

CERATONOVA SHASTA

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ABSTRACT

Ceratonova Shasta is a two-channel fixed media composition featuring the sonification of microbiome data. All sound gestures made in the piece sonify measurements of a parasite spore sampled from 2008-2016. This parasite (*ceratonova shasta*) resulted in particularly high mortality rates at an index site located in the mainstem of Klamath River, where it intersects with Beaver Creek in Northern California. The sound content and formal procedures are influenced by this single data set on both a macro and micro level. Peaceful and distressed sound characters represent the life and death of the fish within this delicate microbiome. The composition can be found at: http://jasonfick.com/Jason_Fick/Ceratonova_Shasta.html.

1. GOALS AND AESTHETICS

This piece is the first in a series of collaborations with the department of Microbiology at Oregon State University. The initial goal of the project was to create an artistic commentary on the parasite data collected for a concert performance in 2017 but has extended to include future sonifications as a method to learn more about parasite infection: to uncover patterns through sound that might not be seen with traditional methods.

1.1. Motivations and Composition Choices

This composition is entirely driven by the sonification of nine years of microbiome data. The sampled data measures the amount of parasite infection (*ceratonova shasta*) at an index site located in the mainstem of Klamath River, where it intersects with Beaver Creek in Northern California. In some cases, this infection resulted in extremely high rates of mortality of salmon at the index site.

I desired to depict the varying levels of mortality through aggressive and calming musical gestures. Each of these gestures is devised of several layers of sound characters intended to mimic the many layers one would expect to find in a large body of water. While a majority of the sound characters are busy in nature, a conscious effort was made to combine gestures that have great variety in spectral content, spatial positioning, and amplitude balance.

In addition, the narrative of the piece represents the life cycle of these fish over the testing period. I choose to project a calming mood during the points of low infection and a more aggressive and uncomfortable state during high mortality rates.

2. TECHNICAL DISCUSSION

An extreme amount of variability exists in the data collected from this index site. There are long periods of low infection, in which the values stay at 3.0 or below and other shorter moments when the values jump to 900 and above (in which 90% of the fish died). There are 447 index values ranging from 0.0 to 1092, with a majority of the numbers occupying the extreme registers.

Ceratonova Shasta uses this single data stream as its sonification source (parasite infection level), but it is applied on both micro and macro levels. On the micro level, each individual sound event in the piece is influenced by the data series, whether the set is directly applied to a sound parameter or series of parameters, scaled, or augmented through additional processing. In many cases, the data stream is applied in a linear fashion to various effect parameters to influence change overtime (grain density, grain length, filter cut-offs, pitch variants, etc.). The audio source material is comprised of processed samples that are constructed into sound characters that are then shaped into intricate textures. Example sound characters include low rumbles, busy high frequency chatters, dense rattles and rustles, water-like droplets, among others. In many cases, these sounds are used as motives and return during characteristic formal moments, namely during points of high and low mortality. The sound samples used are all of things breaking (egg shells, aluminum cans, tiles, and a milk carton). I built a tool to read, edit, and alter playback speed of the data in Max/MSP, as well as patches to scale, augment, and map the values to meaningful parameters. In some cases, the playback speed was varied to maximize artistic result. The sound modification tools consist of granulators, filters, and pitch shifters all built by the composer in Max/MSP.

In addition to the localized gestures being influenced by the data stream, the activity intensity and emotional essence of the composition are related to a linear timeline derived from the index values. The piece is five minutes in length. All 447 index values are addressed, with each new data point occurring every .671141 seconds. Using an activity timeline in this manner provided creative opportunities to design aggressive and active sound during moments of high mortality and less active and calming music during points



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of low infection. The seven instances of high mortality (0:00; 0:23; 0:49; 2:54; 3:25; 4:06; 4:49) are represented by musical extremes in amplitude, textural density, harsh frequency content, and emotional content.

3. REVIEW OF LITERATURE/RELEVANT WORKS

Ceratanova Shasta seeks to present a creative and narrative representation of a particular data set of microbes. There is a growing trend in the makers and circuit bending communities to build devices and generate music based on microbiome data, such as Energy Bending Lab's, *Non Human Rhythms* and the various musical projects made by BiotaBeats. In both of these examples, the music is commercial in nature with driving beats in 4/4, repetitive harmonic progressions, and homophonic-dominated textures. My composition falls into the computer music and electroacoustic genre. Its treatment of subject material connects more closely to Stephen Taylor's sonification of genetic data, specifically in those works that feature electronics, such as *Indian Hedgehog*, *Writhe*, and *Sonic Hedgehog*. In each of these compositions, the composer sonifies multiple streams of DNA sequences through vivid aural manipulations and presents intricate sound textures and goal-driven gestural progressions.

A review of recent ICAD conference compositions show composers have sonified data from the stock market, atoms, spatial ambisonics, weather, and various other environmental data. *Ceratanova Shasta* is a hybrid in musical style between the sound mass-based sonifications found in pieces such as *Atom Tone* by Jirí Suchánek and Stephen Roddy's *Sonification: The Good Ship Hibernia* with the more gesturally-dominated shapes seen in Natasha Barrett's *Topology Chamber 2*.

4. USER FEEDBACK

Because the purpose of this composition was to present creative interpretations of a single data set, composer reactions and feedback to the values, and the initial perceptions of their sonifications was a crucial part of the design process. In many cases, feedback from early improvisations informed the current shapes of the sound characters. Upon preliminary hearings/improvisations, alterations were made to the mapping or processing of the data set to better suit the artistic aims of the project. Example modifications include altering the scaling factor or algorithmic processing, changing the reading/playback rate of the set, or simply applying the pattern to different parameters. Furthermore, additional feedback from others was taken under consideration during initial draft, specifically in the granular processing during the more aggressive sections.

Further projects are in development for the microbiologist in which sonifications can broaden our understanding of infectious spores.