Why we published a paper we knew was wrong

I have to admit, we recently published a paper that was wrong. Well not totally wrong, more like incomplete. This is how science works we put something forward and people say if they think the idea is solid or needs work. If the latter they hopefully do something productive, like amend the formulae to be more generalizable. This is what I am hoping happens. Let me tell you about my errant paper.

This paper started as a chat during the closed door session of my doctoral defense. The day was Good Friday, 2008 and I had just given an hour-long presentation on the biogeography, evolution and conservation of Melanesian fishes. My committee member, Les Kaufman, asked me how the genetic approaches that I had used in my dissertation could help with the shifting baselines of coral reefs.

Shifting baselines probably require a whole blog post on their own, but I'll briefly outline the idea here. I own some land behind my grandparent's house. My dad used to play there when he was growing up, and I played in those same woods when I was a kid. A year or so ago we were sitting around over Thanksgiving and my dad mentioned that he hadn't seen any bobcat or fox scat in the woods in a long time. I remarked that I didn't know that those species were ever in our woods. When my dad was a kid exploring those woods his baseline for the predator community included mesopredators, when I was first exposed to those woods 20 years later my baseline was set without those animals. I never knew that the woods were missing them because they had become extirpated before I had a chance to recognize that they existed. **This is the shifting baselines phenomenon – each generation defines the 'natural' state for an area as the state that area is in when that individual first explores it.**

Shifting baselines have been recorded in a variety of environments including rivers in China, coral reefs in Indonesia, Mexico, and Florida and pelagic fisheries in the Gulf of Mexico. However in the majority of those cases the reports are fundamentally qualitative*. I come from a population genetics background, and if genetics do one thing well it is giving quantitative answers. So Les challenged me to see if we could use these qualitative tools to help give some rough numbers.

What we came up was this. Imagine a group of people living off of a reef. Now imagine that something bad happens to that reef and a fish species becomes extirpated**. How much migration would be necessary from healthy areas into that perturbed reef for that population to be reseeded in enough time that people would remember that those species were once found on that reef?** This is where we apply the quantitative (numbers of fish) to what has previously been largely qualitative (interviewing people about if they remember the fish).

Population genetics is really good at quantifying number of migrants per generation, and with a little algebra we can translate those numbers into number of migrants per human generation. Now what we said was that on average bigger species are more memorable than smaller ones, so there's going to be an inverse relationship between the number of migrants into an area and body mass. So Les and I came up with this formula

$$N = 10M^{-1}$$

where N is the minimum number of individuals of a particular species necessary to forestall the shifting baselines syndrome, and M is the mass of the species

We also put in some caveats about kinds of species (diurnal vs. nocturnal) and a minimum threshold of migration (once every 3 human generations). **However I will now fully admit in front of the Internet that this is wrong. Or at least incomplete.**

We know that there are a lot of other factors which could influence how memorable a species is (and memory in this case is going to be the inverse of migration). Things like coloration, habitat, danger, degree of deliciousness, cultural or monetary value and probably a host of others are going to factor in. I invite people to take a look at our paper and write their own (either with us or on your own) about how we can improve it. Be civil and remember the more thoroughly we can work this out, the more conservation good we'll be able to do.

Now scientific debates are not always civil *cough SLOSS cough* but I'm hoping that people who are critical of this are not going to just trash it without adding anything substantive. I am also hoping that by Les and I not believing we nailed it 100% on the first pass will allow us to be open to hearing good ideas. Also, neither he nor I are jackasses so hopefully that will factor in too.

So have a look at it here and tell us what you think. Try thinking about it in your system; try modifying the equation to include salient factors in your own environment. Apply it to your own data set and tell us if it helps you make useful inferences. My main hope is that even if we got it wrong, this paper will help get people thinking about ways to improve the science that they do, and to think about conservation in a slightly new way. If you hate the paper but start doing the other things then I'll call it a win.

*Julia Baum's work is in stark contrast, and her quantitative approach to shifting baselines and conservations serves as a real high benchmark in marine conservation

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1 Comment

Jacquelyn Gill
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I really like this post as an example of how papers capture the process of science, which isn't always appreciated. People often decry high-visibility papers that end up being wrong (or partially so) (like many in the Big Three journals), but the fact that they propel discussions science forward is important. It's even better if YOU can now go on and publish the next paper and say "here is another approach."

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