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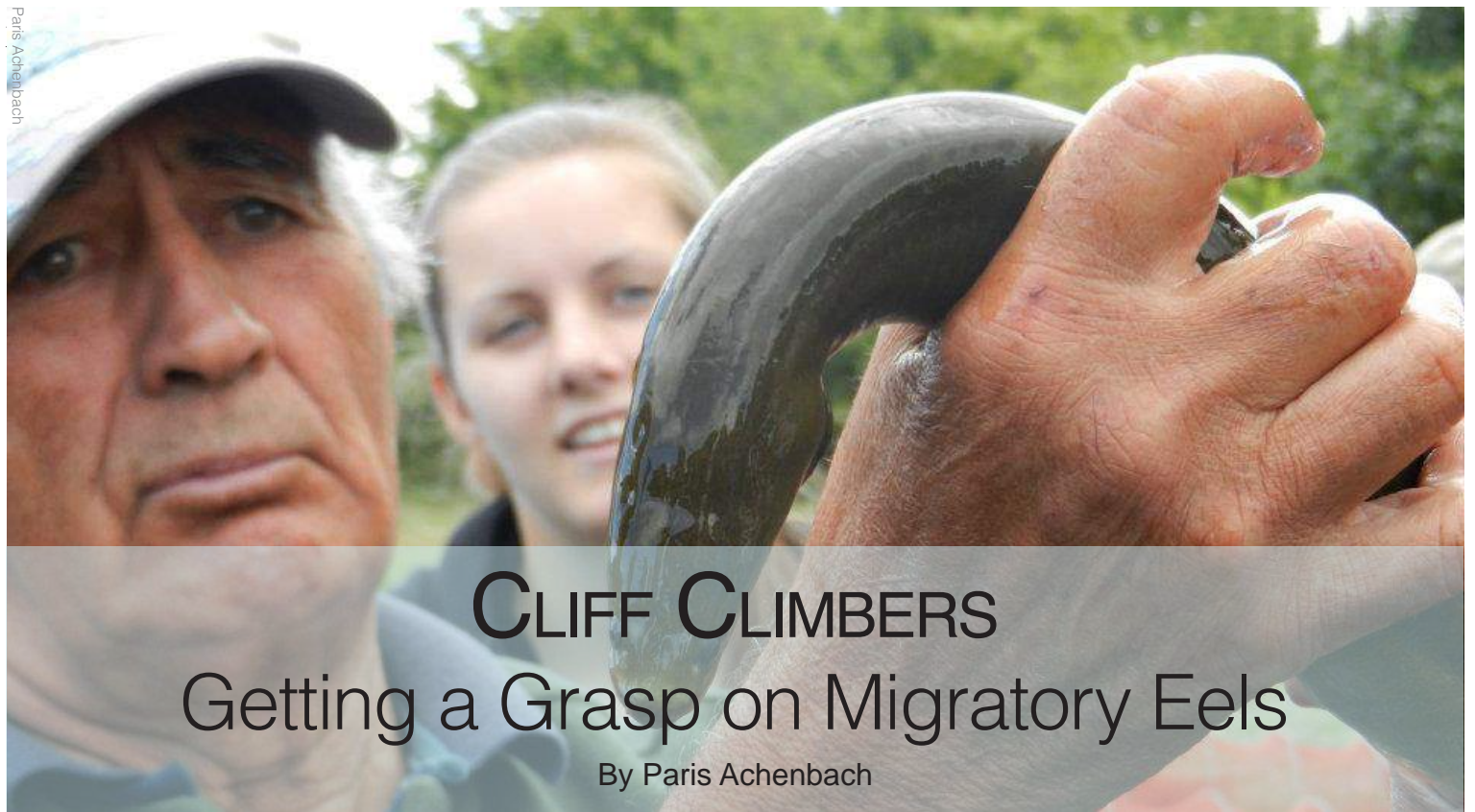
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CLIFF CLIMBERS

Getting a Grasp on Migratory Eels

By Paris Achenbach

It was the purest water I had ever seen: crisp, clean, and not a piece of sediment or grain to taint it. We followed this tranquil river upstream, as it wound its way through the North Island of New Zealand, until we began to hear a rushing sound. The noise became louder and louder, and right before I deemed myself crazy, there it was: At a 600-foot vertical drop, the Tarawera River came crashing over volcanic rocks into a glassy pool below.

The waterfall was awesome in every sense of the word, silencing every member in our party. Then, one of our study abroad program's instructors said something even more astounding:

"The eels can crawl up that, you know," he told us. "They migrate up and over that waterfall before they're even six inches long."

