of our shared humanity.

Thank you.