

Latitudinal Diversity Gradients in Freshwater

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Introduction/Methods

I did a literature search using Web of Science, trying to find as many studies of latitudinal diversity gradients (LDG) in freshwater as possible. The search term was *latitud* diversity freshwater*. That search found 228 articles of which I saved 50 after reading the abstracts. Laura added several articles as well. I compiled the results in a table, for those studies that had valid tests of the LDG, and classified them by taxon, type of waterbody, type of gradient, response variable, and continent. I also found a few elevational gradient studies, which I've ignored for the moment. Almost all the studies looked at richness, but there were 2 or 3 studies that looked at some other diversity metric (which incorporated richness), 1 study that looked at functional diversity, and 2 or 3 studies that looked at intraspecific genetic diversity. I have lumped those together for the moment. A study could have multiple rows in the table if it reported gradients for different taxa. I just classified the LDG results by whether it declined with latitude, increased, had a peaked/unimodal pattern, had a trough/U-shaped pattern, or no pattern, rather than reporting the slope.

Results

Overall, the majority (58%) of the studies found a “standard” LDG, which I define as richness declining with latitude as you go away from the equator. This is probably pretty close to what meta-analyses that encompass terrestrial and aquatic systems have found, but might be a little less than expected.

Table by number of gradients

```
##
## standard opposite unimodal   trough   none
##      36         8         4       1      13
```

Table by proportion

```
##
## standard opposite unimodal   trough   none
##    0.581    0.129    0.065    0.016    0.210
```

In addition, I classified the results by taxon and by type of waterbody. The first figure below shows that the breakdown is pretty consistent across taxa, though invertebrates seem disproportionately likely to show a non-standard pattern. The second figure shows that streams (including all running waterbodies) may be more likely to show a non-standard pattern than lakes (including ponds, etc.) though there are few studies done only on streams. I had to lump a lot of studies together as “freshwater” because it either included both streams and lakes or it was not adequately clear if it focused on one or the other.

Contingency table by taxon

Taxon	plant	5	1	0	0	2
	vertebrate	14	2	0	0	3
	invertebrate	13	4	2	0	8
	microbe	4	1	2	1	0
		standard	opposite	unimodal	trough	none
		Latitudinal Diversity Gradient				

Contingency table by waterbody class

Waterbody Class	stream	2	2	0	1	2
	lake	10	2	1	0	1
	freshwater	24	4	3	0	10
		standard	opposite	unimodal	trough	none
		Latitudinal Diversity Gradient				