Comparing the end-Ordovician and end-Devonian mass extinctions can be used to examine how major changes come about in the fossil record. The paper found that while the end-Ordovician and end-Devonian had similar losses of diversity, they differed in how great the ecological change was immediately afterward. The end-Ordovician had a significant diversity loss, but no real change in the general types of animals that formed the ecosystems. The end-Devonian, meanwhile, ushered in a new type of ocean. This paper defines four paleoecological “levels” of decreasing impact. The first level indicates the loss or addition of an ecosystem; the second implies a reorganization of an ecosystem; the third means community-scale changes and the fourth is shown by taxonomic turnover in the same niches. The Ordovician-Silurian transition saw a re-radiation among common taxa, representing fourth-order ecological changes, and some brachiopod turnover (considered a third-level change here). Importantly, while reefs suffered a drastic drop in diversity and extent, they rebounded fully and comprised the same faunal associations as before. The Devonian-Mississppian transition, however, amounted to a dramatic ecological shift in the marine realm. Reef-building organisms from the early Paleozoic went extinct, while the iconic placoderms were decimated and the survivors confined to freshwater environs. The loss of reefs and large predators changed the oceans significantly, amounting to a second-order ecological change along with third-and-fourth order ones.

The qualitative presentation of the data made the paper readable and accessible. I had no significant problems with comprehension, and absorbed the paper easily. I liked that the paper ignored conventional paper subsections and let the writing flow easily from the abstract through to the discussion. The question was also definitely worth asking; how do mass extinctions differ, besides their magnitude and cause? Often researchers pursue the extinction mechanisms, particularly after the influential Alvarez hypothesis, and not enough information is given to the aftermaths and recovery periods. I found the paper’s emphasis on lasting impacts to be useful for interpreting the significance of mass extinctions in the fossil record. I hope the authors followed up their conclusions with similar examinations of other mass extinctions; I’d like to know how they might re-rank the five big ones based not on diversity loss but on ecological impact. I also wonder how the sixth mass extinction might chart in the future?

Unfortunately, there was no discussion whatsoever of the methods used by the researchers, so I have no idea how they arrived at their conclusions. Was it all qualitative, or was mathematical or statistical sorting used? What exactly was taken into consideration? Was the difference across the period boundary the most important criterion? Are the terms and orders common terminology in paleoecological studies, or were they first applied in this paper? The terminology was unfamiliar and it was unclear whether it was part of the subdiscipline’s discourse or was being proposed for use in this paper. Also, even a vague discussion of possible mechanisms and evidence thereof would have really helped me to situate all these changes. How are community and community types defined, too? I found those terms to be opaque, so I am not sure I fully understood the definitions of third-order and fourth-order changes. I also would have liked to have seen a brief discussion of possible mechanisms in their discussion sections; both extinctions were not abrupt events and so probably incorporate multiple interlocking causes, but it would have helped me to situate their importance in my own understanding of the Paleozoic. Uniting mechanisms and impact is what I find most interesting, so I was disappointed that this paper did not address how possible causes relate to their findings.

Only one figure was present in the paper, illustrating how Sepkoski’s three evolutionary faunas shifted their distributions spatially over time. The figure clearly shows the dramatic excursion of Paleozoic fauna onto the nearshore at the end-Devonian, and the lack thereof at the end-Ordovician. The Cambrian fauna encroached into shallow waters during both mass extinctions. I am a little puzzled by the dashed Cambrian line, though; I assume it veers off the chart because the fauna were driven into deeper waters, but this isn’t made explicit.