When people ask me how I – an Oberlin student, a geology major, etc – possibly wound up studying eel migration for five months in New Zealand, I think back to this moment: Standing at the base of the most epic waterfall I'd ever seen and trying to conceive how an organism could sliver and crawl its way up six hundred feet of gushing water. The scientific side of my brain (and

the imaginative side as well) exploded with questions: How did they do that? Why did they do that? Eels migrate?? How is New Zealand so full of mysteries?!

Apparently, I wasn't the only one to wonder about the oddities of this species; I soon became exposed to a whole world of research, myths, and beliefs about the migration of "freshwater" eels. The term "freshwater" is perhaps misleading, because New Zealand eels are actually born in the ocean, thousands of miles away from any

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river or estuary, and migrate as wormy babies through some of the fastest ocean currents in the world. Once they reach New Zealand, they migrate up the rivers, over waterfalls, and into the cold mountainous lakes where they stay for approximately 40 to 100 years (preposterous, I know) and

grow to be eight or nine feet long (also preposterous, and somewhat terrifying). Then, when they've reached maturity, they head back down the river, out to the Pacific Ocean, and all the way to Tonga, where they each have approximately one million offspring and subsequently die.

It's quite the existence, to say the least. Eels are bizarre, enigmatic creatures, especially in New Zealand, which itself supports a fascinating array of biological taxa. There are three different species of freshwater eel in New Zealand, but nineteen worldwide; all of them make migratory journeys that could humble Chris Columbus.

The day after we hiked to the waterfall, my study abroad group had the chance to see migrating baby eels in action, with the help of an old Maori man named Billy. He led us down a little path on the river to the base of a hydroelectric dam and into a clearing that had a white, plastered tank and several buckets.

I peered over the tank's edge. Inside were approximately 1,000 baby eels, swimming and squirming and slithering over each other in the clear water. If I hadn't known any better, I would have thought the tub was full of lively ramen noodles. I stuck my hand into the water, and they all swam away; some of them climbed up the

side of the tub, risking the lack of water in an attempt to escape to freedom. What the eels didn't know was that Billy was saving their lives.

Billy, a sun-kissed and crinkly man in his seventies, has carted baby eels in buckets over this hydroelectric dam once or twice a day, every day, for nearly half a century. Without him, all those eels would never make it to the lakes, and perhaps never grow to be much bigger than a noodle-y teenager, barricaded from their migrational destination by the dams.

Despite Billy's daily heroic efforts, the eel population has been rapidly declining over the past few decades, in New Zealand and in the rest of the world. Billy has witnessed it himself; eels trapped and killed in hydroelectric dam turbines, with fewer and fewer turning up each year from the ocean. There's the additional problem of overfishing, and perhaps the changes in weather patterns associated with climate change, which could throw off the eel's migratory cues. No one knows for sure, though, not even scientists who have been studying eels for decades.

One positive in the otherwise dismal situation? The eels that get trapped in the turbines provide a great resource for scientists, who otherwise have a difficult time capturing and studying the evasive fish. There's a unique story that's imprinted in the bones of every eel – specifically in their otoliths, or ear bones. As an eel ages and travels through the oceans and rivers, it deposits a growth ring in its otolith; in that ring lies a specific combination of elements that reflects the environment in which the eel inhabited at the time. If there is a higher ratio of strontium to calcium, for example, then at the time the growth ring was made, the eel was probably still migrating through the ocean, because fish incorporate more strontium into their bones in saltwater than in freshwater.

For the rest of the semester in New Zealand, I dedicated my research project to this: eels, otoliths, migration, and the growth rings the eels deposit. I had two pairs of otoliths, one from a longfin and one from a shortfin eel, both of which died in a turbine in the Tarawera river. By counting their growth rings under a Scanning Electron Microscope (SEM), I was able to make estimates for how long they lived. Inevitably, I also found things I hadn't known I was looking for: strange pores in the shortfin's otolith, and distinct rings within rings – perhaps showing seasonal, or even daily, deposits in the bone.

Either way, my project proved to be challenging, and by the end, I seemed to be left with more questions than I had started with. How do we know that one ring is a “growth” ring, and not just a reflection of starvation, or a measure of the water temperature and pressure of the eel's environment? How do eels know where to go when they migrate? Are their migratory routes and timing determined by lunar cycles, climatological cues, or the Earth's magnetic field? And what if human actions -- through climate change, hydroelectric dam construction, or overfishing -- are causing their extinction? The eels left me conflicted: I was convinced that they were somehow performing magic and yet, clearly, as a scientist, I also know there has to be an explanation.

I left New Zealand to migrate back to Ohio with most of my questions still unanswered. Looking back, I sometimes wonder if it was even real – the pure water, the exhilarating landscape, the research of a nine-foot long slimy animal that so captured my interest. New Zealand and the eels seemed almost too mystical to be true, something that I must have made up. Yet they exist, continent and creature, as not just a reality, but a product of nature's vast and beautiful possibilities. ●

