A Different Kind of Water Music

by Kyrie Newby

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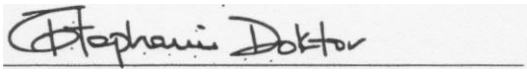
Approved by  Date _____
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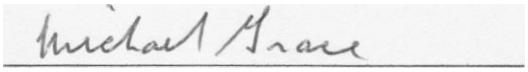 Date 5/8/21
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A Different Kind of Water Music

Sound. Waves. Vibrations. Wind. Loud, quiet, bustling, silent, human, nature, new, old, water. What is music? What are the sounds we associate with listening to the city, the park, or the ocean- and are they music? What other worlds of sound are out there, just waiting to be heard? As soon as I was old enough to crawl, I moved towards any river I could hear. I'm sure I scared my parents half to death, and I even fell into Boulder Creek once, but the sounds of the rushing water brought me such joy that I just had to get closer. Another sonic memory I have is that of crying in response to a simplified piano version of Beethoven's *Ode to Joy*. It's hard to explain, because I was only 5 years old, even younger when I crawled towards the rushing mountain rivers of the Rocky Mountains, but I felt the same sort of spark, the same sort of emotional jolt that left me breathless in a way that that felt so full of emotion I couldn't help but cry; a sense of fullness and completion in a way that was so hollow I can recall feeling every emotion I knew of at the time flowing through me all at once.

Nature and sound are two universal experiences of human biology and evolution; we have always existed within nature and acoustic physics are a part of how we define the universe. Even without the ability to hear, in the traditional sense, the sense of soundwave vibrations is something every living organism has evolved alongside with. Music and sound are so much more than what we know of as our sense of hearing; if we consider only what we understand to be hearing, then fish are as deaf as Beethoven was towards the end of his life. This reveals the problem with our definition of hearing. We are made of water, and all life on Earth began in the ocean, where sound moves very differently than in air. In this way, water is both a universal and

a uniquely personal cultural experience- my sister has thalassophobia (a great fear of the ocean) and audibly cringed when I showed her this video, but she also loves the rain more than anyone I know. Music and nature exist within each other and create entirely new worlds of sound.

In 1719, George Frideric Handel was commissioned by King George I to write music for a concert that would take place on the river Thames, resulting in the famous piece now titled *Water Music.* As the sounds of the trumpets, oboes, and bassoons traveled from the barge out on to the water, I can't help but wonder how confused the fish in the river must have been. A strange thought, or, at least unusual, but I feel it's a fair question- sound moves 4.8 times faster through water than it does through air, so sounds are perceived as louder. Acoustics are based on physical properties, and because the physical properties of life underwater are so different from life on land that the sensory properties of fish and other marine animals are uniquely adapted. Fish also use their sense of hearing as a sense of balance and navigation, so if additional sounds are present in the water, it becomes more difficult for them to orient themselves.

On the other hand, however, certain sounds have been known to have a calming effect on fish in stressful situations such as aquaponics or other captive environments. This highlights the key difference in ecoacoustical study: anthropogenic, or human-made, versus passive, or "natural" noise. Anthropogenic noise can refer to music, but also to the sounds of boats moving across the ocean, or the constant drone of a cityscape on a coast. It is almost impossible to completely separate the two because of how radically humans have changed the Earth. We're now in the geological age considered the Anthropocene because of how much we have fundamentally altered our planet in all of its living and nonliving systems. So, how are the two types of sound connected in ways beyond simply the physical clashing of soundwaves of a small

orchestra on a boat and the sounds of the river Thames? The answer comes with human expression and curiosity across hundreds, if not thousands, of years.

I grew up nowhere near the ocean, but I have always heard it calling my name. This is, without a doubt, an *incredibly* cheesy statement, but I've yet to come up with anything else that seems to fit as well as the ocean tapestry that has followed me to every room I've ever lived in. The rolling of the waves, the seaside cliffs, and the rushing of a mountain river, have all been portrayed through art, music, writing, movement, and all other forms of creative expression innumerable times. No matter where you live in the world, there is a similarity among every human being relating to water. 40% of the entire global population lives within 100 kilometers of a coast, and the rest of us, by default and biological necessity, aren't far from a water source, whether it be a major river, lakes, reservoirs, or aquifers.

Water is necessary for life, and not only in terms of survival: how many videos on YouTube do you think there are that contain calming water sounds, rolling waves, or babbling brooks? A quick google search reveals more than 22 million results. We have fountains in our gardens, ponds in our parks, and aquariums in our homes. Water is a commonality among humans either out of biological necessity or other cultural means, but it is also an entirely other world, something seemingly incomprehensible and relatable at the same time because it is so far removed from our own understandings of what life is. Light is refracted through it, soundwaves move strangely through it, and it holds our history, horrific and beautiful and everything in between. The same ocean that provides us with beautiful sunset pictures on Instagram once sailed enslaved African peoples to the "New World." Art concerning water is a mix of all of these conflicting and complementing emotions; it is a creative attempt at explaining what above

water and underwater is and an ever-changing description of how we sense water: how it sounds, how it feels, how it gives and takes, and how it changes.

Water in programmatic music has been written in western art music for centuries, and the similarities among pieces from entirely different eras and countries are able to show similar sensory experiences across time and peoples. I decided to put several of them together to compare them and blur the lines among transitions to create my own depiction of water, the ocean, and the flowing sounds of nature. A common technique is the use of rapidly ascending or descending scalar motifs to represent the movement of the water, either in a cyclical fashion to represent waves or in a continuous fashion to represent the movement of water through a riverbed. “Flowing” was the most prevalent term I found myself using to describe the style of the pieces I was listening to, which was a major reason I was able to put pieces of each work together so smoothly. In particular, the arpeggiated motif from Britten’s *Dawn* from *Four Sea Interludes* allows the listener to feel as if they are floating among the water, perfectly in sync with movement: turbulent, peaceful, or otherwise.

Many of the pieces I studied reminded me of the constant rippling of light that I’ve seen during the few times I’ve been snorkeling on reefs. The use of instrumentation, timbre, and texture aurally described this image so well that I could vividly see the constant diamond-like patterns that the light made as it refracted into the seawater when I listened to Ravel’s *Un Barque Sur L’ocean.* The direct connection between the image of light rippling through water and the rolling left hand in the piece made me realize that a visual component would be necessary to convey the feelings I was experiencing. I encourage you to let this music paint a picture in your own mind about the movement of waves in the sunlight.

Music allows us to connect with the elements of nature in a way that we are often separated from; it creates a link between ourselves and nature in a way that reminds us of our connection to all the lives around us, human and otherwise.

Humans have studied music for a very long time. We have also studied the natural world from practically the very beginning of our species. But, what about the combination of the two? Well, as it turns out, humans love to put things in boxes, and the Ecomusicology Review journal published its first volume in 2012. Ecomusicology is defined as "the study of music, culture, and nature in all the complexities of those terms," and ecoacoustics, an even newer academic creation, studies "the complex relationship between sounds and the ecological processes." Because these areas of study are so new, I had to dive headfirst into the base idea of what my project was aiming to do- what question was I trying to answer? I had to get out of the idea of putting things into boxes and just start finding both music in water and water in music.

The is more to the ocean than meets the ear, and the new disciplines of ecoacoustics and ecomusicology have had a large impact on the understanding of individual ecosystems and populations around the world. These disciplines will continue to grow as people keep asking the questions "How does the environment change music?" and "How does music change the environment?" In addition to our spatial understanding of what ecosystems look like, the acoustical habitat theory states that habitats are "composed of the [living] and [nonliving] sounds [used] by a species to learn about their environment." This theory proposes the combination of both anthropogenic, or, human-based, sounds and natural sounds, which are referred to as anthrophony and the combination of biophony and geophony, respectively.

To understand what this means, imagine the ecosystem of the pond down the road in

Monument Valley Park. It doesn't only include the pond and the grassy area surrounding it, but it also includes the sounds of all of the birds in the trees and the buzzing of the insects (biophony), the sounds of the cars from I-25 and the people walking by on the Monument Creek trail (anthrophony), and the sound of the wind blowing the snow through the trees (geophony). Each part of the acoustic niche is in a unique balance with the others, but the balance is almost constantly changing because of how quickly humans are increasing the amount of sound pollution.

In bony fishes, the sensory perception occurs with the adaptation of otolith stones covered in cilia, or small hair-like structures, that can sense the movement of soundwaves in the water. Sound moves through water almost five times faster than it moves through air, so fish need more sensitive sensory abilities to accurately perceive the sounds around them. Just like in humans, the sense of hearing in fish is also directly linked to balance and is vital for their navigational abilities. As human noise increases, it becomes more difficult for them to differentiate and identify sounds, especially those that are quieter, which usually include the sounds of other fishes or the ambient noise of the ocean. The importance of ambient sounds and sonic interactions between smaller organisms has been shown in a study that was able to *bring back* fish to an otherwise dead coral reef by using underwater speakers to play ambient noises of a healthy reef.

In order to further understand and study this dilemma, I conducted an experiment in the Florida Keys during November of 2020 looking to answer the question: does the abundance of soniferous, or sound-specific, fish decrease as sound waves become louder? To test the effects of sound speed on soniferous fish abundance, three diver surveys were conducted at six locations

across two sections of reef at Looe Key. The results showed a strong relationship between temperature and underwater sound speed, with hotter temperatures creating louder soundscapes. The reef with higher sound speed had lower numbers of all fishes, including soniferous fishes, and showed a possible exponential decay pattern between sound speed and fish abundance in coral reefs. The strong correlation between temperature and sound speed suggests that the global warming of the ocean may have significant impacts on soundscape volume. In turn, this could lead to decreasing abundances of all bony fish on coral reefs in Florida.

My findings, while significant, were somewhat disheartening. An exponential decrease in fish abundance was shown with an increase of sound speed that was directly linked to increasing temperatures. This alludes to the possibility of major problems in fish populations as the impacts of global warming continue to change the chemistry of our oceans. Water provides life for all living beings on Earth, and as the ocean warms, the life in it may continue to decrease. The beauty of the fish that I saw during my experiment was unparalleled and difficult to describe with only words, so I turned to the music about water and the sounds of the water itself to express the great smallness, elegance, malleability, and infinite existence I found myself in while swimming through the choppy waves.

When you snorkel for the first time, you quickly realize just how different the underwater world is. All of your senses have to be altered in order to understand the new situation, and you almost have to trick your brain into believing that you're not going to drown, despite the fact that your head is under the water. Smell is impossible, touch and hearing become distorted, sight is limited to goggles that often fog up, and salt is the only taste you get. However, this distortion is part of what makes it so incredible. It's like being on an entirely different planet,

where the cold makes you want to swim faster, and the bottom is nowhere in sight. You can hear the rushing of the water against your ears, and also, oddly enough, the strange sort of whistling sound that comes from the mouthpiece of the snorkel. It is not dissimilar to the shape of the opening on the head joint of a flute, which is used to direct the movement of air in order to create the instrumental sound. When I listened to the audio of the videos that I had taken during my snorkeling sessions in both the Florida Keys and the Sea of Cortez, I was disappointed by the whistling sound, thinking that it was taking away from the sounds of the water and the bubbles around me, but the more I listened to it, the more I realized that the creation of a tone from a human invention to experience the underwater world was somewhat astonishing. It was a sort of forced combination of technophony and biophony on a micro level, and I could see the reaction of the fishes that I was close to in the videos.

The feeling of performing brings a similar kind of anxious but thrilling experience, with your brain focusing on too many things to count and all your senses altering your experience in a space just slightly separate from reality. I've learned, over time, just like when I'm underwater, how to calm myself with invisible breaths and tranquility of the muffled quiet around me as my fingers begin to feel the keys moving underneath them. In order to fully understand one of the water pieces I was studying, Gaubert's *Sur L'eau*, I decided to perform it, both here in this concert hall and on a ship in the middle of the Gulf of Mexico. They were certainly different experiences, but the comparison allowed me to think about these odd sorts of similarities between being surrounded by ocean waves and being surrounded by sound waves. My performance of *Sur L'eau* and its recording served as my main source of inspiration and recorded material to be used in my piece, which you'll hear at the beginning and the end. As we listen and

watch, I hope you can feel the connection to the sounds of nature, each other, and the link we have to the water that we all came from.

I was able to create something new from the music and sounds of and in the water in a way that enabled me to put together a complete experience of "underwater" and everything associated with it. As a response and a call to both my experiences and the findings of my research, I made an experiential realization of the haunting, breathtaking, and alien nature of a world that we can't hear. It's certainly a different type of water music.